



WORLDWIDE EQUIPMENT GUIDE



TRADOC DCSINT Threat Support Directorate

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Introduction

This Worldwide Equipment Guide (WEG) serves as an interim guide for use in training, simulations, and modeling until the publication of equipment FM. The WEG supports the draft OPFOR FM series (100-7) for the Contemporary Operational Environment (COE). It provides the basic characteristics of selected equipment and weapons systems readily available to the OPFOR, and generally listed in either *FM 100-60, Armor- and Mechanized-Based Opposing Force: Organization Guide* or *FM 100-63, Infantry-Based Opposing Force: Organization Guide*. Selected weapons systems and equipment are included in the categories of infantry weapons, infantry vehicles, reconnaissance vehicles, tanks/assault vehicles, antitank, artillery, air defense, engineer and logistic systems, rotary- and fixed-wing aircraft, and communications equipment.

The pages in this WEG are designed for insertion into loose-leaf notebooks. Since the guide and current updates do not include all possible OPFOR systems identified in the OPFOR FMs, additional equipment sheets for those systems will be published periodically. Systems selected will be keyed directly to baseline equipment contained in the 100-60 series and substitute systems in the appropriate substitution matrix. The WEG is published on the worldwide web for use by authorized government organizations.

WORLDWIDE OPFOR EQUIPMENT

Due to the proliferation of weapons through sales and resale, wartime capture, and licensed or unlicensed production of major end items, distinctions between equipment as friendly or OPFOR have blurred. Sales of upgrade equipment and kits for application to weapon systems have further blurred distinctions between old or obsolete systems and modern systems. This WEG describes base models listed in the FMs or upgrades of those base models, which reflect current capabilities. Many less common variants and upgrades are also addressed.

HOW TO USE THIS GUIDE

The WEG is organized by categories of equipment, in chapters. The format of the equipment pages is basically a listing of parametric data. This permits updating on a standardized basis as data becomes available. For meanings of acronyms and terms, see the Glossary. Please note that although most terms are the same as U.S. terminology, some reflect non-U.S. concepts and are not comparable or measurable against U.S. standards. For example, if an OPFOR armor penetration figure does not say RHA (rolled homogeneous armor), do not assume that is the standard for the figure. Please consult the Glossary often. If questions remain, contact this office.

System names refer back to the field manuals. However, they also reflect intelligence community changes in naming methods. Alternative designations include the manufacturer's name, as well as U.S./NATO designators. Note also that the WEG focuses on the complete weapon system (e.g., AT-4/5 antitank guided missile launcher or 9P148 ATGM launcher vehicle), versus a component or munition (9P135 launcher assembly or AT-4/5 ATGM).

Many common technical notes and parameters are used in chapters 2 through 7, since the systems contained in those chapters have similar weapon and automotive technologies. Chapters 1 (Infantry Weapons), and 8 through 12 (Engineer and Logistics, Unmanned Aerial Vehicles) offer systems that have many unique parameters and therefore may not be consistent with those in other chapters.

Please note the updated Threat Support Directorate website. The WEG and other TSD products can be downloaded at: <http://leav-www.army.mil/threats/index/index.htm>.

We solicit your assistance in finding unclassified information which is not copyright-restricted, and which can be certified for use. Questions and comments on systems data should be addressed to the author noted for each chapter. For general questions concerning production, content, and distribution to U.S. government organizations please contact:

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Units of Measure

The following symbols and abbreviations are used in this guide.

<u>Unit of Measure</u>	<u>Parameter</u>
(°)	degrees of slope/gradient, elevation, traverse
cal	caliber—(tube length in multiples of cannon bore)
GHz	gigahertz—frequency (GHz = 1 billion hertz)
hp	horsepower (kWx1.341 = hp)
Hz	hertz—unit of frequency
kg	kilogram(s) (2.2 lb.)
kg/cm ²	kg per square centimeter—pressure
km	kilometer(s)
km/h	km per hour
kW	kilowatt(s) (1 kW = 1,000 watts)
liters	liters—liquid measurement (1 gal. = 3.785 liters)
m	meter(s)—if over 1 meter use meters; if under use mm
m ³	cubic meter(s)
m ³ /hr	cubic meters per hour—earth moving capacity
m/hr	meters per hour—operating speed (earth moving)
MHz	megahertz—frequency (MHz = 1 million hertz)
mach	mach + (<i>factor</i>) —aircraft velocity (See Glossary)
mil	milliradian, radial measure (360° = 6400 mils, 6000 Russian)
min	minute(s)
mm	millimeter(s)
m/s	meters per second—velocity
mt	metric ton(s) (mt = 1,000 kg)
rd/min	rounds per minute—rate of fire
RHAe	rolled homogeneous armor (equivalent)
shp	shaft horsepower—helicopter engines (kWx1.341 = shp)
µm	micron/micrometer—wavelength for lasers, etc.

ERRATA NOTES

The following changes reflect updated information about data in preceding editions of the Worldwide Equipment Guide. We recommend that users note the changes in their copies. In a future edition, we will incorporate changes into published pages.

Page	Change
Chapters 2-5	For all direct-fire guns, or armored fighting vehicles with guns, 100 mm and over, under "MAIN ARMAMENT AMMUNITION", and after "Armor Penetration (mm)", if penetration number is not available for Frag-HE or HE rounds, add: "Can defeat IFVs on impact." NOTE: A near miss can cause collateral damage against IFVs and is likely to cause collateral damage to APCs and most IFVs.
Chapters 2-5	For all direct-fire guns, or armored fighting vehicles with 100-125-mm guns, under "MAIN ARMAMENT AMMUNITION", maximum aimed range for HEAT rounds, unless otherwise stated is limited to no greater than 2,500 m.
2-5	Under VARIANTS, delete: 1V118 Reostat. This vehicle is not artillery-related. See sheet for ACRV 1V119.
2-8, etc.	For the BTR-80A (2-8), BMD-3 (2-20), BMP-2 (2-24), BMP-3 (2-26), and BRM-3K (3-5), change 30-mm APDS round penetration to 25 mm at (60°) and 1,500 m. Ammunition data also applies to 2S6M (7-8), Ka-50/HOKUM (9-9), Mi-24/HIND (9-11), Mi-28/ HAVOC (9-12.1), and Su-25/FROGFOOT (10-9).
2-9	Under VARIANTS, after Artillery command and reconnaissance vehicles: Change to: ACRV 1V18 and 1V19 are battery and battalion command and observation vehicles, respectively.
2-11	For MT-LB Light Multipurpose Vehicle, "Max Swim Speed" is changed.
2-17	For BMD-1 AIFV, under VARIANTS, add: BMD-1KShM: Command and communications vehicle which replaces BMP-1KSh for airborne forces. It has a raised structure vs turret, six road wheels, a CLOTHESLINE radio antenna, and an AGS-17 AGL.
2-18, 5-15	For additional information on the AT-3 ATGM launcher and AT-3 on BMD-1, see sheet for BMP-1 IFV, pg. 2-20.1 in this update, in sections for ATGM launcher, Ammunition data, and NOTES.
2-21 2-23 5-7 5-16	For the AT-4/AT-5 ATGM launcher, for the 9P148 ATGM Launcher vehicle, and for the BMP-1P and BMP-2, add the Indian NAG to the list of ATGMs available for export, and which can be launched from the launcher. The fire-and-forget (IIR-homing) missile has a 5-6 km range and offers a top-attack mode.
	x
2-25	For BMP-3, under FIRE CONTROL, Gunner Night, change to:

1K13-2 II night channel/NAMUT thermal for "Desert BMP-3"

- 2-26 For BMP-3, under VARIANTS, change last entry, "BMP-3: UAE" to:
Desert BMP-3: Improved IFV exported to UAE and Kuwait, with NAMUT thermal sights and other upgrades--the most proliferated version of BMP-3.
Add: **BMP-3M:** New version of BMP-3 for sale, with improved computer-based integrated and superior stabilized fire control, one of the first IFV gun autotrackers, thermal sights with an ATGM channel, an increased capacity autoloader for ATGMs and gun rounds, and other mobility, survivability and lethality upgrades. Other options include ARENA or SHTORA-1 active protection system.
- For all guns or vehicles with guns 76-99 mm, data item "Armor Penetration (mm):", if penetration number is not available for Frag-HE or HE-type rounds, add the following: "Can defeat most IFVs on impact." NOTE: A near miss can cause collateral damage against IFVs and is likely to cause collateral damage to APCs.
- 4-6.1 Add NOTE: For all direct-fire guns, or armored fighting vehicles with 105-mm
4-8.1 guns which fit NATO standard rifled ammunition, a new option is the Israeli LAHAT gun-launched semi-active laser homing ATGM. For tank-directed fires, this requires a fire control modification to accommodate the laser guidance device, although a remote designator may be used. The ATGM has a 5+ km range, tandem HEAT warhead, and a top-attack mode.
- 4-13 Under line drawing, add the following entry:
T-62M with Bra Armor
- After Applique Armor (mm): Bra armor..., add
is common
- 4-15 Under **VARIANTS**, add the following entry:
T-72B1: Variant introduced in 1986 without ATGM launch capability.
- 4-15 Under **VARIANTS**, add the following entry:
T-72BV: Under the Russian naming scheme, a T-72B with ERA could be expected to add V to the name.
- 7-1 In Ch 7. AIR DEFENSE, change analyst assigned.
- 7-7 For ZSU-23-4, note clarification of ammunition altitude and fuze data.
- 7-8 For 2S6M, add , gun ammunition, night sight and NOTES on day/night capability.

- 7-11.1 to 7-12 For SA-2/GUIDELINE, SA-3/GOA, and SA-5/GAMMON, Missile and Space Intelligence Center provided comments which were incorporated in replacement pages.
- 8-14 Under **VARIANTS**, add the following entry:
TZ 8-255B: POL truck, capacity 8,000 liters.
- 9-1 In Ch 9. ROTARY-WING AIRCRAFT, change analyst assigned.
- 10-1 In Ch 10. FIXED-WING AIRCRAFT, change analyst assigned.
- G-1 to G-6 In Glossary, new terms and acronyms were added.

Supplement Page Changes

To Incorporate this supplement into the WEG, please make the page changes as noted below:

<u>System</u>	<u>Page</u>	<u>Change</u>
Memorandum		Replace and change
Enclosure 1	i, ii	Replace and chg
Table of Contents	iii-vi	Replace and chg
Supplement Page Changes	xiii, xiv	Replace and chg
W-87 Automatic Grenade Launcher	1-8.1, 1-8.2	Add
Table: Infantry Weapon Night Vision Systems	1-8.2, 1-8.3	Add
Table: Selected Infantry Weapons	1-8.4 to 1-8.8	Add
Kliver IFV/APC Turret	2-29, 2-30	Add
Ch. 3 Reconnaissance Chapter Introduction	3-1 to 3-2	Replace and page chg
Horizon Battlefield Surveillance Radar	3-9, 3-10	Add
Type 63A Modernized Light Tank	4-4.3, 4-4.4	Add
Technology Report: Gun-Launched ATGMs	5-21 to 5-25	Add
9A51/Prima 122-mm MRL	6-20	*Replace and page chg
9A52-2 300-mm MRL	6-25/6-26	*/Replace and page chg
MO-120-RT 120-mm Mortar	6-26.1, 6-26.2	Add
TOS-1 220-mm Flamethrower Weapon	6-33, 6-34	Add
Ch 7. AIR DEFENSE	7-1	Replace and chg
GDF-003 35-mm Towed AA Gun (Skyguard)	7-2	Add
ZU-23 23-mm Towed AA Gun	7-5	Replace and chg
Gepard 35-mm SP AA Gun	7-6	Add
SA-10b/GRUMBLE	7-12.4	Replace and chg
SA-10c/GRUMBLE	7-12.5	Add
SA-11/GADFLY	7-12.6	Add
SA-12a/GLADIATOR, SA-12b/GIANT	7-12.7	Add
Aspide Mk 1 SAM (Skyguard)	7-14.1	Add
Crotale 4000 SAM	7-14.2	Add
Crotale-New Generation SAM	7-14.3, 7-14.4	Add
Giraffe Air Defense Radar	7-17, 7-18	Add
Tables: Line-Charge Minebreaching Systems	8-6.3 to 8-6.6	Add
Hermes 450S UAV	12-7, 12-8	Add
Ch 14. EQUIPMENT UPGRADES	14-1 to 14-8	Add
Countermeasures	14-9 to 14-13	Add

* Also replaces sheet on back page of added sheet

GLOSSARY

AA - antiaircraft

acquisition range - sensor range against a category of targets. Targets are usually categorized as infantry, armored vehicles, or aircraft. Acquisition includes four types (or levels of clarity, in ascending order of clarity): detection, classification, recognition, and identification. Where the type of acquisition is not specified, the acquisition range will be regarded as sufficient for accurate targeting. This range is comparable to the former Soviet term *sighting range*.

AAM - air-to-air missile

AD - antihandling device (mines)

ADHPM - artillery-delivered high-precision munition. This term can be used to describe various

artillery precision munitions, including guided, terminally homing, SAL-homing, and course-corrected mortar and cannon rounds and rockets.

AGL - automatic grenade launcher

AIFV - airborne infantry fighting vehicle

aka - also known as

ALCM - air-launched cruise missile

AL/RDX - aluminized RDX (ammunition) is an enhanced blast filler with aluminum added to the RDX high explosive, often used in Russian Frag-HE munitions with increased lethality.

AM - amplitude modulated (communications)

antitank - functional area and class of weapons characterized by destruction of tanks. In the modern context used in this guide, the role has expanded to fit the term "antiarmor" (which includes systems and munitions which can be employed against light armored vehicles)

AP - antipersonnel

APAM - antipersonnel - anti-materiel (ammunition)

APE - armor-piercing explosive (ammunition)

APERS-T - antipersonnel - tracer (ammunition)

APC - armored personnel carrier

APC-T - armor-piercing capped tracer (ammunition)

AP HE - armor-piercing high explosive (ammunition)

API-T - armor-piercing incendiary tracer (ammunition)

APERS-T - antipersonnel tracer (ammunition)

APT - armor-piercing tracer (ammunition)

APU - auxiliary power unit; auxiliary propulsion unit

ARM - anti-radiation missile. The missile homes in on the radar pulse to kill a radar system.

ASM - air-to-surface missile

AT - antitank

ATGL - antitank grenade launcher

ATGM - antitank guided missile

aux - auxiliary

average cross-country (speed) - vehicle speed (km/hr) on unimproved terrain without a road

AVLB - armored vehicle-launched bridge

burst (rate of fire) - artillery term: the greatest number of rounds that can be fired in 1 minute
BW - biological warfare, including ammunition type.

cal - caliber

caliber - barrel length to gun bore ratio (for all gun systems), and used as a measure of gun barrel size or as a component of ammunition/gun size; in the case of US-made infantry weapons, diameter of ammunition/gun bore only, measured in inches, and used to describe ammunition/gun size

canister - close-range direct-fire ammunition which dispenses a fan of flechettes forward

C - centigrade

CC - cargo-carrying (ammunition)

CCD - cover, concealment, and deception; also charged-coupled device, an imaging sensor which operates in the visual and near-IR bands, with day and limited night capability.

CCM - counter-countermeasure

CE - chemical energy: the class of ammunition which employs a shaped charge for the lethal mechanism. Ammunition types which employ CE include HEAT and HESH (see below).

Chem - chemical (ammunition type)

CM - countermeasure

coax - coaxial

CRV - combat reconnaissance vehicle

CW - continuous wave (communications)

cyclic (rate of fire) - maximum rate of fire for an automatic weapon (in rd/min)

decon - decontamination

direct-fire range - maximum range of a weapon, operated in the direct-fire mode, at which the bullet's trajectory will not rise above the height of the intended point of impact on the target. At this range, the gunner is not required to adjust for range in order to aim the weapon. The comparable Russian term is *point blank range*.

DPICM - dual-purpose improved conventional munitions (ammunition)

DPICM-BB - dual-purpose improved conventional munitions, base-bleed (ammunition)

DU - depleted uranium (ammunition)

DVO - direct-view optics

ECM - electronic countermeasure

EFP - explosively-formed penetrator (ammunition); kinetic-energy penetrator which is created by a plate, shaped into a slug by an explosive charge, then propelled by it to a target

EIOC - estimated IOC

EMD - engineering, manufacture and development. Fielding phase between prototype and IOC.

EMP - electro-magnetic pulse, including ammunition type. The pulse can kill electronic microcircuits in a target area.

EO - electro-optic, electro-optical

ERA - explosive reactive armor

ERFB - extended range full-bore (ammunition)

ERFB-BB - extended range full-bore, base-bleed (ammunition)

est - estimate

ET - electronic timing (ammunition fuze type)

European - from a consortium of firms located or headquartered in several European countries

EW -electronic warfare

FCS - fire control system

FFAR - folding-fin aerial rockets

FAE - fuel-air explosive (ammunition). This munition technology is employed in aerial bombs and artillery munitions, and uses a dispersing explosive fill to produce intense heat, a long-duration high-pressure wave, and increased HE blast area

flechette – small steel darts (much like nails) used to fill artillery rounds (and some bombs). Generally thousands of these darts are fired (similar to a shotgun in an anti-personnel role) dispensing the flechettes forward over a wide area. Unlike **canister rounds**, FSU artillery rounds use a time fuze, permitting close-in direct fire, long-range direct fire, and indirect fire.

FH - frequency-hopper (radio, communications)

FLIR - forward-looking infrared (thermal sensor)

FLOT - forward line of own troops

FM - frequency modulated (communications)

FOV - field of view

frag-HE - fragmentation-high explosive (ammunition)

FSU - former Soviet Union

GCS - ground control station

gen - generation. Equipment such as APS and (thermal and II) night sights are often categorized in terms of 1st, 2nd or 3rd generation of development, with different capabilities for each.

GP MG - general purpose machinegun

GPS - global positioning system

HE - high explosive (ammunition)

HEAT - high-explosive antitank (also referred to as shaped-charge ammunition)

HEAT-FS - high-explosive antitank, fin-stabilized (ammunition)

HEAT-MP - high-explosive antitank, multi-purpose

HEFI - high-explosive fragmentation incendiary (ammunition)

HEI - high-explosive incendiary (ammunition)

HEP-T - high explosive plastic-tracer (ammunition)

HESH - high-explosive squash head (ammunition)

HF - high frequency (communications)

hps - hops per second (communications)

HUD - head-up display

HVAP-T - hypervelocity, armor-piercing tracer (ammunition)

ICM - improved conventional munition (ammunition, round containing submunitions/grenades)

IFF - identification friend-or-foe

IFV - infantry fighting vehicle - improved conventional munition; frag-He bomblet submunition

II - image intensification (night sighting system)

ILS - instrument landing system

Glossary-3

INA - information not available

incend - incendiary

IOC - interim operational capability

IR - infrared

IRBM - intermediate-range ballistic missile (3,001-5,500 km)

I-T - incendiary - tracer (ammunition)

K-kill - catastrophic kill (simulation lethality data)

kbits - kilobites per second (communications)

KE - kinetic energy: class of ammunition which transfers energy to the target for the lethal mechanism. Ammunition types which employ KE include AP, APFSDS-T, and HVAP-T.

LAFV - light armored fighting vehicle

LLLTV - low-light-level television

LMG - light machinegun

LRF - laser rangefinder

mach - speed of sound, based on atmospheric conditions (1160 km/h at sea level)

max - maximum

maximum aimed range - maximum range of a weapon (based on firing system, mount, and sights) for a given round of ammunition, while aiming at a ground target or target set with sights in the direct-fire mode. The range is not based on single-shot hit probability on a point target, rather on tactical guidance for firing multiple rounds if necessary to achieve a desired lethality effect. One writer referred to this as *range with the direct laying sight*. Even greater ranges were cited for *salvo fire*, wherein multiple weapons (e.g., tank platoon) will fire a salvo against a point target.

max effective range - maximum range at which a weapon may be expected to achieve a high single-shot probability of hit (50%) and a required level of destruction against assigned targets. This figure may vary for each specific munition and by type of target (such as infantry, armored vehicles, or aircraft).

max off-road (speed) - vehicle speed (km/hr) on dirt roads

MCLOS - manual command-to-line-of-sight

MG - machinegun

Mk - Mark

MRBM - medium-range ballistic missile (1,001-3,000 km)

MRL - multiple rocket launcher

MMW - millimeter wave (sensor mode, band in the electromagnetic spectrum)

MVV - muzzle velocity variation (RF tracker for monitoring round-to-round variations in muzzle

velocity variations due to tube wear, or for tracking artillery course-corrected rounds for command course adjustment)

N/A - not applicable

NBC - nuclear, biological, and chemical

Nd - neodymium, type of laser rangefinder

NFI - no further information

normal (rate of fire) - artillery term: rate (in rd/min) for fires over a 5-minute period

Nuc - nuclear (ammunition type)
NVG - night-vision goggle
NVS - night-vision system

PD - point-detonating (ammunition fuze type)
penaid - Penetration aid, countermeasure system in the warhead to counter air defense weapons effectiveness.
Ph - probability of hit (simulation lethality data)
PIBD - point-initiating base-detonating (ammunition fuze type)
pintel - post attached to a firing point or vehicle, used to replace the base for a weapon mount
Pk - probability of kill (simulation lethality data)
Poss - possible
practical (rate of fire) - maximum rate of fire for sustained aimed weapon fire against point targets. The rate includes reload time and reduced rate to avoid damage from overuse. Former Soviet writings also refer to this as the **technical rate of fire**.

RAP - rocket-assisted projectile (ammunition type)
ready - rapid detectability under normal mobility conditions (mines)
mirecon - reconnaissance
rd - round
ready rounds - rounds available for use on a weapon, whether in autoloader or in nearby stowage, which can be loaded within the weapon's stated rate of fire
RF - radio frequency
RHA - rolled homogeneous armor, often used as a standard armor hardness for measuring penetration of anti-tank munitions
RHAe - RHA equivalent, a standard used for measuring penetrations against various type armors
rpm - rounds per minute (aircraft)
RV - reentry vehicle. That portion of a TBM separating (or multiple separating) warhead which reenters the atmosphere and maneuvers to the target.

SACLOS - semiautomatic command-to-line-of-sight
SAL - semi-active laser; guidance method used in precision munitions, such as ADHPM, and ATGMs.
SAM - surface-to-air missile
SHF - super high-frequency (sensors)
SFM - sensor-fuzed munition (artillery ammunition)
shp - shaft horsepower (aircraft)
SLAP - sabot light armor penetrator (ammunition). Small arms/machinegun round with a sub-caliber penetrator guided down a gun bore by sabots, designed to defeat light armor.
SP - self-propelled
SOF - special operations forces
SRBM - short-range ballistic missile (0-1,000 km)
SSM - surface-to-surface missile (can include IRBM, MRBM, or SRBM, or cruise missile)
stadimetric - in this guide, a method of range-finding using stadia line intervals in sights and target size within those lines to estimate target range

stowed rounds - rounds available for use on a weapon, but stowed and requiring a delay greater than that for ready rounds (and cannot be loaded within the weapon's stated rate of fire)

sustained (rate of fire) - artillery term: rate (in rd/min) for fires over the duration of an hour

tactical AA range - maximum targeting range against aerial targets, aka: **slant range**

TAR - target acquisition radar

TBM - theater ballistic missile

TEL - transporter-erector-launcher. Vehicle which carries, raises, and launches TBMs.

TELAR - transporter-erector-launcher and radar

thermobaric - HEI volumetric (blast effect) explosive technology similar to fuel-air explosive and used in shoulder-fired infantry weapons and ATGMs

TLAR - transporter-launcher and radar

TOF - time of flight (seconds)

TTP - tactics, techniques, and procedures

TTR - target tracking radar

TV - television (sensor mode)

UAV - unmanned aerial vehicle, class of unmanned aerodynamic systems which include remotely piloted vehicles and preprogrammed (drone) aircraft

UHF - ultra-high frequency (communications)

UI - unidentified

VEESS - vehicle engine exhaust smoke system

VHF - very high frequency (communications)

volumetric - class of explosive ammunition fill which produces high long-duration blast and heat (includes thermobaric and FAE)

vs - versus

w/ - with (followed by associated object)

WMD - weapons of mass destruction (ammunition type). These generally consist of nuclear, bacteriological, and chemical munitions.

WP - white phosphorus (ammunition)



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REPLY TO
ATTENTION OF

ATIN-L-T (71)

24 Sep 01

MEMORANDUM FOR: See Distribution

SUBJECT: Worldwide Equipment Guide (WEG) Semiannual Update 1-2001

1. This is our fourth supplement to the WEG, the first for the year 2001. This issue is intended to support—
 - FMs 100-60 (Armor- and Mechanized-Based Opposing Force Organization Guide) and 100-63 (Infantry-Based Opposing Force Organization Guide).
 - The draft OPFOR manual series (FM 7-100, posted at the TSD web site), for the Contemporary Operational Environment (COE).
 - The spectrum of worldwide systems, to reflect technological and proliferation trends. These systems also support the expanding scope of U.S. Army training, and ongoing U.S. Army operations.
2. The WEG (Enclosure 2) is organized as a loose-leaf document to permit page changes (see page xiii). Accumulated Errata sheets for all the updates are included, with notes which reflect changes to previous WEG editions. We appreciate comments from users and the intelligence community.
3. The Threat Support Directorate (TSD) would like to remind users that the WEG is not a product of the U.S. Army intelligence community. It was developed to support OPFOR portrayal in training simulations (constructive, virtual, and live) and activities, and is approved for that use.
4. Due to limited budget, TSD asks that users accept only one copy per office and either make xerox copies or download additional copies from the TSD web site. The TSD web site address is: <http://leav-www.army.mil/threats/index/index.htm>. We solicit your questions and comments. For specific comments contact authors noted in chapter introductions. For general comments or questions, requests for distribution, or for address change, contact Tom Redman, DSN 552-7925, commercial (913) 684-7925, e-mail: redmant@leavenworth.army.mil.

2 Encls
as

NICHOLAS C. COMER
GS-14, Director
Threat Support Directorate

TRADOC DCSINT TSD OPFOR BASELINE DOCUMENTATION

The following tables list TSD products currently available for use in OPFOR development and application. The TSD-produced FM 100-60 series is the most recent documentation, and is posted at the TSD web site: <http://leav-www.army.mil/threats/index/index.htm>.

TSD-PUBLISHED FIELD MANUALS

Document No.	Document Title	Published	Posted on Web Site
FM 100-60	Armor- and Mechanized-Based Opposing Force: Organization Guide	16 Jul 97	Yes PDF File
	Replaced TP 350-12		
	Replaced TP 350-14		
FM 100-63	Infantry-Based Opposing Force: Organization Guide	18 Apr 96	Yes HTML File
	Replaced TP 350-13		

New OPFOR FMs are currently in review for describing operations and tactics in the Contemporary Operational Environment (COE). Those consist of :

- FM 7-100 OPFOR Doctrinal Framework and Strategy
- FM 7-100.1 OPFOR Operations.
- FM 7-100.2 OPFOR Tactics

Future additions to the series will include a COE organization guide FM. This World-wide Equipment Guide update is the last planned update. In the 2nd Quarter of FY 2002, a COE equipment FM will incorporate and supersede the WEG.

Chapter 1 Infantry Weapons

This chapter provides the basic characteristics of selected infantry weapons either in use or readily available to the OPFOR and therefore likely to be encountered by U.S. forces in varying levels of conflict. The selection of weapons is not intended to be all inclusive, rather a representative sampling of weapons and equipment supporting various military capabilities.

This chapter is divided into two categories—*small arms* and *recoilless weapons*. *Small arms* covers, in order, assault rifles, under-barrel grenade launchers, light machineguns, general purpose machineguns, heavy machineguns, and automatic grenade launchers. The second category, *recoilless weapons*, contains the US 106-mm Recoilless Rifle M40 and the Russian 73-mm Recoilless Gun SPG-9. This category also covers a rapidly growing segment of shoulder-fired (unguided) infantry weapons. While originally limited to shoulder-fired unguided antitank weapons such as the Russian 40-mm Antitank Grenade Launcher RPG-7, the utility of shoulder-fired weapons has expanded to include multi-purpose systems such as the Swedish 84-mm Recoilless Rifle Carl Gustaf M2. This field of weapons is often labeled “antitank” and also includes “bunker-buster” warheads, and weapons fired from close spaces such as the German 67-mm Disposable Antitank Grenade Launcher Armbrust.

Another emerging battle-tested, lethal, shoulder-fired weapon is the Russian Infantry Rocket Flame Weapon RPO-A Series (RPO-A/D/Z) capable of firing either a smoke, incendiary, or a thermobaric warhead to 600 meters. At 200 meters it is accurate to 0.5 m². The thermobaric warhead has a demolition effect corresponding to a round of 122-mm HE artillery. Due to the relative low cost, availability, versatility, transportability, trainability, and lethality of this category of infantry weapons, trainers should expect to encounter these systems in larger numbers with increasing levels of lethality, penetration, and utility. For information on guided antitank weapon systems see Chapter 5.

Questions and comments on data listed in this chapter should be addressed to:

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Russian 5.45-mm Assault Rifle AK-74

	Ammunition Types 5.45-mm cartridge Ball Ball-tracer Incendiary-T AP	Typical Combat Load 300
SYSTEM Alternative Designations: INA Date of Introduction: 1974 Proliferation: Widespread Description: Weight (kg): Loaded (with magazine): 3.95 Empty (w/o magazine): 3.4 Length (mm): Overall: 880 (937 including muzzle brake) Barrel: 415 Rate of Fire (rd/min): Cyclic: 600 Practical: Automatic: 100 Semiautomatic: 40 Operation: Gas Feed: 30-rd detachable box magazine (40-rd used by RPK-74 LMG is interchangeable) Fire Mode: Selective, automatic or semi-automatic SIGHTS Name: INA Type: Fore, pillar; rear, U-notch Magnification: None Night Sights Available: Yes. AK-74M N3 mounts an NSPU-3	VARIANTS AKS-74: AK-74M: AKS-74U: AK-101: AK-102: AK-103: AK-104: AK-105: AMMUNITION Name: 7N6 Caliber/length: 5.45x39-mm Type: Ball Range (m): Effective: 500 Maximum: 800 Armor Penetration: INA Muzzle Velocity (m/s): 880 Name: 7N10 Caliber/length: 5.45x39-mm Type: Armor piercing Range (m): Effective: INA for AK-74 (800 for RPK-74) Armor Penetration (mm): 16 @ 100 m 80% of time Muzzle Velocity (m/s): INA for AK-74 (960 for RPK-74)	

NOTES

The AK-74 is basically an AKM rechambered and rebored to fire a 5.45-mm cartridge. The AK-74 can mount a 40-mm under-barrel grenade launcher and a passive image intensifier night sight. The AK-74 is also the basis for other 5.45-mm infantry weapons including the RPK-74 light machinegun.

Russian 5.45-mm Light Machinegun RPK-74

	Ammunition Types 5.45-mm cartridge Ball Ball-tracer Incendiary-T AP	Typical Combat Load 320
SYSTEM Alternative Designations: INA Date of Introduction: Late 1970s Proliferation: Widespread Description: Weight (kg): Loaded (with magazine): 5.0 Empty (w/o magazine): 4.6 Length (mm): Overall: 1.07 m Barrel: 590 mm (including flash suppresser) Rate of Fire (rd/min): Cyclic: 600 Practical: Automatic: 150 Semiautomatic: 50 Operation: Gas Feed: 40-rd detachable box magazine (30-rd used by AK-74 is interchangeable) Fire Mode: Selective, automatic or semi-automatic SIGHTS Name: INA Type: Fore, cylindrical post; rear, tangent leaf with U-notch; adjustable to 1,000 m Magnification: None Night Sights Available: Yes. 1LH51 night sight	VARIANTS RPKS-74: Folding stock AMMUNITION Name: 7N6 Caliber/length: 5.45x39-mm Type: Ball Range (m): Effective: 800 Maximum: 1,000 Armor Penetration: INA Muzzle Velocity (m/s): 960 Name: 7N10 Caliber/length: 5.45x39-mm Type: AP Range (m): Effective: 800 Armor Penetration (mm): 16 @ 100 m 80% of time Muzzle Velocity (m/s): 960	

NOTES

The RPK-74 is the machinegun version of the AK-74, firing the same ammunition. Instead of the prominent muzzle brake used on the AK-74, the machinegun is longer than that normally used with the AK-74, but the magazines are interchangeable. The RPK-74 has a bipod and is compatible with the front firing ports of BMPs. The RPK-74 is the standard squad machinegun in OPFOR infantry units. It generally replaces both the RPK and PKM 7.62-mm weapons.

Russian 7.62-mm Assault Rifle AK-47/AKM

	Ammunition Types 7.62-mm cartridge Ball Tracer API Tracer Incendiary	Typical Combat Load 120
SYSTEM Alternative Designations: AK, Kalashnikov Date of Introduction: 1949/1961 Proliferation: Widespread (over 50 million) Description: Weight (kg): Loaded (with magazine): 3.8 Empty (w/o magazine): 4.3/3.14 Length (mm): 870/880 Rate of Fire (rd/min): Cyclic: 600 Practical: Automatic: 100 Semiautomatic: 40 Operation: Gas Feed: 30-round curved box magazine Fire Mode: Selective, automatic or semi-automatic SIGHTS Name: INA Type: Fore, pillar; rear, U-notch Magnification: None Night Sights Available: Yes	VARIANTS Numerous. Many countries manufacture clones of the AK-47 or weapons using the basic AK action. Some of these are made in different calibers. AKS: Folding stock. AKM: Improved AK-47, sights, magazine, and stock. Easier to manufacture with stamped receiver. AKMS: Folding stock variant of AKM. AMMUNITION Name: M1943 (57N231) Caliber/length: 7.62x39-mm Type: Ball Range (m): Effective: 300 Maximum: 2,500 Armor Penetration: INA Muzzle Velocity (m/s): 710 Name: M1943 (T-45) Caliber/length: 7.62x39-mm Type: Tracer Range of Trace (m): 800 Muzzle Velocity (m/s): 718	

NOTES

Photo is of an AKM. All 7.62-mm Kalashnikov assault rifles are very dependable weapons. They produce a high volume of fire and are simple to maintain and produce. The primary difference between the AK-47 and the improved AKM is the receiver. The receiver of the AK-47 is forged and machined while the receiver of the AKM is stamped metal facilitating easier manufacturing. Both the AK-47 and the AKM can mount a 40-mm under-barrel grenade launcher. The AK-47 and AKM have been replaced in many armies by the newer AK-74. The AK-74 is basically an AKM rechambered to fire a 5.45-mm x 39-mm cartridge. The 7.62-mm RPK light machinegun is based on the AK/AKM design while the RPK-74 is a machinegun version of the AK-74.

Sniper and Anti-materiel Rifle Threat

Summary: Sniper rifles in 7.62 mm have been used by all armies for many years. The accepted U.S. definition of sniper is a “highly skilled military marksman detailed to spot and pick off enemy troops from a concealed position.” Most of these weapons have limited armor penetration ability (lightly armored vehicles). More recently sniper rifles in 12.7 mm (.50 cal) and above have proliferated to the point that any U.S. force is likely to encounter them in every combat environment. Within the past ten years another trend is to equip armies with anti-materiel rifles (a.k.a. hand cannons) generally in 14.5 to 20 mm. Some of these were designed not to destroy a vehicle but to neutralize a specific capability mounted externally on the vehicle (see Croatia’s RT-20 below).

7.62 mm (.308 cal). The representative rifle in this caliber is the widely proliferated 7.62x54R SVD (Russian and clones). It can penetrate lightly armored vehicles (10 mm @ 200 m).

12.7 mm (.50 cal) Sniper/anti-materiel rifles. These rifles are integral to any modern battlefield. Although generally categorized as sniper rifles (and capable of being used against personnel), they are generally employed as anti-materiel rifles. The most widely proliferated of these rifles, whether labelled as a sniper or anti-materiel rifle, is the U.S. Barrett M82A1/M95 .50 cal semi-automatic rifle, followed by the Croatian MACS M2-1/M3 (12.7-mm bolt action), then the Russian V-94 (12.7-mm semi-auto). The Barrett M82A1 is employed by all U.S. military forces as well as 27 other countries including Belgium, Chile, Denmark, Finland, France, Greece, Italy, Netherlands, Norway, Philippines, Portugal, Saudi Arabia, and UK. The Saboted Light Armor Penetrator (SLAP) round fired from the M82A1 can penetrate 19 mm (.75 in) of armor @ 1,500 m. It can also fire a multi-purpose round (See M82A1 data sheet). Approximately 25 variants of 12.7-mm sniper/anti-materiel rifles are available.

Larger-caliber Anti-materiel Rifles (14.5 to 20-mm). A trend during the past ten years has been towards larger-caliber anti-materiel rifles. Although several are manufactured, the Croatian RT20 20-mm “hand cannon” is the most prevalent (range 1,800 m). It can fire either HE or API. The RT20 was developed primarily to penetrate the armored casing around the thermal sight head on M84 tanks (a 20-mm round was the smallest caliber that could penetrate the casing). During the war in the former Yugoslavia, M84s were frequently deployed to detect Croatian infantry moving at night, so a method of removing their night-vision capability was found with this RT20 “hand cannon”.

Other anti-materiel rifles readily available are:

- South African NTW 20-mm (range 1,500 m)
- NTW 14.5-mm (range 2,300 m)
- Hungary Gepard M3 14.5-mm (range 1,000 m)
- Austria Steyr IWS 2000 15.2-mm (range 1,000 m)

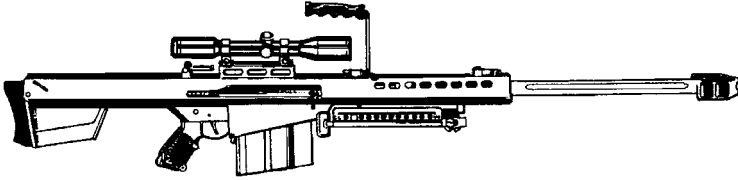
Russian 7.62-mm Sniper Rifle SVD

	<table><tr><th>Ammunition Types</th><th>Typical Combat Load</th></tr><tr><td>7.62-mm cartridge Light Ball Heavy Ball Sniper Enhanced Penetration AP-I Tracer</td><td>40</td></tr></table>	Ammunition Types	Typical Combat Load	7.62-mm cartridge Light Ball Heavy Ball Sniper Enhanced Penetration AP-I Tracer	40
Ammunition Types	Typical Combat Load				
7.62-mm cartridge Light Ball Heavy Ball Sniper Enhanced Penetration AP-I Tracer	40				
SYSTEM Alternative Designations: Dragunov Date of Introduction: 1967 Proliferation: Widespread Description: Weight (kg): Loaded (with magazine): 4.5 Empty (w/o magazine): 4.3 Length (mm): Overall: 1,230 With Bayonet: 1,370 Barrel: 620 Rate of Fire (rd/min): 30 Operation: Gas Feed: 10-rd detachable box magazine (15-rd available for the SVD-S) Fire Mode: Semi-automatic only SIGHTS Name: PSO-1 Type: Infrared detection capability for night firing Magnification: 4x Field of View (°): 6 Night Sights Available: Yes. NSPU-3 . The NSPU-3 increases accuracy to 1,000 m at night or during poor visibility. Sighting Range (m): 1,300 VARIANTS SVD-S: Folding stock, 15-rd magazine SVU: Bullpup (trigger forward of magazine) OTs-03AS: SVU w/PSO-1 sight. 6V1: SVD with PSO-1 sight. 6V1-N3: SVD with NSPU-3 night sight.	AMMUNITION Name: Sniper (7N14) Caliber/length: 7.62x54R-mm rimmed Type: Steel core Range (m): Maximum: 3,800 With Scope: 1,300 Without Scope: 800 Armor Penetration: INA Muzzle Velocity (m/s): 823 Name: 7N13 Caliber/length: 7.62x54R-mm rimmed Type: Enhanced penetration Range (m): Sighting: 2,000 Armor Penetration (mm): INA. (Effective against lightly armored vehicles and crews.) Muzzle Velocity (m/s): INA Name: B-32 Caliber/length: 7.62x54R-mm rimmed Type: AP-I Range (m): Sighting: 2,000 Armor Penetration: 10-mm @ 200 m Muzzle Velocity (m/s): 808 Name: T-46 Caliber/length: 7.62x54R-mm rimmed Type: Tracer Range of Trace (m): 1,200 Muzzle Velocity (m/s): 798				

NOTES

The bolt mechanism and gas recovery system of the SVD are similar to those of the AK and AKM. The 7.62x54-mm rimmed cartridge of the SVD is not interchangeable with the 7.62x39-mm rimless round of the AK-47/AKM. The SVD performs best when using target grade ammunition, however standard (PKM/PKT) 7.62x54-mm rimmed rounds may also be fired. One squad in each OPFOR mechanized infantry platoon has an SVD. The platoon leader and sniper normally ride in the first squad vehicle. While the sniper has received centralized training on the SVD he also has an assault rifle (usually AKS-74U) for normal combat. His SVD is carried in the IFV/APC for those instances when he acts as a sniper.

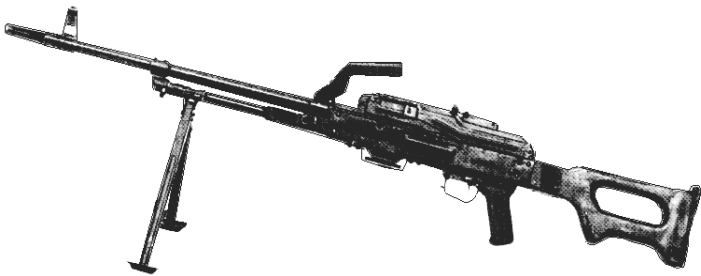
United States M82A1A .50-cal Anti-Materiel Rifle

	Ammunition Types .50-cal cartridge Raufoss Grade A Ball (M2/M33) AP (M2) AP-I (M8) API-T (M20) Tracer (M10/21) SLAP (M903) MP (MK211 Mod 0)	Typical Combat Load 30
SYSTEM Alternative Designations: None Date of Introduction: Early 1980s Proliferation: Widespread (27+) Description: Weight (kg): Empty (w/o magazine): 14.75 Length (mm): Overall: 1,448 Barrel: 736 Operation: Recoil Feed: 10-rd detachable box magazine Fire Mode: Semi-automatic only SIGHTS Name: Unertl Type: Optical (matches trajectory of .50-cal Raufoss Grade A) Magnification: 10x Name: Swarovski Type: Optical (with ranging reticle) Magnification: 10x42 Night Sights Available: yes AMMUNITION Name: Raufoss Grade A (match)(DODIC A606) (USMC) Caliber/length: .50-cal BMG/12.7-mm x 99-m (NATO) Type: Standard operating round Range (m) (equipment-size targets): Maximum (w/scope): 1,800 Muzzle Velocity (m/s): 854	Name: MP NM140 (Nammo) MK211 Mod 0 Caliber/length: .50-cal BMG/12.7-mm x 99-m (NATO) Type: Multipurpose Range (m) (equipment-size targets): Maximum (w/scope): 1,800 Armor Penetration: 11 mm @45° @1,000 m Fragmentation: 20 fragments after hitting 2 mm steel Incendiary Effect: Ignition of JP4 and JP8 Accuracy: <15 cm @ 550 m Muzzle Velocity (m/s): 915 Name: AP-S NM173 (Nammo) Caliber/length: .50-cal BMG/12.7-mm x 99-m (NATO) Type: Armor piercing Range (m) (equipment-size targets): Maximum (w/scope): 1,800 Armor Penetration: 11 mm @30° @1,500 m Accuracy: <15 cm @ 550 m Muzzle Velocity (m/s): 915 Name: M903 (Olin) Caliber/length: .50 cal BMG/12.7-mm x 99-m (NATO) Type: Saboted Light Armor Penetrator (SLAP) (actual bullet is tungsten .30 inch penetrator wrapped in a .50-cal plastic sabot) Range (m) (equipment-size targets): Maximum (w/scope): 1,500 Armor Penetration: 19 mm (.75 in) @1,500 m Accuracy: INA Muzzle Velocity (m/s): 1,014 VARIANTS Model 95: Bullpup bolt action, 5-round magazine	

NOTES

The M82A1A provides maneuver commanders with the tactical option of employing snipers with an anti-materiel weapon to augment present 7.62-mm anti-personnel sniper rifles. Recoil equals 7.62x51-mm levels. The USMC uses Raufoss Grade A ammunition, but the rifle is capable of firing any standard 12.7x99-mm Browning machinegun ammunition.

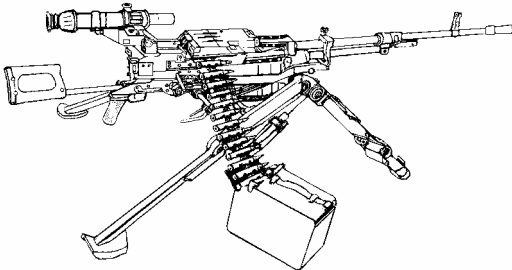
Russian 7.62-mm General Purpose Machinegun PKM

	Ammunition Types 7.62-mm cartridge Ball Ball-tracer Incendiary-ranging API API-T	Typical Combat Load INA
SYSTEM Alternative Designations: (see VARIANTS) Date of Introduction (PKM/PKT): 1971/1968 Proliferation: Widespread Description: Weight (kg): Empty (w/o magazine) (PKM/PKT) (kg): 8.4/10.66 Loaded (with magazine): Varies with magazine Ammo box (only) with 100/200-rd belt (kg): 3.9/8.0 Tripod (lightweight) (kg): 4.75 Length (mm): Overall (PKM/PKT): 1,160/1,080 On tripod (PKS): 1,267 Barrel: 658 Barrel Change: Yes Mount Type: Pintle, coaxial, bipod or tripod (Stepanov) Mounted On: (see VARIANTS) Rate of Fire (rd/min): Cyclic: 650 Practical: 250 Fire Mode: Automatic Operation: Gas Feed: Belt, 100-rd belt carried in a box fastened to the right side of the receiver. 25-rd belts can be joined in several combination lengths (100/200/250)	SIGHTS Name: INA Type: Open iron sights Sighting range (PKM/PKT) (m): 1,500/2,000 Magnification: None Night Sights Available: Yes VARIANTS PKM: Squad machinegun PKT: Tank-mounted coaxial, lacks stock, sights, bipod, has solenoid electric trigger, longer heavier barrel. PKS: Lightweight tripod-mounted infantry weapon PKMS: Lightweight tripod-mounted variant of the PKS PKB (PKBM): Pintle-mounted on APCs, SP guns, BRDM, BTRs, has butterfly trigger rather than solenoid, double space grips, and front and rear sights AMMUNITION Name: INA Caliber and Length: 7.62x54-mm rimmed Type: Ball Max Range (PKM/PKT) (m): 3,800/4,000 Practical Range (PKM/PKT) (m): Day: 1,000/2,000 Night: 300/INA Armor Penetration @ 0° obliquity @ 500 range (mm): 8 Muzzle Velocity (PKM/PKT) (m/s): 825/855	

NOTES

The 7.62-mm general-purpose machinegun (PKM) is a gas-operated, belt-fed, sustained-fire weapon. The basic PKM is bipod-mounted but can also fit in vehicle firing ports. It is constructed partly of stamped metal and partly of forged steel. Compared to the US M-60, the PK-series machineguns are easier to handle during firing, easier to care for, and lighter. The 7.62x54R is a more powerful cartridge than the US with a slightly shorter effective range.

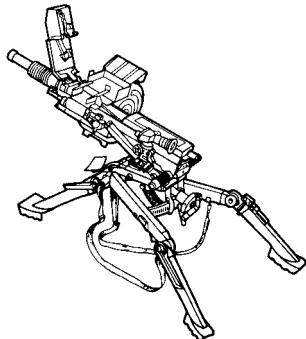
Russian 12.7-mm Heavy Machinegun NSV/NSV-T

	<table><tr><th>Ammunition Types</th><th>Typical Combat Load</th></tr><tr><td>12.7-mm cartridge API (B-32) API-T (BZT-44) HEI</td><td>300</td></tr></table>	Ammunition Types	Typical Combat Load	12.7-mm cartridge API (B-32) API-T (BZT-44) HEI	300
Ammunition Types	Typical Combat Load				
12.7-mm cartridge API (B-32) API-T (BZT-44) HEI	300				
SYSTEM Alternative Designations: NSVS (tripod-stand mounted), Utyos Date of Introduction: Early 1970s Proliferation: Widespread Description: Weight (kg): Total System (w/6T7): 43 Empty: 25 Loaded: INA Tripod (6T7 tripod): 16 Length (mm): Overall: 1,560 On 6T7 Tripod: 1,900 Width (on 6T7 tripod) (mm): 860 Height (on 6T7 tripod) (mm): 380 Barrel Life (rds): 5,000 Barrel Change Time (sec): 5 Barrel Weight (kg): 9.2 Mount Type: 6T7 (infantry) tripod or 6U6 (w/seat) universal tripod Mounted On: (see VARIANTS) Traverse (°): 360 Elevation (°): -5 to +75 Rate of Fire (rd/min): Cyclic: 680-800 Practical: 100 Fire Mode: Automatic; short bursts (four to six) or long bursts (10 to 15) or continuously Operation: Gas Feed: Left or right from metal link belt from 50-rd boxes	SIGHTS Name: INA Type: Metallic sights, (tangent leaf rear and folding front post) Sight Range (m): 2,000 Name: 10P50 Optical Type: Day optical sight Magnification: 3-6x Name: 1PN52-1 Type: Night sight Magnification: 5.3x Name: 10P80 (used w/ 6U6 mount) Type: AA collimating sight (aircraft speed to 300 km/h) Name: 10P81 (used w/ 6U6 mount) Type: Ground target sight Name: K10-T (on NSVT for T-72/T-80) Type: Reflex AA sight VARIANTS NSVT: Tank-mounted, (see NOTES) AMMUNITION Name: B-32 Caliber and Length: 12.7x108-mm Type: Armor Piercing Incendiary Max Range (ground) (m): 7,850 Effective Range (m): AA: 1,000 Ground: 2,000 Armor: 800 Night (w/1PN52-1): 1,000 Armor Penetration @ 0° obliquity @ 500/1,000m range (mm): 20/13.2 Muzzle Velocity (m/s): 860				

NOTES

A tripod-mount (6T7) version is available for infantry use in a ground role. However, the NSVT appears more commonly mounted on the turrets of tanks as an anti-aircraft machinegun. On the T-72 and the T-80, it has a rotating mount and can be fired from within the tank. The tank commander employs the K10-T reflex sight to engage aircraft. On the T-72/T-80 mount he engages ground targets with metallic sights on the gun itself. The T-64 tank mounts a modified version with a fixed mount on the commander's cupola. It fires by means of an electrical solenoid when the tank is buttoned up. An optic serves this purpose. Instead of the normal 50-round ammunition belt container, the NSVT on the T-64 may use a larger belt container holding 200 rounds.

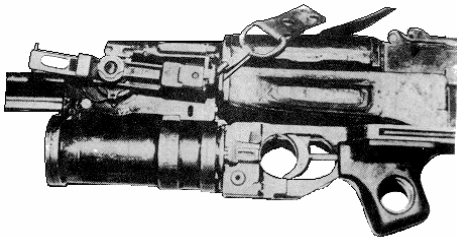
Russian 30-mm Automatic Grenade Launcher AGS-17

	Ammunition Types 30-mm grenade Frag-HE	Typical Combat Load (Dismounted) 87
SYSTEM Alternative Designations: Plamya (Flame) Date of Introduction: 1974 Proliferation: At least 12 countries Description: Crew: 3 (see NOTES) Weight (kg): Empty (without magazine): 30.71 Loaded (with magazine): 45.05 Launcher: 17.86 Sight: .99 Tripod: 11.86 Magazine (loaded): 14.34 Length (m): 1.28 Height (m): INA Width (m): INA Tripod Name: SAG-17 Mounts: Tripod, vehicle, or helicopter Traverse (°): 30 total Elevation (°): +7 to +87 Service Life of Barrel (rds): 6,000 Barrel Change Time: Quick disconnect Rate of Fire (rd/min): Practical: 60-100 Cyclic: 100-400 Adjustable with a thumb safety. May be fired single shot or in short (≤ 5 rds) or long (6-10 rds) bursts. Operation: Blowback Feed: Drum magazine containing 29 round belt. Fire Mode: Selective, automatic and semi-automatic Loader Type: Manual	SIGHTS Name: PAG-17 Type: Illuminated day optical sight Sighting Range (m): 1,700 Magnification: 2.7x Location: Left rear of launcher Night Sights Available: Yes VARIANTS AG-17: Vehicle mounted. AG-17A: Helicopter mounted, electric trigger, rate of fire increased to 420-500 rd/min, 300 rd belt. TKB-722K AGL: Lighter version and possibly the follow-on to the AGS-17, shoots the same ammunition as the AGS-17 AMMUNITION Name: VOG-17A, VOG-17M (self-destruct) Caliber/length: 30x132.8-mm Type: Frag-HE Range (m) Direct Fire Range (m): 700 Effective (m): 1,200 Min Range (m): 50 Max Indirect Range (m): 1,730 Armor Penetration: Lightly armored vehicles. Accuracy @ 400 m: Distance: 4.3 m Deflection: .2 m Casualty Radius (m): 15 (90% at 7 m) Complete Round Weight (grams): 350 Grenade Weight (grams): 280 Warhead Explosive Weight (grams): 36 Muzzle Velocity (m/s): 185 Fuze Type: Impact, activates after 25 spins.	

NOTES

The AGS-17 provides the infantry with an area suppressive capability. One AGL can create a damage zone 15 meters wide. The fire from an AGL platoon covers a sector approximately 90 m across. Although primarily intended for use against personnel, it has a limited capability to engage lightly armored vehicles. The crew consists of a gunner and two riflemen-assistant gunners, and may have an additional ammunition bearer. For ground transport the AGS-17 breaks down into four parts: launcher, sight, tripod, and magazine. When dismounted the gunner carries the sight and launcher, the first assistant carries the tripod and a magazine, and the second assistant carries two additional magazines. It is very accurate in the semiautomatic mode and is quite effective in area coverage in the automatic mode. The 50-meter increments in the range table atop the receiver indicate accuracy against point targets. The AGS-17 is normally organized in a platoon consisting of 6 launchers, carried in pairs in three armored vehicles (they can also be carried in trucks, or by individuals). The AGS-17 is capable of mounting night vision sights.

Russian 40-mm Under-Barrel Grenade Launcher GP-30

	Ammunition Types 40-mm grenade Frag-HE (impact) Frag-HE (bounding) Smoke	Typical Combat Load 10
SYSTEM Alternative Designations: BG-15 Mukha; GP-25 Koster, GP-30 Obuvka Date of Introduction: 1980 Proliferation: Widespread Description: Weight (kg): Loaded: 1.79 Empty: 1.5 Length (mm): Overall: 323 Barrel: 205 Rate of Fire (rd/min): 4-5 Operation: N/A Feed: Muzzle-loaded Fire Mode: Single-shot Accuracy @ 400 m: Distance: 6.7 m Deflection: 3 m Components: Barrel (w/ mounting bracket and sight), trigger assembly SIGHTS Name: N/A Type: Front post and rear open U-notched Location: Left side of mounting bracket Sighting Range (m): Graduated out to 400 VARIANTS BG-15, GP-25: (see NOTES)	AMMUNITION Name: VOG-25 Caliber/length: 40x102-mm Type: Frag-HE with impact fuze Weight (kg): Round: .250 Exposive: .048 Range (m): Maximum: 400 Minimum: 10-40 (arms itself) Casualty Radius (m): 6; (90% @ 10) Self-destruct Time (sec): 14-19 Muzzle Velocity (m/s): 76 Name: VOG-25P Caliber/length: 40x122-mm Type: Bounding Frag-HE, explodes .5 to 1.5 m from impact Weight (kg): Round: .278 Exposive: .037 Range (m): Maximum: 400 Minimum: 10 - 40 (arms itself) Casualty Radius (m): 6; 90% @ 10 Self-destruct Time (sec): 14 -19 Muzzle Velocity (m/s): 75 Name: GRD-40 Caliber/length: 40x150-mm Type: Smoke Effective Against: Visual and infrared Weight (g): 260 Smoke Screening Range (m): 50, 100, 200 Smoke Screen Dispersion (m): 1 sec..... 10x10x10 2 sec..... 20x20x20 3 sec..... 25x25x25 Smoke Screen Duration @ wind speed of 3-5 m/s: At least 60 sec Muzzle Velocity (m/s): 70-75	

NOTES

The GP-30 Obuvka is a widely proliferated, muzzle-loaded, single-shot, detachable, under-barrel grenade launcher. The BG-15, GP-25 and the GP-30 are all basically the same weapon. Variants can be mounted on all models of Kalashnikov assault rifles. The rifleman can fire the launcher only when the complete weapon is attached to the assault rifle.

Chinese 35-mm Automatic Grenade Launcher W-87

	Ammunition Types 35-mm grenades Frag-HE HEAT	Typical Combat Load At least 12
SYSTEM Alternative Designations: INA Date of Introduction: Prior to 1988 Proliferation: At least one Description: Weight (kg): Empty (without magazine): 12 Tripod: 8 Mounts: Bipod (attached) or Tripod Operation: Blowback Feed: 6, 9-rd box, 12-rd drum Fire Mode: Semi or Automatic Loader Type: Manual Recoil: Similar to .50 cal rifle PERFORMANCE Range (m) Direct Fire Range: INA Effective: 600 Max Range: 1,500 Rate of Fire (rd/min): 400 Muzzle Velocity (m/s): 170	AMMUNITION Name: INA Caliber/length: 35-mm Type: Frag-HE Grenade Fill: HE and 400 3-mm steel balls Armor Penetration: Penetrates body armor Lethal Radius (m): 10 Complete Round Weight (grams): 270 Muzzle Velocity (m/s): 170 Name: INA Caliber/length: 35-mm Type: HEAT Armor Penetration: 80 mm @ 600 m Lethal Radius (m): 5 Complete Projectile Weight (grams): 270 Muzzle Velocity (m/s): 170 SIGHTS Type: Optical	

NOTES

The W-87 is significant in that it weighs a little more than a medium 7.62-mm GP MG (PKM 18.5 lbs/U.S. M60 MG 32 lbs). It is smaller and lighter than the AGS-17 but still provides the infantryman with the ability to destroy lightly armored vehicles at 2 to 3 times the range of the majority of infantry light AT systems. Ten 35-mm W-87 rounds weigh less than 100 linked 7.62 rounds. The 35-mm rounds are probably more effective against point targets at medium to long ranges than ball 7.62-mm.

Infantry Weapon Night Vision Systems

In the past, most military forces reacted to darkness by: (1) reducing combat activities during the period, and (2) using cover of darkness to carry out clandestine activities. A selected number of forces, however, learned to exploit the cover of darkness to execute combat missions. For close combat at night, the most common solution for that vulnerability has been to illuminate the battlefield ("turn night into day"). Illumination technologies include pyrotechnics (flares, white phosphorus rounds, set fires, etc.). Of course, non-military illumination sources, including moonlight, civilian illumination, etc. can be used. Night vision technologies with military applications are: (1) Lights operating in the visual light band, such as vehicle headlights and spotlights. (2) Spotlights and sensors in the the infrared (IR) band (3) Spotlights and sensors which use other bands of the light spectrum. Other sensors for day and night use include infrared laser and radio-frequency radars. A critical vulnerability associated with all of these systems is that they are active systems and emit energy which can be detected, targeted, and engaged with weapons. Some sensors (such as passive sights and some radars) can use energy from other emitters; but they are subject to limitations on range and availability of emitters. They can supplement night vision systems; but they would still permit the majority of the operational area to be concealed in darkness. With the limitations of illumination systems, they concede to the enemy cover of night for widespread clandestine activities.

The need for equipment for commercial and military markets has generated a technology explosion in the night vision field. With these night vision instruments, goggles, and weapon sights in recent decades, higher tier countries were able to "own the night", and execute operations with a clear advantage which often led to decisive battlefield success. Cost and budget considerations excluded many military forces from effective access to these technologies. Most forces worldwide accept the limitations incrementally upgraded night systems (which may technically inferior to most sights in the US and other western countries). However, that separation has narrowed. In most areas of the world today, *no one force owns the night*.

The wide availability of night vision systems and the general consensus for their use in the civilian sector has driven down cost for some technologies and led to proliferation of new technologies. These technologies generally consist of electro-optic (EO) passive systems using the infrared light band. The most numerous type of EO sensors is sights (which combine EO processing with viewing optics); and most sights worldwide employ image intensifier (II) systems. Image intensifiers use ambient light in a portion of the near IR band (0.7-0.9 μ) and intensify the image in a microchannel plate or photocathode tube. Most Russian armored vehicle sights are II/IR sights; thus, an II sight can be used in conjunction with an IR searchlight. The sights may be operated passively without the searchlight, with a corresponding range reduction. In the past, many forces used active infrared much of the time, and sensors in the passive mode only part of the time. The current trend is to reduce force vulnerability by eliminating active light sources and to reduce reliance on ambient light sources for II, through widespread use of improved II and thermal sights. Technology improvements in the II field are categorized into generations, now up to 4th generation. Improvements in range, resolution, resistance to blooming from bright light, and weight reductions will continue to make II a competitive night vision option.

With the microcircuit revolution, there has been a corresponding revolution in imaging systems technologies. An immediate product is charged-coupled device (CCD) TV cameras, which operate in both visual and near-IR bands (0.4-0.9) for day TV and low light (dusk and dawn) applications. Another resultant technology is thermal imaging. A thermal imaging system uses a camera which converts a heat (temperature differential) image to a digital electronic signal, then converts the signal back to a display circuit. With a sight system, the signal is sent to a microchannel plate for viewing. For more sophisticated applications, the signal can be converted for transmission over cable to a monitor or to a computer and processed for further exploitation. The signal can also be sent as a TV signal as an RF signal over digital communications nets. Thermal imaging systems (TIS) have seen a variety of technology improvements. Within the 1st generation of thermal imagers (also called Forward Looking Infrared - FLIR), there is a variety of improvements in camera design, processing technologies, application, and display system technologies. Thus, increased capabilities in range, resolution, weight reduction, variety of applications, and operating time (given coolant requirement) can be noted. A recent development is uncooled thermal sensors. Currently, 2nd generation TIS with further improvements in these areas are being fielded. However, due to limited infantry weapons ranges and cost factors, the most numerous military sensors will continue to be II sights.

The following are examples of night sight capabilities for portrayal of the listed OPFOR equipment. Given the wide variety of military and commercial systems which can be used, night vision device capabilities vary widely from older 1 gen II sights to thermal and CCD systems. Although some hand-held and tripod-mounted systems are used, the most proliferated and highest priority systems are weapon sights. The below table provides data for OPFOR applications, reflecting a mix of older and newer night vision systems.

Night Vision Capabilities for OPFOR Infantry TOE Weapons

Weapon	Lowest Unit Level	Description	Range vehicle (m)	Range Man (m)	Ref Comments
GP-30 Grenade Launcher	Squad	3 gen II	300-500	300	Mounts on AK-74
Carl Gustaf Recoilless Rifle	Squad	2 gen II LRF sight	1,000	500+	Ballistic computer sight
RPK-74 Light MG	Squad	4 gen II	1,500	600	Compact and lightweight
BTR-80A APC	Squad	1 gen II	800	<800	Upgrade sight available
SVD Sniper Rifle	Platoon	4 gen II	1,500	600	Compact weapons sight
RPG-29 AT Grenade Launcher	Platoon Wpn Sqd	2 gen II LRF sight	1,000	500+	Ballistic computer sight
PKM General Purpose MG	Platoon Wpn Sqd	2 gen II	1,500	600	Wide variety available
Eryx ATGM Launcher	Platoon Wpn Sqd	Thermal	600+	<600	ATGM range capability
W-87 Automatic Grenade Launcher	Platoon Wpn Sqd	Thermal hand-held 4 gen II on W-87	2,000	700+	Thermal can adjust fires and observe for the platoon
Metis-2 ATGM Launcher	Company AT	Thermal	3,200	>1,000	1st generation thermal
SA-18/GROUSE MANPADS	Company	II gen 2			Against aircraft 4500 m
Kornet ATGM Launcher	Battalion AT	Thermal	4,000+	>1,500	1st generation thermal
AT-5b/Konkurs-M ATGM	Battalion AT	Thermal	3,600	>1,500	Can fit on other launchers.

* Ranges are based on sensor capabilities (and reflect standard range criteria for: detection, classification, recognition or identification). These are capabilities of representative marketed foreign sensors fielded on systems or available for OPFOR systems upgrades.

Selected Infantry Weapons

Automatic Grenade Launchers (AGLs)

Name	Producing Country / Number of Users	Crew/ Combat Load Total Weight (kg)	Munition Nomenclature (Diameter and Type)	Munition Capabilities: Range (m)/ Effectiveness (mm) (HEAT armor penetration)	Sights Day/night	Comments
W-87 35-mm	China	1 12 or more 12.0 (empty)	HEAT Frag-HE	600m/80mm	D: optical N: see comment	Shoulder-fired with bipod, pintel or tripod mount Thermal hand-held or II sights are used to adjust fire.
QLZ-87 35-mm	China	1 15 or more	HEAT Frag-HE	600m/80mm	D: optical N: see comment	Shoulder-fired with bipod, pintel or tripod mount Thermal hand-held or II sights are used to adjust fire.
RAG-30 30-mm	Slovak Rep (development)	1 15 or more 11 empty 13.2 full	VOG-30 (Frag-HE) VOG-17M (Frag-HE self-destruct)	1,200m/AP and soft targets casualty radius 15 m =90% @ 7 m)	D: iron N: INA	Shoulder-fired with bipod
AGS-30 30-mm (aka TKB-722K)	Russia +12	2 90 16.55 less ammo & sight (includes tripod)	VOG-30 (Frag-HE) VOG-17M (Frag-HE self-destruct)	1,200m/AP and light armored vehicles casualty radius 15 m =90% @ 7 m)	D: PAG-17 (2.7x) N: yes	The AGS-30 is a lightweight variant of the AGS-17. Tripod= 6 kg, Mag (30 rd)=13.7 kg Tripod or pintel mount
MK19 40-mm	US widespread	2 48 rd ammo can gun (35kg) tripod (22kg)	HE HE DP Buckshot (HEAT made by Pakistan)	1,500m/55mm max 2,400m	D: open N: yes (AN/TVS-5)	The fire control systems for the Striker and the CIS-40 AGL
Striker 40-mm (aka CG40)	Sweden widespread	2 gun (17.5kg)	Same as MK19 ABM (airburst)	1,500m	D: optical (8x) N: yes (Gen III II)	Integrated fire control with LRF, day/night sight, with video imaging, ballistic computer. Computer-controlled fire control system manufactured by Saco and Bofors/Carl Gustav/CDC. ABM = Air bursting munitions
CIS-40 AGL 40-mm	Singapore	2 lighter than Mk 19	Same as MK19 ABM	1,500m	D: optical N: yes	Integrated fire control with LRF, day/night sight, ballistic computer. The ABMS (ABM System made by Singapore Technologies Kinetics -STK) can be retrofitted to any new and current 40mm systems including US MK 19.

1-8.5

Antitank Grenade Launchers (ATRLs)						
Name	Producing Country / Number of Users	Crew/ Combat Load Total Weight (kg)	Munition Nomenclature (Diameter and Type)	Munition Capabilities: Range (m)/ Effectiveness (mm) (HEAT armor penetration)	Sights Day/night	Comments
RPG-7V 40-mm	Russia +40 Variants +7	2 5 7.9 (Empty)	PG-7VL (93mm HEAT) PG-7VR (105mm Tandem HEAT) OG-7VM (Frag-HE) TBG-7V (105mm Thermobaric)	300m/600mm 200m/750+ includes ERA 1000m/rein concrete: +1,500, Log/dirt: +1,000 200m/INA	D: PGO-7 N: NSP-3, NSP-2 (IR), NSPU, PGN-1 (II), 1PN58 (II), others.	In addition to AT role, can be used against personnel and for bunkerbusting and as a side-attack mine system (See Note 2). Other countries have developed rounds for RPG-7V. For TBG-7V see Thermobaric/Bunkerbusters.
Panzerfaust-3 60-mm tube Panzerfaust 3-T (with 3-T grenade) (Systems aka Pzf-3 or Pzf-3T) Fire Salamander	German +8	1 INA 12	3-T (110mm Tandem HEAT) PZF3 (110 HEAT-original rd) Other munitions include: HEAT-125, HEAT-90, HESH, MZ-110 (Multipurpose-Frag), Illumination, IR Smoke, and Smoke. For BASTEG, see BUNKERBUSTERS.	500m/700+mm 500m/500mm	D: optical. The 3-T uses Simrad IS200 laser N: yes. IR goggles. The 3-T uses Simrad KN205F II night sight	Tube is disposable—the firing post & sight are reusable. System can fire from enclosures. Add 3-T & LRF to convert to Panzerfaust 3-T 600. In addition to AT role, Pzf-3 can be used for AP, bunkerbusting and as a side-attack mine system (See Note 2). Advanced -tripod mount with a SIRA sensor package uses acoustic detection and IR sensor triggering. Fire Salamander is a 4 x Pzf-3 launcher mount on a tripod with remote controlled TV camera, and sensors for auto-launch.
Panzerfaust 3-T 600 60-mm Pzf 3-IT600 Pzf-3-LR / RS PZF 3		1 INA 12+sight (+ laser unit for Pzf-3-LR)	3-T (110mm Tandem HEAT) Other munitions as noted above. Pzf-N (Tandem HEAT) IT600 (Tandem HEAT) Pzf-3-LR (Tandem SAL-H)	600m/700+mm 600m/700+mm, Netherlands 600m/900+mm 800m/700+mm	D: Simrad IS200 laser rangerfinder sight. N: yes. Simrad KN205F II night sight	Same as above. System w/ IT600 grenade is Pzf 3-IT600. The Pzf 3-LR is a developmental semi-active laser homing (SAL-H) system. It requires a CO ² laser guidance unit and SAL-H grenade.
Carl Gustaf M2/M3 Recoilless Gun 84-mm in-bore round	Sweden +20	1, 2 if ammo bearer INA M2: 14.2 M3: 8.5	FFV 551 (HEAT) FFV 751 (Tandem HEAT) FFV 502 (DP-HEAT/HE) FFV 441B (HE) Smoke and illumination	700m/400mm 500m/500+mm 1000m AP-500m AT/150+mm 1100m/INA	D: optical 3x Option is CLASS LRF computerized sight. N: May be used with gen 3 II sight, such as CLASS night channel.	Weapon uses a round with a rocket-propelled grenade, for shorter flight time and better hit probability. In addition to AT role, it can be used against personnel, for smoke/illum support, and for bunker busting. The M3 is a lightweight variant of the M2.
Type 69-1 40-mm tube (similar to RPG-7V)	Chinese widespread	2 5 5.6	Type 84 (85mm HEAT) HE/HEAT (HEAT/Frag-HE) AP (See comments) HE-Incendiary (76mm) Illumination (75mm) Can fire all RPG-7 ammunition.	350m/180mm at 65° 1,800m AP/20m lethal radius 300m AT/150mm at 60° 1,500m/15m lethal radius 1,500m/15m lethal radius 600m or 1,500m/35 seconds	D: optical N: yes, II and IR.	See Note 2. The AP is an airburst grenade. It strikes the ground and bounds up to explode. *OPFOR could mix Chinese, Russian, and Bulgarian rounds, as well as commercial ammunition for these systems marketed by western firms. The G-Law SAL-H guided grenade can be fired from this system.
RPG-29 105-mm in-bore grenade	Russia +15	2 INA 11.5	PG-29V (Tandem HEAT)	500 or 800m/750+mm /reinforced concrete 1,500+mm Log/dirt 3,700+mm	D: optical N: avail	A tripod variant has an optical sight, laser rangefinder, and ballistic data computer-increase the range to 800m against stationary target. Launch tube folds in half. See Note 2.
RPG-2 40-mm	Russia widespread	1, 2 if ammo bearer 5/2.8 (empty)	PG-2 (80-mm HEAT)	100m/180mm	D: folding leaf N: yes, NSP-2 IR	
SMAW 83-mm	US (USMC)	1 INA/7.6	HEDP HEAA (antitank)	500, 250 for 1x2m target 500, 250 for 1x2m target	D: optical N: yes, AN/PVS-4	SMAW (Shoulder-launched Multipurpose Assault Weapon).

NOTES: 1. All weapons can be shoulder fired, as well as other mounts as noted in comments.

2. Generally, the systems can be employed as a side-attack (off-route) mine, with a break wire. Selected systems can be fitted with a multi-sensor unit for conversion into a sensor-fuzed mine.

3. There is no counterpart U.S. system.

Antitank Rocket Launchers (ATRLs - Disposable)						
Name	Producing Country /Number of Users	Crew Combat Load Total Weight (kg)	Munition Nomenclature (Diameter and Type)	Munition Capabilities: Range (m)/ Effectiveness (mm) (HEAT armor penetration)	Sights Day/night	Comments
RPG-18 64-mm	Russia +15	All have a crew of 1 w/single launchers 2.7	HEAT	200m/Armor: 375	D: Iron N: No	RPG-18, 22, & 26 are copies of the US M72 LAW. Also penetrates reinforced concrete: 500, brick: 1,000
RPG-22 72-mm	Russia +15	2.8	HEAT	250/ Armor: 390	D: Iron N: No	Improved (range) version of the RPG-18 (LAW). Also rein concrete: 1,000 brick: 1,200
RPG-26 72.5-mm	Russia + 15	2.9	HEAT	250/ armor: 400	D: Iron N: No	Improved RPG-22 Also rein concrete: 1,000 brick: 1,500 log & earth: 2,400
RPG-27 105-mm	Russia +15	8	Tandem HEAT	200/ armor: 750	D: Iron N: No	Disposable version of RPG-29. Also rein concrete & brick : 1,500 log & earth: 3,700
RPG-75 68-mm	former Czech +13		HEAT HEDP	300/ 300 300/300	D: Iron N: No	Similar to US M-72 LAW
M-72 LAW 66-mm	US widespread		HEAT	300/300	D: Peep N: Yes, AN/PVS-4	
AT-4 (US M136) 84-mm	Sweden +7	6	AT4 HEAT (HEAT) LMAW (HEDP) AT4 (CS Confined Space) AT4E2 HP-T (High Penetration)	330/420 330/150 330/INA 330/600+	D: popup N: yes, INA	LMAW = Light Multipurpose Assault Weapon Grenade is similar to Carl Gustaf FFV 502. AT4 CS can be fired from confined space.
Armbrust 67-mm	German +7	6.3	HEAT	400/300	D: reflex N: no	Low signature and IR detectability. Does not emit smoke or flash, and no flash can be seen from the rear. Quieter than a pistol shot. Only .8 m clearance is required to fire. Armbrust can be fired from confined space.
APILAS 112-mm	France +15	9	HEAT	330/720 rein concrete: 2,000	D: optical 3x N: yes, (nonexpendable) INA	APILAS-APA mounts on a tripod with break-wire sensor. Can also be used on a tripod with the AJAX sensor package. (see Notes)
C-90-C (M3) 90-mm	Spain +3	3.9	HEAT Smoke Incendiary HE Frag	400/400	D: optical N: yes	Four variants: C-90-CR-RB (M3) = AT C-90-CR-AM (M3) = (DP+ AT & AP) C-90-CR-FIM (M3) = Smoke, incendiary C-90-CR-BK (M3) = Anti-bunker
RBR M80 64-mm	Former Yugo +3	3	HEAT	250/300	D: Iron N: INA	Very similar to US M72 LAW
AT-12-T / 120-mm	Sweden 1	14	Tandem HEAT	300/900	D: popup N: no	
RBR HORNET 120-mm	Former Yugo +2	10	HEAT	400/700-800	D: optical N: INA	A reuseable Hornet-S launcher (which launches this grenade) was in development.
RBR M90 120-mm	Former Yugo +2	10	HEAT	250/800+	D: optical N: INA	

- NOTES: 1. Single disposable ATRLs are issued (to crew of one), as rounds of ammunition. Users are assigned the mission in addition to other duties, to supplement AT fires.
2. All disposable ATRLs can be shoulder fired, as well as other mounts as noted in comments.
3. Generally, the systems can be employed as a side-attack (off-route) mine, with a break wire. Selected systems can be fitted with a multi-sensor unit for conversion into a sensor-fuzed mine.
The AJAX advanced side-attack mine sensor uses acoustic sensors to identify targets and to turn on the IR sensor. When in view of the IR sensor the rocket is fired, destroying the target.

Thermobaric, Flame, and Smoke Weapons						
Name	Producing Country / Number of Users	Crew/ Combat Load Total Weight (kg)	Munition Nomenclature (Diameter and Type)	Munition Capabilities: Range (m)/ Effectiveness (mm) (HEAT armor penetration)	Sights Day/night	Comments
TBG-7V (Grenade on RPG-7V)	See RPG-7V 3	See RPG-7V 4.5 kg	TBG-7V (105-mm HE) See Thermobaric above	200m/2 m radius 200m/AT against light armor	See RPG-7V	The demolitions effect of the TBG-7V equates to that of a 122-mm HE artillery round.
RPO Flame Launcher	Russia +15	1 2 per pack 22 for a pack	RPO (Napalm-type Pyrogel)	190m/10-40m path 3-4m wide	Post sight	Being replaced by RPO-A/Z/D Pack=launcher & 2 rds
RPO-A Thermobaric Launcher (Disposable)	Russia +15	1 2 per package 11	RPO-A (Thermobaric) (encapsulated)	600m/50m lethal radius 600m/AT against light armor	Post sight OPO-1	LMAW (Light Multipurpose Assault Weapon) Can be fired from enclosures.
RPO-Z Flame Launcher (Disposable)	Russia +15	1 2 per package 11	RPO-Z (Incendiary)		Post sight OPO-1	Can be fired from enclosures.
RPO-D Smoke Launcher (Disposable)	Russia +15	1 2 per package 11	RPO-D (Red Phosphorus) (encapsulated)	200m/2 m radius	Post sight OPO-1	Can be fired from enclosures. Smoke screen 55 to 90 m long for 3 to 5 min. Effective against visual & IR.

NOTES: 1. Disposable ATRLs are issued as rounds of ammunition. Users are assigned the mission in addition to other duties to supplement fires.

2. All grenades have some incendiary and smoke effects. Thermobaric grenades are sometimes classed within the category HE. They have flame effects, and have demolition effects as noted below.

3. Note other thermobaric, flame and smoke grenades under ATRL listings.

Multi-Purpose and Bunker Buster Weapons						
Name	Producing Country / Number of Users	Crew/ Combat Load Total Weight (kg)	Munition Nomenclature (Diameter and Type)	Munition Capabilities: Range (m)/ Effectiveness (mm) (HEAT armor penetration)	Sights Day/night	Comments
SMAW HEPD 83-mm	US		HEDP	500, 250 for 1x2m target		See ATRLs
AT8 Bunker Buster 84-mm Disposable	Sweden/US	1 INA-issued as round 7.2	AT8 (HEDP Multi-purpose)	250m/1-m hole in LAV /260+mm in concrete	D: Pop-up sight	Designed to fit in AT-4 launcher. Grenade is same as for SMAW.
C90-CR-BK (M3) 90-mm	Spain	1 INA Fire: 5.1 Trans: 5.4	Tandem HE	350m/70mm /600mm brick wall /300+mm concrete reinforced	D: optical N: yes	Precursor shaped charge for punching a hole and follow-through HE grenade explodes(400 fragments) inside the bunker.
RPO-A			See Thermobaric above			
TBG-7V (Grenade on RPG-7V)	See RPG-7V 3	4.5 kg	TBG-7V (105-mm HE) See Thermobaric above	200m/2 m radius 200m/AT against light armor		The demolitions effect of the TBG-7V equates to that of a 122-mm HE artillery round.
BASTEG (Grenade on Pzf-3, 3-T, 3-T600, 3-IT600) 60-mm	See Pzf-3		BASTEG (HEMP—High Explosive Multipurpose, Tandem 110-mm HEAT/47-mm HE)	/15mm armor at 45° /AP fragmentation		BASTEG is Barricade & Street Encounter Grenade. Other penetrations: 920 mm sand-bag, 256 mm concrete

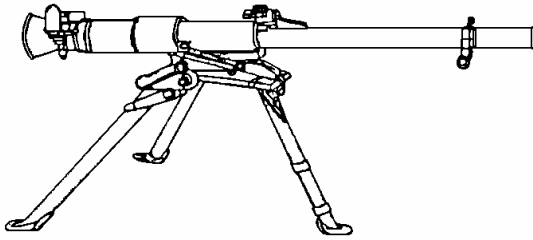
NOTES: 1. Disposable weapons are issued as rounds of ammunition. Users are assigned the mission in addition to other duties to supplement fires, or to create a breach.

2. All shaped charge grenades have some penetration effect for bunker-busting and against structures.

3. All high-explosive (HE) warheads have some demolition effects against structures. Thermobaric grenades have superior demolition effects against bunkers and structures, as well as personnel inside.

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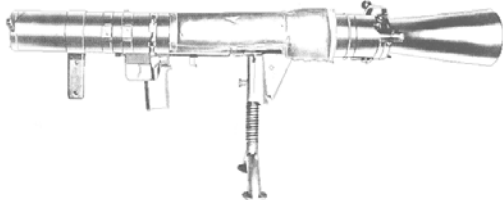
Russian 73-mm Recoilless Gun SPG-9

	Ammunition Types 73-mm recoilless gun RA HEAT RA HE	Typical Combat Load INA
SYSTEM Alternative Designations: INA Date of Introduction: 1970 Proliferation: Widespread Description: Crew: 3 Caliber (mm): 73 Weight (kg): Firing Position: 47.5 Travel Position: 47.5 Tripod: 12 Length (travel) (m): 2.11 Width (travel) (m): .99 Height (travel) (m): .80 Rifling: None Breech Mechanism Type: Interrupted screw Feed: Breech load Traverse (°): 30 total Elevation (°): -3 to +7 Rate of Fire (rd/min): 6 Emplacement/displacement time (min): 1 Fire From Inside Building: No	SIGHTS Name: PGO-9 Type: Optical and iron Magnification: Optical 4x, 10° field of view Location: Left side Sighting Range (m): 1,300 Night Sights Available: IR and passive night, PGN-9 VARIANTS SPG-9D: Airborne version with detachable wheels AMMUNITION Range (m): Maximum Effective: HEAT: 1,000 HE: 1,300 Minimum: INA Armor Penetration (mm) @ 1,000 m: 400 (HEAT any range) Casualty Radius (m): INA Length (mm): 1,000 Complete Round Weight (kg): Rocket-Assisted HEAT: 3.5 Rocket-Assisted HE: 4 Muzzle Velocity (m/s): 435 Max Velocity w/rocket assist (m/s): 700	

NOTES

The SPG-9 is a recoilless, smooth-bore, single-shot antitank weapon that fires both antiarmor and antipersonnel ammunition. Several generations of night vision equipment are available for the SPG-9. It is manportable, but a truck or APC normally carries it. It must be dismounted and placed on its tripod for firing.

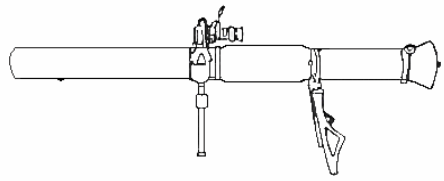
Swedish 84-mm Recoilless Rifle Carl Gustaf M2

	Ammunition Types 84-mm round HEAT (tandem) HEDP HEAT HE Smoke Illumination	Typical Combat Load INA
SYSTEM Alternative Designations: INA Date of Introduction: INA Proliferation: At least 20 countries Description: Crew: 1 or 2 (see NOTES) Caliber (mm): 84 Weight (kg): Mount: .8 M2: 14.2 M3: 8.5 Length (mm): 1,065 Rifling: 24 lands/progressive twist Breech Mechanism Type: Hinged Rate of Fire (rd/min): 6 Fire From Inside Building: INA SIGHTS Name: INA Type: Iron and telescoped Magnification: 3x Location: Left side Weight (kg): 1 Used With Range Finders: Yes, laser Night Sights Available: May be used with Generation III Image Intensification Systems. VARIANTS M3: Lightweight version of the M2 AMMUNITION Name: FFV 751 Type: HEAT (tandem) Range (m): Effective: 500 Minimum: INA Moving: INA Penetration: Armor (mm): +500 Weight (kg): 4	Name: FFV 502 Type: HEDP (with dual mode fuze) Range (m): Effective (personnel in open): 1,000 Effective (stationary): 500 Moving: 300 Arming Range: 15-40 Penetration: Armor (mm): +150 Weight (kg): 3.3 Muzzle Velocity (m/s): 230 Name: FFV 551 Type: HEAT Range (m): Effective: 700 Arming Range: 5-15 Penetration: Armor (mm): 400 Weight (kg): 3.2 Muzzle Velocity (m/s): 255 Name: FFV 441B Type: HE Range (m): Effective (unprotected troops, soft-skinned vehicles): 1,100 Arming Range: 20-70 Casualty Radius (m): INA Weight (kg): 3.1 Muzzle Velocity(m/s): 240 Name: FFV 469B Type: Smoke Range (m): Effective: Up to 1,300 Weight (kg): 3.1 Muzzle Velocity (m/s): 240 Name: FFV 545 Type: Illumination Range (m): Practical: 300-2,100 Burning Time (sec): 30 Illuminated Area, dia: 400-500 Candle Power: 650,000 cd Weight (kg): 3.1 Muzzle Velocity (m/s): 260	

NOTES

The 84-mm Carl Gustaf recoilless rifle is a one-man portable, direct-fire, single-shot, breech-loading weapon. Several versions of the Carl Gustaf are produced outside Sweden; however, the ammunition is interchangeable among the variants. While the weapon can be operated by one person it is better to have two—one to fire the gun, and the other to carry and load the ammunition. In addition to its antitank role, the weapon can be used as part of an illumination plan, to provide smoke, or for bunker busting.

United States 90-mm Recoilless Rifle M67

	Ammunition Types 90-mm recoilless gun HE HEAT APERS Target Practice	Typical Combat Load 7
SYSTEM Alternative Designations: INA Date of Introduction: Late 1940s Proliferation: At least 11 countries Description: Crew: 3 (see Note) Caliber (mm): 90 Weight (empty) (kg): 16.4 Length (mm): 1.35 Height (ground-mounted) (mm): 432 Mount: Rear bipod and forward monopod Feed: Manual Rate of Fire (rd/min): Maximum: 1 each 6 seconds, not to exceed 5 rounds Sustained: 1 Fire From Inside Building: No SIGHTS Name: M103 Type: Optical, (graduated in 50 m intervals up to 400 m, every 100 m up to 800 m) Magnification: x3 Field of View (°): 10 Location: Left center VARIANTS (INA)	AMMUNITION Name: INA Type: HE Range (m): Effective: 400 Weight (kg): INA Name: M371E1 Type: HEAT Range (m): Aimed: 800 Effective: 420 Penetration: Armor (mm): 350 Weight (kg): 4.2 Fuze: Point Detonating Muzzle Velocity (m/s): 213 Name: XM590E1 Type: APERS Canister (antipersonnel) Fill: 2,400 eight-grain flechettes Range (m): Effective: 200 Weight (kg): 3.08 Muzzle Velocity (m/s): 381 Name: XM590E1 Type: Target Practice Range (m): Ballistically identical to the HEAT M371E1 Weight (kg): 3.08 Muzzle Velocity (m/s): 381	

NOTES

The M67 90-mm recoilless rifle is a lightweight, portable, direct-fire only, crew-served antitank weapon. It is designed to be fired primarily from the ground using the bipod and monopod, but it may be fired from the shoulder. It is an air-cooled, breech-loaded, single-shot rifle that fires fixed ammunition. Although intended primarily for use as an antitank weapon, the M67 can be used against secondary targets such as gun emplacements and bunkers. It is also very effective in an anti-personnel role. Although no longer produced in the US, the M67 is still in production by South Korea.

The crew consists of a gunner, assistant gunner, and ammo bearer. The M67 can be operated with a crew of only two; however, the third crew member (ammo bearer) is considered necessary for efficient operations. In the absence of an individual to perform the duties assigned to the ammo bearer, the gunner (crew member 1) lays and fires the 90-mm rifle and is the crew leader. He carries the M67 and a pistol. The loader (crew member 2) is responsible for loading the rifle and acts as the gunner when required. He secures ammunition and checks the clearance of the backblast area prior to firing. He carries a pistol, spare parts, cleaning materiel, and 3 rounds of 90-mm. The ammunition bearer (crew member 3) is responsible for securing ammunition and providing security for the recoilless rifle position. He carries an assault rifle and 4 rounds of 90-mm.

Russian 40-mm Antitank Grenade Launcher RPG-7V

	Ammunition Types 40-mm grenade PG-7V PG-7VM PG-7VS PG-7VL PG-7VR TBG-7V OG-7V OG-7VM	Typical Combat Load 5
SYSTEM Alternative Designations: INA Date of Introduction: 1962 Proliferation: At least 40 countries Description: Crew: 2 Caliber (launcher) (mm): 40 Weight (kg): Empty: 7.9 Loaded: Varies with grenade Length (mm): 950 Rate of Fire (rd/min): 6 Fire From Inside Building: No Grenade Components: Warhead, rocket motor, tail assembly SIGHTS Name: PGO-7 Type: Optical w/II Magnification: 2.7x, 13° field of view Location: Top of launcher/sight-left side Sighting Range (m): 500 Night Sights Available: Yes, NSP-3, NSP-2 (IR), NSPU, PGN-1 (II), 1PN58 (II) VARIANTS RPG-7D, RPG-7DV1: Folding variants used by airborne troops AMMUNITION Name: PG-7V Caliber (mm): 85 Type: HEAT Range (m): Effective: 500 Minimum: INA Moving: 300 Penetration: Armor (mm): 330 Length (mm): INA Weight (kg): 2.2	Name: PG-7VM Caliber (mm): 70.5 Type: INA Range (m): Effective: 500 Minimum: INA Penetration: Armor (mm): 330 Muzzle Velocity (m/s): 140 Length (mm): 950 Weight (kg): 2 Name: PG-7VS Caliber (mm): 72 Type: INA Range (m): Effective: 500 Minimum: INA Penetration: Armor (mm): INA Brick (m): + 1.5 Reinforced concrete (m): + 1 Casualty Radius (m): INA Muzzle Velocity (m/s): INA Length (mm): INA Weight (kg): 2 Name: PG-7VL Caliber (mm): 93 Type: INA Range (m): Effective: 300 Minimum: INA Penetration: Armor (mm): 600 Brick (m): 1.7 Reinforced concrete (m): + 1.1 Muzzle Velocity (m/s): 112 Length (mm): 980 Weight (kg): 2.6	

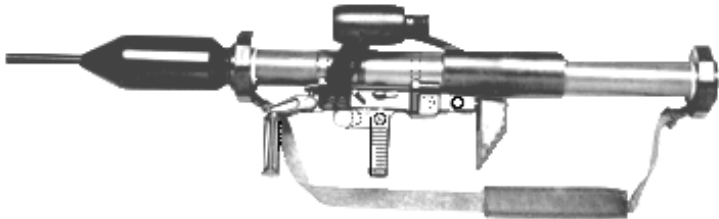
NOTES

The RPG-7V is a recoilless, shoulder-fired, muzzle-loaded, reloadable, antitank grenade launcher. It fires a variety of rocket-assisted grenades from a 40-mm smoothbore launcher tube. It is the standard squad antitank weapon in use by the OPFOR. The RPG-7V is light enough to be carried and fired by one person. However, an assistant grenadier normally deploys to the left of the gunner to protect him from small arms fire. The RPG-7V requires a well-trained gunner to estimate ranges and lead distances for moving targets. Crosswinds as low as 7 miles per hour can complicate the gunner's estimate and reduce first-round hit probability to 50% at ranges beyond 180 meters.

Russian Antitank Grenade Launcher RPG-7V continued

Name: PG-7VR (uses RPG-7V1 launcher sights) Caliber (mm): 105 Type: Tandem Range (m): Effective: 200 Minimum: INA Sighting Range: INA Penetration: Armor (mm): +750 (all armor including reactive armor) Brick (m): 2 Reinforced concrete (m): +1.5 Muzzle Velocity (m/s): INA Length (mm): 1,306 Weight (kg): 4.5 Name: TBG-7V (uses RPG-7V1 launcher sights) Caliber (mm): 105 Type: Thermobaric (similar to RPO-A warhead) Range (m): Effective: 200 Sighting Range: 800 Penetration: Armor (mm): INA Brick (m): +1.5 Reinforced concrete (m): + 1.5 Casualty Radius (m): INA Muzzle Velocity (m/s): INA Length (mm): INA Weight (kg): 4.5	Name: OG-7V Caliber (mm): 40 Type: Frag-HE Range (m): Effective: 950 Casualty Radius (m): INA Muzzle Velocity (m/s): 152 Length (mm): 569 Weight (kg): 1.7 Name: OG-7VM Caliber (mm): 40 Type: Frag-HE Range (m): Effective: 1,000 Casualty Radius (m): INA Muzzle Velocity (m/s): 145 Length (mm): 595 Weight (kg): 1.7
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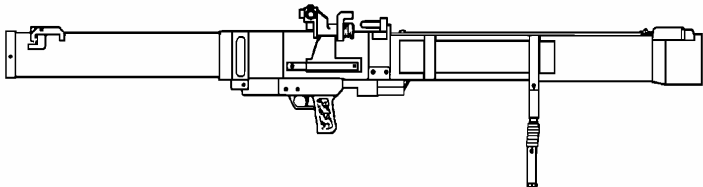
German 60-mm Antitank Grenade Launcher Panzerfaust-3

	Ammunition Types 60-mm grenade HEAT Multipurpose-FRAG BASTEG Illumination Smoke Practice	Typical Combat Load INA
SYSTEM Alternative Designations: Balliste, Pzf 3 Date of Introduction: 1990 Proliferation: At least eight countries Description: Crew: 1 Caliber (mm): Launch Tube: 60 Warhead: 110 Weight (kg): 12 Length (mm): Firing Position: 1,200 Travel Position: 1,200 Rifling: None Breech Mechanism Type: N/A Rate of Fire (rd/min): 5 Fire From Inside Building: Yes SIGHTS Name: INA Type: Optical Magnification: INA Location: Left side Used With Range Finders: Yes Night Sights Available: Yes VARIANTS Panzerfaust 3-T 600: Simrad IS2000 laser gun sight with range of moving targets out to 600 m. Can be fitted with Simrad KN205F night sights.	AMMUNITION Name: INA Caliber (mm): 110 Type: HEAT Range (m): Effective (moving): 300 Effective (stationary): 500 Penetration: Armor (mm): + 700 Weight (kg): 3.8 Muzzle Velocity(m/s): 170 Flight Velocity(m/s): 250 Time of Flight to 300 m (sec): 1.3 Name: BASTEG (Barricade and Street Encounter Grenade) Caliber (mm): 110 Type: Shaped-charge w/stand-off fuze Range (m): INA Penetration: Concrete (mm): INA Weight (kg): INA Muzzle Velocity(m/s): INA Flight Velocity(m/s): INA Time of Flight to 300 m (sec): INA OFF-ROUTE MINE SYSTEM Target Speed range (km/h): 30-60 Effective Range (m): 150 Operational Time (days): 40 Acquisition: Targets detected by acoustic sensor which activates the infra-red sensor. Sensors: IR Sensor: Passive, two-color IR Optics: Double parabolic, off-axis Acoustic: Capacitative microphone.	

NOTES

The Panzerfaust 3 is a compact, lightweight, shoulder-fired, unguided antitank weapon. It consists of a disposable cartridge with a 110-mm warhead and reusable firing and sighting device. The Panzerfaust can be adapted to serve as an off-route mine.

Russian 105-mm Antitank Grenade Launcher RPG-29

	Ammunition Types 105-mm grenade HEAT (tandem)	Typical Combat Load INA
SYSTEM Alternative Designations: Vampir Date of Introduction: Late 1980s Proliferation: Former Soviet Union Description: Crew: 2 Caliber (tube) (mm): 105 Weight (kg): 11.5 Length (mm): 1,000 Life of Tube/barrel: 300 Rate of Fire (rd/min): INA Fire From Inside Building: INA Maximum Target Speed (km/h): INA Emplacement/displacement time (min): (see NOTES) SIGHTS Name: INA Type: Iron, optical, and night Magnification: INA Location: Left side Sighting Range (m): 450 Night Sights Available: Yes, INA	VARIANTS (see NOTES) AMMUNITION Name: PG-29V Caliber (warhead): 105 Type: HEAT (tandem) Range (m): Effective: 500 Minimum: INA Penetration (m): Armor: +750, (650 behind ERA) Concrete and brick: +1.5 Casualty Radius (m): INA Length (mm): INA Complete Round Weight (kg): 6.7 Muzzle Velocity (m/s): 280	

NOTES

For ease of transportation the RPG-29 can be broken down into two parts which one soldier can carry. It can be made ready to fire within a few seconds. A folding bipod is provided to assist aiming during prone firing. An unnamed variant has a tripod mount and guidance and control system. The guidance and control system of the mounted variant includes an optical sight, laser rangefinder and ballistic data computer for firing on moving targets. This increases the effective range of the mounted system to 800 m against a stationary target with a hit probability of 80%.

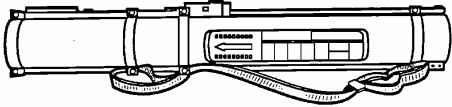
German 67-mm Disposable Antitank Grenade Launcher Armbrust

	Ammunition Type 67-mm grenade HEAT	Typical Combat Load INA
SYSTEM Alternative Designations: Crossbow Date of Introduction: INA Proliferation: At least seven countries Description: Crew: 1 Caliber (mm): 67 Weight (kg): 6.3 Length (mm): 850 Rifling: None Breech Mechanism Type: N/A Rate of Fire (rd/min): N/A (disposable) Fire From Inside Building: Yes (see NOTES) SIGHTS Name: N/A Type: Reflex Magnification: None Location: Left side Sighting Range (m): INA Night Sights Available: INA	VARIANTS (INA) AMMUNITION Name: INA Type: HEAT Range (m): Maximum: 1,500 Effective AT: 300 Flight Time (sec) @ 300 m: 1.5 Penetration: Armor (mm): 300 Reinforced Concrete (m): INA Muzzle Velocity(m/s): 210	

NOTES

The Armbrust is a preloaded, disposable, shoulder-fired antitank weapon. It has a low signature and low IR detectability and can be safely fired from small enclosed rooms. The muzzle does not emit smoke or blast and no flash can be seen from the rear. Only .8 m clearance is required between the rear of the weapon and the wall. It is quieter than a pistol shot. The entire weapon is considered a round of ammunition and the launcher is thrown away once the weapon is fired. Manufactured by Singapore.

Russian 72-mm Disposable Antitank Grenade Launcher RPG-22

		Ammunition Types 72-mm grenade HEAT	Typical Combat Load INA
SYSTEM Alternative Designations: INA Date of Introduction: 1985 Proliferation: At least three countries Description: Crew: 1 Caliber (mm): 72 Weight (kg): 2.8 Length (mm): Firing Position: 850 Travel Position: 750 Rifling: None Breech Mechanism Type: N/A Rate of Fire (rd/min): N/A (disposable) Fire From Inside Building: No, backblast out to 30 m behind the weapon. SIGHTS Name: INA Type: Iron, calibrated for 50, 150, 200 m Magnification: None Location: Top of launcher Sighting Range (m): 250 Night Sights Available: No	VARIANTS (None) AMMUNITION (see NOTES) Name: INA Caliber (mm): 72 Type: HEAT Range (m): Effective: 250 Arming Range: INA Penetration: Armor (mm): 390 Brick (m): 1.2 Reinforced Concrete (m): 1 Muzzle Velocity(m/s): Initial: 133 Maximum: 300 Length (mm): 618 Weight (kg): 1.48		

NOTES

The RPG-22 is a lightweight, shoulder-fired, preloaded, disposable antiarmor weapon intended for firing one round, after which the tube is discarded. It is basically a scaled-up version of the RPG-18 (similar to the US LAW) and has no dedicated grenadier; however, all soldiers train to use the squad-level disposable weapon.

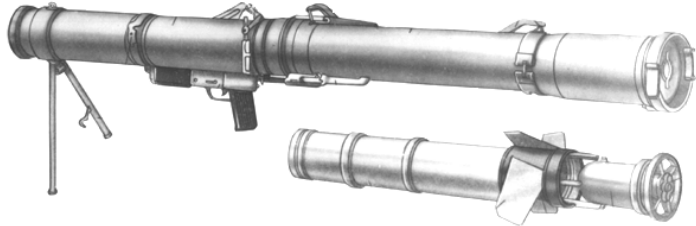
Swedish 84-mm Disposable Light Antitank Weapon AT4

	Ammunition Types 84-mm round HEDP HEAT	Typical Combat Load INA
SYSTEM Alternative Designations: US M136, Bofors AT 4, FFV AT4 Date of Introduction: INA Proliferation: At least seven countries Description: Crew: 1 Caliber (mm): 84 Weight (kg): 6 Length (mm): Firing Position: 1,000 Travel Position: 1,000 Rate of Fire (rd/min): N/A (disposable) Fire From Inside Building: See AT4 CS SIGHTS Name: INA Type: Popup, preset to 200 m Location: Top left Night Sights Available: Yes, INA VARIANTS (see NOTES) LMAW: Light Multipurpose Assault Weapon, uses HEDP AT4 CS: Confined space AT4 HP: High penetration AMMUNITION Name: AT4 HEAT Caliber (mm): 84 Type: HEAT Range (m): Effective: 300 Arming Range: INA Penetration: Armor (mm): 420 Weight (kg): 6.7 Muzzle Velocity(m/s): 285	Name: LMAW (see VARIANTS) Caliber (mm): 84 Type: HEDP, modified Carl Gustaf HEPD FFV 502 (with dual mode fuze) Range (m): Effective: 300 Arming Range: INA Penetration: Armor (mm): 150 Concrete (m): INA Casualty Radius (m): INA Muzzle Velocity (m/s): 235 Name: AT4 CS (confined space) can fire from confined spaces as small as 22.5 m³ Caliber (mm): 84 Type: HEAT or HEDP (LMAW) warheads Range (m): Effective: INA Arming Range: INA Penetration: Armor (mm): INA Weight (kg): INA Muzzle Velocity(m/s): INA Name: AT4 HP (high penetration) Caliber (mm): 84 Type: HEAT Range (m): Effective: INA Arming Range: INA Penetration: Armor (mm): 600 Weight (kg): Less than 7 Muzzle Velocity(m/s): 290	

NOTES

The AT4 is a lightweight, preloaded, disposable antiarmor weapon intended for firing one round, after which the tube is discarded. All AT4 systems share the same launcher but may contain different preloaded munitions. The variant selected depends on the intended use. The AT4's average recoil is comparable to the M16 rifle.

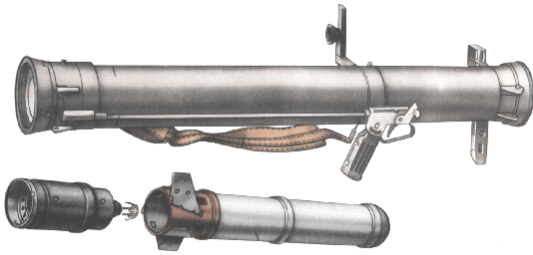
Russian Infantry Rocket Flame Weapon RPO

	<table><tr><th>Ammunition Types</th><th>Typical Combat Load</th></tr><tr><td>Rocket Rocket-propelled encapsulated napalm projectile.</td><td>2</td></tr></table>	Ammunition Types	Typical Combat Load	Rocket Rocket-propelled encapsulated napalm projectile.	2
Ammunition Types	Typical Combat Load				
Rocket Rocket-propelled encapsulated napalm projectile.	2				
SYSTEM Alternative Designations: Rys (Lynx) Date of Introduction: Late 1970s Proliferation: FSU Description: Crew: 1 Weight (kg): Empty: 3.5 Pack (launcher and two rounds): 22 Length (ready to fire) (m): 1.44 Rate of Fire (rockets/min): 1 Reaction Time-Travel to Fire (sec): 60 Fire From Inside Building: INA Tube Life: 100 rounds Launcher Components: Firing tube, firing mechanism, mechanical sights, collapsing bipod and sling. PERFORMANCE Range (m): Effective: 190 Maximum: 400 Minimum: INA Accuracy: INA Muzzle Velocity (m/s): INA	SIGHTS Name: N/A Type: Open metal, front and rear Location: Left side, rear is on-line with rear of grip Magnification: None Night Sights Available: INA VARIANTS (None) AMMUNITION Name: RPO Type: Incendiary Warhead Incendiary Fill (liters): 4 Weight of Incendiary in Warhead (kg): 4 Type of Incendiary: Pyrogel Burn Temperature (°C): 800-1,000 Caliber (mm): 122 Casualty Radius: Fire envelope 10-40 m deep in the direction of The shot with a spray width of 3-4 m. Components: Container, warhead canister, propulsion unit				

NOTES

The RPO is a combat-tested, shoulder-fired reusable weapon that fires a rocket-propelled encapsulated napalm warhead. It was designed to replace the LPO-50. The RPO is carried in two parts that must be connected to fire. Squeezing the trigger ignites the rocket with an electric spark. Part of the propellant gas enters the container and pushes the canister, kindling the igniter which in turn, ignites the incendiary mixture. The napalm in the RPO ignites at the initial stage of the flight and upon impact burning pieces are scattered all over the target. Although still in use by the OPFOR Flamethrower Bn (Encapsulated) at Corps or Army level (and other armies), the RPO has generally been replaced by the Infantry Rocket Flame Weapon RPO-A Series (RPO-A/D/Z).

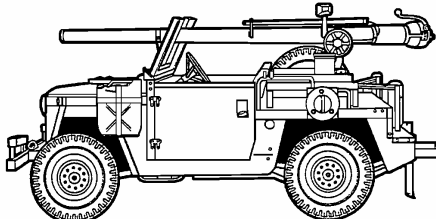
Russian Infantry Rocket Flame Weapon RPO-A Series (RPO-A/Z/D)

	Ammunition Types Rocket RPO-A: Thermobaric- flammable mixture RPO-Z: Incendiary RPO-D: Smoke	Typical Combat Load 2
SYSTEM Alternative Designations: Shmel (Bumblebee) Date of Introduction: 1984 Proliferation: Widespread Description: Crew: 1 Caliber (mm): 93 Number of Weapons in a Package: 2 Weight of Package (kg): 12 Total weapon (1) weight (kg): 11 Length (mm): 920 Rate of Fire (rockets/min): 2 Reaction Time-Travel to Fire (sec): 30 Fire From Inside Building: Yes. It can be fired in enclosures of 60 m³ or greater or with a barrier behind the weapon. Components: Container, ejection motor, warhead. PERFORMANCE Range (m): Direct Fire: 200 With Optical Sight: 850 Effective: 600 Minimum: 20 Indirect Fire: 1,000 Accuracy @ 200 m: .5 m² Muzzle Velocity (m/s): 125	SIGHTS Name: OPO-1 Type: Optical calibrated to 600 m Location: Left, next to grip Magnification: None Night Sights Available: INA VARIANTS (None) AMMUNITION Name: RPO-A Type: Thermobaric Casualty Radius (m): 50 (personnel in open) Lightly armored materiel kill probability at 400 m: 0.7 Burn Temperature (°C): 800+ Warhead Explosive Type: Trotyl equivalent (kg) -2 Warhead Mixture Weight (kg): 2.1 Name: RPO-Z Type: Incendiary Warhead Mixture Weight (kg): 2.5 Name: RPO-D Warhead Weight (kg): 2.3 Smoke-Incendiary Type: Based on red phosphorous. Smokescreen: Time of Formation (min): 2 Length (m): 55 to 90 Depth (m): INA Height (m): INA Duration (min): 3 to 5 Effective Against: Visual and infrared	

NOTES

Designed as a follow-on to the RPO, the RPO-A, -Z, and -D are one-shot, disposable, shoulder-fired, combat tested (Afghanistan, Tajikistan, Chechnya), flame weapons. They are reliable and can be ready to fire within 30 seconds. Any soldier, infantryman, or paratrooper can use this close-combat weapon with minimal instruction. The RPO-A comprises three basic components: container, ejection motor, and case which is filled, depending on its purpose, with thermobaric (enhanced blast explosive), smoke or incendiary rockets. At any range the blast effects of the thermobaric munitions are much more serious than the thermal effects. The RPO-A is known as the infantryman's pocket artillery because the demolition effect corresponds to the 122-mm HE artillery, and 120-mm mortar projectile. The RPO series of flame weapons also serves as an extremely effective counter-sniper weapon. The armor- and mechanized -based OPFOR usually issues one RPO-A per BMP (mechanized infantry squad). They are also found in the Flamethrower Bn (Encapsulated) at Corps or Army level. One squad per infantry platoon has a RPO-A in the infantry-based OPFOR. The RPO-A series of flame weapons are issued more along the lines of ammunition rather than a weapon, therefore the BOI may vary.

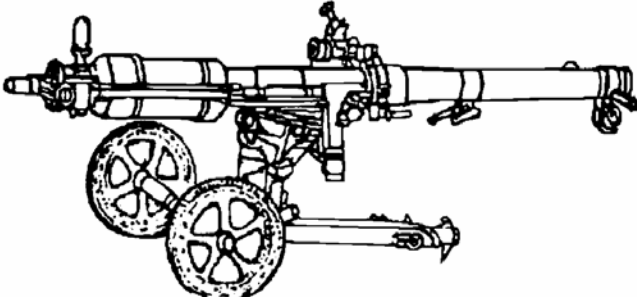
United States 106-mm Recoilless Rifle M40

	Ammunition Types 106-mm recoilless gun HEAT HEAT-T HEP-T APERS-T HEAP	Typical Combat Load INA
SYSTEM Alternative Designations: (see VARIANTS) Date of Introduction: 1953 Proliferation: At least 50 countries Description: Crew: 2 Caliber (mm): 106 Weight (kg): With Spotting Rifle: 130 Gun Only: 113 Length (m): Total: 3.40 Barrel: 2.85 Width (on M79 mount) (m): Legs Spread: 1.524 Legs Closed: .8 Height (on M79 mount) (m): 1.3 Bore: Rifled 36 grooves, rh Breech Type: Interrupted thread Recoil System: Vented breech Feed: Manual Traverse (°): 360 Elevation (°) (M79 Mount): -17/+65 Rate of Fire (rd/min): 5 Spotting Rifle: .50 cal M8C Emplacement/displacement time (min): INA Fire From Inside Building: No Complete Round Weight (kg): 13 Muzzle Velocity (m/s): 570 SIGHTS Name: INA Type: Optical Name: Bofors modernization package Type: Simrad LP101 laser sight in place of the ranging gun Magnification: INA Location: INA Name: Bofors modernization package Type: Computerized LASer Sight (CLASS) Magnification: INA Location: INA Night Sights Available: Yes, INA	VARIANTS M79 Mount: Tripod, ground, or vehicle M50 Ontos: Six-barrel mount on small tracked vehicle PAK-66: Austrian M40 on two-wheel carriage AMMUNITION Name: M344A1 Type: HEAT Range (m): Maximum Effective: 1,350 Maximum Range: 2,745 Armor Penetration (mm): INA Complete Round Weight (kg): 16.8 Muzzle Velocity (m/s): 503 Name: 3/A-HEAT-T (Bofors upgrade) Type: HEAT-Tracer Range (m): Maximum Effective: 2,000 Armor Penetration (mm): 700 + Complete Round Weight (kg): 14.5 Muzzle Velocity (m/s): 570 Name: M346A1 Type: HEP-T (HE plastic-tracer) Range (m): Maximum: 6,870 Complete Round Weight (kg): 16.95 Muzzle Velocity (m/s): 498 Name: M581 Type: APERS-T (antipersonnel-tracer) (flechette) Fill (.5 g ea): 10,000 flechettes Range (m): Maximum Effective: 300 Complete Round Weight (kg): 18.73 Muzzle Velocity (m/s): 438 Name: HEAP M-DN Type: HE antipersonnel (steel pellets) Fill: 1,000 steel pellets Range (m): Maximum Effective: 1,500 Lethal Radius: 40 Complete Round Weight (kg): 16.4 Muzzle Velocity (m/s): 560	

NOTES

The US M40 or M40A1 recoilless rifle is an antitank weapon. It uses a .50 cal spotting rifle mounted along the axis of the barrel to determine proper elevation for the 106-mm barrel. Upgraded systems may have the Simrad laser sight in lieu of the ranging (spotting) gun.

Russian 82-mm Recoilless Gun B-10

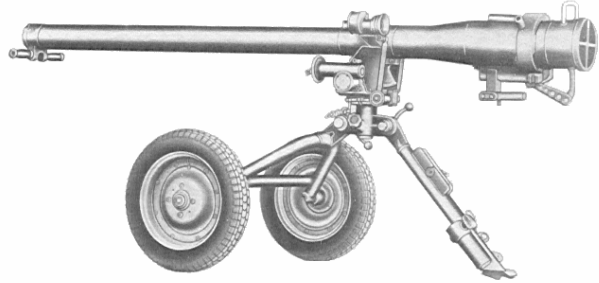
	<table><tr><th>Ammunition Types</th><th>Typical Combat Load</th></tr><tr><td>82-mm recoilless gun</td><td>36</td></tr><tr><td>HEAT</td><td>12</td></tr><tr><td>HE/Frag-HE</td><td>24</td></tr></table>	Ammunition Types	Typical Combat Load	82-mm recoilless gun	36	HEAT	12	HE/Frag-HE	24
Ammunition Types	Typical Combat Load								
82-mm recoilless gun	36								
HEAT	12								
HE/Frag-HE	24								
SYSTEM Alternative Designations: RG82 Date of Introduction: 1950s Proliferation: At least 10 countries Description: Crew: 4 Caliber (mm): 82 Weight (kg): Firing Position: 85.3, 71.7 without wheels Travel Position: 85.3, 71.7 without wheels Tripod: 6.5 Length (travel) (m): 1.85 Width (travel) (m): INA Height (travel) (m): INA Rifling: None Breech Mechanism Type: Horizontally hinged Feed: Breech load Traverse (°): 250 each direction, 360 total Elevation (°): -20/+35 Rate of Fire (rd/min): 5-7 Emplacement/displacement time (min): 1/ 0.5 Fire From Inside Building: No SIGHTS Name: PBO-2 combination, and iron Type: Optical, panoramic and iron Magnification: Optical 5.5x direct/2.5x indirect Location: Left side Sighting Range (m): 1,000 direct 4,500 indirect Night Sights Available: Direct and indirect (illuminated)	VARIANTS Type 65: This Chinese variant weighs only 28.2 kg (with tripod but without wheels). The gun uses the Type 69 combination sight and fires a mix of ammunition including the Type 65 HEAT round. Type 65-1: Chinese variant with a two-piece gun tube for long distance dismantled carry. Estimated weight is still 28.2 kg. AMMUNITION Name: BK-881M Type: HEAT Range (m): Maximum Effective: 400 Maximum Aimed Range: 1,000 (direct) Maximum Range: 4,500 Armor Penetration (mm): 240 Complete Round Weight (kg): 4.87 Muzzle Velocity (m/s): 322 Name: Type 65 Type: HEAT Range (m): Maximum Effective: 450 Maximum Aimed Range: INA Maximum Range: 3,750 Armor Penetration (mm): 356 Complete Round Weight (kg): 3.5 Muzzle Velocity (m/s): 240 Name: O-881A Type: Frag-HE Range (m): Maximum Effective: 4,500 (indirect) Maximum Aimed Range: 1,000 direct/4,500 indirect Maximum Range: 7,300 Lethal radius (m): INA Complete Round Weight (kg): 4.87 Muzzle Velocity (m/s): 320								

NOTES

The B-10 can be mounted on a pintel, but is normally towed on a two-wheeled carriage with an under-slung tripod. The gun can be fired while on two wheels or on the tripod.

Other ammunition types include O-881 HE and BK-881 HEAT.

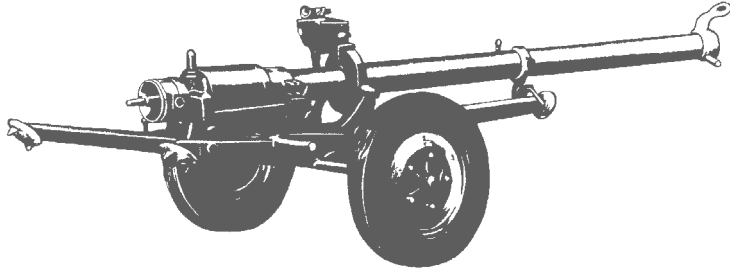
Former Yugoslavian 82-mm Recoilless Gun M60

	Ammunition Types 82-mm recoilless gun HEAT	Typical Combat Load 36
SYSTEM Alternative Designations: M60A Date of Introduction: First sighted 1965 Proliferation: At least 2 countries Description: Crew: 2-5 Caliber (mm): 82 Weight (kg): Firing Position: 122 Travel Position: 122 Tripod: INA Length (travel) (m): 2.4 approximate Width (travel) (m): 1.0 approximate, firing position Height (travel) (m): 0.83 approximate, firing position Rifling: Yes, 4 with left rotation Breech Mechanism Type: Vertically hinged with flange rotate lock Feed: Breech load Traverse (°): 360 Elevation (°): -20 to +35 Rate of Fire (rd/min): 4 Emplacement/displacement time (min): 0.5/ 0.5 Fire From Inside Building: No SIGHTS Name: INA Type: Optical telescopic Magnification: INA Location: Left side Sighting Range (m): 1,500 Night Sights Available: INA	VARIANTS Distinction between M60 and M60A is unknown. AMMUNITION Name: M60 Type: HEAT Range (m): Maximum Effective: 500 Maximum Aimed Range: 1,500 stationary target 	

NOTES

The M60 is mounted on a two-wheeled carriage with a trailing leg that is used as a tripod leg for firing, as well as a tow bar for towing the gun. The gun can be towed behind a variety of vehicles, then moved into position by hand. Gun height is adjustable based on wheel and leg lock settings. The M60 can also be mounted on a pintel, such as the antitank version of the M-60PB APC, which features two guns. Back-blast safety area is 45 m deep by 25 m wide.

Russian 107-mm Recoilless Gun B-11

	<table><tr><th>Ammunition Types</th><th>Typical Combat Load</th></tr><tr><td>107-mm recoilless gun</td><td>30</td></tr><tr><td>HEAT</td><td>10</td></tr><tr><td>HE</td><td>20</td></tr></table>	Ammunition Types	Typical Combat Load	107-mm recoilless gun	30	HEAT	10	HE	20
Ammunition Types	Typical Combat Load								
107-mm recoilless gun	30								
HEAT	10								
HE	20								
SYSTEM Alternative Designations: RG107 Date of Introduction: 1950s Proliferation: At least 5 countries Description: Crew: 5 Caliber (mm): 107 Weight (kg): Firing Position: 304.8 Travel Position: 304.8 Length (m): Firing Position: 3.54 Travel Position: 3.56 Width (travel) (m): 1.45 Height (m): Firing Position: 1.19 Travel Position: 0.9 Rifling: None Breech Mechanism Type: Interrupted screw Feed: Breech load Traverse (°): 35 each direction, 360 total with slight move Elevation (°): -10 to +45 Rate of Fire (rd/min): Emplacement/displacement time (min): 1/1 Fire From Inside Building: No	SIGHTS Name: PBO-4 combination (direct/indirect) and iron Type: Optical, panoramic and iron Magnification: Optical 5.5x direct/2.5x indirect Location: Left side Sighting Range (m): Direct: 1,800 Indirect: 6,650 Night Sights Available: Direct and indirect (illuminated) AMMUNITION Name: BK-883 Type: HEAT Range (m): Max Effective: 450 Max Aimed Range: 1,400 (est) Max Range: INA Armor Penetration (mm): 381 at 0° Complete Round Weight (kg): 12.5 Muzzle Velocity (m/s): 400 Name: O-883A Type: Frag-HE Range (m): Max Effective: N/A Max Aimed Range: 1,300 direct/ 6,650 indirect Max Range: 6,650 Armor Penetration (mm): N/A Complete Round Weight (kg): 13.5 Muzzle Velocity (m/s): 375								

NOTES

The B-11 is towed on a two-wheeled carriage with an under-slung tripod. The gun can be fired while on two wheels; but due to recoil effect on accuracy, it is usually fired from the tripod.

The gun can easily be moved and repositioned by hand.

A unit of fire is 80 rounds.

Chapter 2

Infantry Vehicles

Infantry vehicles can vary from general transport assets such as trucks, to specially designed ***light armored fighting vehicles (LAFVs)***. The intensity of combat on the modern battlefield requires infantry vehicles that are mobile, survivable, and lethal. Many ground forces have programs underway to field infantry LAFVs for modern requirements. Because of budgetary constraints, many ground forces continue using infantry vehicles which we might consider obsolete, but which are well suited for their environment and military role. A number of forces have aggressive upgrade programs for older systems. The U.S. Army, in its next conflict, is likely to encounter infantry forces with a mix of older and newer infantry vehicles.

CLASSIFICATION

Infantry LAFVs are generally classed as ***armored personnel carriers (APCs)*** or ***infantry fighting vehicles (IFVs)***. The lighter, less protected and less lethal system is the APC. It is intended to carry soldiers to the close combat zone, then dismount them for their commitment to the fight. An IFV is designed to fight with soldiers onboard, to carry the soldiers forward without dismounting them if possible, and to support them with direct fires if they do dismount. The plethora of upgrade options available is permitting both APCs and IFVs to become more mobile, survivable, and lethal. Thus we see APCs with IFV survivability or IFV lethality, or with both—which transforms them into IFVs. We also see IFVs with vulnerabilities which ill-suit them for their mission requirement. This chapter highlights key infantry vehicles, with an emphasis on their capabilities in mobility, survivability and lethality. Please note that on the modern battlefield, lack of a capability (swim, night sights, etc.) is in fact a vulnerability.

TRENDS

This chapter highlights infantry LAFV features in terms of mobility, survivability, and lethality. Armies have been looking at ways to balance the need for increased protection with limitations that additional armor brings, such as the need to be amphibious. One solution is to accept a lack of swim capability for a segment of up-armored IFVs, coupled with a distribution of (less armored) amphibious vehicles within the force. Other armies are looking at limited addition of applique armor or active protection systems. Several companies have developed light explosive reactive armor (ERA), which can be used on LAFVs. However, this is a less likely upgrade, because exploding armor fragments are a hazard to dismounted soldiers.

In the past, higher combat power and cost of tanks justified the wide disparity in firepower between tanks and IFVs. However, modern IFVs, when fully manned and equipped, may have equal or higher combat power and similar cost. Therefore, lethality improvements previously afforded to tanks are being added to selected IFVs. A wide variety of lethality upgrades are available for LAFVs. These include larger main weapons and antitank guided missile (ATGM) launchers, and improved fire control systems (FCS), especially night sights. The simplest but sometimes most costly upgrade is improved ammunition.

Improved secondary armaments for aerial targets permit the main weapon to focus more on heavy targets. Thus, several countries are adding remote day sights and night sights and improved ammunition for machineguns (MGs). Others are adding automatic grenade launchers to supplement MG fires.

The aerial threat to AFVs has prompted ground forces to address that threat. One response is proliferation of air defense assets, such as shoulder-fired SAMs. A more direct response which is difficult to counter, is cost-effective, and has long-term benefits for force effectiveness, is to better equip the vehicles for counterair fires. Some infantry vehicles have been fitted with high-angle-of-fire turrets (e.g., BTR-80) and antiaircraft sights (BMP-3). Improved fire control technology has led to more exotic ammunition solutions. The BMP-3 gun-launched ATGM has a higher velocity for use against helicopters. Another new development is ballistic computer-based electronically-fuzed frag-HE rounds, including forward- and side-firing rounds, which can defeat rotary-wing aircraft and ground-based antiarmor positions at stand-off range.

Infantry vehicles offer the most economical armored vehicle chassis for development of combat support and service support vehicles, including air defense vehicles, artillery, C⁴, reconnaissance, etc. Noted variants offer a link to other systems described in the WEG.

This chapter provides a representative sampling of infantry vehicles in use today. The selection is not comprehensive, rather reflects APCs and IFVs currently available to the OPFOR. Within this chapter, other types of infantry vehicles are also noted. These include airborne vehicles and multipurpose transporters. Other armored transport vehicles available to infantry units are armored trucks (e.g., former Soviet BTR-152), amphibious assault vehicles (such as U.S. LVTP7), jeep-type vehicles (e.g., HMMWV), and fast-attack vehicles (based on so-called dune buggy designs). Examples of alternative vehicles will be added in later issues of the WEG.

TECHNICAL NOTES

The following notes apply to infantry LAFVs, and to combat vehicles (in other chapters) that are used for reconnaissance, tank/assault, antitank, air defense, and artillery roles. Weapon, fire control, and munition-related narrative applies to towed and ground weapon systems.

On each equipment sheet, the top of the page provides an illustration (line drawing or photo of the system) and a summary of weapons and munitions. Note that a Typical Combat Load, when available, may be estimated. In actuality, ammunition load depends on specific country holdings, on time frame, and on scenario tactical considerations.

System and Variants sections provide basic data to assist in understanding current system status and proliferation, as well as possible upgrade options. Under Description, to assure comparability on vehicle dimensions, gun tube length is not included in those dimensions.

In the area, Automotive Performance, the figure *max off-road* denotes speed on dirt roads. The figure *average cross-country* is used for true off-road speed; for selected systems, it was measured on an approved course. Although some systems have specified radios, for many OPFOR countries, radios will be replaced to link with their military radio nets.

Protection figures for use in simulation applications must be measured by certifying agencies in accordance with specific Army standards. Figures on equipment sheets include published data provided for general information use, and may not coincide with vulnerability data developed by approved agencies. Protection options are available for upgrading systems. The wide variety of supplemental protection packages include active and passive armor, active protection systems and countermeasure systems. Although upgrades are being advertised and are technically possible, that does not mean that they are tactically sound, or that the application fits the OPFOR to be portrayed. Other options are generally available for installation; but, because their applicability has not been noted for specific systems, they were not included. Only a few countermeasure parameters were included. However, specific protection upgrades and systems are noted for selected OPFOR systems.

System lethality is determined by a variety of interrelated functions and considerations in the process of bringing destruction upon enemy forces and equipment. Lethality is addressed on the equipment sheets under the headings of Armament, Fire Control, Sights, and Main Armament Ammunition. Lethal fires can be delivered by **direct fire**, in which weapon systems acquire and observe their targets, or by **indirect fire**, in which weapons use remote acquisition assets to direct their fires. Note that direct-fire systems such as tanks can receive remote acquisition reports and engage targets by indirect fire; and indirect fire systems (such as artillery) can employ direct-fire sights to fire in the direct-fire mode. For the WEG, high-angle fires are not interpreted as indirect fires as long as the firing weapon uses its own sights to acquire and aim.

Factors affecting lethality, which are considered in the WEG, include: rates of fire, various ranges, accuracy and errors, acquisition/fire control capabilities, lethality effects, ammunition, and ability to engage targets on the move. Any of these technical factors, and other more subtle ones, may affect lethality in combat. Note also that various rates of fire are used, with adjusting factors, such as movement status and type of target. Generally automatic weapon use life dictates that, for more than a 3-4 second interval, the number of rounds expended will not exceed the **practical** rate of fire. However, maximum rate is critical against fast-closing targets, such as flying aircraft.

Range is not a fixed figure for most systems. It can be directly affected by four technical factors: gun/launcher configuration, mount (how it is fixed to the system), acquisition capability, and specific munition ballistics. Range is also related to less tangible factors, such as movement status (moving versus stationary, and movement speed), target type, elevation angle (such as for air defense weapons), visibility conditions, and terrain. Each weapon can have different ranges listed by ammunition type and model, where munitions are broken out. Generally, the range of direct-fire frag-HE rounds is greater than munitions designed for point targets, because the effects area is much greater than those of shaped-charge or kinetic-energy rounds. With fragmentation and blast effects, a near miss may be good enough to inflict severe damage. With these considerations, the WEG provides a figure called **maximum aimed range**. This range indicates the farthest range for system-on-system aimed direct fire.

The maximum aimed range is based on a combination of tactics, techniques and procedures (TTPs), and on parameters of the technical factors noted above: gun/launcher, mount, acquisition system, and ammunition ballistics. This direct-fire range significantly exceeds the weapon's *maximum effective range*. The maximum effective range/night denotes the effective range for a round, given available night acquisition capabilities. The TTPs also call for a "salvo range" for armored fighting vehicles, which exceeds other ranges and requires one or more volleys of a platoon against a single point target. These figures are less tangible, are based on TTP, and are not included in the WEG.

Probability of hit data is included for instructional purposes, not for use in simulations and models. Accuracy for weapons, munitions, and acquisition systems decreases with range. Antitank guided missiles are an exception; they usually have a singular probability of hit for all ranges, based on technical precision capability. Limitations, vulnerabilities, and countermeasures can affect actual performance. Several of these factors are noted on equipment pages.

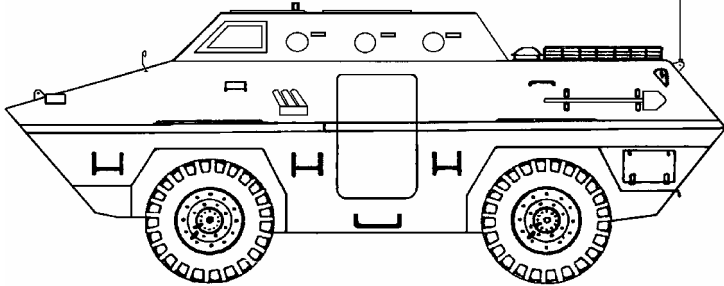
Lethality performance given a hit can be measured in terms of radius of effects for fragmentation/blast effects against soft targets, and penetration distance (through steel) against hard targets. The fragmentation and blast effects of a frag-HE round mean that it is less lethal against hard targets, such as heavily armored vehicles. Another consideration is the level of destruction required. For many possible adversary forces, the critical requirement against armored vehicles is not a 100% or catastrophic kill. A mobility kill or firepower kill may be sufficient to render a system combat-ineffective, and may be counted in lethality data. The OPFOR can employ a mix of lethal and nonlethal methods. Fires of degrading (versus destructive) munitions such as smoke, mines, and radio frequency jammers can be used to suppress units and support the effort. Consult other manuals in the FM 100-60 series and other approved publications for guidance on these tactics, techniques, and procedures.

Questions and comments on data listed in this chapter should be addressed to:

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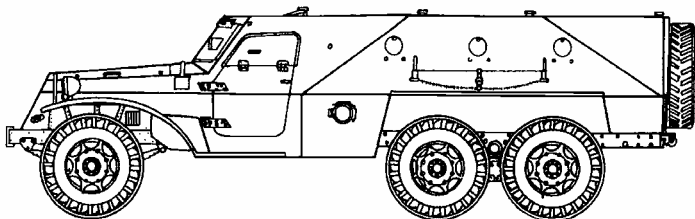
Yugoslavian Armored Personnel Carrier BOV-M

	Weapons & Ammunition Types 7.62-mm MG, M86 Ball-T, API, API-T	Typical Combat Load (est) 2,000
SYSTEM Alternative Designations: Sometimes referred to as "BOV" Date of Introduction: 1984 Proliferation: At least 3 countries Description: Crew: 2 Troop Capacity: 8 Combat Weight (mt): 7.0 -9.0, depending on the variant Chassis Length Overall (m): 6.0 Height Overall (m): 2.34 to top of cabin Width Overall (m): 2.53 Ground Pressure (kg/cm²): INA Drive Formula: 4 x 4 Automotive Performance: Engine Type: 148-hp Diesel Cruising Range (km): 800 Speed (km/h): - Max Road: 95 - Max Off-Road: INA - Average Cross-Country: 40 - Max Swim: N/A Fording Depths (m): 1.1 Radio: INA Protection: Armor, Turret Front (mm): 6-10 mm, defeats 7.62 mm AP at 300 m Applique Armor (mm): Grill armor over windows, sides on variants Explosive Reactive Armor (mm): N/A Active Protective System: N/A Mineclearing Equipment: N/A Self-Entrenching Blade: N/A NBC Protection System: Available Smoke Equipment: 3 smoke grenade launchers on each side ARMAMENT Main Armament: (See NOTES) Caliber, Type, Name: 7.62-mm (7.62x 54R) M86 MG Rate of Fire (rd/min): 250 practical / 650 cyclic, 2-10 round bursts Loader Type: Belt-feed (100-rd belts) Ready/Stowed Rounds: INA Elevation (°): INA Fire on Move: Yes Auxiliary Weapon: N/A	ATGM Launcher: N/A Firing Ports: 3 firing ports on each side, plus 1 for commander FIRE CONTROL FCS Name: N/A Main Gun Stabilization: N/A Rangefinder: N/A Infrared Searchlight: Yes, on MG Sights w/Magnification: Gunner: - Day: Optical sight, INA - Field of View (°): INA - Acquisition Range (m): 1,500 - Night: IR night sight on MG Commander Fire Main Gun: No VARIANTS BOV-M: APC was produced in the republic of Slovenia. Some APCs have a 12.7-mm MG. BOV-VP: Security version with metal grates on the sides which can be swung out to direct crowds. BOV-1/Polo M-83: ATGM launcher vehicle w/6 x AT-3 launchers. BOV-3: Air defense variant with 3 turret-mounted 20-mm cannon. BOV-30: Air defense vehicle with 2 turret-mounted 30-mm cannon. BOV-SN ambulance: Ambulance variant. LOV: Croatian APC variant without the raised compartment, with a 12.7-mm MG, and optional increased hull protection. The family of LOV vehicles includes recon and NBC recon vehicles, command vehicle, rocket launcher, EW vehicle, and AA missile vehicle. MAIN ARMAMENT AMMUNITION Caliber, Type, Name: 7.62-mm API, API-T - Maximum Aimed Range (m): 1,500 - Max Effective Range (m): - Day: 1,000/400-500 on the move - Night: INA - Tactical AA Range: INA - Armor Penetration (mm): 8 (RHA) at 500 m Other Ammunition Types: Light Ball, Ball-T, Heavy Ball, Incendiary	

NOTES

The M86 MG is a license-built copy of the Russian PKT. Vehicle has central tire inflation system. Many vehicles have steel mesh screen over the windows.

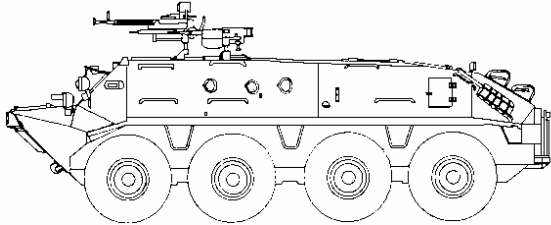
Russian Armored Transporter BTR-152

 BTR-152V2 Variant	Weapons & Ammunition Types 7.62-mm SGMB MG Lt ball, ball-T, API or 12.7mm MG <u>Optional in side mounts</u> 2x 7.62-mm SGMB MG Lt ball, ball-T, API	Typical Combat Load 1,250 1,250-1,750
SYSTEM Alternative Designations: BTR-140, Chinese Type 56 Date of Introduction: 1950 Proliferation: At least 20 countries Description: Crew: 2 Troop Capacity: 17 Combat Weight (mt): 9.0 Chassis Length Overall (m): 6.83 Height Overall (m): 2.04 Width Overall (m): 2.32 Ground Pressure (kg/cm²): 3.7 Drive Formula: 6 x 6 Automotive Performance: Engine Type: 110-hp Gasoline Cruising Range (km): 650 Speed (km/h): Max Road: 65 Max Off-Road: INA Average Cross-Country: INA Max Swim: N/A Fording Depths (m): 0.80 Radio: 10RT-12 or R-123 Protection: Armor, Turret Front (mm): 11-15 on hull front (no turret) Applique Armor (mm): Available Explosive Reactive Armor (mm): N/A Active Protective System: N/A Mineclearing Equipment: N/A Self-Entrenching Blade: N/A NBC Protection System: N/A Smoke Equipment: N/A ARMAMENT Main Armament: Note: 12.7-mm MG can be used instead. Caliber, Type, Name: 7.62-mm (7.62x 54R) machinegun, SGMB Rate of Fire (rd/min): 250 practical Loader Type: Belt-fed Ready/Stowed Rounds: 250 in box, 1,000 ready/0 Elevation (°): -6 to +23.5 Fire on Move: Yes Auxiliary Weapon: (Optional) Caliber, Type, Name: 2x 7.62-mm (7.62x 54R) machinegun, SGMB Mount Type: Optional MGs on side pintel mounts Maximum Aimed Range (m): 2,000	Max Effective Range (m): Day: 1,000/ 400-500 on the move Night: II sights available Fire on Move: Yes Rate of Fire (rd/min): 250 practical each/650 cyclic, 2-10 rd bursts ATGM Launcher: N/A Firing Ports: 3 on each side, 2 in rear doors FIRE CONTROL FCS Name: N/A Main Gun Stabilization: N/A Rangefinder: N/A Infrared Searchlight: No Sights w/Magnification: Gunner: Day: Optical sight Field of View (°): INA Acquisition Range (m): 2,000 Night: II and IR sights available Commander Fire Main Gun: No VARIANTS BTR-152: Basic APC; many of which would later be covered and converted for other uses, such as ambulances, radio stations, and engineer vehicles. Versions for AA use include an Egyptian M53 gun (4x 12.7 mm) mount, and PLO-held ZU-23-2 gun mount. BTR-152A: Anti-aircraft version with twin 14.5-mm MG turret BTR-152D and E: Anti-aircraft versions with 4x 14.5-mm MGs BTR-152I: BTR-152V version for artillery command vehicle. BTR-152K: Version similar to BTR-152V3 but with armored roof BTR-152V: APC variant has central tire inflation system. BTR-152U: Command vehicle with high rear structure BTR-152V1: BTR-152V version with winch BTR-152V2: BTR-152V version without winch BTR-152V3: BTR-152V with winch and infrared driving lights MAIN ARMAMENT AMMUNITION Caliber, Type, Name: 7.62-mm API Maximum Aimed Range (m): 2,000 Max Effective Range (m): Day: 1,000 Night: INA Tactical AA Range: 1,000 Armor Penetration (mm): 8 at 500 m Other Ammunition Types: Light ball, ball-T, hvy ball, API-T, I-T	

NOTES

Vehicles are early examples of armored transporters built from converted truck chassis (ZIL-151, and later ZIL-157)

Russian Armored Personnel Carrier BTR-60PA

	<table><tr><th>Weapons & Ammunition Types</th><th>Typical Combat Load</th></tr><tr><td>12.7-mm DShK MG APDS, API, API-T, HE-T, HEI, I-T</td><td>500 250 250</td></tr><tr><td>2 x 7.62-mm PKT MG Lt Ball, Ball-T API, API-T</td><td>3,000</td></tr></table>	Weapons & Ammunition Types	Typical Combat Load	12.7-mm DShK MG APDS, API, API-T, HE-T, HEI, I-T	500 250 250	2 x 7.62-mm PKT MG Lt Ball, Ball-T API, API-T	3,000
Weapons & Ammunition Types	Typical Combat Load						
12.7-mm DShK MG APDS, API, API-T, HE-T, HEI, I-T	500 250 250						
2 x 7.62-mm PKT MG Lt Ball, Ball-T API, API-T	3,000						
SYSTEM Alternative Designations: BTR-60-PK Date of Introduction: 1963 Proliferation: At least 30 countries (including variants) Description: Crew: 2 Troop Capacity: 12 Combat Weight (mt): 10.1 Chassis Length Overall (m): 7.22 Height Overall (m): 2.06 Width Overall (m): 2.82 Ground Pressure (kg/cm²): INA Drive Formula: 8 x 8 Automotive Performance: Engine Type: 2 x 180-hp Gasoline Cruising Range (km): 500 Speed (km/h): Max Road: 80 Max Off-Road: 60 Average Cross-Country: INA Max Swim: 10 Fording Depths (m): Amphibious Radio: INA Protection: Armor, Turret Front (mm): 7-9mm hull front (no turret) Applique Armor (mm): N/A Explosive Reactive Armor (mm): N/A Active Protective System: N/A Mineclearing Equipment: N/A Self-Entrenching Blade: N/A NBC Protection System: Collective Smoke Equipment: N/A ARMAMENT Main Armament: Caliber, Type, Name: 12.7-mm (12.7 x 108) heavy MG, DShK Rate of Fire (rd/min): 80-100 (practical) Loader Type: Belt feed Ready/Stowed Rounds: INA Elevation (°): -10/+80 Fire on Move: Yes Auxiliary Weapons: Caliber, Type, Name: 2 x 7.62-mm machinegun PKT Mount Type: Vehicle top Maximum Aimed Range (m): 1,500 Max Effective Range (m): Day: 1,000 Night: N/A	Fire on Move: Yes Rate of Fire (rd/min): 250 practical / 650 cyclic, in 2-10 rd bursts ATGM Launcher: N/A Firing Ports: 3 on each side FIRE CONTROL FCS Name: N/A Main Gun Stabilization: N/A Rangefinder: N/A Infrared Searchlight: N/A Sights w/Magnification: Gunner: Day: K10-T Field of View (°): INA Acquisition Range (m): 1,500 (est) Night: N/A Commander Fire Main Gun: No VARIANTS A variety of armament variants for the vehicle were used, including single 7.62-mm PKT MG, or 12.7-mm MG, or no MG. Artillery command and reconnaissance vehicles. ACRV 1V18 is a command and observation vehicle (COP). ACRV 1V19 is a fire direction center (FDC). BTR-60PB: The most widely fielded variant has a one- man turret, a 14.5-mm KPV-T MG, a coaxial 7.62-mm MG and day/night sights. BTR-60PBK: Company commander variant with 3 additional radios BTR-60 PU: Armored command vehicle (ACV) variant with a 10-m mast radio antenna and front-to-rear rail antenna for mobile use BTR-60 PU-12/-12M: Air defense associated ACV and its upgrade BTR-60 R-975: Forward air controller turreted variant. MTP-2: Armored recovery vehicle R-145BM: ACV with R-111, R-123, and R-130M radios and the distinctive Clothesline antenna						

Russian Armored Personnel Carrier BTR-60PA continued

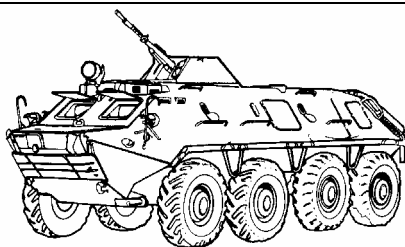
MAIN ARMAMENT AMMUNITION Caliber, Type, Name: 12.7-mm, APDS Chinese, Type 54 Maximum Aimed Range (m): 1,500 Max Effective Range (m): Day: 1,500 vehicles Night: N/A Tactical AA Range: 1,600 Armor Penetration (mm): INA 12.7-mm, API/API-T Type 54 Maximum Aimed Range (m): 1,500 Max Effective Range (m): Day: 1,500 unarmored ground / 800 armored Night: N/A Tactical AA Range: 1,000 Armor Penetration (mm): INA	Other Ammunition Types: Incendiary-T, HE-T Type MDZ, HEI Type ZP, Russian Duplex, Russian Duplex-T
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NOTES

This vehicle is a roofed variant of the BTR-60P open-hatch armored carrier. It is widely fielded in original and modified form. The APC has a top-mounted 12.7-mm MG forward of rectangular gunner's hatch. Where an additional two 7.62-mm MGs are mounted, they are right and left of the hatch. Because of space restriction, no more than one or two gunners can fit in the opening.

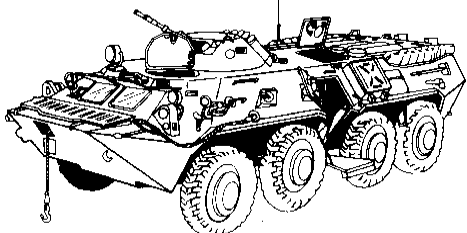
A notable vulnerability is that passengers have to exit the vehicle through top hatches, which makes them vulnerable to fires. Also, gunners must be at least shoulder high out of the vehicle to operate the weapons.

Russian Armored Personnel Carrier BTR-60PB

	<table><tr><th>Weapons & Ammunition Types</th><th>Typical Combat Load</th></tr><tr><td>14.5-mm turret MG API, API-T</td><td>500</td></tr><tr><td>7.62-mm coax PKT MG Light ball, Ball-T, API, API-T, I-T</td><td>2,000</td></tr></table>	Weapons & Ammunition Types	Typical Combat Load	14.5-mm turret MG API, API-T	500	7.62-mm coax PKT MG Light ball, Ball-T, API, API-T, I-T	2,000
Weapons & Ammunition Types	Typical Combat Load						
14.5-mm turret MG API, API-T	500						
7.62-mm coax PKT MG Light ball, Ball-T, API, API-T, I-T	2,000						
SYSTEM Alternative Designations: INA Date of Introduction: 1966 Proliferation: At least 33 countries Description: Crew: 2 Troop Capacity: 8 Combat Weight (mt): 10.3 Chassis Length Overall (m): 7.22 Height Overall (m): 2.3 Width Overall (m): 2.82 Ground Pressure (kg/cm²): 0.90 Drive Formula: 8 x 8 Automotive Performance: Engine Type: 2x 90-hp Gasoline Cruising Range (km): 500 Speed (km/h):Max Road: 80 Max Off-Road: INA Average Cross-Country: INA Max Swim: 10 Fording Depths (m): Amphibious Radio: R-123 Protection: Armor, Turret Front (mm): 7 Applique Armor (mm): Available Explosive Reactive Armor (mm): N/A Active Protective System: N/A Mineclearing Equipment: N/A Self-Entrenching Blade: N/A NBC Protection System: Collective Smoke Equipment: N/A ARMAMENT Main Armament: Caliber, Type, Name: 14.5-mm (14.5 x 114) heavy MG, KPVT Rate of Fire (rd/min): 150 practical Loader Type: Belt-fed Ready/Stowed Rounds: 50/450 Elevation (°): -5 to +30 Fire on Move: Yes Auxiliary Weapon: Caliber, Type, Name: 7.62-mm machinegun, PKT Mount Type: Coax	Maximum Aimed Range (m): 2,000 Max Effective Range (m): Day: 1,000/ 400-500 on the move Night: N/A Fire on Move: Yes Rate of Fire (rd/min): 250 practical/650 cyclic, 2-10 round bursts ATGM Launcher: N/A Firing Ports: 3 on each side FIRE CONTROL FCS Name: N/A Main Gun Stabilization: N/A Rangefinder: N/A Infrared Searchlight: Yes Sights w/Magnification: Gunner: Day: PP-61AM, 2.6x Field of View (°): 23 Acquisition Range (m): 2,000 Night: N/A Commander Fire Main Gun: No VARIANTS BTR-60PBK: Command APC variant, with three additional radios. BTR-60PB FAC: Turreted forward air control variant without gun. BTR-60PZ: Final production model, with 1PZ-2 roof-mounted periscope and high angle-of-fire turret. BTR-70: Similar design with diesel engines and added side doors. BTR-80: Similar design with many upgrades, including greater dimensions, larger side doors, high angle-of-fire turret, new radio, single more powerful diesel engine, smoke grenade launchers, etc. MAIN ARMAMENT AMMUNITION Caliber, Type, Name: 14.5-mm API-T Maximum Aimed Range (m): 2,000 Max Effective Range (m): Day: 2,000 Night: INA Tactical AA Range: 1,400 Armor Penetration (mm): 20 at 1,000 m/ 30 at 500 m Other Ammunition Types: API, I-T						

NOTES

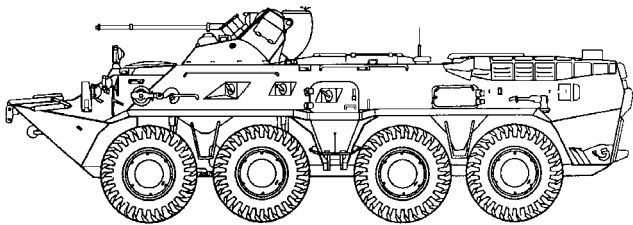
The APC has self-sealing tires and a central tire inflation system. A vulnerability is that troops must dismount from the top. In Afghanistan a variety of weapons were used, such as the AGS-17 automatic grenade launcher instead of the main gun. Current options include several one-man turrets, such as the Modular Weapons Station (as on BTR-80A, with a 30-mm gun), or Kliver (with a 30-mm gun, 7.62-mm coax MG, thermal sights, superior day sights, and four Kornet ATGM launchers).

	<table><tr><th>Weapons & Ammunition Types</th><th>Typical Combat Load</th></tr><tr><td>14.5-mm turret MG API, API-T</td><td>500</td></tr><tr><td>7.62-mm coax PKT MG Light ball, Ball-T, API, API-T, I-T</td><td>2,000</td></tr></table>	Weapons & Ammunition Types	Typical Combat Load	14.5-mm turret MG API, API-T	500	7.62-mm coax PKT MG Light ball, Ball-T, API, API-T, I-T	2,000
Weapons & Ammunition Types	Typical Combat Load						
14.5-mm turret MG API, API-T	500						
7.62-mm coax PKT MG Light ball, Ball-T, API, API-T, I-T	2,000						
SYSTEM Alternative Designations: GAZ-5903 Date of Introduction: 1984 Proliferation: At least 22 countries Description: Crew: 2 Troop Capacity: 8 Combat Weight (mt): 13.6 Chassis Length Overall (m): 7.55 Height Overall (m): 2.41 Width Overall (m): 2.95 Ground Pressure (kg/cm²): INA Drive Formula: 8 x 8 Automotive Performance: Engine Type: 260-hp Diesel Cruising Range (km): 600 Speed (km/h):Max Road: 85 Max Off-Road: 60 Average Cross-Country: 40 Max Swim: 10 Fording Depths (m): Amphibious Radio: R-173 Protection: Armor, Turret Front (mm): Against 12.7mm Applique Armor (mm): Available Explosive Reactive Armor (mm): N/A Active Protective System: N/A Mineclearing Equipment: N/A Self-Entrenching Blade: N/A NBC Protection System: Collective Smoke Equipment: 6 x 81-mm smoke grenade launchers ARMAMENT Main Armament: Caliber, Type, Name: 14.5-mm (14.5 x 114) heavy MG, KPVT Rate of Fire (rd/min): 150 practical Loader Type: Belt-fed Ready/Stowed Rounds: 50/450 Elevation (°): -4/+60 Fire on Move: Yes Auxiliary Weapon: Caliber, Type, Name: 7.62-mm machinegun, PKT Mount Type: Coax Maximum Aimed Range (m): 1,500	Max Effective Range (m): Day: 1,000 Night: N/A Fire on Move: Yes Rate of Fire (rd/min): 250 practical/650 cyclic, 2-10 round bursts ATGM Launcher: N/A Firing Ports: 3 on each side FIRE CONTROL FCS Name: N/A Main Gun Stabilization: N/A Rangefinder: N/A Infrared Searchlight: OU-3GA2M Sights w/Magnification: Gunner: Day: 1P3-6, 1.2x/4x Field of View (°): 49/14 Acquisition Range (m): 2,000 Night: N/A Commander Fire Main Gun: No VARIANTS BTR-80A: IFV with a stabilized turret containing a 30-mm 2A42 (BMP-2) automatic gun, coax 7.62-mm MG, and TNP-3 day/night sights. This vehicle is in prototype and offered for export. The drop-in turret package is also offered for export. A BTR-80S variant includes the turret/fire control, but with 14.5-mm versus 30-mm gun. BTR-80K: Command variant w/ added R-173, R-173P, and R-159 (portable) radios, R-174intercom, navigation aids, and an 11-m mast 1V152: Artillery battalion command vehicle 2S23: 120-mm self-propelled combination gun (howitzer/mortar) BREM-K: Armored recovery vehicle RKhM-4: NBC reconnaissance vehicle UNSh: Standardized expanded chassis for current variants, including Kushetka-B ACRV and BMM vehicle series. MAIN ARMAMENT AMMUNITION Caliber, Type, Name: 14.5-mm API-T Maximum Aimed Range (m): 2,000 Max Effective Range (m): Day: 2,000 Night: INA Tactical AA Range: 1,500-2,000 Armor Penetration (mm): 20 at 1,000 m/ 30 at 500 m Other Ammunition Types: API, I-T						

NOTES

BTR-80 is superior to BTR-60/70 with a larger chassis, high-angle-of- fire turret, and single more powerful diesel engine (vs gasoline). Options include the Kliver turret with a 30-mm gun, 7.62-mm coax MG, thermal sights, superior day sights, and (four) Kornet ATGM launchers.

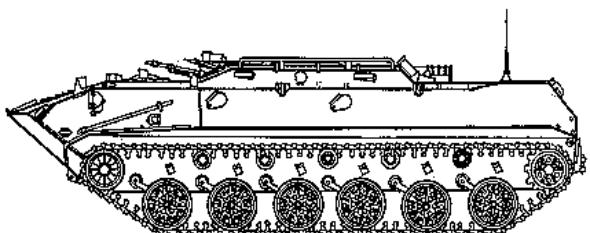
Russian Armored Personnel Carrier BTR-80A

	Weapons & Ammunition Types 30-mm automatic gun HEI-T, Frag-HE-T AP-T, APDS-T, APFSDS-T 7.62-mm coax MG	Typical Combat Load 300 2,000
SYSTEM Alternative Designations: GAZ-59034 Date of Introduction: 1994 Proliferation: At least 3 countries Description: Crew: 2 Troop Capacity: 8 Combat Weight (mt): 14.6 Chassis Length Overall (m): 7.65 Height Overall (m): 2.80 Width Overall (m): 2.90 Ground Pressure (kg/cm²): INA Drive Formula: 8 x 8 Automotive Performance: Engine Type: 260-hp Diesel Cruising Range (km): 800 Speed (km/h): Max Road: 90 Max Off-Road: INA Average Cross-Country: INA Max Swim: 10 Fording Depths (m): Amphibious Radio: R-163-50U VHF, R-163-UP receiver, R-174 intercom Protection: Armor, Turret Front (mm): Can defeat 12.7-mm Applique Armor (mm): N/A Explosive Reactive Armor (mm): N/A Mineclearing Equipment: No Self-Entrenching Blade: N/A Active Protective System: N/A NBC Protection System: Collective Smoke Equipment: 6 x 81-mm smoke grenade launchers ARMAMENT Main Armament: Caliber, Type, Name: 30-mm automatic gun, 2A72 Rate of Fire (rd/min): 200-330 variable cyclic in bursts Loader Type: Dual-belt feed Ready/Stowed Rounds: 300/0 Elevation (°): -5 to +70 Fire on Move: Yes Auxiliary Weapon: Caliber, Type, Name: 7.62-mm machinegun PKT Mount Type: Coax Maximum Aimed Range (m): 1,500 Max Effective Range (m): Day: 1,000 Night: 800+	Fire on Move: Yes Rate of Fire (rd/min): 250 practical/650 cyclic, 2-10 round bursts ATGM Launcher: N/A Firing Ports: 4 right side, 3 left side FIRE CONTROL FCS Name: N/A Main Gun Stabilization: 2-plane Rangefinder: INA Infrared Searchlight: OU-5 Sights w/Magnification: Gunner: Day: 1P3-9, 1.2x/4x Field of View (°): 49/14 (est) Acquisition Range (m): 4,000 Night: TPN3-42 II/IR Field of View (°): INA Acquisition Range (m): 800 Commander Fire Main Gun: No VARIANTS BTR-80S: APC has the same turret with 14.5-mm vs 30-mm gun. MAIN ARMAMENT AMMUNITION Caliber, Type, Name: 30-mm APDS-T Maximum Aimed Range (m): INA Max Effective Range (m): Day: 2,000 Night: INA Tactical AA Range: 2,500 Armor Penetration (mm): 25 (RHA) at 1,500 m 30-mm APFSDS-T, M929 Maximum Aimed Range (m): INA Max Effective Range (m): Day: 2,000+ Night: INA Tactical AA Range: 2,500 Armor penetration (mm): 55 (RHA) at 1,000 m/45 at 2,000 m 30-mm Frag-HE Maximum Aimed Range (m): 4,000 Max Effective Range (m): Day: 4,000 Night: INA Tactical AA Range: 2,500 Armor Penetration (mm): INA Other Ammunition Types: 30-mm AP-T, HEI-T	

NOTES

The drop-in gun/turret package (Modular Weapon System) is offered for export, to upgrade a wide variety of vehicles to BTR-80A standard. BTR-80A can mount K1-126 bullet-resistant tires.

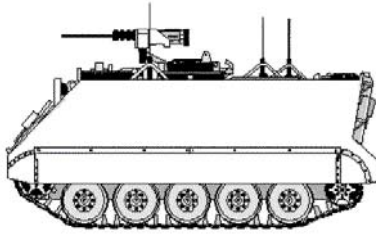
Russian Airborne Armored Personnel Carrier BTR-D

	Weapons & Ammunition Types 2x 7.62-mm hatch MG Lt Ball, Ball-T, API, API-T, In- cendiary	Typical Combat Load 2,000
SYSTEM Alternative Designations: BMD M1979 Date of Introduction: 1974 Proliferation: At least 1 country Description: Crew: 1 Troop Capacity: 12 passengers Combat Weight (mt): 6.7 Chassis Length Overall (m): 5.88 Height Overall (m): 1.67 Width Overall (m): 2.63 Ground Pressure (kg/cm ²): 0.5 Automotive Performance: Engine Type: 240-hp Diesel Cruising Range (km): 500 Speed (km/h): Max Road: 61 Max Off-Road: 35 Average Cross-Country: INA Max Swim: 10 Fording Depth (m): Amphibious Radio: R-123 Protection: Armor, Turret Front (mm): "Antibullet" (7.62-mm) Applique Armor (mm): N/A Explosive Reactive Armor (mm): N/A Mineclearing Equipment: N/A Self-Entrenching Blade: N/A Active Protective System: No NBC Protection System: Yes Smoke Equipment: 2x2 forward firing smoke grenade launchers Vehicle engine exhaust smoke system (VEESS) ARMAMENT Main Armament: Caliber, Type, Name: 7.62-mm (7.62 x 54R) machinegun, PKT Rate of Fire (rd/min): 250 practical / 650 cyclic, in 2-10 round bursts Loader Type: Belt-fed Ready/Stowed Rounds: INA Elevation (°): INA Fire on Move: Yes Auxiliary Weapon: N/A	ATGM Launcher: N/A Firing Ports: 2 on each side, 1 in left rear door, permit two 5.45-mm RPK-74 light machineguns to be used. FIRE CONTROL FCS Name: N/A Main Gun Stabilization: N/A Rangefinder: N/A Infrared Searchlight: N/A Sights w/Magnification: Open, 1x Commander Fire Main Gun: No VARIANTS 1V118 Reostat/1V119 Spektr: Artillery command and observation posts for amphibious and airborne forces. 2S9: 120-mm self-propelled combination gun, with a turreted breech-loaded mortar/howitzer system. BMD-KShM: Former Soviet regiment or division command and staff variant, with large Clothes-line antenna. BREM-D: Armored repair and recovery variant. BTR-RD/Robot: An ATGM variant (AT-4/-5) with 2 launchers, dismounted or mounted on pintles for vehicle launch. BTR-ZD: Air defense variant with porteed or towed ZU-23 twin 23-mm air defense gun. Vehicle also carries manpad SAM launchers. BTR-3D: Air defense variant with a rear-mounted ZU-23 gun. Sterkh (Malakit/Shmel): UAV transporter and launcher vehicle. MAIN ARMAMENT AMMUNITION Caliber, Type, Name: 7.62-mm API Maximum Aimed Range (m): 1,500 Max Effective Range (m): Day: 1,000 m / 400-500 on the move Night: INA Tactical AA Range: INA Armor Penetration (mm): 8 (RHA) at 500 m Other Ammunition Types: 7.62-mm Light Ball, Ball-T, Heavy Ball, API, API-T, Incendiary	

NOTES

BTR-D is a variant of the BMD-1, with an additional road wheel, with the turret removed, and with a raised hatch area. The vehicle can be parachute landed with airborne troops. The BTR-Ds in grenade launcher units will carry one AGS-17 30-mm AGL in the rear. Options include the Kliver turret with a 30-mm gun, 7.62-mm coax MG, thermal sights, superior day sights, and (four) Kornet ATGM launchers.

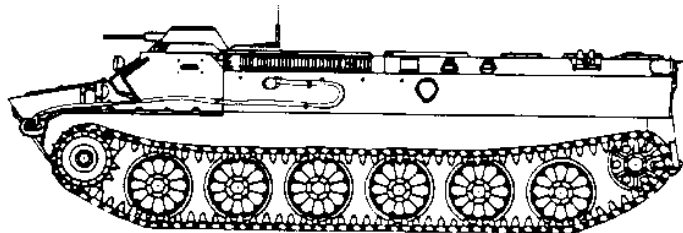
US Armored Personnel Carrier M113A1

	<table><tr><th>Weapons & Ammunition Types</th><th>Typical Combat Load</th></tr><tr><td>.50 cal cupola MG Slap, API, API-T, Ball, Ball-T, Incendiary, I-T</td><td>2,000</td></tr></table>	Weapons & Ammunition Types	Typical Combat Load	.50 cal cupola MG Slap, API, API-T, Ball, Ball-T, Incendiary, I-T	2,000
Weapons & Ammunition Types	Typical Combat Load				
.50 cal cupola MG Slap, API, API-T, Ball, Ball-T, Incendiary, I-T	2,000				
SYSTEM Alternative Designations: INA Date of Introduction: 1964 Proliferation: At least 46 countries Description: Crew: 2 Troop Capacity: 11 passengers Combat Weight (mt): 11.20 Chassis Length Overall (m): 4.90 Height Overall (m): 1.80 Width Overall (m): 2.70 Ground Pressure (kg/cm²): .55 Automotive Performance: Engine Type: 215-hp Diesel Cruising Range (km): 483 Speed (km/h): Max Road: 64 Max Off-Road: INA Average Cross-Country: INA Max Swim: 5.8 Fording Depths (m): Amphibious Radio: Various, including intercom Protection: Armor, Turret Front (mm): N/A—No turret Applique Armor (mm): Yes—anti-mine armor on bottom Explosive Reactive Armor (mm): Available Active Protective System: N/A Mineclearing Equipment: N/A Self-Entrenching Blade: N/A NBC Protection System: N/A Smoke Equipment: N/A ARMAMENT Main Armament: Caliber, Type, Name: .50 cal (12.7 x 99) heavy machinegun, M2HB Rate of Fire (rd/min): 450-550 cyclic Loader Type: Belt feed Ready/Stowed Rounds: 250/1750 Elevation (°): -20/+60 Fire on Move: Yes Auxiliary Weapon: N/A ATGM Launcher: N/A Firing Ports: None FIRE CONTROL FCS Name: N/A	Main Gun Stabilization: N/A Rangefinder: N/A Infrared Searchlight: N/A Sights w/Magnification: Gunner: Day: Open ladder sight, 1x Field of View (°): INA Acquisition Range (m): 2,000 Night: N/A Commander Fire Main Gun: No VARIANTS More than 100 variants have been produced in numerous countries, with 7.62-mm MGs, 40-mm automatic grenade launchers, 90-mm recoilless rifles, and turrets with 20-to-76-mm cannons. The following are US variants. Command variants are M577 and M114 (C&R). Self-propelled mortars are M125 (81-mm) and M106A2 (4.2-inch). The M901/ITV ATGM launcher vehicle is a common variant. The M163 SP air defense gun has a 20-mm Vulcan cannon; and M730 is a Chapparral AD missile launcher. Other variants include ambulances, recovery and engineer vehicles. M113A2: This multi-national variant features mobility improvements. One version is being developed with the Giat TS90 90-mm cannon. M113A3: Changes for this multi-national variant include a new power train and increased armor protection. AIFV: The multi-national IFV variant has M113A3 armor upgrades, a stabilized turret with 25-mm gun, and a 7.62-mm MG. VCC-1: Italian M113 copies are supplemented by this variant MAIN ARMAMENT AMMUNITION Caliber, Type, Name: .50 SLAP (sabot light armor penetrator) Maximum Aimed Range (m): 2,000 Max Effective Range (m): Day: 2,000 Night: INA Armor Penetration (mm): INA .50 Cal Ball Maximum Aimed Range (m): 2,000 Max Effective Range (m): Day: 1,000 Night: N/A Armor Penetration (mm): INA Other Ammunition Types: Ball-T, Incendiary, I-T, API, API-T				

NOTES

The M113A1 is a variant of the gasoline-powered **M113**. Armors available include Rafael Enhanced Add-on Armor Kit (EAAK), Creusot-Marrel plate armor, and SNPE explosive reactive armor. Thermal and TV sights are also available.

Russian Light Armored Multi-purpose Vehicle MT-LB

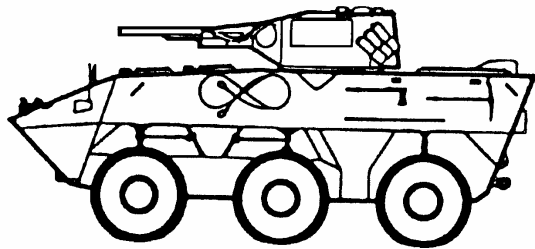
	Weapons & Ammunition Types 7.62-mm Turret MG Lt Ball , Ball-T, API, API-T, Incendiary	Typical Combat Load 2,000
SYSTEM Alternative Designations: MT-LB-T Date of Introduction: 1970, modernized in 1995 Proliferation: At least 9 countries Description: Crew: 2 Troop Capacity: 11 passengers Combat Weight (mt): 11.9 Chassis Length Overall (m): 6.35 Height Overall (m): 1.87 Width Overall (m): 2.85 Ground Pressure (kg/cm²): 0.46 standard track / 0.28 wide track Automotive Performance: Engine Type: 290-hp Diesel Cruising Range (km): 500 Speed (km/h): Max Road: 61.5/70 modernized Max Off-Road: 30/45 modernized Average Cross-Country: INA Max Swim: 5-6 Fording Depth (m): Amphibious Radio: R-123 or upgrade to -123M/-173 Protection: Armor, Turret Front (mm): 7-14 Applique Armor (mm): N/A Explosive Reactive Armor (mm): INA Active Protective System: N/A Mineclearing Equipment: N/A Self-Entrenching Blade: Yes NBC Protection System: Collective Smoke Equipment: N/A ARMAMENT Main Armament(s): Caliber, Type, Name: 7.62-mm (7.62x 54R) machinegun, PKT Rate of Fire (rd/min): 250 practical / 650 cyclic, 2-10 round bursts Loader Type: Belt-feed Ready/Stowed Rounds: INA Elevation (°): -5/ +35 Fire on Move: Yes Auxiliary Weapon: N/A ATGM Launcher: N/A	Firing Ports: 1 on each side and 1 in each rear door. FIRE CONTROL FCS Name: INA Main Gun Stabilization: N/A Rangefinder: N/A Infrared Searchlight: N/A Sights w/Magnification: Gunner: Day: PP-61AM, 2.6x Field of View (°): 23 Acquisition Range (m): 1,500 (est) Night: N/A Commander Fire Main Gun: No VARIANTS MT-LB Upgrade: 1995 upgrade includes improved steering and a new engine. 2S1: 122-mm self-propelled howitzer. 9P149/Shturm-S: ATGM launcher vehicle with AT-6 autoloader. MT-LB "blade": Dozer version with a blade attached to the vehicle. MT-LBu: Expanded variant for artillery command and reconnaissance vehicles (ACRVs) and other uses. MT-LBV: Arctic variant with .57m wide track for snow and improved flotation. MTP-LB: Technical support vehicle. MT-SON: Ground surveillance radar vehicle with Pork Trough/SNAR-2 radar. RKhM: Chemical reconnaissance vehicle. SA-13: Regimental surface-to-air missile launcher vehicle. SNAR-10: Ground surveillance radar vehicle with Big Fred radar. MAIN ARMAMENT AMMUNITION Caliber, Type, Name: 7.62-mm API, API-T Maximum Aimed Range (m): 1,500 Max Effective Range (m): Day: 1,000/400-500 on the move Night: INA Tactical AA Range: INA Armor Penetration (mm): 8 (RHA) at 500 m Other Ammunition Types: Light Ball, Ball-T, Heavy Ball, Incendiary	

NOTES

Russian AG-17 30-mm automatic grenade launcher modification is available for use on MT-LB.

Russian KBP offers a drop-in one-man turret, called Kliver, with a stabilized 2A72 30-mm gun, a 4 Kornet ATGM launcher, thermal sights, and improved fire control system.

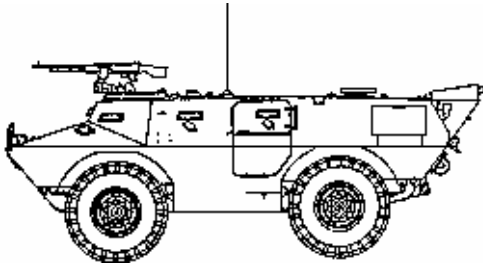
Austrian Armored Personnel Carrier Pandur

 Sketch of MICV 1/127 APC	<table><tr><th>Weapons & Ammunition Types</th><th>Typical Combat Load</th></tr><tr><td>12.7mm MG, M2HB SLAP, API, API-T, Ball, Ball-T, Incend, I-T</td><td>1,000</td></tr><tr><td>7.62-mm MG, FN-MAG Ball-T, API, API-T</td><td>1,600</td></tr></table>	Weapons & Ammunition Types	Typical Combat Load	12.7mm MG, M2HB SLAP, API, API-T, Ball, Ball-T, Incend, I-T	1,000	7.62-mm MG, FN-MAG Ball-T, API, API-T	1,600
Weapons & Ammunition Types	Typical Combat Load						
12.7mm MG, M2HB SLAP, API, API-T, Ball, Ball-T, Incend, I-T	1,000						
7.62-mm MG, FN-MAG Ball-T, API, API-T	1,600						
SYSTEM Alternative Designations: System featured is MICV 1/127 version Date of Introduction: 1996 Proliferation: At least 3 countries, 2 more to follow, and the UN Description: Crew: 3 Troop Capacity: 8-9 Combat Weight (mt): 11.3 Chassis Length Overall (m): 5.70 Height Overall (m): 2.64 top of cupola Width Overall (m): 2.50 Ground Pressure (kg/cm²): INA Drive Formula: 6 x 6 Automotive Performance: Engine Type: 210-hp Diesel/265-hp in upgrade Cruising Range (km): 650 Speed (km/h): Max Road: 105 Max Off-Road: INA Average Cross-Country: INA Max Swim: 9/11 with Amphibious Vehicle Fording Depths (m): 1.2 Radio: INA Protection: Armor, Turret Front (mm): 12.7-mm on front 30°, 7.62-mm other Applique Armor (mm): Add-on protection to 14.5 mm available Explosive Reactive Armor (mm): N/A Active Protective System: N/A Mineclearing Equipment: N/A Self-Entrenching Blade: N/A NBC Protection System: Yes Smoke Equipment: 6-12 smoke grenade launchers ARMAMENT Main Armament: Note: Caliber, Type, Name: .50 cal (12.7 x 99) heavy MG, M2HB Rate of Fire (rd/min): 450-550 cyclic Loader Type: Belt-fed Ready/Stowed Rounds: 250 /750 Elevation (°): -15 to +50 Fire on Move: Yes Auxiliary Weapon: Caliber, Type, Name: 7.62-mm (7.62 x 51) machinegun, FN-MAG Mount Type: Turret/cupola mount Maximum Aimed Range (m): 2,000	Max Effective Range (m): Day: 1,500 Night: II sights available Fire on Move: Yes Rate of Fire (rd/min): 250 practical each/650-1000 cyclic, in bursts ATGM Launcher: N/A Firing Ports: 2 on each side, for several APC variants. FIRE CONTROL FCS Name: N/A Main Gun Stabilization: N/A Rangefinder: N/A Infrared Searchlight: No Sights w/Magnification: Gunner: Day: Optical sight, Swarovski F-450, 2x Field of View (°): INA Acquisition Range (m): 2,000 Night: II and IR sights available, thermal for cannon variants Commander Fire Main Gun: No VARIANTS Pandur offers a wide variety of configurations on a modern 6x6 vehicle chassis, with weights varying 9-15t. Base vehicle is the APC, with flat hull top and 2- and 3-step hull top configurations. A recent variant is Amphibious Vehicle, stretch flat-hull APC with slab sides and minimal preparation time for amphibious operation. Options include 1-3 cupolas and/or drop-in turrets with weapons: 7.62- and/or 12.7-mm MGs, 25-, 30-, or 35-mm autocannon, 40-mm AGL, and 90-mm cannon. Other variants include recon, fire support, TOW, Hell-fire, and HOT ATGM launchers, engineer, command and control, NBC, ambulance, mortar, and logistics vehicles. A recent 8x8 fire support chassis prototype was displayed with a 105-mm gun. MAIN ARMAMENT AMMUNITION Caliber, Type, Name: .50 cal SLAP Maximum Aimed Range (m): 2,000 Max Effective Range (m): Day: 2,000 Night: INA Armor Penetration (mm): INA .50 cal Ball Maximum Aimed Range (m): 2,000 Max Effective Range (m): Day: 1,000 Night: INA Armor Penetration (mm): INA Other Ammunition Types: Ball-T, API, API-T, Incendiary, I-T						

NOTES

A spall liner and mine protection carpet are included on the APC.

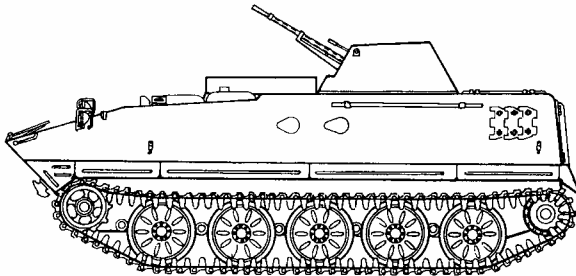
US Armored Personnel Carrier V-150

	Weapons & Ammunition Types 7.62-mm cupola MG Ball-T, Match API, API-T	Typical Combat Load 3,200
SYSTEM Alternative Designations: Commando Date of Introduction: 1971 Proliferation: At least 20 countries Description: Crew: 3 Troop Capacity: 2 Combat Weight (mt): 9.89 Chassis Length Overall (m): 5.69 Height Overall (m): 1.98 Width Overall (m): 2.26 Ground Pressure (kg/cm²): INA Drive Formula: 4 x 4 Automotive Performance: Engine Type: 202-hp Diesel Cruising Range (km): 643 Speed (km/h): Max Road: 89 Max Off-Road: INA Average Cross-Country: INA Max Swim: 5 Fording Depth (m): Amphibious Radio: INA Protection: Armor, Turret Front (mm): Against 7.62-mm ball Applique Armor (mm): N/A Explosive Reactive Armor (mm): N/A Mineclearing Equipment: N/A Self-Entrenching Blade: N/A Active Protective System: N/A NBC Protection System: N/A Smoke Equipment: Optional ARMAMENT Main Armament: Caliber, Type, Name: 7.62-mm (7.62 x 51) MG, FN-MAG (example) Rate of Fire (rd/min): 650-1000 cyclic Loader Type: Belt feed, box magazines Ready/Stowed Rounds: INA Elevation (°): INA Fire on Move: Yes Auxiliary Weapon: N/A	ATGM Launcher: N/A Firing Ports: None FIRE CONTROL FCS Name: N/A Main Gun Stabilization: N/A Rangefinder: N/A Infrared Searchlight: N/A Sights w/Magnification: Gunner: Day: Open ladder sight Field of View (°): INA Acquisition Range (m): 2,000 Night: N/A Commander Fire Main Gun: No VARIANTS Armament options vary widely and include: a turret with 7.62-mm or 12.7-mm MG or turrets with 20-mm, 25-mm, 30-mm, 76-mm, or 90-mm gun. Another turret offers a 12.7-mm MG and 40-mm grenade launcher. An 81-mm self-propelled mortar launcher variant and a TOW ATGM launcher variant are available. Variants include a cargo carrier, police and security vehicles, an air defense variant with 20-mm Vulcan cannon. V-100: This earlier 4x4 APC has a gasoline engine. V-150S: This slightly larger 4x4 variant has improved drive train and the above variety of turret and gun options. A Commando command variant includes a raised compartment area with external-mount 7.62-mm MG. Taiwan has versions with an open-mount 12.7-mm MG and a 107-mm (4.2 inch) mortar. V-200: Variant sold to Singapore with 20-mm turret, 90-mm turret, air defense variant with RBS-70 surface-to-air missile and a recovery variant. Another variant has a 120-mm mortar. MAIN ARMAMENT AMMUNITION Caliber, Type, Name: 7.62-mm Ball, NATO Maximum Aimed Range (m): 2,000 (est) Max Effective Range (m): Day: 1,500 Night: INA Tactical AA Range: INA Armor Penetration (mm): INA Other Ammunition Types: Ball-T, API, API-T, Match	

NOTES

The baseline V-150 is equipped with a variety of pintle-mounted 7.62-mm machineguns. Many MGs are installed by user countries from their inventories. The Belgian FN-MAG general purpose MG is a widely used MG that represents a common capability.

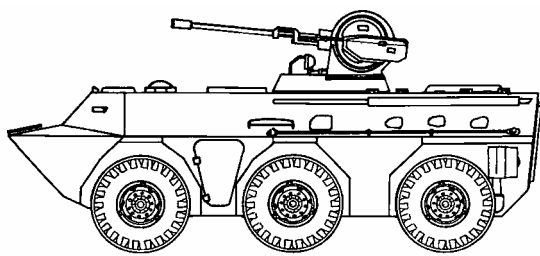
North Korean Armored Personnel Carrier VTT-323

	<table><tr><th>Weapons & Ammunition Types</th><th>Typical Combat load</th></tr><tr><td>2 x 14.5-mm KPVT MG API, API-T HE-T</td><td>1,000 500 500</td></tr><tr><td>*AT Vehicle AT-3-Type ATGM HEAT HE SA-7/-14/16 MANPAD</td><td> 4 2</td></tr></table>	Weapons & Ammunition Types	Typical Combat load	2 x 14.5-mm KPVT MG API, API-T HE-T	1,000 500 500	*AT Vehicle AT-3-Type ATGM HEAT HE SA-7/-14/16 MANPAD	 4 2
Weapons & Ammunition Types	Typical Combat load						
2 x 14.5-mm KPVT MG API, API-T HE-T	1,000 500 500						
*AT Vehicle AT-3-Type ATGM HEAT HE SA-7/-14/16 MANPAD	 4 2						
SYSTEM Alternative Designations: M1973 Date of Introduction: 1973 Proliferation: At least one country Description: Crew: 3 Troop Capacity: 9 passengers Combat Weight (mt): 13.5 Length Overall (m): 6.20 Height Overall (m): 2.50 Width Overall (m): 3.06 Ground Pressure (kg/cm²): 0.58 Automotive Performance: Engine Type: 260-hp Diesel Cruising Range (km): 450 Speed (km/h): Max Road: 80 Max Off-Road: 70-80 Average Cross-Country: INA Max Swim: 10 Fording Depths (m): Amphibious Radio: INA Protection: Armor, Turret Front (mm): 24 Applique Armor (mm): No Explosive Reactive Armor (mm): No Active Protective System: No NBC Protection System: No Smoke Equipment: No ARMAMENT Main Armament: Caliber, Type, Name: 2 x 14.5-mm (14.5x114) Heavy MGs, KPVT Rate of Fire (rd/min): 300 practical (2 x 150) Loader Type: Belt Ready/Stowed Rounds: INA Elevation (°): -5 to +60 Fire on Move: Yes Auxiliary Weapon: None Firing Ports: 2 on each side ATGM Launcher: Name: 9P111-type Launch Method: Rail-launched Guidance: MCLOS Command Link: Wire Launcher Dismountable: Yes	FIRE CONTROL FCS Name: No Main Gun Stabilization: No (est.) Rangefinder: No Infrared Searchlight: No Sights w/Magnification: Gunner: Day: INA Field of View (°): INA Acquisition Range (m): 1,500 Night: INA Commander Fire Main Gun: No VARIANTS North Korean variant of Chinese YW 531A/ Type 63-II APC. An AT variant also mounts an AT-3-type ATGM launcher, and may include a SA-14 or SA-16 manportable air defense launcher. Other vehicles using the chassis are the PT-85 light tank, a 120-mm combination gun, a 122-mm SP howitzer, 107-mm MRLs (12/18/24 tubes), a 4-barreled 14.5-mm SP AA Gun, the M1985 (AT-3-type 4-rail) ATGM launcher vehicle, and 82- and 120-mm SP mortars. MAIN ARMAMENT AMMUNITION Caliber, Type, Name: 14.5-mm API-T Max Aimed Range (m): 2,000 (EST) Max Effective Range (m): Day: 1,500 Night: INA Tactical AA Range: 1,500 Armor Penetration (mm): 20 at 1,000 m/ 30 at 500 m, 38 at muzzle Other Ammunition Types: API, I-T, HE-T Type MDZ ANTITANK GUIDED MISSILES See AT-3 for ATGM types. Name: AT-3c Imp/ Polk (Slovenian) Warhead Type: Tandem HEAT Armor Penetration (mm): 580 (RHA) Range (m): 3,000 Name: Red Arrow-73A (Chinese) Warhead Type: HEAT Armor Penetration (mm): 500 RHA Range (m): 3,000 Name: Red Arrow-73B/C (Chinese) Warhead Type: HEAT Armor Penetration (mm): 600 RHA Range (m): 3,000 Other ATGMs: I-RAAD (Iranian), Malyutka-2 HE (Russian)						

NOTES

Thermal sights are available. Slovenian TS-M ATGM thermal night sight ranges are: detection 4,500 m, recognition 2,000 m. The HE-Blast ATGM is used for killing personnel and destroying bunkers and other fortifications.

Chinese Armored Personnel Carrier WZ 551

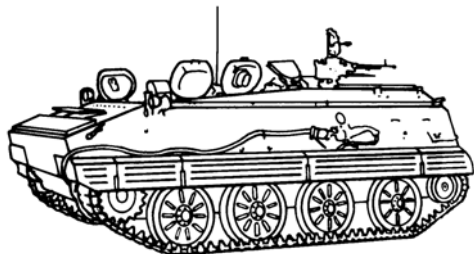
	<table><tr><th>Weapons & Ammunition Types</th><th>Typical Combat Load</th></tr><tr><td>25-mm automatic gun</td><td>*400</td></tr><tr><td>API</td><td>200</td></tr><tr><td>HE</td><td>200</td></tr><tr><td>7.62-mm coax MG</td><td>1,000</td></tr><tr><td></td><td>*mix estimate</td></tr></table>	Weapons & Ammunition Types	Typical Combat Load	25-mm automatic gun	*400	API	200	HE	200	7.62-mm coax MG	1,000		*mix estimate
Weapons & Ammunition Types	Typical Combat Load												
25-mm automatic gun	*400												
API	200												
HE	200												
7.62-mm coax MG	1,000												
	*mix estimate												
APC w/25-mm gun													

SYSTEM Alternative Designations: M1986/1, M1986/2, Type 86 Date of Introduction: 1994 Proliferation: At least 3 countries Description: Crew: 3 Troop Capacity: 10 Combat Weight (mt): 15.3 Chassis Length Overall (m): 6.63 Height Overall (m): 2.89 Width Overall (m): 2.80 Ground Pressure (kg/cm²): INA Drive Formula: 6 x 6 Automotive Performance: Engine Type: 256-hp Diesel Cruising Range (km): 600 Speed (km/h): Max Road: 85 Max Off-Road: INA Average Cross-Country: INA Max Swim: 8 Fording Depths (m): Amphibious Radio: INA Protection: Armor, Turret Front (mm): INA Applique Armor (mm): N/A Explosive Reactive Armor (mm): N/A Mineclearing Equipment: No Self-Entrenching Blade: No Active Protective System: N/A NBC Protection System: Collective Smoke Equipment: 8 smoke grenade launchers ARMAMENT Main Armament: Caliber, Type, Name: 25-mm automatic overhead turreted gun Rate of Fire (rd/min): 100/300/500 in bursts, or semi-automatic Loader Type: Drum feed Ready/Stowed Rounds: 200/ 200 Elevation (°): -8 to +55 Fire on Move: Yes, reduced range (est.) Auxiliary Weapon: Caliber, Type, Name: 7.62-mm machinegun PKT Mount Type: Coax Max Aimed Range (m): 2,000	Max Effective Range (m): Day: 1,000 Night: 800+ Fire on Move: Yes Rate of Fire (rd/min): 250 practical/ 650 cyclic, 2-10 round bursts ATGM Launcher: N/A Firing Ports: 4 FIRE CONTROL FCS Name: N/A Main Gun Stabilization: INA Rangefinder: INA Infrared Searchlight: IR sight w/searchlight optional Sights w/Magnification: Gunner: Day/night sight Day: INA Field of View (°): INA Acquisition Range (m): INA Night: II Field of View (°): INA Acquisition Range (m): INA Commander Fire Main Gun: No VARIANTS Other versions include APCs with other 25-mm guns, and with 12.7-mm machinegun. There are also IFV variants with the Dragar 1-man turret and 25-mm gun, and the BMP-1 turret with 73-mm gun. Other vehicle types include: C3 vehicle, ambulance, and an engineer vehicle. The ATGM launcher vehicle variants launch Red Arrow-8E (HJ-8E), and the new Red Arrow-9 (HJ-9) ATGM. MAIN ARMAMENT AMMUNITION Caliber, Type, Name: 25-mm API Max Aimed Range (m): INA Max Effective Range (m): Day: 2,000 (est.) Night: INA Tactical AA Range: 2,000 (est) Armor Penetration (mm): INA Caliber, Type, Name: 25-mm HE Max Aimed Range (m): INA Max Effective Range (m): Day: 2,000+ (est) Night: INA Tactical AA Range: 2,000 (est) Armor penetration (mm): INA Other Ammunition Types: INA
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NOTES

The tires have run-flat capability.

Chinese Armored Personnel Carrier YW 531A/531C

	Weapons & Ammunition Types 12.7-mm MG APDS, API, API-T, HE-T, HEI	Typical Combat Load 1,120 500 620
YW 531 Baseline APC		
SYSTEM Data is for YW 531A/C where different Alternative Designations: Type 63, North Korean M1967 Date of Introduction: Late 1960s Proliferation: At least 9 countries Description: Crew: 4 Troop Capacity: 10 passengers Combat Weight (mt): 12.60 Chassis Length Overall (m): 5.48 Height Overall (m): 2.85 Width Overall (m): 2.98 Ground Pressure (kg/cm²): 0.44 Automotive Performance: Engine Type: 260-hp Diesel/320-hp Diesel Cruising Range (km): 500 Speed (km/h): Max Road: 42/66 Max Off-Road: 32/40 Average Cross-Country: INA Max Swim: 6.0 Fording Depths (m): Amphibious Radio: Type 889 Protection: Armor, Turret Front (mm): 14, front glacis Applique Armor (mm): N/A Explosive Reactive Armor (mm): N/A Mineclearing Equipment: N/A Self-Entrenching Blade: N/A Active Protective System: NA NBC Protection System: N/A Smoke Equipment: N/A ARMAMENT Main Armament: Caliber, Type, Name: 12.7-mm (12.7 x 108), heavy MG, Type 54 Rate of Fire (rd/min): 80-100 practical/600 air targets in bursts Loader Type: Belt feed Ready/Stowed Rounds: INA Elevation (°): -5 to +85 Fire on Move: Yes Auxiliary Weapon: N/A ATGM Launcher: N/A Firing Ports: 2 left side, 1 right, 1 in the rear/1 each side and rear FIRE CONTROL FCS Name: N/A	Main Gun Stabilization: N/A Rangefinder: N/A Infrared Searchlight: N/A Sights w/Magnification: Gunner: Day: Open ladder sight, optical sight, NFI Field of View (°): INA Acquisition Range (m): 3,300 Night: N/A Commander Fire Main Gun: No VARIANTS YW531A/Type 63-II: Upgrade APC with gun shield. Other vehicles with this chassis are: YW 531B and Type 54-1 122-mm SP howitzer, Type 70 130-mm (19-tube) MRL, and a Red Arrow-8 ATGM launcher vehicle with 4-rail launcher and 4 stowed ATGMs. YW-531C: Variant APC with gun shield, better vision ports, and ventilation. Other vehicles use this chassis, including YW 750 ambulance, and YW 701A/B and YW 702 command post vehicles. The C, D and E variants differ in intercom sets and firing ports. Two SP mortar variants are Type YW-304 (82-mm M-1937 type, 120 rounds, 3,040 m) and Type YW-381 (120-mm, 50 rds, 7,700 m). YW-531H/Type 85, Type 89, and Type 90: Expanded 5-road wheel variants. For the -H variant and vehicle series, see sheet. VTT-323: North Korean variant, also known as M1973 (See sheet). MAIN ARMAMENT AMMUNITION Caliber, Type, Name: 12.7-mm, APDS (Tungsten Core), Type 54 Max Aimed Range (m): 2,000 (est) Max Effective Range (m): Day: 1,500 vehicles, 1,600 aircraft Night: INA Tactical AA Range: 1,600 Armor Penetration (mm): INA 12.7-mm, API, Type 54 Max Aimed Range (m): 2,000 (est) Max Effective Range (m): Day: 1,500 Unarmored ground, 800 armored vehicles Night: INA Tactical AA Range: 1,600 Armor Penetration (mm): 21 (RHA) at 500 m, 13 at 1,000 m Other Ammunition Types: API-T, Russian Duplex, Russian Duplex-T, Incendiary-T, HE-T Type MDZ, HEI Type ZP	

NOTES

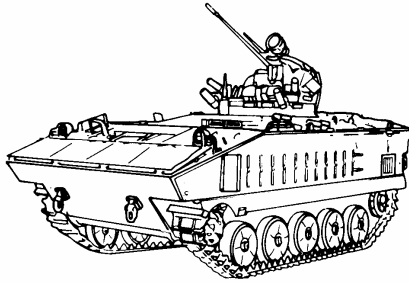
Type 54 MG is a Chinese copy of former Soviet 12.7-mm DShKM.

Chinese Armored Personnel Carrier YW 531H and Vehicle Series Type 85

	Weapons & Ammunition Types 12.7-mm MG APDS, API, API-T, HE-T, HEI or Missile Launcher (ATGM launcher vehicle) HEAT ATGM	Typical Combat Load 1,120 500 620 8
Type 85 ATGM Launcher Vehicle with Red Arrow-8 ATGM		
SYSTEM: Data is for APC / ATGM vehicle where different Alternative Designations: Type 85 is preferred nomenclature Date of Introduction: 1986 Proliferation: At least 4 countries Description: Crew: 2 / 4 Troop Capacity: 13 / 0 passengers Combat Weight (mt): 13.6 / 13.8 Chassis Length Overall (m): 5.9 Height Overall (m): 2.85 / INA Width Overall (m): 2.98 Ground Pressure (kg/cm²): 0.59 Automotive Performance: Engine Type: 320-hp Diesel Cruising Range (km): 500 Speed (km/h): Max Road: 65 / 60 Max Off-Road: 46 Average Cross-Country: 35 Max Swim: 6.0 Fording Depths (m): Amphibious Radio: Type 889 / Type 889 or VRC 83 Protection: Armor, Turret Front (mm): 14 front glacis Applique Armor (mm): N/A Explosive Reactive Armor (mm): N/A Mineclearing Equipment: N/A Self-Entrenching Blade: N/A Active Protective System: NA NBC Protection System: N/A Smoke Equipment: 2 x 4 grenade launchers, some versions ARMAMENT Main Armament: Caliber, Type, Name: 12.7-mm (12.7 x 108), heavy MG, Type 54 Rate of Fire (rd/min): 80-100 practical/600 air, in bursts / 2-3 Loader Type: Belt feed Ready/Stowed Rounds: 4/4 for ATGM launcher vehicle Elevation (°): -4 to +82 / -7 to +13 Fire on Move: Yes / No Auxiliary Weapon: N/A ATGM Launcher: N/A Firing Ports: 6-7 (3 on each side, 1 in rear door, Thai version) FIRE CONTROL FCS Name: N/A Main Gun Stabilization: N/A	Rangefinder: N/A Infrared Searchlight: N/A Sights w/Magnification: Gunner: Day: Open ladder sight / day periscope Field of View (°): INA Acquisition Range (m): 2,000 / 4,000 Night: INA / Thermal sight optional Commander Fire Main Gun: No VARIANTS Type 85: Export vehicle series derived from the C-variant APC but expanded, and with addition of a fifth road wheel. Note: Thai version has .50 cal (12.7-mm) M2HB MG vs Type 54. The -H APC sired a new family of combat and support vehicles. Combat variants include: armored command APC, YW 309 IFV (73-mm gun), NVH-1 IFV (25- or 30-mm gun), NVH-4 IFV (25-mm gun), Type 70-1/ YW 302 122-mm SP howitzers and YW 306 130-mm MRL. Support vehicles include a maintenance engineer vehicle, recovery vehicle, command post vehicle, fire fighting vehicle, and WZ 751 ambulance. Mortars are SP Type 67 82-mm (M1937-type, 120 rounds, 3,040 m max range), and YW 381 120-mm (50 rounds, 7,700 m max range). Each also has a 12.7-mm MG with 540 rounds. Type 85 ATGM launcher vehicle: Raised hull variant with 4-rail launcher turret for Red Arrow-8 SACLOS wire-guided ATGM. The ROF is 2-3 rd/min. See launcher sheet for ATGM data. Type 89/ YW 534: A 5-wheeled APC, combat, and support vehicle series (250 mm longer and 74 mm wider) for Chinese forces. MAIN ARMAMENT AMMUNITION Caliber, Type, Name: 12.7-mm, APDS (Tungsten Core), Type 54 Max Aimed Range (m): 2,000 Max Effective Range (m): Day: 1,500 vehicles /1,600 aircraft Night: INA Tactical AA Range: 1,600 Armor Penetration (mm): INA 12.7-mm, API, Type 54 Max Aimed Range (m): 2,000 Max Effective Range (m): Day: 1,500 Unarmored ground / 800 armored Night: INA Tactical AA Range: 1,000 Armor Penetration (mm): 21 (RHA) at 500 m, 13 at 1,000 m Other Ammunition Types: API-T, Russian Duplex, Russian Duplex-T, Incendiary-T, HE-T Type MDZ, HEI Type ZP	

NOTES None

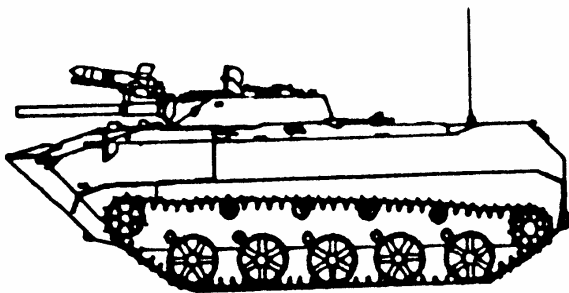
French Infantry Fighting Vehicle AMX-10P

	<table><tr><th>Weapons & Ammunition Types</th><th>Typical Combat Load</th></tr><tr><td>20-mm Cannon APDS-T, API-T HEI, HEI-T</td><td>760 (est) 260 500</td></tr><tr><td>7.62-mm coax MG Tracer, AP, API, In- cendiary</td><td>2,000</td></tr></table>	Weapons & Ammunition Types	Typical Combat Load	20-mm Cannon APDS-T, API-T HEI, HEI-T	760 (est) 260 500	7.62-mm coax MG Tracer, AP, API, In- cendiary	2,000
Weapons & Ammunition Types	Typical Combat Load						
20-mm Cannon APDS-T, API-T HEI, HEI-T	760 (est) 260 500						
7.62-mm coax MG Tracer, AP, API, In- cendiary	2,000						
SYSTEM Alternative Designations: INA Date of Introduction: 1973 Proliferation: At least 3 countries Description: Crew: 3 Troop Capacity: 8 passengers Combat Weight (mt): 14.5 Length Overall (m): INA Height Overall (m): 2.57 Width Overall (m): 2.78 Ground Pressure (kg/cm²): 0.53 Automotive Performance: Engine Type: 300-hp Diesel Cruising Range (km): 600 Speed (km/h): Max Road: 65 Max Off-Road: INA Average Cross-Country: INA Max Swim: 7 Fording Depths (m): Amphibious Mineclearing Equipment: N/A Self-Entrenching Blade: N/A Radio: INA Protection: Armor, Turret Front (mm): 12.7-mm frontal Applique Armor (mm): N/A Explosive Reactive Armor (mm): Available Active Protective System: N/A NBC Protection System: Yes Smoke Equipment: 4 smoke grenade launchers ARMAMENT Caliber, Type, Name: 20-mm automatic cannon M693 F1 Rate of Fire (rd/min): 740 Loader Type: Dual belt feed Ready/Stowed Rounds: INA Elevation (°): -8/+50 Fire on Move: INA Auxiliary Weapon: Caliber, Type, Name: 7.62-mm (7.62 x 51) MG, AAT 52 NF1 Mount Type: Coax Maximum Aimed Range (m): INA	Max Effective Range: Day: INA Night: INA Fire on Move: Yes Rate of Fire (rd/min): INA ATGM Launcher: N/A Firing Ports: None FIRE CONTROL FCS Name: INA Main Gun Stabilization: INA Rangefinder: INA Infrared Searchlight: Yes Sights w/Magnification: Gunner: Day: OB 40 Day/ night sight Field of View (°): INA Acquisition Range (m): INA Night: OB 40 Day/ night sight Field of View (°): INA Acquisition Range (m): INA Commander Fire Main Gun: No VARIANTS AMX-10P: Variant with Milan or HOT ATGM launcher AMX-10P/Milan: ATGM launcher vehicle, with two launchers AMX/HOT: ATGM launcher vehicle (Toucan II turret, 4 launchers) AMX-10 TM: Mortar carrier towing 120-mm RT-61 mortar AMX-10 PAC 90: Fire support/AT variant with Giat 90-mm gun AMX-10P Marine: Improved swim variant w/ 12.7/25/90-mm gun AMX-10 PC: Command variant with varied command stations AMX-10 RC: Wheeled (6 x 6) fire support vehicle with 90-mm gun AMX-10 RAC: The same fire support chassis with 105-mm gun MAIN ARMAMENT AMMUNITION Caliber, Type, Name: 20-mm (20x139) APDS-T Maximum Aimed Range (m): INA Max Effective Range (m): Day: 1,300 Night: INA Tactical AA Range: INA Armor Penetration (mm): INA Other Ammunition Types: API, API-T, HEI, HEI-T						

NOTES

A French SNPE explosive reactive armor (ERA) kit and others are available for use on the AMX-10P. However, during dismounted troop movement, ERA would be a hazard. Thus, passive armor is more likely; and ERA application is doubtful.

Russian Airborne Fighting Vehicle BMD-1

	<table><tr><th>Weapons & Ammunition Types</th><th>Typical Combat Load</th></tr><tr><td>73-mm gun HEAT HE</td><td>40 (est) 16 24</td></tr><tr><td>AT-3/a/b/c/Imp ATGM HEAT HE</td><td>4 3 1</td></tr><tr><td>7.62-mm coax MG 2x 7.62-mm bow MG</td><td>2,000 4,000</td></tr></table>	Weapons & Ammunition Types	Typical Combat Load	73-mm gun HEAT HE	40 (est) 16 24	AT-3/a/b/c/Imp ATGM HEAT HE	4 3 1	7.62-mm coax MG 2x 7.62-mm bow MG	2,000 4,000
Weapons & Ammunition Types	Typical Combat Load								
73-mm gun HEAT HE	40 (est) 16 24								
AT-3/a/b/c/Imp ATGM HEAT HE	4 3 1								
7.62-mm coax MG 2x 7.62-mm bow MG	2,000 4,000								
SYSTEM Alternative Designations: Date of Introduction: 1969 Proliferation: At least 1 country Description: Crew: 2 Troop Capacity: 5 passengers (+1) Combat Weight (mt): 13.3 Chassis Length Overall (m): 6.74 Height Overall (m): 2.15 Width Overall (m): 2.94 Ground Pressure (kg/cm²): 0.57 Automotive Performance: Engine Type: 240-hp Diesel Cruising Range (km): 600 Speed (km/h): Max Road: 65 Max Off-Road: 40-45 Average Cross-Country: INA Max Swim: 7 Fording Depth (m): Amphibious Radio: R-123M Protection: Armor, Turret Front (mm): 23 or Antibullet Applique Armor (mm): See NOTES Explosive Reactive Armor (mm): See NOTES Active Protective System: N/A Mineclearing Equipment: N/A Self-Entrenching Blade: N/A NBC Protection System: Collective Smoke Equipment: VEESS ARMAMENT Main Armament: Caliber, Type, Name: 73-mm smoothbore gun, 2A28/Grom Rate of Fire(rd/min): 7-8 Loader Type: Autoloader Ready/Stowed Rounds: 40 / 0 Elevation (°): -4/ +33 Fire on Move: Yes, but only 10 km/h or less (est) Auxiliary Weapons: Caliber, Type, Name: 7.62-mm (7.62x 54R) machinegun, PKT Mount Type: Coax Maximum Aimed Range (m): 1,300 Max Effective Range (m): Day: 1,000/400-500 on the move Night: 800	Fire on Move: Yes Rate of Fire (rd/min): 250 practical / 650 cyclic, 2-10 round bursts Caliber, Type, Name: 7.62-mm machinegun, PKT Mount Type: Bow (ball-mounted) Maximum Aimed Range (m): 1,000 Max Effective Range (m): Day: 1,000/ 400-500 on the move Night: N/A Fire on Move: Yes Rate of Fire (rd/min): 250 practical / 650 cyclic, 2-10 round bursts ATGM Launcher: Name: 9P111 Launch Method: Rail-launched Guidance: MCLOS Command Link: Wire Launcher Dismountable: Yes Firing Ports: 1 on each side, 1 in left rear door FIRE CONTROL FCS Name: INA Main Gun Stabilization: N/A Rangefinder: Stadiametric Infrared Searchlight: Yes Sights w/Magnification: Gunner: Day: 1PN22M1, 8x Field of View (°): 15 Acquisition Range (m): Night: 1PN22M1, 6.7x Field of View (°): 6 Acquisition Range (m): 800-1,000, based on light Commander Fire Main Gun: No VARIANTS BMD-1K: Command IFV (FSU), with added R-126 and R-107. BMD-1M: Variant with improved ventilation and road wheels. BMD-1P: Widely fielded IFV with AT-4/5 replacing AT-3. BMD-1PK: Company commander variant (FSU) of BMD-1P. BMD-2: Widely fielded variant with a 30-mm automatic gun and with AT-3 ATGM launcher replaced by AT-4/5 ATGM launcher. BTR-D: Stretched (6-road wheel) armored multipurpose transporter variant, with two 7.62-mm MGs but no turret. This chassis has been used for a variety of other airborne vehicles.								

Russian Airborne Fighting Vehicle BMD-1 continued

MAIN ARMAMENT AMMUNITION Caliber, Type, Name: 73-mm HEAT-FS, PG-9 Maximum Aimed Range (m): 1,300 Max Effective Range (m): Day: 800, but 600 or less on the move Night: 800 Tactical AA Range: INA Armor Penetration (mm): 335 (RHA) 73-mm HEAT-FS, NFI Maximum Aimed Range (m): 1,300 Max Effective Range (m): Day: 1,000, but 600 or less on the move Night: 800-1,000 Tactical AA Range: INA Armor Penetration (mm): >400 (RHA) 73-mm HE, OG-9 Maximum Aimed Range (m): 1,300, 600 or less on the move Max Effective Range (m): Day: 1,300, but 600 or less on the move Night: 800-1,000 Tactical AA Range: INA Armor penetration (mm): INA 73-mm HE, OG-9M1 Maximum Aimed Range (m): 4,500 Max Effective Range (m): Day: 1,300, but 600 or less on the move Night: 800-1,000 Tactical AA Range: INA Armor Penetration (mm): INA Other Ammunition Types: OG-9M	Antitank Guided Missiles: Name: AT-3, -3A, -B Warhead Type: Tandem HEAT Armor Penetration (mm): 410 RHA Range (m): 3,000 Name: AT-3C Warhead Type: Tandem HEAT Armor Penetration (mm): 520 RHA Range (m): 3,000 Name: AT-3C Imp/ Polk (Slovenian) Warhead Type: Precursor with HEAT Armor Penetration (mm): 580 RHA Range (m): 3,000 Name: Malyutka-2 (Russian) Warhead Type: Tandem HEAT Armor Penetration (mm): 800 RHA Range (m): 3,000 Name: Malyutka HE (Russian) Warhead Type: Frag-HE Armor Penetration (mm): N/A Range (m): 3,000
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NOTES

Vehicle can be parachute landed with airborne troops onboard. Height can be lowered.

Russian KBP offers a drop-in one-man turret, called Kliver, with a stabilized 2A72 30-mm gun, a 4-Kornet ATGM launcher, thermal sights, and improved fire control system. The Russian Volgorod Tractor Plant offers the B30 turret (a drop-in one-man turret with 2A42 30-mm gun, 7.62-mm coax MG, and a 9P135M launcher for AT-4/-5 ATGM). A Russian AG-17 30-mm automatic grenade launcher is available for BMD-1.

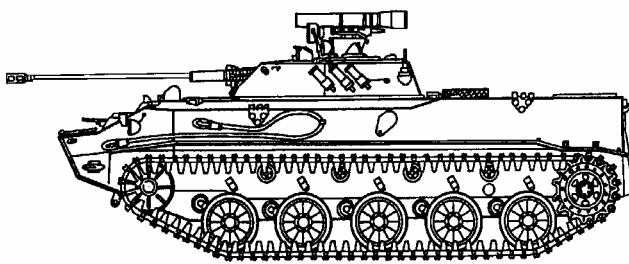
Other options are spall liners, air conditioning, and a more powerful engine. A French SNPE explosive reactive armor (ERA) kit and others are available for use on the BMD-1. However, during dismounted troop movement, ERA would be a hazard. Thus, passive armor is more likely; and ERA application is doubtful. For amphibious use, additional armor application is unlikely.

The Slovenian TS-M ATGM thermal night sight has a detection range of 4,500m and a recognition range of 2,000m.

The AT-3 HE-Blast ATGM is used for killing personnel and destroying bunkers and other fortifications.

The AT-3C Polk features a nose probe, an improved motor for increased velocity, lower smoke noise signature and a SACLOS launcher with improved sights.

Russian Airborne Fighting Vehicle BMD-3

	<table><tr><th>Weapons & Ammunition Types</th><th>Typical Combat Load</th></tr><tr><td>30-mm automatic gun HEI-T, Frag-HE AP-T, APDS-T, APFSDS</td><td>860 340/240 160/120</td></tr><tr><td>ATGM launcher 7.62-mm coax MG 30-mm grenade launcher 5.45-mm light MG</td><td>6 2,000 551 2,325</td></tr></table>	Weapons & Ammunition Types	Typical Combat Load	30-mm automatic gun HEI-T, Frag-HE AP-T, APDS-T, APFSDS	860 340/240 160/120	ATGM launcher 7.62-mm coax MG 30-mm grenade launcher 5.45-mm light MG	6 2,000 551 2,325
Weapons & Ammunition Types	Typical Combat Load						
30-mm automatic gun HEI-T, Frag-HE AP-T, APDS-T, APFSDS	860 340/240 160/120						
ATGM launcher 7.62-mm coax MG 30-mm grenade launcher 5.45-mm light MG	6 2,000 551 2,325						
SYSTEM Alternative Designations: N/A Date of Introduction: 1992 Proliferation: At least 1 country Description: Crew: 3 Troop Capacity: passengers: 4 (+3) Combat Weight (mt): 12.9 Length Overall (m): 6.00 Height Overall (m): 2.25 Width Overall (m): 3.13 Ground Pressure (kg/cm²): 0.32 (wide track) / .48 (standard track) Automotive Performance: Engine Type: 450-hp Diesel Cruising Range (km): 500 Speed (km/h): Max Road: 70 Max Off-Road: 45 Average Cross-Country: INA Max Swim: 10 Fording Depth (m): Amphibious Radio: R-173 Protection: Armor, Turret Front (mm): "Antibullet" (7.62) Applique Armor (mm): N/A Explosive Reactive Armor (mm): Available Active Protective System: N/A Mineclearing Equipment: KMT-8 plow or -10 roller Self-Entrenching Blade: N/A NBC Protection System: Collective Smoke Equipment: Smoke grenade launchers, 3 x each side of turret Vehicle engine exhaust smoke system (VEESS) ARMAMENT Main Armament: Caliber, Type, Name: 30-mm automatic gun, 2A42 Rate of Fire (rd/min): 550 cyclic in bursts/ 200-300 practical Loader Type: Dual-belt feed Ready/Stowed Rounds: 500/ 360 Elevation (°): -5 to +74 Fire on Move: Yes Auxiliary Weapons: Caliber, Type, Name: 30-mm automatic grenade launcher, AG-17 Mount Type: Bow left side Maximum Aimed Range (m): 1,700	Max Effective Range (m): Day: 1,200 Night: N/A Fire on Move: Yes Rate of Fire (rd/min): 60-100 practical in short (≤ 5 rds) or long (6-10 rd) bursts. Caliber, Type, Name: 7.62-mm (7.62 x 54R) machinegun, PKT Mount Type: Turret coax Maximum Aimed Range (m): 2,000 Max Effective Range (m): Day: 1,000 Night: 1,000 Fire on Move: Yes Rate of Fire (rd/min): 250 practical / 650 cyclic, 2-10 round bursts Caliber, Type, Name: 5.45-mm light machinegun, RPK-74 Mount Type: Bow right side Maximum Aimed Range (m): 1,000 Max Effective Range (m): Day: 800 Night: INA Fire on Move: Yes Rate of Fire (rd/min): 150 automatic/ 50 semiautomatic ATGM Launcher: Name: 9P135 Launch Method: Tube-launched Guidance: SACLOS Command Link: Wire Launcher Dismountable: Yes FIRE CONTROL FCS Name: INA Main Gun Stabilization: 2-plane Rangefinder: Laser Infrared Searchlight: Yes Sights w/Magnification: Gunner: Day: BPK-2-42 Field of View (°): 8 Acquisition Range (m): INA Night: BPK-2-42 II/IR Field of View (°): INA Acquisition Range (m): INA Commander Fire Main Gun: No VARIANTS None						

Russian Airborne Fighting Vehicle BMD-3 continued

MAIN ARMAMENT AMMUNITION Caliber, Type, Name: 30-mm AP-T Maximum Aimed Range (m): 2,500 Max Effective Range (m): Day: 1,500 Night: INA Tactical AA Range: 4,000 Armor Penetration (mm): 18 (RHA) at 1,500m 30-mm APDS Maximum Aimed Range (m): 2,500 Max Effective Range (m): Day: 2,000 Night: INA Tactical AA Range: 4,000 Armor Penetration (mm): 25 (RHA) at 1,500m 30-mm APFSDS-T M929 Maximum Aimed Range (m): 2,500 Max Effective Range (m): Day: 2,000+ Night: INA Tactical AA Range: 4,000 Armor penetration (mm): 55 (RHA) at 1,000m, 45 at 2,000m	30-mm Frag-HE Maximum Aimed Range (m): 4,000 Max Effective Range (m): Day: 4,000 Night: INA Tactical AA Range: 4,000 Armor Penetration (mm): INA Other Ammunition Types: 30-mm HEI-T Antitank Guided Missiles: Name: AT-5B/Konkurs-M Warhead Type: Tandem shaped charge (HEAT) Armor Penetration (mm): 925 (RHA) Range (m): 4,000 Name: AT-5/Spandrel Warhead Type: Shaped charge (HEAT) Armor Penetration (mm): 650 (RHA) Range (m): 4,000
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NOTES

BMD-3 has variable height control.

Automatic grenade launcher has 290 ready rounds and 261 in the rack. The ATGM launcher has 3 ready rounds (one on the launcher), and two stowed.

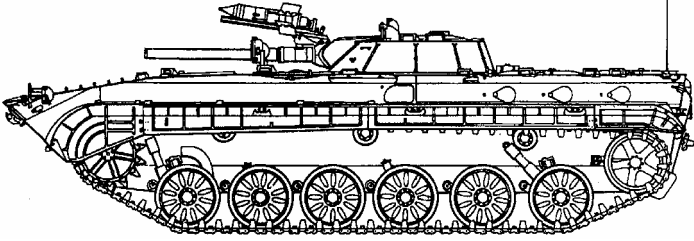
A French SNPE explosive reactive armor (ERA) kit and others are available for use on the BMD-3. However, during dismounted troop movement, ERA would be a hazard. Thus, passive armor is more likely and ERA application is doubtful. For amphibious use, additional armor application is unlikely. Other options are spill liners, air conditioning, and a more powerful engine.

The Russian SANOET-1 thermal gunner's sight is available. Thermal sights are available for the ATGM launcher. The Russian Trakt/IPN65 thermal imaging ATGM night sight is optional. Acquisition range is 2,500 m (NFI). For the ATGM launcher in dismount configuration, the Russian Mulat/IPN86 lightweight thermal ATGM night sight has 3,600 m detection range and 2,000 m identification range.

French-German Flame-V adapter kit permits the BMD-3 to launch Milan, Milan-2 and Milan-3 ATGMs.

Russian KBP offers a drop-in one-man turret, called Kliver, with a stabilized 2A72 30-mm gun, a 4 Kornet ATGM launcher, thermal sights, a coaxial 7.62-mm MG and improved fire control system.

Russian Infantry Fighting Vehicle BMP-1

	<table> <tr> <th>Weapons & Ammunition Types</th><th>Typical Combat load</th></tr> <tr> <td>73-mm gun</td><td>40</td></tr> <tr> <td>HEAT</td><td>20</td></tr> <tr> <td>HE</td><td>20</td></tr> <tr> <td>AT-3/a/b/C/Imp ATGM</td><td>5</td></tr> <tr> <td>HEAT</td><td>3</td></tr> <tr> <td>HE</td><td>2</td></tr> <tr> <td>7.62-mm coax MG</td><td>2,000</td></tr> </table>	Weapons & Ammunition Types	Typical Combat load	73-mm gun	40	HEAT	20	HE	20	AT-3/a/b/C/Imp ATGM	5	HEAT	3	HE	2	7.62-mm coax MG	2,000
Weapons & Ammunition Types	Typical Combat load																
73-mm gun	40																
HEAT	20																
HE	20																
AT-3/a/b/C/Imp ATGM	5																
HEAT	3																
HE	2																
7.62-mm coax MG	2,000																
SYSTEM Alternative Designations: BMP Model 1970, Korshun Date of Introduction: 1970 Proliferation: At least 33 countries Description: Crew: 3 Troop Capacity: 6 passengers (+2) Combat Weight (mt): 13.3 Length Overall (m): 6.74 Height Overall (m): 2.15 Width Overall (m): 2.94 Ground Pressure (kg/cm²): 0.57 Automotive Performance: Engine Type: Diesel Cruising Range (km): 600 Speed (km/h): Max Road: 65 Max Off-Road: 40-45 Average Cross-Country: INA Max Swim: 7 Fording Depths (m): Amphibious Mineclearing Equipment: KMT-8 or 10 mine plow available Self-Entrenching Blade: No Radio: R-123, R-M or R-173 Protection: Armor, Turret Front (mm): 19-23 Applique Armor (mm): Available Explosive Reactive Armor (mm): Available Active Protective System: No NBC Protection System: Collective protection Smoke Equipment: Vehicle engine exhaust smoke system (VEESS) ARMAMENT Main Armament: Caliber, Type, Name: 73-mm smoothbore gun 2A28/Grom Rate of Fire: 7-8 rd/min Loader Type: Autoloader Ready/Stowed Rounds: 40 / 0 Elevation (°): -4 to +33 Fire on Move: Yes, but only 10 km/h or less (est.) Auxiliary Weapon: Caliber, Type, Name: 7.62-mm (7.62x 54R) Machinegun PKT Mount Type: Coax Max Aimed Range (m): 1,300 Max Effective Range (m): Day: 1,000 / 400-500 on the move Night: 800 Fire on Move: Yes Rate of Fire: 250 rpm (practical, in 2-10 round bursts)	Firing Ports: 4 on each side, 1 in left rear door ATGM Launcher: Name: 9P111 Launch Method: Rail-launched Guidance: MCLOS Command Link: Wire Launcher Dismountable: Yes FIRE CONTROL FCS Name: INA Main Gun Stabilization: No Rangefinder: Laser Infrared Searchlight: Yes Sights w/Magnification: Gunner: Day: 1PN22M1, 8x Field of View (°): 15 Acquisition Range (m): Night: 1PN22M1, 6x Field of View (°): 6 Acquisition Range (m): 800-1,000, based on light Commander Fire Main Gun: No VARIANTS Earlier models, referred to as BMP and BMP-A were produced in small numbers from 1966. The standard BMP-1 (Model 1970) features improved fume venting, NBC protection, and swim features. Copies include: Chinese WZ 501/Type 86, Czech BVP-1, and the Polish BWP-1. A variety of variant IFVs/APCs and support vehicles have been developed using this chassis. For instance, the Chinese WZ 503 is a raised hull APC variant replacing the 73-mm gun with a 12.7-mm MG. The WZ 504 is an ATGM launcher vehicle with 4-rail AT-3-type ATGM launcher. The WZ 505 is an ambulance vehicle; and WZ 506 is a regimental command and staff vehicle. BMP-1K: Company command IFV, with added R-126 and R-107 transceivers. Firing ports and most periscopes are blocked. BMP-1KSh: Former Soviet regiment or division command and staff vehicle, with turret mounted erectable 10-meter radio mast. Radios include R-130, R-111, and R-173. BMP-1M: Iranian variant with drop rear gate vs double doors. BMP-1P: Widely fielded FSU IFV with an AT-4/5 ATGM launcher and smoke grenade launchers (see pp. 2-21 and 2-22). BMP-1PG: Recently offered upgrade similar to BMP-1P with an automatic grenade launcher and other options (see p. 2-21). BMP-1PK: Command variant for BMP-1P (see p. 2-21).																

Russian Infantry Fighting Vehicle BMP-1 continued

BPzV: Czechoslovakian reconnaissance variant with a TALL MIKE external tripod mounted radar. BREM-2: Light recovery and repair vehicle with a light crane. BREM-4: Armored recovery vehicle. Czech version is VPV. BRM-1, BRM-1K: Reconnaissance command variants with improved sensors and low-profile 2-man turret (see p. 3-4). BRM-23: Bulgarian reconnaissance variant with a 23-mm cannon, AT-3 ATGM, navigation system, NBC and artillery reconnaissance devices, and image intensifier night sights. IMR: Armored engineer tractor, with crane and dozer blade. IRM: Engineer underwater reconnaissance vehicle, with mine detectors and mapping capabilities. MLI-84: Romanian APC variant with a 12.7-mm MG. MP-31: Modernized command and staff vehicle. OT-90: Czech APC variant with 14.5-mm and 7.62-mm MGs. PRAM-S: Czechoslovakian self-propelled 120-mm mortar variant. PRP-3/PRP-4: Artillery reconnaissance vehicle (see p. 6-3). Snezka: Czech stretched version battlefield surveillance vehicle, with a sensor suite (including radar) mounted on a telescoping arm. SVO: Czechoslovakian turretless mine clearing variant with 24 large rocket-propelled line charges. VP90: Czech reconnaissance vehicle with 14.5 and 7.62-mm MGs Main Armament Ammunition: Caliber, Type, Name: 73-mm HEAT-FS, PG-9 Max Aimed Range (m): 1,300 Max Effective Range (m): Day: 800, but 600 or less on the move in 2-4 rd bursts Night: 800 Tactical AA Range: INA Armor Penetration (mm): 335 (RHA) Caliber, Type, Name: 73-mm HEAT-FS, NFI Max Aimed Range (m): 1,300	Max Effective Range (m): Day: 1,000/ 600 or less on the move Night: 800-1,000 Tactical AA Range: INA Armor Penetration (mm): >400 (RHA) Caliber, Type, Name: 73-mm HE, OG-9M1 Max Aimed Range (m): 4,500 Max Effective Range (m): Day: 1,300/ 600-1,000 on the move Night: 800-1,000 Tactical AA Range: INA Armor penetration (mm): INA Other Ammunition Types: OG-9, OG-9M Antitank Guided Missiles: Name: AT-3 Malyutka/-3a, -b Malyutka-M Warhead Type: Tandem HEAT Armor Penetration (mm): 410 (RHA) Range (m): 800-3,000 Name: AT-3c/ Malyutka-P Warhead Type: Tandem HEAT Armor Penetration (mm): 520 (RHA) Range (m): 800-3,000 Name: AT-3c Imp/ Polk (Slovenia) Warhead Type: Tandem HEAT Armor Penetration (mm): 580 (RHA) Range (m): 3,000 Name: Malyutka-2 (Russian) Warhead Type: Tandem HEAT Armor Penetration (mm): 800 (RHA) Range (m): 3,000 Name: Red Arrow-73A (Chinese) Warhead Type: HEAT Armor Penetration (mm): 500 RHA Range (m): 3,000 Name: Red Arrow-73B/C (Chinese) Warhead Type: HEAT Armor Penetration (mm): 600 RHA Range (m): 3,000 Name: Malyutka-2 HE (Russian) Warhead Type: Frag-HE Armor Penetration (mm): INA Range (m): 3,000
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NOTES

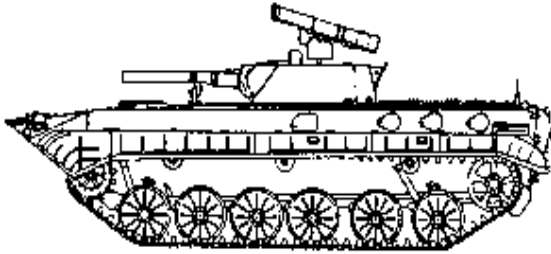
Thermal gunner sights are available; however, most upgrades involve adding a thermal sight with an improved gun and improved fire control system. The Slovenian TS-M ATGM thermal night sight has a detection range of 4,500 m and a recognition range of 2,000 m.

Russian BMP-2 2-man turrets with gun and fire control system are being marketed for BMP-1 customers. The Volgograd Tractor Plant offers the BMP-1/B30 package with a B30 turret (a drop-in one-man turret with 2A42 30-mm gun, 7.62-mm coax MG, BMP-2-type fire control system, PZU-8 AA sight, and a 9P135M ATGM launcher for AT-4/-5 ATGM). Russian KBP offers a drop-in one-man turret, called Kliver, with a stabilized 2A72 30-mm gun, a 4-Kornet ATGM launcher, thermal sights, and improved fire control system. A Ukrainian turret is also available.

Russian AG-17 30-mm AGL modification is available for use on BMP-1. A French SNPE ERA kit and others are available for use on the BMP-1. Other options are improved tracks, spall liners, air conditioning, smoke grenade launchers/laser warning receivers, and a more powerful engine (360 hp).

The AT-3-type ATGM can be upgraded by an operator with a new warhead in minutes. Low-mid-level maintenance can upgrade the missile motor. The HE-Blast ATGM is used for killing personnel and destroying bunkers and other fortifications. The AT-3C Polk features a nose probe, an improved motor for increased velocity, lower smoke and noise signature, and a SACLOS launcher with improved sights.

Russian Infantry Fighting Vehicle BMP-1P

	<table><tr><th>Weapons & Ammunition Types</th><th>Typical Combat Load</th></tr><tr><td>73-mm gun HEAT-FS HE</td><td>40 (est) 16 24</td></tr><tr><td>ATGM AT-4/-4B/-5/-5B</td><td>4</td></tr><tr><td>7.62-mm coax MG</td><td>2,000</td></tr></table>	Weapons & Ammunition Types	Typical Combat Load	73-mm gun HEAT-FS HE	40 (est) 16 24	ATGM AT-4/-4B/-5/-5B	4	7.62-mm coax MG	2,000
Weapons & Ammunition Types	Typical Combat Load								
73-mm gun HEAT-FS HE	40 (est) 16 24								
ATGM AT-4/-4B/-5/-5B	4								
7.62-mm coax MG	2,000								
SYSTEM Alternative Designations: BWP-1 (Poland), see NOTES Date of Introduction: 1974 Proliferation: At least 7 countries Description: Crew: 3 Troop Capacity: 6 passengers Combat Weight (mt): 13.3 Chassis Length Overall (m): 6.74 Height Overall (m): 2.15 Width Overall (m): 2.94 Ground Pressure (kg/cm²): 0.57 Automotive Performance: Engine Type: 300-hp Diesel Cruising Range (km): 600 Speed (km/h): Max Road: 65 Max Off-Road: 40-45 Average Cross-Country: INA Max Swim: 7 Fording Depth (m): Amphibious Radio: R-123, or R-173 Protection: Armor, Turret Front (mm): 19-23 Applique Armor (mm): N/A Explosive Reactive Armor (mm): Available Active Protective System: N/A Mineclearing Equipment: KMT-8 plow available Self-Entrenching Blade: N/A NBC Protection System: Collective Smoke Equipment: Six 81-mm smoke grenade launchers, VEES ARMAMENT Main Armament: Caliber, Type, Name: 73-mm smoothbore gun 2A28/Grom Rate of Fire (rd/min): 7-8 Loader Type: Autoloader Ready/Stowed Rounds: 40 / 0 Elevation (°): -4/+33 Fire on Move: Yes, but only 10 km/h or less (est) Auxiliary Weapon: Caliber, Type, Name: 7.62-mm (7.62x 54R) machinegun, PKT Mount Type: Coax Maximum Aimed Range (m): 1,300 Max Effective Range (m): Day: 1,000 / 400-500 on the move Night: 800 Fire on Move: No Rate of Fire (rd/min): 250 practical / 650 cyclic, 2-10 round bursts	ATGM Launcher: Name: 9P135M2 Launch Method: Tube-launched Guidance: SACLOS Command Link: Wire Launcher Dismountable: Yes Firing Ports: 4 on each side, 1 in left rear door FIRE CONTROL FCS Name: 1PN22M1 Main Gun Stabilization: N/A Rangefinder: Stadiametric Infrared Searchlight: OU-3GK Sights w/Magnification: Gunner: Day: 1PN22M1, 8 x Field of View (°): 15 Acquisition Range (m): 1,300 Night: 1PN22M1, 6.7x Field of View (°): 6 Acquisition Range (m): 800-1,000 based on light Commander Fire Main Gun: No VARIANTS BMP-1PG: This recently offered Russian upgrade is similar to BMP-1P with an added AG-17 30-mm automatic grenade launcher and other options, including thermal sights. BMP-1PK: Command variant, with addition of R-126 and R-107 transceiver. A small telescoping antenna is mounted on right rear. Firing ports and telescopes on right side are blocked off. MAIN ARMAMENT AMMUNITION Caliber, Type, Name: 73-mm HEAT-FS, PG-9 Maximum Aimed Range (m): 1,300 Max Effective Range (m): Day: 800, but 600 or less on the move in 2-4 round bursts Night: 800-1,000 Tactical AA Range: INA Armor Penetration (mm): 335 (RHA) 73-mm HEAT-FS, NFI Maximum Aimed Range (m): 1,300 Max Effective Range (m): Day: 1,000/ 600 or less on the move Night: 800-1,000 Tactical AA Range: INA Armor Penetration (mm): >400 (RHA)								

Russian Infantry Fighting Vehicle BMP-1P continued

73-mm HE, OG-9M1 Maximum Aimed Range (m): 4,500 Max Effective Range (m): Day: 1,300/ 600-1,000 on the move Night: 800-1,000 Tactical AA Range: INA Armor penetration (mm): INA Other Ammunition Types: OG-9, OG-9M Antitank Guided Missiles: Name: AT-5/SPANDREL Warhead Type: Shaped charge (HEAT) Armor Penetration (mm): 650 (RHA) Range (m): 4,000	Name: AT-5B/Konkurs-M Warhead Type: Tandem shaped charge (HEAT) Armor Penetration (mm): 925 (RHA) Range (m): 4,000 Name: AT-4/SPIGOT Warhead Type: Shaped charge (HEAT) Armor Penetration (mm): 480 (RHA) Range (m): 2,000 Name: AT-4B/Factoria Warhead Type: Tandem Shaped charge (HEAT) Armor Penetration (mm): 550 (RHA) Range (m): 2,500
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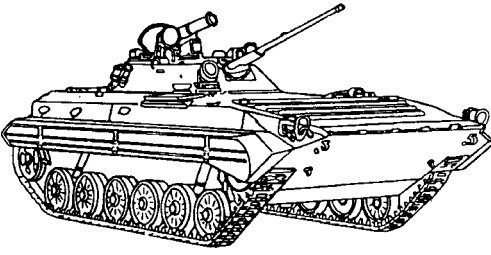
The prototype IFV, known as BMP, was not fielded. Initial BMP production variant, BMP-A, was halted with insignificant numbers. The base-line production IFV, BMP-1, has an AT-3/SAGGER antitank guided missile. The BMP-1P upgrade is widely fielded, with an AT-4/-5 ATGM launcher replacing the AT-3 launcher. The vehicle also added smoke grenade launchers. This variant should generally be portrayed where OPFOR calls for the BMP-1. For applications where a robust and modernized OPFOR is expected, use AT-5B ATGM. The AT-4/-4B ATGMs are less likely to be employed on this vehicle.

Other options are spall liners, air conditioning, and a more powerful engine. A French SNPE explosive reactive armor (ERA) kit and others are available for use on the BMD-1. However, during dismounted troop movement, ERA would be a hazard. Thus, passive armor is more likely; and ERA application is doubtful. Additional armor application may jeopardize amphibious capability.

Russian AG-17 30-mm automatic grenade launcher modification is available for use on BMP-1P. Russian KBP offers a drop-in one man turret, called Kliver, with a stabilized 2A72 30-mm gun, a 4 Kornet ATGM launcher, thermal sights, and improved fire control system.

The Russian Alis thermal gunner's sight is available. The Slovenian TS-F ATGM thermal night sight has a detection range of 4,500 m and a recognition range of 2,000 m.

Russian Infantry Fighting Vehicle BMP-2

	<table> <tr> <th>Weapons & Ammunition Types</th><th>Typical Combat Load</th></tr> <tr> <td>30-mm automatic gun</td><td>500</td></tr> <tr> <td>HEI-T, Frag-HE</td><td>340</td></tr> <tr> <td>AP-T, APDS-T, APFSDS-T</td><td>160</td></tr> <tr> <td>ATGM</td><td>5</td></tr> <tr> <td>AT-5/-5B/-4/-4B</td><td></td></tr> <tr> <td>7.62-mm coax MG</td><td>2,000</td></tr> </table>	Weapons & Ammunition Types	Typical Combat Load	30-mm automatic gun	500	HEI-T, Frag-HE	340	AP-T, APDS-T, APFSDS-T	160	ATGM	5	AT-5/-5B/-4/-4B		7.62-mm coax MG	2,000
Weapons & Ammunition Types	Typical Combat Load														
30-mm automatic gun	500														
HEI-T, Frag-HE	340														
AP-T, APDS-T, APFSDS-T	160														
ATGM	5														
AT-5/-5B/-4/-4B															
7.62-mm coax MG	2,000														
SYSTEM Alternative Designations: Yozh (Russia), Sarath (India) Date of Introduction: 1980 Proliferation: At least 20 countries Description: Crew: 3 Troop Capacity: 7 passengers Combat Weight (mt): 14.3 Chassis Length Overall (m): 6.72 Height Overall (m): 2.45 Width Overall (m): 3.15 Ground Pressure (kg/cm²): 0.63 Automotive Performance: Engine Type: 300-hp Diesel Cruising Range (km): 600 Speed (km/h): Max Road: 65 Max Off-Road: 45 Average Cross-Country: 35 Max Swim: 7 Fording Depth (m): Amphibious Radio: R-123M transceiver or R-173 Protection: Armor, Turret Front (mm): 23-33 Applique Armor (mm): On BMP-2D Explosive Reactive Armor (mm): Available, see NOTES Active Protective System: N/A Mineclearing Equipment: KMT-8 mine plow available Self-Entrenching Blade: N/A NBC Protection System: Collective Smoke Equipment: 6 smoke grenade launchers, VEES ARMAMENT Main Armament: Caliber, Type, Name: 30-mm automatic gun, 2A42 Rate of Fire (rd/min): 550 cyclic in bursts/ 200-300 practical Loader Type: Dual-belt feed Ready/Stowed Rounds: 500/0 Elevation (°): -5 to +74 Fire on Move: Yes Auxiliary Weapon: Caliber, Type, Name: 7.62-mm (7.62x 54R) machinegun, PKT Mount Type: Turret coax Maximum Aimed Range (m): 2,000	Max Effective Range (m): Day: 1,000 Night: INA Fire on Move: Yes Rate of Fire (rd/min): 250 practical/650 cyclic, 2-10 round bursts ATGM Launcher: Name: 9P135M1/M3 Launch Method: Tube-launched Guidance: SACLOS Command Link: Wire Launcher Dismountable: Yes Firing Port: 4 on left side, 3 on right side 1 in left rear door FIRE CONTROL FCS Name: BPK-1-42 or BPK-2-42 Main Gun Stabilization: 2-plane Rangefinder: Laser Infrared Searchlight: Yes Sights w/Magnification: Gunner: Day: BPK-1-42 or BPK-2-42 Field of View (°): 8 Acquisition Range (m): 2,500-4,000 (est) Night: BPK-1-42 or BPK-2-42 II/IR Field of View (°): INA Acquisition Range (m): INA Commander Fire Main Gun: No VARIANTS BMP-2D: Variant with add-on plate armor, but which cannot swim BMP-2E: Variant with 6-mm steel plates added and track skirts BMP-2K: Command variant with additional radio MAIN ARMAMENT AMMUNITION Caliber, Type, Name: 30-mm AP-T Maximum Aimed Range (m): 2,500 Max Effective Range (m): Day: 1,500 Night: INA Tactical AA Range: 4,000 Armor Penetration (mm): 18 (RHA, 60°) at 1,500 m														

Russian Infantry Fighting Vehicle BMP-2 continued

30-mm APDS Maximum Aimed Range (m): 2,500 Max Effective Range (m): Day: 2,000 Night: INA Tactical AA Range: 4,000 Armor Penetration (mm): 25 (RHA) at 1,500m 30-mm APFSDS-T M929 Maximum Aimed Range (m): 2,500 Max Effective Range (m): Day: 2,000+ Night: INA Tactical AA Range: 4,000 Armor penetration (mm): 55 (RHA) at 1,000m/45 at 2,000m 30-mm Frag-HE Maximum Aimed Range (m): 4,000/ 2,500 point target Max Effective Range (m): Day: 4,000 Night: INA Tactical AA Range: 4,000 Armor Penetration (mm): INA Other Ammunition Types: 30-mm HEI-T	Antitank Guided Missiles: Name: AT-5/SPANDREL Warhead Type: Shaped charge (HEAT) Armor Penetration (mm): 650 (RHA) Range (m): 4,000 Name: AT-5B/Konkurs-M Warhead Type: Tandem shaped charge (HEAT) Armor Penetration (mm): 925 (RHA) Range (m): 4,000 Name: AT-4/SPIGOT Warhead Type: Shaped charge (HEAT) Armor Penetration (mm): 480 (RHA) Range (m): 2,000 Name: AT-4B/Factoria Warhead Type: Tandem shaped charge (HEAT) Armor Penetration (mm): 550 (RHA) Range (m): 2,500
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NOTES

A French SNPE explosive reactive armor (ERA) kit and others are available for use on the BMP-2. However, during dismounted troop movement, ERA would be a hazard. Thus, passive armor is more likely and ERA application is doubtful. For amphibious use, additional armor application is unlikely. Other options are spall liners, air conditioning, and a more powerful engine.

Russian AG-17 30-mm automatic grenade launcher modification is offered for BMP-2.

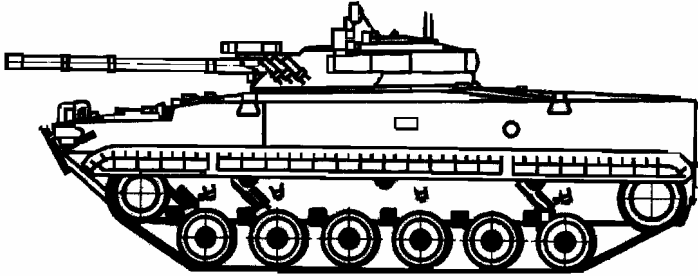
Russian KBP offers a drop-in one-man turret, called Kliver, with a stabilized 2A72 30-mm gun, a 4 Kornet ATGM launcher, thermal sights, a coaxial 7.62-mm MG and improved fire control system.

ATGM load consists of one ready on the launcher and four stowed. They are readily accessible, but require hand loading from an open hatch. The AT-5 and AT-5B are more likely than AT-4 and -4B.

French-German Flame-V adaptor kit permits the BMP-2 system to launch Milan, Milan-2, and Milan-3 ATGMs.

Thermal sights are available. The Russian SANOET-1 thermal gunner's sight is available. The Russian Trakt/1PN65 thermal imaging (TI) ATGM night sight is optional. Acquisition range is 2,500 m (NFI). For the launcher in dismount configuration, the Slovenian TS-F ATGM night sight is available and has a detection range of 4,500 m and recognition range of 2,000 m. The Russian Mulat/1PN86 lightweight TI ATGM thermal sight has 3,600 m detection range and 2,000 m identification range.

Russian Infantry Fighting Vehicle BMP-3

	<table> <tr> <th>Weapons & Ammunition Types</th><th>Typical Combat Load</th></tr> <tr> <td>100-mm rifled gun</td><td>40</td></tr> <tr> <td>Frag-HE</td><td>40</td></tr> <tr> <td>AT-10/Imp ATGM</td><td>8</td></tr> <tr> <td>30-mm automatic gun</td><td>500</td></tr> <tr> <td>HEI-T, Frag-HE</td><td>340</td></tr> <tr> <td>AP-T, APDS-T or APFSDS-T</td><td>160</td></tr> <tr> <td>7.62-mm coax MG</td><td>2,000</td></tr> <tr> <td>2 x 7.62-mm bow MG</td><td>4,000</td></tr> </table>	Weapons & Ammunition Types	Typical Combat Load	100-mm rifled gun	40	Frag-HE	40	AT-10/Imp ATGM	8	30-mm automatic gun	500	HEI-T, Frag-HE	340	AP-T, APDS-T or APFSDS-T	160	7.62-mm coax MG	2,000	2 x 7.62-mm bow MG	4,000
Weapons & Ammunition Types	Typical Combat Load																		
100-mm rifled gun	40																		
Frag-HE	40																		
AT-10/Imp ATGM	8																		
30-mm automatic gun	500																		
HEI-T, Frag-HE	340																		
AP-T, APDS-T or APFSDS-T	160																		
7.62-mm coax MG	2,000																		
2 x 7.62-mm bow MG	4,000																		
SYSTEM Alternative Designations: Soviet ICV M1990/1 Date of Introduction: 1990 Proliferation: At least 7 countries Description: Crew: 3 Troop Capacity: 7 passengers Combat Weight (mt): 18.70 Chassis Length Overall (m): 6.73 Height Overall (m): 2.45 Width Overall (m): 3.15 Ground Pressure (kg/cm²): 0.62 Automotive Performance: Engine Type: 500-hp Diesel Cruising Range (km): 600 Speed (km/h): Max Road: 70 Max Off-Road: 45 Average Cross-Country: 35 Max Swim: 10 Fording Depth (m): Amphibious Radio: R-173, R-173P Protection: Armor, Turret Front (mm): 30-35 front glacis Applique Armor (mm): Yes on turret Explosive Reactive Armor (mm): Available, see NOTES Active Protective System: N/A Mineclearing Equipment: KMT-8 plow available Self-Entrenching Blade: Yes NBC Protection System: Collective Smoke Equipment: 6 smoke grenade launchers, VEES ARMAMENT Main Armaments: Caliber, Type, Name: 100-mm rifled gun 2A70 Rate of Fire (rd/min): 8-10 Loader Type: Autoloader gun rounds; manual for gun and ATGMs Ready/Stowed Rounds: 22/18 for rounds, 3/5 for ATGMs Elevation (°): -5 to +60 Fire on Move: Yes Caliber, Type, Name: 30-mm automatic gun 2A72 Rate of Fire: 350 rd/min (cyclic) in bursts Loader Type: Dual-belt feed Ready/Stowed Rounds: 500/ 0	Elevation (°): -5 to +60 Fire on Move: Yes Auxiliary Weapon: Caliber, Type, Name: 7.62-mm (7.62x 54R) machinegun, PKT Mount Type: Turret coax Maximum Aimed Range (m): 2,000 Max Effective Range (m): Day: 1,000 Night: INA Fire on Move: Yes Rate of Fire (rd/min): 250 practical / 650 cyclic, in 2-10 round bursts Caliber, Type, Name: 7.62-mm (7.62x 54R) machinegun, PKT Mount Type: Bow left and right Maximum Aimed Range (m): 1,000 Max Effective Range (m): Day: 1,000/400-500 on the move Night: N/A Fire on Move: Yes Rate of Fire (rd/min): 250 practical / 650 cyclic, in 2-10 round bursts ATGM Launcher: Name: 2A70 100-mm gun Launch Method: Gun-launched Guidance: SACLOS, laser-beam rider Command Link: Encoded infrared laser-beam Launcher Dismountable: No Firing Ports: 2 on each side, 1 in left rear door FIRE CONTROL FCS Name: 1K13-2 Main Gun Stabilization: 2-plane Rangefinder: Laser Infrared Searchlight: Yes Sights w/Magnification: Gunner: Day: 1K13-2, 8x ; 1P3-10 antiaircraft, 2.6x; PPD-1 stand-by Field of View (°): INA Acquisition Range (m): 5,200 Night: 1K13-2 II night channel, 5.5x Field of View (°): INA Acquisition Range (m): INA Commander Fire Main Gun: Yes																		

Russian Infantry Fighting Vehicle BMP-3 continued

VARIANTS BMP-3F: Amphibious Armored Combat Vehicle developed for Naval Infantry. BMP-3 M1995: ATGM launcher vehicle, with Kornet (AT-14) launcher and autoloader, and thermal sights. 9P157: ATGM launcher vehicle, with Krizantema (AT-15) ATGM autoloader, MMW and thermal fire control system. BMP-3K: Command variant, with electronic round fuze system for 100-mm gun. Bow MGs are removed. Added radios are R-159, R-143 and R-174. BREhM-L: Armored recovery vehicle (ARV). BRM-3K: Combat recon vehicle with radar and 30-mm gun. BMP-3: UAE upgrade improvements including Namut Thermal Night sight. MAIN ARMAMENT AMMUNITION Caliber, Type, Name: 100-mm HE 3UOF17 Maximum Aimed Range (m): 5,000 Max Effective Range (m): Day: 4,000 Night: INA Tactical AA Range: 4,000 Armor Penetration (mm): 25 (RHA) Caliber, Type, Name: 100-mm HE-Shapnel (HEF/MOD.96) Focused-fragmentation, electronically-fuzed Maximum Aimed Range (m): 5,200 Max Effective Range (m): Day: 5,200 Night: INA Tactical AA Range: 4,000 Armor Penetration (mm): INA 30-mm APFSDS-T M929 Maximum Aimed Range (m): 2,500 Max Effective Range (m): Day: 2,000+ Night: INA Tactical AA Range: 4,000 Armor penetration (mm): 55 (RHA) at 1,000 m, 45 at 2,000 m	30-mm Frag-HE Maximum Aimed Range (m): 4,000 Max Effective Range (m): Day: 4,000 Night: INA Tactical AA Range: 4,000 Armor Penetration (mm): INA 30-mm AP-T Maximum Aimed Range (m): 2,500 Max Effective Range (m): Day: 1,500 Night: INA Tactical AA Range: 4,000 Armor Penetration (mm): 18 (RHA, 60°) at 1,500 m 30-mm APDS Maximum Aimed Range (m): 2,500 Max Effective Range (m): Day: 2,000 Night: INA Tactical AA Range: 4,000 Armor Penetration (mm): 25 (RHA) at 1,500 m Other Ammunition Types: 100-mm HE-I, 30-mm HEI-T Antitank Guided Missiles Name: AT-10/Basnya Warhead Type: Shaped charge Command Link: Encoded laser-beam Warhead Type: Shaped charge (HEAT) Armor Penetration (mm): 650 (RHA) Range (m): 4,000 Name: AT-10 Improved Warhead Type: Tandem shaped charge Armor Penetration (mm): 700 (RHA) behind ERA Range (m): 4,000 Launcher Dismountable: No
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NOTES

A French SNPE ERA kit and others are available for use on the BMP-3. However, during dismounted troop movement ERA would be a hazard. Thus, passive armor is more likely and ERA application is doubtful. Other options are spall liners and air conditioning.

Russian AG-17 30-mm automatic grenade launcher modification is available for use on BMP-3.

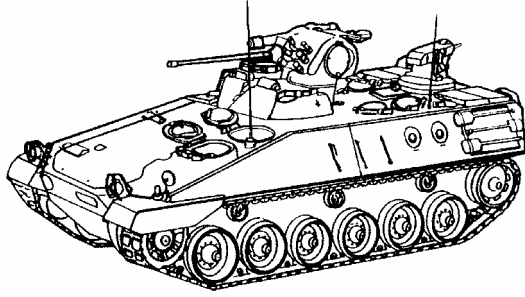
Russian KBP offers a drop-in one-man turret called Kliver, with a stabilized 2A72 30-mm gun, a 4 Kornet ATGM launcher, thermal sights, and improved fire control system.

The Namut thermal gunner's sight is available for use on BMP-3. This uses the French Athos thermal camera. Namut sight has 3x and 10x channels. Night acquisition range: 2,600 m (NFI)

Stowed rounds and ATGMs can be passed from the passenger compartment to the gunner for hand loading. This includes ATGMs.

The "HEF" (or "HE-Shrapnel") round can be employed in indirect fire mode with air burst to 7,000 m.

German Infantry Fighting Vehicle Marder 1

	<table><tr><th>Weapons & Ammunition Types</th><th>Typical Combat Load</th></tr><tr><td>20-mm automatic cannon HEI/HEI-T API-T or APDS-T</td><td>1,250</td></tr><tr><td>7.62-mm coax MG coaxial rear/remote turret</td><td>5,000</td></tr><tr><td>Milan ATGM Launcher</td><td>5</td></tr></table>	Weapons & Ammunition Types	Typical Combat Load	20-mm automatic cannon HEI/HEI-T API-T or APDS-T	1,250	7.62-mm coax MG coaxial rear/remote turret	5,000	Milan ATGM Launcher	5
Weapons & Ammunition Types	Typical Combat Load								
20-mm automatic cannon HEI/HEI-T API-T or APDS-T	1,250								
7.62-mm coax MG coaxial rear/remote turret	5,000								
Milan ATGM Launcher	5								
SYSTEM Alternative Designations: INA Date of Introduction: 1971 Proliferation: At least 2 countries Description: Crew: 4 (3+1 squad member, who dismounts with the squad) Troop Capacity: 5 Combat Weight (mt): 29.2/35.0* for Marder 1A3 Chassis Length Overall (m): 6.79/6.88* Height Overall (m): 2.99/3.02* Width Overall (m): 3.24/3.38* Ground Pressure (kg/cm²): 0.83/0.94* Automotive Performance: Engine Type: 590-600-hp Diesel Cruising Range (km): 520 Speed (km/h): Max Road: 75 Max Off-Road: 65 Average Cross-Country: 35 Max Swim: N/A Fording Depth (m): 1.5/2.0 with preparation Radio: INA Protection: Armor, Turret Front (mm): Against 20 mm/30 mm* Applique Armor (mm): Available/Standard* Explosive Reactive Armor (mm): Brenus ERA available Active Protective System: N/A Mineclearing Equipment: N/A Self-Entrenching Blade: N/A NBC Protection System: Collective Smoke Equipment: 6 smoke grenade launchers ARMAMENT Main Armaments: Caliber, Type, Name: 20-mm automatic cannon (92 Cal), Rh202 Rate of Fire (rd/min): 800-1,000 Loader Type: Dual belt feed/manual for Milan Ready/Stowed Rounds: 345 HE and 75 AP/830 stowed Elevation (°): -17 to +65 Fire on Move: No Auxiliary Weapon: Caliber, Type, Name: 7.62-mm (7.62x 51) machinegun, MG3 Mount Type: Turret coax Maximum Aimed Range (m): 2,000 Max Effective Range (m): Day: INA	Night: INA Fire on Move: Yes Rate of Fire (rd/min): INA Caliber, Type, Name: 7.62-mm (7.62x 51) machinegun, MG3 Mount Type: Rear/ turret remote Maximum Aimed Range (m): 2,000 Max Effective Range (m): Day: INA Night: INA Fire on Move: Yes Rate of Fire (rd/min): INA ATGM Launcher: Name: Milan, Milan 2, Milan 3 Launch Method: Tube (from canister) Guidance: SACLOS Command Link: Wire Launcher Dismountable: Yes, with attached folded tripod. Firing Ports: Two on each side FIRE CONTROL FCS Name: INA Main Gun Stabilization: N/A Rangefinder: Laser Infrared Searchlight: Yes/removed in later variants Sights w/Magnification: Gunner: Day: PERI Z 11, 2x and 6x Field of View (°): INA Acquisition Range (m): INA Night: IR and white light/thermal sight* Field of View (°): INA Acquisition Range (m): INA Commander Fire Main Gun: Yes VARIANTS Marder 1A1: Variant includes PERI Z 59 II gunner night sight, and Milan launcher. Marder 1A1A has original night sight. Marder 1A3: Variant includes applique armor package, 7.62-mm MG moved to left side coaxial turret mount, three upper hull doors. In addition the suspension and turret interior were upgraded. Extra armor blocks the firing ports. Roland: German air defense missile launcher vehicle with Marder chassis. * Data for Marder 1A3								

German Infantry Fighting Vehicle Marder 1 continued

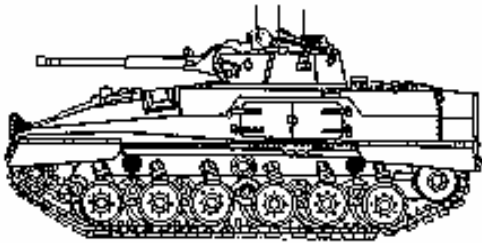
VCTP: Argentine Army IFV with a Marder chassis, a 720-hp engine, a 20-mm gun on a two-man turret, and two 7.62-mm MGs. TAM: Argentine Army tank uses the Marder chassis and a 105-mm gun. MAIN ARMAMENT AMMUNITION Caliber, Type, Name: 20-mm (20x139) APDS-T, DM43A1 Maximum Aimed Range (m): INA Max Effective Range (m): Day: 2,000 Night: INA Tactical AA Range: INA Armor Penetration (mm): 32 at 1,000 m 20-mm HEI, DM51A2/HEI-T, DM81 Maximum Aimed Range (m): INA Max Effective Range (m): Day: 2,000+ Night: INA Tactical AA Range: INA Armor Penetration (mm): INA	20-mm Shrapnel, DM111 (canister with forward fragment dispense) Maximum Aimed Range (m): INA Max Effective Range (m): Day: INA Night: INA Tactical AA Range: INA Armor Penetration (mm): INA Other Ammunition Types: DM63 APDS-T, canister Antitank Guided Missiles Name: Milan Warhead Type: Shaped charge (HEAT) Armor Penetration (mm): 600 (RHA) Range (m): 25-2,000 Name: Milan 2 Warhead Type: Tandem Shaped charge Armor Penetration (mm): 800 (RHA) Range (m): 20-2,000 Name: Milan 3 Warhead Type: Tandem Shaped charge with precursor charge Armor Penetration (mm): 880 (RHA) Range (m): 20-1,920
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NOTES

German Brenus ERA and others are available for use on the Marder 1. However, during dismounted troop movement ERA would be a hazard. Thus, passive armor is more likely and ERA application is doubtful.

All Milan launchers will fire all ATGMs. However, Milan 3 countermeasures will only function with the Milan 3 launcher. All Milan launchers can mount (and many are fitted with) the MIRA thermal night sight.

British Infantry Fighting Vehicle Warrior

	<table><tr><th>Weapons & Ammunition Types</th><th>Typical Combat Load</th></tr><tr><td>30-mm auto gun HEI-T APDS-T, APSE-T</td><td>228</td></tr><tr><td>7.62-mm coax MG Ball, Ball-T</td><td>2,200</td></tr></table>	Weapons & Ammunition Types	Typical Combat Load	30-mm auto gun HEI-T APDS-T, APSE-T	228	7.62-mm coax MG Ball, Ball-T	2,200
Weapons & Ammunition Types	Typical Combat Load						
30-mm auto gun HEI-T APDS-T, APSE-T	228						
7.62-mm coax MG Ball, Ball-T	2,200						
SYSTEM Alternative Designations: FV 511, MCV-80 Date of Introduction: 1988 Proliferation: At least two countries Description: Crew: 3 Troop Capacity: 7 passengers Combat Weight (mt): 24.00 Chassis Length Overall (m): 6.34 Height Overall (m): 2.79 Width Overall (m): 3.03 Ground Pressure (kg/cm²): 0.65 Automotive Performance: Engine Type: 550-hp Diesel Cruising Range (km): 660 Speed (km/h): Max Road: 75 Max Off-Road: 60 Cross-Country: 48 Max Swim: N/A Fording Depth (m): 1.3 Unprepared Radio: INA Protection: Armor, Turret Front (mm): Against 14.5-mm gun Applique Armor (mm): Available (see VARIANTS) Explosive Reactive Armor (mm): N/A Active Protective System: N/A Mineclearing Equipment: N/A Self-Entrenching Blade: N/A NBC Protection System: Yes Smoke Equipment: Smoke grenade launchers (4 each side of turret) ARMAMENT Main Armament: Caliber, Type, Name: 30-mm automatic cannon, RARDEN L21A1 Rate of Fire (rd/min): 80-90 cyclic Loader Type: Feed tray, clip-fed (3-round clips) Ready/Stowed Rounds: 228/0 Elevation (°): -10/+45 Fire on Move: INA Auxiliary Weapon: Caliber, Type, Name: 7.62-mm chain gun, L94A1 Mount Type: Turret coax Maximum Aimed Range (m): INA Max Effective Range: INA	Fire on Move: Yes Rate of Fire (rd/min): 520-570 ATGM Launcher: N/A Firing Ports: None FIRE CONTROL FCS Name: INA Main Gun Stabilization: N/A Rangefinder: INA Infrared Searchlight: Yes Sights w/Magnification: Gunner: Day: INA Field of View (°): INA Acquisition Range (m): INA Night: SPAV L2A1 II sight Field of View (°): INA Acquisition Range (m): INA Commander Fire Main Gun: No VARIANTS Command variant is outfitted with radios, mapboards, other staff support equipment, and Vickers Defence Turret. Desert Warrior: Variant with the 2-man turret from LAV-25, with a US M242 Bushmaster 25-mm automatic cannon, coaxial MG and 1-2 ATGM launchers. Other modifications are additional passive armor and three periscopes for improved vision. Sold to Kuwait. Desert Storm Variant: Changes included passive armor added to hull sides and a pintle mount for a Milan-2 ATGM launcher. Mechanized Artillery Observation Vehicle (MAOV): It resembles an IFV, but is fitted with a dummy cannon, improved artillery reconnaissance and automation systems, and land navigation. Options include an Osprey 8-power optical and thermal sight with Nd:YAG laser designator for the observer. MAIN ARMAMENT AMMUNITION Caliber, Type, Name: 30-mm APDS-T, L14 Maximum Aimed Range (m): 4,000 Max Effective Range (m): Day: 1,100 Night: INA Armor Penetration (mm): INA Other Ammunition Types: 30-mm APSE-T (AP Secondary Effects-T L5, HEI-T L13						

NOTES

Variants available but not in production include engineer, recovery, mortar vehicles, armored fighting vehicles with 90-mm and 105-mm guns, an APC with 7.62-mm chain gun, ATGM launcher vehicles for Milan, HOT and Trigat, and a low-profile chassis for a reduced signature IFV.

Russian IFV/APC Turret Kliver

	<table><tr><th>Weapons & Ammunition Types</th><th>Typical Combat Load</th></tr><tr><td>30-mm automatic gun HEI-T, Frag-HE APDS-T or APFSDS-T</td><td>300</td></tr><tr><td>7.62-mm coax MG</td><td>2,000</td></tr><tr><td>ATGM Kornet-LR Kornet-LR HE</td><td>4 or 8 (See Notes)</td></tr></table>	Weapons & Ammunition Types	Typical Combat Load	30-mm automatic gun HEI-T, Frag-HE APDS-T or APFSDS-T	300	7.62-mm coax MG	2,000	ATGM Kornet-LR Kornet-LR HE	4 or 8 (See Notes)
Weapons & Ammunition Types	Typical Combat Load								
30-mm automatic gun HEI-T, Frag-HE APDS-T or APFSDS-T	300								
7.62-mm coax MG	2,000								
ATGM Kornet-LR Kornet-LR HE	4 or 8 (See Notes)								
BMP-1 with Kliver turret									

SYSTEM Alternative Designations: TKB-799 Date of Introduction: Displayed first time in 1996 Proliferation: Prototypes displayed on BTR-80, BMP-1 and -3 chassis. This represents upper tier (higher cost) turret upgrades. Description: Turret crew: 1, gunner in 1-man turret Combat Weight (mt): 1.5-2.5 Fording Depths (m): Amphibious vehicle capability retained Protection: Armor, Turret Front (mm): INA Smoke Equipment: Not on prototypes, but could be added ARMAMENT Main Armaments: Caliber, Type, Name: 30-mm automatic gun 2A72 Rate of Fire: 350 rd/min (cyclic) in bursts Loader Type: Belt feed Ready/Stowed Rounds: 300/ 0 Elevation (°): -10 to +60 Fire on Move: Yes Auxiliary Weapon: Caliber, Type, Name: 7.62-mm (7.62x 54R) machinegun, PKT Mount Type: Turret coax Maximum Aimed Range (m): 2,000 Max Effective Range (m): Day: 1,500 Night: INA Fire on Move: Yes Rate of Fire (rd/min): 250 practical / 650 cyclic, in 2-10 rd bursts ATGM Launcher: Name: Kornet Launch Method: Turret mount launcher, with free-slew elevation Guidance: Laser-beam rider Command Link: Encoded infrared laser-beam Launch Method: 4x tube-launched missiles Launcher Dismountable: No, however Kornet-E spare possible Elevation (°): INA Rate of Launch: (missiles/min): 2-3, depending on range Reaction Time (sec): 1-2 Ready/Stowed Missiles: 4/ 0 APC or IFV, 4 for DF support role	FIRE CONTROL FCS Name: Main Gun Stabilization: 2-plane for fire on move Rangefinder: Laser, built into sight Infrared Searchlight: No Sights w/Magnification: Gunner: 1K13-2 12x independent 2-plane stabilized sight Day: TV Field of View (°): INA Acquisition Range (m): 5,500 Night: Thermal sight Field of View (°): INA Acquisition Range (m): 3,500 Commander Fire Main Gun: No VARIANTS Prototypes displayed include BTR-80 and BMP-3 chassis. KBP Tula claims that it can be installed on any vehicle with 1.5-2.5 tonne turret capacity. Hull opening rework for the turret ring would be required. KBP (manufacturer) says that a 2-man turret version is available. BMP-1M: IFV with Kliver upgrade. The turret was designed for the BMP-1 turret ring. MAIN ARMAMENT AMMUNITION Caliber, Type, Name: 30-mm APFSDS-T M929 Maximum Aimed Range (m): 2,500 Max Effective Range (m): Day: 2,000+ Night: INA Tactical AA Range: 4,000 Armor penetration (mm): 55 (RHA) at 1,000 m, 45 at 2,000 m 30-mm Frag-HE Maximum Aimed Range (m): 4,000 Max Effective Range (m): Day: 4,000 Night: INA Tactical AA Range: 4,000 Armor Penetration (mm): INA
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Russian IFV/APC Turret Kliver continued

30-mm APDS Maximum Aimed Range (m): 2,500 Max Effective Range (m): Day: 2,000 Night: INA Tactical AA Range: 4,000 Armor Penetration (mm): 25 (RHA) at 1,500 m Other Ammunition Types: 100-mm HE-I, 30-mm HEI-T	Antitank Guided Missiles Name: Kornet-LR Alternative Designation: 9M133 Missile Weight (kg): 27 Warhead Type: Tandem Shaped Charge (HEAT) Armor Penetration (mm): 1,200 Min/Max Range (m): 100/5,500 Probability of Hit (%): 90 Average Velocity (m/s): 550 Time of Flight to Max Range (sec): 22 Other Missiles: Kornet-LR HE (thermobaric, 9M133F)
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NOTES

Force could use a partial maneuver unit upgrade, such as one per platoon, or 3-4 per company, to serve the direct-fire support role in an APC or IFV-based mechanised infantry unit. The cost would be less than conversion of all vehicles, with a significant lethality improvement against armored vehicles (tanks and IFVs) as well as against aircraft. In the DF support role, 4 more ATGMs and MANPADS launcher could be stowed in place of 2-4 troops. Stowed rounds and ATGMs can be passed from the passenger compartment to the gunner for hand loading.

Turret installation would not interfere with NBC system, commander's station, or with onboard ammunition stowage.

Chapter 3 Reconnaissance

Reconnaissance represents all measures associated with organizing, collecting, and studying information on the enemy, terrain, and weather in area of upcoming battles. Aggressive continuous reconnaissance allows the timely accomplishment of combat missions with minimum losses. Poor reconnaissance can lead to failure. This chapter focuses on the reconnaissance systems of ground maneuver forces and specialized ground reconnaissance troops such as special purpose forces. However, there are also dedicated reconnaissance assets which other chapters in this manual discuss in more detail:

- Artillery target acquisition (Chapter 6).
- Aerial reconnaissance (Chapters 9, 10, & 12).
- Air defense reconnaissance, early warning, and target acquisition (Chapter 7).
- Engineer reconnaissance (Chapter 8).
- Signals reconnaissance (Chapter 13).
- NBC reconnaissance (when published).

As the modern battlefield becomes increasingly mobile and lethal the challenge is to design and deploy reconnaissance systems with the ability to acquire the enemy, transmit intelligence, and survive for the next mission. In this era, the struggle for "information dominance" complements other technological struggles (such as armor/antiarmor and mobility/counter mobility) that characterize the modern battlefield. Reconnaissance developments are increasingly utilizing the electromagnetic spectrum, integrating C2, navigation systems, data processing, and fusing technologies, as well as new mobility systems to provide greater situational awareness and forecasting for the combined arms commander in battlefield management. Assets are specially designed for different branches and echelons, from tactical to strategic.

Much of the reconnaissance effort will continue to be executed by assigned maneuver units. This challenge also translates to reconnaissance as a combined arms mission, not solely the business of reconnaissance troops. Most forces employ a mix of maneuver vehicles, including tanks and infantry fighting vehicles, dismounted reconnaissance patrols with ground sensors, aerial reconnaissance, and reconnaissance vehicles.

Ground sensors include optics (sights, binoculars, and telescopes) that operate in the visual light (0.4-0.7 μ) bandwidth of the electro-magnetic spectrum. Electro-optical systems, such as laser rangefinders, laser designators, aiming circles or goniometers, and remote cameras can operate in the visual band, as well as in the infrared (0.7-13 μ +) band. Television (TV) systems employ a camera which transforms an image into RF data which can be linked to a system for processing and transmission. Among current emphases are lightweight hand-held/tripod mounts, weapons optics, and EO sensors for infantry. Sensor systems increasingly use acoustic and seismic sensors, and radars. Acoustic sensors include multi-directional microphones, directional microphones that can be linked for determining azimuth, as well as sound-ranging arrays and vehicles which intersect azimuths to locate sound sources. Acoustic sensors can generate a wake-up signal to actuate sensor suites. Weapon sensors continue to be the preponderant ones for surveillance, target location, and successful reconnaissance operations.

Radars are finding new applications. Battlefield surveillance radars continue to include ground radars on tripod mounts and towed carriages, vehicle mounted systems, and on aerial platforms. Through the use of micro-circuit miniaturization and fire control computer application technology, target acquisition radars are finding new applications on vehicles and weapons carriages, such as antitank guns. Compact radars are being marketed for manportable carry and attachment to weapons, such as automatic grenade launchers. Airborne applications of imaging radar reconnaissance systems use MTI and synthetic aperture radars and doppler processing for tactical and operational-strategic surveillance and target acquisition.

A variety of recent sensor systems are fused into sensor suites, which can employ multiple sensors for day/night integrated detection, location, and target acquisition. The most common sensor suites incorporate day/night cameras and laser rangefinder/designators. More sophisticated suites include radars for long-range detection. Several suites can be mounted on tripods or masts for easy vehicle mounting. Thus, forces are using sensor suites to convert light armored vehicles or wheeled combat support vehicles into reconnaissance sensor vehicles.

Digital communication and graphic display technologies support fused intelligence networks which can incorporate a wide variety of assets, such as reconnaissance vehicles and aircraft, UAVs, operational-strategic intelligence sources (such as satellite data, map data, and links to higher-level assets). Modern commercial products such as imageary, simplified ground station terminals, TV, and internet will contribute to real-time availability of fused intelligence.

Much attention will continue to focus on combat reconnaissance applications. Recent developments include assets for special operations forces that vary from lightweight manportable precision location and laser designators, to semi-submersible infiltration landing craft (SILC) for use by naval special operations forces.

The modern lethal battlefield (increased lethality, mobility, day/night coverage, and longer range of coverage) poses an increasing hazard to reconnaissance assets and personnel. Therefore, two other technology trends are on the increase: remote sensors and robotic sensors. Civilian applications have led to a wide variety of remote cameras, remote mines which can be used as trigger/alert devices for patrols, and unattended ground sensors (including acoustic, IR, seismic, tripwire-electronic, and magnetic). Key technology problems, particularly detectability, power supply/battery limitations, and signal transmission problems have generally been resolved. Rechargeable batteries, acoustic/IR wake-up, miniaturization, increased sensor sensitivity, and other advances contribute to break-throughs. Robotic chassies permit applications in dangerous areas (e.g., minefields, urban and defilade areas, and open areas without cover).

Questions and comments on reconnaissance for specific BOSs should be addressed to the respective chapter POC. Questions concerning data in this chapter should be addressed to:

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Reconnaissance Vehicles

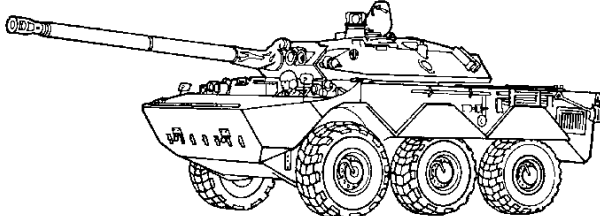
The reconnaissance requirement is for a continuous and pervasive effort throughout the battlefield at all phases of operation. To accomplish that effort, ground forces employ a mix of vehicles in areas that vary based on types of threat, and on mobility requirement. Some of the vehicles must act as independent reconnaissance patrols, combat reconnaissance patrols, and combat outposts against high threat forces. Many reconnaissance missions will be executed by maneuver units using organic vehicles, such as APCs, IFVs, tanks, and combat support vehicles.

The spectrum of reconnaissance vehicles currently ranges from older systems ill-suited for modern requirements, to survivable, mobile, and lethal systems, equipped with complex sensor arrays and communications suites. A number of forces fielded *combat reconnaissance vehicles* (CRVs) designed for operations at or beyond the FLOT, not to initiate combat but to survive if engaged. They may operate in combat reconnaissance patrols with heavily armed vehicles such as tanks and IFVs. Swim capability is a valuable asset. Many offer sensors no better than those on other armored vehicles, and use optics for a variety of combat support missions, such as fire support. Examples of these are the British Saladin Armored Car and the Austrian Pandur armored reconnaissance Fire Support Vehicle. Main guns on these vehicles can range up to 105 mm (South African Rooikat). A growing trend is for CRVs with added sensors (such as the Russian BRM-3K). It is a versatile vehicle configured for maneuver reconnaissance with thermal sights and a 30-mm gun, but is also useful for setting up a stationary surveillance position with its Tall Mike radar. As a command (-K type) vehicle, it employs a mix of radios to transmit intelligence across several nets in a combined arms force.

Reconnaissance missions closer to the protection of maneuver units or within the area of responsibility (AOR) still bear some risk. Therefore sensor reconnaissance missions and force security patrol missions require vehicles with some weapons and armor protection. A recent trend is the fielding of *sensor reconnaissance vehicles* with sophisticated multi-sensor arrays specially designed to operate behind or near the FLOT and provide continuous data to combined arms forces. Among these vehicles, addition of an elevating mast or arm permits the crew to use defilade cover yet raise the sensor suite and surveil the battlefield. An example is the Czech Snezka, or the Chinese Type 85 with HJ-62C radar. Vehicles designed to support specific branches are included with those branches (such as PRP-3/4 for artillery).

A class of vehicles widely proliferated for such light patrol duties is the *armored scout car*. With wheels rather than tracks, light armor, and guns generally of 7.62 - 20 mm, they offer low cost but are vulnerable to a wide variety of weapons. Examples include the British Ferret and Russian BRDM-2. A recent category of vehicle which US Army forces will encounter is lightly armored vehicles on truck or jeep-type chassis with very light armor for security, and patrol. Some are unarmed; whereas others employ sophisticated weapons stations and lethal firepower (up to 30-mm guns). Smaller 4x4 scout vehicles (such as French VBL) and ultra-light *fast-attack* vehicles have also been built for light patrol and rapid reconnaissance missions. For site security and other internal security patrol missions, such as MP patrol, *light patrol vehicles* may be fashioned with small arms protection, minimum sensors, and troop carrying capacity.

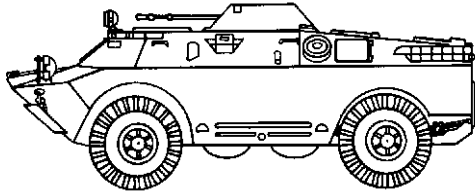
A critical reconnaissance mission for maneuvering forces is route reconnaissance. The mission requires systems that are highly mobile, with superior sensors as well as superior communications capabilities. Swim capability is generally required. The system should be survivable and avoid a fight when possible, but armed sufficiently to fight and survive when necessary. Specialized capabilities to support the route reconnaissance effort on a complex battlefield include NBC and engineer recon vehicles. They should have comparable mobility and survivability with accompanied vehicles. Engineer vehicles must clear obstacles, and may be required to conduct underwater reconnaissance for prospective water crossings. For information on engineer reconnaissance vehicles, see the Engineer chapter.

	<table><tr><th>Weapons & Ammunition Types</th><th>Typical Combat Load</th></tr><tr><td>105-mm rifled gun APFSDS-T HEAT-T HE-T</td><td>38 (est) 10 9 19</td></tr><tr><td>7.62-mm coax MG</td><td>4,000</td></tr></table>	Weapons & Ammunition Types	Typical Combat Load	105-mm rifled gun APFSDS-T HEAT-T HE-T	38 (est) 10 9 19	7.62-mm coax MG	4,000
Weapons & Ammunition Types	Typical Combat Load						
105-mm rifled gun APFSDS-T HEAT-T HE-T	38 (est) 10 9 19						
7.62-mm coax MG	4,000						
SYSTEM Alternative Designations: INA Date of Introduction: 1979 Proliferation: At least 3 countries Description: Crew: 4 Troop Capacity: None Combat Weight (mt): 15.8 Chassis Length Overall (m): 6.35 Height Overall (m): 2.29 Width Overall (m): 2.95 Drive Formula: 6 x 6 Automotive Performance: Engine Type: 260-hp Diesel Cruising Range (km): 1,000 Speed (km/h):Max Road: 85 Max Off-Road: INA Average Cross-Country: INA Max Swim (km/h): 4.5/7.2 with 2 hydrojets Fording Depth (m): INA Radio: INA Protection: Armor, Turret Front (mm): INA Applique Armor (mm): Available, Desert Storm version Explosive Reactive Armor (mm): N/A Active Protective System: KCBM ATGM IRCM decoy device Mineclearing Equipment: N/A Self-Entrenching Blade: N/A NBC Protection System: Yes Smoke Equipment: 2x2 smoke grenade launchers (16 grenades) ARMAMENT Main Armament: Caliber, Type, Name: 105-mm (48 Cal) rifled gun, CN-105-F2 Rate of Fire (rd/min): INA Loader Type: Manual Ready/Stowed Rounds: 12/26 Elevation (°): -8 to +20 Fire on Move: No Auxiliary Weapons: Caliber, Type, Name: 7.62-mm MG, INA Mount Type: Coax Maximum Aimed Range (m): 2,000 Max Effective Range (m): Day: INA	Night: INA Fire on Move: Yes Rate of Fire (rd/min): INA ATGM Launcher: N/A Firing Ports: N/A FIRE CONTROL FCS Name: COTAC M401 Main Gun Stabilization: No Rangefinder: Cilas APX M550 laser Infrared Searchlight: No Sights w/Magnification: Gunner: Day: APX M504-04, 10x Field of View (°): INA Acquisition Range (m): INA Night: DIVT 13 LLLTV Field of View (°): INA Acquisition Range (m): INA Commander Fire Main Gun: No VARIANTS Desert Storm version: Vehicles have applique armor, an ATGM IRCM decoy device, and a DIVT 16 thermal sight, range 4,000 m. MAIN ARMAMENT AMMUNITION Caliber, Type, Name: 105-mm APFSDS-T, OFL 105 Mle F3, Giat Maximum Aimed Range (m): 2,000 Max Effective Range (m): Day: 1,500 Night: INA Armor Penetration (mm): Single heavy tank target at 1,000 m 105-mm HEAT-T, OCC 105 F3, French Giat Maximum Aimed Range (m): 1,300 Max Effective Range (m): Day: 1,250 Night: INA Armor Penetration (mm): 100 at 70° 105-mm HE, OE 105 Mle F3 Maximum Aimed Range (m): 2,500 Max Effective Range (m): Day: 1,000 Night: INA Armor Penetration (mm): INA Other Ammunition Types: Smoke						

NOTES

The Alis modular thermal sight can be used on AMX-10RC. A 280-hp Baudouin engine replaced the original engine in some upgrades. In 1997 the French army demonstrated a version of the Leclerc Battlefield Management System on the AMX-10RC.

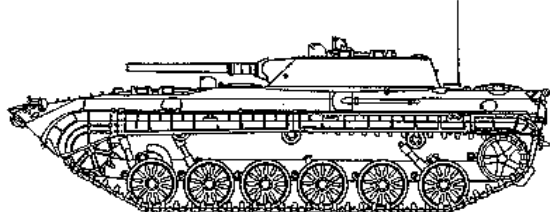
Russian Armored Scout Car BRDM-2

	<table><tr><th>Weapons & Ammunition Types</th><th>Typical Combat Load</th></tr><tr><td>14.5-mm machinegun API, API-T, I-T HE-T</td><td>500 160 340</td></tr><tr><td>7.62-mm coax MG Heavy ball, I-T, Light ball, Ball-T, API-T</td><td>2,000</td></tr></table>	Weapons & Ammunition Types	Typical Combat Load	14.5-mm machinegun API, API-T, I-T HE-T	500 160 340	7.62-mm coax MG Heavy ball, I-T, Light ball, Ball-T, API-T	2,000
Weapons & Ammunition Types	Typical Combat Load						
14.5-mm machinegun API, API-T, I-T HE-T	500 160 340						
7.62-mm coax MG Heavy ball, I-T, Light ball, Ball-T, API-T	2,000						
SYSTEM Alternative Designations: GAZ 41-08 Date of Introduction: 1963 Proliferation: At least 45 countries Description: Crew: 4 Troop Capacity: 0 (for this configuration) Combat Weight (mt): 7.0 Chassis Length Overall (m): 5.75 Height Overall (m): 2.31 Width Overall (m): 2.75 Ground Pressure (kg/cm²): INA Drive Formula: 4 x 4 (+ 4 auxiliary wheels) Automotive Performance: Engine Type: 140-hp Gasoline Cruising Range (km): 750 Speed (km/h):Max Road: 95 Max Off-Road: INA Average Cross-Country: INA Max Swim: 10 Fording Depths (m): Amphibious Radio: R-123 Protection: Armor, Turret Front (mm): 10 Applique Armor (mm): N/A Explosive Reactive Armor (mm): N/A Mineclearing Equipment: N/A Self-Entrenching Blade: N/A Active Protective System: N/A NBC Protection System: Collective Smoke Equipment: N/A ARMAMENT Main Armament: Caliber, Type, Name: 14.5-mm Machinegun KPVT Rate of Fire (rd/min): 150 practical/600 cyclic Loader Type: Belt feed Ready/Stowed Rounds: 500/0 Elevation (°): -5 / +30 Fire on Move: Yes Auxiliary Weapon: Caliber, Type, Name: 7.62-mm (7.62x 54R) Machinegun PKT Mount Type: Coax Maximum Aimed Range (m): 1,500 Max Effective Range (m): Day: 1,000m / 400-500 on the move Night: N/A	Fire on Move: Yes Rate of Fire (rd/min): 250 practical / 650 cyclic in 2-10 round bursts ATGM Launcher: N/A Firing Ports: INA FIRE CONTROL FCS Name: N/A Main Gun Stabilization: N/A Rangefinder: N/A Infrared Searchlight: INA Sights w/Magnification: Gunner: Day: PP-61AM Field of View (°): 23 Acquisition Range (m): 2,000 Night: N/A Field of View (°): INA Acquisition Range (m): INA Commander Fire Main Gun: No VARIANTS Polish modernized variant has been offered in five versions, with upgrades such as: 12.7-mm MG, improved PKT MG mount, roof-mounted AT-4 ATGM, surveillance radar, improved fire control, etc. Antitank guided missile launcher vehicles: 9P122 variant with 6-rail AT-3 ATGM launcher 9P124 variant with 4-rail AT-2 MCLOS ATGM launcher 9P133 variant with 6-rail AT-3C SACLOS ATGM launcher 9P137 variant with 5-rail AT-5 ATGM launcher 9P148 variant with 5-rail AT-4 or AT-5 ATGM launcher. BRDM-2Rkh: NBC reconnaissance vehicle BRDM-2U: Command variant without a turret SA-9: SAM system transporter-erector-launcher vehicle MAIN ARMAMENT AMMUNITION Caliber, Type, Name: 14.5-mm API-T Maximum Aimed Range (m): INA Max Effective Range (m): Day: 2,000 Night: INA Tactical AA Range: 1,400 Armor Penetration (mm): 20 at 1,000 m/30 at 500 m Other Ammunition Types: 14.5-mm API, I-T, HE-T Type MDZ						

NOTES

Some BRDMs may include an AT-4 launcher and ATGMs for dismounted self-defense.

Russian Armored Reconnaissance Command Vehicle BRM-1K

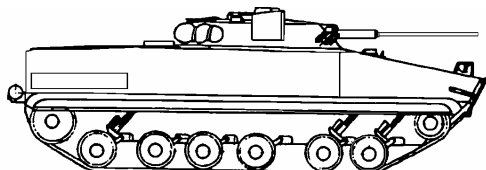
	<table><tr><th>Weapons & Ammunition Types</th><th>Typical Combat Load</th></tr><tr><td>73-mm gun</td><td>20</td></tr><tr><td>HEAT</td><td>(est) 10</td></tr><tr><td>HE</td><td>10</td></tr><tr><td>7.62-mm coax MG</td><td>2,000</td></tr></table>	Weapons & Ammunition Types	Typical Combat Load	73-mm gun	20	HEAT	(est) 10	HE	10	7.62-mm coax MG	2,000
Weapons & Ammunition Types	Typical Combat Load										
73-mm gun	20										
HEAT	(est) 10										
HE	10										
7.62-mm coax MG	2,000										
SYSTEM Alternative Designations: BMP M1976/2 Date of Introduction: 1976 Proliferation: At least 3 countries Description: Crew: 4 (with addition of a navigator) Troop Capacity: 6 passengers Combat Weight (mt): 13.3 Chassis Length Overall (m): 6.74 Height Overall (m): 2.15 Width Overall (m): 2.94 Ground Pressure (kg/cm²): 0.57 Automotive Performance: Engine Type: 300-hp diesel Cruising Range (km): 600 Speed (km/h): Max Road: 65 Max Off-Road: 40-45 Average Cross-Country: INA Max Swim: 7 Fording Depth (m): Amphibious Radio: R-173, R-130, 2x R-148 manportable, R-014D telegraph Protection: Armor, Turret Front (mm): 19-23 Applique Armor (mm): Available Explosive Reactive Armor (mm): Available Active Protective System: N/A Mineclearing Equipment: N/A Self-Entrenching Blade: N/A NBC Protection System: Yes Smoke Equipment: VEESS ARMAMENT Main Armament: Caliber, Type, Name: 73-mm smoothbore gun, 2A28/Grom Rate of Fire (rd/min): 7-8 Loader Type: Autoloader Ready/Stowed Rounds: 20 / 0 Elevation (°) : -4/+33 Fire on Move: Yes, but only 10 km/h or less (est) Auxiliary Weapon: Caliber, Type, Name: 7.62-mm (7.62x 54R) machinegun PKT Mount Type: Coaxial Maximum Aimed Range (m): 1,300 Max Effective Range (m): Day: 1,000 / 400-500 on the move	Night: 800 Fire on Move: Yes Rate of Fire (rd/min): 250 practical / 650 cyclic, in 2-10 round bursts Firing Ports: 1 on each side, 1 in left rear door FIRE CONTROL FCS Name: INA Main Gun Stabilization: No Rangefinder: Laser Infrared Searchlight: Yes Sights w/Magnification: Gunner: Day: 1PN22M2, 8x Field of View (°): 15 (est) Acquisition Range (m): INA Night: 1PN22M2 II channel, 6x Field of View (°): 6 (est) Acquisition Range (m): 800-1,000, based on light VARIANTS BRM-1: Baseline armored reconnaissance vehicle (BMP M1976/1) without smoke grenade launchers, added comms (R-130, R-014D telegraph), and Tall Mike radar but with four more passengers. MAIN ARMAMENT AMMUNITION Caliber, Type, Name: 73-mm HEAT-FS, PG-9 Maximum Aimed Range (m): 1,300 Max Effective Range (m): Day: 800, 600 on the move Night: 800 Armor Penetration (mm): 335 (RHA) 73-mm HEAT-FS, NFI Maximum Aimed Range (m): 1,300 Max Effective Range (m): Day: 1,000, 600 on the move Night: 800-1,000 Armor Penetration (mm): >400 (RHA) 73-mm HE, OG-9 Maximum Aimed Range (m): 1,300 Max Effective Range (m): Day: 1,300, 1,000 on the move Night: 1,000 Armor penetration (mm): INA Other Ammunition Types: 73-mm HE, OG-9M										

NOTES

Derived from BMP-1, the vehicle has a 2-man turret and additional sensors. Two manportable SAM launchers are included. BMP-1 options fit BRM-1 and -1K.

SENSORS: 1PN22M2 sight, 1D8 laser rangefinder, and Tall-Mike battlefield surveillance radar. Radar characteristics: operating band I (9.0 GHz); detection ranges 30 km personnel, 12 km vehicles. The Russian Alis or Sanoet thermal gunner's sight can be installed. Passengers may dismount from BRM-1K and will dismount from BRM-1 to form an alternate reconnaissance post.

Russian Combat Reconnaissance Vehicle BRM-3K

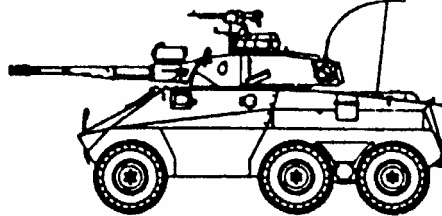
	<table><tr><th>Weapons & Ammunition Types</th><th>Typical Combat Load</th></tr><tr><td>30-mm auto gun HE-I & Frag-HE-T APDS, APFSDS-T</td><td>500 340 160</td></tr><tr><td>7.62-mm coax MG</td><td>2,000</td></tr></table>	Weapons & Ammunition Types	Typical Combat Load	30-mm auto gun HE-I & Frag-HE-T APDS, APFSDS-T	500 340 160	7.62-mm coax MG	2,000
Weapons & Ammunition Types	Typical Combat Load						
30-mm auto gun HE-I & Frag-HE-T APDS, APFSDS-T	500 340 160						
7.62-mm coax MG	2,000						
SYSTEM Alternative Designations: Lynx, Rys Date of Introduction: 1990 Proliferation: At least 1 country Description: Crew: 6 Combat Weight (mt): 19.6 Chassis Length Overall (m): 6.10 Height Overall (m): 2.65 Width Overall (m): 3.15 Ground Pressure (kg/cm²): 0.62 Automotive Performance: Engine Type: 500-hp Diesel Cruising Range (km): 600 Speed (km/h): Max Road: 70 Max Off-Road: 45 Average Cross-Country: 35 Max Swim: 10 Fording Depths (m): Amphibious Radio: R-163-50U UHF, R-163-50K HF, R-163-10U (dismounts) Protection: Armor, Turret Front (mm): 30-35 mm (front glacis) Applique Armor (mm): Yes on turret Explosive Reactive Armor (mm): Available Mineclearing Equipment: N/A Self-Entrenching Blade: N/A Active Protective System: N/A NBC Protection System: Collective Smoke Equipment: 6 Smoke grenade launchers, VEESS ARMAMENT Main Armament: Caliber, Type, Name: 30-mm automatic gun, 2A72 Rate of Fire: 350 rd/min (cyclic) in bursts Loader Type: Dual-belt feed Ready/Stowed Rounds: 500/ 0 Elevation (°): -5 to + 60 Fire on Move: Yes Auxiliary Weapon: Caliber, Type, Name: 7.62-mm machinegun, PKT Mount Type: Turret coax Max Effective Range: Day: 2,000 m Night: 1,200-1,500 passive/2,000 active Fire on Move: Yes	Rate of Fire (rd/min): 250 practical / 650 cyclic, in 2-10 round bursts Firing Ports: 1 on each side FIRE CONTROL FCS Name: BPK-2-42 Main Gun Stabilization: 2-plane, 2E52-1 Rangefinder: Laser Infrared Searchlight: Yes Sights w/Magnification: Gunner: Day: BPK-2-42 Field of View (°): 8 Acquisition Range (m): 4,000 (est) Night: 1PN61 II/IR sight Field of View (°): INA Acquisition Range (m): 1,200-1,500/3,000+ active IR Commander Fire Main Gun: INA VARIANTS N/A MAIN ARMAMENT AMMUNITION Caliber, Type, Name: 30-mm APDS Maximum Aimed Range (m): 4,000 (est) Max Effective Range (m): Day: 2,500 Night: 1,200-1,500 passive/ 2,500 active Tactical AA Range: 4,000 Armor Penetration (mm): 25 (RHA) at 1,500 m 30-mm APFSDS-T M929 Maximum Aimed Range (m): 4,000 (est) Max Effective Range (m): Day: 2,500+ Night: 1,200-1,500 passive/2,500+ active Tactical AA Range: 4,000 Armor penetration (mm): 55 (RHA) at 1,000 m, 45 at 2,000 m 30-mm Frag-HE Maximum Aimed Range (m): 4,000 Max Effective Range (m): Day: 4,000 Night: 1,200-1,500 passive/ 3,000+ active Tactical AA Range: 4,000 Armor Penetration (mm): INA Other Ammunition Types: 30-mm HEI-T, AP-T						

NOTES

BRM-3K is a variant of BMP-3 with a steel hull.

ONBOARD SENSORS: The 1PN71 thermal sight (3.7x/11.5x) has an acquisition range against tanks of 3.0 km. The 1D14 laser rangefinder (73x and 18x sights) has a day light only acquisition range of 10.0 km. The 1PN61 passive image intensifier night sight uses a laser illuminator. In the passive mode, the Generation II (7x) sight has a night acquisition range of 1.2-1.5 km. Using the active laser pulse illuminator, the acquisition range can be extended. Tall Mike Radar has an operating band I (9.0 GHz), and detection ranges: 3.0 km against personnel, 12.0 against moving vehicles.

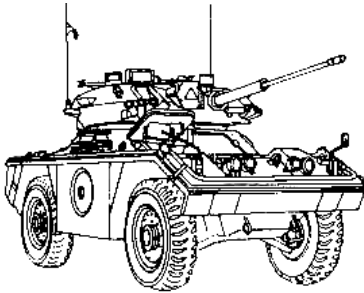
Brazilian Armored Reconnaissance Vehicle EE-9

	<table><tr><th>Weapons & Ammunition Types</th><th>Typical Combat Load</th></tr><tr><td>90-mm cannon APFSDS-T HEAT-T, HESH HE-T</td><td>44 (est) 11 11 22</td></tr><tr><td>7.62-mm coax MG .50 cal AA MG</td><td>2,000 500</td></tr></table>	Weapons & Ammunition Types	Typical Combat Load	90-mm cannon APFSDS-T HEAT-T, HESH HE-T	44 (est) 11 11 22	7.62-mm coax MG .50 cal AA MG	2,000 500
Weapons & Ammunition Types	Typical Combat Load						
90-mm cannon APFSDS-T HEAT-T, HESH HE-T	44 (est) 11 11 22						
7.62-mm coax MG .50 cal AA MG	2,000 500						
SYSTEM Alternative Designations: Cascavel IV Date of Introduction: 1977 Proliferation: At least 18 countries (all variants) Description: Crew: 3 Troop Capacity: None Combat Weight (mt): 13.4 Chassis Length Overall (m): 5.19 Height Overall (m): 2.36 Width Overall (m): 2.66 Drive Formula: 6 x 6 Automotive Performance: Engine Type: 212-hp Diesel Cruising Range (km): 880 Speed (km/h):Max Road: 100 Max Off-Road: INA Average Cross-Country: INA Max Swim: N/A Fording Depth (m): 1.0 unprepared Radio: INA Protection: Armor, Turret Front (mm): 16 Applique Armor (mm): N/A Explosive Reactive Armor (mm): N/A Active Protective System: N/A Mineclearing Equipment: N/A Self-Entrenching Blade: N/A NBC Protection System: N/A Smoke Equipment: 6 smoke grenade launchers ARMAMENT Main Armament: Caliber, Type, Name: 90-mm gun, Engesa EC-90 (Cockerill-type) Rate of Fire (rd/min): INA Loader Type: Manual Ready/Stowed Rounds: 24/ 20 Elevation (°): -8/+15 Fire on Move: INA Auxiliary Weapons: Caliber, Type, Name: 7.62-mm MG, INA Mount Type: Coax Maximum Aimed Range (m): 2,000 Max Effective Range (m): Day: INA Night: INA Fire on Move: Yes Rate of Fire (rd/min): INA	Caliber, Type, Name: .50 Cal M2 HB MG Mount Type: Cupola Maximum Aimed Range (m): 2,000 Max Effective Range (m): Day: 2,000 Night: INA Fire on Move: Yes Rate of Fire (rd/min): INA ATGM Launcher: N/A Firing Ports: N/A FIRE CONTROL FCS Name: INA Main Gun Stabilization: N/A Rangefinder: LV3 laser rangefinder Infrared Searchlight: N/A Sights w/Magnification: Gunner: Day: SS-123, 10x Field of View (°): INA Acquisition Range (m): INA Night: SS-122 II channel, 5.6x Field of View (°): INA Acquisition Range (m): INA Commander Fire Main Gun: No VARIANTS Cascavel I: Original vehicle had a US M36 37-mm gun turret. Cascavel II: Variant with a French 90-mm gun from AML-90. Cascavel III: Uses the 90-mmCockerill gun and new transmission. Cascavel IV: Has a new engine and transmission, improved day and night optics with laser rangefinder, and a 50 cal antiaircraft MG. MAIN ARMAMENT AMMUNITION Caliber, Type, Name: 90-mm APFSDS-T, Engequimica-produced Maximum Aimed Range (m): INA Max Effective Range (m): Day: 2,000+ Night: INA Armor Penetration (mm): INA 90-mm HE-T, Engequimica-produced Maximum Aimed Range (m): INA Max Effective Range (m): Day: 2,200 Night: INA Armor Penetration (mm): INA Other Ammunition Types: HEAT-T, HESH-T, Smoke, Cannister						

NOTES

Other ammunition maximum effective ranges are (m): HEAT-T - 1,500, HESH-T - 800.

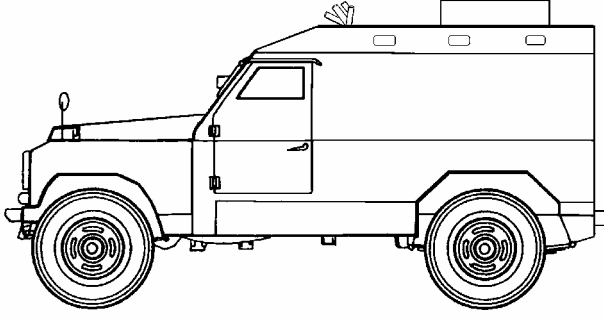
British Armored Reconnaissance Vehicle Fox

	<table><tr><th>Weapons & Ammunition Types</th><th>Typical Combat Load</th></tr><tr><td>30-mm auto-cannon HEI-T, APDS-T, APSE-T</td><td>99 (est) 66 33</td></tr><tr><td>7.62-mm coax MG</td><td>2,600</td></tr></table>	Weapons & Ammunition Types	Typical Combat Load	30-mm auto-cannon HEI-T, APDS-T, APSE-T	99 (est) 66 33	7.62-mm coax MG	2,600
Weapons & Ammunition Types	Typical Combat Load						
30-mm auto-cannon HEI-T, APDS-T, APSE-T	99 (est) 66 33						
7.62-mm coax MG	2,600						
SYSTEM Alternative Designations: FV721 Date of Introduction: 1973 Proliferation: At least 3 countries Description: Crew: 3 Troop Capacity: 0 Combat Weight (mt): 6.12 Chassis Length Overall (m): 4.17 Height Overall (m): 2.20 Width Overall (m): 2.13 Ground Pressure (kg/cm²): INA Drive Formula: 4 x 4 Automotive Performance: Engine Type: 190-hp Gasoline Cruising Range (km): 434 Speed (km/h): Max Road: 104 Max Off-Road: INA Average Cross-Country: INA Max Swim: 5.23 Fording Depth (m): 1.0 Unprepared Radio: INA Protection: Armor, Turret Front (mm): Resistant to heavy MG (NFI) Applique Armor (mm): N/A Explosive Reactive Armor (mm): N/A Active Protective System: N/A Mineclearing Equipment: N/A Self-Entrenching Blade: N/A NBC Protection System: N/A Smoke Equipment: 2 x 4-barrel smoke grenade launchers ARMAMENT Main Armament: Caliber, Type, Name: 30-mm auto-cannon, Rarden L21 Rate of Fire (rd/min): 80-90 cyclic (1-6 round bursts) Loader Type: Feed tray, manual clip-fed (3-round clips) Ready/Stowed Rounds: INA Elevation (°): -14/+40 Fire on Move: INA Auxiliary Weapon: Caliber, Type, Name: 7.62-mm machinegun L7A2	Mount Type: Coax Maximum Aimed Range (m): INA Max Effective Range (m): INA Fire on Move: Yes Rate of Fire (rd/min): INA ATGM Launcher: N/A Firing Ports: None FIRE CONTROL FCS Name: INA Main Gun Stabilization: N/A Rangefinder: N/A Infrared Searchlight: N/A Sights w/Magnification: Gunner: Day: SPAV L2A1, 5.8/1.6 x Field of View (°): 8/28 Acquisition Range (m): INA Night: L2A1, II sight Field of View (°): INA Acquisition Range (m): INA Commander Fire Main Gun: No VARIANTS None of the variants have been fielded. MAIN ARMAMENT AMMUNITION Caliber, Type, Name: 30-mm APDS-T, L14A2 Maximum Aimed Range (m): 1,500 Max Effective Range (m): Day: 1,000 Night: INA Tactical AA Range: INA Armor Penetration (mm): 40 (RHA, 45°) at 1,500 meters Caliber, Type, Name: 30-mm HE-T, L13A1 Maximum Aimed Range (m): 2,000 Max Effective Range (m): INA Tactical AA Range: INA Armor Penetration (mm): N/A Other Ammunition Types: APSE-T (AP Secondary Effects-T L5A2). The gun can fire the KCB (Oerlikon) family of munitions.						

NOTES

These vehicles have been phased out of British service.

British Personnel Carrier S55

 S55 without machinegun turret	<table><tr><th>Weapons & Ammunition Types</th><th>Typical Combat Load</th></tr><tr><td>7.62-mm Turret MG Ball Ball-T API API-T</td><td>1,500</td></tr></table>	Weapons & Ammunition Types	Typical Combat Load	7.62-mm Turret MG Ball Ball-T API API-T	1,500
Weapons & Ammunition Types	Typical Combat Load				
7.62-mm Turret MG Ball Ball-T API API-T	1,500				
SYSTEM Unless otherwise stated, data is for Mk 5 upgrade. Alternative Designations: FV18061, S5 Shorland Date of Introduction: 1963 original, 1990s for Mk 5 Proliferation: At least 21 countries Description: Crew: 3 Troop Capacity: 0, 8 passengers in raised roof personnel carrier Combat Weight (mt): 3.6 Chassis Length Overall (m): 4.51 Height Overall (m): 1.85, 2.29 for turret Width Overall (m): 1.80 Drive Formula: 4 x 4, with run-flat tires Automotive Performance: Engine Type: 114-hp Gasoline Cruising Range (km): 514 Speed (km/h): Max Road: 105 Mk 5 Max Off-Road: INA Average Cross-Country: 48 Max Swim: N/A Fording Depth (m): 0.5 Radio: INA Protection: Armor, Turret Front (mm): 11.0, can defeat 7.62-mm ball at 26 m Applique Armor (mm): Grass-reinforced plastic flooring NBC Protection System: No Smoke Equipment: 2 x 4 smoke grenade launchers + roof mount ARMAMENT Main Armament: Caliber, Type, Name: 7.62-mm (7.62x 51) GP Machinegun, L7A2 Mount Type: Turret Rate of Fire: 80-100 (practical) Loader Type: Belt feed Ready/Stowed Rounds: INA Elevation (°): -4 to +82 Fire on Move: Yes Rate of Fire (rd/min): INA	ATGM: N/A Firing Ports: 3 each side, 2 in the rear doors for personnel carrier FIRE CONTROL Infrared Searchlight: None, visual searchlight only Sights w/Magnification: Gunner: Day: Periscopic sight on turret roof Night: N/A Commander Fire Main Gun: No VARIANTS The vehicle is produced in several versions, including armored car (with notchback cab and room for 3), personnel carrier van version. Upgrades: Mk 1: Initial version, with 7.25-mm armor and 67-hp engine. Mk 2: Variant with 8.25-mm armor and 77-hp engine. Mk 3: Upgrade with 91-hp engine. Mk 4: Variant with 11-mm armor and 114-hp engine. Mk 5: Upgrade with improved suspension, wider wheelbase. Special-Purpose Vehicles: S53 Mobile Air Defense Vehicle: Vehicle with lightweight multiple launcher (3 ready, 6 stowed). S54 Anti-Hijack Vehicle: Version has special rifle marksman turret. MAIN GUN AMMUNITION Caliber, Type, Name: Maximum Aimed Range (m): 2,000 (est) Max Effective Range (m): Day: 800 Night: INA Armor Penetration (mm RHA): Other Ammunition Types: Ball, Ball-T, API, API-T				

NOTES

Vehicle is based on British Land Rover chassis. Primary use for the vehicle is for military site security, and internal security vehicle for police and border forces.

Air conditioning is available.

French Heliborne Battlefield Surveillance Radar HORIZON



SYSTEM

Alternative Designations: Helicoptere d'Observation Radar et d'Investigation sur Zone

Date of Introduction: 1994

Proliferation: At least 1 country

Description:

Crew: 4

Platform: Mounted on AS-532UL/Cougar helicopter

Combat Weight (mt): 11.5

Antenna size (m): 3.5 x 5

Radio: INA

RADAR

Antenna:

Mount: Vertical post mount pointing downward from left rear.

Radar stows under helicopter tail on take-off and landings, then lowers hydraulically during operation.

Antenna Type: Doppler, with MTI

Mode: Search

Scan Method: Antenna rotates horizontally for azimuth scan. Radar rotates 10°/sec, for a low pulse repetition frequency (PRF). Electronic for elevation.

Transmitter:

Transmitter Type: Traveling Wave Tube fully coherent, agile frequency and adaptive burst mode.

Frequency band: I/J

RF maximum (GHz): 12.0

Power (kw): 50

Mode: Doppler MTI radar

Receiver and Processing Requirements:

Aircraft has onboard processing system. The processor is designed for a low false alarm rate. Ground station is mounted in a 7-mt truck. Each ground station holds 2 work stations. System receives 60° and 90° sector scans, independent of aircraft flight dynamics. Real-time digital data link can be integrated into French RITA communications net. Each moving target is automatically detected, located, analyzed, and classified. System can operate separately or as part of an intelligence network.

Protection and Electronic Counter-countermeasures:

Radar snapshot mode reduces vulnerability to anti-radiation missiles. Very low sidelobes reduce ECM effects. The aircraft carries flares and decoys.

VARIANTS

System derived from the **Orchidee** system used in Desert Storm. Orchidee was compatible with the British Astor and US JSTARS systems.

PERFORMANCE

Surveillance range (km): 200 / 150 in rain clutter

Surveillance rate: 20,000 km²every 10 sec

Target location accuracy (m): 40

Datalink range: 120 km, Agatha data link

Surveillance targets: Wheeled or tracked vehicles, moving or hovering rotary wing aircraft, slow-flying FW aircraft, watercraft.

Target speed (km/hr): 4-400, including nap-of-the-earth (NOE)

Flight speed (km/hr): 130

Surveillance altitude (m): 2,000-4,000

Endurance (hrs): 4

NOTES

The system was designed to operate under army control at division level. HORIZON set consists of 2 aircraft, one ground station, navigation equipment, and Agatha data link.

Chapter 4 Tanks/Assault Vehicles

The lethality and variety of weapons available to armored, mechanized, and infantry forces for the close fight require a continued and expanded use of heavily armored fighting vehicles (AFVs). This chapter provides a representative sampling of AFVs in use today and designed for combat assault. The selection is not comprehensive, rather reflects a mix of systems currently available for the OPFOR and likely to be encountered in varying levels of conflict. The selection is also used to highlight trends within this field of weapons.

Vehicles used for combat assault in this Guide are divided into two categories—*main battle tanks* and *light tanks/assault vehicles*. Tanks are tracked, heavily armored vehicles with guns of generally 75 mm or more. Among modern trends in AFVs are: increased variety of systems worldwide, and a wider application of these systems for varied roles and missions on the battlefield. As a result, technology sharing and proliferation of upgrade packages have blurred lines among vehicles used for assault, antiarmor, combat reconnaissance and fire support missions. Another trend is increased weight for all types of armored vehicles. With heavier armor protection packages, higher-output engines and larger weapons, a significant proportion of medium tanks have grown into the heavy tank weight category. Therefore, the term *main battle tank* is more relevant than previous weight categories.

There are still *light tanks* on the battlefield, although increased armor and gun size on light armored fighting vehicles such as infantry fighting vehicles and armored reconnaissance vehicles have blurred lines of distinction. A number of AFVs, such as the British Scorpion and French AMX-13 can be characterized as reconnaissance vehicles, tank destroyers, fire support vehicles, or assault vehicles; but they have tracks, armor protection, and guns of 60 mm or greater. Thus, they can also be used for light tank missions. The term *assault vehicle* currently represents a narrow category of older vehicles used by (former) Soviet forces - medium-armored vehicles with medium-heavy guns and no turrets. None of these vehicles were selected for this initial publication. Some representative systems will be included in the next iteration. With blurring of lines among roles and missions for heavier LAFVs and light tanks, the term *assault vehicle* will likely broaden to reflect a variety of modern programs for light - medium armored vehicles with medium to heavy guns, for use in the assault role.

Two notable trends for vehicles in this chapter are a reflection of increasing systems costs and declines or leveling of military budgets - development of variants off of established systems, and use of equipment/packages to extend the use life of systems and enhance their effectiveness. As a result, seemingly old and out-of-date tanks, some of which pre-date World War II, can be a threat to modern armored and mechanized forces. The WEG highlights a variety of upgrades as well as limitations for selected tanks. Systems-related trends can be divided among mobility, survivability, and lethality, as noted on the data sheets.

To improve mobility and compensate for weight increases, many forces have replaced older engines with more powerful diesel engines. Swim capability is limited to a few light tanks.

Within the area of survivability, the most obvious consideration is increasing armor protection levels. A prominent trend is the application of additional armor, such as plate armor or panels on turrets, side-skirts over tracks, and addition of explosive reactive armor (ERA). Additional protection measures include use of entrenching blades for self-emplacement, mine-clearing plows and rollers, nuclear, biological and chemical (NBC) protection, vehicle smoke emission systems, and smoke grenade launchers. To complement these systems are sensors such as mine detectors, laser warning receivers, and radar warning receivers. A trend receiving increasing attention is the use of active measures: electro-optical countermeasures, such as infrared jammers, and active protection systems (also known as defensive aides suites) designed to intercept incoming projectiles and destroy them prior to impact.

The area of lethality has seen a variety of upgrades, including: gun replacement, improved stabilization and fire control systems, additional weapons such as antitank guided missile systems, and improved ammunition. Critical parameters include fire on the move capability, which can be linked to stabilization, rate of fire, integrated sights, acquisition ranges, and weapon range. Note, because weapon range is really a function of sights, gun precision, the type of mount, and specific round ballistics, the WEG will incorporate those factors in the round data, as maximum aimed range. That figure conforms to the OPFOR tactics and accounts for technical capabilities (see Glossary). Maximum effective range is also included (see Glossary).

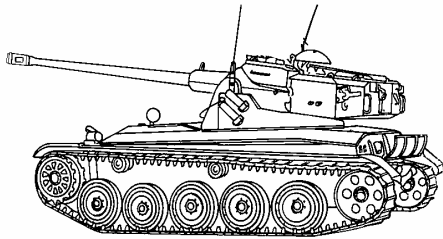
The WEG notes a variety of new ammunition natures, such as electronically fuzed tank rounds for use against helicopters, and OPFOR availability of western-style HEAT-multipurpose rounds, which can be used as both antitank and antipersonnel rounds, for greater flexibility and lethality. For some systems, the ammunition mix could be determined or estimated. For others, that data was not available. Within each category, the specific round mix will depend on tactical considerations, comparative lethality and the intended targets. A general rule for OPFOR is that tanks will have approximately 50% antitank rounds and 50% rounds for use against soft targets. Because of the relative increase in protection against HEAT rounds vs kinetic energy rounds, mix estimates reflect a bias toward KE rounds. The term *stowed rounds* does not mean rounds which are not in the tank's autoloader. Rounds in ready reach are ready rounds. Stowed rounds are those which are in compartments away from the gunner's or loader's positions, requiring a slower than normal rate of fire (see Glossary). In calculating tank rounds, the figure does not include the tactical possibility of adding an additional round in the breach.

Secondary arms continue to play an important role for OPFOR tanks, because their use permits the main gun to focus fires more on heavy and area targets. Tankers will fire main guns at hovering or slow-flying aircraft; however, the more likely weapon is the antiaircraft machine-gun. Similarly, OPFOR tanks will fire main guns at personnel and other soft targets as required; but the more efficient weapon for targets at close range is the coaxial machinegun.

Questions and comments on data listed in this chapter should be addressed to:

Mr. Tom Redman
DSN: 552-7925 Commercial (913) 684-7925
e-mail address: redmant@leavenworth.army.mil

French Light Tank AMX-13

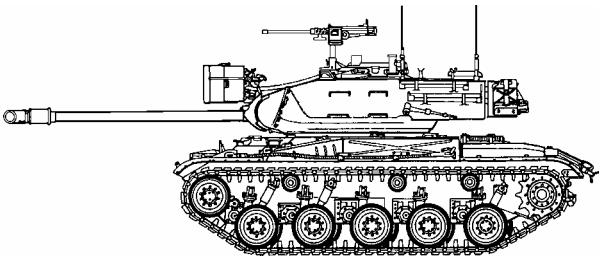
	<table><tr><th>Weapons & Ammunition Types</th><th>Typical Combat Load</th></tr><tr><td>90-mm rifled gun APFSDS-T HEAT HE Cannister</td><td>34</td></tr><tr><td>7.62-mm coax MG</td><td>3,600</td></tr></table>	Weapons & Ammunition Types	Typical Combat Load	90-mm rifled gun APFSDS-T HEAT HE Cannister	34	7.62-mm coax MG	3,600
Weapons & Ammunition Types	Typical Combat Load						
90-mm rifled gun APFSDS-T HEAT HE Cannister	34						
7.62-mm coax MG	3,600						
AMX-13 Model 51/75 mm Gun							

SYSTEM Alternative Designations: AMX-13/90 Date of Introduction: 1966 Proliferation: At least 15 countries Description: Crew: 3 Combat Weight (mt): 15.0 Chassis Length Overall (m): 4.88 Height Overall (m): 2.28 Width Overall (m): 2.51 Ground Pressure (kg/cm²): 0.74 Automotive Performance: Engine Type: 250-hp Gasoline Cruising Range (km): 350 Speed (km/h): Max Road: 60 Max Off-Road: INA Average Cross-Country: INA Max Swim: N/A Fording Depths (m): 0.6 unprepared, 2.1 with snorkel Radio: TR-VP118 and intercom Protection: Armor, Turret Front (mm): 25 at 45° impact angle Applique Armor (mm): N/A Explosive Reactive Armor (mm): N/A Active Protective System: N/A Mineclearing Equipment: N/A Self-Entrenching Blade: N/A NBC Protection System: N/A Smoke Equipment: 2 smoke grenade launchers each side of turret ARMAMENT Main Armaments: Caliber, Type, Name: 90-mm rifled gun CN-90-F3 Rate of Fire (rd/min): INA Loader Type: Autoloader and manual Ready/Stowed Rounds: 10 in autoloader, 11/13 in hull Elevation (°): -5.5/+12.5 Fire on Move: N/A Auxiliary Weapon: Caliber, Type, Name: 7.62-mm (7.62x51) MG, AA52 Mount Type: Turret coax Maximum Aimed Range (m): INA Max Effective Range (m): Day: INA	Night: INA Fire on Move: Yes Rate of Fire (rd/min): INA FIRE CONTROL FCS Name: INA Main Gun Stabilization: N/A Rangefinder: N/A Infrared Searchlight: Yes Sights w/Magnification: Gunner: Day: L862, 7.5x and 8x Field of View (°): INA Acquisition Range (m): INA Night: OB-11-A, 5x Field of View (°): INA Acquisition Range (m): 800-1,000 Commander Fire Main Gun: No VARIANTS AMX-13 Model 51: Original tank destroyer/recon vehicle, Model 51, w/75-mm gun. Many variants and upgrades have diesel engines and a 7.62-mm AA MG. Two versions were fitted with 2 x SS-11 or 3 x HOT ATGM launchers AMX-13/90: This is the variant portrayed on this data sheet. AMX-13/105: Variant with a GIAT 105G1 105-mm gun. AMX-13 CD Model 55: Armored recovery variant. AMX-13 DCA: Air defense variant with twin 30-mm guns. AMX-13 with LAR: Multiple Rocket Launcher System. AMX 105-mm Mk 61: Self-propelled howitzer variant. AMX F3: 155-mm self-propelled gun. AMX-VCI: Variant used as an APC. MAIN ARMAMENT AMMUNITION Caliber, Type, Name: 90-mm APFSDS-T, NFI Maximum Aimed Range (m): INA Max Effective Range (m): Day: 2,000 Night: 800-1,000 Armor Penetration (mm): INA 90-mm HEAT, NFI Maximum Aimed Range (m): INA Max Effective Range (m): Day: 1,000 Night: N/A Armor Penetration (mm): 160 (RHA) at 60° impact angle Other Ammunition Types: HE, Cannister, Smoke
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NOTES

Israeli EL-OP thermal sights are available for use on the tank.

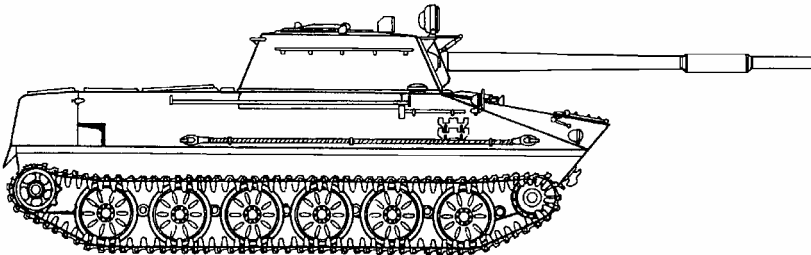
US Light Tank M41A3

	<table><tr><th>Weapons & Ammunition Types</th><th>Typical Combat Load</th></tr><tr><td>76-mm rifled gun M32</td><td>65</td></tr><tr><td>APDS-T/APFSDS-T</td><td>20</td></tr><tr><td>HEAT -T</td><td>20</td></tr><tr><td>Frag-HE</td><td>20</td></tr><tr><td>Cannister</td><td>5</td></tr><tr><td>7.62-mm coax MG</td><td>5,000</td></tr><tr><td>12.7-mm AA MG</td><td>2,175</td></tr></table>	Weapons & Ammunition Types	Typical Combat Load	76-mm rifled gun M32	65	APDS-T/APFSDS-T	20	HEAT -T	20	Frag-HE	20	Cannister	5	7.62-mm coax MG	5,000	12.7-mm AA MG	2,175
Weapons & Ammunition Types	Typical Combat Load																
76-mm rifled gun M32	65																
APDS-T/APFSDS-T	20																
HEAT -T	20																
Frag-HE	20																
Cannister	5																
7.62-mm coax MG	5,000																
12.7-mm AA MG	2,175																
SYSTEM Alternative Designations: Walker Tank, Walker Bulldog Date of Introduction: 1951 Proliferation: At least 18 countries Description: Crew: 4 Combat Weight (mt): 23.5 Chassis Length Overall (m): 5.82 Height Overall (m): 2.73 Width Overall (m): 3.20 Ground Pressure (kg/cm²): 0.72 Automotive Performance: Engine Type: 500-hp Gasoline Cruising Range (km): 161 Speed (km/h): Max Road: 72 Max Off-Road: 48 Average Cross-Country: 40 Max Swim: N/A Fording Depths (m): 1.0 Unprepared, 2.4 prepared Radio: INA Protection: Armor, Turret Front (mm): 38 Applique Armor (mm): Available Explosive Reactive Armor (mm): N/A Active Protective System: N/A Mineclearing Equipment: N/A Self-Entrenching Blade: N/A NBC Protection System: N/A Smoke Equipment: N/A ARMAMENT Main Armament: Caliber, Type, Name: 76-mm rifled gun M32 Rate of Fire (rd/min): INA Loader Type: Manual Ready/Stowed Rounds: INA Elevation (°): -9.75/ +19.75 Fire on Move: No Auxiliary Weapon: Caliber, Type, Name: 7.62-mm (7.62x51) MG, M9194E1 Mount Type: Turret coax Maximum Aimed Range (m):	Max Effective Range (m): Day: INA Night: N/A Fire on Move: Yes Rate of Fire: INA Caliber, Type, Name: .50 (12.7 x 99) AA machinegun, M2HB Mount Type: Cupola AA mount Maximum Aimed Range (m): INA Max Effective Range (m): Day: 2,000 Night: INA Fire on Move: Yes Rate of Fire (rd/min): 450-550 FIRE CONTROL FCS Name: INA Main Gun Stabilization: N/A Rangefinder: N/A Infrared Searchlight: Available Sights w/Magnification: Gunner: Day: M97A1 and M20A1 Field of View (°): INA Acquisition Range (m): INA Night: Available Commander Fire Main Gun: No VARIANTS M41 DK-1: Danish variant with diesel engine and LRF-based fire control. Other upgrades are side skirts, thermal sights, NBC protection, smoke grenade launchers and 7.62-mm AA MG. Brazilian M41: Upgrades are similar to DK-1 except for AA MG and change to 90-mm gun using Cockerill Mk III ammunition. Uruguayan M41: M41A3 fitted with Cockerill Mk III gun. YUNG HU: Taiwanese upgrade with diesel engine. M42/Duster: Air defense gun system with twin 40-mm AA cannon. MAIN ARMAMENT AMMUNITION Caliber, Type, Name: 76-mm APFSDS-T, AAI M464 Maximum Aimed Range (m): INA Max Effective Range (m): INA Armor Penetration (mm): NATO triple heavy (57°) at 1000 m Other Ammunition Types: M33A1 and A2 APDS-T, M319 and M339 AP-T, M496 HEAT-T, HE, Smoke (WP), M363 cannister																

NOTES

German Atlas offers the MOLFF 1-plane stabilized laser rangefinder fire control system and retrofit kit. The FCS includes a thermal night sight. Israeli EL-OP offers a FCS for the system. Maximum range for the canister round is 155 meters.

North Korean Light Tank M1985

	<table><tr><th>Weapons & Ammunition Types</th><th>Typical Combat load</th></tr><tr><td>85-mm rifled gun APC-T/HVAP-T HEAT-FS AP HE Frag-HE, HE</td><td>47*</td></tr><tr><td>ATGM Launcher AT-3-type ATGM</td><td>4*</td></tr><tr><td>12.7-mm AAMG</td><td>500*</td></tr><tr><td>7.62-mm coax MG</td><td>*(est) 1,000*</td></tr></table>	Weapons & Ammunition Types	Typical Combat load	85-mm rifled gun APC-T/HVAP-T HEAT-FS AP HE Frag-HE, HE	47*	ATGM Launcher AT-3-type ATGM	4*	12.7-mm AAMG	500*	7.62-mm coax MG	*(est) 1,000*
Weapons & Ammunition Types	Typical Combat load										
85-mm rifled gun APC-T/HVAP-T HEAT-FS AP HE Frag-HE, HE	47*										
ATGM Launcher AT-3-type ATGM	4*										
12.7-mm AAMG	500*										
7.62-mm coax MG	*(est) 1,000*										
SYSTEM Alternative Designations: Often called <u>PT-85</u> Date of Introduction: 1985 Proliferation: At least 1 country Description: Crew: 3-4 Combat Weight (mt): 19.0 Chassis Length Overall (m): 7.0 Height Overall (m): 2.6 Width Overall (m): 3.2 Ground Pressure (kg/cm²): INA Automotive Performance: Engine Type: 320-hp Diesel Cruising Range (km): 500 Speed (km/h): Max Road: 60 Max Off-Road: INA Average Cross-Country: INA Max Swim: 10 Fording Depths (m): Amphibious Radio: INA Protection: Armor, Turret Front (mm): 30 (est.) Applique Armor (mm): N/A Explosive Reactive Armor (mm): N/A Mineclearing Equipment: N/A Self-Entrenching Blade: N/A Active Protective System: No NBC Protection System: INA Smoke Equipment: INA ARMAMENT Main Armament: 85-mm rifled gun, resembles CH Type 62 and 63 Rate of Fire(rd/min): 8 Loader Type: Manual Ready/Stowed Rounds: INA Elevation (°) : -5 to + 18 Fire on Move: No (est.) Auxiliary Weapons: Caliber, Type, Name: 12.7-mm (12.7 x 108), Type 54/DSHKM Mount Type: Cupola Max Aimed Range (m): 2,000	Max Effective Range (m): Day: 1,600 unarmored ground / 800 armored (est) Night: INA Tactical AA Range: 1,600 (est.) Armor Penetration (mm): 21 at 500 m, 13 at 1,000 m Caliber, Type, Name: 7.62-mm Machine gun PKT Mount Type: Turret coax Max Effective Range (m): Day: 1,000 (400-500 on the move) Night: 800 Fire on Move: Yes Rate of Fire (rd/min): Practical: 250 Cyclic: 650, in 2-10 round bursts ATGM Launcher: Name: Similar to 9P111 Launch Method: Rail-launched Guidance: MCLOS Command Link: Wire Launcher Dismountable: Yes FIRE CONTROL FCS Name: INA Main Gun Stabilization: None Rangefinder: None Infrared Searchlight: Yes Sights w/Magnification: Gunner: Day: INA Field of View (°): INA Acquisition Range (m): 1,500-3,000 (est) Night: IR, INA Field of View (°): INA Acquisition Range (m): 800 (est.) Commander Fire Main Gun: INA VARIANTS: N/A MAIN ARMAMENT AMMUNITION Caliber, Type, Name: 85-mm HVAP-T, BR-365PK Max Aimed Range (m): 1,500 (est) Max Effective Range (m): Day: 1,150 (direct fire range) Night: 800 Armor Penetration (mm): 130 (0°) at 1,000 m										

North Korean Light Tank M1985 continued

Caliber, Type, Name: 85-mm APC-T, Type 367 Max Aimed Range (m): 1,500 (est) Max Effective Range (m): Day: 1,150 (est) Night: 800 Armor Penetration (mm): 120 (0°) at 1,000 m Caliber, Type, Name: 85-mm HEAT-FS (variant of BK-2M) Max Aimed Range (m): 1,500 (est) Max Effective Range (m): Day: 1,500/970 direct fire range Night: 800 Armor Penetration (mm): 100 at 65°, 300-400 at 0° all ranges Caliber, Type, Name: 85-mm, AP HE, Max Aimed Range (m): 2,000-3,000 (est.) Max Effective Range (m): Day: 1,500/950 direct-fire range Night: 800 Armor Penetration (mm): 102 (0°) at 1,000 m Caliber, Type, Name: 85-mm Frag-HE, INA (Copy of O-365K) Max Aimed Range (m): 4,000 (est) Max Effective Range (m): Day: 1,500 (est) Night: 800 Armor Penetration (mm): Can defeat most IFVs on impact Other Ammunition Types: Chinese Smoke, AP HE. Russian BR-365P HVAP-T, BK-2M HEAT-FS Antitank Guided Missiles: Name: AT-3, -3A, -B Warhead Type: Tandem HEAT Armor Penetration (mm): 410 RHA Range (m): 3,000	Name: AT-3C Warhead Type: Tandem HEAT Armor Penetration (mm): 520 RHA Range (m): 3,000 Name: AT-3C Imp/ Polk (Slovenian) Warhead Type: Precursor with HEAT Armor Penetration (mm): 580 RHA Range (m): 3,000 Name: Red Arrow-73A (Chinese) Warhead Type: HEAT Armor Penetration (mm): 500 RHA Range (m): 3,000 Name: Red Arrow-73B/C (Chinese) Warhead Type: HEAT Armor Penetration (mm): 600 RHA Range (m): 3,000 Name: Malyutka-2 Warhead Type: Tandem HEAT Armor Penetration (mm): 800 RHA Range (m): 3,000 Name: Malyutka-2 HE Warhead Type: Frag-HE Armor Penetration (mm): N/A Range (m): 3,000
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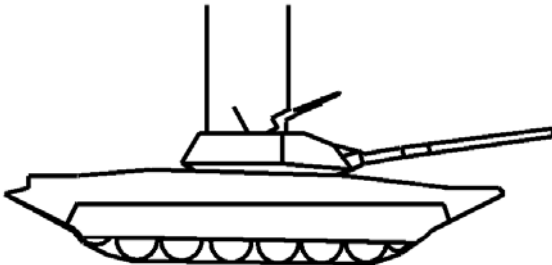
NOTES

Chassis is derived from North Korean stretched VTT-323 APC chassis.

Main gun is of the family which includes Chinese Type 62 and 63 tank guns, Chinese Type 56/ FSU D-44 field guns, and the T-34/85 tank. Therefore, ammunition options includes the variety of ammunition available for these guns.

The AT-3-type ATGM can be upgraded by an operator with a new warhead in minutes. Low-mid level maintenance can upgrade the missile motor. The HE-Blast ATGM is used for killing personnel and destroying bunkers and other fortifications.

Chinese Light Tank Type 63A Modernized

	<table><tr><th>Weapons & Ammunition Types</th><th>Typical Combat Load</th></tr><tr><td>105-mm rifled gun New CH APFSDS-T M456 HEAT L35 HESH</td><td>57</td></tr><tr><td>7.62-mm coax MG</td><td>2,000</td></tr><tr><td>12.7-mm AA MG</td><td>500</td></tr></table>	Weapons & Ammunition Types	Typical Combat Load	105-mm rifled gun New CH APFSDS-T M456 HEAT L35 HESH	57	7.62-mm coax MG	2,000	12.7-mm AA MG	500
Weapons & Ammunition Types	Typical Combat Load								
105-mm rifled gun New CH APFSDS-T M456 HEAT L35 HESH	57								
7.62-mm coax MG	2,000								
12.7-mm AA MG	500								
SYSTEM Alternative Designations: Type 99, Type ZTS 63A Date of Introduction: 1999 Proliferation: At least 1 country Description: Crew: 3 Combat Weight (mt): INA Chassis Length Overall (m): 8.15 Height Overall (m): INA Width Overall (m): 3.20 Ground Pressure (kg/cm²): INA Automotive Performance: Engine Type: 1,000-hp Diesel Cruising Range (km): 370 Speed (km/h): Max Road: 64 Max Off-Road: 28 Average Cross-Country: 28 Max Swim: 7, can swim in 1.3-m waves with waveboard Fording Depth (m): Amphibious Radio: A-220A Protection: Armor, Turret Front (mm): Against 35-mm AP round at 300 m Applique Armor (mm): Added armor defeats 35-mm at 0 m Explosive Reactive Armor (mm): Available - degrades swim ability Active Protective System: N/A Mineclearing Equipment: N/A Self-Entrenching Blade: N/A NBC Protection System: Probable Smoke Equipment: 8 x smoke grenade launchers ARMAMENT Main Armaments: Caliber, Type, Name: 105-mm rifled gun, similar to German design Rate of Fire (rd/min): 8 Loader Type: Manual Ready/Stowed Rounds: INA Elevation (°): -4 to +22 Fire on Move: Probable Auxiliary Weapon: Caliber, Type, Name: 7.62-mm (7.62x 54R) Machine gun Mount Type: Turret coax Maximum Aimed Range (m): 2,000 Max Effective Range (m): Day: 1,000 Night: 800	Fire on Move: Yes Rate of Fire (rd/min): 250 practical, 600 cyclic in 2-10 round bursts Caliber, Type, Name: 12.7-mm (12.7x108) W 85 Mount Type: Turret cupola Maximum Aimed Range (m): 2,000 Max Effective Range (m): Day: 1,500 ground/1,600 for air targets (APDS) Night: N/A, II sights available Fire on Move: Yes Rate of Fire (rd/min): 80-100 practical, 600 air targets 2-10 rd bursts FIRE CONTROL FCS Name: INA Main Gun Stabilization: Probable Rangefinder: LRF Infrared Searchlight: Yes Sights w/Magnification: Gunner: Modern day/night sights improved with ballistic computer Day: INA Field of View (°): INA Acquisition Range (m): INA Night: Yes Field of View (°): INA Acquisition Range (m): 1,650 claimed Commander Fire Main Gun: No VARIANTS: Type 63: Original amphibious tank with 85-mm gun. Modernized tank is lengthened with boat-shaped hull for improved swim effects, improved lethality and protection, and a welded turret. MAIN ARMAMENT AMMUNITION Caliber, Type, Name: 105-mm New CH (Chinese) APFSDS-T Maximum Aimed Range (m): 3,000 Max Effective Range (m): Day: 2,000-3,000 (est) Night: 800-1,300 Armor Penetration (mm): 460 at 2,000 m 105-mm APFSDS, H6/62 Maximum Aimed Range (m): 3,000 Max Effective Range (m): Day: 2,000-3,000 (est) Night: 800-1,300 Armor Penetration (mm): INA								

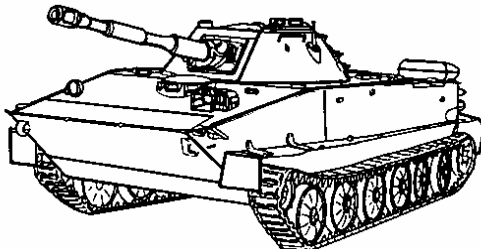
Chinese Light Tank Type 63A Modernized continued

105-mm HESH, L35 (UK) Maximum Aimed Range (m): 5,000 Max Effective Range (m): Day: 2,000-3,000 (est) Night: 800-1,300 Armor Penetration (mm): NATO single heavy target	105-mm HEAT, M456 (multinational) Maximum Aimed Range (m): 3,000 Max Effective Range (m): Day: 1,500-2,500 (est) Night: 800-1,300 Armor Penetration (mm): 432, NATO single heavy target Other Ammunition Types: Chinese Type 83/ UK L64/ US M735 APFSDS, UK L52 APDS, multinational M393 HEP-T, French OE 105-F1 HE, L39 Smoke, cannister
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NOTES

Next upgrade mentioned in articles is addition of a "35mm shell launcher" (probably a 35-mm automatic grenade launcher similar to a W-87 - see data sheet this update).

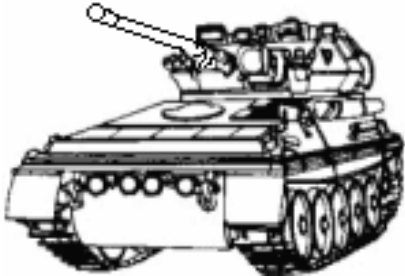
Russian Amphibious Tank PT-76B

	<table><tr><th>Weapons & Ammunition Types</th><th>Typical Combat Load</th></tr><tr><td>76-mm rifled gun D-56</td><td>40</td></tr><tr><td>HVAP, AP-T/API-T</td><td>10</td></tr><tr><td>HEAT</td><td>10</td></tr><tr><td>Frag-HE</td><td>20</td></tr><tr><td>7.62-mm coax MG</td><td>1,000</td></tr></table>	Weapons & Ammunition Types	Typical Combat Load	76-mm rifled gun D-56	40	HVAP, AP-T/API-T	10	HEAT	10	Frag-HE	20	7.62-mm coax MG	1,000
Weapons & Ammunition Types	Typical Combat Load												
76-mm rifled gun D-56	40												
HVAP, AP-T/API-T	10												
HEAT	10												
Frag-HE	20												
7.62-mm coax MG	1,000												
SYSTEM Alternative Designations: INA Date of Introduction: 1952 Proliferation: At least 21 countries Description: Crew: 3 Combat Weight (mt): 14.0 Chassis Length Overall (m): 6.91 Height Overall (m): 2.26 Width Overall (m): 3.14 Ground Pressure (kg/cm²): 0.46 Automotive Performance: Engine Type: 240-hp Diesel Cruising Range (km): 260 Speed (km/h): Max Road: 44 Max Off-Road: INA Average Cross-Country: 25 Max Swim: 10 Fording Depth (m): Amphibious Radio: R-123 Protection: Armor, Turret Front (mm): 20 Applique Armor (mm): N/A Explosive Reactive Armor (mm): N/A Active Protective System: N/A Mineclearing Equipment: N/A Self-Entrenching Blade: N/A NBC Protection System: N/A Smoke Equipment: VEES ARMAMENT Main Armament: Caliber, Type, Name: 76-mm rifled gun D-56B Rate of Fire (rd/min): 6-8 Loader Type: Manual Ready/Stowed Rounds: INA Elevation (°): -4/+30 Fire on Move: Yes Auxiliary Weapon: Caliber, Type, Name: 7.62-mm (7.62x54R) machinegun PKT Mount Type: Coax Maximum Aimed Range (m): 1,500 Max Effective Range (m): Day: 1,000/400-500 on the move Night: 600	Fire on Move: Yes Rate of Fire (rd/min): 250 practical / 650 cyclic, 2-10 round bursts FIRE CONTROL FCS Name: INA Main Gun Stabilization: 2-plane Rangefinder: N/A Infrared Searchlight: Available Sights w/Magnification: Gunner: TShK-66 Day: Field of View (°): INA Acquisition Range (m): 4,000 Night: TVN-28 IR Available Field of View (°): INA Acquisition Range (m): 600 Commander Fire Main Gun: No VARIANTS Polish PT-76: Variant with a separate commander's hatch and 12.7-mm MG. Type 63: Chinese variant with a new turret, 85-mm gun, and 12.7-mm AA MG. MAIN ARMAMENT AMMUNITION Caliber, Type, Name: 76-mm HVAP-T, BM-354P Maximum Aimed Range (m): 1,060 Max Effective Range (m): Day: 650 Night: 600 Armor Penetration (mm): 127 at muzzle, 50 at 1,000 m 76-mm HEAT, BK-350M Maximum Aimed Range (m): 1,000 Max Effective Range (m): Day: 650 Night: 600 Armor Penetration (mm): 280 to max range 76-mm, Frag-HE, OF-350 Maximum Aimed Range (m): 4,000 Max Effective Range (m): Day: INA Night: 600 Armor Penetration (mm): INA Other Ammunition Types: 76-mm AP-T, BR-350 API-T												

NOTES

Original PT-76 was produced in limited numbers with a non-stabilized main gun. Some PT-76s are augmented with 12.7-mm AA MGs. Israel offers an upgrade package with a 90-mm gun, LRF fire control and a 300-hp engine.

British Combat Reconnaissance Vehicle, Tracked Scorpion

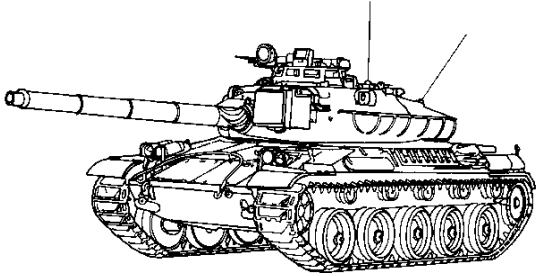
	<table><tr><th>Weapons & Ammunition Types</th><th>Typical Combat Load</th></tr><tr><td>76-mm rifled gun HESH HE Cannister</td><td>40</td></tr><tr><td>7.62-mm coax MG</td><td>3,600</td></tr></table>	Weapons & Ammunition Types	Typical Combat Load	76-mm rifled gun HESH HE Cannister	40	7.62-mm coax MG	3,600
Weapons & Ammunition Types	Typical Combat Load						
76-mm rifled gun HESH HE Cannister	40						
7.62-mm coax MG	3,600						
SYSTEM Alternative Designations: FV101 Date of Introduction: 1972 Proliferation: At least 18 countries Description: Crew: 3 Combat Weight (mt): 8.07 Chassis Length Overall (m): 4.79 Height Overall (m): 2.10 Width Overall (m): 2.24 Ground Pressure (kg/cm²): 0.36 Automotive Performance: Engine Type: 190-hp Gasoline Cruising Range (km): 650 Speed (km/h): Max Road: 80 Max Off-Road: INA Average Cross-Country: INA Max Swim: 4/6 with propeller Fording Depth (m): 1.07, amphibious Radio: INA Protection: Armor, Turret Front (mm): Against 14.5-mm projectiles Applique Armor (mm): N/A Explosive Reactive Armor (mm): N/A Active Protective System: N/A Mineclearing Equipment: N/A Self-Entrenching Blade: N/A NBC Protection System: Yes Smoke Equipment: 4 smoke grenade launchers each side of turret ARMAMENT Main Armament: Caliber, Type, Name: 76-mm rifled gun L23A1 Rate of Fire (rd/min): 6 Loader Type: INA Ready/Stowed Rounds: INA Elevation (°): -10/ +35 Fire on Move: N/A	Auxiliary Weapon: Caliber, Type, Name: 7.62-mm (7.62x51) MG, L8A1 Mount Type: Turret coax Maximum Aimed Range (m): INA Max Effective Range (m): INA Fire on Move: Yes Rate of Fire (rd/min): INA FIRE CONTROL FCS Name: INA Main Gun Stabilization: N/A Rangefinder: Laser rangefinder Infrared Searchlight: Yes Sights w/Magnification: Gunner: Day: Barr and Stroud Tank Laser Sight, 10x Field of View (°): INA Acquisition Range (m): 2,200 Night: GEC Sensors SS100, II, x5.8/1.6 Field of View (°): 8/28 Acquisition Range (m): INA Commander Fire Main Gun: No VARIANTS Scorpion 90: Variant with a 90-mm Cockerill Mk III gun. A number of vehicles use the same Alvis chassis. They include the Scimitar armored reconnaissance vehicle, Striker armored ATGM launcher vehicle, Spartan armored personnel carrier or Milan ATGM launcher, Stormer modernized APC, Samaritan armored ambulance, and Saber modernized reconnaissance vehicle. MAIN ARMAMENT AMMUNITION Caliber, Type, Name: 76-mm HESH, L29 Maximum Aimed Range (m): 2,200 Max Effective Range (m): INA Armor Penetration (mm): INA Other Ammunition Types: L24A1/2 HE (max effective range--indirect fire: 5,000 meters), L33A1 Cannister (max effective range: 100 meters), L32A5 Smoke (BE), L42 Illumination						

NOTES

As a reflection of the vehicle's suitability for a variety of roles, in recent times it is referred to as an armored reconnaissance vehicle or combat vehicle reconnaissance (tracked)--CVR (T).

A British upgrade program includes a diesel engine, thermal sights, and secure communications. The Tank Laser Sight and Avimo LV10 Day/Night LRF sight can accept a thermal channel. Thermal sights are available for use on the tank.

French Main Battle Tank AMX-30

	<table><tr><th>Weapons & Ammunition Types</th><th>Typical Combat Load</th></tr><tr><td>105-mm rifled gun APFSDS-T HEAT-T HE</td><td>47</td></tr><tr><td>20-mm coaxial cannon</td><td>1,050</td></tr><tr><td>7.62-mm cupola MG</td><td>2,050</td></tr></table>	Weapons & Ammunition Types	Typical Combat Load	105-mm rifled gun APFSDS-T HEAT-T HE	47	20-mm coaxial cannon	1,050	7.62-mm cupola MG	2,050
Weapons & Ammunition Types	Typical Combat Load								
105-mm rifled gun APFSDS-T HEAT-T HE	47								
20-mm coaxial cannon	1,050								
7.62-mm cupola MG	2,050								
SYSTEM Alternative Designations: INA Date of Introduction: 1967 Proliferation: At least 10 countries Description: Crew: 4 Combat Weight (mt): 36.00 Chassis Length Overall (m): 6.59 Height Overall (m): 2.29 Width Overall (m): 3.10 Ground Pressure (kg/cm²): 0.77/0.85 for AMX-30B2 Automotive Performance: Engine Type: 720-hp Diesel multi-fuel Cruising Range (km): 500-600 Speed (km/h): Max Road: 65 Max Off-Road: INA Average Cross-Country: 35-40 Max Swim: N/A Fording Depths (m): 1.3, 2.2 prepared, 4.0 with snorkel Radio: INA Protection: Armor, Turret Front (mm): 81 KE & CE (RHA) /120 AMX-30B2 Applique Armor (mm): N/A Explosive Reactive Armor (mm): GIAT Brenus ERA available Active Protective System: Galix decoys and IR jammer available Mineclearing Equipment: No Self-Entrenching Blade: No NBC Protection System: Yes Smoke Equipment: 2x2 smoke grenade launchers, VEES ARMAMENT Main Armament: Caliber, Type, Name: 105-mm (56 Cal) rifled gun CN-105-F1 Rate of Fire (rd/min): 6 Loader Type: Manual Ready/Stowed Rounds: 19/28 Elevation (°): -8 to +20 Fire on Move: No/Yes, AMX-30B2 with COTAC FCS Auxiliary Weapon: Caliber, Type, Name: 20-mm (20x139) Auto-cannon M693 Mount Type: Turret Coax Maximum Aimed Range(m): 2,000	Max Effective Range (m): Day: 1,300 Night: INA Fire on Move: No Rate of Fire (rd/min): 1,200 Caliber, Type, Name: 7.62-mm (7.62x51) Machinegun Giat NF1 Mount Type: Turret Cupola Maximum Aimed Range(m): 1,200 Max Effective Range (m): Day: 600 Night: INA Fire on Move: Yes Rate of Fire (rd/min): 900 ATGM Launcher: N/A FIRE CONTROL FCS Name: INA Main Gun Stabilization: None/stabilization for AMX-30B2 Rangefinder: Optical/APX-550 Laser for AMX-30B2 Infrared Searchlight: PH-8-B Sights w/Magnification: Gunner: Day: M271 telescope, 8x Field of View (°): 9 Acquisition Range (m): INA Night: OB-17-A IR periscope Field of View (°): INA Acquisition Range (m): 1,000/1,500 white light Commander Fire Main Gun: No VARIANTS AMX-30S: Export for desert use. The engine is downrated to 620 hp. The FCS is upgraded with Sopelem LRF day/night sight. AMX-30B2: System is upgraded with improved transmission, suspension, NBC system, gun stabilization, and COTAC FCS with a thermal night sight. French Army AMX-30s were upgraded to -B2. AMX-30EM2: Spanish upgrade program with 850-hp engine, new transmission, Hughes FCS, enlarged ammunition stowage, ERA, and C-437 APFSDS-T ammunition. AMX-30 DCA: AD version - 2x30-mm guns on AMX-30 chassis. GCT/AU-F1: Self-propelled 155-mm howitzer on AMX-30 chassis. AMX-30D: Armored recovery vehicle. AMX-30 EBG: Combat engineer tractor. AMX-30 Bridge Layer: Scissors bridge on AMX-30 chassis. Pluton: Theater ballistic missile launcher on AMX-30 chassis.								

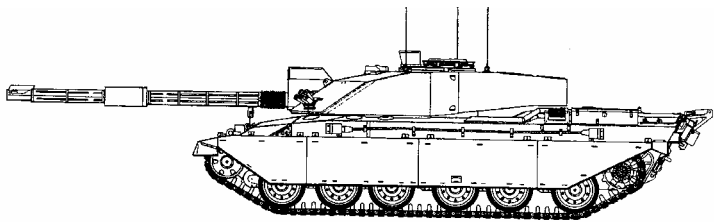
French Main Battle Tank AMX-30 continued

MAIN ARMAMENT AMMUNITION Caliber, Type, Name: 105-mm APFSDS-T, OFL 105 F1, French Giat Maximum Aimed Range (m): 3,000 Max Effective Range (m): Day: 1,800 Night: INA Armor Penetration (mm): NATO triple heavy target; 5,500 m Caliber, Type, Name: 105-mm APFSDS-T, M413, Israeli Military Industries Maximum Aimed Range (m): 6,000 Max Effective Range (m): Day: 2,000 Night: INA Armor Penetration (mm): NATO triple heavy target, 6,000+m Caliber, Type, Name: 105-mm HEAT-T, OCC 105 F1, French Giat Maximum Aimed Range (m): 2,500 Max Effective Range (m): Day: 2,500 Night: INA Armor Penetration (mm): 360 at 0°	105-mm HEAT-T, M456A2, Belgian Mecar Maximum Aimed Range (m): 2,500-8,200 Max Effective Range (m): Day: INA Night: INA Armor Penetration (mm): 432 at 0° 105-mm HE, OE 105 F1, French Giat Maximum Aimed Range (m): 2,500 Max Effective Range (m): Day: 2,500 Night: INA Armor Penetration (mm): N/A Other Ammunition Types: Any NATO-standard 105-mm ammunition can be used. They include Belgian Mecar M1060, Chinese Norinco 105, German Rheinmetall DM43, Spanish Santa Barbara C-437, British Royal Ordnance L64A4 and H6/6, US M735 and M833 (depleted uranium), and Canadian FP105 APFSDS-T rounds. Other types available are: HE-T, smoke, illuminating, HESH-T, HE plastic tracer (HEP-T), and canister or APERS-T (flechette). A recent round is the Israeli Military Industries APAM round, which over-flies the target and disperses fragmenting submunitions outward and downward over a much wider kill zone.
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NOTES

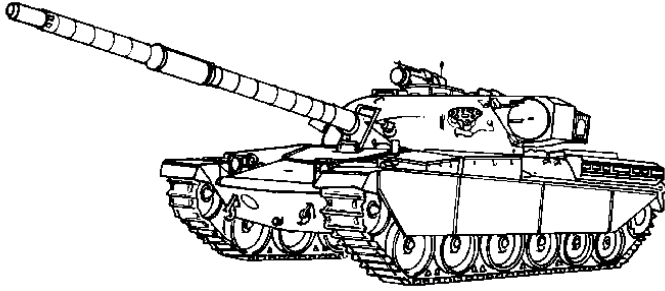
AMX-32: Upgraded tank - did not enter production.
AMX-40: Later upgraded tank - did not enter production.

British Main Battle Tank Challenger 2

	<table><tr><th>Weapons & Ammunition Types</th><th>Typical Combat Load</th></tr><tr><td>120-mm rifled gun</td><td>52</td></tr><tr><td>APFSDS-T</td><td>20</td></tr><tr><td>HESH</td><td>32</td></tr><tr><td>7.62-mm MG</td><td>4,000</td></tr><tr><td>coaxial chain gun</td><td></td></tr><tr><td>cupola AA MG</td><td></td></tr></table>	Weapons & Ammunition Types	Typical Combat Load	120-mm rifled gun	52	APFSDS-T	20	HESH	32	7.62-mm MG	4,000	coaxial chain gun		cupola AA MG	
Weapons & Ammunition Types	Typical Combat Load														
120-mm rifled gun	52														
APFSDS-T	20														
HESH	32														
7.62-mm MG	4,000														
coaxial chain gun															
cupola AA MG															
SYSTEM Alternative Designations: INA Date of Introduction: 1994 Proliferation: At least 2 countries Description: Crew: 4 Combat Weight (mt): 62.5 Chassis Length Overall (m): 8.33 Height Overall (m): 2.50 Width Overall (m): 3.52 Ground Pressure (kg/cm²): 0.97 Automotive Performance: Engine Type: 1,200-hp Diesel Cruising Range (km): 450 Speed (km/h): Max Road: 59 Max Off-Road: 45 est Average Cross-Country: 40 Max Swim: N/A Fording Depths (m): 1.1 Unprepared Radio: INA Protection: Armor, Turret Front (mm): 500 KE RHA at 2,000 m/800 CE Applique Armor (mm): INA Explosive Reactive Armor (mm): N/A Active Protective System: N/A Mineclearing Equipment: INA Self-Entrenching Blade: INA NBC Protection System: Yes Smoke Equipment: Smoke grenade launchers (2x5), VEESS ARMAMENT Main Armaments: Caliber, Type, Name: 120-mm rifled gun, L30 CHARM Rate of Fire (rd/min): INA Loader Type: Separate-loading manual Ready/Stowed Rounds: INA Elevation (°): -10 to +20 Fire on Move: Yes Auxiliary Weapon: Caliber, Type, Name: 7.62-mm McDonnell Douglas Chain Gun Mount Type: Turret Coax Maximum Aimed Range (m): INA Max Effective Range (m): Day: INA Night: INA Fire on Move: Yes Rate of Fire: INA	Caliber, Type, Name: 7.62-mm (7.62x 51) AA Machinegun L37A2 Mount Type: Cupola Maximum Aimed Range (m): INA Max Effective Range (m): Day: 800 Night: INA Fire on Move: Yes Rate of Fire (rd/min): INA ATGM Launcher: None FIRE CONTROL FCS Name: Improved Fire Control System (Marconi IFCS) Main Gun Stabilization: 2-plane electric Rangefinder: SAGEM Laser rangefinder Infrared Searchlight: No Sights w/Magnification: Gunner: Thermal Imaging and Gun Sighting System (TOGS-2) Day: Gunner's Primary Sight Field of View (°): INA Acquisition Range (m): 5,000 Night: Barr & Stroud TOGS-2 (with SAGEM thermal imager) Field of View (°): INA Acquisition Range (m): INA Commander Fire Main Gun: INA VARIANTS Challenger 1: Base tank from which Challenger 2 was derived. The latter tank includes 150 improvements, including mobility upgrades, new FCS, guns, and land navigation system, and an APU. Challenger 2E: The tank has a 1,500-hp engine and L30A1 gun. Omani Challenger 2: Variant with GPS, air conditioning and additional radiators. MAIN ARMAMENT AMMUNITION Caliber, Type, Name: 120-mm APFSDS-T, CHARM 3, depleted uranium Maximum Aimed Range (m): 5,000-6,500 Max Effective Range (m): Day: 3,000+ Night: INA Armor Penetration (mm): INA 120-mm High-Explosive Squash-Head (HESH), L31 Maximum Aimed Range (m): 5,000 Max Effective Range (m): Day: 3,000 Night: INA Armor Penetration (mm): INA Other Ammunition Types: L15 APDS, L34 WP Smoke														

NOTES None

British Main Battle Tank Chieftain Mk 5

	<table><tr><th>Weapons & Ammunition Types</th><th>Typical Combat Load</th></tr><tr><td>120-mm rifled gun</td><td>64</td></tr><tr><td>APFSDS-T</td><td>20</td></tr><tr><td>HESH</td><td>44</td></tr><tr><td>7.62-mm MG</td><td>6,200</td></tr><tr><td>--Coaxial and Stowed</td><td>6,000</td></tr><tr><td>--Cupola AA MG</td><td>200</td></tr></table>	Weapons & Ammunition Types	Typical Combat Load	120-mm rifled gun	64	APFSDS-T	20	HESH	44	7.62-mm MG	6,200	--Coaxial and Stowed	6,000	--Cupola AA MG	200
Weapons & Ammunition Types	Typical Combat Load														
120-mm rifled gun	64														
APFSDS-T	20														
HESH	44														
7.62-mm MG	6,200														
--Coaxial and Stowed	6,000														
--Cupola AA MG	200														
SYSTEM Alternative Designations: FV 4201 Date of Introduction: 1967 Original Chieftain Proliferation: At least 6 countries Description: Crew: 4 Combat Weight (mt): 55.00 Chassis Length Overall (m): 7.48 Height Overall (m): 2.90 Width Overall (m): 3.51 Ground Pressure (kg/cm²): 0.90 Automotive Performance: Engine Type: 750-hp Diesel Cruising Range (km): 400-500 Speed (km/h): Max Road: 48 Max Off-Road: INA Average Cross-Country: 30 Max Swim: N/A Fording Depths (m): 1.1 Unprepared Radio: C42/Larkspur VHF Protection: Armor, Turret Front (mm): 300 (RHA) Applique Armor (mm): ROMOR applique on turret, side skirts Explosive Reactive Armor (mm): N/A Active Protective System: N/A Mineclearing Equipment: Plow variant, and AVLB/engineer variant Self-Entrenching Blade: No NBC Protection System: Yes Smoke Equipment: Smoke grenade launchers (6 each side of turret) ARMAMENT Main Armaments: Caliber, Type, Name: 120-mm rifled gun, L11A5 Rate of Fire (rd/min): 8-10 first minute/6 sustained Loader Type: Separate-loading manual Ready/Stowed Rounds: INA Elevation (°): -10 to +20 Fire on Move: Yes Auxiliary Weapon: Caliber, Type, Name: 7.62-mm (7.62x 51) Machine gun L8A1 Mount Type: Turret Coax Maximum Aimed Range (m): INA Max Effective Range (m): Day: 800 Night: INA Fire on Move: Yes Rate of Fire: INA	Caliber, Type, Name: 7.62-mm (7.62x 51) AA Machine gun L37A1 Mount Type: Cupola Maximum Aimed Range (m): INA Max Effective Range (m): Day: 800 Night: INA Fire on Move: Yes Rate of Fire (rd/min): INA ATGM Launcher: N/A FIRE CONTROL FCS Name: Improved Fire Control System (IFCS) Main Gun Stabilization: 2-plane Rangefinder: Laser, Nd-Yag Infrared Searchlight: Yes Sights w/Magnification: Gunner: Day: Barr and Stroud Tank Laser Sight (TLS), 8x Field of View (°): 10 Acquisition Range (m): 5,000 Night: 1R18 Thermal sight, 3x Field of View (°): INA Acquisition Range (m): INA Commander Fire Main Gun: INA VARIANTS Mk 5: Final production variant, with a new engine and NBC system, modified auxiliary weapons and sights. Mk 6-11 are upgrades to earlier models, with addition of IFCS. Mk 12 added ROMOR (aka: Stillbrew) spaced armor boxes. Mk 11 and Mk 12 have Thermal Observation and Gunnery Sight (TOGS). A variety of support vehicles were developed from the tank. They include recovery vehicles, AVLB, dozer, mineclearer, air defense and 155-mm SP artillery systems. Khalid/Shir 1: Jordanian variant which has chassis, turret and weaponry of the Chieftain, but which incorporates engine and running gear upgrades of Challenger I. The fire control has seen a number of improvements, including a new ballistic computer. MAIN ARMAMENT AMMUNITION Caliber, Type, Name: 120-mm APFSDS-T, L23A1 Maximum Aimed Range (m): 5,000 Max Effective Range (m): Day: 3,000 Night: INA Armor Penetration (mm): INA														

British Main Battle Tank Chieftain Mk 5 continued

120-mm High-Explosive Squash-Head (HESH), L31 Maximum Aimed Range (m): 5,000 Max Effective Range (m): Day: 3,000 Night: INA Armor Penetration (mm): INA	Other Ammunition Types: L15 APDS, L34 WP Smoke
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NOTES

Early Chieftains and some later modified tanks mount the 50. Cal M2HB machinegun over the main gun as a ranging gun. Iran and Kuwait retained the .50 Cal MG.

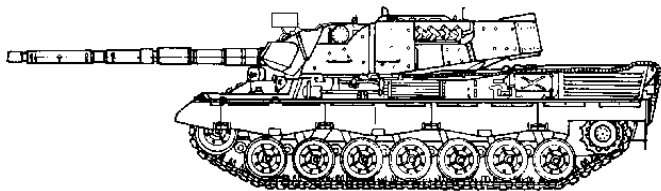
The HESH round is used for antitank chemical-energy (CE) antiarmor missions, and for HE effects against personnel and materiel.

The Iranians claim to employ a snorkel system on Chieftain, for fording to 5 meters depth.

A variety of fire control systems and thermal sights are available for Chieftain. At 324 Chieftains have been upgraded with the Barr and Stroud TOGS thermal sight system. The 1R26 thermal camera can be used with the 1R18 thermal night sight. It has wide (13.6°) and narrow (4.75°) fields of view, and is compatible with TOGS format. GEC Sensors offers a long list of sights including: Multisensors Platform, Tank Thermal Sensor, and SS100/110 thermal night sight. Marconi, Nanoquest, and Pilkington offer day and night sights for the Chieftain.

Charm Armament upgrade program, with the 120-mm L30 gun incorporated in Challenger 1, is available for Chieftain modification programs.

German Main Battle Tank Leopard 1A1

 Leopard 1A1A1 with applique armor	<table><tr><th>Weapons & Ammunition Types</th><th>Typical Combat Load</th></tr><tr><td>105-mm rifled gun APFSDS-T HESH-T</td><td>60/later 55</td></tr><tr><td>7.62-mm MG coaxial cupola</td><td>5,500 1,250 1,250</td></tr></table>	Weapons & Ammunition Types	Typical Combat Load	105-mm rifled gun APFSDS-T HESH-T	60/later 55	7.62-mm MG coaxial cupola	5,500 1,250 1,250
Weapons & Ammunition Types	Typical Combat Load						
105-mm rifled gun APFSDS-T HESH-T	60/later 55						
7.62-mm MG coaxial cupola	5,500 1,250 1,250						
SYSTEM Alternative Designations: INA Date of Introduction: 1965 Proliferation: At least 12 countries Description: Crew: 4 Combat Weight (mt): 40/42.4 LA1A1 and after Chassis Length Overall (m): 7.09 Height Overall (m): 2.61 Width Overall (m): 3.37 Ground Pressure (kg/cm²): 0.86/0.88 LA1A1 and after Automotive Performance: Engine Type: 830-hp Diesel multi-fuel Cruising Range (km): 600 Speed (km/h): Max Road: 65 Max Off-Road: INA Average Cross-Country: INA Max Swim: N/A Fording Depths (m): 1.2 Unprepared, 2.25 prepared, 4.0 snorkel Radio: INA Protection: Armor, Turret Front (mm): 250 RHA, KE/230 CE Applique Armor (mm): Available, standard on LA1A1 and after Explosive Reactive Armor (mm): Brenus available Active Protective System: N/A Mineclearing Equipment: No Self-Entrenching Blade: No NBC Protection System: Yes Smoke Equipment: 2x4 76-mm smoke grenade launchers ARMAMENT Main Armament: Caliber, Type, Name: 105-mm (51 Cal) L7A3 rifled gun Rate of Fire (rd/min): 10 Loader Type: Manual Ready/Stowed Rounds: 13/47 Elevation (°): -9 to +20 Fire on Move: No/Yes (to 28 km/h) Leopard 1A1A1 and after Auxiliary Weapons: Caliber, Type, Name: 7.62-mm (7.62x51) Machinegun M3 Mount Type: Turret Cupola Maximum Aimed Range(m): 1,400 Max Effective Range (m): Day: INA Night: INA Fire on Move: Yes Rate of Fire (rd/min): INA	Caliber, Type, Name: 7.62-mm (7.62x51) Machinegun MG3 Mount Type: Turret Cupola Maximum Aimed Range(m): INA Max Effective Range (m): INA Fire on Move: Yes Rate of Fire (rd/min): INA ATGM Launcher: N/A FIRE CONTROL FCS Name: N/A Main Gun Stabilization: None/stabilization for -1A1A1 and after Rangefinder: TEM 2A Optical Infrared Searchlight: XSW-30-U red/white Sights w/Magnification: Gunner: Day: TZF 1A telescope, 8x Field of View (°): INA Acquisition Range (m): 1,400 Night: IR available Field of View (°): INA Acquisition Range (m): 1,000/1,500 white light Commander Fire Main Gun: No VARIANTS Leopard 1 was the baseline tank (first production batch) with original tracks, and without track skirts, stabilization or thermal sleeve for gun. The Leopard 1A1 version, as featured, can be fitted with applique armor. Leopard 1A1A1 is the third production lot, with applique, air filter intakes. Early tanks have been upgraded to this standard. Leopard 1A2: Production batch and -1A1 upgrade with a new cast turret, improved NBC system, II night sights, and air conditioning. Italian Leopard 1A2: Upgrade with Sirio thermal FCS, gun stabilization and turret drive. Leopard 1A3: Production system with previous improvements, larger welded spaced armor turret, and improved FCS (by country). Leopard 1A4: Final production system, with AEG-Telefunken FCS. Leopard 1A5: More than 1,300 -1A1/1A2 tanks have been refitted with an EMES-18 FCS and thermal sights. Leopard 1A5 (BE): Belgian upgraded -1A1/1A2s, with new FCS, FN MAG 7.62-mm MGs, and thermal sights. Leopard 1-V: Dutch version, of -1A1A1, with German EMES-12A3 FCS and PZB II night sight. A variety of systems use Leopard 1 chassis. These include Gepard air defense gun, engineer and recovery vehicles, and a bridgelayer.						

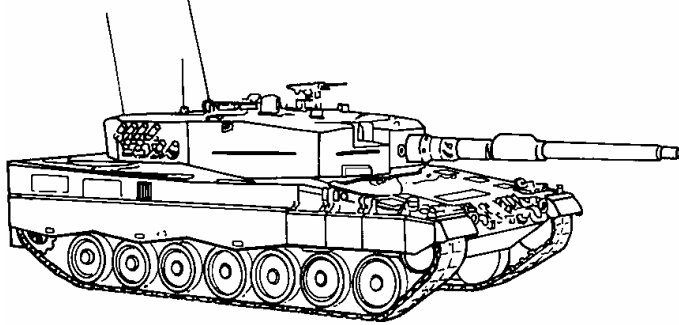
German Main Battle Tank Leopard 1A1 continued

MAIN ARMAMENT AMMUNITION Caliber, Type, Name: 105-mm APFSDS-T, DM43, German Rheinmetall Maximum Aimed Range (m): 2,000+ Max Effective Range (m): Day: 1,400/2,000 Leo 1A1 and later Night: 1,000 IR/1,500 white light/more with thermal Armor Penetration (mm): NATO triple heavy target, 5,500 m 105-mm APFSDS-T, M413, Israeli Military Industries Maximum Aimed Range (m): 6,000 Max Effective Range (m): Day: 2,000 Night: 1,000 IR/1,500 white light/more with thermal Armor Penetration (mm): NATO triple heavy target, 6,000+m 105-mm HEAT-T, OCC 105 F1, French Giat Maximum Aimed Range(m): 2,500 Max Effective Range (m): Day: 2,500 Night: INA Armor Penetration (mm): 360 at 0° 105-mm HEAT-T, M456A2, Belgian Mecar Maximum Aimed Range (m): 2,500-8,200 Max Effective Range (m): Day: INA Night: INA Armor Penetration (mm): 432 at 0°	105-mm HESH-T, DM512, Rheinmetall Maximum Aimed Range (m): 4,000 Max Effective Range (m): Day: 1,500 Night: 1,000 IR/1,500 white light/more with thermal Armor Penetration (mm): N/A 105-mm HE, OE 105 F1, French Giat Maximum Aimed Range (m): 2,500 Max Effective Range (m): Day: 2,500 Night: INA Armor Penetration (mm): N/A Other Ammunition Types: Any NATO-standard 105-mm ammunition can be used. They include: Chinese Norinco 105, British Royal Ordnance L64A4 and H6/6, Belgian Mecar M1060, French Giat OFL 105 F1, Spanish Santa Barbara C-437, US M735 and M833 (depleted uranium), and Canadian FP105 APFSDS-T rounds. Other types available are: HE-T, smoke, illuminating, HESH-T, HE plastic tracer (HEP-T), and canister or APERS-T (flechette). A recent round is the Israeli Military Industries APAM round, which over-flies the target and disperses fragmenting submunitions outward and downward over a much wider kill zone.
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NOTES

More than a dozen fire control systems, many with thermal sights, are available for this tank. A version with LLLTV sights is the Leopard 1A1A2. Improved stabilization systems include US HR Textron, French SAMM, and German FWM. Other options include a front mounted dozer blade, improved air conditioning, a 120-mm smoothbore gun, and other secondary

German Main Battle Tank Leopard 2

	<table><tr><th>Weapons & Ammunition Types</th><th>Typical Combat Load</th></tr><tr><td>120-mm smoothbore gun APFSDS-T HEAT-MP-T</td><td>42</td></tr><tr><td>7.62-mm machineguns</td><td>4750</td></tr><tr><td>--Coaxial</td><td>2000</td></tr><tr><td>--Cupola MG/stowed</td><td>2750</td></tr></table>	Weapons & Ammunition Types	Typical Combat Load	120-mm smoothbore gun APFSDS-T HEAT-MP-T	42	7.62-mm machineguns	4750	--Coaxial	2000	--Cupola MG/stowed	2750
Weapons & Ammunition Types	Typical Combat Load										
120-mm smoothbore gun APFSDS-T HEAT-MP-T	42										
7.62-mm machineguns	4750										
--Coaxial	2000										
--Cupola MG/stowed	2750										
SYSTEM Alternative Designations: Swiss Pz 87, Swedish Strv 121 Date of Introduction: 1979 Proliferation: At least 7 countries Description: Crew: 4 Combat Weight (mt): 55.15 Chassis Length Overall (m): 7.69 Height Overall (m): 2.79 Width Overall (m): 3.70 Ground Pressure (kg/cm²): 0.83 Automotive Performance: Engine Type: 1,500-hp Diesel Cruising Range (km): 550 Speed (km/h): Max Road: 72 Max Off-Road: 45 Average Cross-Country: 40 Max Swim: N/A Fording Depths (m): 1.0 Unprepared, 4.0 with snorkel Radio: INA Protection: Armor, Turret Front (mm): 700 KE/1,000 against HEAT rounds Applique Armor (mm): Track skirt Explosive Reactive Armor (mm): N/A Active Protective System: Galix (See note Strv 122) Mineclearing Equipment: No Self-Entrenching Blade: No NBC Protection System: Yes Smoke Equipment: Smoke grenade launchers, 8 each side of turret ARMAMENT Main Armaments: Caliber, Type, Name: 120-mm smoothbore gun M256 Rate of Fire (rd/min): INA Loader Type: Manual Ready/Stowed Rounds: 15/27 Elevation (°): -9 to +20 Fire on Move: Yes Auxiliary Weapon: Caliber, Type, Name: 7.62-mm (7.62x 51) Machinegun MG3A1 Mount Type: Turret Coax Maximum Aimed Range(m): INA Max Effective Range (m): Day: INA Night: INA	Fire on Move: Yes Rate of Fire (rd/min): 1,200 Caliber, Type, Name: 7.62-mm (7.62x 51) Machinegun MG3A1 Mount Type: Turret Cupola Maximum Aimed Range(m): INA Max Effective Range (m): Day: INA Night: INA Fire on Move: Yes Rate of Fire (rd/min): 1,200 ATGM Launcher: N/A FIRE CONTROL FCS Name: INA Main Gun Stabilization: WNA-H22, 2-plane Rangefinder: Laser neodymium Infrared Searchlight: Yes Sights w/Magnification: Gunner: Day: Krupp-Atlas EMES-15, 12x / FERO Z18 secondary, 8x Field of View (°): 5/10 Acquisition Range (m): INA Night: Zeiss thermal imager Field of View (°): INA Acquisition Range (m): INA Commander Fire Main Gun: Yes VARIANTS A variety of MBT variants from 2A1 to 2A4 denote minor changes, as well as FCS upgrades. Combat support variants include an armored recovery vehicle. Pz87: Swiss variant with indigenous machineguns, communications and FCS, and improved NBC equipment. Dutch Leopard 2: Uses indigenous equipment as noted above. Leopard 2A5/Leopard 2 (Improved): Recent upgrade with spaced armor added to turret front, and increased armor on hull and side skirts. Other improvements include improved stabilization, suspension, navigation, fire control, and hatch design. Strv 122: Swedish-licensed variant resembling 2A5 with an indigenous turret and other upgrades. The tank features French Galix active protection system and improved command and control. Sweden developed an HE-T round designed to range 2,000 meters or more for its Leopard-2 and Strv-122 tanks. With additional armor, Strv 122 will weigh 62 mt.										

German Main Battle Tank Leopard 2 continued

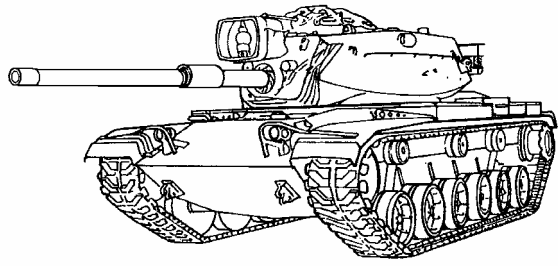
MAIN ARMAMENT AMMUNITION Caliber, Type, Name: 120-mm APFSDS-T, DM43 Maximum Aimed Range(m): 3,500 Max Effective Range (m): Day: INA Night: INA Armor Penetration (mm): 450 at 2,000 meters 120-mm APFSDS-T, US Olin GD120 Maximum Aimed Range(m): 3,500 Max Effective Range (m): Day: 3,000 Night: INA Armor Penetration (mm): 520 at 2,000 meters	120-mm HEAT-MP-T, DM-12A1/US Olin M830 Maximum Aimed Range(m): INA Max Effective Range (m): Day: 2,500 Night: INA Armor Penetration (mm): INA Other Ammunition Types: US-produced M829, M829A1 APFSDS-T; US M830A1 HEAT-MP-T (MPAT), GE DM12A1 (US copy M830) HEAT-MP-T (MPAT)
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NOTES

A variety of upgrade programs and options are available for the Leopard 2. These include the Atlas Elektronik Vehicle Integrated Command and Information System (IFIS), a digital command and information system.

A new longer gun barrel (L55 gun barrel, 1.30 meters longer) is available. It permits effective use of a new APFSDS-T round, DM53 (LKE II), with a longer rod penetrator, and which is under development. The German Army has decided not to buy the DM43 APFSDS-T round (aka: LKE 1), rather to wait and upgrade to the DM53.

United States Main Battle Tank M60A1/M60A3

 M60A1	<table><tr><th>Weapons & Ammunition Types</th><th>Typical Combat Load</th></tr><tr><td>105-mm rifled gun APFSDS-T HEAT HE APERS-T/Canister</td><td>63</td></tr><tr><td>.50 cal AA MG 7.62-mm coaxial MG</td><td>900 5,950</td></tr></table>	Weapons & Ammunition Types	Typical Combat Load	105-mm rifled gun APFSDS-T HEAT HE APERS-T/Canister	63	.50 cal AA MG 7.62-mm coaxial MG	900 5,950
Weapons & Ammunition Types	Typical Combat Load						
105-mm rifled gun APFSDS-T HEAT HE APERS-T/Canister	63						
.50 cal AA MG 7.62-mm coaxial MG	900 5,950						
SYSTEM (M60A1 / M60A3, where their data differs) Alternative Designations: INA Date of Introduction: 1963/1979 Proliferation: At least 17 countries Description: Crew: 4 Combat Weight (mt): 52.5 Chassis Length Overall (m): 6.95 Height Overall (m): 3.27 Width Overall (m): 3.63 Ground Pressure (kg/cm²): 0.87 Automotive Performance: Engine Type: 750-hp Diesel Cruising Range (km): 550 Speed (km/h): Max Road: 48 Max Off-Road: 45 Average Cross-Country: 35 Max Swim: N/A Fording Depths (m): 1.2, 2.4 Prepared, 4 with snorkel Radio: AN/VRC-12, or compatible with army net radios Protection: Armor, Turret Front (mm): 325 KE RHA at 2,000 m/325 CE Applique Armor (mm): Available, including modular armor Explosive Reactive Armor (mm): BLAZER and others available Active Protective System: N/A Mineclearing Equipment: GDLS mine roller system available Self-Entrenching Blade: INA NBC Protection System: Yes Smoke Equipment: Smoke grenade launchers (2 x 6) on M60A3 VEESS on later M60A3s ARMAMENT Main Armaments: Caliber, Type, Name: 105-mm 51-cal rifled gun, M68 Rate of Fire (rd/min): 6-8 Loader Type: Manual Ready/Stowed Rounds: 16/ 47 Elevation (°): -10 to +20 Fire on Move: No Auxiliary Weapon: Caliber, Type, Name: 7.62-mm (7.62x51) Machinegun, M73/M240 Mount Type: Turret coax Max Aimed Range (m): 2,000 (est) Max Effective Range (m): Day: 1,800 Night: INA Fire on Move: Yes Rate of Fire (rd/min): 600-950	Caliber, Type, Name: .50 cal (12.7-mm) AA Machinegun, M85 Mount Type: Cupola Max Aimed Range (m): 2,000 Max Effective Range (m): Day: 2,000 (est) Night: INA Fire on Move: Yes Rate of Fire (rd/min): 450-550 (est) FIRE CONTROL FCS Name: M32E1 day/night periscope / M35 or M36E1 sight Main Gun Stabilization: Available / poor 2-plane Rangefinder: M17C coincidence / AN/VVG-2 ruby laser Infrared Searchlight: Number 2 IR and white light Sights w/Magnification: Gunner: Day: M31, 8x / M35 or M36E1, 8x Field of View (°): 7.5 Acquisition Range (m): 2,000 / 3,000 Night: None, IR, II available/ None, II, thermal (See NOTES) Field of View (°): INA / See NOTES Acquisition Range (m): INA Commander Fire Main Gun: INA VARIANTS M60: Original tank was derived from M48, but with a 105-mm gun. Vehicles derived from the M60 include M60 AVLB, the M9 bulldozer, and M728 Combat Engineer Vehicle. M60A1: Features a reshaped turret, added ammunition stowage, rangefinder, improved fire control, and improved running gear. M60A2: Unique and less successful tank version with a 152-mm gun and Shillelagh ATGM from the M-551/Sheridan. M60A3: This version has better engine, fire control, thermal sights, ballistic computer, thermal sleeve, and improved stabilizer. A number of countries have upgraded M60A1s to comparability to the M60A3 standard. These include Israel, Austria, and Saudi Arabia. MAGACH-7: Israeli variant with improved engine, track, fire control system, added stabilized sights, modular armor, armor track skirts, thermal sleeve, and with two 7.62-mm only cupola MGs. MAIN ARMAMENT AMMUNITION Caliber, Type, Name: 105-mm APFSDS, UI (New Chinese) Max Aimed Range (m): 3,000 Max Effective Range (m): Day: 2,000 / 3,000 (est) Night: INA Armor Penetration (mm): 460 at 2,000 m						

United States Main Battle Tank M60A1/M60A3 continued

Caliber, Type, Name: 105-mm APFSDS, H6/62 (UK) Max Aimed Range (m): 3,000 Max Effective Range (m): Day: 2,000 / 3,000 Night: INA Armor Penetration (mm): NATO single heavy target, 5,000 m Caliber, Type, Name: 105-mm APFSDS, DM23 (GE) Max Aimed Range (m): 3,000 Max Effective Range (m): Day: 2,000 / 3,000 Night: INA Armor Penetration (mm): 150, NATO single heavy target, 60° at 2,000 m Caliber, Type, Name: 105-mm HEAT, M456 (multinational) Max Aimed Range (m): 3,000 Max Effective Range (m): Day: 1,500-2,000 / 1,500-2,500 (est.) Night: INA Armor Penetration (mm): 432, NATO single heavy target	Caliber, Type, Name: 105-mm HESH, L35 (UK) Max Aimed Range (m): 3,000 Max Effective Range (m): Day: 2,000 / 2,000-2,500 (est.) Night: INA Armor Penetration (mm): NATO single heavy target Caliber, Type, Name: 105-mm HE, HE-OE (FR) Max Aimed Range (m): 3,000 Max Effective Range (m): Day: 2,000 / 2,500-3,000 (est.) Night: INA Armor Penetration (mm): INA Caliber, Type, Name: 105-mm APERS-T, M494 (Flechette) Max Aimed Range (m): 3,000 Max Effective Range (m): Day: 2,000 / 3,000 Night: INA Armor Penetration (mm): N/A Other Ammunition Types: Chinese Type 83/ UK L64/ US M735 APFSDS, UK L52 APDS, multinational M393 HEP-T, L39 Smoke, French OBUS 105 F1 Illuminating, Australian TC800 Canister (balls)
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NOTES

A variety of day and night sights (including thermal and stabilized), stabilization systems and ballistic computers are available for M60A1 and M60A3. The TTS thermal sight (5x and 10x, FOV 6x4 and 12x8°) was added to US M60A3, and has been widely fielded.

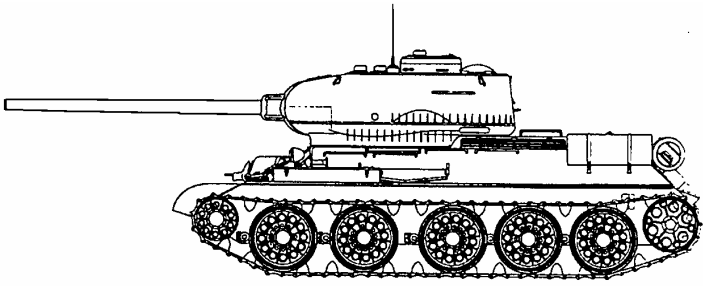
The Swiss 120-mm Compact Tank Gun is available.

Israeli IMI offers the APAM round with submunitions and a time fuze.

Israeli IAI now offers LAHAT gun-launched ATGM, with semi-active laser homing and tandem warhead; but it requires modified fire control.

Israeli IMI offers several upgrade packages, such as SABRA, for the SABRA MBT. This private venture includes extensive upgrades for mobility, lethality, and protection, including a 120-mm main gun.

Russian Main Battle Tank T-34/85

	<table> <tr> <th>Weapons & Ammunition Types</th><th>Typical Combat load</th></tr> <tr> <td>85-mm rifled gun APC-T/HVAP-T HEAT-FS AP HE Frag-HE, HE</td><td>55</td></tr> <tr> <td>2 x 7.62-mm MG (7.62x54R)</td><td>2,745</td></tr> </table>	Weapons & Ammunition Types	Typical Combat load	85-mm rifled gun APC-T/HVAP-T HEAT-FS AP HE Frag-HE, HE	55	2 x 7.62-mm MG (7.62x54R)	2,745
Weapons & Ammunition Types	Typical Combat load						
85-mm rifled gun APC-T/HVAP-T HEAT-FS AP HE Frag-HE, HE	55						
2 x 7.62-mm MG (7.62x54R)	2,745						
SYSTEM Alternative Designations: T-34-85 Model 1944 Date of Introduction: 1944 Proliferation: At least 20 countries with T-34 tanks and variants Description: Crew: 5 Combat Weight (mt): 32 Chassis Length Overall (m): 6.1 Height Overall (m): 2.7 Width Overall (m): 2.99 Ground Pressure (kg/cm²): 0.88 Automotive Performance: Engine Type: 500-hp Diesel Cruising Range (km): 300, 500 with extra tanks Speed (km/h): Max Road: 56 Max Off-Road: 35 Average Cross-Country: INA Max Swim: N/A Fording Depths (m): 1.3, 5.5 with snorkel Radio: R-113, R-123 in later versions Protection: Armor, Turret Front (mm): 75-85 Applique Armor (mm): No Explosive Reactive Armor (mm): No Mineclearing Equipment: Plow, roller, and dozer blade available Self-Entrenching Blade: N/A Active Protective System: No NBC Protection System: No Smoke Equipment: 2 x BDSH smoke charges ARMAMENT Main Armament: 85-mm rifled gun, D-5T or ZIS-S-53 Rate of Fire(rd/min): 3-4 Loader Type: Manual Ready/Stowed Rounds: INA Elevation (°): -5 to + 25 Fire on Move: No Auxiliary Weapon: Caliber, Type, Name: 7.62-mm MG, SGMT (early upgrade) Mount Type: Coaxial Maximum Aimed Range (m): 2,000 Max Effective Range (m): Day: 1,000/ 400-500 on the move Night: N/A	Fire on Move: Yes Rate of Fire (rd/min): 250 practical /650 cyclic, 2-10 rd bursts Caliber, Type, Name: 7.62-mm MG, SGMB (early upgrade) Mount Type: Bow Maximum Aimed Range (m): 2,000 Max Effective Range (m): Day: 1,000/ 400-500 on the move Night: N/A Fire on Move: Yes Rate of Fire (rd/min): 250 practical/650 cyclic, 2-10 rd bursts FIRE CONTROL FCS Name: INA Main Gun Stabilization: None Rangefinder: Stadiametric Infrared Searchlight: No Sights w/Magnification: Gunner: Day: TSh-15 or TSh-16 articulated telescope, 4.5x Field of View (°): 15 Acquisition Range (m): 1,500 direct fire, 5,200 indirect fire Night: N/A Field of View (°): N/A Acquisition Range (m): N/A Commander Fire Main Gun: No VARIANTS: T-34: The baseline tank, also referred to as T-34/76, has a 76-mm main gun. Many T-34s have been modified. Earlier versions use the 7.62-mm DTM MG, and later versions 7.62-mm SGMT or PKT MG. Some countries have replaced 7.62-mm AAMG with a 12.7-mm MG. Some Chinese variants have LRFs. Egyptian variants have rubber skirts and a VEES system. Conversions include 122-mm SP guns, self-propelled AA guns, armored recovery vehicles, bridgelayers, bulldozers, and flamethrowers. Most are no longer in service. OT-34-85: Flamethrower version is indistinguishable from the T-34/85, with a ZIS-S-53 gun and 60-70 m flame range. Poland and Czechoslovakia also produced T-34/85. MAIN ARMAMENT AMMUNITION Caliber, Type, Name: 85-mm HVAP-T, BR-365PK Max Aimed Range (m): 1,500 Max Effective Range (m): Day: 1,150 (direct fire range) Night: N/A Armor Penetration (mm): 130 (0°) at 1,000 m, 167 (0°) at muzzle						

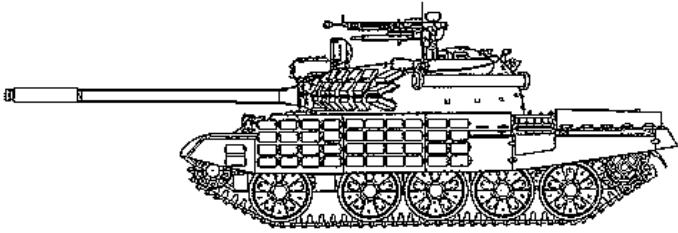
Russian Main Battle Tank T-34/85 continued

Caliber, Type, Name: 85-mm APC-T, BR-367 Max Aimed Range (m): 1,500 Max Effective Range (m): Day: 1,150 (est) Night: N/A Armor Penetration (mm): 120 (0°) at 1,000 m Caliber, Type, Name: 85-mm HEAT-FS, BK-2M Max Aimed Range (m): 1,500 (est) Max Effective Range (m): Day: 970 direct fire range Night: N/A Armor Penetration (mm): 100 at 65°, 300-400 at 0° all ranges Caliber, Type, Name: 85-mm, AP HE, Max Aimed Range (m): 1,500 (est) Max Effective Range (m): Day: 1,150 (est) Night: N/A Armor Penetration (mm): 102 (0°) at 1,000 m	Caliber, Type, Name: 85-mm Frag-HE, O-365K Max Aimed Range (m): 5,200 Max Effective Range (m): Day: INA Night: N/A Armor Penetration (mm): Can defeat most IFVs on impact Other Ammunition Types: Chinese smoke, Russian HVAP-T BR-365P, Russian AP-T BR-365 and BR-365K, Russian Frag-HE O-365, North Korean APC-T Type 367
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NOTES

Main gun is in the family which includes D-44 and SD-44 field guns, KS-12 AA Gun and ASU-85 assault gun. Ammunition options include the variety of ammunition available for these guns.

Russian Main Battle Tank T-55AMV

	<table><tr><th>Weapons & Ammunition Types</th><th>Typical Combat Load</th></tr><tr><td>100-mm rifled gun APFSDS-T HEAT Frag-HE ATGM</td><td>(mix est) 43 14 3 21 5</td></tr><tr><td>7.62-mm coax PKT MG 12.7-mm AA MG</td><td>1,250 500</td></tr></table>	Weapons & Ammunition Types	Typical Combat Load	100-mm rifled gun APFSDS-T HEAT Frag-HE ATGM	(mix est) 43 14 3 21 5	7.62-mm coax PKT MG 12.7-mm AA MG	1,250 500
Weapons & Ammunition Types	Typical Combat Load						
100-mm rifled gun APFSDS-T HEAT Frag-HE ATGM	(mix est) 43 14 3 21 5						
7.62-mm coax PKT MG 12.7-mm AA MG	1,250 500						
SYSTEM Alternative Designations: INA Date of Introduction: 1983 Proliferation: At least 3 countries Description: Crew: 4 Combat Weight (mt): 40.5 Chassis Length Overall (m): 6.20 Height Overall (m): 2.32 Width Overall (m): 3.60 Ground Pressure (kg/cm²): 0.89 Automotive Performance: Engine Type: 620-690 hp Diesel Cruising Range (km): 390/600 with extra tanks Speed (km/h): Max Road: 50 Max Off-Road: 35 Average Cross-Country: 25 Max Swim: N/A Fording Depths (m): 1.4 Unprepared, 5.5 with snorkel Radio: R-173, R-173P, R-124 intercom Protection: Armor, Turret Front (mm): 200 (base T-55 armor) Applique Armor (mm): Rubber screens and box armor Explosive Reactive Armor (mm): 1st Gen raises to KE/700-900 against HEAT; 2nd Gen raises to 450-480 KE/700-900 HEAT Active Protective System: Russian Drozd APS available Mineclearing Equipment: Roller-plow set, and plows available Self-Entrenching Blade: No NBC Protection System: Yes Smoke Equipment: Smoke grenade launchers (4x 81-mm each side of turret), and 24 grenades. Vehicle engine exhaust smoke system ARMAMENT Main Armaments: Caliber, Type, Name: 100-mm rifled gun, D-10T2S Rate of Fire (rd/min): 5-7 Loader Type: Manual Ready/Stowed Rounds: INA Elevation (°): -5 to +18 Fire on Move: Yes (gun rounds only--ATGMs require a short halt) Auxiliary Weapon: Caliber, Type, Name: 7.62-mm (7.62x 54R) Machinegun PKT-T Mount Type: Turret coax Maximum Aimed Range (m): 2,000 Max Effective Range (m): Day: 800	Night: 800 Fire on Move: Yes Rate of Fire (rd/min): 250 rpm practical, 800 cyclic, 2-10 rd bursts Caliber, Type, Name: 12.7-mm (12.7x108) AA MG DShKM Mount Type: Turret top Maximum Aimed Range (m): 2,000 Max Effective Range (m): Day: 1,500 Night: N/A Fire on Move: Yes Rate of Fire (rd/min): 80-100 practical, 600 cyclic, 2-10 rd bursts ATGM Launcher : Name: D-10T2S gun Launch Method: Gun-launched Guidance: SACLOS, Infrared laser-beam rider Command Link: Encoded laser-beam Launcher Dismountable: No FIRE CONTROL FCS Name: Volna Main Gun Stabilization: M1 Tsiklon 2-plane Rangefinder: KDT-2 Laser Infrared Searchlight: L-4 Sights w/Magnification: Gunner: Day: TShSM-32PV, 3.5x and 7x Field of View (°): 18 and 8 Acquisition Range (m): 4,000 Night: 1K13 Field of View (°): INA Acquisition Range (m): 800-1,300, gun rounds only Commander Fire Main Gun: No VARIANTS More than a dozen countries have produced upgraded T-55 variants with similar capabilities in protection and lethality. Many countries have upgraded to a larger main gun. T-55AMV is derived from a line of variants of T-55 MBT. T-55A added an NBC protection system. T-55M added the Volna fire control system (with ATGM launcher), improved gun stabilization and sights, improved engine, new radio, and increased protection. That included side skirts, smoke grenade launchers, applique armor, and fire protection. T-55AM added bra armor, an armor band around the turret for 180° coverage. The -AMV upgrade means substitution of ERA for the bra armor. Variants ending with -1 denote replacement of the engine w/V-46 engine from T-72 MBT. The Ukraine and Syria will upgrade to the T-55AMV standard.						

Russian Main Battle Tank T-55AMV continued

T-55AM2B: Czech version of T-55AMV with Kladivo fire control. T-55AM2: Variant does not have ATGM capability or Volna FCS. T-55AM2P: Polish version of T-55AMV but with Merida FCS. T-55AMD: Variant with the Drozd APS instead of ERA. T-55AD Drozd: Variant with Drozd but not Volna FCS and ERA. MAIN ARMAMENT AMMUNITION Caliber, Type, Name: 100-mm APDS-T, BM-8 Russian Maximum Aimed Range (m): 2,500 Max Effective Range (m): Day: 1,500 Night: 800-1,300 Armor Penetration (mm): 200 at 1,000 meters 100-mm APFSDS-T, BM-25 Maximum Aimed Range (m): 2,500 Max Effective Range (m): Day: INA Night: 800-1,300 Armor Penetration (mm): INA 100-mm APFSDS-T, BM-412M, Romanian Maximum Aimed Range (m): 2,500 Max Effective Range (m): Day: 2,000+ (est) Night: 800-1,300 Armor Penetration (mm): 418 at 2,000 m, 380 at 3,000 m 100-mm APFSDS-T, M1000, Belgian Maximum Aimed Range (m): 2,500 Max Effective Range (m): Day: 2,500 (est) Night: 800-1,300 Armor Penetration (mm): NATO triple heavy target, 4,500 m	100-mm HEAT, BK-17 Maximum Aimed Range (m): 2,500 Max Effective Range (m): Day: 1,000 (est) Night: 800-1,000 (est) Armor Penetration (mm): 380 100-mm Frag-HE, OF-32 Maximum Aimed Range (m): 4,000 Max Effective Range (m): Day: <2,500 Night: 800-1,300 Armor Penetration (mm): INA Other Ammunition Types: A variety of other rounds within the range noted above are available. They include the GIAT NR 322/NR 352 APFSDS-T and Slovak JPrSv AP-T with ranges beyond 2,000 m. Antitank Guided Missiles: Name: AT-10/BASTION Warhead Type: Shaped charge (HEAT) Armor Penetration (mm): 650 (RHA) Range (m): 4,000 (day only, see NOTES) Name: AT-10 Improved Warhead Type: Tandem shaped charge Armor Penetration (mm): 700 (RHA) behind ERA Range (m): 4,000 (day only, see NOTES)
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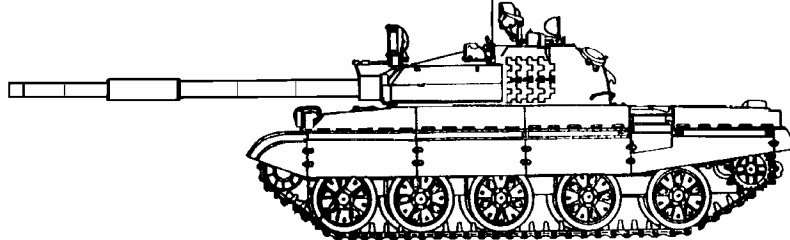
The 1K13 sight is both night sight and ATGM launcher sight; however, it cannot be used for both functions simultaneously.

T-55s with "bra armor", semi-circular add-on armor, have turret protection increased to 330 mm (KE) and 400-450 mm (CE). Other improvements available include a hull bottom reinforced against mines, better engines, rubber track pads, and a thermal sleeve for the gun.

Optional sights and fire control systems include the Israeli El-Op Red Tiger and Matador FCS, Swedish NobelTech T-series sight, and German Atlas MOLF. The Serbian SUV-T55A FCS, British Marconi Digital FCS, South African Tiger, and Belgian SABCA Titan offer upgraded function. One of the best is the Slovenian EFCS-3 integrated FCS.

A variety of thermal sights is available. They include the Russian/French ALIS and Namut-type sight from Peleng. There are thermal sights available for installation which permit night launch of ATGMs.

Russian Main Battle Tank T-62M

	<table><tr><th>Weapons & Ammunition Types</th><th>Typical Combat Load</th></tr><tr><td>115-mm rifled gun</td><td>(mix est) 40</td></tr><tr><td>APFSDS-T</td><td>12</td></tr><tr><td>HEAT</td><td>3</td></tr><tr><td>Frag-HE</td><td>20</td></tr><tr><td>ATGM</td><td>5</td></tr><tr><td>7.62-mm coax PKT MG</td><td>2,500</td></tr></table>	Weapons & Ammunition Types	Typical Combat Load	115-mm rifled gun	(mix est) 40	APFSDS-T	12	HEAT	3	Frag-HE	20	ATGM	5	7.62-mm coax PKT MG	2,500
Weapons & Ammunition Types	Typical Combat Load														
115-mm rifled gun	(mix est) 40														
APFSDS-T	12														
HEAT	3														
Frag-HE	20														
ATGM	5														
7.62-mm coax PKT MG	2,500														
SYSTEM Alternative Designations: INA Date of Introduction: 1983 Proliferation: At least 1 country Description: Crew: 4 Combat Weight (mt): 41.5 Chassis Length Overall (m): 6.63 Height Overall (m): 2.4 Width Overall (m): 3.52 Ground Pressure (kg/cm²): INA Automotive Performance: Engine Type: 620-hp Diesel Cruising Range (km): 450/650 with extra tanks Speed (km/h): Max Road: 45 Max Off-Road: INA Average Cross-Country: INA Max Swim: N/A Fording Depths (m): 1.4 Unprepared, 5.5 with snorkel Radio: R-173, R-173P, R-124 intercom Protection: Armor, Turret Front (mm): 230 Applique Armor (mm): Bra armor (+100 on turret) and track skirts Explosive Reactive Armor (mm): Available, replaces bra armor Active Protective System: Russian Drozd APS will fit Mineclearing Equipment: Roller-plow set, and plows Self-Entrenching Blade: No NBC Protection System: Nuclear radiation only Smoke Equipment: Vehicle engine exhaust smoke system 2 x 4 Smoke grenade launchers ARMAMENT Main Armaments: Caliber, Type, Name: 115-mm smoothbore gun, 2A20/Sheksna Rate of Fire (rd/min): 3-5 Loader Type: Manual Ready/Stowed Rounds: INA Elevation (°): -5 to +18 Fire on Move: Yes (gun rounds only--ATGMs require a short halt) Auxiliary Weapon: Caliber, Type, Name: 7.62-mm (7.62x 54R) machinegun PKT Mount Type: Turret coax Maximum Aimed Range (m): 2,000 Max Effective Range (m): Day: 800 Night: 800	Fire on Move: Yes Rate of Fire (rd/min): 250 rpm practical, 800 cyclic, 2-10 rd bursts ATGM Launcher: Name: 2A20 gun Launch Method: Gun-launched Guidance: SACLOS, Infrared laser-beam rider Command Link: Encoded laser-beam Launcher Dismountable: No FIRE CONTROL FCS Name: Volna Main Gun Stabilization: M1 Meteor 2-plane Rangefinder: KTD-2 Laser Infrared Searchlight: L-4 Sights w/Magnification: Gunner: Day: TShSM-41U, 3.5x and 7x Field of View (°): 18 and 8 Acquisition Range (m): 4,000 Night: 1K13-1 Field of View (°): INA Acquisition Range (m): 850-1,300, gun rounds only Commander Fire Main Gun: No VARIANTS T-62M is one of a variety of T-62 variants. T-62A: added a 12.7-mm MG. T-62M adds protection, FCS and ATGM capability. T-62 variants with a V-46 T-72-type engine add -1 to their designation. T-62M1: Variant with Volna FCS but no missile launch capability. T-62D: Variant with the Drozd APS vs ERA. T-62MK: Command variant. T-62MV: Version with ERA in place of the bra armor. The ERA includes Kontakt ERA and Kontakt-5 2nd-Generation ERA. MAIN ARMAMENT AMMUNITION Caliber, Type, Name: 115-mm APFSDS-T, BD/36-2 Maximum Aimed Range (m): 3,000 Max Effective Range (m): Day: 2,000+ (est) Night: 850-1,300 Armor Penetration (mm): 520 (RHA, 71° angle) at 1,000 m 115-mm APFSDS-T, BM-6 Russian Maximum Aimed Range(m): 3,000 Max Effective Range (m): Day: 1,500 Night: 850-1,300 Armor Penetration (mm): 237 (RHA) at 1,000 m														

Russian Main Battle Tank T-62M

115-mm HEAT, BK-4 Maximum Aimed Range (m): 1,500 (est) Max Effective Range (m): Day: 1,200 Night: 850-1,200 Armor Penetration (mm): 495 (RHA) 115-mm Frag-HE-T, OF-27 Maximum Aimed Range (m): 4,000 Max Effective Range (m): Day: 1,500-2,000 Night: 850-1,300 Armor Penetration (mm): INA Other Ammunition Types: BM-3 APFSDS, BM-4 APFSDS, BK-4M HEAT, BK-15 HEAT, OF-11 Frag-HE, OF-18 Frag-HE	Antitank Guided Missiles Name: AT-10/Sheksna Warhead Type: Shaped charge (HEAT) Armor Penetration (mm): 650 Range (m): 4,000 (day only, see NOTES) Name: AT-10 Improved Warhead Type: Tandem shaped charge Armor Penetration (mm): 700 behind ERA Range (m): 4,000 (day only, see NOTES)
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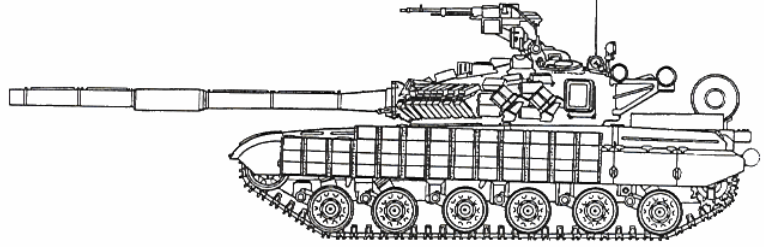
The 1K13 sight is both night sight and ATGM launcher sight; however, it cannot be used for both functions simultaneously.

Other improvements available include a hull bottom reinforced against mines, rubber track pads, and a thermal sleeve for the gun.

Optional sights and fire control systems include the Israeli El-Op Red Tiger and Matador FCS, Swedish NobelTech T-series sight, and German Atlas MOLF. The British Marconi Digital FCS, South African Tiger, and Belgian SABCA Titan offer upgraded function. One of the best is the Slovenian EFCS-3 integrated FCS.

A variety of thermal sights is available. They include the Russian Agava, French SAGEM-produced ALIS and Namut sight from Peleng. There are thermal sights available for installation which permit night launch of ATGMs.

Russian Main Battle Tank T-64B

 T-64BV	<table><tr><th>Weapons & Ammunition Types</th><th>Typical Combat Load</th></tr><tr><td>125-mm smoothbore gun APFSDS-T HEAT Frag-HE ATGM</td><td>37 (mix est) 12 2 17 6</td></tr><tr><td>7.62-mm coax MG 12.7-mm NSVT AA MG</td><td>1,250 300</td></tr></table>	Weapons & Ammunition Types	Typical Combat Load	125-mm smoothbore gun APFSDS-T HEAT Frag-HE ATGM	37 (mix est) 12 2 17 6	7.62-mm coax MG 12.7-mm NSVT AA MG	1,250 300
Weapons & Ammunition Types	Typical Combat Load						
125-mm smoothbore gun APFSDS-T HEAT Frag-HE ATGM	37 (mix est) 12 2 17 6						
7.62-mm coax MG 12.7-mm NSVT AA MG	1,250 300						
SYSTEM Alternative Designations: INA Date of Introduction: 1979 Proliferation: At least 2 countries Description: Crew: 3 Combat Weight (mt): 40.3 Chassis Length Overall (m): 6.45 Height Overall (m): 2.17 Width Overall (m): 3.41 Ground Pressure (kg/cm²): 0.86 Automotive Performance: Engine Type: 720-hp Diesel Cruising Range (km): 500 with extra tanks Speed (km/h): Max Road: 60 Max Off-Road: INA Average Cross-Country: INA Max Swim: N/A Fording Depths (m): 1.8 Unprepared, 5.0 w/snorkel Radio: R-123M, R-124 intercom Protection: Armor, Turret Front (mm): 450 KE RHA at 2,000 m/900 CE Applique Armor (mm): N/A Explosive Reactive Armor (mm): Standard on T-64BV Active Protective System: Available Mineclearing Equipment: Mine rollers and plows available Self-Entrenching Blade: Yes NBC Protection System: Yes Smoke Equipment: Smoke grenade launchers (4x 81-mm each side of turret), and 24 grenades. Vehicle engine exhaust smoke system ARMAMENT Main Armament: Caliber, Type, Name: 125-mm smoothbore gun 2A46-2 Rate of Fire (rd/min): 6-8 (lower in manual mode) Loader Type: Separate-loading autoloader, ATGMs manual Ready/Stowed Rounds: 24 in carousel, 6 ATGMs manual/7 stowed Elevation (°): -6 to +18 Fire on Move: Yes (30 km/h rounds/low speed or stop ATGMs) Auxiliary Weapon: Caliber, Type, Name: 7.62-mm (7.62x 54R) Machinegun PKT Mount Type: Turret coax Maximum Aimed Range (m): 2,000	Max Effective Range (m): Day: 1,000 Night: 850-1,300 Fire on Move: Yes Rate of Fire (rd/min): 250 practical / 650 cyclic, 2-10 round bursts Caliber, Type, Name: 12.7-mm (12.7x108) AA MG NSVT Mount Type: Turret top Maximum Aimed Range (m): 2,000 Max Effective Range (m): Day: 1,500 ground/1,600 for air targets (APDS) Night: 800-1,300 Fire on Move: Yes Rate of Fire (rd/min): 210 practical/ 800 air targets in bursts ATGM Launcher: Name: 2A46-2 tank gun Launch Method: Gun-launched Guidance: SACLOS Command Link: Encoded radio frequency Launcher Dismountable: No FIRE CONTROL FCS Name: INA Main Gun Stabilization: 2E26M 2-plane Rangefinder: Laser Infrared Searchlight: Yes Sights w/Magnification: Gunner: Day: 1G42 Field of View (°): INA Acquisition Range (m): 5,000 Night: TPN-1-49-23 Field of View (°): INA Acquisition Range (m): 800-1,300 (est) Commander Fire Main Gun: No VARIANTS T-64A: Production version of base tank. That tank has a history of reliability problems. It also lacks the high armor protection, track skirts, a FCS and ATGM launch capability of T-64B. T-64BK: Command tank version, with 10-m whip antenna. T-64B1: Version of -B tank without ATGM launch capability. T-64BV: Variant noted in the above line drawing has Kontakt ERA mounted. This variant is more likely for encounter by US forces.						

Russian Main Battle Tank T-64B continued

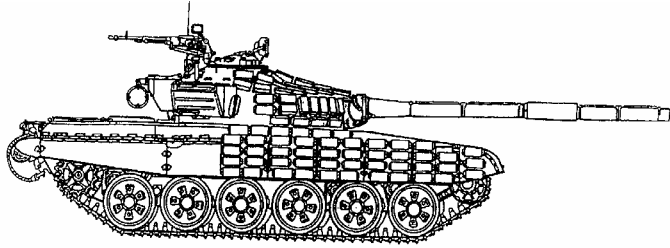
MAIN ARMAMENT AMMUNITION Caliber, Type, Name: 125-mm APFSDS-T, BM-42M Maximum Aimed Range (m): 3,000-4,000 Max Effective Range (m): Day: 2,000-3,000 Night: 850-1,300 Armor Penetration (mm): 590-630 at 2,000 meters 125-mm Frag-HE-T, OF-26 Maximum Aimed Range (m): 5,000 Max Effective Range (m): Day: INA Night: 850-1,300 Armor Penetration (mm): INA 125-mm HEAT-MP, BK-29M Maximum Aimed Range (m): 4,000 Max Effective Range (m): Day: 2,000-3,000 Night: 850-1300 Armor Penetration (mm): 650-750	125-mm HEAT, BK-27 Maximum Aimed Range (m): 4,000 Max Effective Range (m): Day: 2,000-3,000 Night: 850-1,300 Armor Penetration (mm): 700-800 Other Ammunition Types: Giat 125G1 APFSDS-T, Russian BM-42 and BM-32 APFSDS-T. Note: The Russians may have a version of the BM-42M with a DU penetrator. Antitank Guided Missile: Name: AT-8/SONGSTER Warhead Type: Shaped charge (HEAT) Armor Penetration (mm): 700 (RHA) conventional Range (m): 4,000
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NOTES

The night sight cannot be used to launch the ATGM. The daysight can be used at night for launching ATGMs if the target is illuminated. A variety of thermal sights is available. They include the Russian Agava-2, French SAGEM-produced ALIS and Namut sight from Peleng. There are thermal sights available for installation which permit night launch of ATGMs.

The more recent BK-27 HEAT round offers a triple-shaped charge warhead and increased penetration against conventional armors and ERA. The BK-29 round, with a hard penetrator in the nose is designed for use against reactive armor, and as an MP round has fragmentation effects. If the BK-29 HEAT-MP is used, it may substitute for Frag-HE (as with NATO countries) or complement Frag-HE. With three round natures (APFSDS-T, HEAT-MP, ATGMs) in the autoloader vs four, more antitank rounds would be available for the higher rate of fire.

Russian Main Battle Tank T-72B

 T-72B w/Kontakt ERA	<table><tr><th>Weapons & Ammunition Types</th><th>Typical Combat Load</th></tr><tr><td>125-mm smoothbore gun</td><td>45</td></tr><tr><td>APFSDS-T</td><td>(mix est) 15</td></tr><tr><td>HEAT</td><td>3</td></tr><tr><td>Frag-HE</td><td>21</td></tr><tr><td>ATGM</td><td>6</td></tr><tr><td>7.62-mm coax MG</td><td>2,000</td></tr><tr><td>12.7-mm AA MG</td><td>300</td></tr></table>	Weapons & Ammunition Types	Typical Combat Load	125-mm smoothbore gun	45	APFSDS-T	(mix est) 15	HEAT	3	Frag-HE	21	ATGM	6	7.62-mm coax MG	2,000	12.7-mm AA MG	300
Weapons & Ammunition Types	Typical Combat Load																
125-mm smoothbore gun	45																
APFSDS-T	(mix est) 15																
HEAT	3																
Frag-HE	21																
ATGM	6																
7.62-mm coax MG	2,000																
12.7-mm AA MG	300																
SYSTEM Alternative Designations: T-72S (export), SMT M1988 Date of Introduction: 1985 Proliferation: At least 2 countries Description: Crew: 3 Combat Weight (mt): 44.5 Chassis Length Overall (m): 6.91 Height Overall (m): 2.19 Width Overall (m): 3.58 Ground Pressure (kg/cm²): 0.90 Automotive Performance: Engine Type: 840-hp Diesel Cruising Range (km): 500/ 900 with external tanks Speed (km/h): Max Road: 60 Max Off-Road: 45 Average Cross-Country: 35 Max Swim: N/A Fording Depths (m): 1.2 Unprepared/5.0 with snorkel Radio: R-173 and R-134 Protection: Armor, Turret Front (mm): 520/950 against HEAT Applique Armor (mm): Side of hull over track skirt, turret top Explosive Reactive Armor (mm): Kontakt or Kontakt-5 ERA Active Protective System: Arena available Mineclearing Equipment: Roller-plow set, and plows available Self-Entrenching Blade: Yes NBC Protection System: Yes Smoke Equipment: Smoke grenade launchers (8x 81-mm left side of turret), and 32 grenades. Vehicle engine exhaust smoke system. ARMAMENT Main Armament: Caliber, Type, Name: 125-mm smoothbore gun 2A46M/ D-81TM Rate of Fire (rd/min): 4-6/2 in manual mode Loader Type: Autoloader (separate loading) and manual Ready/Stowed Rounds: 22/23 Elevation (°): -6 to +14 Fire on Move: Yes, up to 25 km/h. Depending on the road and distance to the target, most crews may halt before firing. Auxiliary Weapon: Caliber, Type, Name: 7.62-mm (7.62x 54R) Machinegun PKT Mount Type: Turret coax Maximum Aimed Range (m): 2,000 Max Effective Range (m): Day: 1,000 Night: 800	Fire on Move: Yes Rate of Fire (rd/min): 250 practical, 600 cyclic in 2-10 round bursts Caliber, Type, Name: 12.7-mm (12.7x108) AA MG NSVT Mount Type: Turret top Maximum Aimed Range (m): 2,000 Max Effective Range (m): Day: 1,500/1,000 antiaircraft Night: N/A Fire on Move: Yes Rate of Fire (rd/min): 200 practical, 600 cyclic in bursts ATGM Launcher: Name: 2A46M Launch Method: Gun-launched Guidance: SACLOS, Laser beam rider Command Link: Encoded infrared laser beam Launcher Dismountable: No FIRE CONTROL FCS Name: 1A40-1 Main Gun Stabilization: 2E42-2, 2-plane Rangefinder: TPD-K1M laser rangefinder Infrared Searchlight: Yes Sights w/Magnification: Gunner: Day: TPD-K1, 8 Field of View (°): 9 Acquisition Range (m): 3,000 with LRF, 5,000 without ATGM/Night: 1K13-495 5.6x (8x ATGM) Field of View (°): 6, 40 min (5 ATGM) Acquisition Range (m): INA Commander Fire Main Gun: No VARIANTS T-72BK: Commander's variant with additional radios T-72BM: Version with Kontakt-5 explosive reactive armor. This system is being fielded and is available for export. T-72S/Shilden: Russian export T-72A upgraded to be comparable to the T-72BM standard. Although similar to the T-72BM, it may have less turret front protection. The early T-72S tank has Kontakt ERA, as shown above. T-90: Successor to T-72BM. This tank has been tentatively approved for production and adoption as a standard tank, alongside the T-80U, for the Russian army. The T-90 uses the gun and 1G46 gunner sights from T-80U, a new engine, and thermal sights. Protective measures include Kontakt-5 ERA, laser warning receivers, and the SHTORA infrared ATGM jamming system.																

Russian Main Battle Tank T-72B continued

MAIN ARMAMENT AMMUNITION Caliber, Type, Name: 125-mm APFSDS-T, BM-42M Maximum Aimed Range (m): 3,000 Max Effective Range (m): Day: 2,000-3,000 Night: 850-1,300 Armor Penetration (mm): 590-630 at 2,000 meters 125-mm Frag-HE-T, OF-26 Maximum Aimed Range (m): 5,000 Max Effective Range (m): Day: INA Night: 850-1,300 Armor Penetration (mm): INA 125-mm HEAT-MP, BK-29M Maximum Aimed Range (m): 3,000 Max Effective Range (m): Day: INA Night: 850-1300 Armor Penetration (mm): 650-750	125-mm HEAT, BK-27 Maximum Aimed Range (m): 3,000 Max Effective Range (m): Day: INA Night: 850-1,300 Armor Penetration (mm): 700-800 Other Ammunition Types: Giat 125G1 APFSDS-T, Russian BM-42 and BM-32 APFSDS-T. Note: The Russians may have a version of the BM-42M with a DU penetrator. Antitank Guided Missiles: Name: AT-11/SVIR Warhead Type: Shaped charge (HEAT) Armor Penetration (mm): 700 behind ERA/800 conventional Range (m): 4,000 Name: AT-11B/INVAR Warhead Type: Tandem Shaped charge (HEAT) Armor Penetration (mm): 800 behind ERA /870 conventional Range (m): 4,000
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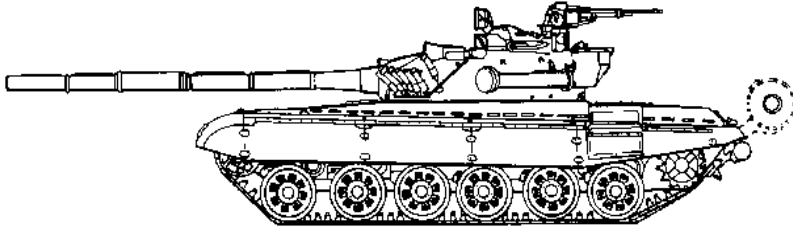
NOTES

The T-72B is the second main variant from the original Russian T-72 tank (after T-72A).

The 1K13-49 sight is both night sight and ATGM launch sight. However, it cannot be used for both functions simultaneously. A variety of thermal sights is available. They include the Russian Agava-2, French SAGEM-produced ALIS and Namut sight from Peleng. Thermal gunner night sights are available which permit night launch of ATGMs.

The more recent BK-27 HEAT round offers a triple-shaped charge warhead and increased penetration against conventional armors and ERA. The BK-29 round, with a hard penetrator in the nose is designed for use against reactive armor, and as an MP round has fragmentation effects. If the BK-29 HEAT-MP is used, it may substitute for Frag-HE (as with NATO countries) or complement Frag-HE. With three round natures (APFSDS-T, HEAT-MP, ATGMs) in the autoloader vs four, more antitank rounds would be available for the higher rate of fire.

Polish/Czechoslovakian Main Battle Tank T-72M1

	<table><tr><th>Weapons & Ammunition Types</th><th>Typical Combat Load</th></tr><tr><td>125-mm smoothbore gun APFSDS-T HEAT Frag-HE</td><td>44 (mix est) 15 7 22</td></tr><tr><td>7.62-mm coax MG</td><td>2,000</td></tr><tr><td>12.7-mm AA MG</td><td>300</td></tr></table>	Weapons & Ammunition Types	Typical Combat Load	125-mm smoothbore gun APFSDS-T HEAT Frag-HE	44 (mix est) 15 7 22	7.62-mm coax MG	2,000	12.7-mm AA MG	300
Weapons & Ammunition Types	Typical Combat Load								
125-mm smoothbore gun APFSDS-T HEAT Frag-HE	44 (mix est) 15 7 22								
7.62-mm coax MG	2,000								
12.7-mm AA MG	300								
SYSTEM Alternative Designations: Russian T-72A Date of Introduction: 1975 Proliferation: At least 7 countries Description: Crew: 3 Combat Weight (mt): 41.5 (without ERA) Chassis Length Overall (m): 6.91 Height Overall (m): 2.19 Width Overall (m): 3.59 Ground Pressure (kg/cm²): 0.90 Automotive Performance: Engine Type: 780-hp Diesel Cruising Range (km): 460/700 with extra tanks Speed (km/h): Max Road: 60 Max Off-Road: 45 Average Cross-Country: 35 Max Swim: N/A Fording Depths (m): 1.2 Unprepared/5.0 with snorkel Radio: R-173M Protection: Armor, Turret Front (mm): 500/560 against HEAT Applique Armor (mm): Side of hull over track skirt, turret top Explosive Reactive Armor (mm): 1st or 2nd Gen ERA available Active Protective System: Arena or Drozd available Mineclearing Equipment: Roller-plow set, and plows available Self-Entrenching Blade: Yes NBC Protection System: Yes Smoke Equipment: Smoke grenade launchers (6x 81-mm each side of turret), and 24 grenades. Vehicle engine exhaust smoke system. ARMAMENT Main Armaments: Caliber, Type, Name: 125-mm smoothbore gun 2A46M/ D-81TM Rate of Fire (rd/min): 4-6/2 in manual mode Loader Type: Autoloader (separate loading) and manual Ready/Stowed Rounds: 22/22 (22 in carousel) Elevation (°): -6 to +14 Fire on Move: Yes, up to 25 km/h. Depending on the road and distance to the target, most crews may halt before firing. Auxiliary Weapon: Caliber, Type, Name: 7.62-mm (7.62x 54R) Machinegun PKT Mount Type: Turret coax Maximum Aimed Range (m): 1,800	Max Effective Range (m): Day: 1,000 Night: 800 Fire on Move: Yes Rate of Fire (rd/min): 250 practical, 600 cyclic in 2-10 round bursts Caliber, Type, Name: 12.7-mm (12.7x108) AA MG NSVT Mount Type: Turret top Maximum Aimed Range (m): 2,000 Max Effective Range (m): Day: 1,500, 1,000 AA Night: N/A Fire on Move: Yes Rate of Fire (rd/min): 200 practical, 600 cyclic in bursts ATGM Launcher: N/A FIRE CONTROL FCS Name: INA Main Gun Stabilization: 2E28M, 2-plane Rangefinder: TPD-K1 laser rangefinder Infrared Searchlight: Yes Sights w/Magnification: Gunner: Day: TPD-K1 laser rangefinder sight, 8 x Field of View (°): 9 Acquisition Range (m): 3,000 with LRF, 5000 without Night: TPN-1-49, 5.5 x Field of View (°): 6 Acquisition Range (m): 800 Commander Fire Main Gun: No VARIANTS T-72: Original Russian tank from which T-72 variants were derived. T-72M: Original Polish and former-Czechoslovakian T-72-series tank from which Polish/Czechoslovakian T-72M1 was derived. T-72M differs from T-72 in replacing the right-side coincident rangefinder with a centerline-mounted TPDK-1 LRF. T-72A: The Russian variant differs from T-72 with the TPDK-1 LRF, added sideskirts, additional armor on the turret front and top, smoke grenade launchers, internal changes, and a slight weight increase. The Russian export version and Polish/Czechoslovakian counterparts are called T-72M1. Versions with Kontakt ERA are known as T-72AV /T-72 M1V. Please note that some countries have inventories of T-72, T-72M and T-72M1, with different versions of each variant. Also, many variants were upgraded or modified. Some T-72M1s do not have smoke grenade launchers or track skirts. Some T-72s/T-72Ms have smoke grenade launchers. More reliable discriminators are armor and rangefinder/FCS.								

Polish/Czechoslovakian Main Battle Tank T-72M1 continued

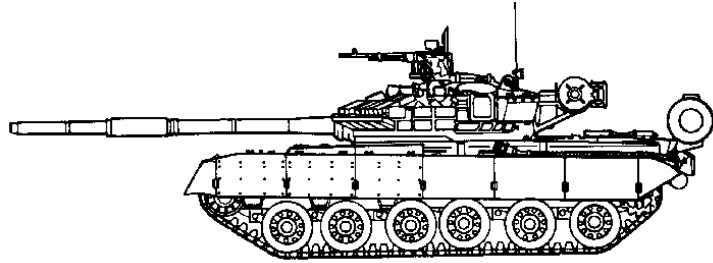
T-72AK/7T-2M1K: Commander's variant with additional radios T-72AM/Banan: Ukrainian T-72A upgrade with ERA, a new engine, and additional smoke grenade launchers. The T-72AG upgrade has a 1200-hp engine, Shtora-1 ATGM jammer, and 1G46 (T-80U) FCS with thermal night sights. T-72M1M: T-72M1 variant upgraded to T-72B standard. T-72M2/Moderna. Slovakian T-72M upgrade with new engine and fire control, SFIM thermal sight, laser warning receiver, ERA, and 2 x 20-mm AA guns on turret T-72M4CZ: Czech variant with TURMS FCS with thermal sight, new engine, increased protection ERA, and 48t weight. T72M3CZ is a less radical upgrade-- for instance existing engine is modified. T-72MP: Ukrainian upgrade with a 1,000-hp engine, added armor, Shtora-1, and SAGEM FCS and thermal sights. T-72S/Shilden: Russian export T-72A upgraded to T-72B standard. M-84: Former Yugoslavian tank upgraded to T-72M1 standard, but with indigenous sights. With an upgraded engine, the tank is M-84A. A Croatian improved version of M-84 is M84A4/Sniper, with improved fire control and thermal night sights. A Slovenian upgrade uses the state-of-the-art and the well-marketed EFCS-3 FCS. PT-91/Twardy: Polish upgrade tank with ERA, laser warning receiver, smoke grenade launchers, and Tiger fire control system. Sights include a thermal gunner night sight.	MAIN ARMAMENT AMMUNITION Caliber, Type, Name: 125-mm APFSDS-T, BM-42M Maximum Aimed Range (m): 3,000 Max Effective Range (m): Day: 2,000-3,000 Night: 850-1,300 Armor Penetration (mm): 590-630 at 2,000 meters 125-mm Frag-HE-T, OF-26 Maximum Aimed Range (m): 5,000 Max Effective Range (m): Day: INA Night: 850-1,300 Armor Penetration (mm): INA 125-mm HEAT-MP, BK-29M Maximum Aimed Range (m): 3,000 Max Effective Range (m): Day: INA Night: 850-1300 Armor Penetration (mm): 650-750 125-mm HEAT, BK-27 Maximum Aimed Range (m): 3,000 Max Effective Range (m): Day: INA Night: 850-1,300 Armor Penetration (mm): 700-800 Other Ammunition Types: Giat 125G1 APFSDS-T, Russian BM-42 and BM-32 APFSDS-T. Note: The Russians may have a version of the BM-42M with a DU penetrator.
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NOTES

A variety of thermal sights is available. They include the Russian Agava-2, French SAGEM-produced ALIS and Namut sight from Peleng.

The more recent BK-27 HEAT round offers a triple-shaped charge warhead and increased penetration against conventional armors and ERA. The BK-29 round, with a hard penetrator in the nose is designed for use against reactive armor, and as an MP round has fragmentation effects. If the BK-29 HEAT-MP is used, it may substitute for Frag-HE (as with NATO countries) or complement Frag-HE. With three round natures (APFSDS-T, HEAT-MP, ATGMs) in the autoloader vs four, more antitank rounds would be available for the higher rate of fire.

Russian Main Battle Tank T-80B

	<table><tr><th>Weapons & Ammunition Types</th><th>Typical Combat Load</th></tr><tr><td>125-mm smoothbore gun APFSDS-T HEAT Frag-HE ATGM</td><td>45 (mix est) 15 3 21 6</td></tr><tr><td>7.62-mm coax MG 12.7-mm NSVT AA MG</td><td>1,250 500</td></tr></table>	Weapons & Ammunition Types	Typical Combat Load	125-mm smoothbore gun APFSDS-T HEAT Frag-HE ATGM	45 (mix est) 15 3 21 6	7.62-mm coax MG 12.7-mm NSVT AA MG	1,250 500
Weapons & Ammunition Types	Typical Combat Load						
125-mm smoothbore gun APFSDS-T HEAT Frag-HE ATGM	45 (mix est) 15 3 21 6						
7.62-mm coax MG 12.7-mm NSVT AA MG	1,250 500						
SYSTEM Alternative Designations: See NOTES Date of Introduction: 1978 Proliferation: At least 1 country Description: Crew: 3 Combat Weight (mt): 44.5 Chassis Length Overall (m): 6.98 Height Overall (m): 2.22 Width Overall (m): 3.58 Ground Pressure (kg/cm²): 0.87 Automotive Performance: Engine Type: 1,000-hp or 1,100-hp Gas turbine (multifuel), Cruising Range (km): 370/ 500 with extra tanks Speed (km/h): Max Road: 70 Max Off-Road: 48 Average Cross-Country: 40 Max Swim: N/A Fording Depths (m): 1.8 Unprepared, 5.0 w/snorkel, 12.0 with BROD-M system Radio: R-173, R-174 intercom Protection: Armor, Turret Front (mm): Defeat 120-mm rounds (triple layer) Applique Armor (mm): N/A Explosive Reactive Armor (mm): 1st Generation ERA available Active Protective System: Available Mineclearing Equipment: Mine rollers and plows available Self-Entrenching Blade: Yes NBC Protection System: Yes Smoke Equipment: Smoke grenade launchers (4x 81-mm each side of turret), and 24 grenades. Vehicle engine exhaust smoke system ARMAMENT Main Armaments: Caliber, Type, Name: 125-mm smoothbore gun 2A46-2 Rate of Fire (rd/min): 6-8 (lower in manual mode) Loader Type: KORZINA separate-loading autoloader and manual Ready/Stowed Rounds: 28 in carousel/17 rounds stowed but readily available for manual loading Elevation (°): -7 to +20 Fire on Move: Yes (30 km/h gun rounds/low speed or stop ATGMs) Auxiliary Weapon: Caliber, Type, Name: 7.62-mm (7.62x 54R) Machinegun PKT Mount Type: Turret coax Maximum Aimed Range (m): 2,000	Max Effective Range (m): Day: 1,000 Night: 850-1,300 Fire on Move: Yes Rate of Fire (rd/min): 250 practical / 650 cyclic, 2-10 round bursts Caliber, Type, Name: 12.7-mm (12.7x108) AA MG NSVT Mount Type: Turret top Maximum Aimed Range (m): 2,000 Max Effective Range (m): Day: 1,500 ground/1,600 for air targets (APDS) Night: 800-1,300 Fire on Move: Yes Rate of Fire (rd/min): 210 practical/ 800 air targets in bursts ATGM Launcher: Name: 2A46-2 tank gun Launch Method: Gun-launched Guidance: SACLOS Command Link: Encoded radio frequency Launcher Dismountable: No FIRE CONTROL FCS Name: FCS 1A33 Main Gun Stabilization: 2E26M 2-plane Rangefinder: Laser Infrared Searchlight: Yes Sights w/Magnification: Gunner: Day: 1G42 Field of View (°): INA Acquisition Range (m): 5,000 Night: 1-4A Field of View (°): INA Acquisition Range (m): 800-1,300 (est) Commander Fire Main Gun: No VARIANTS T-80BV: Variant noted in the above line drawing has ERA mounted. This variant is more likely for encounter by US forces. MAIN ARMAMENT AMMUNITION Caliber, Type, Name: 125-mm APFSDS-T, BM-42M Maximum Aimed Range (m): 3,000-4,000 Max Effective Range (m): Day: 2,000-3,000 Night: 850-1,300 Armor Penetration (mm): 590-630 at 2,000 meters						

Russian Main Battle Tank T-80B continued

125-mm Frag-HE-T, OF-26 Maximum Aimed Range (m): 5,000 Max Effective Range (m): Day: INA Night: 850-1,300 Armor Penetration (mm): INA 125-mm HEAT-MP, BK-29M Maximum Aimed Range (m): 4,000 Max Effective Range (m): Day: 2,000-3,000 Night: 850-1300 Armor Penetration (mm): 650-750 125-mm HEAT, BK-27 Maximum Aimed Range (m): 4,000 Max Effective Range (m): Day: 2,000-3,000 Night: 850-1,300 Armor Penetration (mm): 700-800	Other Ammunition Types: Giat 125G1 APFSDS-T, Russian BM-42 and BM-32 APFSDS-T. Note: The Russians may have a version of the BM-42M with a DU penetrator. Antitank Guided Missile: Name: AT-8/SONGSTER Warhead Type: Shaped charge (HEAT) Armor Penetration (mm): 700 (RHA) conventional Range (m): 4,000
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NOTES

The T-80B and -BV variants are often misidentified as T-80. They are visibly different and bear other distinctions, such as T-80B/-BV capability for launching AT-8/ Songster ATGM.

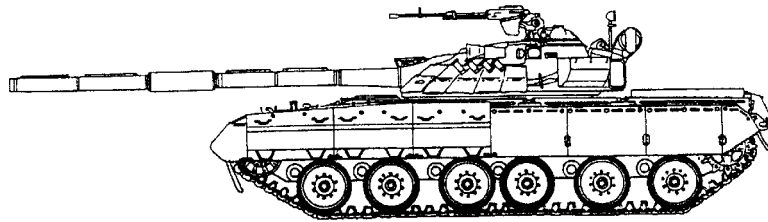
The night sight cannot be used to launch the ATGM. The daysight can be used at night for launching ATGMs if the target is illuminated. A variety of thermal sights is available. They include the Russian Agava-2, French SAGEM-produced ALIS and Namut sight from Peleng. There are thermal sights available for installation which permit night launch of ATGMs.

The 12.7-mm MG NSVT has both remote electronically operated sight PZU-5 and gun-mounted K10-T reflex sight.

The more recent BK-27 HEAT round offers a triple-shaped charge warhead and increased penetration against conventional armors and ERA. The BK-29 round, with a hard penetrator in the nose is designed for use against reactive armor, and as an MP round has fragmentation effects. If the BK-29 HEAT-MP is used, it may substitute for Frag-HE (as with NATO countries) or complement Frag-HE. With three round natures (APFSDS-T, HEAT-MP, ATGMs) in the autoloader vs four, more antitank rounds would be available for the higher rate of fire.

The ATGM may be launched while moving slowly (NFI). The AT-8 can be auto-loaded with the two halves mated during ramming; but the stub charge is manually loaded.

Russian Main Battle Tank T-80U

	<table><tr><th>Weapons & Ammunition Types</th><th>Typical Combat Load</th></tr><tr><td>125-mm smoothbore gun</td><td>45</td></tr><tr><td>APFSDS-T</td><td>(mix est) 15</td></tr><tr><td>HEAT</td><td>3</td></tr><tr><td>Frag-HE</td><td>21</td></tr><tr><td>ATGM</td><td>6</td></tr><tr><td>7.62-mm coax MG</td><td>1,250</td></tr><tr><td>12.7-mm NSVT AA MG</td><td>500</td></tr></table>	Weapons & Ammunition Types	Typical Combat Load	125-mm smoothbore gun	45	APFSDS-T	(mix est) 15	HEAT	3	Frag-HE	21	ATGM	6	7.62-mm coax MG	1,250	12.7-mm NSVT AA MG	500
Weapons & Ammunition Types	Typical Combat Load																
125-mm smoothbore gun	45																
APFSDS-T	(mix est) 15																
HEAT	3																
Frag-HE	21																
ATGM	6																
7.62-mm coax MG	1,250																
12.7-mm NSVT AA MG	500																
SYSTEM Alternative Designations: SMT (Soviet Medium Tank) M1989 Date of Introduction: 1987 Proliferation: At least 3 countries Description: Crew: 3 Combat Weight (mt): 46.0 Chassis Length Overall (m): 7.01 Height Overall (m): 2.20 Width Overall (m): 3.60 Ground Pressure (kg/cm²): 0.92 Automotive Performance: Engine Type: 1250-hp Gas turbine (multi-fuel), diesel on T-80UD Cruising Range (km): 335 km/600 km with extra tanks Speed (km/h): Max Road: 70 Max Off-Road: 48 Average Cross-Country: 40 Max Swim: N/A Fording Depths (m): 1.8 Unprepared, 5.0 w/snorkel, 12.0 with BROD-M system Radio: R-173, R-174 intercom Protection: Armor, Turret Front (mm): Against 120-mm ammunition Applique Armor (mm): Side of hull , over track skirt Explosive Reactive Armor (mm): Kontakt-5 2nd Generation ERA Active Protective System: ARENA is available Mineclearing Equipment: Roller-plow set and plows available Self-Entrenching Blade: Yes NBC Protection System: Yes Smoke Equipment: Smoke grenade launchers (4x 81-mm each side of turret), and 24 grenades. Vehicle engine exhaust smoke system. ARMAMENT Main Armaments: Caliber, Type, Name: 125-mm smoothbore gun 2A46M-1 Rate of Fire (rd/min): 7-8 (lower in manual mode) Loader Type: KORZINA separate-loading autoloader, and manual Ready/Stowed Rounds: 28 in carousel/17 stowed (manual loaded) Elevation (°): -4 to +18 Fire on Move: Yes (gun rounds and ATGMs) Auxiliary Weapon: Caliber, Type, Name: 7.62-mm (7.62x 54R) Machinegun PKT Mount Type: Turret coaxial Maximum Aimed Range (m): 2,000	Max Effective Range (m): Day: 800 Night: 800 Fire on Move: Yes Rate of Fire (rd/min): 250 practical / 650 cyclic, 2-10 round bursts Caliber, Type, Name: 12.7-mm (12.7x108) AA MG NSVT Mount Type: Turret top Maximum Aimed Range (m): 2,000 Max Effective Range (m): Day: 1,500 Night: 800-1,300 Fire on Move: Yes Rate of Fire (rd/min): 210 practical/ 800 air targets in bursts ATGM Launcher: Name: 2A46M-1 tank gun Launch Method: Gun-launched Guidance: SACLOS, Laser-beam rider Command Link: Encoded infrared laser-beam Launcher Dismountable: No FIRE CONTROL FCS Name: FCS 1A42 Main Gun Stabilization: 2E42, 2-plane Rangefinder: Laser Infrared Searchlight: Yes Sights w/Magnification: Gunner: Day: 1G46/PERFECT, 3.6/12x Field of View (°): INA Acquisition Range (m): 5,000 (70%P-hit for ATGM) Night: AGAVA-2 Field of View (°): INA Acquisition Range (m): 2,600 (gun rounds only) Commander Fire Main Gun: Yes VARIANTS T-80UD: Version produced in the Ukraine with a 1000-hp diesel engine instead of the turbine engine, and 1st generation ERA. T-80UK: Command version with R-163-50K and R-163-U radios, TNA-4 land navigation system, and an electronic fuze-setting device that permits use of Ainet Shrapnel Round. The AGAVA thermal sight provides a 2,600-meter night acquisition range. T-84: Recent Ukrainian upgrade of T-80UD with a welded turret, a French ALIS thermal sight, a more powerful engine, optional use of ARENA active protection system (APS) and SHTORA-1 active IR ATGM jammer system. Prototypes have been demonstrated, and the tank is available for export.																

Russian Main Battle Tank T-80U continued

MAIN ARMAMENT AMMUNITION Caliber, Type, Name: 125-mm APFSDS-T, BM-42M Maximum Aimed Range (m): 3,000-4,000 Max Effective Range (m): Day: 2,000-3,000 Night: 800-1,300 Armor Penetration (mm): 590-630 at 2,000 meters 125-mm HE-Shapnel Focused-fragmentation, Ainet Maximum Aimed Range (m): 5,000 Max Effective Range (m): Day: 4,000 Night: 800-1,300 Tactical AA Range: 4,000-5,000 Armor Penetration (mm): INA 125-mm Frag-HE-T, OF-26 Maximum Aimed Range (m): 5,000 Max Effective Range (m): Day: INA Night: 800-1,300 Armor Penetration (mm): INA 125-mm HEAT-MP, BK-29M Maximum Aimed Range (m): 4,000 Max Effective Range (m): Day: INA Night: 800-1300 Armor Penetration (mm): 650-750	125-mm HEAT, BK-27 Maximum Aimed Range (m): 4,000 Max Effective Range (m): Day: INA Night: 800-1,300 Armor Penetration (mm): 700-800 Other Ammunition Types: Giat 125G1 APFSDS-T, Russian BM-42 and BM-32 APFSDS-T. Note: The Russians may have a version of the BM-42M with a DU penetrator. Antitank Guided Missiles: Name: AT-11/SVIR Warhead Type: Shaped charge (HEAT) Armor Penetration (mm): 700 (RHA) behind ERA/800 conventional Range (m): 5,000 Name: AT-11B/INVAR Warhead Type: Tandem shaped charge Armor Penetration (mm): 800 (RHA) behind ERA /870 conventional Range (m): 5,000
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NOTES

Line drawing is a T-80UD.

GTA-18A Auxiliary Power Unit is used when the engine is off.

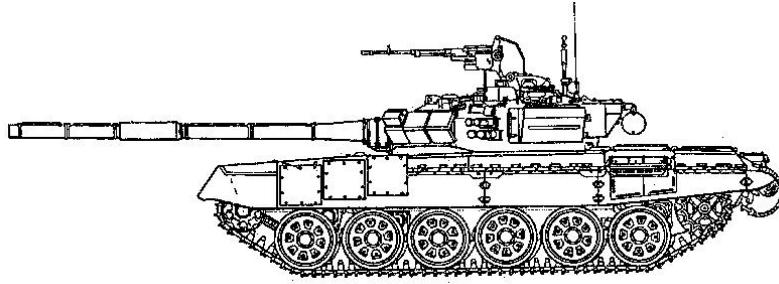
The BK-29 round, with a hard penetrator in the nose is designed for use against reactive armor, and as an MP round has fragmentation effects. The more recent BK-27 HEAT round offers a triple-shaped charge warhead and 50 mm more penetration.

The electronic round fuzing system for Ainet rounds is available for other tanks. This round uses technology similar to that for French Oerlikon's AHEAD round. The round is specially designed to defeat targets by firing fragmentation patterns forward and radially, based on computer calculated settings from the laser rangefinder and other inputs. Targets are helicopters and dug in or defilade priority ground threats, such as ATGM positions. Rate of fire is 4 rd/min.

The 12.7-mm MG NSVT has both remote electronically operated sight PZU-5 and gun-mounted K10-T reflex sight.

The original night sight is the II Buran-PA (800-1300 meters range). The sight cannot be used to launch the ATGM. The daysight can be used at night for launching ATGMs if the target is illuminated. A variety of thermal sights is available. They include the Russian Agava-2, French SAGEM-produced ALIS and Namut sight from Peleng. There are thermal sights available for installation which permit night launch of ATGMs.

Russian Main Battle Tank T-90

	<table><tr><th>Weapons & Ammunition Types</th><th>Typical Combat Load</th></tr><tr><td>125-mm smoothbore gun APFSDS-T HEAT-MP/HEAT HE-Shrapnel/Frag-HE ATGM</td><td>43 (mix est) 14 3 20 6</td></tr><tr><td>7.62-mm coax MG</td><td>2,000</td></tr><tr><td>12.7-mm NSVT AA MG</td><td>300</td></tr></table>	Weapons & Ammunition Types	Typical Combat Load	125-mm smoothbore gun APFSDS-T HEAT-MP/HEAT HE-Shrapnel/Frag-HE ATGM	43 (mix est) 14 3 20 6	7.62-mm coax MG	2,000	12.7-mm NSVT AA MG	300
Weapons & Ammunition Types	Typical Combat Load								
125-mm smoothbore gun APFSDS-T HEAT-MP/HEAT HE-Shrapnel/Frag-HE ATGM	43 (mix est) 14 3 20 6								
7.62-mm coax MG	2,000								
12.7-mm NSVT AA MG	300								
SYSTEM Alternative Designations: T-90S, T-90E Date of Introduction: 1994 Proliferation: At least 1 country Description: Crew: 3 Combat Weight (mt): 46.5 Chassis Length Overall (m): 6.86 Height Overall (m): 2.23 Width Overall (m): 3.37 Ground Pressure (kg/cm²): 0.87 Automotive Performance: Engine Type: 1,000-hp Diesel (See NOTES) Cruising Range (km): 500 km/650 km with extra tanks Speed (km/h): Max Road: 60 Max Off-Road: INA Average Cross-Country: INA Max Swim: N/A Fording Depths (m): 1.2 Unprepared, 5.0 w/snorkel Radio: R-163-504 UHF, R-163-UP receiver/R-173 for T-90S Protection: Armor, Turret Front (mm): 780-810 KE, 1,020-1,220 CE Applique Armor (mm): Turret roof, front of track skirt Explosive Reactive Armor (mm): Kontakt-5 2nd Generation ERA Active Protective System: TshU-1-7/Shtora-1 countermeasure suite Mineclearing Equipment: Roller-plow set and plows available Self-Entrenching Blade: Yes NBC Protection System: Yes Smoke Equipment: 12 x 3D17 smoke grenade launchers, VEES ARMAMENT Main Armaments: Caliber, Type, Name: 125-mm smoothbore gun 2A46M-1 or -4 Rate of Fire (rd/min): 7-8 (lower in manual mode) Loader Type: Separate-loading autoloader, and manual Ready/Stowed Rounds: 22 in carousel, 15 more at hand /6 (est) Elevation (°): INA Fire on Move: Yes (gun rounds and ATGMs)	Auxiliary Weapon: Caliber, Type, Name: 7.62-mm (7.62x 54R) Machinegun PKT Mount Type: Turret coaxial Maximum Aimed Range (m): 2,000 Max Effective Range (m): Day: 800 Night: 800 Fire on Move: Yes Rate of Fire (rd/min): 250 practical / 650 cyclic, 2-10 round bursts Caliber, Type, Name: 12.7-mm (12.7x108) AA MG NSVT Mount Type: Turret top Maximum Aimed Range (m): 2,000 Max Effective Range (m): Day: 1,500 Night: 800-1,300 Fire on Move: Yes Rate of Fire (rd/min): 210 practical/ 800 air targets in bursts ATGM Launcher: Name: 2A46M-1 tank gun Launch Method: Gun-launched Guidance: SACLOS laser-beam rider, REFLEKS missile launcher Command Link: Encoded infrared laser beam Launcher Dismountable: No FIRE CONTROL FCS Name: FCS 1A45T Main Gun Stabilization: 2E42-4, 2-plane Rangefinder: Laser sight Infrared Searchlight: Yes, when II sight employed (See NOTES) Sights w/Magnification: Gunner: Day: 1A43 and 1G46/PERFECT, 3.6/12x Field of View (°): 20/2.5 Acquisition Range (m): 5,000 detection (70%P-hit for ATGM) Night: AGAVA-2 (See NOTES) Field of View (°): INA Acquisition Range (m): 2,600 (See NOTES) Commander Fire Main Gun: Yes VARIANTS T-90E: INA T-90S: Export variant T-90SK: Export command variant								

Russian Main Battle Tank T-90 continued

MAIN ARMAMENT AMMUNITION Caliber, Type, Name: 125-mm APFSDS-T, BM-42M Maximum Aimed Range (m): 3,000-4,000 Max Effective Range (m): Day: 2,000-3,000 Night: 2,000-2,600 Armor Penetration (mm): 590-630 at 2,000 meters 125-mm HE-Shapnel Focused-Fragmentation, Ainet Maximum Aimed Range (m): 5,000 Max Effective Range (m): Day: 4,000 Night: 2,600 Tactical AA Range: 4,000-5,000 Armor Penetration (mm): INA 125-mm Frag-HE-T, OF-26 Maximum Aimed Range (m): 5,000 Max Effective Range (m): Day: INA Night: 2,600 Armor Penetration (mm): INA 125-mm HEAT-MP, BK-29M Maximum Aimed Range (m): 4,000 Max Effective Range (m): Day: INA Night: 2,600 Armor Penetration (mm): 650-750	125-mm HEAT, BK-27 Maximum Aimed Range (m): 4,000 Max Effective Range (m): Day: INA Night: 2,600 Armor Penetration (mm): 700-800 Other Ammunition Types: French Giat 125G1 APFSDS-T, Russian BM-42 and BM-32 APFSDS-T. Note: The Russians may have a version of the BM-42M with a DU penetrator. Antitank Guided Missiles: Name: AT-11/SVIR Warhead Type: Shaped charge (HEAT) Armor Penetration (mm): 700 (RHA) behind ERA/800 conventional Range (m): 5,000 Name: AT-11B/INVAR Warhead Type: Tandem shaped charge Armor Penetration (mm): 800 (RHA) behind ERA /870 conventional Range (m): 5,000
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NOTES

The original tank version of the tank has an 840-hp diesel engine. The engine in subsequent models is upgraded. Engine options include 950, 1,000 and 1,100 hp.

The tank may be fielded with the original II sight from the T-80 series (Buran-PA, 800-1300 meters range). However, marketing materials feature the AGAVA-2 thermal sight. There are thermal sights available which permit night launch of ATGMs.

The T-90 may be fielded with full Shtora-1 package (laser warning receiver with auto-slew gun capability, LWR-directed smoke grenade launchers, and EO-IR jammer), with a partial package, or without Shtora-1. Shtora-1 illuminators can be used for night illumination.

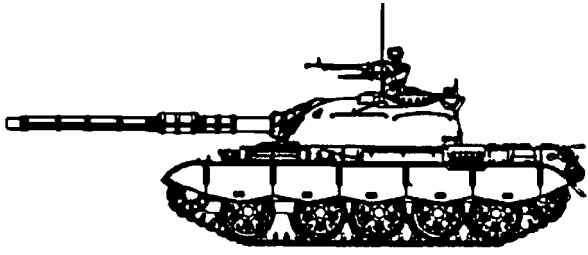
An improved gun, 2A46M-4, with improved accuracy and use life is available for fitting to the T-90.

The BK-29 round, with a hard penetrator in the nose is designed for use against reactive armor, and as an MP round has fragmentation effects. The more recent BK-27 HEAT round offers a triple-shaped charge warhead and 50 mm more penetration.

The electronic fuzing system for HE-Shrapnel rounds uses technology similar to that for French Oerlikon's AHEAD round. The round is specially designed to defeat targets by firing fragmentation patterns forward and radially, based on computer calculated settings from the LRF and other inputs. Targets are helicopters and dug in or defilade priority ground threats, such as ATGM positions. Rate of fire is 4 rd/min.

The 12.7-mm MG NSVT has both remote electronically operated sight PZU-5 with vertical stabilization, night acquisition, and a gun-mounted K10-T reflex sight.

Chinese Main Battle Tank Type 59-II

	<table><tr><th>Weapons & Ammunition Types</th><th>Typical Combat Load</th></tr><tr><td>105-mm rifled gun L7</td><td>34</td></tr><tr><td>New CH APFSDS-T</td><td>12</td></tr><tr><td>M456 HEAT</td><td>6</td></tr><tr><td>L35 HESH</td><td>16</td></tr><tr><td>7.62-mm coax MG</td><td>2,000</td></tr><tr><td>7.62-mm bow MG</td><td>1,000</td></tr><tr><td>12.7-mm AA MG</td><td>500</td></tr></table>	Weapons & Ammunition Types	Typical Combat Load	105-mm rifled gun L7	34	New CH APFSDS-T	12	M456 HEAT	6	L35 HESH	16	7.62-mm coax MG	2,000	7.62-mm bow MG	1,000	12.7-mm AA MG	500
Weapons & Ammunition Types	Typical Combat Load																
105-mm rifled gun L7	34																
New CH APFSDS-T	12																
M456 HEAT	6																
L35 HESH	16																
7.62-mm coax MG	2,000																
7.62-mm bow MG	1,000																
12.7-mm AA MG	500																
SYSTEM Alternative Designations: WZ 120B Date of Introduction: 1951 Proliferation: At least 2 countries Description: Crew: 4 Combat Weight (mt): 36.5-37.0 Chassis Length Overall (m): 6.04 Height Overall (m): 2.59 Width Overall (m): 3.30 Ground Pressure (kg/cm²): 0.8 Automotive Performance: Engine Type: 520-hp Diesel Cruising Range (km): 440/600 with external tanks Speed (km/h): Max Road: 50 Max Off-Road: 25 Average Cross-Country: INA Max Swim: N/A Fording Depths (m): 1.4 Unprepared, 5.5 with snorkel Radio: INA Protection: Armor, Turret Front (mm): 203 Applique Armor (mm): Track skirts are fitted to some tanks Explosive Reactive Armor (mm): N/A Active Protective System: N/A Mineclearing Equipment: Mine plows and roller-plows available Self-Entrenching Blade: N/A NBC Protection System: N/A Smoke Equipment: 8 x 81-mm smoke grenade launchers Vehicle engine exhaust smoke system ARMAMENT Main Armaments: Caliber, Type, Name: 105-mm rifled gun, similar to L7 Rate of Fire (rd/min): 6-10 Loader Type: Manual Ready/Stowed Rounds: INA Elevation (°): -5/+18 Fire on Move: Yes Auxiliary Weapon: Caliber, Type, Name: 7.62-mm (7.62x 54R) Machine gun Type 59T Mount Type: Turret coax Maximum Aimed Range (m): 2,000 Max Effective Range (m): Day: 1,000 Night: 800	Fire on Move: Yes Rate of Fire (rd/min): 250 practical, 600 cyclic in 2-10 round bursts Caliber, Type, Name: 7.62-mm (7.62x 54R) Machine gun Type 59T Mount Type: Bow ball mount Maximum Aimed Range (m): 1,000 Max Effective Range (m): Day: 1,000 Night: N/A Fire on Move: Yes Rate of Fire (rd/min): 250 practical, 600 cyclic in 2-10 round bursts Caliber, Type, Name: 12.7-mm (12.7x108) AA MG Type 54 Mount Type: Turret cupola Maximum Aimed Range (m): 2,000 Max Effective Range (m): Day: 1,500 ground/1,600 for air targets (APDS) Night: N/A, II sights available Fire on Move: Yes Rate of Fire (rd/min): 80-100 practical, 600 air targets 2-10 rd bursts FIRE CONTROL FCS Name: UI light spot fire control system Main Gun Stabilization: 2-plane Rangefinder: LRF Infrared Searchlight: Yes Sights w/Magnification: Gunner: Day: INA Field of View (°): INA Acquisition Range (m): INA Night: Type DC 1024/00 II sights, x7 Field of View (°): 6 Acquisition Range (m): 1,000 Commander Fire Main Gun: No VARIANTS: Type 59: Original model is a copy of the Former Soviet T-54 MBT and has a 100-mm main gun. T-72Z/ Safir 74: Iranian variant which constitutes state of the art for upgraded 50s-generation former Warsaw Pact tanks. This tank has a 780-hp diesel engine, track skirts, and smoke grenade launchers. An Iranian ERA package will fit T-72Z. Armament includes an M68 105-mm rifled gun, 7.62-mm Type 59T (PKT) MG, and a 12.7-mm Type 59 (DSHKM) MG. The cannon can launch AT-10/ Bastion ATGMs (to 4000 meters) and fire a broad range of NATO 105-mm ammunition. Fire control includes the robust Slovenian EFCS-3-55 fire control system with stabilization, a laser rangefinder, and a ballistic computer. The FCS includes a commander's independent viewer and target designation system, and II gunner night sights.																

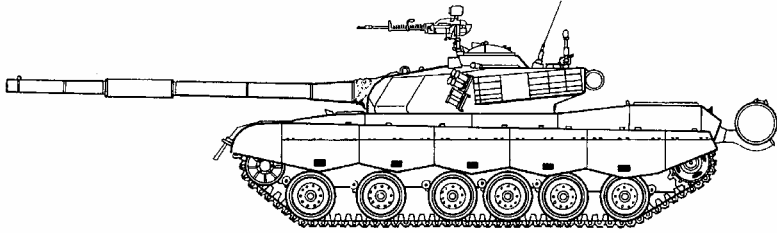
Chinese Main Battle Tank Type 59-II continued

MAIN ARMAMENT AMMUNITION Caliber, Type, Name: 105-mm APFSDS, H6/62 Maximum Aimed Range (m): 3,000 Max Effective Range (m): Day: 2,000-3,000 (est) Night: 800-1,300 Armor Penetration (mm): INA 105-mm APFSDS, UI (New Chinese) Maximum Aimed Range (m): 3,000 Max Effective Range (m): Day: 2,000-3,000 (est) Night: 800-1,300 Armor Penetration (mm): 460 at 2,000 m	105-mm HEAT, M456 (multinational) Maximum Aimed Range (m): 3,000 Max Effective Range (m): Day: 1,500-2,500 (est) Night: 800-1,300 Armor Penetration (mm): 432, NATO single heavy target 105-mm HESH, L35 (UK) Maximum Aimed Range (m): 5,000 Max Effective Range (m): Day: 2,000-3,000 (est) Night: 800-1,300 Armor Penetration (mm): NATO single heavy target Other Ammunition Types: Chinese Type 83/ UK L64/ US M735 APFSDS, UK L52 APDS, multinational M393 HEP-T, French OE 105-F1 HE, L39 Smoke, cannister
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NOTES

GEC-Marconi Centaur fire control system is available. British Barr and Stroud thermal based FCS can be fitted.

Chinese Main Battle Tank Type 85-IIM

	<table><tr><th>Weapons & Ammunition Types</th><th>Typical Combat Load</th></tr><tr><td>125-mm smoothbore gun APFSDS-T HEAT Frag-HE</td><td>42 (mix est) 15 6 21</td></tr><tr><td>7.62-mm coax MG</td><td>2,000</td></tr><tr><td>12.7-mm cupola AAMG</td><td>500</td></tr></table>	Weapons & Ammunition Types	Typical Combat Load	125-mm smoothbore gun APFSDS-T HEAT Frag-HE	42 (mix est) 15 6 21	7.62-mm coax MG	2,000	12.7-mm cupola AAMG	500
Weapons & Ammunition Types	Typical Combat Load								
125-mm smoothbore gun APFSDS-T HEAT Frag-HE	42 (mix est) 15 6 21								
7.62-mm coax MG	2,000								
12.7-mm cupola AAMG	500								
SYSTEM Alternative Designations: INA Date of Introduction: 1991 Proliferation: At least 2 countries Description: Crew: 3 Combat Weight (mt): 41.0 Chassis Length Overall (m): 10.28 Height Overall (m): 2.30 Width Overall (m): 3.450 Ground Pressure (kg/cm²): 0.771 Automotive Performance: Engine Type: 730-hp Diesel Cruising Range (km): 700/900 with external tanks Speed (km/h): Max Road: 57 Max Off-Road: 45 Average Cross-Country: 35 Max Swim: N/A Fording Depths (m): 1.4 Unprepared, 2.4 with snorkel Radio: INA Protection: Armor, Turret Front (mm): INA Applique Armor (mm): Track skirts. Composite panels available. Explosive Reactive Armor (mm): N/A Active Protective System: N/A Mineclearing Equipment: Mine plows and roller-plow set Self-Entrenching Blade: N/A NBC Protection System: Yes Smoke Equipment: 12x 81-mm smoke grenade launchers Vehicle engine exhaust smoke system ARMAMENT Main Armament: Caliber, Type, Name: 125-mm smoothbore gun 2A46M/ D-81TM Rate of Fire (rd/min): 4-6/2 in manual mode Loader Type: Autoloader (separate loading) and manual Ready/Stowed Rounds: 22/23 (22 in carousel) Elevation (°): -6 to +14 Fire on Move: Yes, up to 25 km/h. Depending on the road and distance to the target, most crews may halt before firing. Auxiliary Weapon: Caliber, Type, Name: 7.62-mm (7.62x 54R) Machine gun Type 59 Mount Type: Turret coax Maximum Aimed Range (m): 1,800 Max Effective Range (m): Day: 1,000	Night: 800 Fire on Move: Yes Rate of Fire (rd/min): 250 practical, 600 cyclic, 2-10 rd bursts Caliber, Type, Name: 12.7-mm (12.7x108) AA MG Type 54 Mount Type: Cupola Maximum Aimed Range (m): 2,000 Max Effective Range (m): Day: 1,500 ground/1600 for air targets (APDS) Night: N/A Fire on Move: Yes Rate of Fire (rd/min): 80-100 practical, 600 air targets, 2-10 rd bursts FIRE CONTROL FCS Name: ISFCS-212 (Image-Stabilized Fire Control System) Main Gun Stabilization: 2-plane Rangefinder: LRF Infrared Searchlight: Yes Sights w/Magnification: Gunner: Day: UI stabilized gunner sight Field of View (°): INA Acquisition Range (m): INA Night: 2nd Generation II sights Field of View (°): INA Acquisition Range (m): INA Commander Fire Main Gun: No VARIANTS Type 85-IIAP: Variant assembled from Type 59s and Type 69-IIs and upgrade kits, or from licensed production in Pakistan. Type 85-III: Upgraded variant with 1,000-hp engine and composite armor panels. Variant is in prototype stage. MAIN ARMAMENT AMMUNITION Caliber, Type, Name: 125-mm APFSDS-T, BM-42M Maximum Aimed Range (m): 3,000 Max Effective Range (m): Day: 2,000-3,000 Night: 850-1,300 Armor Penetration (mm): 590-630 at 2,000 meters 125-mm Frag-HE-T, OF-26 Maximum Aimed Range (m): 5,000 Max Effective Range (m): Day: INA Night: 850-1,300 Armor Penetration (mm): INA								

Chinese Main Battle Tank Type 85-IIM continued

125-mm HEAT-MP, BK-29M Maximum Aimed Range (m): 3,000 Max Effective Range (m): Day: INA Night: 850-1300 Armor Penetration (mm): 650-750 125-mm HEAT, BK-27 Maximum Aimed Range (m): 3,000 Max Effective Range (m): Day: INA Night: 850-1,300 Armor Penetration (mm): 700-800	Other Ammunition Types: Giat 125G1 APFSDS-T, Russian BM-42 and BM-32 APFSDS-T. Note: The Russians may have a version of the BM-42M with a DU penetrator.
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NOTES

GEC-Marconi Centaur fire control system is available. British Barr and Stroud thermal based FCS can be fitted.

The more recent BK-27 HEAT round offers a triple-shaped charge warhead and increased penetration against conventional armors and ERA. The BK-29 round, with a hard penetrator in the nose is designed for use against reactive armor, and as an MP round has fragmentation effects. If the BK-29 HEAT-MP is used, it may substitute for Frag-HE (as with NATO countries) or complement Frag-HE. With three round natures (APFSDS-T, HEAT-MP, ATGMs) in the autoloader vs four, more antitank rounds would be available for the higher rate of fire.

Chapter 5

Antitank

As armored combat vehicles have ascended in importance on the battlefield, so have the systems designed to stop those vehicles. The umbrella term *antitank* originally denoted systems specifically designed to destroy tanks. But today it is also more broadly constructed. Modern combat is combined arms combat. Mechanized forces include other armored combat vehicles, such as armored reconnaissance vehicles, infantry fighting vehicles, armored personnel carriers, etc. Tanks cannot survive or achieve their tactical objectives without support from other armored systems. The more recent term *antiarmor* may supplant the current term; because antitank weapons which cannot penetrate tank armor can still be a formidable threat if they can defeat or damage more lightly armored fighting vehicles. With upgrades and innovative tactics even older, seemingly obsolete, weapons can be used as OPFOR antiarmor weapons.

Antitank weapons can include guns of various sizes, antitank guided missile launcher systems, rocket and grenade launchers, mines and their delivery systems, and other obstacle systems. The rocket and grenade launchers are described in Chapter 1, Infantry Weapons. Mines and other obstacle systems are noted at Chapter 8, Engineer Systems. Because the OPFOR place a high priority on stopping and destroying armored combat vehicles, they will use all other available assets which can doctrinally support the effort. These include fixed and rotary-wing aircraft, artillery, NBC assets, etc. A number of recent systems have been fielded seemingly for other roles, but available for use as antitank weapons: light tanks, heavy armored reconnaissance vehicles with guns of 60 millimeters or more, assault vehicles, fire support vehicles, and artillery/mortar-type combination guns, such as Russian 120-mm 2S9, 2S23, and 2S31. Many OPFOR countries will employ antitank weapons for roles other than antitank, including AT guns against personnel and soft targets, and ATGMs against personnel and rotary-wing aircraft.

Antitank guns include towed guns and self-propelled antitank guns (also known as tank destroyers). A number of guns were designed as field guns, with multi-role capability as both artillery and antitank guns. The modern focus on maneuver warfare has brought a slight decline in development of uniquely antitank guns. Thus, the 85-mm D-44 gun, which can be used as artillery, is effective for use in an antitank role. Although recent systems have been developed, the number fielded has not kept pace with production of armored combat vehicles. Nevertheless, their effectiveness and selected armies' continued reliance on linear positional battles and protracted defenses have kept a large number of these systems in inventories. Based on numbers fielded and likelihood of their threat to US forces, only towed antitank guns were included.

A number of upgrades are available. These include night sights, such as passive image intensifier sights and thermal sights for the Russian 100-mm MT-12. This is a robust antitank weapon, with a high rate of fire and rapid mobility. Note the Russian innovation in the MT-12R, an AT gun with a radar-directed all-weather fire control system. Improved ammunition is critical for continued effectiveness of antitank weapons. The MT-12 and its variants can fire a variety of modern ammunition, including the Russian gun-launched ATGM, Kastet.

The *antitank guided missile* (ATGM) is the singular greatest threat to tanks today. These systems are distinguished from other antitank weapons in that they are guided to the target. Most employ SACLOS guidance (see Glossary). An operator holds crosshairs on the target, and the missile tracker directs the missile to that point. There is a wide variety of countermeasures (such as smoke and counterfire, due to long flight time and operator vulnerability) for use against ATGMs. Thus, a 90% probability of hit is a technical figure, and does not mean a 90% probability of success. On the other hand, there is a variety of counter-countermeasures which the ATGMs, launchers, and operators can use to increase the chance for success. Tactics, techniques and procedures within the antitank arena are critical to mission success.

As armor protection levels and antitank weapon lethality levels continue to rise, armor protection for many modern tanks has outpaced most AT weapons. However, ATGMs have been able to increase their size, range, and warhead configurations to threaten even the heaviest tanks. Among notable trends in ATGMs is the worldwide proliferation and variety of manportable and portable *antitank guided missile launchers*. These include shoulder-launched, short-range systems, such as the French Eryx, and a variety of copies of former Soviet systems, such as the AT-3/Malyutka ("Suitcase SAGGER). Another notable trend is in development of upgrade ATGMs, with increased lethality. The most common type of lethality upgrade is addition of a nose precursor or tandem warhead. A more recent lethality upgrade has been the use of warheads that permit the "fly-over, shoot-down" mode. These missiles can over-fly a vehicle behind a hill, and fire an explosively-formed penetrator (EFP, in the shape of a cannon kinetic-energy penetrator round) downward through the relatively soft top of armored vehicles. Other improvements include improved guidance and resistance to countermeasures, reduced smoke and noise signature, and increased range. A fairly common trend has been addition of night sights, including thermal sights for the launcher. As the missiles and launchers have been improved, weight loads have increased. Most of the so-called portable launchers (AT-4 launcher, TOW, and HOT) have outgrown the portability weight limit, and must be carried in vehicles and only dismounted short distances from the carriers.

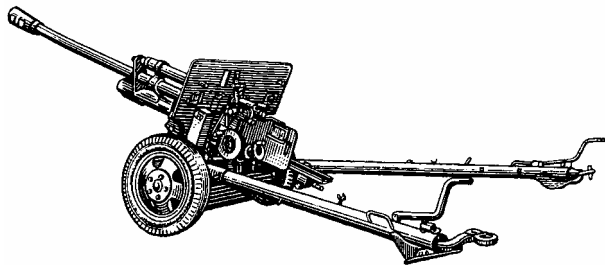
Although there are unique *ATGM launcher vehicles* with unique ATGMs, most numerous launcher vehicles are military and commercial vehicles adapted with pintel mounts for portable ground launchers, with ATGMs manually loaded and launched. Configurations of those vehicles consist of simply pairing of vehicle and launcher, and can be executed with equipment at hand; therefore, they were not described in this guide. The number of fielded ATGM launcher vehicles specially designed for the mission numbers no more than a few dozen systems. They constitute a high level threat to vehicles and rotary-winged aircraft in the US Army.

Systems selected for this chapter are the more common threat systems, or represent the spectrum of antitank systems which can threaten US Army forces in the world today.

Questions and comments on data listed in this chapter should be addressed to:

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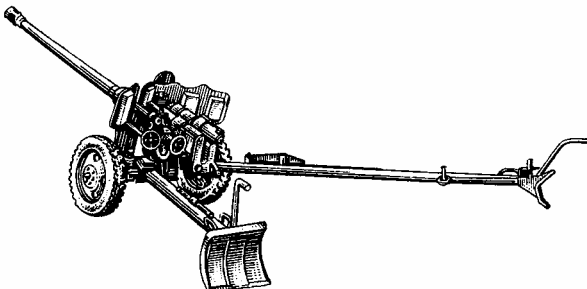
Russian 76-mm Towed Antitank Gun ZIS-3

	Weapons & Ammunition Types 76-mm rifled gun HVAP-T HEAT APC-T Frag-HE	Typical Combat Load INA
SYSTEM Alternative Designations: M1942 Date of Introduction: INA Proliferation: At least 14 countries Description: Crew: 5-7 Combat Weight (mt): 1.12 Length Overall, Travel (m): 6.10 Height Overall, Travel (m): 1.3 Width Overall, Travel (m): 1.4 Mobility: Mount: Two-wheeled carriage with twin trails Prime mover: AT-P tractor, light trucks Towed Speed (km/h): Max Road: INA Max Off-Road: INA Average Cross-Country: INA Fording Depth (m): N/A Emplace Time (min): INA Displace Time (min): INA Radio: N/A Protection: Gun shield ARMAMENT Main Armaments: Caliber, Type, Name: 76-mm rifled gun Rate of Fire (rd/min): 8-10 normal / 15-20 burst indirect fire Loader Type: Manual Ready/Stowed Rounds: N/A Elevation (°): -5/+37 Fire on Move: No FIRE CONTROL FCS Name: N/A Main Gun Stabilization: N/A Rangefinder: N/A Sights w/Magnification: Gunner: Day: INA Field of View (°): INA Acquisition Range (m): INA Night: INA Field of View (°): INA Acquisition Range (m): INA	VARIANTS N/A MAIN ARMAMENT AMMUNITION Caliber, Type, Name: 76-mm HVAP-T, BR-354P Maximum Aimed Range (m): INA Max Effective Range (m): Day: 1,000 Night: INA Armor Penetration (mm): 58 at 1,000 meters 92 at 500 meters 76-mm APC-T , BR-350B Maximum Aimed Range (m): INA Max Effective Range (m): INA Day: 1,000 Night: INA Armor Penetration (mm): 61 at 1,000 meters 76-mm HEAT, BK-354M Maximum Aimed Range (m): 1,000 Max Effective Range (m): INA Day: 500 Night: INA Armor Penetration (mm): 120 (RHA) 76-mm Frag-HE, OF-350A Maximum Aimed Range (m): INA Max Effective Range (m): Day: INA Night: INA Armor Penetration (mm): INA 76-mm Frag-HE Maximum Aimed Range (m): INA Max Effective Range (m): Day: 1,500 Night: INA Armor Penetration (mm): INA Other Ammunition Types: API-T BZR-350B, Smoke (WP)	

NOTES

Although the ZIS-3 is categorized as an antitank gun, some OPFOR forces will employ it for general support, especially against light targets. Typical combat load is based on the prime mover; and a wide variety of systems can be used as prime movers.

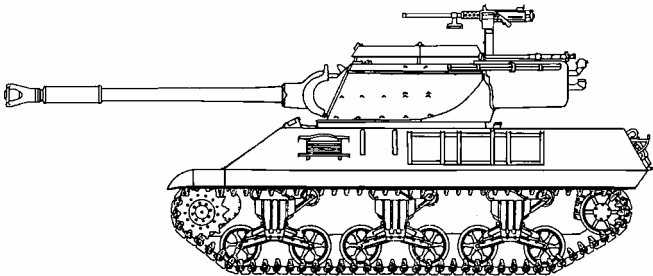
Russian 85-mm Towed Gun D-44

	<table><tr><th>Weapons & Ammunition Types</th><th>Typical Combat Load</th></tr><tr><td>85-mm rifled gun</td><td>21</td></tr><tr><td>HVAP-T</td><td>(est) 3</td></tr><tr><td>HEAT-FS</td><td>3</td></tr><tr><td>AP HE</td><td>3</td></tr><tr><td>Frag-HE</td><td>9</td></tr><tr><td>Smoke</td><td>3</td></tr></table>	Weapons & Ammunition Types	Typical Combat Load	85-mm rifled gun	21	HVAP-T	(est) 3	HEAT-FS	3	AP HE	3	Frag-HE	9	Smoke	3
Weapons & Ammunition Types	Typical Combat Load														
85-mm rifled gun	21														
HVAP-T	(est) 3														
HEAT-FS	3														
AP HE	3														
Frag-HE	9														
Smoke	3														
SYSTEM Alternative Designations: M1945 Date of Introduction: 1944 Proliferation: At least 16 countries Description: Crew: 8 Combat Weight (mt): 3.1 Length Overall, Travel (m): 8.34 Height Overall, Travel (m): 1.42 Width Overall, Travel (m): 1.73 Mobility: Mount: Two-wheeled carriage with twin trails and coaster wheel Prime mover: AT-P tractor, light trucks Towed Speed (km/h): Max Road: 60 Max Off-Road: 35 Average Cross-Country: INA Fording Depth (m): INA Emplace Time (min): 2 Displace Time (min): 2 Radio: N/A Protection: Gun shield ARMAMENT Main Armaments: Caliber, Type, Name: 85-mm rifled gun Rate of Fire (rd/min): 8 normal / 15 burst Indirect Fire Loader Type: Manual Ready/Stowed Rounds: 0 / 140 on prime mover Elevation (°): -7/+35 Fire on Move: No FIRE CONTROL FCS Name: N/A Main Gun Stabilization: N/A Rangefinder: N/A Sights w/Magnification: Gunner: Day: OP-2-7 Direct Fire, 5.5x / PG-1M Indirect Fire Field of View (°): INA Acquisition Range (m): 1,500 Night: INA Field of View (°): INA Acquisition Range (m): INA	VARIANTS D-44-N: Variant with II night sight. SD-44: Airborne version with auxiliary propulsion unit which permits self-propulsion for short distances at speeds of up to 25 km/h on the road, 5.5 km/h off road. MAIN ARMAMENT AMMUNITION Caliber, Type, Name: 85-mm HVAP-T, BR-365P/365PK Maximum Aimed Range (m): 1,500 Max Effective Range (m): Day: 1,150 Night: INA Armor Penetration (mm): 180 (RHA) at 1,000 meters 113 (RHA, 30°) at 500 meters 85-mm HEAT-FS, BK-2M Maximum Aimed Range (m): 1,500 Max Effective Range (m): Day: 1,500 Night: INA Armor Penetration (mm): 300 85-mm AP HE Maximum Aimed Range (m): 1,500 Max Effective Range (m): Day: 950 Night: INA Armor Penetration (mm): 91 (30° angle) at 500 meters 85-mm Frag-HE, O-365K Maximum Aimed Range (m): 1,500 Max Effective Range (m): Day: 1,500 Night: INA Armor Penetration (mm): INA Other Ammunition Types: HE, BR-365 and -365K AP-T and APC-T (obsolete)														

NOTES

The gun is variously referred to as artillery, as a field gun or as an antitank gun. It can be used for all roles or specifically for artillery or antitank. Typical combat load is based on the prime mover; and a wide variety of systems can be used as prime movers. PG-1M indirect fire sight characteristics are: 4x, 10° field of view. The PG-1 and -M can be used to a limited extent as direct fire sights.

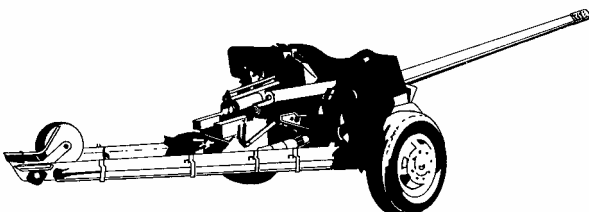
U.S. Self-Propelled Antitank Gun M36

 M36B2	Weapons & Ammunition Types 90-mm gun APFSDS-T, HVAP, HEAT-T or APC HE 12.7-mm bustle MG API, API-T, APDS-T	Typical Combat Load 47 1,000
SYSTEM Alternative Designations: INA Date of Introduction: 1944 Proliferation: At least 5 countries Description: Crew: 5 Combat Weight (mt): 27.7/30.8 for M36B1/29.9 for M36B2 Chassis Length Overall (m): 5.98 Height Overall (m): 3.19 Width Overall (m): 3.05 Ground Pressure (kg/cm²): 0.95/0.86 M36B2 Automotive Performance: Engine Type: 500-hp Gasoline/375-hp Diesel for M36B2 Chassis: M-10 tank destroyer Cruising Range (km): 177 Speed (km/h): Max Road: 42/40 M36B2 Max Off-Road: INA Average Cross-Country: 29 Max Swim: N/A Fording Depth (m): 0.91/1.07 M36B2 Radio: INA Protection: Armor, Turret Front (mm): 76 Applique Armor (mm): N/A Explosive Reactive Armor (mm): N/A Active Protective System: N/A Mineclearing Equipment: N/A Self-Entrenching Blade: N/A NBC Protection System: No Smoke Equipment: No ARMAMENT Main Armament: Caliber, Type, Name: 90-mm (50 Cal) rifled gun, M3 Rate of Fire (rd/min): 8 est Loader Type: Manual Ready/Stowed Rounds: INA Elevation (°): -10 to +20 Fire on Move: No Auxiliary Weapon: Caliber, Type, Name: 12.7-mm machinegun, M2HB Mount Type: Turret bustle	Maximum Aimed Range (m): 2,000 Max Effective Range (m): Day: 2,000 Night: N/A Fire on Move: Yes Rate of Fire (rd/min): 550 ATGM Launcher: None FIRE CONTROL FCS Name: INA Main Gun Stabilization: No Rangefinder: No Infrared Searchlight: No Sights w/Magnification: Gunner: Day: INA Night: No Commander Fire Main Gun: No VARIANTS M36B1: Variant uses an M4A3/Sherman tank chassis. M36B2: Variant uses an M10 chassis with plate canopy protection. MAIN ARMAMENT AMMUNITION Caliber, Type, Name: 90-mm HVAP, INA Maximum Aimed Range (m): INA Max Effective Range (m): Day: 1,000 Night: N/A Armor Penetration (mm): 195 at 1,000 m 90-mm APFSDS-T, Mear 90 Maximum Aimed Range (m): 1,000-2,000 Max Effective Range (m): Day: 1,000+ Night: N/A Armor Penetration (mm): INA 90-mm HEAT-T, Yugoslavian M74 Maximum Aimed Range (m): INA Max Effective Range (m): Day: 1,000 Night: N/A Armor Penetration (mm): 150 (30° impact) at 1,000 m Other Ammunition Types: HE M71, APC-T M82	

NOTES

This type vehicle is historically referred to as a "tank destroyer". The above label is more modern. The baseline vehicle has an open-top turret.

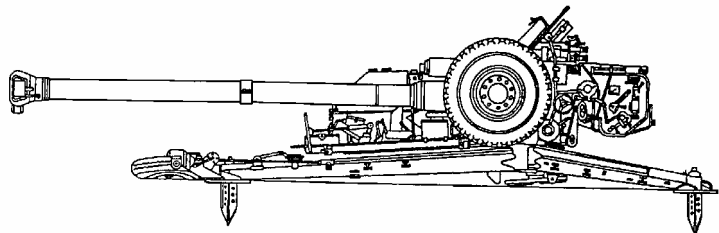
Russian 100-mm Towed Antitank Gun MT-12

	<table><tr><th>Weapons & Ammunition Types</th><th>Typical Combat Load</th></tr><tr><td>100-mm smoothbore gun</td><td>20</td></tr><tr><td>APFSDS-T</td><td>8</td></tr><tr><td>HEAT</td><td>4</td></tr><tr><td>Frag-HE</td><td>4</td></tr><tr><td>AT-10 ATGM</td><td>4</td></tr></table>	Weapons & Ammunition Types	Typical Combat Load	100-mm smoothbore gun	20	APFSDS-T	8	HEAT	4	Frag-HE	4	AT-10 ATGM	4
Weapons & Ammunition Types	Typical Combat Load												
100-mm smoothbore gun	20												
APFSDS-T	8												
HEAT	4												
Frag-HE	4												
AT-10 ATGM	4												
SYSTEM Alternative Designations: T-12A, 2A29 Date of Introduction: 1972 Proliferation: At least 12 countries Description: Crew: 6 Combat Weight (mt): 3.1 Length Overall, Travel (m): 9.65 Height Overall, Travel (m): 1.6 Width Overall, Travel (m): 2.3 Automotive Performance: Mount: Two-wheeled carriage with twin trails and coaster wheel Prime mover: MT-LB-T, URAL-375D and other trucks Towed Speed (km/h): Max Road: 60 Max Off-Road: INA Average Cross-Country: 25 Fording Depth (m): INA Emplace Time (min): 2-3 Displace Time (min): 2-3 Radio: N/A Protection: Gun shield ARMAMENT Main Armaments: Caliber, Type, Name: 100-mm smoothbore gun 2A29 Rate of Fire (rd/min): 6-8/up to 15 indirect fire Loader Type: Manual Ready/Stowed Rounds: 0/20 Elevation (°): -7/+20 Fire on Move: No ATGM Launcher: Launch Method: Gun-launched, 2A29 smoothbore gun Guidance: Laser-beam rider Command Link: Encoded laser-beam Launcher Dismountable: No FIRE CONTROL FCS Name: N/A Main Gun Stabilization: N/A Rangefinder: N/A Sights w/Magnification: Gunner: Day: OP40M-40U direct fire, 5.5x / PG-1M indirect fire Field of View (°): 11 Acquisition Range (m): 3,000/8,200 indirect fire Night: APN6-40 II sight, 6.8x	Field of View (°): 7 Acquisition Range (m): 2,000 VARIANTS T-12: Original version of Russian gun. MT-12 has changes in carriage and obturator, which do not affect lethality performance. MT-12R: Russian upgrade with radar-directed fire control system, for use at night and adverse weather. Topaz: Former-Yugoslav variant of T-12, with the 2A19M gun mounted on a D-30 carriage. Some have AT FCS-1 (see NOTES). MAIN ARMAMENT AMMUNITION Caliber, Type, Name: 100-mm APFSDS-T, BM-412M, Romanian Maximum Aimed Range (m): 2,500, 3,000 platoon volley Max Effective Range (m): Day: INA Night: INA Armor Penetration (mm): 418 at 2,000 m/380 at 3,000 m Caliber, Type, Name: 100-mm APFSDS-T, M1000, Belgian Maximum Aimed Range (m): 3,000/platoon volley INA Max Effective Range (m): Day: INA Night: INA Armor Penetration (mm): Triple heavy target at 4,000 meters Caliber, Type, Name: 100-mm HEAT, BK-17 Maximum Aimed Range (m): 2,500, 3,000 platoon volley Max Effective Range (m): Day: INA Night: INA Armor Penetration (mm): 380 Other Ammunition Types: Russian BM-2/-20/-25 APFSDS-T; OF-15 Frag-HE; BK-5M HEAT-FS Antitank Guided Missiles: Name: AT-10/Kastet Warhead Type: Shaped charge (HEAT) Armor Penetration (mm): 650 (RHA) Range (m): 5,000 Name: AT-10b/Kan Warhead Type: Tandem Shaped charge (HEAT) Armor Penetration (mm): 700 (RHA) behind ERA Range (m): 5,000												

NOTES

Russian 2nd generation II sights are available. The daysight can be used at night if the target is illuminated. Thermal sights are available. The MT-12R radar FCS can be used for surveillance, acquisition, and tracking. The Serb Iskra AT FCS-1 computerized laser rangefinder FCS is on offer for sale. Range is 500-3,000 meters. The ATGM sight and laser guidance device has a 5,000-meter range and is a day sight only. Ranges (m) for Frag-HE: 8,200 indirect fire/3,000 direct-fire. Rate of fire for indirect fire (Frag-HE) is up to 15 rd/min.

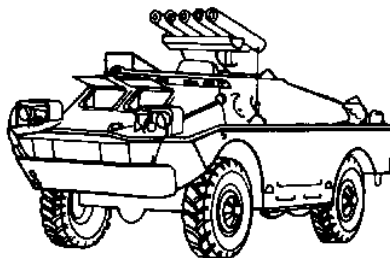
Russian 125-mm Towed Antitank Gun 2A45M

	<table><tr><th>Weapons & Ammunition Types</th><th>Typical Combat Load</th></tr><tr><td>125-mm smoothbore gun</td><td>*60</td></tr><tr><td>APFSDS-T</td><td>28</td></tr><tr><td>HEAT</td><td>4</td></tr><tr><td>Frag-HE</td><td>20</td></tr><tr><td>Invar/Svir ATGM</td><td>8</td></tr><tr><td></td><td>* Mix estimate</td></tr></table>	Weapons & Ammunition Types	Typical Combat Load	125-mm smoothbore gun	*60	APFSDS-T	28	HEAT	4	Frag-HE	20	Invar/Svir ATGM	8		* Mix estimate
Weapons & Ammunition Types	Typical Combat Load														
125-mm smoothbore gun	*60														
APFSDS-T	28														
HEAT	4														
Frag-HE	20														
Invar/Svir ATGM	8														
	* Mix estimate														
SYSTEM Alternative Designations: SPRUT-B (Octopus-B) Date of Introduction: 1980s Proliferation: At least 1 country Description: Crew: 7 Combat Weight (mt): 6.5 Length Overall, Travel (m): 7.12 Height Overall, Travel (m): 2.09, 2.35 with APU (0.90 firing) Width Overall, Travel (m): 2.3 Automotive Performance: Mount: Two-wheeled carriage with three trails and coaster wheel Prime mover: MT-LB, URAL-4320, and other trucks Towed Speed (km/h): Max Road: 80 Max Off-Road: INA Average Cross-Country: 25 Emplace Time (min): 1.5 Displace Time (min): 2.0 Radio: On the prime mover Protection: Gun shield ARMAMENT Main Armaments: Caliber, Type, Name: 125-mm smoothbore gun 2A45M Rate of Fire (rd/min): 6-8 Loader Type: Manual, separate-loading Ready/Stowed Rounds: 6/60 on prime mover Elevation (°): -6 to +25 Fire on Move: No ATGM Launcher: Launch Method: Gun-launched Guidance: Laser-beam rider, with 9S53 guidance device Command Link: Encoded laser-beam Launcher Dismountable: No FIRE CONTROL FCS Name: N/A Main Gun Stabilization: N/A Rangefinder: N/A Sights w/Magnification: Gunner: Day: OP4M-48A, 5x, direct fire, 5.5x / 2Ts33 iron PG-1M, 4x, indirect fire Field of View (°): 11 on OP4M-48A, 10 on PG-1M Acquisition Range (m): 4,000/8,200 indirect fire	Night: 1PN53-10 II sight, 6.8x; 1PN80 thermal sight available Field of View (°): 7 Acquisition Range (m): 800-1,300 VARIANTS None MAIN ARMAMENT AMMUNITION Caliber, Type, Name: 125-mm APFSDS-T, BM-42M Max Aimed Range (m): 3,000 Max Effective Range (m): Day: 2,000-3,000 Night: 800-1,300 II sight Armor Penetration (mm): 590-630 at 2,000 meters Caliber, Type, Name: 125-mm HEAT, BK-27 Max Aimed Range (m): 2,500 Max Effective Range (m): Day: INA Night: 800-1,300 II sight Armor Penetration (mm): 700-800 Caliber, Type, Name: 125-mm HEAT-MP, BK-29M Max Aimed Range (m): 2,500 Max Effective Range (m): Day: 2,500 Night: 800-1,300 II sight Armor Penetration (mm): 650-750 Caliber, Type, Name: 125-mm Frag-HE-T, OF-26 Max Aimed Range (m): 5,000 Max Effective Range (m): Day: 2,500 Night: 800-1,300 II sight, direct fire Armor Penetration (mm): Can defeat IFVs on impact Other Ammunition Types: Giat 125G1, and BM-42 and BM-32 APFSDS-T. The Russians may have a BM-42M with DU penetrator. Antitank Guided Missiles: Name: AT-11/SVIR Warhead Type: Shaped charge (HEAT) Armor Penetration (mm): 700 (RHA) behind ERA/800 conventional Range (m): 5,000 Name: AT-11B/INVAR Warhead Type: Tandem shaped charge Armor Penetration (mm): 800 (RHA) behind ERA /870 conventional Range (m): 5,000														

NOTES

The ATGM sight and laser guidance device has a 5,000-meter range, day sight only. The day sight can be used at night if the target is illuminated.

Russian ATGM Launcher Vehicle 9P148

	<table><tr><th>Weapons & Ammunition Types</th><th>Typical Combat Load</th></tr><tr><td>Launcher AT-5/AT-5B ATGM</td><td>15-20 15</td></tr><tr><td>Mixed (see NOTES) AT-4/AT-4B ATGM AT-5/AT-5B ATGM</td><td>10 10</td></tr></table>	Weapons & Ammunition Types	Typical Combat Load	Launcher AT-5/AT-5B ATGM	15-20 15	Mixed (see NOTES) AT-4/AT-4B ATGM AT-5/AT-5B ATGM	10 10
Weapons & Ammunition Types	Typical Combat Load						
Launcher AT-5/AT-5B ATGM	15-20 15						
Mixed (see NOTES) AT-4/AT-4B ATGM AT-5/AT-5B ATGM	10 10						
SYSTEM Alternative Designations: BRDM-2/AT-5 Date of Introduction: 1977 Proliferation: At least 6 countries Description: Crew: 2 Platform: BRDM-2M/GAZ-41-08 Combat Weight (mt): 7.0 Chassis Length Overall (m): 5.73 Height (m): Overall: 2.31 In Firing Position: INA Width Overall (m): 2.26 Drive Formula: 4 x 4 (+ 4 auxiliary wheels) Automotive Performance: Engine Type: 140-hp Gasoline Cruising Range (km): 750 Speed (km/h): Max Road: 100 Max Off-Road: INA Average Cross-Country: INA Max Swim: 10 Fording Depth (m): Amphibious Self-Entrenching Blade: N/A Radio: R-123 Protection: Armor, Turret Front (mm): 10 Applique Armor (mm): N/A Explosive Reactive Armor (mm): N/A Active Protective System: N/A NBC Protection System: Collective Smoke Equipment: N/A ARMAMENT Antitank Guided Missile Launcher Name: 9P135M3 (recent upgrade) Launch Method: tube-launched Number of missiles on launcher: 5 Elevation (°): INA Rate of Launch: (missiles/min): 2-3, depending on range Reaction Time (sec): INA Emplacement Time (min): INA Displacement Time (min): INA Can Launch Missiles Simultaneously : NA Ready/Stowed Missiles: 15 (launcher + autoloader)/ 0-5 by mix Loader Type: Automated Launcher dismountable: No Auxiliary Launcher: Yes Fire on the Move: No	FIRE CONTROL FCS Name: N/A Guidance: SACLOS Command Link: Wire Beacon Type: Incandescent bulb Tracker Type: IR, 9S451M1 Susceptible To Countermeasures: EO jammers, smoke, counterfire Counter-countermeasures: Electro-optical jamming alarm (See note) Rangefinder: N/A Infrared Searchlight: N/A Sights w/Magnification: Gunner: Day: 9Sh119M1 Field of View (°): INA Acquisition Range (m): INA Night: 1PN65 Field of View (°): INA Acquisition Range (m): 2,500 VARIANTS 9P137: Original launcher vehicle with 5 AT-5 (only) launch rails AMMUNITION Antitank Guided Missiles: Name: AT-5/SPANDREL Alternative Designations: Konkurs Missile Weight (kg): 25.2 (in tube) Warhead Type: Shaped Charge (HEAT) Armor Penetration (mm): 650 Minimum/Maximum Range (m): 75/4,000 Probability of Hit (%): 90 Average Velocity (m/s): 200 Time of Flight to Max Range (sec): 20 Name: AT-5B Alternative Designations: Konkurs-M Missile Weight (kg): 26.5 (in tube) Warhead Type: Tandem Shaped Charge (HEAT) Armor Penetration (mm): 925 Minimum/Maximum Range (m): 75/4,000 Probability of Hit (%): 90 Average Velocity (m/s): 208 Time of Flight to Max Range (sec): 19 Name: AT-4/SPIGOT Alternative Designations: Fagot Missile Weight (kg): 13.0 (in tube) Warhead Type: Shaped Charge (HEAT) Armor Penetration (mm): 480 Minimum/Maximum Range (m): 70/2,000 Probability of Hit (%): 90 Average Velocity (m/s): 186 Time of Flight to Max Range (sec): 11						

Russian ATGM Launcher Vehicle 9P148 continued

Name: AT-4B Alternative Designations: Factoria, Konkurs M Missile Weight (kg): 13.4 (in tube) Warhead Type: Shaped Charge (HEAT) Armor Penetration (mm): 550 Minimum/Maximum Range (m): 70/2,500 Probability of Hit (%): 90 Average Velocity (m/s): 180 Time of Flight to Max Range (sec): 13.2-14.0	Other Missile Types: N/A
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NOTES

A variety of ATGM mixes have been seen with 9P148, between AT-4 and AT-5-type ATGMS. The primary benefit of adaptability is increased launcher load and adaptability to user countries' inventories of ATGMS. Most common ATGM is AT-5. As AT-5B is produced, it is likely to replace AT-5 in better-budgeted country inventories.

Reload time for the launcher is 25 seconds.

Russian firms have developed countermeasures, such as encoded-pulse beacons for ATGMS and counter-dazzler adjustments to the 9S451M1 guidance box. Filters can be mounted in front of reticles.

The 1PN66 thermal sight is available for the ATGM launcher. Acquisition range is approximately 2,500 meters.

Russian KBP offers a drop-in one-man turret, called Kliver, with a stabilized 2A72 30-mm gun, a 4 Kornet ATGM launcher, thermal sights, and improved fire control system.

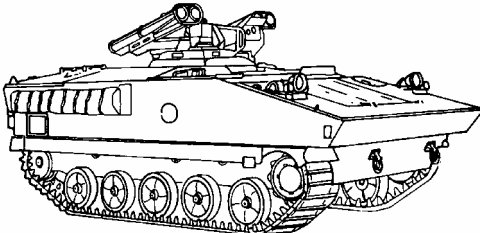
Russian ATGM Launcher Vehicle 9P149

	Weapons & Ammunition Types Launcher AT-6 HEAT ATGM AT-9 HEAT ATGM AT-6 HE ATGM AT-9 HE ATGM	Typical Combat Load 12
SYSTEM Alternative Designations: Shturm-S Date of Introduction: 1990 Proliferation: At least 9 countries Description: Crew: 2 Platform: MT-LB Combat Weight (mt): 12.3 Chassis Length Overall (m): 6.35 Height (m): Overall: 1.8 In Firing Position: INA Width Overall (m): 2.85 Automotive Performance: Engine Type: 290-hp Diesel Cruising Range (km): 500 km Speed (km/h): Max Road: 65 Max Off-Road: INA Average Cross-Country: INA Max Swim: 3-4 Fording Depths (m): Amphibious Self-Entrenching Blade: Yes Radio: R-123M or R-173 Protection: Armor, Turret Front (mm): 7-14 Applique Armor (mm): N/A Explosive Reactive Armor (mm): N/A Active Protective System: N/A NBC Protection System: Collective Smoke Equipment: N/A ARMAMENT Antitank Guided Missile Launcher Name: INA Launch Method: tube-launched Number of missiles on launcher: 1 Elevation (°): -5/+15 Rate of Launch: (missiles/min): 2-3, depending on range Reaction Time (sec): INA Emplacement Time (min): INA Displacement Time (min): INA Can Launch Missiles Simultaneously: N/A Ready/Stowed Missiles: 12/0 Loader Type: Automated	Launcher dismountable: No Auxiliary Launcher: No Fire on the Move: No FIRE CONTROL FCS Name: INA Guidance: SACLOS Command Link: Radio frequency Beacon Type: INA Tracker Type: IR Susceptible To Countermeasures: Smoke, counterfire Counter-countermeasures: 5 encoded frequencies Rangefinder: INA Infrared Searchlight: INA Sights w/Magnification: Gunner: Day: INA Field of View (°): INA Acquisition Range (m): 5,000 Night: Yes Field of View (°): INA Acquisition Range (m): INA VARIANTS N/A AMMUNITION Antitank Guided Missiles Name: AT-6a/SPIRAL Alternative Designations: Kokon Missile Weight (kg): 46.5 (in tube) Warhead Type: Shaped Charge (HEAT) Armor Penetration (mm): 750, 600 behind ERA Minimum/ Maximum Range (m): 400/5,000 Probability of Hit (%): 90 Average Velocity (m/s): 345 Time of Flight to Max Range (sec): 14.5 Name: AT-9 Alternative Designations: Ataka Missile Weight (kg): 48.3 (in tube) Warhead Type: Tandem Shaped Charge (HEAT) Armor Penetration (mm): 950, 800 behind ERA Minimum/Maximum Range (m): 400/6,000, 5,000 ground use Probability of Hit (%): 90 Average Velocity (m/s): 400 Time of Flight to Max Range (sec): 15.0 (12.5 in ground use) Other Missile Types: AT-6 HE thermobaric, AT-9 HE thermobaric	

NOTES

Other missiles (AT-6b and AT-6c) can be launched from helicopters; but their length exceeds the 1832-mm limit for the Shturm-S autoloader. A modular AT-6 ATGM launcher system with launcher and autoloader is available for installation on vehicles, fixed sites and boats.

French ATGM Launcher Vehicle AMX-10 HOT

	Weapons & Ammunition Types Total HOT/ HOT 2, 2T/ HOT 3	Typical Combat load 18
SYSTEM Alternative Designations: INA Date of Introduction: INA Proliferation: At least 1 country Description: Crew: 4-5 Platform: AMX-10P Combat Weight (mt): 14.1 Chassis Length Overall (m): 5.78 Height (m): Overall: 2.57 In Firing Position: INA Width Overall (m): 2.78 Automotive Performance: Engine Type: 300-hp Diesel Cruising Range (km): 600 km Speed (km/h): Max Road: 65 Max Off-Road: INA Average Cross-Country: 30-40 Max Swim: 7 (with optional water jets) Fording Depths (m): Amphibious Self-Entrenching Blade: N/A Radio: VHF and intercom Protection: Armor, Turret Front (mm): 12.7-mm frontal (distance NFI) Applique Armor (mm): N/A Explosive Reactive Armor (mm): Available (see NOTES) Active Protective System: N/A NBC Protection System: Collective Smoke Equipment: 3 smoke grenade launchers ARMAMENT Antitank Guided Missile Launcher Name: Lancelot 3 Launch Method: tube-launched Number of missiles on launcher: 4 Elevation (°): -12/+18 Rate of Launch: (missiles/min): INA Reaction Time (sec): INA Emplacement Time (min): INA Displacement Time (min): INA Can Launch Missiles Simultaneously : INA Ready/Stowed Missiles: 4/14 Loader Type: Manual Launcher dismountable: No Auxiliary Launcher: No Fire on the Move: No	FIRE CONTROL FCS Name: INA Guidance: SACLOS Command Link: Wire Beacon Type: INA Tracker Type: INA Susceptible To Countermeasures: Smoke, counterfire Counter-countermeasures: Infrared CM hardening on later ATGMs Rangefinder: M427 Laser rangefinder Infrared Searchlight: INA Sights w/Magnification: Gunner: Day: M509, 3x/12x Field of View (°): INA Acquisition Range (m): INA Night: Castor Thermal Image System available Field of View (°): INA Acquisition Range (m): INA VARIANTS N/A Antitank Guided Missiles Name: HOT Alternative Designations: Euromissile Missile Weight (kg): 32 (in tube) Warhead Type: Shaped Charge (HEAT) Armor Penetration (mm): 800 Minimum/ Maximum Range (m): 75/4,000 Probability of Hit (%): INA Average Velocity (m/s): 233 Time of Flight to Max Range (sec): 17.3 Name: HOT 2 Alternative Designations: INA Missile Weight (kg): 32 (in tube) Warhead Type: Tandem Shaped Charge (HEAT) Armor Penetration (mm): 900 Minimum/Maximum Range (m): 75/4,000 Probability of Hit (%): INA Average Velocity (m/s): 233 Time of Flight to Max Range (sec): 17.3 Name: HOT 2T Alternative Designations: INA Missile Weight (kg): 32 (in tube) Warhead Type: Tandem shaped Charge (HEAT) Armor Penetration (mm): 1250 Minimum/Maximum Range (m): 75/4,000 Probability of Hit (%): INA Average Velocity (m/s): INA Time of Flight to Max Range (sec): INA Other Missile Types: HOT 3--similar to HOT 2T, but with improved countermeasures	

French ATGM Launcher Vehicle AMX-10 HOT continued

NOTES

The HOT Antitank guided missile is produced by a European consortium which includes France and Germany. It can be launched from a ground launcher, the same launcher mounted on a variety of vehicles, from infantry fighting vehicles and ATGM launcher vehicles, and from helicopters. The AMX-10 HOT constitutes a high-end application on that spectrum, and has not been widely proliferated.

The cruciform-based single-tube ground launcher system exceeds the weight limit for the portable class of ATGM launchers. An updated launcher for HOT-2T offers a Thermal Modular System night sight and a dual band tracker. Alternate mounts for the launcher include the ATLAS/Commando lightweight launcher (140 kg) mounted on the Spanish Santana (4 x 4 Land Rover light truck).

The Lancelot turret used on AMX-10 HOT can be mounted on other armored fighting vehicles.

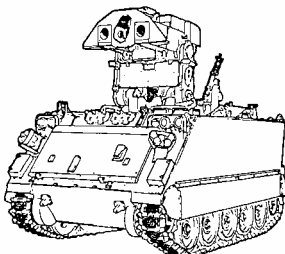
The French-produced VAB HOT uses a Mephisto retractable twin-tube launcher, and has an onboard load of 10 HOT ATGMs.

The UTM800 turret holds four HOT missiles, with a stabilized sight and Castor thermal night sight. The UTM800 is used on two applications. The French VCR/TH employs the turret on a Panhard VCR/TT 6 x 6 APC chassis. The other is the UTM turret on a VAB APC chassis.

The German Jaguar 1 Jagdpanzer is a modified Leopard 1 tank chassis with a single-tube HOT launcher.

French SNPE explosive reactive armor can be employed on AMX-10 type vehicles.

US ATGM Launcher Vehicle M901

	Weapons & Ammunition Types ATGM Launcher TOW, ITOW, TOW 2, TOW 2A, TOW 2B 7.62-mm Cupola MG	Typical Combat Load 12 2,000
SYSTEM Alternative Designations: ITV (Improved TOW Vehicle), ITOW Date of Introduction: 1978 Proliferation: At least 8 countries Description: Crew: 4-5 Platform: M113A1 Combat Weight (mt): 11.79 Chassis Length Overall (m): 4.90 Height (m): Overall: 2.91 In Firing Position: 3.35 Width Overall (m): 2.70 Automotive Performance: Engine Type: 212-hp Diesel Cruising Range (km): 483 Speed (km/h): Max Road: 64 Max Off-Road: INA Average Cross-Country: INA Max Swim: 5.8 Fording Depths (m): Amphibious Self-Entrenching Blade: N/A Radio: Various, including intercom Protection: Armor, Turret Front (mm): INA Applique Armor (mm): Available. Anti-mine armor on bottom Explosive Reactive Armor (mm): Available Active Protective System: No NBC Protection System: No Smoke Equipment: 4 smoke grenade launchers on each front corner ARMAMENT Antitank Guided Missile Launcher Name: M27 cupola with launcher head ("Hammerhead") Launch Method: Tube-launched Number of missiles on launcher: 2 Elevation (°): -30/+34 Rate of Launch: (missiles/min): 2 Reaction Time (sec): 4.25 Emplacement Time (min): 0.33 Displacement Time (min): INA Can Launch Missiles Simultaneously : No Ready/Stowed Missiles: 2/10 Loader Type: Manual Launcher dismountable: No Auxiliary Launcher: No Fire on the Move: No	Auxiliary Weapon: Caliber, Type, Name: 7.62-mm (7.62x51) MG Mount Type: Cupola Direct Fire Range (m): INA Max Effective Range (m): Day: INA Night: INA Fire on Move: Yes Rate of Fire: INA Firing Ports: INA FIRE CONTROL FCS Name: INA Guidance: SACLOS Command Link: Wire Beacon Type: Xenon (Infrared), thermal on TOW-2 and after Tracker Type: INA Susceptible To Countermeasures: Smoke, counterfire Counter-countermeasures: Rangefinder: INA Infrared Searchlight: INA Sights w/Magnification: Gunner: Day: Day sight/tracker, 13x Field of View (°): 5.5 x Acquisition Range (m): INA Night: AN/TAS-4 thermal sight Field of View (°): INA Acquisition Range (m): INA VARIANTS ITOW: Launcher variants have been upgraded with new turrets and launcher heads to fit the later TOW variants, such as ITOW, TOW 2, 2A and 2B. M901A2: Launcher vehicle fitted for TOW 2. A variety of M113-based vehicles have incorporated TOW "hammer-head" launcher for use as ATGM launcher vehicles. These include the Italian VCC-1-based launcher vehicle, and the Dutch Armored Infantry Fighting Vehicle (AIFV) -based launcher vehicle. AMMUNITION Antitank Guided Missiles Name: TOW Alternative Designations: BGM-71 Missile Weight (kg): 25.5 (in tube) Warhead Type: Shaped Charge (HEAT) Armor Penetration (mm): 600 Minimum/ Maximum Range (m): 65/3,750 Probability of Hit (%): INA Average Velocity (m/s): 179 Time of Flight to Max Range (sec): 21	

US ATGM Launcher Vehicle M901 continued

Name: ITOW Alternative Designations: BGM-71C Missile Weight (kg): 25.7 (in tube) Warhead Type: Tandem Shaped Charge (HEAT, short probe) Armor Penetration (mm): 800 Minimum/ Maximum Range (m): 65/3,750 Probability of Hit (%): INA Average Velocity (m/s): 179 Time of Flight to Max Range (sec): 21 Name: TOW 2 Alternative Designations: BGM-71D Missile Weight (kg): 28.1 (in tube) / 21.5 (missile only) Warhead Type: Tandem Shaped Charge (Larger HEAT, long probe) Armor Penetration (mm): INA Minimum/ Maximum Range (m): 65/3,750 Probability of Hit (%): 90 Average Velocity (m/s): 179 Time of Flight to Max Range (sec): 21	Name: TOW 2A Alternative Designations: BGM-71E Missile Weight (kg): 22.65 (missile only) Warhead Type: Tandem Shaped Charge (Larger HEAT, long probe) Armor Penetration (mm): INA Minimum/ Maximum Range (m): 65/3,750 Probability of Hit (%): INA Average Velocity (m/s): 188 Time of Flight to Max Range (sec): 20 Name: TOW 2B Alternative Designations: BGM-71F Missile Weight (kg): 22.60 (missile only) Warhead Type: Dual explosive-formed penetrators (EFP), top-attack Armor Penetration (mm): INA Minimum/ Maximum Range (m): 200/3,750 Probability of Hit (%): INA Average Velocity (m/s): 179 Time of Flight to Max Range (sec): 21 Other Missile Types: See NOTES, below
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NOTES

The loader has side and overhead protection during loading, which requires 40 seconds.

The Improved Target Acquisition System (ITAS) was developed for TOW 2 and later. It includes a laser rangefinder, increased acquisition range, improved night capabilities (second-generation thermal channel), an automatic boresight and greater hit probability.

The UK-developed Further-Improved TOW (FITOW) program is expected to be similar to TOW 2B, but with two smaller warheads.

The Israeli MAPATS is a TOW missile variant with laser-beam rider guidance and a laser guidance system.

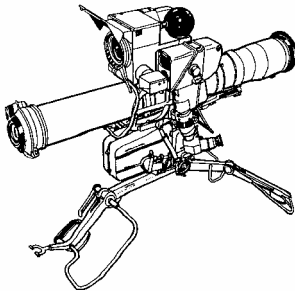
The Israeli TAAS tandem warhead is the same diameter as the warhead on the original TOW missile, and appears to be a candidate for retrofit. The warhead is claimed to be able to penetrate 1,020 mm of armor.

	Weapons & Ammunition Types ATGM Launcher AT-3 HEAT ATGM AT-3 HE ATGM	Typical Combat Load 4/ 3 Polk Set 1 on launcher
SYSTEM Alternative Designations: Malyutka Complex Date of Introduction: 1963 Proliferation: At least 45 countries Description: Crew: 3 Primary Mount: Ground mount on "suitcase" launcher Alternate Mounts: Rail on BMP-1, BMD-1, BRDM, BRDM-2 etc. Weight Overall, Excluding Missile (kg): 30.5 launcher + guidance Length Overall in Firing Position (m): 0.86 with AT-3/a/b/c 1.02 with Malyutka-2 Height Overall In Firing Position (m): INA Width Overall In Firing Position (m): INA ARMAMENT Launcher Name: 9P111 Case launcher Launch Method: Rail on case Elevation (°): Fixed for launcher (see NOTES) Rate of Launch: (missiles/min): 2 Reaction Time (sec): INA Emplacement Time (min): 1.7 POLK set Displacement Time (min): INA Ready/Stowed Missiles: 4/0, 3/0 POLK set FIRE CONTROL FCS Name: 9S415/9S415M/9S415M1 guidance panel Guidance: MCLOS (9S415/-M panel), SACLOS Command Link: Wire Beacon Type: Incandescent infrared bulb (SACLOS) Tracker Type: N/A for MCLOS, flare tracker for SACLOS Susceptible To Countermeasures: EO jammers, smoke, counterfire Counter-countermeasures: Offset guidance panel, laser filters Rangefinder: INA Frequency: INA Counter-countermeasures: INA Sights w/Magnification: Gunner: - Day: 9Sh16, 8x - Field of View (°): 22.5 (see NOTES) - Acquisition Range (m): 4000 - Night: Available	VARIANTS Copies include North Korean Susong-Po, Taiwanese Kun Wu, and the Chinese copy, Red Arrow-73/HJ-73, with indigenous guidance. POLK: Slovenian Portable Anti-armor Launching Set includes a new launcher, guidance panel with binocular sight, and 3 ATGMs similar to AT-3C Improved (nose probes and lower smoke signature). With a nose probe and improved propellant, the MCLOS-guided ATGM can reach maximum range in 25 sec and penetrate 580 mm. A Russian AT-3c/Improved (SACLOS) has similar capabilities. AMMUNITION Antitank Guided Missiles Name: AT-3, -3a, -3b/SAGGER Alternative Designations: Malyutka, Malyutka-M Missile Weight (kg): 10.9 Warhead Type: Shaped Charge (HEAT) Armor Penetration (mm): 400 Minimum/Maximum Range (m): 500/3,000 Probability of Hit (%): 70 against moving tanks Average Velocity (m/s): 115 Time of Flight to Max Range (sec): 26 Name: AT-3c/SAGGER Alternative Designations: Malyutka-P Missile Weight (kg): 11.4 Warhead Type: Shaped Charge (HEAT) Armor Penetration (mm): 520 Minimum/Maximum Range (m): 500/3,000 Probability of Hit (%): 90 (SACLOS) Average Velocity (m/s): 115 Time of Flight to Max Range (sec): 26 Name: Malyutka-2 Alternative Designations: Malyutka (Modernized) Missile Weight (kg): 12.5 Warhead Type: Tandem Shaped Charge (HEAT) Armor Penetration (mm): 800 Minimum/Maximum Range (m): 500/3,000 Probability of Hit (%): 90 (SACLOS) Average Velocity (m/s): 130 Time of Flight to Max Range (sec): 23 Other Missiles: Malyutka (Modernized) HE, AT-3c Imp, POLK	

AT-3 is classed by weight as portable (21-40 kg), rather than manportable (<21 kg). The launcher is also a missile carry case. The guidance panel can be located up to 15 meters from the launcher, and can control up to four launchers. If target is <1,000 meters from launcher, the operator can joystick the missile to target without using optics. Guidance elevation (°) is -5/+10. Because the module is small and can be shifted, elevation and field of view are operationally unlimited. Improved versions can be used on older launchers, but in the MCLOS mode. The Slovenian Iskra TS-M thermal sight is available, with detection at 3,000 meters and recognition at 1,800 meters.

5-15

Russian ATGM Launcher AT-4/AT-5

	Weapons & Ammunition Types ATGM Launcher Total AT-4/AT-4B ATGM AT-5/AT-5B ATGM	Typical Combat Load 4 or 8 (see NOTES)
9P135M3 w/AT-5B and thermal sight		
SYSTEM Alternative Designations: 9P135M Firing Post, Fagot/Fagot-M Date of Introduction: 1973 Proliferation: At least 25 countries Description: Crew: 3 Primary Mount: Ground mount on folding tripod Alternate Mounts: Pintel (post) on BMP-1P, BTR-D, UAZ-469, etc. Weight Overall, Excluding Missile (kg): 22.5 Length Overall in Firing Position (m): 1.1/1.3 AT-4/5 tube Height Overall In Firing Position (m): INA Width Overall In Firing Position (m): INA ARMAMENT Launcher Name: 9P135 (AT-4 only), 9P135M (AT-4/AT-5), -M1, -M2, -M3 Launch Method: Tube-launched Elevation (°) (-/+): INA Rate of Launch: (missiles/min): 2-3, depending on range Reaction Time (sec): INA Emplacement Time (min): INA Displacement Time (min): INA Ready/Stowed Missiles: 4/0 full dismount, 4/4 on or near vehicle FIRE CONTROL FCS Name: 9S451M1 Guidance control box Guidance: SACLOS Command Link: Wire Beacon Type: Incandescent infrared bulb Tracker Type: IR, 9S451M1 Susceptible To Countermeasures: EO jammers, smoke, counterfire Counter-countermeasures: EO jamming alarm (see NOTES) Rangefinder: INA Sights w/Magnification: Gunner: Day: 9Sh119M1, 4x Field of View (°): 4.5 Acquisition Range (m): INA Night: Available (See NOTES)	VARIANTS P135M3: Konkurs-M Complex. Launcher with 1PN65 thermal sight and AT-5B/Konkurs-M missiles. Night range is 2,500m. AMMUNITION Antitank Guided Missiles Name: AT-5B/SPANDREL-B Alternative Designations: Konkurs-M Missile Weight (kg): 26.5 (in tube) Warhead Type: Tandem Shaped Charge (HEAT) Armor Penetration (mm): 925 Minimum/Maximum Range (m): 75/4,000 Probability of Hit (%): 90 Average Velocity (m/s): 208 Time of Flight to Max Range (sec): 19 Name: AT-5/SPANDREL Alternative Designations: Konkurs Missile Weight (kg): 25.2 (in tube) Warhead Type: Shaped Charge (HEAT) Armor Penetration (mm): 650 Minimum/Maximum Range (m): 75/4,000 Probability of Hit (%): 90 Average Velocity (m/s): 200 Time of Flight to Max Range (sec): 20 Name: AT-4/SPIGOT Alternative Designations: Fagot Missile Weight (kg): 13.0 (in tube) Warhead Type: Shaped Charge (HEAT) Armor Penetration (mm): 480 Minimum/Maximum Range (m): 70/2,000 Probability of Hit (%): 90 Average Velocity (m/s): 186 Time of Flight to Max Range (sec): 11 Other Missiles: AT-4B/Factoria (see NOTES)	

NOTES

Because of its weight, the Russians categorize the AT-4/4B system as portable (21-40 kg) rather than manportable. For dismounted carry load is divided among three packs. Due to the greater weight, AT-5/-5B fits into the "heavy" class (40+ kg), and should only be carried short distances from vehicles (<500 meters). For crews using both ATGM classes and operating near vehicles, combat load is 8 (4 stowed in the vehicle).

The AT-4B/Factoria is an upgrade ATGM with a 2,500 meter range, 550-mm penetration, and a velocity of 180 m/s (13.2 - 14.0 sec TOF). Russian firms have developed counter-countermeasures, such as encoded-pulse beacons for ATGMs and counter-dazzler adjustments to the 9S451M1 guidance box. Filters can be mounted in front of reticles.

TPVP/1PN65 thermal sight is available, with the range approximately 2,500 meters (see VARIANTS, above). Weight is 13 kg. Slovenian TS-F sight and Russian 1PN86-1/1PN86/Mulat have a 3,600 meter detection range.

	Weapons & Ammunition Types ATGM Launcher AT-7 HEAT ATGM AT-13 HEAT ATGM AT-13 HE ATGM	Typical Combat Load 4
SYSTEM Alternative Designations: 9P151Firing Post Date of Introduction: 1978 Proliferation: At least 5 countries Description: Crew: 2 Primary mount: Ground mount on tripod Alternate mounts: Shoulder for launch, UAZ-469 pintel mount Weight Overall, Excluding Missile (kg): 10.2 Length Overall in Firing Position (m): 0.78 with AT-7/Metis 0.98 with AT-13/Metis-M Height Overall In Firing Position (m): 0.72 with AT-7/Metis Width Overall In Firing Position (m): INA ARMAMENT Launcher Name: 9P151 Firing Post Launch Method: Tube Elevation (°): -5/+10 Rate of Launch (missiles/min): 3-5, depending on range Reaction Time (sec): INA Emplacement Time (min): 0.20 Displacement Time (min): 0.33 Ready/Stowed Missiles: 4/0 (1 on launcher) FIRE CONTROL FCS Name: 9S816 Guidance system Guidance: SACLOS Command Link: Wire Beacon Type: INA Tracker Type: IR Susceptible To Countermeasures: EO jammers, smoke, counterfire Counter-countermeasures: INA Rangefinder: Frequency: INA Counter-countermeasures: INA	Sights w/Magnification: Gunner: Day: INA Field of View (°): INA Acquisition Range (m): INA Night: Available VARIANTS Metis-M System: 9P151firing post adapted for and including the Metis-M missile, IOC 1992. AMMUNITION Antitank Guided Missiles Name: AT-7/Saxhorn Alternative Designations: Metis Missile Weight (kg): 6.3 (in tube) Warhead Type: Shaped Charge (HEAT) Armor Penetration (mm): 460 Minimum/Maximum Range (m): 40/1,000 Probability of Hit (%): 90 Average Velocity (m/s): 180 Time of Flight to Max Range (sec): 6.2 Name: AT-13 Alternative Designations: Metis-M (often mislabeled Metis-2) Missile Weight (kg): 13.8 (in tube) Warhead Type: Tandem Shaped Charge (HEAT) Armor Penetration (mm): 1,000/900 behind ERA Minimum/Maximum Range (m): 80/1500 Probability of Hit (%): 90 Average Velocity (m/s): 287 Time of Flight to Max Range (sec): 8 Other missiles: Metis-M HE thermobaric	

The Russians characterize the AT-7 ATGM complex as light or manportable (5-20 kg), permitting long-distance carry by dismounted infantry. Although the AT-13 complex slightly exceeds 20 kg, it is close enough to fit into the category.

The Russian 1PN86V/Mulat-115 thermal sight is available for use on the launcher, with detection at 3,200 meters and recognition beyond the missile's 1,500 meter range. Field of view is 4.6°.

French ATGM Launcher Eryx

	Weapons & Ammunition Types ATGM Launcher Eryx ATGM	Typical Combat Load 1
SYSTEM Alternative Designations: Anti-Char Courtee Portee (ACCP) Date of Introduction: 1991 Proliferation: At least 5 countries Description: Crew: 1 Primary mount: Ground mount on tripod or shoulder launch Alternate mounts: Shoulder launch--standing, kneeling or prone Weight Overall, Excluding Missile (kg): 3, 4 with tripod Length Overall in Firing Position (m): 0.905 Height Overall In Firing Position (m): INA Width Overall In Firing Position (m): INA tripod, 0.16 on shoulder ARMAMENT Launcher Name: Eryx Launch Method: Tube (disposable canister/ launch tube) Elevation (°): INA, tripod; unlimited on shoulder launch Rate of Launch: (missiles/min): INA Reaction Time (sec): 20-30 (includes emplace time) Emplacement Time (min): See Reaction Time (above) Displacement Time (min): < 0.03 Ready/Stowed Missiles: 1/ 0 FIRE CONTROL FCS Name: INA Guidance: SACLOS Command Link: Wire Beacon Type: Infrared laser diode Tracker Type: Charged couple device (CCD) Susceptible To Countermeasures: EO jammers, smoke, counterfire Counter-countermeasures: Flight time less than 4 seconds	Rangefinder: INA Sights w/Magnification: Gunner: Day: INA, 3x Field of View (°): 3.4 Acquisition Range (m): INA Night: Sopelem OB50 II sight Field of View (°): INA Acquisition Range (m): INA VARIANTS N/A AMMUNITION Antitank Guided Missile Name: Eryx Alternative Designations: ACCP Missile Weight (kg): 11 (in tube) Warhead Type: Tandem Shaped Charge (HEAT) Armor Penetration (mm): 900 Minimum/Maximum Range (m): 50/600 Probability of Hit (%): 90 Average Velocity (m/s): 162 Time of Flight to Max Range (sec): 3.7 Other missiles: N/A	

NOTES

The disposable canister/launch tube is attached to the reusable firing post (which includes sight systems).

Eryx employs a recoil reduction system with reduced back-blast, which permits launch from inside of buildings. Signature reduction includes noise and smoke reduction.

A rest such as a ledge or sandbag is required for launches beyond 350 meters.

The optional French Mirabel thermal night sight is available for use on Eryx. The Mirabel offers an acquisition range of 1,000 meters, but weighs an additional 3.4 kg.

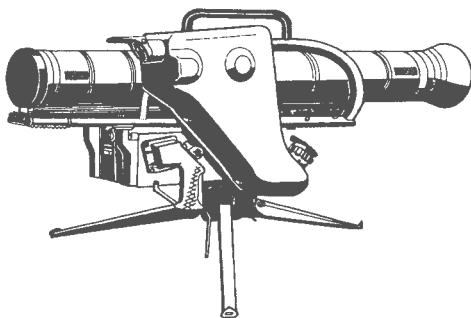
Russian ATGM Launcher Kornet-E

		Weapons & Ammunition Types ATGM Launcher Total HEAT ATGM HE ATGM	Typical Combat Load 3-4
Kornet-E system (with Kornet-LR missile) SYSTEM Alternative Designations: Kornet, AT-14 Date of Introduction: 1997-98 Proliferation: At least 3 countries Description: Crew: 2-3 Primary Mount: Ground mount on tripod Alternate Mounts: IFV, APC, ATGM launcher vehicle, jeep Weight Overall, Excluding Missile (kg): 30 with thermal sight (11) Length Overall in Firing Position (m): 1.21 (missile canister) Height Overall In Firing Position (m): INA Width Overall In Firing Position (m): INA ARMAMENT Launcher Name: 9P163 Launch Method: Tube-launched from carrying canister Elevation (°): INA Rate of Launch: (missiles/min): 2-3, depending on range Reaction Time (sec): 1-2 Emplacement Time (min): 1.0 Displacement Time (min): 1.0 Ready/Stowed Missiles: 2 for 2-man crew, 3-4 for 3-man crew FIRE CONTROL FCS Name: INA Guidance: Laser beam rider Command Link: N/A Beacon Type: N/A Tracker Type: N/A Susceptible To Countermeasures: Smoke, counterfire Counter-countermeasures: Encoded laser beam Rangefinder: Not included Sights w/Magnification: Gunner: Day: IP45-1 elbow sight Field of View (°): INA Acquisition Range (m): 5,500 Night: 1PN79 / Metis-2 thermal sight Field of View (°): INA Acquisition Range (m): 3,500 (ID range 2,500)		VARIANTS Kornet-E: Export version of the Kornet system includes a light-weight launcher tripod, thermal night sight, and Kornet-LR missile. A version of the system is available for use in hot desert climates (to 60° C). Since Russian KBP began development of a medium-range (2,500 m) version, it divided domestic programs into the following: Kornet-MR: Manportable system with E-type launcher and -MR missile. This missile is not currently fielded. Kornet-LR.portable: System with the -LR missile. Kornet-LR self-propelled: ATGM system on BMP-3 chassis with twin launchers, auto-loader, automated dual-track FCS with dual target trackers, Kredo surveillance radar, and improved FLIR. Kliver: Missile-gun turret upgrade; 1-man turret with 30-mm gun, 7.62-mm MG, automated FCS and 4-tube Kornet ATGM launcher. KBP displayed a prototype overhead weapons module to mount on a variety of vehicles (displayed on a HMMWV). It has dual twin (4-tube) launcher, and a central module with TV/FLIR sights and MG. AMMUNITION Antitank Guided Missiles Name: Kornet-LR Alternative Designation: 9M133 Missile Weight (kg): 27 Warhead Type: Tandem Shaped Charge (HEAT) Armor Penetration (mm): 1,200 Min/Max Range (m): 100/5,500 Probability of Hit (%): 90 Average Velocity (m/s): 550 Time of Flight to Max Range (sec): 22 Name: Kornet-MR Alternative Designation: INA Missile Weight (kg): INA Warhead Type: Tandem Shaped Charge (HEAT) Armor Penetration (mm): 1,000 Min/Max Range (m): 100/2,500 Probability of Hit (%): 90 Average Velocity (m/s): INA Time of Flight to Max Range (sec): INA Other Missiles: Kornet-LR HE (thermobaric, 9M133F) Kornet-MR HE (thermobaric).	

NOTES

By weight, Kornet-MR can be broken down into a portable (marginally manportable) 2-man system, or into a clearly manportable 3-man system. Kornet-LR can be manportable with MR missiles or a larger crew, but generally is only portable (short-distance carry – See AT-3). Medium-range and long-range Kornet missiles are interchangeable among Kornet-LR, -MR, and Kornet-E launcher systems.

European ATGM Launcher MILAN 2 /MILAN 3

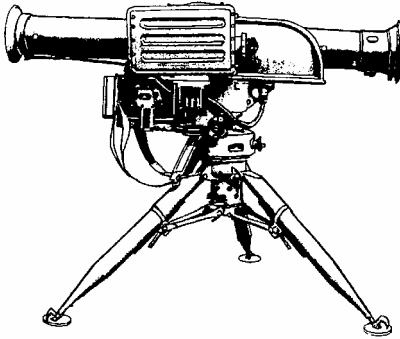
 MILAN 2	Weapons & Ammunition Types ATGM Launcher Total HEAT ATGM	Typical Combat Load 1 or 2
SYSTEM (MILAN 2 / MILAN 3, where their data differs) Alternative Designations: Missile d/Infanterie Leger Antichar Date of Introduction: 1985 MILAN 2/1996 MILAN 3 Proliferation: At least 39 countries MILAN/MILAN 2/1 MILAN 3 Description: Crew: 2, 3 with ammo bearer for second missile Primary Mount: Ground mount on tripod, including operator prone Alternate Mounts: IFV, ATGM Launcher Vehicle, jeep, helicopter Weight Overall, Excluding Missile (kg): 16.5 Length Overall in Firing Position (m): 1.2 (missile canister) Height Overall In Firing Position (m): 0.6 Width Overall In Firing Position (m): 0.42 ARMAMENT Launcher Name: MILAN 2/MILAN 3 Launch Method: Tube-launched from carrying canister Elevation (°): INA Rate of Launch: (missiles/min): 2-3, depending on range Reaction Time (sec): INA Emplacement Time (min): INA Displacement Time (min): INA Ready/Stowed Missiles: 2-man crew (1 on launcher), 0 stowed 3-man crew (1 on launcher), + 1 ready, 0 stowed FIRE CONTROL FCS Name: Guidance: SACLOS Command Link: Wire Beacon Type: Pyrotechnic flare, MILAN 2/ xenon bulb, MILAN 3 Tracker Type: IR, 2.2 μm/ 0.9 μm MILAN 3 Susceptible To Countermeasures: Smoke, counterfire, moving Counter-countermeasures: Encoded tracker, counters EOIRCM Rangefinder: INA Sights w/Magnification: Gunner: Day: Name INA, 7x Field of View (°): 4.3 Acquisition Range (m): INA Night: MIRA Thermal sight available Field of View (°): 3 x 6 Acquisition Range (m): 4,000 detection/ 2,000 recognition	VARIANTS The missile launchers can be pintle-mounted for launch from vehicles, such as the Marder 1A3 IFV. A variety of reconnaissance vehicles, such as the French VBL, are fitted with MILAN launchers. MILAN 2T: Improved ATGM with tandem warhead - not fielded MILAN 3: Variant with a CCD tracker for the missile beacon. MILAN, MILAN 2, and MILAN 3 missiles can be fired from all three launchers; however, the EOIRCM will only work with both MILAN 3 launcher and MILAN 3 missile. MCT: Compact turret w/two launchers for Spartan and other APCs. AMMUNITION Antitank Guided Missiles Name: MILAN Missile Weight (kg): 6.7 Warhead Type: Shaped Charge (HEAT) Armor Penetration (mm): 600 (RHA) Min/Max Range (m): 25/2,000 Probability of Hit (%): >90 Average Velocity (m/s): 160 Time of Flight to Max Range (sec): 12.5 Name: MILAN 2 Missile Weight (kg): 6.7 Warhead Type: Tandem Shaped Charge Armor Penetration (mm): 800 (RHA) Min/Max Range (m): 25/2,000 Probability of Hit (%): >90 Average Velocity (m/s): 160 Time of Flight to Max Range (sec): 12.5 Name: MILAN 3 Missile Weight (kg): 7.1 Warhead Type: Tandem Shaped Charge with precursor charge Armor Penetration (mm): 880 (RHA) Min/Max Range (m): 20/1,920 Probability of Hit (%): >90 Average Velocity (m/s): 160 Time of Flight to Max Range (sec): 12.5 Other Missiles: N/A	

NOTES

Although the launcher is portable and has been labeled man-portable, it is too heavy for one-man carry with missile.

A kit is available for retrofit to MILAN and MILAN 2 launchers, to permit firing MILAN 3 ATGM with EOIRCM (jammer countermeasure).

Chinese ATGM Launcher Red Arrow-8

	<table><tr><td>Weapons & Ammunition Types</td><td>Typical Combat Load</td></tr><tr><td>ATGM Launcher Total</td><td>Ground 1-5</td></tr><tr><td>HEAT ATGM</td><td>Vehicle 8-12</td></tr></table>	Weapons & Ammunition Types	Typical Combat Load	ATGM Launcher Total	Ground 1-5	HEAT ATGM	Vehicle 8-12
Weapons & Ammunition Types	Typical Combat Load						
ATGM Launcher Total	Ground 1-5						
HEAT ATGM	Vehicle 8-12						
SYSTEM Alternative Designations: Hongjian-8, RA-8, HJ-8 Date of Introduction: 1986 Proliferation: At least 4 countries Description: Crew: 4 Primary Mount: Ground mount on tripod, including operator prone Alternate Mounts: APC, ATGM Launcher Vehicle, jeep, helicopter Weight Overall, Excluding Missile (kg): 63 Length Overall in Firing Position (m): 1.57 (missile canister) Height Overall In Firing Position (m): INA Width Overall In Firing Position (m): INA ARMAMENT Launcher Name: Red Arrow 8 Launch Method: Tube-launched from carrying canister Elevation (°) (-/+): -7 to +12 Rate of Launch: (missiles/min): 2-3, depending on range Reaction Time (sec): INA Emplacement Time (min): INA Displacement Time (min): INA Ready/Stowed Missiles: INA FIRE CONTROL FCS Name: INA Guidance: SACLOS Command Link: Wire Beacon Type: Incandescent infrared bulb Tracker Type: IR Susceptible To Countermeasures: IR jammer, smoke, counterfire Counter-countermeasures: Jamming CM (NFI) Rangefinder: INA	Sights w/Magnification: Gunner: Day: Name INA, 12x Field of View (°): INA Acquisition Range (m): INA Night: PTI-32 Thermal sight available (copy of Thorn EMI) Field of View (°): INA Acquisition Range (m): 4,000 detection/2,000 identification VARIANTS Baktar Shikan: Pakistani variant, also called Green Arrow. Missile data is similar to Red Arrow-8A AMMUNITION Antitank Guided Missiles Name: Red Arrow-8A Alternative Designation: HJ-8A Missile Weight (kg): 24.5 (in tube), 22.5 ready for launch Warhead Type: Shaped Charge (HEAT) Armor Penetration (mm): 800 Min/Max Range (m): 100/3,000 Probability of Hit (%): 90 Average Velocity (m/s): 220 Time of Flight to Max Range (sec): 13.6 Name: Red Arrow-8E Alternative Designation: HJ-8E Missile Weight (kg): 24.5 (in tube), 22.5 ready for launch Warhead Type: Tandem Shaped Charge (HEAT) Armor Penetration (mm): 900 Min/Max Range (m): 100/4,000 Probability of Hit (%): 90 Average Velocity (m/s): 210 Time of Flight to Max Range (sec): 19 Other Missiles: There may be -8, -8B and -8C versions of the ATGM; however, the above are more likely for encounter.						

NOTES

Although the launcher is portable, it too heavy for one-man carry. Vehicle mounts are jeeps, such as the Chinese BJ-212 and BJ 2023 C, and APCs such as the Chinese WZ-551 and Type 90 APC. A Chinese four launcher turret has been fitted on ATGM launcher vehicles including the Chinese YW 531, WZ-551, and YW 534, and Chilean Piranha. Helicopter mounts are the Chinese Zhi-9 (license-built SA-354N/Dauphin 2) and French Antelope.

Gun-launched Antitank Guided Missiles

A critical element of modern warfare is the use of "high-precision weapons" to extend the lethal range of ground forces. Maneuver forces can add gun-launched missiles to tanks and anti-tank (AT) guns to increase accuracy and range. Also, these missiles offer a higher missile speed than most other ATGMs for intercepting moving targets. Thus they can engage a wider range of targets (such as fast-moving helicopters or vehicles) at longer ranges in the modern operational environment.

A gun-launched ATGM must be ballistically matched to a stub case with an eject charge, which expels the missile from the gun. For the more common laser beam-riding ATGMs, another requirement is a laser guidance unit/designator in its sight. Application to antitank (AT) guns is even simpler and more cost-effective, with a tripod-mounted laser guidance unit. For semi-active laser homing ATGMs, a laser designator is not required on the vehicle, as long as one is coordinated with the gun to start designating, and is within designation range of the target.

There are attractive advantages to the ATGM upgrade. Few countries are producing or buying significant numbers of modern tanks. Many, however, are upgrading current inventories to approach the lethality (including range, rate of fire, precision, and penetration) of newer tanks. Gun-launched ATGMs provide an easy upgrade for older tanks with addition of the missile and its related FCS. Applications are available for tanks, assault guns, infantry fighting vehicles, and AT guns in any known gun caliber of 100-125 mm. Current estimate is that 10-20% of 140,000 potential OPFOR tanks (about 21,000) are missile-capable. Nearly all operational Russian-made tanks, and close to 1,000 BMP-3 IFVs are either equipped with or can be retrofitted with gun-launched ATGMs.

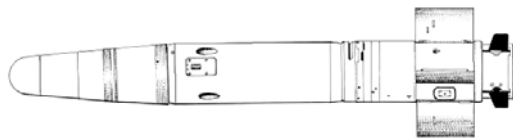
With upgrade kits available for low-level depot conversion, the task of distinguishing missile-capable vehicles is much more difficult. The most common upgrade uses a 1K13 sight, which replaces the vehicle night sight. Other more capable laser projectors and fire controls are available. Because laser guidance units for AT guns are manportable units, which can be concealed and easily transported, the number of ATGM-launch AT guns cannot be determined.

There are benefits and downsides to this technology. The cost to upgrade a tank for launching six missiles will run \$120,000-\$300,000 (subject to varying negotiable costs). Many modern canister-launch ATGMs currently enjoy a lethality overmatch against certain aspects of even the heaviest tanks. Because gun-launched ATGMs offer penetration inferior to some ATGMs, they may be overlooked in the budget-constrained military markets of today. NOTE: The lethality is limited by gun-caliber which can be expanded using a different attack trajectory (i.e., dive- or top-attack.) As with other ATGMs, range advantage may be of limited utility in selected battlefield environments, such as many cluttered, forested, or uneven terrains of Europe and Asia. However, for many applications in the battlefield environment, such as in urban combat, a gunner can use the increased precision for applications, such as placing the round through the top-left pane of the third window on the right of that fourth floor apartment. Units lacking employment discipline could quickly expend missile allocation, then find themselves out-ranged by enemy guns. For many environments, however, such as in European terrain, limited numbers of missiles could be used to control line-of-sight in open areas. Once the enemy

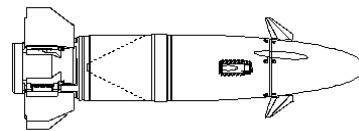
approaches within his effective range, flight time (vs KE round) and the limited penetration of a bore diameter HEAT warhead can place the firer at risk. Night use and fire-on-the move limitations can reduce opportunities for use of most gun-launched ATGMs.

Ground forces may employ moderate use by balancing selective gun-launched ATGM upgrades with acquisition of newer more conventional ATGMs. Countries with limited budgets may select high-priority units for the gun-launched ATGMs. Others may designate specially-assigned maneuver units for use with the upgrade. Another selective approach would be to configure units with one vehicle per platoon equipped for employing gun-launch ATGMs. Another critical consideration is missile availability. Under shifting wartime conditions, a force may not be able to shift missile-launch units, missiles and laser units to support the main effort.

The first successful gun-launched ATGM application was the 125-mm Kobra (aka AT-8/SONGSTER) radio frequency (RF) guided ATGM, fired from the T-64B Russian tank. Later, Kobra was adopted for the widely fielded T-80B tank, and is still used today.



Kobra



Svir

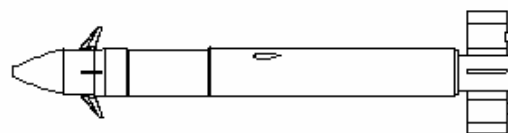
The Russian SVIR (aka AT-11/SNIPER), for the T-72B tank and other applications has a configuration which permits it to be handled by the autoloader like conventional separate-loading ammunition, with the missile loaded in the first stroke, and a second stroke for the stub case. SVIR uses laser beam-rider (LBR) guidance, which means that the gunner must use the 1K13 sight rather than the daysight.

The T-80U and later tanks use the Refleks fire control system, in which the laser guidance unit is in the day sight rather than the night sight. With this sight, the missile used is called Refleks; and the range is 5,000 meters. The Russians now offer a tandem warhead version, INVAR. A new Ukrainian ATGM, Komban, is an indigenous design missile produced for use with their T-84 tanks, and for tanks with compatible FCS.

The Russian BASTION missile family (aka AT-10) fits a variety of 100-115 mm guns. It is a single-piece round combining missile and eject charge configured similarly to a unitary round.



Bastion Round Configuration



Bastion Flight Configuration

With different chamber configurations and bore diameters on user guns, the different configurations have their own Russian names. Improved versions include the Bastion-M family with

Past and Current Gun-launched ATGMs

Designator/Name (Producer Country)	Number Users/ Status	Bore (mm)	Launcher Platform (Tank unless noted)	Range (km)	Shift to Gun Rd (km)*	Penetration (mm)/Type Warhead	Guidance/ P-Hit (%)
US Shillelagh (Obsolete)	At least 1	152	M60A2 M551 recon vehicle	3	1-1.5	500/HEAT Unitary	SACLOS Wire/<80
Russian Kobra	At least 2	125	T-64B T-80B	4	2-2.5	700/HEAT Uni- tary	SACLOS RF/80
Russian Bastion	At least 4	100	T-55AM	4	1.0-2.5	650/HEAT Uni- tary	LBR/ 80-90
		100	T-55AM2V	4	1.0-2.5		80-90
Sheksna		115	T-62D	4	1.0-2.5		80-90
		115	T-62M	4	1.0-2.5		80-90
Basnya		100	BMP-3 IFV	4	.5		80 on move 90 stopped
Kastet		100	MT-12 AT Gun	5	1.0-2.5		90
Russian Bastion-M	At least 1	100	BMP-3 IFV and others	4	.5 1.0-2.5	700/Tandem HEAT	LBR 90
Russian Arkan	At least 1	100	BMP-3 IFV Poss others	5	.5 1.0-2.5	700/Tandem HEAT	LBR 90
Russian Svir Refleks	At least 2 At least 5	125	T-72B/S, 2A45M	4	2-2.5	800/HEAT	LBR/80-90
			T-80U, T-84	5	2-3		80-90
			T-90	5	2-3		80-90
			2A45M AT Gun	5	2-3		80-90
Russian Invar	At least 1	125	T-72B/S	4	2-2.5	870/Tandem HEAT	LBR/80-90
			T-80U, T-84	5	2-3		80-90
			T-90	5	2-3		80-90
			2A45M AT Gun	5	2-3		80-90
Ukrainian Kombat	At least 1	125	T-84 Poss others	5 5	2-3 2-3	UNK/Tandem HEAT	LBR/80-90 80-90

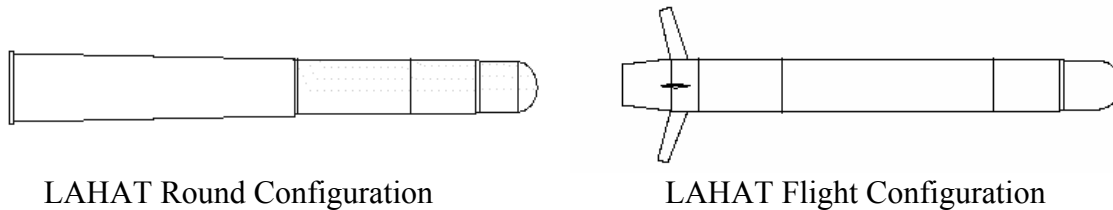
NOTES: *Average point of shift from using ATGM to gun round is close to the conventional ammunition's maximum effective range; but the decision involves various factors (Next page).

Recently Marketed And Future Gun-Launched ATGMs

Designator/Name (Producer Country)	Number Users/ Status	Bore (mm)	Launcher Platform/ # Missiles	Range (km)	Shift to Gun Rd (km)*	Penetration (mm)/Type Warhead	Guidance/ P-Hit (%)
Russian/German Spear	Near fielding	105	Leopard 1 tank or other NATO type	5	1.4-2	700/Tandem HEAT	LBR 90
Israeli LAHAT	Marketed	105 120 106	Merkava or M60 tank or other NATO type, poss M40 recls gun	5-7 5-7 5-7	1.5-2.5 2.0-3.0 1.0-1.5	700+ (est)/ Tandem HEAT Top-Attack	SAL- Homing
Israeli Excalibur	In R&D	120	Merkava or M1A1 or other NATO type				Terminal Hom- ing

tandem warheads. ARKAN, has a tandem warhead and a control surface adapted from the SVIR. The initial version fits BMP-3; but it is now being marketed for all variants. A German and Russian R&D effort will produce SPEAR, a 105-mm ATGM for use with NATO guns.

A recent development is the Israeli LAHAT ATGM, which is initially marketed in 105 mm for NATO-standard cannon, and which can be adapted to NATO-standard 120-mm guns.



There are reports that the LAHAT missile could possibly be adapted for use with the M40 106-mm recoilless rifle, to extend the usefulness of that well-proliferated older weapon. The LAHAT's semi-active laser-homing guidance means that the ATGM can be designated with the vehicle's designator or launched at a target beyond the line-of-sight and homed to target by a down-range designator. Indirect fire capability allows the option for armored combat vehicles working in a combined arms formation to extend their lethal range and destroy enemy sensors, while reducing the enemy's opportunity to detect them and trigger deadly counter-fires.

Technical capabilities and limitations affect use of the systems. The missiles can be launched at moving targets; but hit probability is highest if the target is stopped or moving slowly. Smoke and dust can degrade the laser beam and the associated optics. However, effects of obscurants on ATGM seeker sensitivity have in some cases been shown to improve the hit performance of certain LBR missiles. Launch rate varies from 2-3 per minute, depending on target range. As target units approach within the gun's maximum effective range (see Glossary), the system should cease launching ATGMs and shift to gun rounds. Given the lethality of modern kinetic energy main gun rounds at 3,000 meters, an ATGM-launch vehicle may not want to risk a missile's 8-second flight time against a 2-second KE round. Determination of the point of shift from ATGM to cannon round is primarily dependent on accuracy of the vehicle's gun sight, and capabilities of specific rounds onboard. For instance, improved KE rounds can range out to 3 km; but most have a max effective range of no more than 2.5 km. The BMP-3 ATGM is the IFV's only true AT round, and can be employed to its minimum range.

Missile proliferation cannot be determined, because ammunition packaged for transport is difficult to track. Basic load is 5-8 rounds per vehicle, with another basic load at battalion re-supply and a half basic load at division. In a gun basic load, the ATGMs substitute for Frag-HE rounds (used beyond KE round range) and a portion of the of HEAT round allocation.

Most gun-launched ATGM fire control systems do not have a night channel which permits observation for launch at night. The few that do are limited by the range (800-1,300 meters) of their infrared sensors. However, with proper battlefield illumination, engagements can take place using its full range. They just need a lot of well-positioned and well-timed

illumination. Recently, thermal night sights have been introduced with thermal sights (FLIRs) which permit launch at night, but with restrictions in range based on the technical capability of the FLIR to detect and recognize targets, and launch on the move.

Laser beam guidance ATGMs have not received as much attention for countermeasures as have semi-active command line-of-sight (SACLOS) systems. Those ATGMs using LBR guidance are not susceptible to interference from electro-optical countermeasures. Even electro-optical jammers operating in the same wavelengths as the laser are ineffective because the missile optical receiver is looking back towards its launch point rather than at the target. Laser decoy devices used against SAL-homing munitions are also ineffective. The ATGM rider laser beam, however, can trigger laser warning receivers. Operator counter-tactics can reduce warning time. Conventional reactions against ATGMs, such as obscuration of optics, can degrade performance of gun-launch missiles. But the longer target range and shorter flight time can reduce a target's awareness and time window in which to react. Explosive reactive armor, stand-off plates, and hard-kill active protection systems can significantly reduce penetration by HEAT (or shaped-charge) warheads, characteristic kill mechanisms on most ATGMs.

Considerations such as tactics, specific deployment, and technology of each gun and upgrade impact on their effectiveness. These upgrades could apply to OPFOR portrayal of numerous systems in this document, especially in chapters for: infantry weapons (Chapter 1), infantry vehicles (Ch 2), tanks and assault vehicles (Ch 4), and antitank guns (Ch 5). Similar upgrades could be added to heavy reconnaissance vehicles (Ch 3). For more information see the subject white paper, which will be added on the TSD website.

Chapter 6

Artillery

This chapter provides the basic characteristics of selected artillery weapon systems either in use or readily available to the OPFOR. Therefore, the artillery systems discussed in this chapter are those likely to be encountered by U.S. forces in varying levels of conflict. The selection of artillery systems is not intended to be all-inclusive, rather a representative sampling of weapons and equipment supporting various military capabilities.

This update is divided into the following categories—artillery reconnaissance, towed artillery systems, mortar/gun-mortar systems, and multiple rocket launchers. Later updates of this guide will include data sheets addressing the aforementioned categories as well as ground mounted mortars, artillery locating radars, sound and flash systems, and surface-to-surface missiles (SSMs).

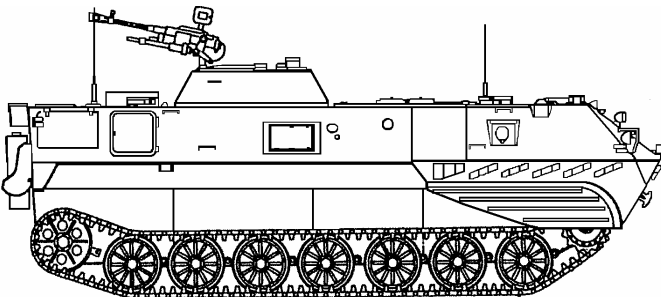
Questions and comments on data listed in this chapter should be addressed to:

Mr. Walter L. Williams

DSN: 552-7923 Commercial (913) 684-7923

e-mail address: williamw@leavenworth.army.mil

Russian Artillery Command and Reconnaissance Vehicle 1V13

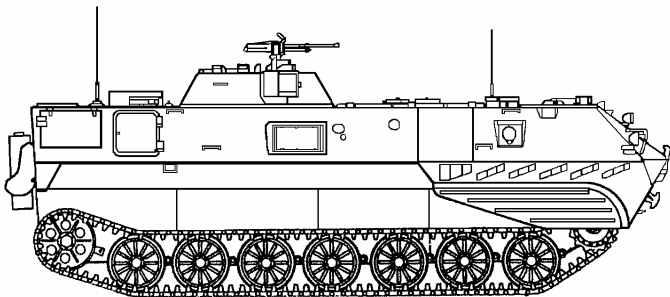
	Weapons &Ammunition Types 12.7-mm DShK MG	Typical Combat Load 500
SYSTEM Alternative Designations: M1974-1 Date of Introduction: 1974 Proliferation: At least 1 country Description: Crew: 6 Platform (chassis): MT-LBu Combat Weight (mt): 15.7 Chassis Length Overall (m): 7.62 Height Overall (m): 2.72 Width Overall (m): 2.85 Automotive Performance: Engine Type: YaMZ-238, 240 hp diesel Cruising Range (km): 500 km Speed (km/h): Max Road: 60 Max Off-Road: 26 Cross-Country: INA Max Swim: 4.5 Fording Depths (m): Amphibious Radio: R-123M radio (3 each) Protection: Armor, Turret Front (mm): 20 Armor Turret Top (mm): INA Armor Hull (mm): 15 NBC Protection System: Yes Smoke Equipment: No	ARMAMENT Caliber, Type, Name: 12.7-mm heavy machinegun, DShK Mount Type: Pintle Direct Fire Range (m): 1,500 Max Effective Range (m): Day: 1,500 Night: N/A Fire on Move: Yes Rate of Fire (rpm): 80-100 (practical) VARIANTS 1V13M: INA SENSORS/COMPONENTS Navigation: 1T121-M Navigation System Fire direction: Automated: APK automated firing data receiver Manual: PUO-7 Other equipment: DSP-30 rangefinder, K-1 collimator, roof mounted periscopic aiming circle, VOP-7 vision blocks and driver's periscopes.	

NOTES

The MT-LBu-based 1V12 *Maschina* ACRV set was first noted in 1974. The set provides the command and control vehicles for SP cannon battalions. The eight vehicle set consists of three 1V13 battery senior officer's vehicles, three 1V14 battery commander's vehicles, one 1V15 battalion commander's vehicle, and one 1V16 battalion FDC/chief of staff's vehicle. The 1V12M *Faltset* ACRV set is a modernized version of the system. The installation of an upgraded electronics package in the vehicles necessitated the requirement for an external-mounted power generator (the 1V12 *Machina* ACRV generator was mounted internally). In addition to freeing a small amount of space inside the vehicle, the external mount reduces the internal noise level.

The ACRV 1V13 is the battery FDC of the 1V12 ACRV Complex. The battery senior officer, assisted by fire direction and communications personnel mans the vehicle. It has direct radio communications with the battery COP, the battalion COP, and the battalion FDC. The vehicle is equipped with a land navigation system and has a roof mounted periscopic aiming circle. The roof mounted periscopic aiming circle allows the battery senior officer the ability to lay the howitzers for direction from within his vehicle. There is no battlefield observation equipment present on the 1V13.

Russian Artillery Command and Reconnaissance Vehicle 1V14/1V15

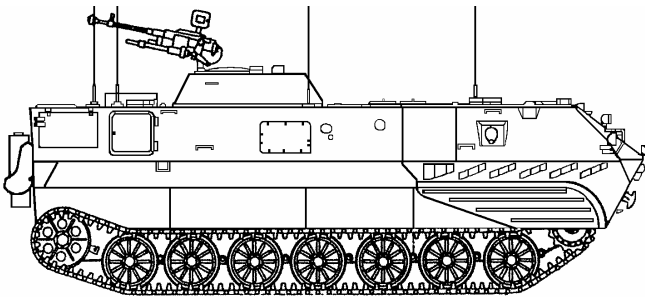
	Weapons &Ammunition Types 7.62-mm MG	Typical Combat Load 2,000
SYSTEM Alternative Designations: M1974-2A (1V14), M1974-2B (1V15) Date of Introduction: 1974 Proliferation: At least 1 country Description: Crew: 1V14 (6)/1V15 (7) Platform (chassis): MT-LBu Combat Weight (mt): 15.7 Chassis Length Overall (m): 7.26 Height Overall (m): 2.72 Width Overall (m): 2.85 Automotive Performance: Engine Type: YaMZ-238, 240hp diesel Cruising Range (km): 500 km Speed (km/h): Max Road: 60 Max Off-Road: 26 Cross-Country: INA Max Swim: 4.5 Fording Depths (m): Amphibious Radios: 1V14: R-123M (3 each), R-107M (1 each) 1V15: R-123M (2 each), R-107M (1 each), R-111 (1 each), R-130M (1 each)	Protection: Armor, Turret Front (mm): 20 Armor Turret Top (mm): INA Armor Hull (mm): 15 NBC Protection System: Yes Smoke Equipment: No ARMAMENT Caliber, Type, Name: 7.62-mm machinegun, PKT Mount Type: Pintle Direct Fire Range (m): 1,500 Max Effective Range (m): Day: 1,000 Night: N/A Fire on Move: Yes Rate of Fire (rpm): 650 (cyclic), 2-10 round bursts VARIANTS 1V14M/1V15M: INA SENSORS/COMPONENTS Navigation: 1T121-M Navigation System Fire direction: Automated: 1V520. Manual: PUO-7 Other equipment: 1D15 laser rangefinder, DSP-30 rangefinder, 1PN44 day/night sight, PAB-2AM aiming circle, DS-1 stereoscopic rangefinder, VOP-7 vision blocks and driver’s periscopes.	

NOTES

The MT-LBu-based 1V12 *Maschina* ACRV set was first noted in 1974. The set provides the command and control vehicles for SP cannon battalions. The eight vehicle set consists of three 1V13 battery senior officer's vehicles, three 1V14 battery commander's vehicles, one 1V15 battalion commander's vehicle, and one 1V16 battalion FDC/chief of staff's vehicle. The 1V12M *Faltset* ACRV set is a modernized version of the system. The installation of an upgraded electronics package in the vehicles necessitated the requirement for an external-mounted power generator (the 1V12 *Maschina* ACRV generator was mounted internally). In addition to freeing a small amount of space inside the vehicle, the external mounting reduces the internal noise level.

The ACRV 1V14 and ACRV 1V15 are the battery and battalion commander's vehicles of the 1V12 ACRV Complex. Both vehicles are equipped with the 1T121 land navigation system, a 1D15 laser rangefinder, and the 1PN44 day/night sight mounted in a basketed turret. The observer uses an analog coordinate converter to translate the polar location data when determining rectangular target coordinates. The 1V14 has an internal power generator. The 1V15 can be distinguished from the 1V14 by the external antenna bracket on the rear of the vehicle. The 1V520 fire direction computer may be transported internally and dismounted at a command observation post. The artillery commander, assisted by target acquisition, fire direction and communications personnel mans the vehicle. The artillery commander decides how to attack targets of opportunity and targets relayed to him by the supported maneuver unit.

Russian Artillery Command and Reconnaissance Vehicle 1V16

	Weapons &Ammunition Types 12.7-mm DShK MG	Typical Combat Load 500
SYSTEM Alternative Designations: M1974-3 Date of Introduction: 1974 Proliferation: At least 1 country Description: Crew: 7 Platform (chassis): MT-LBu Combat Weight (mt): 15.7 Chassis Length Overall (m): 7.26 Height Overall (m): 2.72 Width Overall (m): 2.85 Automotive Performance: Engine Type: YaMZ-238, 240hp diesel Cruising Range (km): 500 km Speed (km/h): Max Road: 60 Max Off-Road: 26 Cross-Country: INA Max Swim: 4.5 Fording Depths (m): Amphibious Radios: R-123M (2 each), R-111M (1 each), R-130M (1 each, R-326 receiver (1 each)	Protection: Armor, Turret Front (mm): 20 Armor Turret Top (mm): INA Armor Hull (mm): 15 NBC Protection System: Yes Smoke Equipment: No ARMAMENT Caliber, Type, Name: 12.7-mm HMG, DShK Mount Type: Pintle Direct Fire Range (m): 1,500 Max Effective Range (m): Day: 1,500 Night: N/A Fire on Move: Yes Rate of Fire (rpm): 80-100 (practical) VARIANTS 1V16M: INA SENSORS/COMPONENTS Fire direction: Automated: 9V59 Manual: PUO-7	

NOTES

The MT-LBu-based 1V12 *Maschina* ACRV set was first noted in 1974. The set provides the command and control vehicles for SP cannon battalions. The eight vehicle set consists of three 1V13 battery senior officer's vehicles, three 1V14 battery commander's vehicles, one 1V15 battalion commander's vehicle, and one 1V16 battalion FDC/chief of staff's vehicle. The 1V12M *Faltset* ACRV set is a modernized version of the system. The installation of an upgraded electronics package in the vehicles necessitated the requirement for an external-mounted power generator (the 1V12 *Machina* ACRV generator was mounted internally). In addition to freeing a small amount of space inside the vehicle, the external mounting reduces the internal noise level.

The 1V16 is the simplest of the vehicles in the 1V12 ACRV Complex and serves as the battalion FDC/chief of staff's vehicle. Normally, the battalion chief of staff, assisted by fire direction and communication personnel mans the vehicle. It has neither battlefield observation optics nor a navigation system. However, the vehicle is equipped with the standard VOP-7 vision blocks and driver's periscopes. It is equipped with extra radios and has an extendable antenna mast mounted on the vehicle rear. The 9V59 fire-direction computer is mounted in the vehicle.

The 9V59 fire-control computer comes in several different models believed to be designated as the 9V59-1, -2, and -3. For example, the 9V59-2 is associated with 152-mm artillery units. The 9V59 fire-control computer is probably a 4-bit computer and, although quite rugged, is assessed to have a low mean time between failures because of a large number of discrete components. The 1V510 is assessed to be a replacement for the 9V59 fire-control computer. The 1V510 is capable of performing survey calculations and technical firing data. The system is assessed to be 33% faster than the 9V59.

Russian Artillery Command and Reconnaissance Vehicle 1V18/1V19

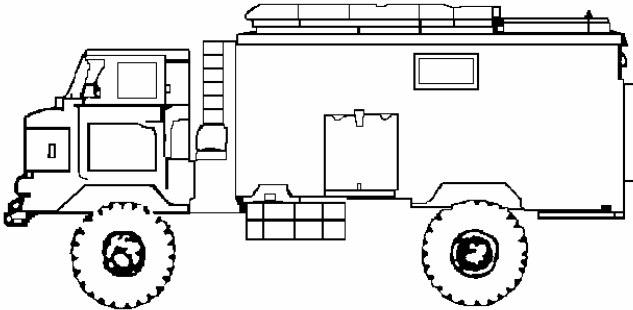
	Weapons &Ammunition Types	Typical Combat Load
SYSTEM Alternative Designations: M1979-2A (1V17), M1979-2B (1V18) Date of Introduction: 1979 Proliferation: At least 1 country Description: Crew: 6 Platform (chassis): BTR-60PB Combat Weight (mt): 10.1 Chassis Length Overall (m): 7.22 Height Overall (m): 2.06 Width Overall (m): 2.82 Automotive Performance: Engine Type: 2 GAZ-49B 90 hp(180 hp total) in-line, water-cooled gasoline Cruising Range (km): 500 km Speed (km/h): Max Road: 80 Max Off-Road: 60 Cross-Country: INA Max Swim: 10 Fording Depths (m): Amphibious Radio: 1V18: R-123M (3 each), R-107M (1 each) 1V19: R-123M (2 each), R-107M (1 each), R-111 (1 each), R-130M (1 each) Protection: Armor, Turret Front (mm): INA Armor Turret Top (mm): INA Armor Hull (mm): INA NBC Protection System: Yes Smoke Equipment: No	VARIANTS None SENSORS/COMPONENTS Navigation: 1T121-M Navigation System Fire direction: Automated: 1V520 Manual: PUO-7 Other equipment: 1D15 laser rangefinder, 1PN44 day/night sight, PAB-2AM aiming circle, DS-1 stereoscopic rangefinder	

NOTES

In 1979, the Soviet Union introduced a similar wheeled ACRV set for multiple rocket launcher and towed cannon units. The eight-vehicle set consists of three 1V110 battery senior officer's vehicles, three 1V18 battery commander's vehicles, one 1V19 battalion commander's vehicle, and one 1V111 battalion chief of staff's vehicle. Early versions of the 1V17 ACRV set included a 1V111 equipped with a modified ZIL-130-mounted 9S77M instead of the ZIL-131. There have been no upgrades to the 1V17 like that of the 1V12 to 1V12M.

The ACRV 1V18 and 1V19 are the battery and battalion commander's vehicles of the 1V17 ACRV Complex. Both vehicles are equipped with the IT121 land navigation system, a 1D15 laser rangefinder, and the 1PN44 day/night sight. The observer uses an analog coordinate converter to translate the polar location data when determining rectangular target coordinates. The 1V520 fire direction computer may be transported internally and dismounted at a command observation post.

Russian Artillery Command and Reconnaissance Vehicle 1V110

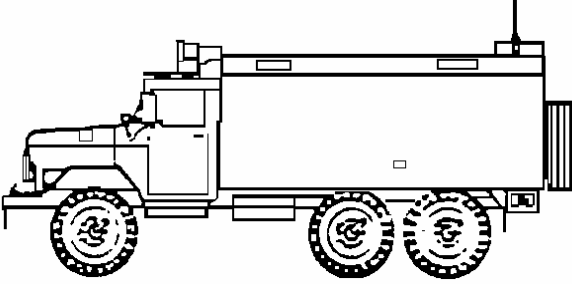
	Weapons & Ammunition Types	Typical Combat Load
SYSTEM Alternative Designations: M1979-1 Date of Introduction: 1979 Proliferation: At least 1 country Description: Crew: 5 Platform (chassis): GAZ-66B, 4x4 wheeled, Box Body Van Combat Weight (mt): 3.6 Chassis Length Overall (m): 5.66 Height Overall (m): 2.44 Width Overall (m): 2.34 Automotive Performance: Engine Type: ZMZ-66, 115 hp V-8, water-cooled, gasoline Cruising Range (km): 875 km Speed (km/h): Max Road: 87 Max Off-Road: 35 Cross-Country: INA Fording Depths (m): .80 Radio: R-123M radio (3 each)	VARIANTS None SENSORS/COMPONENTS Navigation: See NOTES. Fire direction: No computation system is installed. The vehicle is equipped with the APK automated firing data receiver. Other equipment: DSP-30 laser rangefinder, K-1 collimator	

NOTES

In 1979, the Soviet Union introduced a similar wheeled ACRV set for multiple rocket launcher and towed cannon units. The eight-vehicle set consists of three 1V110 battery senior officer's vehicles, three 1V18 battery commander's vehicles, one 1V19 battalion commander's vehicle, and one 1V111 battalion chief of staff's vehicle. Early versions of the 1V17 ACRV set included a 1V111 equipped with a modified ZIL-130-mounted 9S77M instead of the ZIL-131. There have been no upgrades to the 1V17 like that of the 1V12 to 1V12M.

The ACRV 1V110 battery FDC serves the same function as the ACRV 1V13 (1V12 ACRV Complex) and is similarly equipped. However, the land navigation system is a different model.

Russian Artillery Command and Reconnaissance Vehicle 1V111

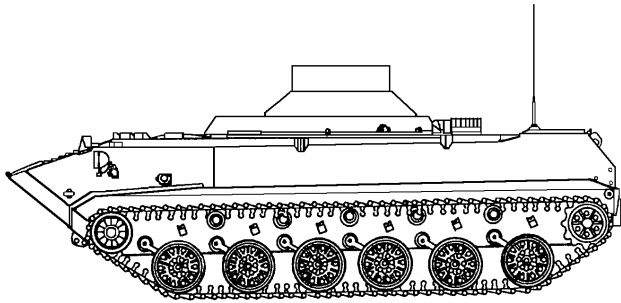
	Weapons & Ammunition Types	Typical Combat Load
SYSTEM Alternative Designations: M1979-3 Date of Introduction: 1979 Proliferation: At least 1 country Description: Crew: 7 Platform (chassis): ZIL 131 6x6 box body van Combat Weight (mt): 6.7 Chassis Length Overall (m): 6.90 Height Overall (m): 2.48 Width Overall (m): 2.50 Automotive Performance: Engine Type: ZIL 131 61, 150 hp V-8, water-cooled, gasoline Cruising Range (km): 850 km Speed (km/h): Max Road: 80 Max Off-Road: 35 Cross-Country: INA Fording Depths (m): 1.4 Radio: R-111M (1 each), R-123M (2 each) radios; R-130M short-wave radio (1 each), and R-326 receiver (1 each)	VARIANTS None SENSORS/COMPONENTS Fire direction: 9V59 fire-control computer	

NOTES

In 1979, the Soviet Union introduced a similar wheeled ACRV set for multiple rocket launcher and towed cannon units. The eight-vehicle set consists of three 1V110 battery senior officer's vehicles, three 1V18 battery commander's vehicles, one 1V19 battalion commander's vehicle, and one 1V111 battalion chief of staff's vehicle. Early versions of the 1V17 ACRV set included a 1V111 equipped with a modified ZIL-130-mounted 9S77M instead of the ZIL-131. There have been no upgrades to the 1V17 like that of the 1V12 to 1V12M.

The ACRV 1V111 battalion FDC/chief of staff's vehicle serves the same function as the ACRV 1V16 (1V12 ACRV Complex) and houses the fire-direction computer. Like the 1V16, it is the simplest of the vehicles in the 1V17 ACRV Complex and lacks a land navigation system.

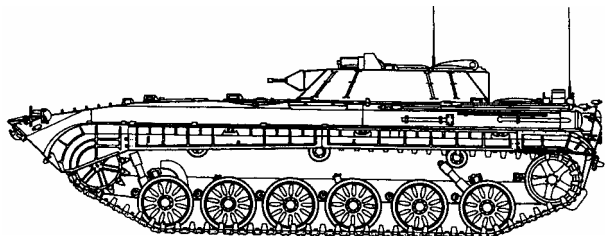
Russian Artillery Command and Reconnaissance Vehicle 1V119

 Artist Drawing From Photo	Weapons & Ammunition Types	Typical Combat Load
SYSTEM Alternative Designations: 1V119 Spekt Date of Introduction: 1981 Proliferation: At least 1 country Description: Crew: 6 Platform (chassis): BMD-1 Combat Weight (mt): 6.7 Chassis Length Overall (m): 5.88 Height Overall (m): 1.97 Width Overall (m): 2.63 Automotive Performance: Engine Type: Type 5D20, 240 hp V-6, liquid-cooled diesel Cruising Range (km): 500 km Speed (km/h): Max Road: 61 Max Off-Road: 35 Cross-Country: INA Max Swim: 10 Fording Depths (m): Amphibious Radio: R-123M (3 each), R-107M (1 each) Protection: Armor, Turret Front (mm): INA Armor Turret Top (mm): INA Armor Hull (mm): 15 NBC Protection System: Yes Smoke Equipment: No	VARIANTS None SENSORS/COMPONENTS Navigation: 1T121-M Navigation System Fire direction: Automated: 1V520. Manual: PUO-7 Other equipment: 1D15 laser rangefinder, DSP-30 rangefinder, 1PN44 day/night sight, PAB-2AM aiming circle, DS-1 stereoscopic rangefinder, VOP-7 vision blocks and driver's periscopes.	

NOTES

The ACRV 1V119 is associated with the deployment of the 2S9 Nona-S 120-mm Combination Gun and can be parachute landed with airborne troops. The 1V119's sensor and fire direction package is similar to the ACRV 1V14. The 1V118 Reostat is classified as a command and reconnaissance vehicle and is not associated with an ACRV complex.

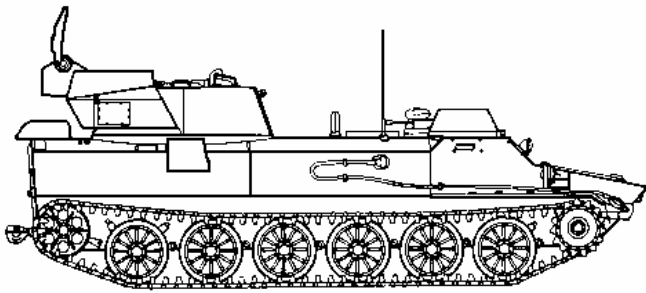
Russian Artillery Mobile Reconnaissance Vehicle PRP-3/PRP-4M

	Weapons & Ammunition Types 7.62 PKT MG	Typical Combat Load 2,000
SYSTEM Alternative Designations: None Date of Introduction: 1975 Proliferation: At least 1 country Description: Crew: 5 Platform (chassis): BMP-1 Combat Weight (mt): 13.2 Chassis Length Overall (m): 6.73 Height Overall (m): 2.14 Width Overall (m): 2.94 Automotive Performance: Engine Type: 293-hp Diesel Cruising Range (km): 600 Speed (km/h): Max Road: 60 Max Off-Road: 35 Cross-Country: INA Max Swim: 7 Fording Depths (m): Amphibious Radio: R-173 Protection: Armor, Turret (mm): 23 Armor Hull (mm): 19 Self-Entrenching Blade: No NBC Protection System: Yes Smoke Equipment: Vehicle engine exhaust smoke system (VEESS) ARMAMENT Main Armament: Caliber, Type, Name: 7.62-mm machinegun PKT Mount Type: coax Direct Fire Range (m): 1,300 Max Effective Range (m): Day: 1,000 / 400-500 on the move Night: 800 Fire on Move: Yes Rate of Fire (rpm): 600 cyclic in 2-10 round bursts	VARIANTS None SENSORS/COMPONENTS PRP-3 Sensors/Components: Navigation: 1G25 gyrocompass and 1G13 gyro course indicator Direction: 1V520 Ballistic Computer Right Side Sensors: 1PN61 Night Vision sensor and 1D11 Laser Rangefinder Left Side Sensors: None Radar: 1RL126 Small Fred Radar Operating Band: K (36.2 – 37.0 GHz) Detection Range: 20 km Tracking Range: 7–12 km PRP-4 Sensors/Components: Navigation: 1G25-1 gyrocompass and 1G13 gyro course indicator Fire Direction: 1V520 Ballistic Computer Right Side Sensors: 1PN61 Night Vision sensor and 1D11M-1 Laser Rangefinder Left Side Sensors: 1PN59 Thermal Imaging Night Vision Device and 1D14 Laser Rangefinder Radar: 1RL133M-1 Tall Mike Radar Operating Band: I (9.0 GHz) Detection Range (personnel): 3.0 km Detection Range (vehicle): 12 km	

NOTES

The PRP-4M has improved 1PN71 night vision sensors. The vehicles are also equipped with a NBC filtration and overpressure system.

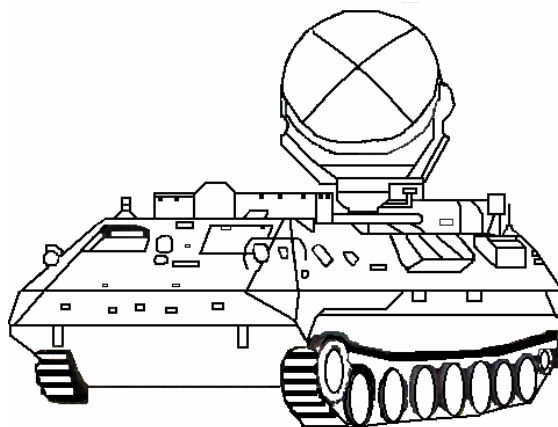
Russian Battlefield Surveillance Radar SNAR 10

	Weapons & Ammunition Types 7.62 PKT MG	Typical Combat Load 2,000
SNAR 10 with radar raised and the turret mounted 7.62 PKT MG pointed to the rear		
SYSTEM Alternative Designations: BIG FRED, 1RL232, 1RL232-1 Date of Introduction: 1975 Proliferation: At least 12 countries Description: Crew: 5 Platform (chassis): MT-LBu Combat Weight (mt): 12.6 Chassis Length Overall (m): 7.62 Height Overall (m): 2.72 (est.) Width Overall (m): 2.85 Automotive Performance: Engine Type: YaMZ-238, 240 hp diesel Cruising Range (km): 500 km Speed (km/h): Max Road: 60 Max Off-Road: 26 Cross-Country: INA Max Swim: N/A Fording Depths (m): INA Radio: R-123M radio, 2 each Protection: Armor, Turret Front (mm): 20 Armor Turret Top (mm): INA Armor Hull (mm): 15 NBC Protection System: Yes Smoke Equipment: No	ARMAMENT Main Armament: Caliber, Type, Name: 7.62-mm machinegun PKT Mount Type: Coax Direct Fire Range (m): 1,300 Max Effective Range (m): Day: 1,000 / 400-500 on the move Night: 800 Fire on Move: Yes Rate of Fire (rpm): 600 cyclic in 2-10 round bursts VARIANTS None RADAR Performance Capability Antenna Type: Parabolic Operating Band: K (34.55 to 35.25 GHz) Detection Range Against Moving Targets, Without MTI (km): Vehicles: 16.0 Ships: 30.0 Shell Impact: 10.0 Detection Range Against Moving Targets, With MTI (km): Vehicles: 10.0 Emplacement Time (minutes): 5.0 Displacement Time (minutes): 5.0	

NOTES

The primary mission of the Big Fred radar is to detect and track both moving ground and water surface targets. Additionally, the radar can be used to provide friendly fire correction data to artillery units. The SNAR 10 is not capable of amphibious operations (unlike other members of the MT-LBu family) due to the heavy turret. The vehicles are also equipped with a NBC filtration and overpressure system.

Russian Artillery Locating Radar ARK-1M Rys



SYSTEM

Alternative Designations: None

Date of Introduction: 1986

Proliferation: At least 1 country

Description:

Crew: 4

Platform (chassis): MT-LBu

Combat Weight (mt): 15.7

Chassis Length Overall (m): 7.62

Height Overall (m): 2.72

Width Overall (m): 2.85

Automotive Performance:

Engine Type: YaMZ-238, 240 hp diesel

Cruising Range (km): 500 km

Speed (km/h):

Max Road: 60

Max Off-Road: 26

Cross-Country: INA

Max Swim: 4.5

Fording Depth (m): Amphibious

Radio: R-123M radio

Protection:

Armor, Turret Front (mm): 20

Armor Turret Top (mm): INA

Armor Hull (mm): 15

NBC Protection System: Yes

Smoke Equipment: No

RADAR

Antenna:

Antenna Type: Reflector

Receiver:

Noise Figure (dB): 8.0

Performance Capability

Detection Range (km):

Mortar: 13.0

Gun/howitzer: 8.0

MLRS: 25.0

Tactical Missile: 30.0

Max Number of Targets (tracks/min): 3

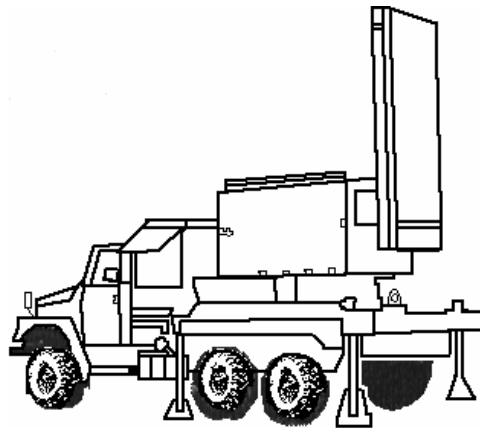
Emplacement Time (minutes): 5.0

Displacement Time (minutes): 5.0

NOTES

The ARK-1M power supply is located on the rear of the vehicle.

Chinese Artillery Locating Radar BL-904



SYSTEM

Alternative Designations: Type 704 and Type 704M

Date of Introduction: 1991

Proliferation: Ready for production

Description:

Crew: 4

Platform (chassis): Dong Feng EQ2100E6D, 2500 kg, 6x6

Combat Weight (mt): 11.5

Chassis Length Overall (m): 6.84 (est.)

Height Overall (m): INA

Width Overall (m): 2.40 (est.)

Automotive Performance:

Engine Type: Cummins 6BT5.9 Diesel

Cruising Range (km): INA

Speed (km/h):

Max Road: 85

Max Off-Road: INA

Cross-Country: INA

Max Swim: N/A

Fording Depths (m): 0.9

Radio: INA

RADAR

Antenna:

Antenna Type: Phased-Array

Antenna Gain (dBi): 43.3

Mode: Search

Scan Method: Electronic

Scan Type: Sector (azimuth)

Scan Width (deg):

Narrow: 30.0

Wide: 90.0

Mode: Verification

Scan Method: Electronic

Scan Type: Nonperiodic

Mode: Track

Scan Method: Electronic

Scan Type: Nonperiodic

Transmitter:

Transmitter Type: Traveling Wave Tube

RF minimum (GHz): 8.0

RF maximum (GHz): 12.0

Mode: All

Receiver:

Noise Figure (dB): 8.0

Single Pulse Processing: Coherent

Multiple Pulse Processing: Doppler Filters

Performance Capability

Detection Range, Wide Scan Mode (km):

82-mm Mortar: 15.0

122-mm Howitzer: 16.0

155-mm Howitzer: 18.0

Detection Range, Narrow Scan Mode (km):

122-mm Howitzer: 20.0

155-mm Howitzer: 25.0

273-mm Rocket: 30.0

Max Number of Targets (tracks/min): 8

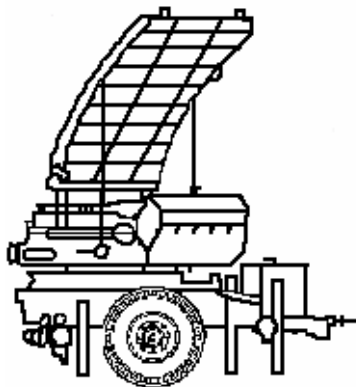
Emplacement Time: 10.0 (2 vehicle configuration)

Displacement Time: 10.0 (2 vehicle configuration)

NOTES

Versions of the BL-904 have been offered for sale by NORINCO Industries since at least 1991. While China's army is a prime candidate for the deployment of the BL-904, there is no evidence of it being fielded to operational units. Additionally, the system has not been exported. It was initially named the Type 704. Later an improved-performance version was called the Type 704M. The system is similar to the U.S. AN/TPQ-36 in both appearance and performance (as claimed by the manufacturer). The system can be used to track friendly artillery fire. The system calculates the impact error of friendly artillery rounds and provides automatic correction parameters for increased accuracy. The radar system is employed as a two-vehicle set. One vehicle carries the radar while the other vehicle carries the command cabin and the system power supply. The command cabin contains the operation and control panel, data processing equipment, computer monitors/displays, etc.

British Artillery Locating Radar Cymbeline



Alternative Designations: MUFAR/PIF-518

Date of Introduction: 1973

Proliferation: At least 3 countries

Description:

Crew: 3

Platform (chassis): MK 1 version trailer

Combat Weight (kg): 980

Chassis Length Overall (m): 2.90 (transit)

Height Overall (m): 1.80 (transit)

Width Overall (m): 1.78 (transit)

Automotive Performance:

Cruising Range (km): INA

Speed (km/h):

Max Road: INA

Max Off-Road: INA

Cross-Country: INA

Max Swim: N/A

Fording Depths (m): .75

Radio: INA

RADAR

Antenna

Antenna Type: Reflector

Search Mode:

Scan Method: Mechanical

Scan Type: Sector

Scan Width (°): 40

Transmitter

Transmitter Type: INA

RF Minimum (GHz): 8.0

RF Maximum (GHz): 12.0

Mode: Search

Receiver

Noise Figure (dB): INA

Multiple Pulse Processing: MTI Optional

Performance Capability

Detection Range (km):

Min: 1.0

Max: 20.0

Max Number of Targets (tracks/min): 3

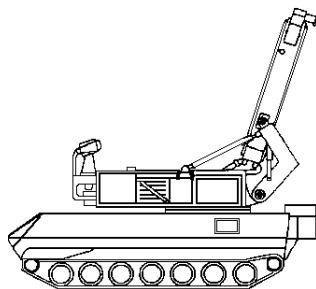
Emplacement Time (min): 10.0

Displacement Time (min): 10.0

NOTES

The primary power source for the Cymbeline radar is a Wankel-engined driven generator delivering 1.5 kW at 28 volts d.c. The generator is capable of operating for a period of eight hours prior to refueling. Normally, the radar is transported on a two-wheeled trailer towed behind a prime mover like a Land Rover (or similar type vehicle). Four men for short distances can carry the radar. Additionally, the Cymbeline radar may be mounted on a self-propelled vehicle like the British FV432 Armored Personnel Carrier.

Russian Artillery Locating Radar IL-219



Alternative Designations: Zoopark-1

Date of Introduction:

Proliferation: At least 1 country

Description:

Crew: 3

Platform (chassis): MT-Lbu

Combat Weight (mt): INA

Chassis Length Overall (m): 7.62

Height Overall (m): 2.72

Width Overall (m): 2.85

Automotive Performance:

Engine Type: YaMZ-238, 240 hp diesel

Cruising Range (km): 500

Speed (km/h):

Max Road: 60

Max Off-Road: 26

Cross-Country: INA

Max Swim: 4.5

Fording Depths (m): Amphibious

Radio: R-123M radio

RADAR

Antenna

Antenna Type: Phased-Array

Antenna Gain (dBi): 40.0

Search Mode:

Scan Method: Electronic

Scan Type: Sector

Scan Width (°): 60

Verification Mode:

Scan Method: Electronic

Scan Type: Nonscanning

Scan Width (°): N/A

Track Mode:

Scan Method: Electronic

Scan Type: Nonperiodic

Scan Width (°): 6 (azimuth - nominal value indicated, equal to 10% of the maximum scan)

Scan Width (°): 4 (elevation - nominal value indicated, equal to 10% of the maximum scan)

Transmitter

Transmitter Type: INA

RF Minimum (GHz): 6.0

RF Maximum (GHz): 8.0

Mode: All

Receiver

Noise Figure (dB): 5.0

Single Pulse Processing: INA

Multiple Pulse Processing: INA

Performance Capability

Detection Range (km):

81-mm Mortar: 12.0

120-mm Mortar: 15.0

105-mm Howitzer: 8.0

155-mm Howitzer: 10.0

122-mm Rocket: 12.0

220-mm Rocket: 20.0

Tactical Missile: 35.0

Max Number of Targets (tracks/min): 12

Emplacement Time (min): 5.0

Displacement Time (min): 5.0

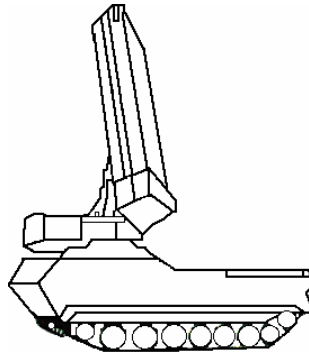
NOTES

The Zoopark-1 automated multifunctional reconnaissance and control complex consists of the IL259 radar mounted on a MT-LBu chassis, IL30 maintenance van on a URAL-43203 truck, and the trailer-mounted ED30-T230P-1RPM power station. The MT-LBu engine driven generator allows for autonomous operation. The ED30-T230P-1RPM power station provides power during vehicle and radar maintenance.

The Zoopark-1 is capable of tracking friendly artillery fire. The system calculates the impact error of friendly artillery rounds and provides automatic correction parameters for increased accuracy. Additionally, the system is also capable of controlling (simultaneously) several remote piloted vehicles (RPVs) using an automatic screen indication with a topographic mapping of calculated and real RPV flight routes. The radar is capable of conducting air traffic control around an airfield or operating area. The radar tracks and establishes the current position of aircraft in the operating area of responsibility and provides real-time data transmission of data received to the air control center.

The antenna beam is electronically phase-steered in azimuth and elevation. The reflect-array is composed of 3328 phase shifters, space-fed by a monopulse horn located on the front side of the array and electronics enclosure. After coming into position, and after the array is raised from the travel position, it is rotated so that its boresight is centered in the assigned coverage sector. The search scan elevation angle is probably fixed, nominally at a low angle in the range of 30 to 50 mils. The search mode will be interrupted by verification and track mode scans during periods when targets are detected. Verification is most likely a non-scanning mode, with the beam pointed at the same elevation angle as the search scan. Also, verification may be repeated for some targets. During the track mode, the radar tracks the target by scanning in both azimuth and elevation.

Ukrainian Artillery Locating Radar IL-220U



Alternative Designations: None
Date of Introduction: Ready for production
Proliferation: At least 1 country
Description:
 Crew: INA
 Platform (chassis): GM-5951 ATV
 Combat Weight (mt): 39.6
 Chassis Length Overall (m): 9.42
 Height Overall (m): 3.35
 Width Overall (m): 3.25

Automotive Performance:
 Engine Type: INA
 Cruising Range (km): INA
 Speed (km/h):
 Max Road: 60
 Max Off-Road: INA
 Cross-Country: INA
 Max Swim: INA
 Fording Depths (m): INA

Radio: INA

RADAR

Antenna

Antenna Type: Phased-Array
 Antenna Gain (dBi): INA
 Search Mode:
 Scan Method: Electronic
 Scan Type: Sector
 Scan Width (°): 60

Verification Mode:
 Scan Method: Electronic
 Scan Type: Monopulse
 Scan Width (°): 2.3 (single beam position is assumed)
 Track Mode:
 Scan Method: Electronic
 Scan Type: Monopulse
 Scan Width (°): 6 (10% of the full azimuth sector assumed for a crossing trajectory)

Transmitter

Transmitter Type: Traveling Wave Tube (TWT)
 RF Minimum (GHz): 3.0
 RF Maximum (GHz): 4.0
 Mode: Pulsed

Receiver

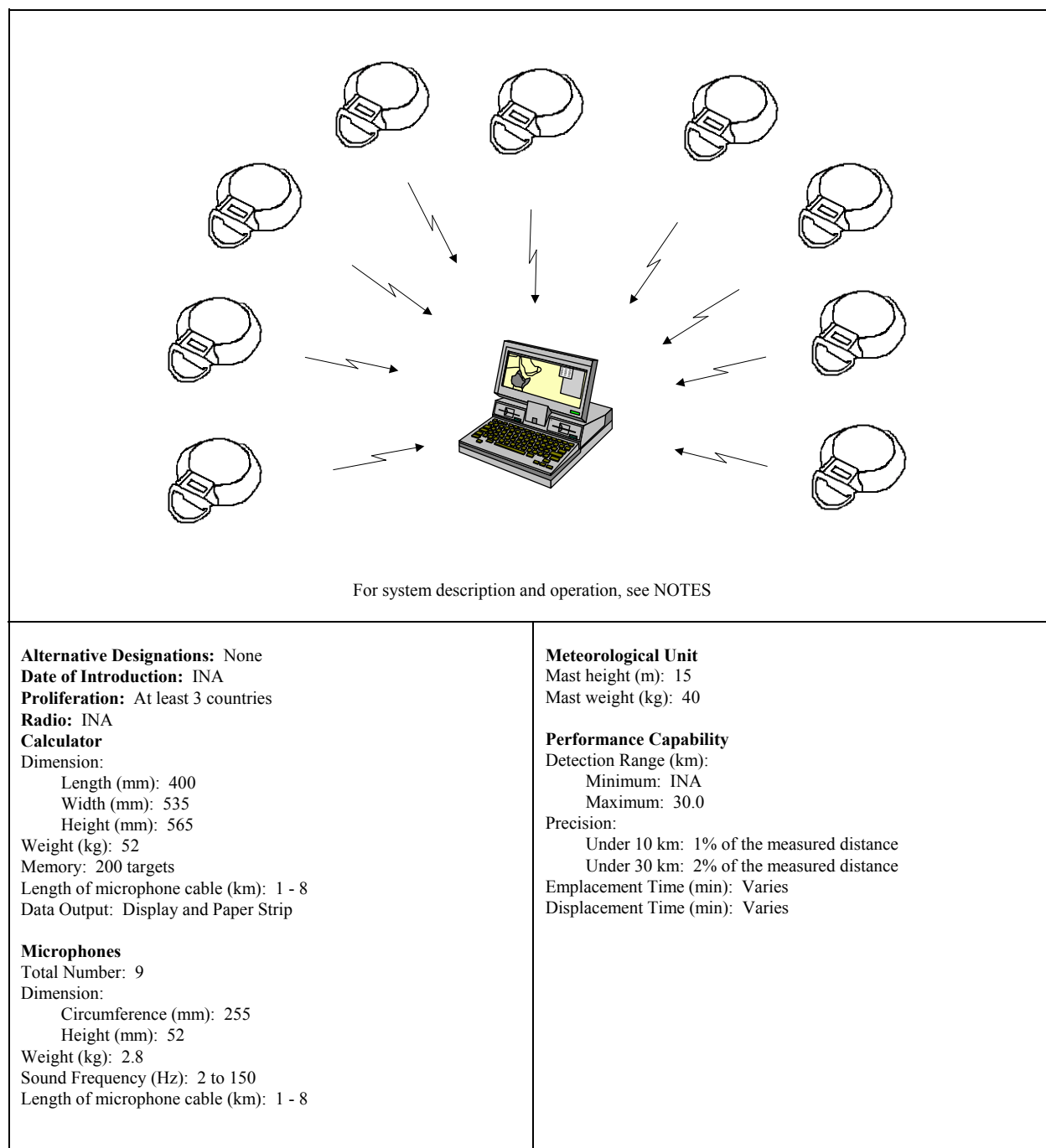
Noise Figure (dB): 5.0
 Single Pulse Processing: Coherent
 Multiple Pulse Processing: MTI and Doppler Filters

Performance Capability

Detection Range (km):
 Mortar: 30.0
 Tube Artillery: 20.0
 Rocket: 40.0
 Tactical Missile: 55.0
 Max Number of Targets (tracks/min):
 Emplacement Time (min): 5.0
 Displacement Time (min): 5.0

NOTES None

Swedish Sound Ranging System SORAS 6

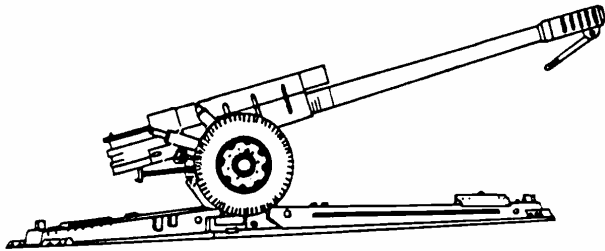


NOTES

SOUND Ranging System (SORAS) 6 is a fully automated, EMP-protected, completely passive sound ranging system capable of accurately locating enemy gun positions. Each microphone is surveyed into position, and acoustically designates an azimuth to each firer. The computer terminal then calculates intersection points with the azimuths, for target locations. The system operates in temperatures ranging from -40° to $+55^{\circ}$ C. Normally, it takes between 2 and 45 seconds for the calculator to calculate target coordinates. But, the target coordinate calculation time depends on the number of sound sources within the same interval of time. Nine microphones are deployed in an area 8 km wide and 1-2 km deep. The microphone positions are determined by conventional surveying methods or by special equipment. An alarm on the calculator is automatically triggered if contact is broken with any of the microphones. Two people can connect the meteorological unit and raise the mast in 15 to 20 minutes.

The above schematic is representative of the system, and does not reflect the actual Soras 6 computer terminal and associated hardware.

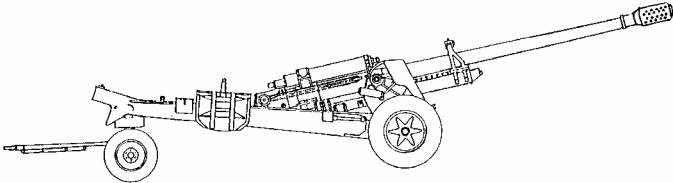
Russian 122-mm Towed Howitzer D-30A

	Weapons & Ammunition Types 122-mm howitzer Frag-HE Smoke Illumination	Typical Combat Load
SYSTEM Alternative Designations: 122-mm D-30A Lyagushka Date of Introduction: 1963 Proliferation: At least 13 countries Description: Crew: 5 (section of 6) Carriage: D-30 Combat Weight (mt): 3.2 Chassis Length Overall (m): Travel Position: 5.4 Firing Position: INA Height Overall (m): 1.6 Width Overall (m): Travel Position: 1.9 Firing Position: INA Towing Speed (km/h): Max Road: 60 Max Off-Road: 25 Max Cross-Country: Fording Depths (m): .5 Emplacement Time (min): 1.5 Displacement Time (min): 3.5 Prime Mover: MT-LB; Ural-375, or equivalent ARMAMENT Main Armament: Caliber, Type, Name: 122-mm, 2A18M canon Barrel Length (cal): 38 (approximately) Rate of Fire (rpm): Burst: 8 Normal: 6 Sustained: 4 Loader Type: Semi-automatic Breech Type: Vertical sliding wedge Muzzle Brake Type: Multi-baffle Traverse (°): Left: 360 Right: 360 Total: 360 Elevation (°) (-/+): -7/+70°	FIRE CONTROL Indirect Fire: PG-1M Panoramic Telescope (PANTEL) Direct Fire: OP 4M-45 Collimator: K-1 Gun Display Unit: None Fire Control Computer: None VARIANTS Saddam: Iraqi produced version of the D-30 D30J: Yugoslavian produced version of the D-30 SP 122: Egyptian self-propelled howitzer (M109A2 chassis and turret with an Egyptian made D-30 howitzer). Type 85: Chinese self-propelled howitzer (Chinese Type 85 APC chassis and a licensed produced version of the D-30 in a semi-open superstructure.) MAIN ARMAMENT AMMUNITION Caliber, Type, Name: 122-mm Frag-HE, OF-81 Indirect Fire Range (m): Minimum Range: 1000 Maximum Range: 15,300 Complete Projectile Weight (kg): 21.76 (OF-56) Muzzle Velocity: 680 m/s Fuze Type: RGM-2 PD 122-mm, HEAT-FS Direct Fire Range (m): Minimum Range: 0 Maximum Range: 1000 Armor Penetration (mm): 460 (@ 0° obliquity any range) Complete Projectile Weight (kg): 21.58 Muzzle Velocity: 740 m/s Fuze Type: GPV-2 PIBD 122-mm Frag-HE Rocket Assisted Indirect Fire Range (m): Minimum Range: INA Maximum Range: 21,900 Complete Projectile Weight (kg): 21.76 (3OF-56) Muzzle Velocity: INA Fuze Type: PD Other Ammunition Types: Incendiary, Chemical, Flechette, Semi-active laser-guided Kitolov-2M Frag-HE	

NOTES

The D-30A is a midlife product improvement of the D-30. The original D-30 was fielded in 1963 and the midlife product improvements occurred in the mid to late 1970's. The original D-30 is in use with at least 50 different countries.

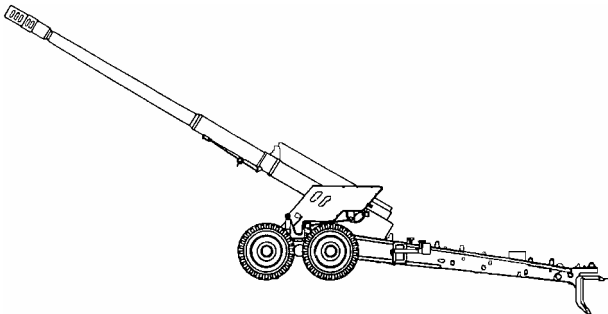
Russian 130-mm Towed Gun M-46

	Weapons & Ammunition Types 130-mm howitzer Frag-HE Smoke Illumination	Typical Combat Load
SYSTEM Alternative Designations: None Date of Introduction: 1954 Proliferation: At least 25 countries Description: Crew: 8 Carriage: M-46 Combat Weight (mt): 8.45 Chassis Length Overall (m): Travel Position: 11.73 Firing Position: 11.10 Height Overall (m): 2.55 Width Overall (m): Travel Position: 2.45 Firing Position: INA Towing Speed (km/h): Max Road: 50 Max Off-Road: 20 Max Cross-Country: 10 Fording Depths (m): INA Emplacement Time (min): 6 Displacement Time (min): 7 Prime Mover: AT-S 59, KrAZ-255 or equivalent ARMAMENT Main Armament: Caliber, Type, Name: 130-mm, canon Barrel Length (cal): 52 (approximately) Rate of Fire (rpm): Burst: 8 Normal: 6 Sustained: 5 Loader Type: Manual Breech Type: Horizontal sliding wedge Muzzle Brake Type: Multiperforated (pepperpot) Traverse: (°): Left: 25 Right: 25 Total: 50 Elevation (°) (-/+): -2.5/+45°	FIRE CONTROL Indirect Fire: PG-1 Panoramic Telescope (PANTEL) Direct Fire: OP 4-35 Collimator: K-1 Gun Display Unit: None Fire Control Computer: None VARIANTS None MAIN ARMAMENT AMMUNITION Caliber, Type, Name: 130-mm Frag-HE, OF44 Indirect Fire Range (m): Minimum Range: INA Maximum Range: 22,500 Complete Projectile Weight (kg): 33.40 (OF33) Muzzle Velocity: 930 m/s Fuze Type: V-429 PD 130-mm, APC-T Direct Fire Range (m): Minimum Range: 0 Maximum Range: 1140 Armor Penetration (mm): INA Complete Projectile Weight (kg): 33.49 (BR-482B) Muzzle Velocity: INA Fuze Type: DBR BD 130-mm Frag-HE, OF-43 Indirect Fire Range (m): Minimum Range: INA Maximum Range: 27,500 Complete Projectile Weight (kg): 33.40 (OF-33) Muzzle Velocity: 930 m/s Fuze Type: V-429 PD 130-mm Frag-HE, ERFB-BB Indirect Fire Range (m): Minimum Range: INA Maximum Range: 38,000 Complete Projectile Weight (kg): 33.40 Muzzle Velocity: 940 m/s Fuze Type: ML-5 PD Other Ammunition Types: Smoke, Chemical, Illumination	

NOTES:

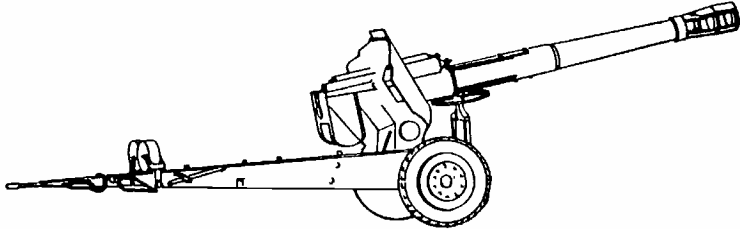
The M-46 gun crew is provided limited frontal protections by virtue of a frontal V-shaped shield (approximately 7-mm thick). Otherwise, the crew, ammunition supply, and equipment are vulnerable to casualties and damage from small arms fire, artillery fire, and bomb shrapnel. The Extended Range Full Bore-Base Bleed round was specifically designed by NORINCO Industries (China) for use with the Chinese 130-mm Type 59 Field Gun. However, this round may be fired by the M-46.

Russian 152-mm Towed Gun 2A36

	Weapons &Ammunition Types 152-mm gun Frag-HE Smoke Illumination	Typical Combat Load
SYSTEM Alternative Designations: 2A36 Giatsint-B Date of Introduction: 1981 Proliferation: At least 11 countries Description: Crew: 8 Carriage: 2A36 Combat Weight (mt): 9.80 Chassis Length Overall (m): Travel Position: 12.9 Firing Position: 11.0 Height Overall (m): 2.7 Width Overall (m): Travel Position: 2.7 Firing Position: 8.7 Towing Speed (km/h): Max Road: 70 Max Off-Road: 20 Max Cross-Country: 15 Fording Depths (m): .6 Emplacement Time (min): 5 Displacement Time (min): 7 Prime Mover: KrAZ-4556, KrAZ-255B, or AT-S tractor ARMAMENT Main Armament: Caliber, Type, Name: 152-mm, cannon Barrel Length (cal): 49 Rate of Fire (rpm): Burst: 6 Normal: 5 Sustained: 4 Loader Type: Semi-automatic Breech Type: Horizontal sliding wedge Muzzle Brake Type: Multi baffle Traverse (°): Left: 25 Right: 25 Total: 50 Elevation (°) (-/+): -2/+57°	FIRE CONTROL Indirect Fire: PG-1M Panoramic Telescope (PANTEL) Direct Fire: N/A Collimator: K-1 Gun Display Unit: None Fire Control Computer: None VARIANTS: None MAIN ARMAMENT AMMUNITION Caliber, Type, Name: 152-mm Frag-HE, OF-39 (RAP) Indirect Fire Range (m): Minimum Range: 9,100 Maximum Range: 28,400 Complete Projectile Weight (kg): 43.51 (OF-29) Muzzle Velocity (m/s): 945 Fuze Type: V-429 PD Caliber, Type, Name: 152-mm, HEAT, BP-540 Direct Fire Range (m): Minimum Range: 0 Maximum Range: 1,000 Armor Penetration (mm): INA Complete Projectile Weight (kg): 27.00 Muzzle Velocity (m/s): 655 Fuze Type: GPV-3 PD Caliber, Type, Name: 152-mm Frag-HE, OF-86 Indirect Fire Range (m): Minimum Range: 0 Maximum Range: 30,500 Complete Projectile Weight (kg): 43.8 (OF-59) Muzzle Velocity (m/s): 945 Fuze Type: V-429 PD Other Ammunition Types: DPICM, DPICM-BB, Incendiary, Chemical, Flechette, Semi-active laser-guided Krasnopol-M Frag-HE	

NOTES

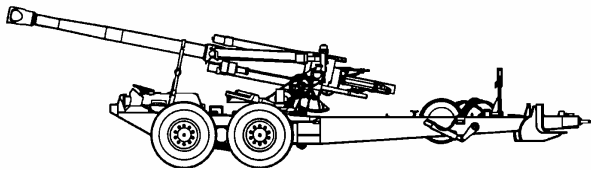
The most distinguishing feature of the 2A36 is its lower carriage. The large system weight required the use of tandem “walking-beam” axles and four wheels to provide mobility. A hydraulically powered firing pedestal is mounted on the front of the lower carriage and serves as part of the travel lock (similar to the D-20). Although the trails do not have the folding summer spades of the D-20, they do have two large spades similar to those found on the M-46/M-47. The weight of the 2A36 normally requires it to be towed by a heavy truck (like the KrAZ-255B). The KrAZ-255B is equipped with a special winch used to lift the trails in order to attach the gun’s lunette to the towing pintle.

	Weapons & Ammunition Types 152-mm howitzer Frag-HE Smoke Illumination	Typical Combat Load
SYSTEM Alternative Designations: None Date of Introduction: 1955 Proliferation: At least 13 countries Description: Crew: 8 Carriage: 122-mm gun D-74 Combat Weight (mt): 5.7 Chassis Length Overall (m): Travel Position: 8.10 Firing Position: 8.69 Height Overall (m): 2.52 Width Overall (m): Travel Position: 2.35 Firing Position: INA Towing Speed (km/h): Max Road: 60 Max Off-Road: 30 Max Cross-Country: 15 Fording Depths (m): .5 Emplacement Time (min): 2.5 Displacement Time (min): 2.5 Prime Mover: AT-S Tracked vehicle; MT-LB; Ural-375; Ural-4320 ARMAMENT Main Armament: Caliber, Type, Name: 152-mm, canon Barrel Length (cal): 25 Rate of Fire (rpm): Burst: 5-6 Normal: INA Sustained: 1 (65 rounds the first hour) Loader Type: Manual Breech Type: Vertical sliding wedge Muzzle Brake Type: Double flared Traverse: (°): Left: 29 Right: 29 Total: 58 Elevation (°) (-/+):-5/+45°	FIRE CONTROL Indirect Fire: PG-1M Panoramic Telescope (PANTEL) Direct Fire: OP 4M Collimator: K-1 Gun Display Unit: None Fire Control Computer: None VARIANTS None MAIN ARMAMENT AMMUNITION Caliber, Type, Name: 152-mm Frag-HE, OF32 Indirect Fire Range (m): Minimum Range: 4600 Maximum Range: 17,400 Complete Projectile Weight (kg): 43.56 (OF25) Muzzle Velocity: 655 m/s Fuze Type: V-90 PD 152-mm, HEAT, BP-540 Direct Fire Range (m): Minimum Range: 0 Maximum Range: 1000 Armor Penetration (mm): INA Complete Projectile Weight (kg): 27.00 Muzzle Velocity: 655 m/s Fuze Type: GPV-3 PD 152-mm Frag-HE, OF-96 Indirect Fire Range (m): Minimum Range: INA Maximum Range: 24,400 Complete Projectile Weight (kg): 43.56 (OF-64) Muzzle Velocity: INA Fuze Type: PD Other Ammunition Types: DPICM, DPICM-BB, Incendiary, Expendable Jammer, Chemical, Flechette, Semi-active laser-guided Krasnopol-M Frag-HE	

NOTES

The D-20 was the first 152-mm cannon system to incorporate a semiautomatic vertical-sliding-wedge breech block. Although the ammunition for the system was not changed, this modification allowed a slightly higher rate of fire to be achieved (6 rounds per minute rather than 4), although the sustained rate of fire was unchanged. Because the carriage is based on that of the 122-mm gun D-74, the D-20 cannot be elevated above 45°.

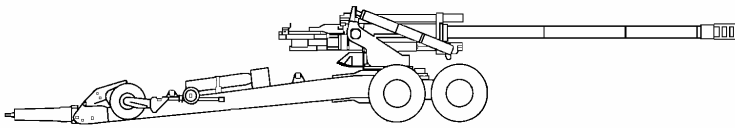
South African 155-mm Towed Gun-Howitzer G5

	Weapons & Ammunition Types 155-mm howitzer Frag-HE Smoke Illumination	Typical Combat Load
SYSTEM Alternative Designations: None Date of Introduction: 1981 Proliferation: At least 4 countries Description: Crew: 8 Carriage: G5 Combat Weight (mt): 13.75 Chassis Length Overall (m): Travel Position: 12.1 Firing Position: 11.0 Height Overall (m): 2.3 Width Overall (m): Travel Position: 3.3 Firing Position: 8.7 Towing Speed (km/h): Max Road: 90 Max Off-Road: 50 Max Cross-Country: 15 Fording Depths (m): .6 Emplacement Time (min): 2 Displacement Time (min): 1 Auxiliary Propulsion Unit Performance: Engine Type: 76 hp air-cooled diesel Cruising Range (km): 100 Speed (km/h): Max Road: 16 Max Off-Road: INA Cross-Country: 3 Max Swim: N/A Prime Mover: Samil 100 6x6 artillery tractor or a 10 ton equivalent ARMAMENT Main Armament: Caliber, Type, Name: 155-mm, canon Barrel Length (cal): 45 Rate of Fire (rpm): Burst: 3 Normal: 2 Sustained: 2	Loader Type: Semi-automatic Breech Type: Interrupted screw Muzzle Brake Type: Single baffle Traverse: (°): Left: 41 Right: 41 Total: 82 Elevation (°) (-/+): -3/+75° FIRE CONTROL Indirect Fire: Digital Panoramic Telescope Direct Fire: Trunnion mounted telescopic sight Collimator: INA Gun Display Unit: None Fire Control Computer: None VARIANTS G-5 MkIII Upgrade of G-5 (see NOTES) MAIN ARMAMENT AMMUNITION Caliber, Type, Name: 155-mm Frag-HE, M1 HE Indirect Fire Range (m): Minimum Range: 3000 Maximum Range: 30,000 Complete Projectile Weight (kg): 8.7 Muzzle Velocity: 897 m/s Fuze Type: PD M841 155-mm Frag-HE BB, M1 HE Indirect Fire Range (m): Minimum Range: INA Maximum Range: 39,000 Complete Projectile Weight (kg): 8.7 Muzzle Velocity: 895 m/s Fuze Type: PD M841 Other Ammunition Types: See NOTES	

NOTES

The G5 is fully compatible with NATO standard 155-mm ammunition and has a direct fire range of 3000 meters (using a Frag-HE round). The APU, combined with the tandem walking-beam suspension, gives the G5 excellent self-propelled mobility over short distances. The four wheels are all powered and give the gun excellent traction over most terrain. But, the APU serves purposes other than mobility. It provides power to open and close the trails, raise and lower the trail wheels, and raise and lower the firing platform. However, there is no power traverse or elevation. Although designed for an eight-man section, the South African Defense Force normally operates the G5 with a five-man section. However, the G5 can operate with minimum of two people when all of the powered systems are working. The G-5 MkIII includes 35 reliability modifications and performance improvements. The improvements include the addition of the AS2000 Gun Monitor, an improved braking system, bigger diameter and wider trail wheels (specifically designed for sand), and incorporation of the REUTECH ACV 58 Communications System.

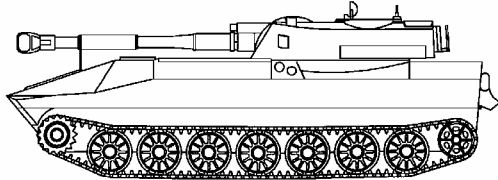
Austrian 155-mm Towed Gun-Howitzer GH N-45

	Weapons &Ammunition Types 155-mm howitzer Frag-HE Smoke Illumination	Typical Combat Load
SYSTEM Alternative Designations: None Date of Introduction: 1980 Proliferation: At least 9 countries Description: Crew: 6 Carriage: GH N-45 Combat Weight (mt): GH N-45: 8.90 GH N-45 APU: 11.00 Chassis Length Overall (m): Travel Position: 9.06 Firing Position: 11.53 Travel Position (GH N-45 APU): 9.55 Firing Position (GH N-45 APU): 11.53 Height Overall (m): (at 0° elevation) Travel Position: 2.15 Firing Position: 2.20 Travel Position (GH N-45 APU): 2.15 Firing Position (GH N-45 APU): 2.20 Width Overall (m): Travel Position: 2.50 Firing Position: 9.93 Travel Position (GH N-45 APU): 2.75 Firing Position (GH N-45 APU): 9.93 Towing Speed (km/h): Max Road: 90 Max Off-Road: 50 Max Cross-Country: 15 Fording Depths (m): .6 Emplacement Time (min): 4 Displacement Time (min): 4 Auxiliary Propulsion Unit Performance: Engine Type: 125 hp air-cooled diesel Cruising Range (km): 150 Speed (km/h): Max Road: 35 Max Off-Road: INA Cross-Country: 3 Max Swim: N/A Prime Mover: 10 ton 6x6 truck or artillery tractor	ARMAMENT Main Armament: Caliber, Type, Name: 155-mm, cannon Barrel Length (cal): 45 Rate of Fire (rpm): Burst: 7 Normal: 3 Sustained: 2 Loader Type: Semi-automatic Breech Type: Interrupted screw Muzzle Brake Type: Multi-baffle Traverse (°): Left: 30 Right: 40 Total: 70 Elevation (°) (-/+): -5/+72° FIRE CONTROL Indirect Fire: Digital Panoramic Telescope Direct Fire: Trunnion mounted telescopic sight Collimator: INA Gun Display Unit: None Fire Control Computer: None VARIANTS GH N-45 A1 Upgrade of GH N-45 (See NOTES) MAIN ARMAMENT AMMUNITION Caliber, Type, Name: 155-mm Frag-HE, SN-101 Indirect Fire Range (m): Minimum Range: INA Maximum Range: 25,100 Complete Projectile Weight (kg): 42.3 Muzzle Velocity (m/s): 897 Fuze Type: PD Caliber, Type, Name: 155-mm Frag-HE ERFB Indirect Fire Range (m): Minimum Range: INA Maximum Range: 39,600 Complete Projectile Weight (kg): 45.4 Muzzle Velocity (m/s):: 895 Fuze Type: PD Other Ammunition Tynes: See NOTES	

NOTES

The GH N-45 is fully compatible with NATO standard 155-mm ammunition. The APU, combined with the tandem walking-beam suspension, gives the GH N-45 excellent self-propelled mobility over short distances. The four wheels are all powered and give the gun excellent traction over most terrain. But, the APU serves purposes other than mobility. It provides power to open and close the trails, raise and lower the trail wheels, and raise and lower the firing platform. However, there is no power traverse or elevation. The GH N-45 also includes an optional chain system (reducing the ground pressure) to improve cross-country mobility in deep, muddy, or sandy terrain. The GH N-45 A1 includes reliability modifications and performance improvements.

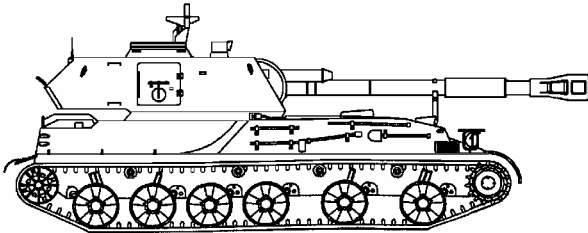
Russian 122-mm Self-Propelled Howitzer 2S1

	Weapons & Ammunition Types 122-mm howitzer Frag-HE HEAT-FS Smoke Illumination	Typical Combat Load 45
SYSTEM Alternative Designations: 122-mm 2S1 Gvozdika Date of Introduction: 1974 Proliferation: At least 12 countries Description: Crew: 4 (section of 6 with 2 in ammo carrier) Platform (chassis): MT-LBu Combat Weight (mt): 15.7 Chassis Length Overall (m): 7.26 Height Overall (m): 2.72 Width Overall (m): 2.85 Automotive Performance: Engine Type: V-8, 300 hp, Diesel Cruising Range (km): 500 km Speed (km/h): Max Road: 60 Max Off-Road: 30 Cross-Country: INA Max Swim: 4.5 Fording Depths (m): Amphibious Emplacement Time (min): 2 Displacement Time (min): 1 Radio: R-123M Protection: Armor, Turret (mm): 20 Armor Turret Top (mm): 10 Armor Hull (mm): 15 Self-Entrenching Blade: No NBC Protection System: Yes Smoke Equipment: No ARMAMENT Main Armament: Caliber, Type, Name: 122-mm, canon, 2A31 Barrel Length (cal): 36 Rate of Fire (rpm): Burst: 5 Normal: 4 Sustained: 1-2 Fire from Ground: INA Loader Type: Semi-automatic Breech Type: Horizontal sliding wedge	Muzzle Brake Type: Double baffle Traverse: (°): Left: 360 Right: 360 Total: 360 Elevation (°) (-/+): -3/+70° FIRE CONTROL Indirect Fire: PG-2 Panoramic Telescope (PANTEL) Direct Fire: OP 5-37 Collimator: K-1 Gun Display Unit: None Fire Control Computer: None VARIANTS None MAIN ARMAMENT AMMUNITION Caliber, Type, Name: 122-mm Frag-HE, OF-81 Indirect Fire Range (m): Minimum Range: 1000 Maximum Range: 15,300 Complete Projectile Weight (kg): 21.76 (OF-56) Muzzle Velocity: 680 m/s Fuze Type: RGM-2 PD 122-mm, HEAT-FS Direct Fire Range (m): Minimum Range: 0 Maximum Range: 1000 Armor Penetration (mm): 460 (@ 0° obliquity any range) Complete Projectile Weight (kg): 21.58 Muzzle Velocity: 740 m/s Fuze Type: GPV-2 PIBD 122-mm Frag-HE Rocket Assisted Indirect Fire Range (m): Minimum Range: INA Maximum Range: 21,900 Complete Projectile Weight (kg): 21.76 (3OF-56) Muzzle Velocity: INA Fuze Type: PD Other Ammunition Types: Incendiary, Chemical, Flechette, Expendable Jammer, Semi-active laser-guided Kitolov-2M Frag-HE	

NOTES

The 2S1's ammunition stowage rack is not mechanized. The 2S1 is manually loaded with a semiautomatic ramming capability. The four-man crew consists of the commander, driver, gunner, and loader.

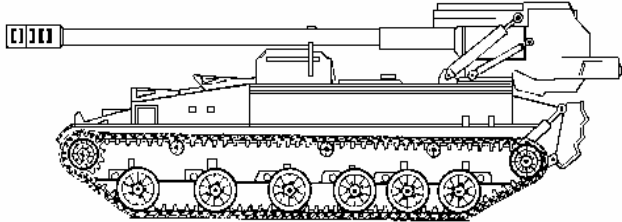
Russian 152-mm Self-Propelled Gun-Howitzer 2S3M

	<table><tr><th>Weapons & Ammunition Types</th><th>Typical Combat Load</th></tr><tr><td>152-mm howitzer Frag-HE Smoke Illumination</td><td>46</td></tr><tr><td>7.62 PKT MG</td><td>1500</td></tr></table>	Weapons & Ammunition Types	Typical Combat Load	152-mm howitzer Frag-HE Smoke Illumination	46	7.62 PKT MG	1500
Weapons & Ammunition Types	Typical Combat Load						
152-mm howitzer Frag-HE Smoke Illumination	46						
7.62 PKT MG	1500						
SYSTEM Alternative Designations: 152-mm 2S3M Akatsiya Date of Introduction: 1973 Proliferation: At least 8 countries Description: Crew: 4 Platform (chassis): Modified SA-4 Ganef Combat Weight (mt): 27.5 Chassis Length Overall (m): 7.75 Height Overall (m): 3.13 Width Overall (m): 3.21 Automotive Performance: Engine Type: 520-hpV-59 V-12 multi-fuel diesel Cruising Range (km): 450 km Speed (km/h): Max Road: 60 Max Off-Road: 25 Cross-Country: INA Max Swim: N/A Fording Depth (m): 1.00 Emplacement Time (min): 3 Displacement Time (min): 3 Radio: R-123M Protection: Armor, Turret (mm): 20 Armor Turret Top (mm): 15 Armor Hull (mm): INA Self-Entrenching Blade: Yes NBC Protection System: Yes Smoke Equipment: No ARMAMENT Main Armament: Caliber, Type, Name: 152-mm, 2A33 Barrel Length (cal): 34 Rate of Fire (rpm): Burst: 4 Normal: 3 Sustained: 1 Fire from Ground: INA Loader Type: Semiautomatic Breech Type: Vertical sliding wedge Muzzle Brake Type: Double baffle Traverse: (°): Left: 360 Right: 360 Total: 360 Elevation (°) (-/+): -4/+60°	Auxiliary Weapon: Caliber, Type, Name: 7.62-mm machinegun PKT Mount Type: Bow (ball-mounted) Direct Fire Range (m): 1000 Max Effective Range (m): Day: 1000 /400-500 on the move Night: 800 Fire on Move: Yes Rate of Fire (rpm): 650 (cyclic) FIRE CONTROL Indirect Fire: PG-4 Panoramic Telescope (PANTEL) Direct Fire: OP 5-38 Collimator: K-1 Gun Display Unit: None Fire Control Computer: None VARIANTS 2S3M1: Upgrade of 2S3M MAIN ARMAMENT AMMUNITION Caliber, Type, Name: 152-mm Frag-HE, OF32 Indirect Fire Range (m): Minimum Range: 4600 Maximum Range: 17,400 Complete Projectile Weight (kg): 43.56 (OF25) Muzzle Velocity: 655 m/s Fuze Type: V-90 PD 152-mm, HEAT, BP-540 Direct Fire Range (m): Minimum Range: 0 Maximum Range: 1000 Armor Penetration (mm): INA Complete Projectile Weight (kg): 27.00 Muzzle Velocity: 655 m/s Fuze Type: GPV-3 PD 152-mm Frag-HE, OF-96 Indirect Fire Range (m): Minimum Range: INA Maximum Range: 24,400 Complete Projectile Weight (kg): 43.56 (OF-64) Muzzle Velocity: INA Fuze Type: PD Other Ammunition Types: DPICM, DPICM-BB, Incendiary, Chemical, Flechette, Semi-active laser-guided Krasnopol-M Frag-HE						

NOTES

The 2S3M is an upgrade version of the 2S3. The 2S3M turret contains the 2A33 cannon, fire-control equipment, ammunition storage space, and work positions for commander, gunner, and loader. The cannon extends beyond the vehicle front and has an electrical loader/rammer attached to the cradle. Ammunition is stored in the rear of the chassis and can be replenished through a hatch in the rear panel.

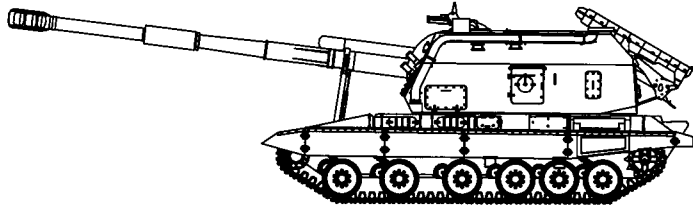
Russian 152-mm Self-Propelled Gun 2S5

	<table><tr><th>Weapons & Ammunition Types</th><th>Typical Combat Load</th></tr><tr><td>152-mm howitzer Frag-HE Smoke Illumination</td><td>30</td></tr><tr><td>7.62 PKT MG</td><td>1500</td></tr></table>	Weapons & Ammunition Types	Typical Combat Load	152-mm howitzer Frag-HE Smoke Illumination	30	7.62 PKT MG	1500
Weapons & Ammunition Types	Typical Combat Load						
152-mm howitzer Frag-HE Smoke Illumination	30						
7.62 PKT MG	1500						
SYSTEM Alternative Designations: 152-mm 2S5 Giatsint-S Date of Introduction: 1981 Proliferation: At least 4 countries Description: Crew: 5 (section of 7 with 2 in ammo carrier) Platform (chassis): Modified 2S3 Combat Weight (mt): 28.2 Chassis Length Overall (m): 8.33 Height Overall (m): 2.76 Width Overall (m): 3.25 Automotive Performance: Engine Type: 520-hp V-59-V-12 multi-fuel diesel Cruising Range (km): 500 km Speed (km/h): Max Road: 63 Max Off-Road: 25 Cross-Country: INA Max Swim: 4.5 Fording Depths (m): 1.05 Emplacement Time (min): 2 Displacement Time (min): 1 Radio: R-123M Protection: Armor, Turret (mm): INA Armor Turret Top (mm): 15 Armor Hull (mm): 15 Self-Entrenching Blade: Yes NBC Protection System: Yes Smoke Equipment: None ARMAMENT Main Armament: Caliber, Type, Name: 152-mm, canon, 2A37 Barrel Length (cal): 52 Rate of Fire (rpm): Burst: 6 Normal: 5 Sustained: 1-2 Fire from Ground: INA Loader Type: Semi-automatic Breech Type: Horizontal sliding wedge Muzzle Brake Type: Multi baffle Traverse (°): Left: 15 Right: 15 Total: 30 Elevation (°) (-/+): -2/+57°	Auxiliary Weapon: Caliber, Type, Name: 7.62-mm machinegun PKT Mount Type: Bow (ball-mounted) Direct Fire Range (m): 1000 Max Effective Range (m): Day: 1000 /400-500 on the move Night: 800 Fire on Move: Yes Rate of Fire (rpm): 650 (cyclic) FIRE CONTROL Indirect Fire: PG-1M Panoramic Telescope (PANTEL) Direct Fire: N/A Collimator: K-1 Gun Display Unit: None Fire Control Computer: None VARIANTS None MAIN ARMAMENT AMMUNITION Caliber, Type, Name: 152-mm Frag-HE, OF-39 Indirect Fire Range (m): Minimum Range: 9100 Maximum Range: 28,400 Complete Projectile Weight (kg): 43.51 (OF-29) Muzzle Velocity: 945 m/s Fuze Type: V-429 PD 152-mm, HEAT, BP-540 Direct Fire Range (m): Minimum Range: 0 Maximum Range: 1000 Armor Penetration (mm): INA Complete Projectile Weight (kg): 27.00 Muzzle Velocity: 655 m/s Fuze Type: GPV-3 PD 152-mm Frag-HE, OF-86 Indirect Fire Range (m): Minimum Range: INA Maximum Range: 30,500 Complete Projectile Weight (kg): 43.8 (OF-59) Muzzle Velocity: 945 m/s Fuze Type: V-429 PD Other Ammunition Types: DPICM, DPICM-BB, Incendiary, Chemical, Flechette, Semi-active laser-guided Krasnopol-M Frag-HE						

NOTES

The 2S5 is more powerful, has a longer range and a higher rate of fire than the 2S3. However, the 2S5 has a limited main armament traverse and a narrower elevation range than the 2S3.

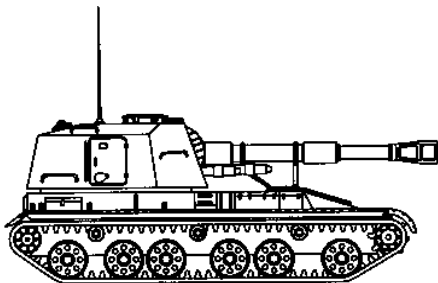
Russian 152-mm Self-Propelled Howitzer 2S19

	<table><tr><th>Weapons & Ammunition Types</th><th>Typical Combat Load</th></tr><tr><td>152-mm howitzer</td><td>50</td></tr><tr><td>Frag-HE Smoke Illumination</td><td></td></tr><tr><td>12.7-mm MG</td><td>300</td></tr></table>	Weapons & Ammunition Types	Typical Combat Load	152-mm howitzer	50	Frag-HE Smoke Illumination		12.7-mm MG	300
Weapons & Ammunition Types	Typical Combat Load								
152-mm howitzer	50								
Frag-HE Smoke Illumination									
12.7-mm MG	300								
SYSTEM Alternative Designations: 152-mm 2S19 Msta-S Date of Introduction: 1989 Proliferation: At least 4 countries Description: Crew: 5 (section of 7 with 2 in ammo carrier) Platform (chassis): Modified T-72 Combat Weight (mt): 42 Chassis Length Overall (m): 11.91 Height Overall (m): 2.98 Width Overall (m): 3.58 Automotive Performance: Engine Type: 840-hp V84-A diesel Cruising Range (km): 500 km Speed (km/h): Max Road: 60 Max Off-Road: 25 Cross-Country: INA Max Swim: N/A Fording Depths (m): Unprepared: 1.5 Emplacement Time (min): 1-2 Displacement Time (min): 1-2 Radio: R-173 Protection: Armor, Turret (mm): 15 Armor Turret Top (mm): 15 Armor Hull (mm): 15 Self-Entrenching Blade: Capable of digging a complete firing pit in 40-60 minutes NBC Protection System: Yes Smoke Equipment: Six Type 902 smoke grenade launchers and Vehicle engine exhaust smoke system (VEESS) ARMAMENT Main Armament: Caliber, Type, Name: 152-mm, canon, 2A64 Barrel Length (cal): 48 Rate of Fire (rpm): Burst: 8 Normal: 6 Sustained: 2 Fire from Ground: 6-7 Loader Type: autoloader Breech Type: Vertical sliding wedge Muzzle Brake Type: Double baffle Traverse: (°): Left: 360 Right: 360	Total: 360 Elevation (°) (-/+): -4/+68° Auxiliary Weapon: Caliber, Type, Name: 12.7-mm NSVT machinegun Mount Type: PZU-5 AA Direct Fire Range (m): 2000 Max Effective Range (m): Day: 1500 (AA)/1500 (Ground) Night: N/A Fire on Move: Yes Rate of Fire (rpm): 800 (cyclic) FIRE CONTROL Indirect Fire: 1P22 Panoramic Telescope (PANTEL) Direct Fire: 1P23 Collimator: K-1 Gun Display Unit: None Fire Control Computer: None VARIANTS None MAIN ARMAMENT AMMUNITION Caliber, Type, Name: 152-mm Frag-HE, OF-72 Indirect Fire Range (m): Minimum Range: 6500 Maximum Range: 24,700 Complete Projectile Weight (kg): 43.56 (OF-45) Muzzle Velocity: 864 m/s Fuze Type: RGM-2 PD 152-mm, HEAT, BP-540 Direct Fire Range (m): Minimum Range: 0 Maximum Range: 1000 Armor Penetration (mm): INA Complete Projectile Weight (kg): 27.00 Muzzle Velocity: 655 m/s Fuze Type: GPV-3 PD 152-mm Frag-HE BB, OF-91 Indirect Fire Range (m): Minimum Range: 6710 Maximum Range: 29,000 Complete Projectile Weight (kg): 42.86 (OF-61) Muzzle Velocity: 828 m/s Fuze Type: KZ-88 PD Other Ammunition Types: All standard 152-mm artillery rounds								

NOTES

The 2S19's gun crew can load the gun at any angle of elevation. The 2S19 can also produce a smokescreen by injecting diesel fuel into the exhaust outlet. The 21-hp gas turbine AP-18D Auxiliary Power Unit provides power for turret operations when the vehicle engine is shut down.

Chinese 152-mm Self-Propelled Gun-Howitzer Type 83

	<table><tr><th>Weapons & Ammunition Types</th><th>Typical Combat Load</th></tr><tr><td>152-mm howitzer</td><td>30</td></tr><tr><td>Frag-HE Smoke Illumination</td><td></td></tr><tr><td>12.7-mm MG</td><td>650</td></tr><tr><td>7.62-mm MG</td><td>650</td></tr></table>	Weapons & Ammunition Types	Typical Combat Load	152-mm howitzer	30	Frag-HE Smoke Illumination		12.7-mm MG	650	7.62-mm MG	650
Weapons & Ammunition Types	Typical Combat Load										
152-mm howitzer	30										
Frag-HE Smoke Illumination											
12.7-mm MG	650										
7.62-mm MG	650										
SYSTEM Alternative Designations: None Date of Introduction: 1984 Proliferation: At least 1 country Description: Crew: 5 Platform (chassis): Type 83 Combat Weight (mt): 30.0 Chassis Length Overall (m): 7.33 Height Overall (m): 3.50 Width Overall (m): 3.24 Automotive Performance: Engine Type: Type 12150L, V-12, 520-hp liquid-cooled diesel Cruising Range (km): 450 km Speed (km/h): Max Road: 55 Max Off-Road: 35 Cross-Country: INA Max Swim: N/A Fording Depth (m): 1.3 Emplacement Time (min): 1 Displacement Time (min): 1 Radio: Type 889D Protection: Armor, Turret (mm): INA Armor Turret Top (mm): INA Armor Hull (mm): INA Self-Entrenching Blade: No NBC Protection System: No Smoke Equipment: No ARMAMENT Main Armament: Caliber, Type, Name: 152-mm, Type 66 cannon Barrel Length (cal): 29 Rate of Fire (rpm): Burst: 4 Normal: INA Sustained: INA Fire from Ground: INA	Loader Type: Semiautomatic Breech Type: Vertical sliding wedge Muzzle Brake Type: Double baffle Traverse: (°): Left: 360 Right: 360 Total: 360 Elevation (°) (-/+): -5/+65° Auxiliary Weapon: Caliber, Type, Name: 12.7-mm (12.7x108) AA MG Type 54 Mount Type: Turret top Direct Fire Range (m): 1500 Max Effective Range (m): Day: 1500 ground/1600 for air targets (APDS) Night: INA Fire on Move: Yes Rate of Fire (rpm): 80-100 practical, 600 for air targets in 2-10 round bursts Caliber, Type, Name: 7.62 (7.62 x 54R) Machinegun Type 59 Mount Type: Turret coax Direct Fire Range (m): 1800 Max Effective Range (m): Day: 1000 Night: 800 Fire on Move: Yes Rate of Fire (rpm): 250 practical, 600 cyclic in 2-10 round bursts FIRE CONTROL Indirect Fire: Panoramic Direct Fire: INA Collimator: INA Gun Display Unit: None Fire Control Computer: None VARIANTS 425-mm Mineclearing Rocket Launcher Type 462: 2-round rocket launcher for use in clearing minefields. 120-mm SP Anti-Tank Gun: The AT gun is fitted with a 120-mm smoothbore mounted inside a turret on a Type 83 Gun-Howitzer chassis.										

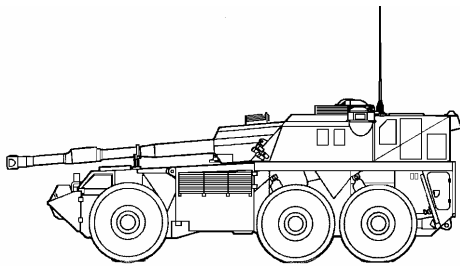
Chinese 152-mm Self-Propelled Gun-Howitzer Type 83 continued

MAIN ARMAMENT AMMUNITION Caliber, Type, Name: 152-mm Frag-HE, Type 66 Indirect Fire Range (m): Minimum Range: 9600 Maximum Range: 17,230 Complete Projectile Weight (kg): 43.6 Muzzle Velocity: 655 m/s Fuze Type: Liu-4 PD and Proximity 152-mm Frag-HE Rocket Assisted Projectile Indirect Fire Range (m): Minimum Range: INA Maximum Range: 21,880 Complete Projectile Weight (kg): INA Muzzle Velocity: INA Fuze Type: PD	152-mm Frag-HE Type 83 Indirect Fire Range (m): Minimum Range: INA Maximum Range: 30,370 Complete Projectile Weight (kg): 46.95 Muzzle Velocity: 955 m/s Fuze Type: Liu-4 PD and Proximity Other Ammunition Types: HE-I, Illumination, Smoke
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NOTES

The Type 83 152-mm SP Gun-Howitzer is capable of firing all standard types of 152-mm rounds. The main armament cannon is based on the Chinese 152-mm Towed Type 66 mounted on a vehicle hull similar to the Russian 152-mm SP Gun-Howitzer 2S3. The crew communicates with each other using the Type 803 intercom system. There are reports of the Type 83 being equipped with an anti-tank rocket launcher referred to as the Type 40. However, it is suspected that the rocket launcher is really the 40-mm anti-tank rocket launcher Type 69-1 (an upgraded variant of the Russian RPG-7).

South African 155-mm Self-Propelled Howitzer G6

	<table><tr><th>Weapons & Ammunition Types</th><th>Typical Combat Load</th></tr><tr><td>155-mm howitzer</td><td>45</td></tr><tr><td>Frag-HE Smoke Illumination</td><td></td></tr><tr><td>.50 Cal. M2 HB MG</td><td>900</td></tr></table>	Weapons & Ammunition Types	Typical Combat Load	155-mm howitzer	45	Frag-HE Smoke Illumination		.50 Cal. M2 HB MG	900
Weapons & Ammunition Types	Typical Combat Load								
155-mm howitzer	45								
Frag-HE Smoke Illumination									
.50 Cal. M2 HB MG	900								
SYSTEM Alternative Designations: 155-mm G6 Rhino Date of Introduction: 1988 Proliferation: At least 2 countries Description: Crew: 6 Platform (chassis): Purpose built 6x6 wheeled Combat Weight (mt): 48 Chassis Length Overall (m): 10.4 Height Overall (m): 3.5 Width Overall (m): 3.4 Automotive Performance: Engine Type: 525-hp air-cooled diesel Cruising Range (km): 700 km Speed (km/h): Max Road: 85 Max Off-Road: 30 Cross-Country: INA Max Swim: N/A Fording Depth (m): 1.00 Emplacement Time (min): 1 Displacement Time (min): 0.5 Radio: INA Protection: Armor, Turret (mm): See NOTES Armor Turret Top (mm): See NOTES Armor Hull (mm): See NOTES Self-Entrenching Blade: No NBC Protection System: Yes Smoke Equipment: 8 81-mm grenade launchers ARMAMENT Main Armament: Caliber, Type, Name: 155-mm, canon Barrel Length (cal): 45 Rate of Fire (rpm): Burst: 3 Normal: 2 Sustained: 1 Fire from Ground: INA Loader Type: Semi-automatic Breech Type: Interrupted screw	Muzzle Brake Type: Single baffle Traverse: (°): Left: 40 Right: 40 Total: 80 Elevation (°) (-/+): -5/+75° Auxiliary Weapon: Caliber, Type, Name: .50 (12.7x99) heavy machinegun, M2HB Mount Type: Cupola AA mount Direct Fire Range (m): INA Max Effective Range (m): Day: 1000 Night: INA Fire on Move: Yes Rate of Fire (rpm): 450-550 (cyclic) FIRE CONTROL Indirect Fire: Digital Panoramic Telescope Direct Fire: Trunnion mounted telescopic sight Collimator: INA Gun Display Unit: None Fire Control Computer: None VARIANTS None MAIN ARMAMENT AMMUNITION Caliber, Type, Name: 155-mm Frag-HE, M1 HE Indirect Fire Range (m): Minimum Range: 3000 Maximum Range: 30,000 Complete Projectile Weight (kg): 8.7 Muzzle Velocity: 897 m/s Fuze Type: PD M841 155-mm Frag-HE BB, M1 HE Indirect Fire Range (m): Minimum Range: INA Maximum Range: 39,000 Complete Projectile Weight (kg): 8.7 Muzzle Velocity: 895 m/s Fuze Type: PD M841 Other Ammunition Types: See NOTES								

South African 155-mm Self-Propelled Howitzer G6 continued

NOTES

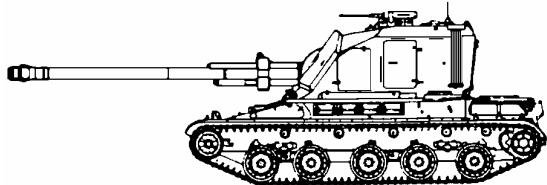
The G6 is a three-axle, six-wheeled, heavily armored system mounting a modified version of the G5 cannon. The G6 is fully compatible with NATO standard 155-mm ammunition and has a direct fire range of 3000 meters (using a Frag-HE round). The rigid chassis is actually divided into two parts, a driver's/engine compartment and a crew compartment. In order to distribute its weight and to maintain mobility over sand and soft terrain, the G6 employs large 21x25 run-flat tires. The driver controls a central tire-inflation system to vary the ground pressure. The system can also be used to maintain some degree of tire pressure in case of air leakage from small punctures. The G6 is equipped with an electronically controlled hydraulic flick rammer that provides an initial rate of fire of 3 rounds per minute.

The vehicle hull and turret provide protection against 7.62-mm small arms fire and artillery shrapnel. The frontal 60° arc provides protection against 20-mm type ammunition. Additionally, the shape and armor thickness of the chassis hull allows it to withstand at least three mine detonations (against TM46 antitank landmine or equivalent) before being immobilized. The separation of the driver/engine compartment from the crew compartment also facilitates survival against mines. The connection between the two is perforated with blowout holes to direct the force of the blast upwards, away from any personnel compartments. The separation also allows the driver to be beyond the detonation point before the mine is activated. The driver also has bullet-resistant glass windows that can be further protected by armored shutters, although it limits him to the use of a periscopic viewing port. The vehicle commander has limited steering and braking capability if the driver becomes a casualty. The crew compartment has four firing ports (two each side) so the crew can engage targets without exposing themselves to return fire.

A 45-hp (34 kw) Auxiliary Power Unit (APU) provides power for turret operations, recharging the batteries, and the driver/crew compartment air conditioning system. A wide range of optional subsystems is available to increase the efficiency of the G6 and its crew. They include the following:

- Inertial navigation and laying or back-up laying systems
- Night vision equipment
- Barrel cooling and thermal warning systems
- Fire control computer interface
- Muzzle velocity analyzer
- Explosion control for fuel tanks

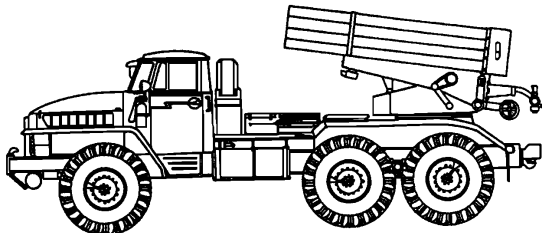
French 155-mm Self-Propelled Howitzer AU-F1

	<table><tr><th>Weapons & Ammunition Types</th><th>Typical Combat Load</th></tr><tr><td>155-mm howitzer</td><td>42</td></tr><tr><td>Frag-HE Smoke Illumination</td><td></td></tr><tr><td>.50 Cal. M2 HB MG</td><td>800</td></tr></table>	Weapons & Ammunition Types	Typical Combat Load	155-mm howitzer	42	Frag-HE Smoke Illumination		.50 Cal. M2 HB MG	800
Weapons & Ammunition Types	Typical Combat Load								
155-mm howitzer	42								
Frag-HE Smoke Illumination									
.50 Cal. M2 HB MG	800								
SYSTEM Alternative Designations: 155-mm GCT (Export Version) Date of Introduction: 1979 Proliferation: At least 4 countries Description: Crew: 4 Platform (chassis): Modified AMX-30 Combat Weight (mt): 42.0 Chassis Length Overall (m): 10.25 Height Overall (m): 3.25 Width Overall (m): 3.15 Automotive Performance: Engine Type: Hispano-Suiza HS110, 720-hp water-cooled multi-fuel Cruising Range (km): 450 km Speed (km/h): Max Road: 60 Max Off-Road: 40 Cross-Country: INA Max Swim: N/A Fording Depth (m): 2.10 Emplacement Time (min): 1-2 Displacement Time (min): 1 Radio: TRC 559 (VHF-FM) Protection: Armor, Turret (mm): See NOTES Armor Turret Top (mm): See NOTES Armor Hull (mm): See NOTES Self-Entrenching Blade: No NBC Protection System: Yes Smoke Equipment: 4 grenade launchers ARMAMENT Main Armament: Caliber, Type, Name: 155-mm, canon Barrel Length (cal): 40 Rate of Fire (rpm): Burst: 8 Normal: 6 Sustained: 2-3 (manual loading) Fire from Ground: INA Loader Type: Autoloader Breech Type: Vertical sliding wedge	Muzzle Brake Type: Double baffle Traverse: (°): Left: 360 Right: 360 Total: 360 Elevation (°) (-/+): -4/+66° Auxiliary Weapon: Caliber, Type, Name: .50 (12.7x99) heavy machinegun, M2HB Mount Type: Cupola AA mount Direct Fire Range (m): INA Max Effective Range (m): Day: 1000 Night: INA Fire on Move: Yes Rate of Fire (rpm): 450-550 (cyclic) FIRE CONTROL Indirect Fire: M 589 Optical Goniometer Direct Fire: INA Collimator: INA Gun Display Unit: ATILA fire direction system Fire Control Computer: None VARIANTS AU-FIT: Upgrade of AU-F1 MAIN ARMAMENT AMMUNITION Caliber, Type, Name: 155-mm Frag-HE, OE-155-56/69 Indirect Fire Range (m): Minimum Range: 9600 Maximum Range: 23,000 Complete Projectile Weight (kg): 43.75 Muzzle Velocity: 810 m/s Fuze Type: PD 155-mm Frag-HE Rocket Assisted H3 Indirect Fire Range (m): Minimum Range: INA Maximum Range: 31,500 Complete Projectile Weight (kg): INA Muzzle Velocity: 830 m/s Fuze Type: PD Other Ammunition Types: DPICM, Illumination, Smoke								

NOTES

The export version of the AU-F1 is known as the GCT (Grande Cadence de Tir or high rate of fire). The AU-F1T is fitted with the Sagem Cita 20 inertial navigation system as well as a 20-24 hp gas turbine auxiliary power unit (APU). A four-man gun crew can reload the AU-F1 in 15 minutes. A two-man gun crew can reload the AU-F1 in 20 minutes. The AU-F1's armor provides crew protection against artillery shrapnel and small arms fire.

Russian 122-mm Multiple Rocket Launcher BM-21

	Weapons & Ammunition Types 122-mm rocket Frag-HE	Typical Combat Load 40
SYSTEM Alternative Designations: BM-21 GRAD (Hail) MRL Date of Introduction: 1963 Proliferation: At least 50 countries Description: Crew: 5 (8 with 9K51 Complex) Chassis/Carriage: Ural 375-D 6x6 wheeled Combat Weight (mt): 13.7 Chassis Length Overall (m): 7.35 Height Overall (m): 3.09 Width Overall (m): 2.40 Automotive Performance: Engine Type: ZIL 375, 180 hp water-cooled, V-8 gasoline engine Cruising Range (km): 450 km Speed (km/h): Max Road: 75 Max Off-Road: 35 Cross-Country: INA Max Swim: N/A Fording Depths (m): Unprepared: 1.5 Emplacement Time (min): 3 Displacement Time (min): 2 Radio: R-123M Protection: Armor, Front (mm): None Armor Side (mm): None Armor Roof (mm): None Self-Entrenching Blade: No NBC Protection System: No Smoke Equipment: No ARMAMENT Launcher: Caliber, Type, Name: 122-mm, 9P132 Number of Tubes: 40 (4 rows of 10 tubes) Launch Rate: Full Salvo Time: 40 rounds in 20 seconds Single Rocket Interval: .5 seconds per rocket Loader Type: Manual Reload Time: 10 minutes Launcher Drive: Electric Traverse: (°): Left: 102 Right: 70 Total: 172 Elevation (°) (-/+): - 0/+55°	FIRE CONTROL Indirect Fire: PG-1M Panoramic Telescope (PANTEL) Collimator: K-1 Fire Control Computer: None Position Location System: None VARIANTS BM-21V: Russian 12-tube version for airborne divisions BM-21B: Russian 36-tube MRL on a 6x6 ZIL-131 chassis Grad-P: Russian 1 round rocket launcher BM-11: North Korean 30-tube version Type 81: Chinese 40- rail-launched version RM-70: Czechoslovakian 40-tube version Sakr: Egyptian 40- tube version MAIN ARMAMENT AMMUNITION Caliber, Type, Name: 122-mm Frag-HE, 9M22U Indirect Fire Range (m): Minimum Range: 5000 Maximum Range: 20,380 Warhead Weight (kg): 18.4 (M21OF) Rocket Length: (m): 2.87 Maximum Velocity: INA Fuze Type: MRV-U (PD) 122-mm Frag-HE, 9M28F Indirect Fire Range (m): Minimum Range: 1500 Maximum Range: 15,000 Warhead Weight (kg): 21.0 Rocket Length: (m): 2.87 Maximum Velocity: INA Fuze Type: MRV-U (PD) or AR-6 (proximity) 122-mm Frag-HE, Type 90A (Chinese) Indirect Fire Range (m): Minimum Range: 12,700 Maximum Range: 32,700 Warhead Weight (kg): 18.3 Rocket Length: (m): 2.75 Maximum Velocity: INA Fuze Type: PD Other Ammunition Types: Smoke, Incendiary, Chemical, RF Jammer, Illumination, Antitank mines, Antipersonnel mines	

NOTES

The BM-21 is unquestionably the world's most widely used MRL. The launcher with supporting equipment is referred to as the complex 9K51. A special electric generator powers the launcher. The 9V170 firing device is cab mounted. But, the rockets can be fired using a remote-firing device that has a 64-meter-long cable.

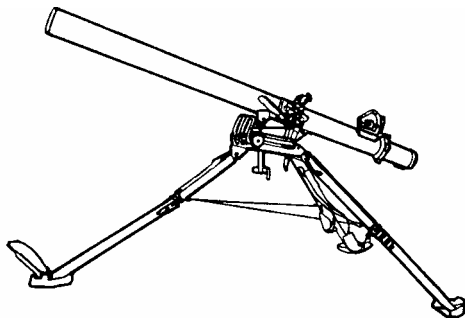
	Weapons & Ammunition Types 122-mm rocket Frag-HE	Typical Combat Load 50
SYSTEM Alternative Designations: 9A51 Date of Introduction: 1988 Proliferation: At least 2 countries Description: Crew: 3 Chassis/Carriage: Ural 4320 6x6 wheeled Combat Weight (mt): 13.9 Chassis Length Overall (m): 7.35 Height Overall (m): 2.50 Width Overall (m): 2.50 Automotive Performance: Engine Type: KAMAZ-740, 210 hp, diesel engine Cruising Range (km): 990 Speed (km/h): Max Road: 85 Max Off-Road: 40 Cross-Country: INA Max Swim: N/A Fording Depths (m): 1.5 Emplacement Time (min): 3 Displacement Time (min): 3 Radio: R-173M FM-VHF Protection: Armor, Front (mm): None Armor Side (mm): None Armor Roof (mm): None Self-Entrenching Blade: No NBC Protection System: No Smoke Equipment: No	ARMAMENT Launcher: Caliber, Type, Name: 122-mm, Prima Number of Tubes: 50 Launch Rate: Full Salvo Time: 50 rounds in 30 seconds Single Rocket Interval: 0.6 seconds per rocket (est) Loader Type: Transloader, crane hoist Reload Time: 10 minutes Launcher Drive: Electric Traverse (°): Left: 58 Right: 58 Total: 116 Elevation (°): -0/+55° FIRE CONTROL Indirect Fire: PG-1M Panoramic Telescope (PANTEL) Collimator: K-1 Fire Control Computer: None Position Location System: None VARIANTS None MAIN ARMAMENT AMMUNITION Caliber, Type, Name: 122-mm Frag-HE, 9M53F Indirect Fire Range (m): Min Range: 5,000 Max Range: 20,500 Warhead Weight (kg): 26 Rocket Length: (m): 3.03 Maximum Velocity: INA Fuze Type: Prox Other Ammunition Types: All standard 122-mm rockets	

NOTES

The 9A51 Prima launcher assembly incorporates 50 launch tubes, a thermal shroud, and a remote electronic fuze setter. The remote fuze setter increases the ease with which the crew can adjust to changing target situations. Small boxes on the upper right surface of the exit end of the launcher tube contain the fuze setter for each rocket. The launch tubes are arrayed from top to bottom: 11-11-11-10-7. A 51st tube in the center of the fourth row is blocked and used for electronics. The elevating arms are mounted in the center of the bottom row (like the 9P138) in order to reduce the height of the system. The 9A51 Prima is capable of firing older 122-mm rockets as well as the newer 122-mm rockets. The new rockets are equipped with a separating, parachute-retarded warhead that has more lethality. The launcher vehicle and the 9T232M ammunition resupply vehicle constitute the 9K59 rocket complex.

Both the 9A51 Prima and the 9T232M-ammunition resupply vehicle are based on the same Ural-4320 5-ton, 6x6 truck used for the BM-21-1. The 9A51 Prima is equipped with manually emplaced hydraulic firing jacks to enhance firing stability. The 9T232M ammunition resupply vehicle carries 50 rockets arranged in racks on the vehicle's rear deck. The crew manually reloads the launcher. The 9A51 Prima is capable (under optimum conditions) of firing a 50 rocket salvo that covers an area of 190,000m².

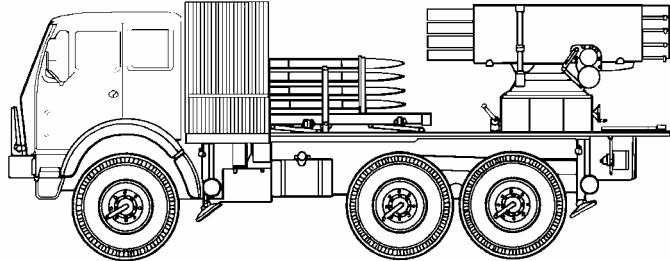
Russian 122-mm 1-Round Rocket Launcher 9P132

	Weapons &Ammunition Types 122-mm rocket Frag-HE	Typical Combat Load 1
SYSTEM Alternative Designations: DKZ-66, BM-21P, Grad-1P, 9K510 Date of Introduction: Mid to late 1960's Proliferation: At least 5 countries Description: Crew: 4-5 (includes ammunition bearers) Combat Weight (kg): Loaded: 101 Unloaded: 55 Length (m): 2.50 Width (m): 1.53 Height (m): 1.00 Emplacement Time (min): 2.5 Displacement Time (min): 2 Radio: R-107M ARMAMENT Launcher: Caliber, Type, Name: 122-mm, 9P132 Number of Tubes: 1 Launch Rate: 1 round per minute Loader Type: Manual Reload Time: .67 minutes (approximately 40 seconds) Traverse(°): Left: 7 Right: 7 Total: 14 Elevation (°) (-/+): +10/+40°	FIRE CONTROL Indirect Fire: PG-1M Panoramic Telescope (PANTEL) Collimator: K-1 VARIANTS None MAIN ARMAMENT AMMUNITION Caliber, Type, Name: 122-mm Frag-HE, 9M22M Indirect Fire Range (m): Minimum Range: 3,000 Maximum Range: 10,800 Warhead Weight (kg): 19.4 Rocket Length: (m): 1.90 Maximum Velocity (m/s):: 450 Fuze Type: PD Caliber, Type, Name: 122-mm Illuminating Rocket Projectile, 9M42 Indirect Fire Range (m): Minimum Range: 1,000 Maximum Range: 5,000 Rocket Weight (kg): 27 Rocket Length: (m): 1.90 Other Ammunition Types: Smoke	

NOTES

The 9P132 is a lightweight, man-portable rocket launcher used by guerrilla, special purpose forces, or other light forces. The 9P132 is only effective as a harassment or interdiction weapon. When used to fire a new illumination rocket (9M42) the system has been referred to as the 9K510. The 9P132 is broken down for manpack transport into two one-man loads – the tube (27 kg) and the tripod sight assembly with a remote firing device (27 to 28 kg). The tripod legs also fold for ease of handling. Each 9M22M rocket is broken down into two one-man loads for transport. It takes approximately 2 minutes for assembly of the rocket. When assembled, the launcher has three course elevation positions, with the final elevation set by means of an elevation screw. The crew uses an electrical remote control with an electrical impulse generator and battery to fire the launcher. The 9P132 is incapable of firing the 9 foot version rockets of the BM-21 and similar 122-mm systems.

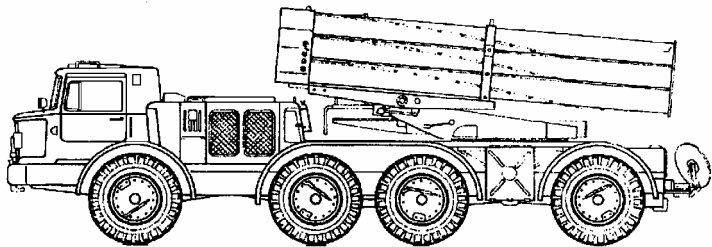
Yugoslav 128-mm Multiple Rocket Launcher M77

	Weapons &Ammunition Types 128-mm rocket Frag-HE	Typical Combat Load 32
SYSTEM Alternative Designations: M-77 Oganj Date of Introduction: Early 1970’s Proliferation: At least 4 countries Description: Crew: 5 Chassis/Carriage: Modified FAP-2026 BDS/AV 6x6 wheeled Combat Weight (mt): 22 Chassis Length Overall (m): 8.40 Height Overall (m): 3.10 Width Overall (m): 2.50 Automotive Performance: Engine Type: Model 2F/002A, 200 hp water-cooled, 8-cylinder diesel engine Cruising Range (km): 600 Speed (km/h): Max Road: 80 Max Off-Road: 35 Cross-Country: INA Max Swim: N/A Fording Depths (m): Unprepared: 1.2 Emplacement Time (min): 3 Displacement Time (min): 2 Radio: R-123M Protection: Armor, Front (mm): None Armor Side (mm): None Armor Roof (mm): None Self-Entrenching Blade: No NBC Protection System: No Smoke Equipment: No	ARMAMENT Launcher: Caliber, Type, Name: 128-mm Number of Tubes: 32 (4 rows of 8 tubes) Launch Rate: Full Salvo Time: 32 rounds in 25.6 seconds Single Rocket Interval: 8 seconds per rocket Loader Type: Hydraulic Reload Time: 2 minutes Launcher Drive: Electric Traverse: (°): Left: 180 Right: 180 Total: 360 Elevation (°) (-/+): 0/+50° FIRE CONTROL Indirect Fire: PG-1M Panoramic Telescope (PANTEL) Collimator: K-1 Fire Control Computer: None Position Location System: None VARIANTS 128-mm Single Tube Launcher MAIN ARMAMENT AMMUNITION Caliber, Type, Name: 128-mm Controlled Frag-HE Indirect Fire Range (m): Minimum Range: 1,000 Maximum Range: 20,600 Warhead Weight (kg): 20 Rocket Length: (m): 2.60 Maximum Velocity (m/s):: INA Fuze Type: PD Other Ammunition Types: DPICM	

NOTES

The M77 is configured and operated in the same manner as the Czechoslovakian 122-mm (40 round) multiple rocket launcher RM-70. The launcher is mounted over the rear axles with the reloader located behind the cab. During reloading, the launcher is rotated to the rear, two hydraulic cylinders raise the reloader, and then the rockets are pushed into the launcher. Unlike the RM-70, the M77 uses hydraulic cylinders rather than a sprocket and chain drive mechanism. The modified FAP2026 truck has four hydraulically emplaced firing jacks to provide firing stability. The rockets can be fired from inside the cab or with a remote-firing device. The M77 MRL is capable of mounting an antiaircraft machinegun for protection.

Russian 220-mm Multiple Rocket Launcher 9P140

	Weapons & Ammunition Types 220-mm rocket Frag-HE	Typical Combat Load 16
SYSTEM Alternative Designations: 9P140 Uragan Date of Introduction: 1977 Proliferation: At least 7 countries Description: Crew: 4 Chassis/Carriage: ZIL-135LM 8x8 wheeled Combat Weight (mt): 20.0 Chassis Length Overall (m): 9.3 Height Overall (m): 3.2 Width Overall (m): 2.8 Automotive Performance: Engine Type: 2 each - 177 hp, 8 cylinder, 4-stroke gasoline engines Cruising Range (km): 500 km Speed (km/h): Max Road: 65 Max Off-Road: INA Cross-Country: INA Max Swim: N/A Fording Depths (m): Unprepared: 1.2 Emplacement Time (min): 3 Displacement Time (min): 3 Radio: R-123M Protection: Armor, Front (mm): None Armor Side (mm): None Armor Roof (mm): None Self-Entrenching Blade: No NBC Protection System: No Smoke Equipment: No ARMAMENT Launcher: Caliber, Type, Name: 220-mm, 9P140 Number of Tubes: 16 (2 rows of 6 tubes and 1 row of 4 tubes) Launch Rate: Full Salvo Time: 16 rounds in 20 seconds Single Rocket Interval: 1.25 seconds per rocket Loader Type: Manual Reload Time: 15-20 minutes Launcher Drive: Electric Traverse (°): Left: 30 Right: 30 Total: 60 Elevation (°) (-/+): -0/+55°	FIRE CONTROL Indirect Fire: PG-1M Panoramic Telescope (PANTEL) Collimator: K-1 Fire Control Computer: None Position Location System: None VARIANTS None MAIN ARMAMENT AMMUNITION Caliber, Type, Name: 220-mm Frag-HE, 9M27F Indirect Fire Range (m): Minimum Range: 10,000 Maximum Range: 35,000 Warhead Weight (kg): 100 Rocket Length: (m): 4.8 Maximum Velocity: INA Fuze Type: Electronic timing (ET) 220-mm DPICM, 9M27K Indirect Fire Range (m): Minimum Range: 10,000 Maximum Range: 35,000 Warhead Weight (kg): 90 Rocket Length: (m): 5.1 Maximum Velocity: INA Fuze Type: Electronic timing (ET) 220-mm Antitank, 9M27K2 Indirect Fire Range (m): Minimum Range: 10,000 Maximum Range: 35,000 Warhead Weight (kg): 90 Rocket Length: (m): 5.1 Maximum Velocity: INA Fuze Type: Electronic timing (ET)	

Russian 220-mm Multiple Rocket Launcher 9P140 continued

MAIN ARMAMENT AMMUNITION (continued) Caliber, Type, Name: 220-mm Antipersonnel, 9M27K3 Indirect Fire Range (m): Minimum Range: 10,000 Maximum Range: 35,000 Warhead Weight (kg): 90 Rocket Length: (m): 5.1 Maximum Velocity: INA Fuze Type: Electronic timing (ET)	220-mm Antitank, 9M59 Indirect Fire Range (m): Minimum Range: 10,000 Maximum Range: 35,000 Warhead Weight (kg): 90 Rocket Length: (m): 5.1 Maximum Velocity: INA Fuze Type: Electronic timing (ET) Other Ammunition Types: None
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NOTES

The 9P140 Uragan (previously referred to incorrectly as BM-22 or BM-27) is the world's first modern fin and spin-stabilized heavy rocket system. Essentially a scaled-up version of the BM-21, the 9P140 use many of the same design features. The launcher, 9T452 transloader, rockets, and support equipment constitutes the 9K57 complex.

The 9P140 and its transloader are both based on variants of the gasoline-powered ZIL-135LM 8-ton 8x8 chassis. The truck is unusual in that it uses two engines, each driving the wheels on one side of the truck, and only the front and rear axles steer. The 9P140 cab has a blast shield that is raised during firing, and the vehicle is stabilized during firing by two manually emplaced hydraulic jacks at the rear of the chassis.

The launcher has electrically powered traversing and elevating mechanisms. During travel, the launcher assembly is oriented rearward and a light sheet metal cover over the muzzle end of the tubes prevents foreign material from entering the tube. This is a safety feature that is designed for travel when loaded. There is no such cover for the muzzle end of an unloaded launcher.

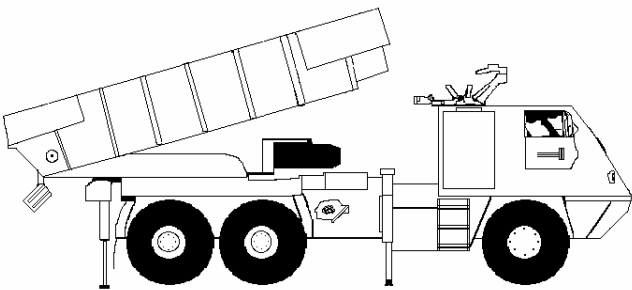
Iranian 240-mm Multiple Rocket Launcher Fadjr-3

	Weapons & Ammunition Types 240-mm rocket Frag-HE	Typical Combat Load 12
SYSTEM Alternative Designations: INA Date of Introduction: 1996 Proliferation: At least 1 country and Hezbollah Units Description: Crew: 5 Chassis/Carriage: Mercedes Benz 6x6 wheeled Combat Weight (mt): 15.0 Chassis Length Overall (m): 10.45 Height Overall (m): 3.34 Width Overall (m): 2.54 Automotive Performance: Engine Type: 280 hp, V-8 liquid-cooled, diesel engine Cruising Range (km): INA Speed (km/h): Max Road: 60 Max Off-Road: 25 (est) Cross-Country: INA Max Swim: N/A Fording Depths (m): INA Emplacement Time (min): INA Displacement Time (min): INA Radio: INA Protection: Armor, Front (mm): None Armor Side (mm): None Armor Roof (mm): None Self-Entrenching Blade: No NBC Protection System: No Smoke Equipment: No	ARMAMENT Launcher: Caliber, Type, Name: 240-mm, Fadjr-3 Number of Tubes: 12 (2 rows of 6 tubes) Launch Rate: Full Salvo Time: 12 rounds in 48 seconds (est) Single Rocket Interval: 4 seconds per rocket (est) Loader Type: Transloader, crane hoist Reload Time: 12 to 15 minutes (est) Launcher Drive: Manual Traverse: (°): Left: 90 Right: 100 Total: 190 Elevation (°) (-/+): -0/+57° FIRE CONTROL Indirect Fire: INA Collimator: INA Fire Control Computer: None Position Location System: None VARIANTS None MAIN ARMAMENT AMMUNITION Caliber, Type, Name: 240-mm Frag-HE, Fadjr-3 Indirect Fire Range (m): Min Range: INA Max Range: 43,000 Warhead Weight (kg): 90 Rocket Length: (m): 5.2 Maximum Velocity: INA Fuze Type: PD Other Ammunition Types: INA	

NOTES

The system is stabilized by 2 firing jacks mounted on the rear of the vehicle and 2 more located behind the cab. The system has a dedicated re-supply vehicle with a crane to assist in reloading. Shahid Bagheri Industries of Iran developed the system with possible technical assistance from North Korea.

Brazilian 127-mm, 180-mm, & 300-mm Multiple Rocket Launcher ASTROS II

	<table> <tr> <th>Weapons & Ammunition Types</th><th>Typical Combat Load</th></tr> <tr> <td>127-mm rocket Frag-HE</td><td>32</td></tr> <tr> <td>180-mm rocket Frag-HE</td><td>16</td></tr> <tr> <td>300-mm rocket Frag-HE</td><td>4</td></tr> <tr> <td>.50 Cal. M2 HB MG</td><td>INA</td></tr> </table>	Weapons & Ammunition Types	Typical Combat Load	127-mm rocket Frag-HE	32	180-mm rocket Frag-HE	16	300-mm rocket Frag-HE	4	.50 Cal. M2 HB MG	INA
Weapons & Ammunition Types	Typical Combat Load										
127-mm rocket Frag-HE	32										
180-mm rocket Frag-HE	16										
300-mm rocket Frag-HE	4										
.50 Cal. M2 HB MG	INA										
SYSTEM Alternative Designations: ASTROS II AV-LMU Date of Introduction: 1983 Proliferation: At least 6 countries Description: Crew: 3 Chassis/Carriage: TECTRAN 10-ton 6x6 wheeled Combat Weight (mt): 20.0 Chassis Length Overall (m): 8.0 Height Overall (m): 2.6 Width Overall (m): 2.4 Automotive Performance: Engine Type: 280 hp, water-cooled turbocharged, diesel engine Cruising Range (km): INA Speed (km/h): Max Road: 70 Max Off-Road: 40 Cross-Country: INA Max Swim: N/A Fording Depths (m): Unprepared: 1.0 Emplacement Time (min): INA Displacement Time (min): INA Radio: INA Protection: Armor, Front (mm): None Armor Side (mm): None Armor Roof (mm): None Self-Entrenching Blade: No NBC Protection System: No Smoke Equipment: 6 smoke grenade launchers ARMAMENT Launcher: Caliber, Type, Name: 127-mm, 180-mm, 300-mm, ASTROS Number of Tubes: 127-mm (32), 180-mm (16), 300-mm (4) Launch Rate: Full Salvo Time: INA Single Rocket Interval: INA Loader Type: Manual Reload Time: INA Launcher Drive: Electric Traverse: (°): Left: INA Right: INA Total: INA Elevation (°) (-/+): INA	Auxiliary Weapon: Caliber, Type, Name: .50 (12.7x99) heavy machinegun, M2HB Mount Type: Cab AA mount Direct Fire Range (m): INA Max Effective Range (m): Day: 1000 Night: INA Fire on Move: Yes Rate of Fire (rpm): 450-550 (cyclic) FIRE CONTROL Indirect Fire: INA Collimator: INA Fire Control Computer: FIELDGAURD Radar or the FILA System Position Location System: INA VARIANTS: None MAIN ARMAMENT AMMUNITION Caliber, Type, Name: 127-mm Frag-HE, SS-30 Indirect Fire Range (m): Minimum Range: 9000 Maximum Range: 30,000 Warhead Weight (kg): INA Rocket Length: (m): 3.9 Maximum Velocity: INA Fuze Type: INA Other Ammunition Types: None Caliber, Type, Name: 180-mm Frag-HE, SS-40 Indirect Fire Range (m): Minimum Range: 15,000 Maximum Range: 35,000 Warhead Weight (kg): INA Rocket Length: (m): 4.2 Maximum Velocity: INA Fuze Type: INA Other Ammunition Types: DPICM, HE-Incendiary, Antitank mines, Antipersonnel mines, Runway Denial										

Brazilian 127-mm, 180-mm, & 300-mm Multiple Rocket Launcher ASTROS II continued

Caliber, Type, Name: 300-mm Frag-HE, SS-60 Indirect Fire Range (m): Minimum Range: 20,000 Maximum Range: 60,000 Warhead Weight (kg): INA Rocket Length: (m): 5.6 Maximum Velocity: INA Fuze Type: INA Other Ammunition Types: DPICM, HE-Incendiary, Antitank mines, Antipersonnel mines, Runway Denial	300-mm Frag-HE, SS-80 Indirect Fire Range (m): Minimum Range: 22,000 Maximum Range: 90,000 Warhead Weight (kg): INA Rocket Length: (m): 5.6 Maximum Velocity: INA Fuze Type: INA Other Ammunition Types: DPICM, HE-Incendiary, Antitank mines, Antipersonnel mines, Runway Denial
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NOTES

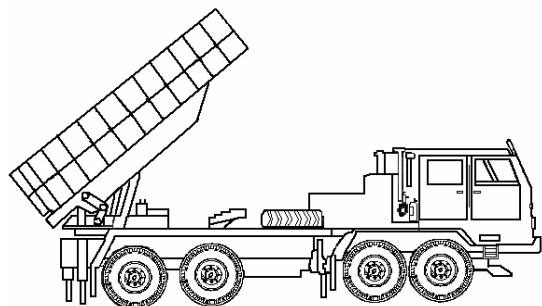
The ASTROS (Artillery SaTuration ROcket System) II is a modular multiple rocket launcher capable of firing three different caliber wrap-around fin rockets (for improved accuracy) using several types of warheads. The universal modules enable the system to accomplish fire missions with ranges from 9 to 90 kilometers.

The ASTROS II system consists of the following vehicles:

Universal Multiple Launcher (AV-LMU), Ammunition Supply Vehicle (AV-RMD), Command and Control Vehicle/Fire Control Unit (AV-VCC), Mobile Workshops (for field maintenance), and the Optional Electronic Fire Control Unit (AV-UCF). All of the ASTROS II vehicles use the Tectran Engenharia 10 ton, 6x6, wheeled vehicle chassis.

A typical firing battery consists of six AV-LMU launchers, six AV-RMD ammunition supply vehicles, and one AV-VCC fire control unit. A AV-VCC command and control unit and two mobile workshops are found at battalion level. The battalion level AV-VCC can coordinate and direct fire missions for three ASTROS batteries. The AV-RMD ammunition supply vehicle carries two complete loads for each launcher.

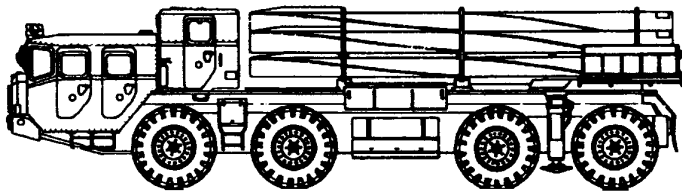
Chinese 273-mm Multiple Rocket Launcher WM-80

	Weapons & Ammunition Types 273-mm rocket Frag-HE	Typical Combat Load 8
SYSTEM Alternative Designations: None Date of Introduction: INA Proliferation: Ready for production Description: Crew: 5 Chassis/Carriage: TA 580 8x8 wheeled Combat Weight (mt): 34 Chassis Length Overall (m): 9.55 Height Overall (m): 3.30 Width Overall (m): 3.06 Automotive Performance: Engine Type: 525 hp air-cooled, diesel engine Cruising Range (km): 400 km Speed (km/h): Max Road: 70 Max Off-Road: INA Cross-Country: INA Max Swim: N/A Fording Depths (m): Unprepared: INA Emplacement Time (min): 3 to 5 Displacement Time (min): 3 to 5 Radio: INA Protection: Armor, Front (mm): None Armor Side (mm): None Armor Roof (mm): None Self-Entrenching Blade: No NBC Protection System: No Smoke Equipment: No ARMAMENT Launcher: Caliber, Type, Name: 273-mm, Number of Tubes: 8 (2 rows of 4 tubes) Launch Rate: Full Salvo Time: 8 rounds in 5 seconds Single Rocket Interval: .5 seconds per rocket Loader Type: Manual	Reload Time: 5-8 minutes Launcher Drive: Electric Traverse: (°): Left: 20 Right: 20 Total: 40 Elevation (°) (+/+): +20/+60° FIRE CONTROL Indirect Fire: INA Collimator: INA Fire Control Computer: None Position Location System: None VARIANTS None MAIN ARMAMENT AMMUNITION Caliber, Type, Name: 273-mm Frag-HE, WM-80 Indirect Fire Range (m): Min Range: 34,000 Max Range: 80,000 Warhead Weight (kg): 150 Rocket Length: (m): 4.58 Maximum Velocity (m/s): 1,140 Fuze Type: WJ-6A (PD) 273-mm DPICM, WM-80 Indirect Fire Range (m): Min Range: 34,000 Max Range: 80,000 Warhead Weight (kg): 150 Rocket Length: (m): 4.58 Maximum Velocity (m/s): 1,140 Fuze Type: MD-23A (proximity) Other Ammunition Types: None	

NOTES

The WM-80 is currently being advertised heavily on the open-market by NORINCO Industries. The WM-80 Rocket System is composed of the multiple rocket launcher, the ammunition transloader, fire command and control vehicles, and the maintenance vehicles. The fire command and control is composed of a brigade/regiment command vehicle, battalion command vehicle, surveillance/spotting radar, and meteorological radar.

Russian 300-mm Multiple Rocket Launcher 9A52-2

	Weapons & Ammunition Types 300-mm rocket Frag-HE	Typical Combat Load 12
SYSTEM Alternative Designations: 9A52-2 Smerch-M Date of Introduction: 1989 Proliferation: At least 4 countries Description: Crew: 4 (7 with 9K58 Complex) Chassis/Carriage: MAZ-543M 8x8 wheeled Combat Weight (mt): 43.7 Chassis Length Overall (m): 12.1 Height Overall (m): 3.05 Width Overall (m): 3.05 Automotive Performance: Engine Type: 518 hp, V-12 diesel engine Cruising Range (km): 850 km Speed (km/h): Max Road: 60 Max Off-Road: 35 Cross-Country: INA Max Swim: N/A Fording Depths (m): Unprepared: 1.1 Emplacement Time (min): 3 Displacement Time (min): 3 Radio: R-123M Protection: Armor, Front (mm): None Armor Side (mm): None Armor Roof (mm): None Self-Entrenching Blade: No NBC Protection System: No Smoke Equipment: No ARMAMENT Launcher: Caliber, Type, Name: 300-mm, 9A52 Number of Tubes: 12 (3 rows of 4 tubes) Launch Rate: Full Salvo Time: 12 rounds in 38 seconds Single Rocket Interval: 3 seconds per rocket Loader Type: Transloader, crane hoist Reload Time: 36 minutes Launcher Drive: Electric Traverse (°): Left: 30 Right: 30 Total: 60 Elevation (°) (-/+): -0/+55°	FIRE CONTROL Indirect Fire: PG-1M Panoramic Telescope (PANTEL) Collimator: K-1 Fire Control Computer: None Position Location System: None VARIANTS None MAIN ARMAMENT AMMUNITION Caliber, Type, Name: 300-mm Frag-HE, 9M55F Indirect Fire Range (m): Min Range: 20,000 Max Range: 90,000 Warhead Weight (kg): 258 Rocket Length (m): 7.6 Maximum Velocity: INA Fuze Type: Electronic timing (ET) Caliber, Type, Name: 300-mm DPICM, 9M55K Indirect Fire Range (m): Min Range: 20,000 Max Range: 90,000 Warhead Weight (kg): 235 Rocket Length (m): 7.6 Maximum Velocity: INA Fuze Type: Electronic timing (ET) Caliber, Type, Name: 300-mm Sensor-fuzed (MOTIV-3M), 9M55K1 Indirect Fire Range (m): Min Range: 20,000 Max Range: 90,000 Warhead Weight (kg): 233 Rocket Length (m): 7.6 Maximum Velocity: INA Fuze Type: Electronic timing (ET) Ammunition Note: All of the above warheads fit on a n inertially course-corrected rocket, with time-fuze adjustment. These provide greatly improved accuracy, with error of 0.019 percent of range. Other Ammunition Types: Smoke, Incendiary, Chemical, Leaflet, Fuel Air Explosive (FAE), R-90 expendable miniature UAV (experimental)	

NOTES

The 9A52-2 launcher with all supporting equipment, including the 9T234-2 Transloader, and the 1K123 Vivary Fire Control System, is referred to as the complex 9K58.

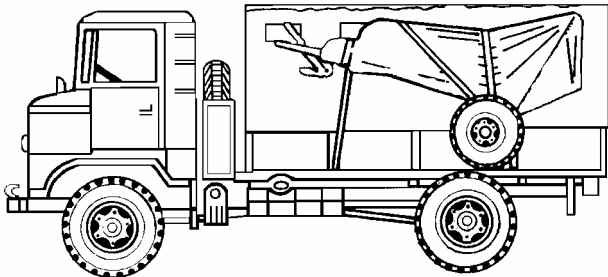
French 120-mm Mortar MO-120-RT

	Weapons & Ammunition Types 120-mm mortar Frag-HE	Typical Combat Load 70
SYSTEM Alternative Designations: RT-61 Date of Introduction: 1961 Proliferation: At least 22 countries Description: Crew: 4-6 Prime Mover: VAB M120 4x4 wheeled Combat Weight (mt): 13.0 Chassis Length Overall (m): 5.98 Height Overall (m): 2.06 Width Overall (m): 2.50 Combat Weight (kg): 582 Wheeled Carriage/Tube Support Mechanism (kg): 220 Baseplate (kg): 194 Length Overall (m): 2.70 Height Overall (m): 1.10 Width Overall (m): 1.55 Bipod (kg): N/A Ground Clearance (m): 0.35 Automotive Performance: Engine Type: Renault VI MIDS, 220 hp, diesel engine Cruising Range (km): 1,000 Speed (km/h): Max Road: 92 Max Off-Road: 60 (est) Cross-Country: 30 (est) Max Swim: N/A Fording Depths (m): Amphibious Emplacement Time (min): 1.5 Displacement Time (min): 2 Radio: INA Protection: Armor, Front (mm): INA Armor Side (mm): INA Armor Roof (mm): INA Self-Entrenching Blade: No NBC Protection System: Yes Smoke Equipment: No	ARMAMENT Main Armament: Caliber, Type, Name: 120-mm, mortar, MO-120-RT Rate of Fire (rpm): Burst: 18 Normal: 10 Sustained: INA Loader Type: Manual Traverse: (°): Left: 7.5 Right: 7.5 Total: 15 Elevation (°): +30/+85° FIRE CONTROL Indirect Fire: INA Collimator: INA Fire Control Computer: None Position Location System: None VARIANTS 120 2R2M: Mounted in light armored vehicles such as the MOWAG Piranha APC or the Turkish FMC-NUROL mortar vehicle. MAIN ARMAMENT AMMUNITION Caliber, Type, Name: 120-mm Frag-HE, PR14 Indirect Fire Range (m): Min Range: 1,100 Max Range: 8,135 Complete Projectile (kg): 18.60 Maximum Velocity: INA Fuze Type: M557 PD Caliber, Type, Name: 120-mm HE-RA, PRPA (Rocket Assist) Indirect Fire Range (m): Min Range: 1,100 Max Range: 13,000 Complete Projectile (kg): 18.60 Maximum Velocity: INA Fuze Type: M557 PD Other Ammunition Types: All standard 120-mm smoothbore mortar projectiles without fold-out fins	

NOTES

The RT-61 is a rifled mortar capable of firing pre-engraved spin-stabilized and smoothbore 120-mm mortar projectiles with or without rocket assist. However, it is not capable of firing smoothbore mortar projectiles with fold out fins (spring-loaded tail assemblies with straight fins). The RT-61 is a three-piece mortar system consisting of a rifled tube, a baseplate, and a wheeled carriage. Trigger firing is the normal method of firing for this mortar. Drop firing can be accomplished only with smoothbore mortar projectiles.

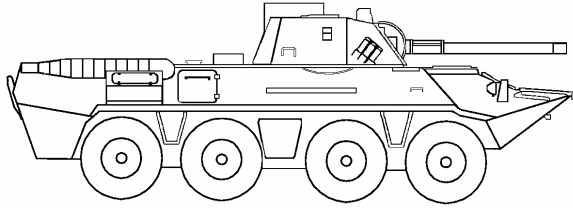
Russian 120-mm Self-Propelled Mortar 2S12-RT

	Weapons &Ammunition Types 120-mm mortar Frag-HE Smoke Illumination	Typical Combat Load 48
SYSTEM Alternative Designations: 120-mm 2S12 Sani (Sled) Date of Introduction: early 1980s Proliferation: At least 1 countries Description: Crew: 5 Vehicle Platform (chassis): GAZ-66 Combat Weight (mt): 3.64 Chassis Length Overall (m): 5.66 Height Overall (m): 2.44 Width Overall (m): 2.34 2B11 Mortar Combat Weight (kg): 210 (firing) /297 (traveling) Wheeled Carriage 2L81 (kg): 87 Baseplate (kg): 80 Bipod (kg): 55 Automotive Performance: Engine Type: ZMZ-66, 115 hp V-8 water cooled gasoline Cruising Range (km): 600 Speed (km/h): Max Road: 87 Max Off-Road: 35 Cross-Country: INA Fording Depths (m): .80 Emplacement Time (min): 3 (est) Displacement Time (min): 3 (est) Radio: R-123M Protection: Armor, Turret Front (mm): None Armor Turret Top (mm): None Armor Hull (mm): None NBC Protection System: No Smoke Equipment: No ARMAMENT Main Armament: Caliber, Type, Name: 120-mm, mortar, 2B11 Rate of Fire (rpm): Burst: 15 Normal: 10 Sustained: 4 (est) Loader Type: Manual	Traverse (°): Left: 5 (on bipod)/26 (moving the bipod) Right: 5 (on bipod)/26 (moving the bipod) Total: 10 (on bipod)/52 (moving the bipod) Elevation (°) (-/+): +45/+80° FIRE CONTROL Indirect Fire: MPM-44M Direct Fire: INA Collimator: K-1 Gun Display Unit: None Fire Control Computer: None VARIANTS None MAIN ARMAMENT AMMUNITION Caliber, Type, Name: 120-mm Frag-HE (3OF843B) Indirect Fire Range (m): Minimum Range: 450 Maximum Range: 7,000 Complete Projectile Weight (kg): 16.8 Muzzle Velocity (m/s):: 325 Fuze Type: GVMZ-7 PD 120-mm Smoke Indirect Fire Range (m): Minimum Range: 1,000 Maximum Range: 6,800 Complete Projectile Weight (kg): 16.7 Muzzle Velocity (m/s):: INA Fuze Type: PD 120-mm Illumination, S-843 Indirect Fire Range (m): Minimum Range: 1,000 Maximum Range: 5,300 Complete Projectile Weight (kg): 16.8 Muzzle Velocity (m/s):: INA Fuze Type: T-1 TSQ Other Ammunition Types: All standard 120-mm mortar rounds	

NOTES

The 2S12 is a self-propelled version of the towed 120-mm mortar 2B11 (M-120) carried on the bed of GAZ-66 truck. The SP version provides greater mobility for this versatile mortar. The 2S12 has a special safety device to prevent double loading when the mortar round is not fired or removed from the tube. When a round is loaded, it trips a tab on the tube, preventing another round from being loaded. The tab shifts to the "ready" position when the round fires, allowing the 2S12 to be reloaded.

Russian 120-mm Self-Propelled Combination Gun 2S23

	<table><tr><th>Weapons &Ammunition Types</th><th>Typical Combat Load</th></tr><tr><td>120-mm mortar</td><td>30</td></tr><tr><td>Frag-HE Smoke Illumination</td><td></td></tr><tr><td>7.62-mm MG</td><td>2,000</td></tr></table>	Weapons &Ammunition Types	Typical Combat Load	120-mm mortar	30	Frag-HE Smoke Illumination		7.62-mm MG	2,000
Weapons &Ammunition Types	Typical Combat Load								
120-mm mortar	30								
Frag-HE Smoke Illumination									
7.62-mm MG	2,000								
SYSTEM Alternative Designations: 120-mm 2S23 Nona-SVK Date of Introduction: 1990 Proliferation: At least 1 countries Description: Crew: 4 Platform (chassis): Modified BTR-80 APC Combat Weight (mt): 14.5 Chassis Length Overall (m): 7.50 Height Overall (m): 2.75 Width Overall (m): 2.90 Automotive Performance: Engine Type: 260 hp V-8 water cooled diesel Cruising Range (km): 600 Speed (km/h): Max Road: 80 Max Off-Road: 60 Cross-Country: 40 Max Swim: 10 Fording Depths (m): Amphibious Emplacement Time (min): 1 (est) Displacement Time (min): 1 (est) Radio: R-173 Protection: Armor, Turret Front (mm): Against 12.7-mm Armor Turret Top (mm): INA Armor Hull (mm): INA NBC Protection System: Yes Smoke Equipment: Six 81-mm smoke grenade launchers ARMAMENT Main Armament: Caliber, Type, Name: 120-mm, gun-mortar, 2A60 Barrel Length (cal): INA Rate of Fire (rpm): Burst: 10 Normal: 6 Sustained: 4 Loader Type: autoloader Breech Type: combined semi-automatic breechblock with wedge locking mechanism and powder gases plastic obturator Muzzle Brake Type: None Traverse (°): Left: 35 Right: 35 Total: 70 Elevation (°) (-/+): -4/+80°	Auxiliary Weapon: Caliber, Type, Name: 7.62-mm machinegun, PKT Mount Type: Coax Direct Fire Range (m): 1,500 Max Effective Range (m)`: Day: 1,000 Night: N/A Fire on Move: Yes Rate of Fire (rpm): 650 (cyclic), 2-10 round bursts FIRE CONTROL Indirect Fire: INA Direct Fire: INA Collimator: K-1 Gun Display Unit: None Fire Control Computer: None VARIANTS None MAIN ARMAMENT AMMUNITION Caliber, Type, Name: 120-mm Frag-HE (3VOF49) Indirect Fire Range (m): Minimum Range: 1,000 Maximum Range: 8,850 Complete Projectile Weight (kg): 19.8 Muzzle Velocity (m/s):: 367 Fuze Type: B35 PD 120-mm, HEAT Direct Fire Range (m): Minimum Range: 40 Maximum Range: 1,000 Armor Penetration (mm): INA Complete Projectile Weight (kg): 13.20 Muzzle Velocity (m/s):: 560 Fuze Type: PD 120-mm Frag-HE rocket assisted Indirect Fire Range (m): Minimum Range: 6,710 Maximum Range: 13,000 Complete Projectile Weight (kg): 19.8 Muzzle Velocity (m/s):: 367 Fuze Type: B35 PD Other Ammunition Types: All standard 120-mm rifled mortar rds								

NOTES

2S23 has a device for loading projectiles from the ground. During traveling the device is externally attached on the right side near the side door.

OPFOR Special Munitions Chart for Training Simulation

WEAPON	SMOKE (km)	SCATTERABLE MINES (km)	CHEMICAL (km)
122-MM: 2S1 SP, D-30 TOWED HOWITZER	15.3	N/A	15.3
152-MM: 2S3/2S3M SP, D-20 TOWED HOWITZER	17.2	N/A	17.2
152-MM: 2S19 SP, 2A65 TOWED HOWITZER	24.0	N/A	24.0
152-MM: 2S5 SP, 2A36 TOWED GUN	28.4	N/A	28.4
122-MM: BM-21 MRL	20.5	13.4	20.5

REMARKS: Currently, Russia has developed and is testing 122-mm rockets with various warheads (Frag-HE, AT/AP mines, jammers, and sensor-fuzed munitions) achieving firing ranges between 32-35 kilometers. These rockets could be deployed within the next 2-5 years.

Advanced Artillery Munitions: Laser-Guided Projectiles

NAME	COUNTRY	CALIBER	WEIGHT (kg)	LENGTH (mm)	TYPE WARHEAD	GUIDANCE SYSTEM	TARGET DESIGNATION RANGE (km) ⁽¹⁾	RANGE (km) MIN MAX		STATUS / PROLIFERATION
BUSSARD	Germany	120-mm mortar	17	1,050	Tandem (precursor and main charge); 800+ mm RHA penetration	IR Focal plane array (3-5μ terminal homing), semi-active laser homing (SAL- 1.06μ)	3-5	.8	12	Developmental
Terminally Guided Mortar Bomb	Ukraine /Poland	120-mm mortar	18	1,200 (+)	HEAT; 550-mm RHA	SAL (1.06μ)	3-5	.5	7	Testing
Kitolov-2	Russia	120-mm mortar, combo gun	25	1,220	Frag-HE	SAL (1.06μ)	3-5	.5	9	Limited production/ 1 country
Smel'chak	Russia	240-mm mortar	134	1,635	Frag-HE	SAL (1.06μ)	3-5	3.6	9.2	Limited production/ 1 country
Kitolov-2M (KM-3)	Russia	122-mm howitzer	27	1,225	Frag-HE	SAL (1.06μ)	3-5	.8	14	Limited production/ 2 countries
Krasnopol	Russia	152-mm howitzer	51	1,300	Frag-HE, 6.5 kg AL/RDX	Inertial (middle stage of flight) SAL (final stage of flight)	3-5	5	20	Full production/ 14 countries
Krasnopol-M (KM-2)	Russia	155-mm howitzer	43.0	955	Frag-HE, 6.2 kg AL/RDX	Inertial (middle stage of flight) SAL (final stage of flight)	3-5	4	17	Full production/ 2 countries
Santimeter-1	Russia	152-mm howitzer	49.5	1,195	Frag-HE, 6.5 kg AL/RDX	SAL (1.06μ)	3-5	3	18	Limited production/ 3 countries
Aurora	Russia	152-mm howitzer	47 (+)	955	Frag-HE, 12.0 kg AL/RDX	SAL (1.06μ)	3-5	5	25	Ready for production, waiting for export customer
Ugroza ⁽²⁾	Russia	122-mm rocket	65.5 (est.)	3,037 (est.)	Tandem HEAT dual main charge; 600-mm penetration	SAL (1.06μ)	3-5	1	20-32	Limited production/ 2 countries
Copperhead	United States	155-mm cannon	62	1,370	HEAT	Inertial (middle stage of flight) SAL (final stage of flight)	3-5	4	16	Production complete/1 country

NOTES:

(1) The Target Designation Range column portrays an engagement of a tank size target moving at 10-15 km/h.

(2) The Ugroza's range is dependent upon the warhead being fitted on a rocket body containing either an older rocket motor (20 km) or new rocket motor (32 km).

Foreign Course Corrected Rocket Programs

NAME	COUNTRY	CALIBER (mm)	WEIGHT (kg)	LENGTH (mm)	WARHEAD TYPE	GUIDANCE SYSTEM	ACCURACY (CEP, m)	RANGE (km)	STATUS/ PROLIFERATION
9M55-series	Russia	300	~800	7,200	Varies - ICM, SFM, HE, thermo- baric, scatterable mines	Inertial	150 @ max range (0.21% of range)	70	Fielded 2 countries
9M5xx- series	Russia	300	~800	7,200	Varies - ICM, DPICM, SFM, HE, thermobaric, scattererable mines	Inertial	171@ maximum range (.19% of range)	90	Production/ Ex- ported, 2 countries
AccuLAR	Israel/Romania	160	120	3,700	DPICM, SFM	RF Ground Track	90-135	45	Late development IOC 2003
MLRS-TCS	Israel	227	308	3,940	DPICM SFM	RF Ground Track	70-120	32	Late development IOC 2001
Angel-100	China	300	~800	7,200	Varies - ICM, SFM, HE	Inertial	210 @ max range (0.21% of range)	100	Development IOC 2005-7
CORECT	Switzerland- Germany	227	308	3,940	DPICM, AT-4 mines	GPS+Inertial and magnetometer	50 (independent of range)	32	Late development IOC 2003-5
MARS- NAW	Germany	227	308	3,940	DPICM, SMArt-155	GPS+Inertial	50	65-70	Late development IOC 2003-2005
LT-2000 Mk45	Taiwan	227	308	3,940	DPICM	GPS+Inertial	50	75	Development IOC 2008
Diehl RM-70 Upgrade	Germany, France, Slovakia	122	77	3,220	DPICM, Multimode (HEAT, HE, Incendiary)	GPS+Inertial	50	36	Development IOC2008

Other countries with course corrected rocket development programs: Indonesia, South Africa, India, Ukraine, Brazil, Iraq.

Foreign Course Corrected Projectile Programs

NAME	COUNTRY	CALIBER (mm)	WEIGHT (kg)	LENGTH (mm)	WARHEAD TYPE	GUIDANCE SYSTEM	ACCURACY (CEP, m)	RANGE (km)	STATUS/ PROLIFERATION
TCM	Sweden	155	47	955	Varies (DPICM, SFM, HE)	Inertial+GPS	50-70	60	Development IOC 2006
Diehl GPS Geschoss	Germany	155	47	955	Varies (DPICM, SFM, HE)	Inertial+GPS	10	40	Development IOC 2003-5
Poleaxe	UK	155	54	1,650	DPICM, SFM	Inertial+GPS	50	80	Development IOC 2014
Pelican	France	155	50	1,350	DPICM, HE, SFM	Inertial+GPS	50-80	80	Development IOC 2014
BWB GPS Fin-stabilized	Germany	155	55	1,650	DPICM, SFM, HE	Inertial+GPS	20-50	100	Development IOC 2012
Ramjet Projectile	Holland-Sweden	155	55	1,500	DPICM, SFM	GPS+Inertial	20-50	80	Research IOC 2018
BROMSA	Sweden	105/155	Fuze	N/A	Any Projectile	GPS or MVV RF tracker	2-4X improvement over ballistic projectiles	25-30	Development IOC 2007
SAMPRASS	France	105/155	Fuze	N/A	Any Projectile	GPS	2-6X improvement over ballistic projectile	25-40	Development IOC 2005-7
STAR	UK	105/155	Fuze	N/A	Any Projectile	GPS	2-6X improvement over ballistic projectile	25-40	Development IOC 2005-7

Other countries with course corrected projectile development programs: Israel, South Africa, Ukraine, and others.

Advanced Artillery Munitions: Sensor-Fuzed Munitions

NAME	COUNTRY	CALIBER DELIVERY SYSTEM	TARGETING SENSOR	SEARCH ALTITUDE	ARMOR PENETRATION	TYPE WARHEAD	RANGE (km)	STATUS/ PROLIFERATION
BONUS	France/ Sweden	155-mm cannon	2-color IR sensor with laser altimeter	175	120-135-mm at 150 meter slant range	Tantalum EFP	27 (39-cal. cannon) 35 (52-cal. cannon)	Full Production
SMARt	Germany	155-mm cannon	94 Ghz MMW Sensor (Active and Passive), 3-5μ IR sensor	150	135-mm RHA pene- tration @ 100 meters	Tantalum liner, COMP-B fill with unique waveshaper	25	Full Production
Indian Sensor Fuzed Munition	India	120-mm mortar 155-mm cannon	MMW	100 (est)	50-70-mm RHA penetration @ 100 meters	Copper penetrator	7	EIOC 2002-2003
Israeli Top-Attack Sensing Submunition	Israel	227-mm rocket	Ka-Band (Active and Passive)	100 (est)	100-mm RHA pene- tration @ 100 meters	Copper penetrator	32	Developmental
Meteor	Poland	122-mm rocket	2 color IR sensor with laser diode altimeter	150	80-100-mm RHA penetration @ 100 meters	Copper penetrator	30	EIOC 2003
Motiv-3M	Russia	300-mm rocket	2 color IR sensor	100 (est)	70-mm RHA pene- tration @ 150 me- ters and 30°	Copper penetrator, Ball slug	90	Full Production
Universal Submunition	Russia	120-mm mortar, 122-mm, 220-mm, and 300-mm rockets	W-band MMW Sensor (Active and Passive), 1-2μ and 8-14μ IR sensor	100 (est)	60-70-mm RHA penetration @ 100 meters and 30°	Copper penetrator, Ball slug	33 (122-mm) 35 (220-mm) 90 (300-mm)	Limited Production
MCS-E1	Russia	152-mm cannon	35 Ghz MMW (Active), 3-5μ IR sensor	100 (est)	90-mm RHA pene- tration	Copper penetrator, Ball slug	24	EIOC 2003-2004
MCS-E2, 152-mm	Russia	152-mm cannon	W-band MMW Sensor (Active and Passive), 1-2μ and 8-14μ IR sensor	150 (est)	80-mm RHA pene- tration @ 125 me- ters and 30°	Copper penetrator, Ball slug	20	Developmental, EIOC 2007-2008
MCS-E2, 155-mm	Russia	155-mm cannon	W-band MMW Sensor (Active and Passive), 1-2μ and 8-14μ IR sensor	150 (est)	80-mm RHA pene- tration @ 125 me- ters and 30°	Copper penetrator, Ball slug	25	Developmental, EIOC 2007-2008
SADARM	US	155-mm cannon	35 Ghz MMW Sensor (Active and Passive), 8-14μ IR sensor	130 (est) 165 (est) P3I	135-mm RHA pene- tration @ 100 meters	INA	24	Limited Production

Russian 220-mm Flamethrower Weapon TOS-1

  Original 30-rocket TOS-1 Current launcher holds 24 rockets	Weapons & Ammunition Types 220-mm rockets (Original launcher) Fuel-Air Explosive Current launcher Fuel-Air Explosive Incendiary	Typical Combat Load 30 24
SYSTEM Alternative Designations: Buratino Date of Introduction: Early 1990s Proliferation: At least 1 country Description: Crew: 3 in vehicle Chassis/Carriage: T-72 tank chassis (data based on T-72M1) Combat Weight (mt): 46.0 Chassis Length Overall (m): 6.91 Height Overall (m): INA Width Overall (m): 3.59 Automotive Performance: Engine Type: 780-hp Diesel Cruising Range (km): 550 without external fuel tanks Speed (km/h): Max Road: 60 Max Off-Road: INA Fording Depth (m): 1.2 Unprepared Radio: R-173M Protection: Armor, Turret Front (mm): 500/560 against HEAT Applique Armor (mm): Side of hull over track skirt	Explosive Reactive Armor (mm): Available Self-Entrenching Blade: Yes NBC Protection System: Yes Smoke Equipment: Smoke grenade launchers (4x 81-mm front hull) ARMAMENT Launcher: Caliber, Type: 220-mm rocket launcher Number of Tubes: 30/24 current launcher Launch Rate, Full Salvo Time: 30 rounds in 7.5 seconds/6 sec current Loader Type: Crane hoist on truck transloader FIRE CONTROL Direct Fire: Unidentified gunner and commander sights Laser rangefinder: Yes Fire Control Computer: Ballistic computer with roll sensors MAIN ARMAMENT AMMUNITION Type: FAE rocket Range (m): Maximum Range: 3,500/6,000 current launcher Minimum Range: 400 Area of effects, 30-rocket salvo (m): 200 x 400 assured destruction Much larger area for suppression	

NOTES

Launchers are maintained with chemical troops, but are often employed with artillery. Other applications include defoliation and mine clearing.

A variety of enhanced blast mixtures (varying from improvised out of common materials to sophisticated) can be used to produce thermobaric or fuel-air explosive (FAE) effects. The sophisticated mix for TOS-1 may be enhanced with powdered tetranite. The primary FAE effect is a long-duration high-pressure blast wave, which creates a vacuum - then precipitates a reverse wave. The pressure/vacuum surges (up to 427 pounds per sq inch) cause a ripping effect on soft materials (such as airplane skin, radar surface, human lung tissue). Walls and surfaces within the affected area do not necessarily shield victims, rather cause multiple pressure waves which amplify the tearing effects and can topple structures. A secondary effect is high-temperature heat - 2,500-3,000° C. An incomplete explosion renders a near-devastating effect, wide-area long-duration high-temperature flame. Even those outside of the blast area will be rendered ineffective with debilitating mental and physical trauma.

Primary TOS-1 use considerations are: (1) it works best under conditions which normally protect targets from weapons:

(2) it has a high assurance of devastation within a large area. The TOS-1 is designed primarily for use against emplacements, defilade areas (such as terrain folds and tunnels), fighting positions, ships, buildings, as well as personnel and other soft targets. High angles-of-fire and steep impact angles support its use in defilade and urban areas. Despite the seeming short range, the weapon was effectively used in Chechnya to disable defenders within a specific sector just prior to an assault, to halt assaults, and to level buildings.

Chinese Type 81 and Type 87 heavy rocket launchers employ FAE rockets for minefield clearing, and other missions (with lethal effects).

Chapter 7 Air Defense

This chapter provides an overview of selected air defense systems either in use or readily available to an OPFOR. The selection of weapons is not intended to be all-inclusive, but rather a representative sampling of weapons and equipment supporting various OPFOR military capabilities.

This chapter is divided into three categories—*towed AA guns*, *self-propelled AA guns/combination guns* and *surface-to-air missiles (SAMs)*. *Towed AA guns* covers, in order, the KS-19M2 100-mm gun, S-60 57-mm gun and the ZU-23 23-mm gun. The next category, *self-propelled AA guns/combination guns*, contains the ZSU-23-4 23-mm gun and the 2S6 30-mm gun/missile system. The final category of *surface-to-air missiles (SAMs)* consists of the SA-7b, SA-8b, SA-14, SA-15b and the SA-18.

Tactical air defense is used to protect ground force units and other potential targets from attack by enemy fixed-wing aircraft and armed helicopters. Due to increases in performance and the sheer number of air defense systems, specifically manportable systems, the selected systems represent some of the most formidable threats to aircraft of all types.

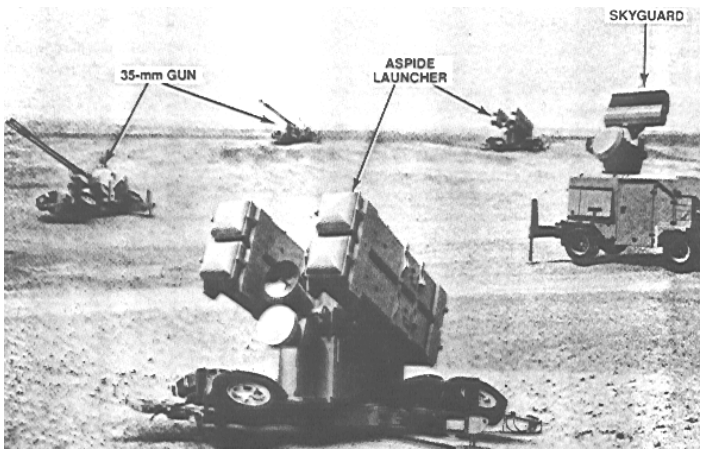
Some trends in air defense development will become more widespread in the near future. These include the production of authorized and unauthorized copies of existing systems and the development of hybrid systems. The sensor package may consist of one or more radars, direct view optics, and electro-optics systems. The sensor package is the single most important aspect of air defense systems since these devices perform the surveillance and tracking functions. As the data classification permits, all attempts have been made to provide the user with as much information as possible in these areas. Radar systems have traditionally been the most popular sensor for air-defense systems, however, with the latest generation weapons they are usually supplemented with a variety of optic or electro-optic sensors such as; TV cameras, night vision sights, and laser rangefinders. As the trends become more defined and more information becomes available, updates to the systems will be produced.

Questions and comments on data listed in this chapter should be addressed to:

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Swiss 35-mm Towed AA Gun GDF-003 (with Skyguard AA Gun-Missile Battery) __

	Weapons & Ammunition Types 35-mm automatic cannon	Typical Combat Load 238
SYSTEM Alternative Designations: Skyguard System Date of Introduction: Circa 1981-84 Proliferation: At least 3 countries Description: Crew: 3 Carriage: 4-wheeled/2-axle towed chassis Combat Weight (kg): 6,400 Length Overall (m): Travel Position: 7.8 Firing Position: 8.83 Length of Barrel (m): INA Height (m): Travel Position: 2.6 Firing Position: 1.72 Width Overall (m): Travel Position: 2.26 Firing Position: 4.49 Prime Mover: Medium (5t 6x6) truck Automotive Performance: Max. Towed Speed (km/h): 60 Emplacement Time (min): 1.5 Battery Emplacement Time: 15 Displacement Time (min): 5 ARMAMENT Gun: Caliber, Type: 35x228 35-mm automatic gun Number of Barrels: 2 Operation: Gas-operated Rate of Fire(rd/min): Cyclic: 1,100 (550/barrel) Practical: INA, bursts up to 25 rounds Loader Type: 2x56-rd magazine automatic feed Reload Time (sec): Traverse (°): 360 Traverse Rate (°/sec): 120 Elevation (°): -5 to +92	Elevation Rate (°/sec): 60 Reaction time (sec): INA FIRE CONTROL Sights w/magnification: On-carriage: lead-computing sight or GUN KING electro-optical system Off-carriage: SEC-Vidicon TV tracking system Laser rangefinder Search and track radars: Name: Skyguard Mk II (SW) Function: Fire control tracker Detection Range (km): INA Tracking Range (km): 25 Frequency: 8-20 GHz Frequency Band: I/J doppler MTI Rotation Rate/min: 60 Mean Power (W): 200 Link: Digital data, virtually invulnerable to ECM, including frequency jumps VARIANTS System used in complex with radar, 2 Aspid missile launchers, and generators. Other radars and missiles can be used with the system. Base radar range was 20 km. GDF-001: System has a simple sight. GDF-002: Add Marconi digital FCS GDF-005: Upgrade (available for -003 in NDF-C kit) has autonomous sight, onboard power supply, and automatic reloader. Skyshield 35-AHEAD gun configuration with Skywhip gun mount is designed for AHEAD ammunition.	MAIN ARMAMENT AMMUNITION Type: HEI-T Range (m): Tactical AA range: 4,000 (self-destruct) Tracer range: 3,100+ Effective Altitude (m): 3,100-4,000 Self-destruct time (sec): 6-12 Type: Semi-armor-piercing HEI-T (SAPHEI-T) Range (m): 4,000 Tactical AA range: 4,000 (self-destruct) Effective Altitude (m): 4,000 (est) Self-destruct time (sec): 6-12 Penetration (mm, KE): 40 at 1,000 m Type: APDS-T Range (m): 4,000 Tactical AA range: 4,000 Tracer range: 2,000 Effective Altitude (m): 4,000 (est) Penetration (mm, KE): 90 at 1,000 m Type: APFSDS-T Range (m): 4,000 Tactical AA range: 4,000 Tracer range: INA Effective Altitude (m): 4,000 (est) Penetration (mm, KE): 115+ at 1,000 m Type: Frangible APDS (FAPDS) - on impact with the target surface, the penetrator breaks into several KE fragments. The round has Frag-HE effects with the higher velocity and flat trajectory of a sabot round. AG 35x228/AHEAD (Advanced Hit Efficiency and Destruction) round uses a programmable time fuze and HE charge to dispense a cloud of 152 pellets (3,800 from a 25-round burst) at or in the path of a target helicopter, LAV, or soft target. Other fuze modes include proximity and PD.

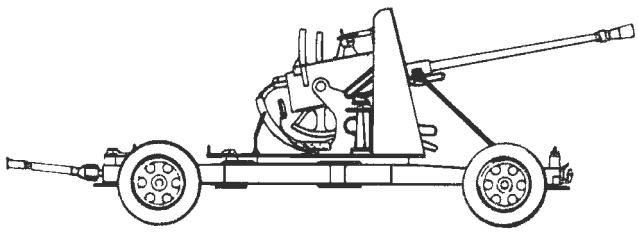
NOTES

System can also be used against ground targets.

An upgrade kit (gun computer, software, muzzle velocity sensor, and electronic fuze programmer) permits -003 gun to fire the AHEAD round.

System uses a wire link among major components.

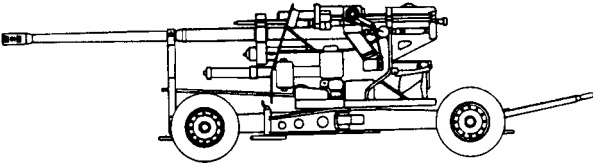
Russian 37-mm Towed AA Gun M-1939

		Weapons & Ammunition Types 1 x 37-mm AA gun HE HE-FRAG-T AP AP-T HVAP HVAP-T HEI-T	Typical Combat Load 200
SYSTEM Alternative Designation: None Date of Introduction: 1939 Proliferation: At least 50 countries Description: Crew: 8 Carriage: Four-wheels Combat Weight (kg): 2,050 Length Overall (m): 6.04 Length of Barrel (m): 2.73 Height Overall (m): 2.11 Width Overall (m): 1.95 Prime Movers: Utility, small, medium trucks Automotive Performance: Max. Towed Speed (km/h): 60 Cross Country (km/h): 25 Fording Depth (m): 0.7 Emplacement Time (sec): 30 Displacement Time (sec): 30	ARMAMENT Gun Caliber, Type: 37-mm rifled Number of Barrels: 1 Breech Mechanism: Rising Block Rate of Fire (rd/min): Cyclic: 180 Practical: 80 Clip Capacity (rds): 5 Feed: Gravity Loader Type: Manual Reload Time (sec): 2 Traverse (°): 360 Traverse Rate (°/sec): 61 Elevation (°) (-/+): -5/+85 Elevation Rate (°/sec): 22 FIRE CONTROL Sights w/magnification: AZP-37 Optical sight	AMMUNITION Type: HE, HE-FRAG-T, AP, AP-T, HVAP, HVAP-T, HEI-T Range (m): Max. Range (ground): 9,600 Max. Eff Range (slant): 3,000 Max. Altitude: 6,700 Armor Penetration (mm): 55 @ 500 m Projectile Weight (kg): HE: 0.74 AP: 0.77 HE-FRAG-T: 0.73 HVAP: 0.62 HEI-T: INA Muzzle Velocity (m/s): HE: 880 AP: 880 HVAP: 960 HEI-T: INA HE-FRAG-T: 880 Self-Destruct (sec): 8 to 12 Self-Destruct Range (m): 3,700 to 4,700 VARIANTS Type 55: Chinese designation Type 65: Chinese twin barrel Twin barrel exports	

NOTES

The M-1939 is a towed 37-mm antiaircraft gun mounted on a four-wheeled carriage. During traveling, it can be fired from wheels at halts or fired while traveling. Normal emplacement however, requires the wheels to be removed and a jack placed under each axle for support prior to firing. The M-1939 is manually loaded with clips of five rounds each. The rounds are gravity fed into the vertically opening sliding breech with the empty cartridges automatically extracted. The M-1939 is a derivative of the BOFORS L60. Because it lacks a radar and powered gun laying motors, the M-1939 is considered to be effective only during daylight and in fair weather.

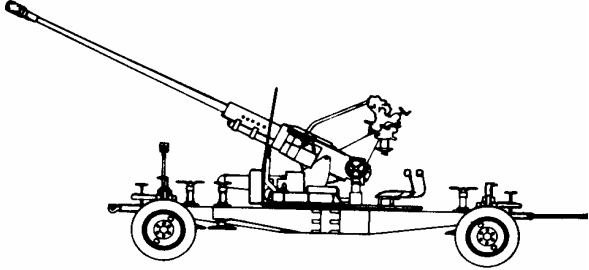
Russian 100-mm Towed AA Gun KS-19M2

		Weapons & Ammunition Types 100-mm gun Frag-HE AP-T APC-T	Typical Combat Load 100
SYSTEM Alternative Designations: None Date of Introduction: 1949 Proliferation: At least 20 countries Description: Crew: 15 Carriage: Towed 2-axle, 4-wheel carriage Combat Weight (kg): 11,000 Length Overall (m): 9.3 Travel Position: 9.45 Firing Position: INA Length of Barrel (m): 5.74 Height (m): Overall: 2.2 Travel Position: INA Firing Position: 7.62 Width Overall (m): 2.32 Prime Mover: Towing vehicle AT-S or AT-T Automotive Performance: Max. Towed Speed (km/h): 35 Emplacement Time (min): 7 Displacement Time (min): 6	ARMAMENT Gun: Caliber, Type: 100-mm gun Number of Barrels: 1 Service Life of Barrel (rds): 2,800 Rate of Fire (rd/min): Maximum: INA Practical: 10-15 Loader Type: Manual Reload Time (min): INA Traverse (°): 360 Traverse Rate (°/sec): 20 Elevation (°) (-/+): -3 to 89 Elevation Rate (°/sec): 12 Reaction time (sec): 30 FIRE CONTROL On-carriage: PO-1M telescope Field of View (°): 14 Power: 5x PG panoramic telescope: Field of View (°): 10 Power: 4x Off-carriage: Rangefinder: D-49 (off carriage) Radar: Name: SON-9/SON-9A (FIRE CAN) Function: Fire Control Detection Range (km): 80 Tracking Range (km): 35 Frequency: 2.7-2.9 GHz Frequency Band: E Peak Power (kW): 300 PUAZO 6-19 or 6-19M fire control director	VARIANTS Type 59: Chinese variant. MAIN ARMAMENT AMMUNITION Types: Frag-HE, AP-T, APC-T Range (m): With on-carriage sight: 4,000 With off-carriage radar: 12,600 Projectile Weight (kg): Frag-HE: 15.61 AP-T: 15.89 APC-T: 16 Muzzle Velocity (m/s): 900-1,000 Fuze Type: Proximity and Time Self-Destruct (sec): 30	

NOTES

The KS-19M2 may also be employed in a ground support role.

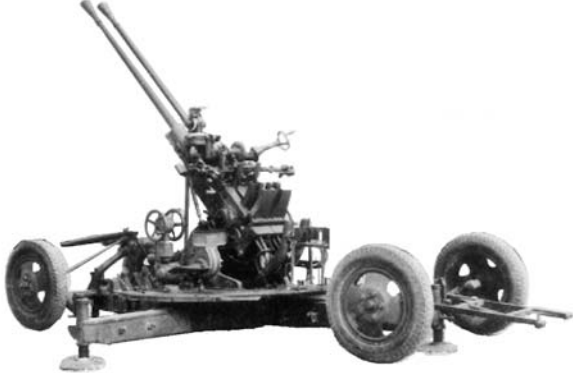
Russian 57-mm Towed AA Gun S-60

	Weapons & Ammunition Types 57-mm gun FRAG-T APC-T	Typical Combat Load 200
SYSTEM Alternative Designations: None Date of Introduction: 1950 Proliferation: At least 46 countries Description: Crew: 7 Carriage: Four-wheel Weight (kg): 4,500 Length Overall (m): Travel Position: 8.50 Firing Position: 8.84 Length of Barrel (m): 4.39 Height (m): Overall: Travel Position: 2.37 Firing Position: 6.02 Width Overall (m): Travel Position: 2.08 Firing Position: 6.9 Prime Mover: Ural-375D Automotive Performance: Max. Towed Speed (km/h): 60 Emplacement Time (min): 1 Displacement Time (min): 3	ARMAMENT Gun: Caliber, Type: 57-mm automatic cannon Number of Barrels: 1 each Service Life of Barrel (rds): INA Rate of Fire (rd/min): Cyclic: 105-120 Practical: 70 Loader Type: 4 rd clip, manual Reload Time (sec): 4-8 Traverse (°): 360 Traverse Rate (°/sec): 40 Elevation (°) (-/+): -4 to +87 Elevation Rate (°/sec): 34 Reaction time (sec): 4.5 FIRE CONTROL On-carriage: Optical mechanical computing sight AZP-57: Target Range (m): 5,500 Direct fire telescope Off-carriage: (see NOTES) Rangefinder: D-49 Radar: Name: SON-9/SON-9A Function: Fire Control Detection Range (km): 80 Tracking Range (km): 35 Frequency: 2.7-2.9 GHz Frequency Band: E Peak Power (kW): 300 PUAZO 6-60 fire control director	VARIANTS Type 59: Chinese variant SZ-60: Hungarian license-built variant MAIN ARMAMENT AMMUNITION Type: FRAG-T, APC-T Range (m): With on-carriage sight: 4,000 With off-carriage radar: 6,000 Projectile Weight (kg): FRAG-T: 2.81 APC-T: 2.82 Muzzle Velocity (m/s): 1,000 Fuze Type: FRAG-T: Point detonating APC-T: Base detonating Self-Destruct (sec): 13-17

NOTES

Some versions may have the FLAP WHEEL as the primary fire control radar. A S-60 battery will generally consist of six guns, a fire-control radar, and a fire-control director. Four-round clips feed ammunition horizontally into weapon. The S-60 also has an ammunition ready rack that can hold 4 four-round clips near ammunition feed mechanism on left side of the breech. The S-60 can also be used in a ground support role.

Chinese 37-mm Towed AA Gun Type 65

	Weapons & Ammunition Types 37-mm automatic cannons	Typical Combat Load 400
SYSTEM Alternative Designations: INA Date of Introduction: Circa 1965 Proliferation: At least 7 countries Description: Crew: 5 to 8 Carriage: 4-wheeled/2-axle towed chassis Combat Weight (kg): 2,700 Length Overall (m): 5.940 Travel Position: 6.036 Firing Position: INA Length of Barrel (m): 2.729 Height (m): 2.080 Overall: INA Travel Position: 2.105 Firing Position: INA Width Overall (m): 1.901 Prime Mover: INA Automotive Performance: Max. Towed Speed (km/h): 60 25 cross-country Emplacement Time (min): INA Displacement Time (min): INA Fording Depth (m): 0.7 Turning Radius (m): 8	ARMAMENT Gun: Caliber, Type: 37-mm automatic gun Number of Barrels: 2 Operation: Recoil Service Life of Barrel (rds): 2,500+ Barrel Change time (min): 2-3 Rate of Fire(rd/min): Cyclic: 320-360 (160-180/barrel) Practical: 80 Loader Type: 5-round clip Reload Time (sec): 4-8 Traverse (°): 360 Traverse Rate (°/sec): INA Elevation (°): -5 to 85 Elevation Rate (°/sec): INA Reaction time (sec): INA FIRE CONTROL Sights w/magnification: Optical mechanical computing sight	VARIANTS Russian twin-barreled variant of M-1939 export version M1985: NKPA has mounted the 37-mm Type 65 on an open turret APC chassis. MAIN ARMAMENT AMMUNITION Types: AP-T, HE-T, HEI-T Range (m): Max Range: 8,500 Tactical AA range: 2,500 Altitude: Max Altitude: 6,000 Effective (m): 1,768 at 45° 2,865 at 65° Self-destruct time (sec): 8-12 Self-destruct range (m): 3,700-4,700

NOTES

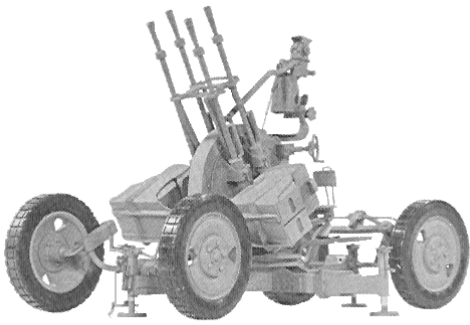
Tire Size is 6.50 x 20. The gun can be employed on an SP tracked vehicle mount. A Chinese built direct copy of the Soviet twin barrel export version of the M-1939. The Type 65 consists of two recoil operated automatic cannons mounted on a towed, four-wheeled carriage. All tracking and loading operations are performed manually by a five to eight man gun crew. Because it lacks a radar and powered gun laying motors, the Type 65 is considered to be effective only during daylight and in fair weather.

Ammunition is interchangeable among Types 55, 65, and 74 AA guns.

Strengths: Highly reliable, rugged and simple to operate.

Weaknesses: Short range, small projectile. No organic radar.

Russian 14.5-mm Heavy Machinegun ZPU-4

		Weapons & Ammunition Types 4 barreled KPV 14.5-mm heavy machinegun AP-T API API-T HEI HEI-T	Typical Combat Load 4,800 rds (1,200 rds/barrel)
SYSTEM Alternative Designations: None Date of Introduction: 1949 Proliferation: At least 45 countries Description: Crew: 5 Carriage: 4 wheeled/2 axle towed chassis Combat Weight (kg): 1,810 Length Overall (m): Travel Position: 4.53 Firing Position: 4.53 Length of Barrel (m): 1.348 Height (m): Overall: INA Travel Position: 2.13 Firing Position: INA Width Overall (m): 1.72 Prime Mover: INA Automotive Performance: Max. Towed Speed (km/h): 35 Emplacement Time (min): 2 Displacement Time (min): 2	ARMAMENT Gun: Caliber, Type: 14.5 mm machinegun Number of Barrels: 4 Service Life of Barrel (rds): INA Rate of Fire(rd/min): Max: 2,200-2,400 (600/barrel) Practical: 600 (150/barrel) Loader Type: Belt of 150 rds Reload Time (sec): 15 Traverse (°): 360 Traverse Rate (°/sec): 48 Elevation (°): -8 to +90 Elevation Rate (°/sec): 29 Reaction time (sec): 8 FIRE CONTROL Optical mechanical computing sight Telescope, ground targets	VARIANTS Type 56: Chinese and NK variant. MR-4: Romanian single axle variant MAIN ARMAMENT AMMUNITION Types: API, API-T, HEI, AP-T, HEI-T Range (m): Max: 8,000 Min: INA Altitude (m): Max: 5,000 Effective: 1,400	

NOTES

The ZPU-4 can be fired with wheels in travel position if necessary.

The ZPU-4 may also be employed in a ground support role.

Strengths: Highly reliable, rugged and simple to operate. Quick reaction time, widely deployed, explosive round.

Weaknesses: The short-range small projectile requires a direct hit. No organic radar (except the NK Type 56 and M1983).

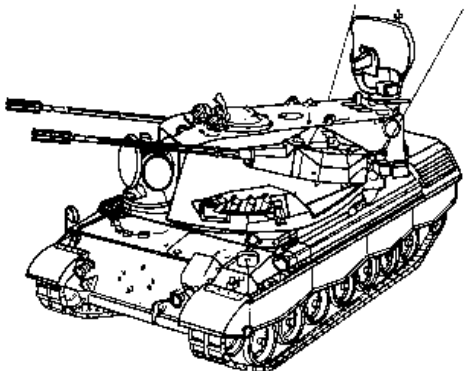
Russian 23-mm Towed AA Gun ZU-23

		Weapons & Ammunition Types 2 x 23-mm AA guns HE-I HEI-T API-T TP	Typical Combat Load 2,400
SYSTEM Alternative Designation: ZU-23-2 Date of Introduction: 1962 Proliferation: At least 50 countries Description: Crew: 5 Carriage: Two-wheeled Combat Weight (kg): 950 Length Overall (m): Travel Position: 4.57 Firing Position: 4.60 Length of Barrel (m): 2.01 Height Overall (m): Travel Position: 1.87 Firing Position: 1.28 Width Overall (m): Travel Position: 1.83 Firing Position: 2.41 Prime Movers: GAZ-69 4 x 4 truck, MTLB-T, BMD-2 Automotive Performance: Max. Towed Speed (km/h): 70 Emplacement Time (sec): 15-20 Displacement Time (sec): 35-40	ARMAMENT Gun: Caliber, Type: 23-mm, gas-operated gun, 2A14 or 2A14M Number of Barrels: 2 Breech Mechanism: Vertical Sliding Wedge Rate of Fire (rd/min): Cyclic: 1,600-2,000 Practical: 400 in 10-30 rd bursts Feed: 50-rd ammunition canisters fitted on either side of the upper mount assembly Loader Type: Magazine Reload Time (sec): 15 Traverse ($^{\circ}$): 360 Traverse Rate ($^{\circ}$ /sec): INA Elevation ($^{\circ}$) (-/+): -10 $^{\circ}$ to +90 $^{\circ}$ Elevation Rate: ($^{\circ}$ /sec): 54 Reaction Time (min): 8 (est.) FIRE CONTROL Sights w/magnification: Optical mechanical sight for AA fire Straight tube telescope for ground targets VARIANTS ZU-23M: Egyptian produced ZU-23, also referred to as the SH-23M.	BTR-3D: Russian BTR-D APC with ZU-23 mounted on rear deck, for SP AA gun. BTR-ZD is BTR-D with towed ZU-23 and MANPADS. MAIN ARMAMENT AMMUNITION Type: HE-I, HEI-T, API-T, TP, APDS-T, FAPDS (frangible APDS) Range (m): Max. Range: 2,500 Min. Range: 0 Altitude (m): Max. Altitude: 3,500 Min. Altitude: 0 Projectile Weight (kg): HE-I: 0.18 HEI-T: 0.19 API-T: 0.189 TP: 0.18 Muzzle Velocity (m/s): 970 Fuze Type: HE-I: Point detonating HEI-T: Point detonating API-T: Base detonating TP: Dummy Self-Destruct (sec): 11 Penetration (mm): 19@ 1000 m API-T	

NOTES

Highly mobile air droppable system. Fires the same ammunition as the ZSU-23-4. The reload time will depend on the proficiency of the crew to manually reload. Can fire from the traveling position in emergencies. The ZU-23 can also be used in a ground support role.

German/Swiss 35-mm SP AA Gun System Gepard

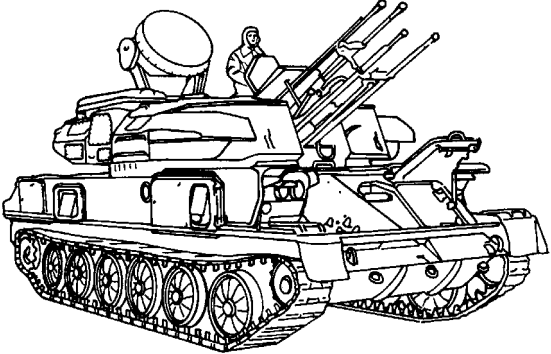
	Weapons & Ammunition Types 2 x 35-mm cannons HEI-T SAPHEI-T FAPDS APDS-T/APFSDS-T	Typical Combat Load 680
SYSTEM Alternative Designations: 5PFZ-B2L Upgrade variant known as FlakPz 1A2 Date of Introduction: 1976 original Proliferation: At least 5 countries Description: Crew: 3 Combat Weight (mt): 46 Chassis: Leopard 1 tank chassis Chassis Length Overall (m): 7.16 Height (m): Radar up: 4.23 Radar down: 3.01 Width Overall (m): 3.25 Automotive Performance: Engine Type: 830-hp Diesel Cruising Range (km): 550 Speed (km/h): Max. Road: 65 Fording Depths (m): 2.25 Radio: INA Protection: Armor (mm): 40 NBC Protection System: Yes Smoke Protection: 8 grenade launchers ARMAMENT Gun: Caliber, Type, Name: 35x228 gun, KDA Number of barrels: 2 Rate of Fire (rd/min): 1,100 (550/barrel) Reaction time (sec): 6-10 Ammunition Loader: Twin belt Reload Time (min): INA Elevation (°): -10 to +85° Fire on Move: Yes (est)	FIRE CONTROL FC System: EADS digital computer-based Sights w/magnification: Stabilized video sights for -1A2 upgrade Magnification: INA Field of View(°): INA Night sights: Thermal for -1A2 upgrade IFF: Yes, MSR-400 Navigation system: Computerized Laser Rangefinder: ND Yag (1.06μ) Linked to Air Defense Net?: Yes Radars: Name: INA, Siemens Manufacture Function: Target Acquisition Detection Range (km): 15 Tracking Range (km): INA Frequency Band: S Search on the Move: Yes Name: INA Function: Target tracking Detection Range (km): 15 Tracking Range (km): 15 Frequency Band: Ku VARIANTS Gepard 1A2: Upgrade variant with new FCS, including stabilized thermal sight and video auto-tracker, integrated C², increased range, reduced reaction time, and FAPDS. Gepard CA1: Dutch variant (also called 95 Cheetah) uses Signaal I-band MTI radar and dual I-band K-band tracking radars. PRTL-35mm GWI: Upgrade Dutch variant, with upgrades similar to 1A2 and new radios, but with different radars. Range with FAPDS is claimed to be 3,500-4,500.	MAIN ARMAMENT AMMUNITION Type: HEI-T Range (m): Tactical AA range: 4,000 (self-destruct) Tracer range: 3,100+ Effective Altitude (m): 3,100-4,000 Self-destruct time (sec): 6-12 Type: Semi-armor-piercing HEI-T (SAPHEI-T) Range (m): 4,000 Tactical AA range: 4,000 (self-destruct) Effective Altitude (m): 4,000 (est) Self-destruct time (sec): 6-12 Penetration (mm, KE): 40 at 1,000 m Type: APDS-T Range (m): 4,000 Tactical AA range: 4,000 Tracer range: 2,000 Effective Altitude (m): 4,000 (est) Penetration (mm, KE): 90 at 1,000 m Type: APFSDS-T Range (m): 4,000 Tactical AA range: 4,000 Tracer range: INA Effective Altitude (m): 4,000 (est) Penetration (mm, KE): 115+ at 1,000 m Type: Frangible APDS (FAPDS) for upgrades. On impact with the target surface, the penetrator breaks into several KE fragments. The round has Frag-HE effects with the higher velocity and flat trajectory of a sabot round. Other Ammunition Types: HEI

NOTES

Auxiliary power unit has 90-hp engine.

KMW is developing an upgrade with 2x Stinger MANPADS missile launchers added to a gun, and integrated with the FCS.

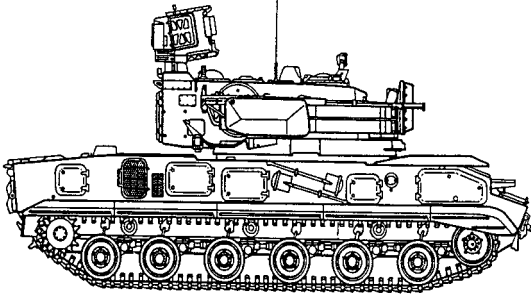
Russian 23-mm SP AA Gun ZSU-23-4

	Weapons & Ammunition Types 4x 23-mm AA guns HE-I HEI-T API-T	Typical Combat Load 2,000
SYSTEM Alternative Designation: Shilka Date of Introduction: 1965 Proliferation: At least 28 countries Description: Crew: 4 Combat Weight (mt): 20.5 Chassis: GM-575 Tracked, six road wheels, no track support rollers Length (m): 6.5 Height (m): Radar up: 3.75 Radar down: 2.60 Width (m): 3.1 Automotive Performance: Engine Type: V6R-1 diesel Cruising Range (km): 450 Speed (km/h): Max. Road: 50 Radio: R-123 Protection: NBC Protection System: Yes	ARMAMENT Gun: Caliber, Type, Name: 23-mm liquid-cooled AA 2A7/2A7M Rate of Fire(rd/min): Practical: INA Cyclic: 850-1,000 Reload Time (min): 20 Elevation (°): -4° to +85° Fire on Move: Yes Reaction Time (sec): 12-18 FIRE CONTROL Sights w/magnification: Day and night vision devices: Driver periscope: BMO-190 Driver IR periscope: INA Commander periscope: TPKU-2 Commander IR periscope: TKH-ITC IFF: INA Radar: 1RL33M1 Name: GUN DISH Function: Search and Tracking Detection Range (km): 20 Tracking Range (km): 10 Frequency: 14.8 to 15.6 GHz Frequency Band: J Optical-mechanical computing sight: Part of fire-control subsystem designated as RPK-2	VARIANTS (see NOTES) MAIN ARMAMENT AMMUNITION Types: HE-I, HEI-T, API-T Range (m): Max. Effective Range: 2,500 Min. Range: INA Altitude (m): Max. Altitude: 5,100 3,500 if self-destruct fuze is included Min. Altitude: INA Projectile Weight (kg): HE-I: 0.18 HEI-T: 0.19 API-T: 0.189 Muzzle velocity (m/s): 950-1,000 Fuze Type: HE-I: Point detonating, self-destruct option HEI-T: Point detonating, self-destruct option APT-T: Base detonating

NOTES

Ammunition is normally loaded with a ratio of three HE rounds to one AP round. ZSU 23-4 Shilka, is capable of acquiring, tracking and engaging low-flying aircraft (as well as mobile ground targets while either in place or on the move). Resupply vehicles carry an estimated additional 3,000 rounds for each of the four ZSUs in a typical battery. Recent (October 1997) information details ZSU-23-4 updates/modernization being offered by the Ukrainians that include: a new radar system replacing the GUN DISH radar, plus a sensor pod believed to include day/night camera, and a laser rangefinder; and mounted above radar/sensor pod is a layer of six fire-and-forget SAMs, believed to be Russian SA-18/GROUSE.

Russian 30-mm SP AA Gun/Missile System 2S6M

		Weapons & Ammunition Types 2 x 30-mm twin-barrel cannons AP-T, APDS Frag-T HE-I APE SA-19/GRISON	Typical Combat Load 1,904 8
SYSTEM Alternative Designations: 2K22M, Tunguska-M Date of Introduction: 1990 Proliferation: At least 2 countries Description: Crew: 4 Combat Weight (mt): 34 Chassis: GM-352M tracked vehicle Chassis Length Overall (m): 7.93 Height (m): TAR up: 4.02 TAR down: 3.36 Width Overall (m): 3.24 Automotive Performance: Engine Type: V-12 turbo diesel Cruising Range (km): 500 Speed (km/h): Max. Road: 65 Max. Swim: INA Fording Depths (m): INA Radio: R-173 Protection: NBC Protection System: Yes	ARMAMENT Gun: Caliber, Type, Name: 30-mm gun, 2A38M Rate of Fire (rd/min): 4,800 (four gun total) Reload Time (min): gun ammunition and missiles in about 16 min. Elevation (°) (-/+): -10 to + 87° Fire on Move: Yes Missile: 9M311 Name: SA-19/GRISON Range (m): Max. Range: 8,000-10,000 (see NOTES) Min. Range: 2,500 Altitude (m): Max. Altitude: 3,500 Min. Altitude: 15 Dimensions: Length (m): 2.83 Weight (kg): 57 (in container) Missile Speed (m/s): 600-900 Guidance: SACLOS Seeker Field of View(°) : INA Tracking Rate: INA Warhead Type: Frag-HE Warhead Weight (kg): 9 Fuze Type: Proximity Self-Destruct (sec): INA System Reaction Time (sec): 6-12 Fire on Move: No (must be at a halt to fire the missile)	FIRE CONTROL Sights w/magnification: Stabilized optical sight 1A29M Magnification: 8x Field of View(°): 8° Commander's position IR day/night sight Night sight: 1TPP1 thermal available IFF: Yes Radars: HOT SHOT radar system Name: 1RL144 (TAR) Function: Target Acquisition Detection Range (km): 18-20 Tracking Range (km): INA Frequency: 2-3 GHz Frequency Band: E Name: 1RL144M (TTR) Function: Target Tracking Detection Range (km): 16 Tracking Range (km): INA Frequency: 10-20 GHz Frequency Band: J VARIANTS (see NOTES) MAIN ARMAMENT AMMUNITION Type: AP-T, APDS, Frag-T, HE-I, APE Range (m): Max. Range: 4,000 Min. Range: 200 Altitude (m): Max. Altitude: 3,000 Min. Altitude: 0 Projectile Weight (kg): INA	

NOTES

Range out to 10 km for hovering aircraft and low flying targets. In addition to the 8 mounted ready missiles two additional missiles can be carried inside. There is a 2S6M1 variant/upgrade, which has improved missile control, range and altitude capabilities of 1.5-10 km, and 0.015-6 km respectively. However, as of November 1997 the 2S6M1 is not known to be fielded.

Main operating mode is radar mode, with day/night capability. The 1TPP1 thermal module is available for mounting on 2S6M. This sight has a range of 4,000-6,000 m.

Russian 57-mm Self Propelled SP AA Gun ZSU-57-2

		Weapons & Ammunition Types Twin 57-mm automatic cannons Frag-HE AP-T APC-T	Typical Combat Load 300
SYSTEM Alternative Designations: None Date of Introduction: 1955 Proliferation: At least 16 countries Description: Crew: 6 Carriage: 4 road wheels/T-54 modified chassis Combat Weight (mt): 28.0 Length Overall (m): 8.4 Length of Barrel (m): INA Height Overall (m): 2.75 Width Overall (m): 3.270 Prime Mover: A shortened T-54 chassis with thinner armor and only four road wheels. Automotive Performance: Emplacement Time (min): N/A Displacement Time (min): N/A Engine Power (hp): 520 Max Road Speed (km/h): 50 Cruising Range (km): 400 Fording Depth (m): 1.4 Armor Protection: 13 mm front hull and turret	ARMAMENT Gun, Caliber, Type: 57-mm recoil-operated air-cooled cannons, S-68 Number of Barrels: 2 Service Life of Barrel (rds): INA Rate of Fire (rd/min): Cyclic: 210-240 (105-120/gun) Practical: 140 (70/gun) Loader Type: 5-round clip, manual Reload Time (min): INA Traverse (°): 360 Traverse Rate (°/sec): 30 Elevation (°): -5 to +85 Elevation Rate (°/sec): 20 FIRE CONTROL Sights w/magnification: Optical mechanical computing reflex sight (not radar controlled) Later variants were fitted with a more sophisticated sighting system, identified by two small ports in forward upper portion of the turret.	VARIANTS Type 80 Chinese variant MAIN ARMAMENT AMMUNITION Types: APHE, Frag-T, APC-T, HVAP-T, HE-T Range (m): Max Range: 12,000 Tactical AA range: 3,993 Altitude: Max Altitude: 8,000 Effective (m): 2,835 at 45° 4,237 at 65° Projectile Weight (kg): Frag-T: 2.81 APC-T: 2.82 HE-T: 2.85 Muzzle Velocity (m/s): 1,000 Fuze Type: Frag-T (point detonating fuze) APC-T (base detonating fuze) HE-T (Yugoslavian, impact [super quick] action with pyrotechnical self-destruct) Self-Destruct time (sec): 13-17 Armor penetration (mm): 96 APC-T at 1,000 m	

NOTES

The ZSU-57-2 can be employed in a ground support role.

No NBC system and no amphibious capability.

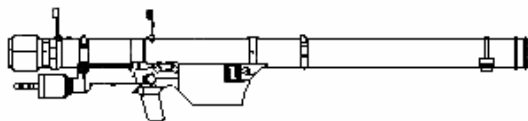
Fuel drums can be fitted on rear of hull.

Absence of a tracking radar, a night vision device, and an enclosed turret makes this a daylight, fair weather weapon system only.

Auto traverse with manual backup.

Uses same ammo as the towed single S-60.

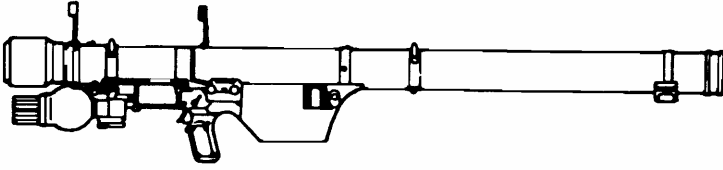
Russian Manportable SAM System SA-7b/GRAIL

		Weapons & Ammunition Types ready missile	Typical Combat Load 1
SYSTEM Alternative Designation: 9K32M Strela-2M Date of Introduction: 1972 Proliferation: Worldwide Description: Crew: 1	ARMAMENT Launcher Name: 9P54M Dimensions: Length (m): 1.47 Diameter (mm): 70 Weight (kg): 4.71 Reaction Time (acquisition to fire) (sec): 5-10 Time Between Launches (sec): INA Reload Time (sec): 6-10 Missile Name: 9M32M Range (m): Max. Range: 5,500 Min. Range: 500 Altitude (m): Max. Altitude: 4,500 Min. Altitude: 18 Dimensions: Length (m): 1.40 Diameter (mm): 70 Weight (kg): 9.97 Missile Speed (m/s): 580 Propulsion: Solid fuel booster and solid fuel sustainer rocket motor. Guidance: Passive IR homing device (operating in the medium IR range) Seeker Field of View(°): 1.9° Tracking Rate(°/sec): 6° Warhead Type: HE Warhead Weight (kg): 1.15 Fuze Type: Contact (flush or grazing) Self-Destruct (sec): 15	FIRE CONTROL Sights w/Magnification: Launcher has sighting device and a target acquisition indicator. The gunner visually identifies and acquires the target. Gunner: Field of View (°): INA Acquisition Range (m): INA IFF: Yes (see NOTES) VARIANTS SA-N-5: Naval version HN-5A: Chinese version Strela 2M/A: Yugoslavian upgrade Sakr Eye: Egyptian upgrade Mounted in several types of vehicles in four, six, and eight-tube launcher varieties. Can be mounted on several helicopters (Mi-24, S-342 Gazelle)	

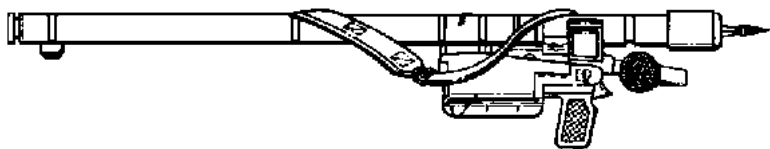
NOTES

The seeker is fitted with a filter to reduce the effectiveness of decoying flares and to block IR emissions. This missile is a tail-chasing heat (IR) seeker that depends on its ability to lock on to heat sources of usually low-flying fixed- and rotary-wing aircraft. An identification friend or foe (IFF) system can be fitted to the gunner/operator's helmet. Further, a supplementary early warning system consisting of a passive RF antenna and headphones can be used to provide early cue about the approach and rough direction of an enemy aircraft. The main difference between the SA-7 and SA-7b is the improved propulsion of the SA-7b. This improvement increases the speed and range of the newer version.

Russian Manportable SAM System SA-14/GREMLIN

		Weapons & Ammunition Types ready missiles	Typical Combat Load 1
SYSTEM Alternative Designation: 9K34 Strela-3 Date of Introduction: 1978 Proliferation: Worldwide Description: Crew: 1	ARMAMENT Launcher Name: 9P59 Dimensions: Length (m): 1.40 Diameter (mm): 75 Weight (kg): 2.95 Reaction Time (sec): 14 Time Between Launches (sec): 35-40 Reload Time (sec): 25 Missile Name: 9M36 or 9M36-1 Range (m): Max. Range: 6,000 Min. Range: 600 Altitude (m): Max. Altitude: 6,000 Min. Altitude: 50 Dimensions: Length (m): 1.4 m Diameter (mm): 75 mm Fin Span (mm): INA Weight (kg): 10.3 Missile Speed (m/s): 600 Propulsion: 2-stage solid-propellant rocket Guidance: passive IR homing Seeker Field of View: INA Tracking Rate: INA Warhead Type: Frag-HE Warhead Weight (kg): 1.0 Fuze Type: Contact/grazing Self-Destruct (sec): 14-17	FIRE CONTROL Sights w/Magnification: Launch tube has simple sights Gunner: Field of View (°): INA Acquisition Range (m): INA IFF: Yes VARIANTS Igla 9M39 (SA-N-8): Naval version	

Russian Manportable SAM System SA-16/GIMLET

		Weapons & Ammunition Types	Typical Combat Load
		Ground mount SP Artillery mount MANPAD transporter	1 2 5
SYSTEM Alternative Designation: 9K310 Igla-1 Date of Introduction: 1986 Proliferation: At least 34 countries Description: Crew: 1 ARMAMENT Launcher Name: 9P322 launch tube 9P519 launcher gripstock Dimensions (m): Length: 1.708 Diameter: 0.08 tube, 0.33 overall Weight (kg): 7.1 Reaction Time (sec): 5-7 seconds Time between launches: INA Reload time (sec): <60	Missile Name: 9M313 Range (m): Max. Range: 5,200 receding 4,500 approaching Min. Range: 600 Altitude (m): Max. Altitude: 3,500 receding slow 3,000 slow approach 2,500 receding fast 2,000 fast approach Min. Altitude: 10 Dimensions (mm): Length: 1,593 Diameter: 72 Weight (kg): 10.8 Missile Speed (m/s): 570 Propulsion: Solid fuel booster and dual-thrust solid fuel sustainer rocket motor. Guidance: Passive IR homing Seeker Field of View: 80° Tracking Rate: INA Warhead Type: Frag-HE Warhead Weight (kg): 1.27 Fuze Type: Contact Self-Destruct (sec): 14-17	FIRE CONTROL Sights w/Magnification: Front hooded ring, rear optical Gunner: Field of View (°): INA Acquisition Range (m): INA IFF: Yes VARIANTS Specialized applications include an LUAZ utility carrier designed for a manpads firing unit. The vehicle has a rack for mounting five 9P322 SA-16 launcher tubes. This rack could be used in other manportable AD unit vehicle applications. Djigit: Russian twin launcher complex mounted on a rail frame with operator's seat and tripod. Missiles can be simultaneously launched using centrally mounted sight. A Hungarian mount with this system on a GAZ-630 4x4 truck is called Igla-1E . Igla-1E: Russian export variant. Unlike the base system, fuel remnants are not fused with the warhead. IFF interrogator can be tailored to customer specifications. Igla-1M: Export variant similar to -1E, but lacks an IFF interrogator.	

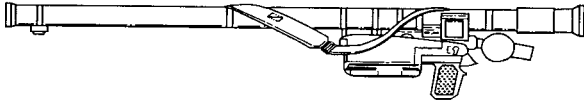
NOTES

Launcher deployment time is 5-13 seconds. Missiles are preloaded in the launch tube for quick loading to the gripstock. A tube can be used up to five times. The missile is cooled by a disposable bottle of refrigerant. The bottle and launcher battery are useable for 30 seconds after activation. The ATGM is more vulnerable to EO/IR decoy countermeasures than is the SA-18. Because the nose extends past the launcher tube, the nose is protected with an extended cap, which is removed before launching.

The unusually wide (80°) FOV seeker permits the missile to respond more quickly to fast-maneuver targets, such as helicopters. Maximum speed for engaged targets varies from 320 m/s rear aspect, receding targets, to 360-400 m/s head-on, approaching targets.

The gunner may have an optional portable electronic plotting board, which warns of location and direction of approaching target(s) with a display range of up to 12.5 km.

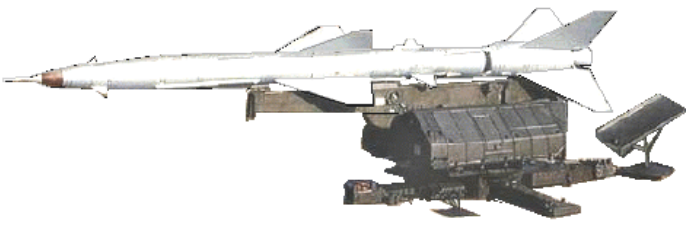
Russian Manportable SAM System SA-18/GROUSE

		Weapons & Ammunition Types ready missiles	Typical Combat Load 1
SYSTEM Alternative Designation: 9K38 Igla Date of Introduction: 1983 Proliferation: At least 4 countries Description: Crew: 1	ARMAMENT Launcher Name: 9P39 Dimensions (m): Length: 1.708 Diameter: INA Weight (kg): 1.63 Reaction Time (sec): 6-7 Time Between Launches (sec): 16 Reload Time (sec): 10 Missile Name: 9M39 Range (m): Max. Range: 6,000 Min. Range: 500 Altitude (m): Max. Altitude: 3,500 Min. Altitude: 10 Dimensions (mm): Length: 1708 Diameter: 70 Weight (kg): 10.6 Missile Speed: Mach 2 Propulsion: Solid fuel booster and dual-thrust solid fuel sustainer rocket motor. Guidance: Passive IR homing Seeker Field of View: INA Tracking Rate: INA Warhead Type: HE Warhead Weight (kg): 1.27 Fuze Type: Contact Self-Destruct (sec): 15	FIRE CONTROL Sights w/Magnification: Launcher has fore and rear sights Gunner: Field of View (°): INA Acquisition Range (m): INA IFF: Yes VARIANTS Igla-V: Air-to-air version Igla-D: Use in airborne forces Igla-N: Increased lethality Igla-S: Improved version of Igla-N	

NOTES

The SAM gunner is provided information about location and direction of approaching target(s) using a portable electronic plotting board. Two variants (Igla-D and Igla-N) can be separated in two parts for easier portability, but this adds 60 seconds to the reaction time. Igla-N is heavier due primarily to the warhead mass increased to 3.5 kg.

Russian SAM System SA-2/GUIDELINE

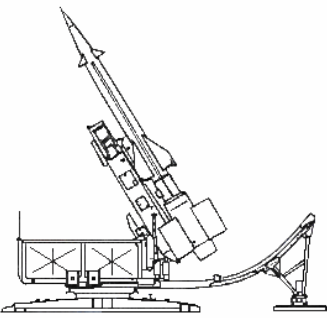
	Weapons & Ammunition Types Single rail ground mounted	Typical Combat Load Six launchers per battery
SYSTEM Alternative Designations: V75SM, S-75 Dvina, V-75 Volkhov Date of Introduction: 1959 Proliferation: At least 41 countries ARMAMENT Launcher Description: Single-rail, ground- mounted, not mobile but transportable Name: INA Dimensions: INA Weight (kg): INA Reaction Time (sec): INA Time Between Launches (sec): INA Reload Time (min): 10-12 Fire on Move: No Emplacement Time (min): < 4 hours Displacement Time (min): < 4 hours Normal Salvo: 3 missiles at six-second intervals Missile: V750K Name: INA Range (km): Max. Range: 35-50 Volga 55, Volga-M 67 Min. Range: 7-9 Altitude (m): Max. Altitude: 28,000 Volga, Volga-M 30,000 Min. Altitude: 100 Dimensions: Length (m): 10.70 Diameter (m): 0.70	Weight (kg): 2,300-2,450 at launch Missile Speed (mach): 4.5 Propulsion: Solid fuel booster 5 sec duration Sustainer liquid <70 sec duration Guidance: Command RF Warhead Types: HE, Nuc Bursting Radius (m): 125-135 Kill Radius (m): 65 CEP (m): 76.3 Fuze Type: Proximity or Command Command destruction at (sec): 115 Warhead Weight (kg): 195 HE FIRE CONTROL Radar: Name: FAN SONG, A-F variants Function: Fire Control Control Range (km): 60-120 A, B 70-145 for C, D, E INA for F Frequency Band: E/F for A, B G for C, D, E, INA for F Location: Within battery formation Radar: Name: SPOON REST, P-12 Function: Target Acquisition, Early Warning Detection Range (km): 275 Frequency Band: A=A (VHF) B=VHF below A band Location: Outside battery formation	Radar: Name: FLAT FACE, P-15 Function: Early warning, target acquisition Detection Range (km): 250 Frequency Band: C Location: At regimental HQ Radar: Name: SIDE NET, PRV-11 Function: Height Finding Radar Detection Range (km): 180 Frequency Band: E Location: At regimental HQs in some cases VARIANTS SA-2a (Mod 0): FAN SONG A SA-2b (Mod 1): FAN SONG B, longer missile SA-2c (Mod 2): FAN SONG C, longer range, lower altitude engagement SA-2d (Mod 3): FAN SONG E, EW enhanced SA-2e (Mod 4): FAN SONG E nuc variant SA-2f (Mod 5): FAN SONG F, EW enhanced Backup optical, home-in on jam-capable missile SA-N-2: Naval test version, unsuccessful HQ-2: Chinese variant (CSA-1) Volga-M upgrade: Mid 90's, digital sub-systems, 41 miles range, less maintenance Iraqi Mod: Infrared terminal guidance/missile

NOTES

The SA-2/Guideline is a two-stage medium-to-high altitude, long-range, radar-tracking SAM. The weapon is a national-level asset usually found in the rear area with the mission of defending static assets such as supply and command installations. It is fired from a single-rail ground-mounted launcher that can be moved by a truck. The missiles are carried on a special transloader-semi-trailer towed by a Zil truck. An SA-2 regiment consists of three battalions, each having a single firing battery. Each battery has six launchers arranged in a star formation, a centrally located FAN SONG fire control radar, and a loading vehicle. The two forward batteries usually locate 40 to 50 km behind front lines; the third battery locates approx 80 km behind.

Limitations include limited effectiveness against updated ECM, restricted mobility, and limited effectiveness against low-altitude targets.

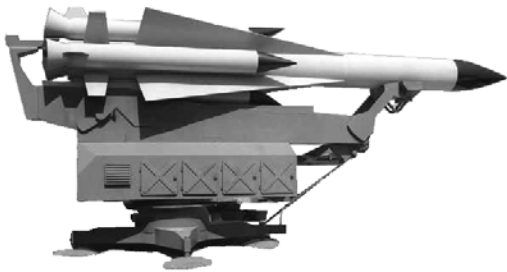
Russian SAM System SA-3/GOA

	Weapons & Ammunition Types Launch rails	Typical Combat Load 2 or 4
SYSTEM Alternative Designations: S-125 Neva, S-125 Pechora (export) Date of Introduction: Twin launcher 1961/ quadruple launcher 1973. Proliferation: At least 39 countries LAUNCHER Description: Towed twin or quad-rail launcher Name: INA Dimensions: INA Weight (kg): INA Reaction Time (sec): INA Time Between Launches (sec): INA Reload Time (min): 50 (quad launcher) Fire on Move: No Emplacement Time (min): 120 Displacement Time (min): 100	ARMAMENT Missile: Name: 5V24, 5V27 Range (m): Max. Range: 29,000 Min. Range: 2,400 Altitude (m): Max. Altitude: 18,300 Min. Altitude: 4.5 Dimensions: Length (m): 6.10 Diameter (mm): 550 Weight (kg): 946 Missile Speed (m/s): 650-1,150 Velocity (mach): 3.5 Propulsion: Solid fuel booster Guidance: Command RF Warhead Type: Frag-HE Fuze Type: Proximity RF Warhead Weight (kg): 73	FIRE CONTROL Radar: Name: LOW BLOW Function: Tracking/Command guidance Control Range (km): 85 Detection Range (km): 110 Frequency Band: I Tracking Capability: 1 target simultaneously (1-2 missiles) Radar: Name: FLAT FACE/P-15 Function: Target Acquisition Detection Range (km): 250 Frequency Band: C Radar: Name: SQUAT EYE/P-15M Function: Target Acquisition (low altitude, instead of FLAT FACE) Detection Range (km): INA Frequency Band: C VARIANTS SA-3a: Two-rail launcher. Missiles without interstage fins. SA-3b (GOA Mod 1): Two-rail launcher. Missiles have interstage fins. SA-3c: Four-rail launcher. S-125 Pechora: Export version SA-N-1: Naval version

NOTES

The SA-3/GOA is a two-stage, low- to medium-altitude SAM. Two ready missiles travel in tandem on a modified truck or tracked vehicle from which the crew loads the missiles onto a ground-mounted, trainable launcher for firing. The truck-mounted FLAT FACE radar acquires the targets, while the LOW BLOW radar carries out the fire control function. It is principally a point/small area defense weapon. The SA-3 system is not mobile. It is movable, but its displacement time is considerable.

Russian SAM System SA-5/GAMMON

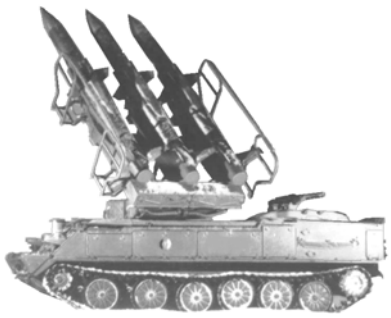
	Weapons & Ammunition Types Single-rail ground mounted	Typical Combat Load Six launchers per Battalion
SYSTEM Alternative Designations: S-200, Vega Date of Introduction: 1963 Proliferation: At least 15 countries ARMAMENT Launcher: Description: Single-rail, ground- mounted, not mobile but transportable Dimensions: INA Weight (kg): INA Reaction Time (sec): INA Time Between Launches (sec): INA Reload Time (min): INA Fire on Move: No Emplacement Time (min): Days Displacement Time (min): Days Missile: (See NOTES) Name: INA Range (km): Max. Slant Range: 300 Effective Range: 250 Min. Range: 17 Altitude (m): Max. Altitude: 29,000 Effective ceiling: 30,000 Min. Altitude: INA Dimensions: Length (m): 10.7 Diameter (mm): 750 Weight (kg): 7,100 Wrap around Boosters: Length (m): 4.9 Diameter (mm): 500 Missile Speed (m/s): 1,100 Propulsion: 2-stage liquid fuel, four wrap-around solid fuel rockets	Guidance: Semi-active homing Warhead Type: Conventional (HE) or nuclear Fuze Type: INA Warhead Weight (kg): 60 HE Self-Destruct (sec): INA Booster separation at (km): 2 Reload Time (min): 5 FIRE CONTROL Radar: Name: SQUARE PAIR Function: Tracking Effective Range (km): 350 Frequency (GHz): 6.62-6.94 Frequency Band: H Located: With firing units Associated Radars: Name: BACK NET initially BAR LOCK B (P-50) follow-on Function: Surveillance/ early warning Range (km): 250/ 390 Frequency Band: E-band (2-2.5 GHz) / E & F bands Location: Generally with separate early warning or Signals Reconnaissance bns Name: SIDE NET/PRV-11 initially, ODD PAIR, E-band follow-on Function: Height Finding Radar Range: INA Frequency Band: E-band Location: Generally with separate early warning or Signals Reconnaissance bns	Name: TALL KING Function: Very long-range early warning Effective Range (km): 500-600 Frequency Band: A-band (150-180 MHz) Location: Generally with separate early warning or Signals Reconnaissance bns Name: BACK TRAP Function: Very long-range early earning Effective Range (km): INA Frequency Band: A-band (172 MHz) Location: Brigade Level Name: BIG BACK Function: Very long-range early warning Effective Range (km): INA Frequency Band: 3-d L-band Location: Brigade Level VARIANTS Possibly as many as 5 missiles/variants

NOTES

The SA-5/Gammon is a long-range, strategic semi-active guided missile system for targeting medium-to-high altitude high-speed aircraft.

The missile has a long cylindrical body with a conical nose, four long chord cruciform delta wings, four small cruciform rectangular control surfaces at the extreme rear, and four jettisonable, wraparound solid-fuel boosters with canted nozzles. It uses a liquid propellant, dual thrust rocket engine, and the missile travels about 2 km before booster separation. The sustainer has four cropped delta wings and steerable rear fins. Control is assisted by ailerons.

Russian SAM System SA-6/GAINFUL

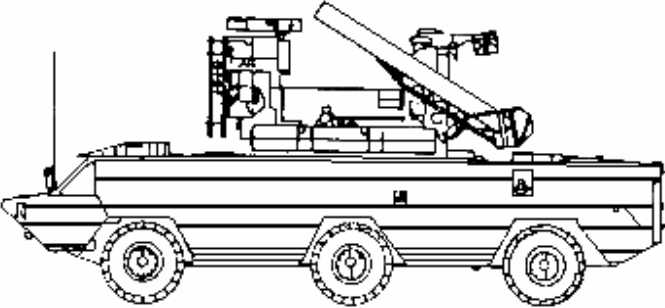
		Weapons & Ammunition Types Launch rails	Typical Combat Load 3
SYSTEM Alternative Designations: Kub, Kvadral Date of Introduction: 1966 Proliferation: At least 22 countries Description: Crew: 3 Combat Weight (mt): 14 TEL Chassis: Modified PT-76 Length (m): 6.09 Height (m): 4.45 Width (m): 3.04 Automotive Performance: Engine Name, Type: V-6R, 6 cyl diesel Cruising Range (km): 250 Speed (km/h): Max. Road: 45 Max. Swim: N/A Radio: INA Protection: NBC Protection System: Yes	ARMAMENT Launcher: Name: 2P25 Reaction Time (min): INA Time Between Launches (sec): INA Reload Time (min): 10 Fire on Move: No Emplacement Time (min): 5 or less Displacement Time (min): INA Missile: Name: 3M9, 9M9 Range (m): Max. Range: 25,000 Min. Range: 4,000 Altitude (m): Max. Altitude: 15,000 Min. Altitude: 50 Dimensions: Length (m): 6.20 Diameter (mm): 335 Weight (kg): 599 Missile Speed: Mach 2.7 Propulsion: Solid fuel Guidance: Semi-active radar homing Warhead Type: Frag HE Fuze Type: Proximity RF Warhead Weight (kg): 50	FIRE CONTROL Sights w/Magnification: EO sighting system on vehicle. Commander and driver have IR. IFF: Pulse-doppler Radar: Name: STRAIGHT FLUSH Function: Fire control /target acquisition Detection Range (km): 60-90 Tracking Range (km): 28 Frequency: I-low altitude (tracking); G/H-med altitude (acquisition); H (detection) Radar: Name: LONG TRACK Function: Battlefield surveillance/target acquisition Detection Range (km): 167 Tracking Range (km): 150 Frequency: 2.6 GHz Frequency Band: E Radar: Name: THIN SKIN Function: Height Finding Detection Range (km): 240 Tracking Range (km): INA Frequency Band: H VARIANTS SA-6b/GAINFUL: Mounted on MT-LB, has integrated radar. The TELAR can operate independently for surveillance.	

NOTES

The SA-6 is a two-stage, solid-fuel, low-altitude SAM. It has radio-command guidance with semi-active radar terminal homing. Targets are low to medium altitude fixed- and rotary-wing aircraft. Two or more missiles may be launched at a target during an engagement. The associated STRAIGHT FLUSH fire control/target acquisition radar vehicle uses the same chassis as the SA-6a TEL. The LONG TRACK target acquisition radar is also associated with the SA-6 system. The LONG TRACK surveillance radar acquires target data, the STRAIGHT FLUSH missile site radars take over target acquisition and fire control.

SA-6 regiments organic to mechanized and tank divisions consist of 20 TELs in five batteries, 4 TELs to a battery. The SA-6b system includes the FIRE DOME fire control radar. When the SA-6a TEL battery is replaced with an SA-6b TELAR, the battery doubles its capability to acquire and engage targets. Each battery has four triple launchers, one STRAIGHT FLUSH vehicle, and two reload vehicles (3 missiles each). Normally, three of these batteries are deployed approximately 5 km behind the front line; the remaining two are deployed about 10 km farther back, filling the gaps between the three forward batteries.

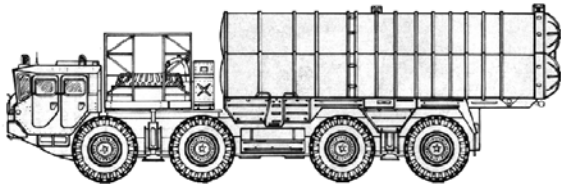
Russian SAM System SA-8b/GECKO

	Weapons & Ammunition Types SA-8b in canisters	Typical Combat Load 6
SYSTEM Alternative Designations: 9K33M3 Osa-AKM Date of Introduction: 1980 Proliferation: At least 25 countries Description: Crew: 3 Combat Weight (mt): 9 TELAR: BAZ-5937 6x6 amphibious cross-country capable vehicle Length (m): 9.14 Height (m): 4.2 (with surveillance radar folded down) Width (m): 2.75 Automotive Performance: Engine Type: D20K300 diesel Cruising Range (km): 500 Speed (km/h): Max. Road: 80 Max. Swim: 8 Radio: R-123M Protection: NBC Protection System: Yes	ARMAMENT Launcher: Name: 9P35M2 Dimensions: Length (m): 3.2 Diameter (mm): INA Weight (kg): 35 Reaction Time (sec): INA Time Between Launches (sec): 4 Reload Time (min): 5 Fire on Move: No Emplacement Time (min): 4 Displacement Time (min): Less than 4 (est.) Missile: Name: 9M33M3 Range (m): Max. Range: 15,000 Min. Range: 200 Altitude (m): Max. Altitude: 12,000 Min. Altitude: 10 Dimensions (mm): Length: 3158 Diameter: 209.6 Weight (kg): 170 Missile Speed (m/s): 1020 Propulsion: Solid propellant rocket motor Guidance: RF CLOS Warhead Type: Frag-HE Fuze Type: Contact and proximity Warhead Weight (kg): 16 Self-Destruct (sec): 25-28	FIRE CONTROL Sights w/Magnification: INA LLLTV/optical assist (for target tracking in low visibility and heavy ECM) IFF: Yes Radar: Name: LAND ROLL Function: Target Acquisition Detection Range (km): 20-30 Tracking Range (km): 20-25 Frequency: 6-8 GHz Frequency Band: H Radar: Name: Monopulse Target Tracking Radar Function: Target Tracking Detection Range (km): 20-25 Tracking Range (km): INA Frequency: 14.2-14.8 GHz Frequency Band: J 2 Missile tracking radars: Frequency: 10-20 GHz VARIANTS SA-8a: Initial production model that carries four missiles on exposed rails. 4K33 Osa-M (SA-N-4): Naval variant

NOTES

The first production version of this system was identified as SA-8a, which only had 4 launcher rails and exposed missiles. The SA-8b typically has two BAZ-5937 resupply/transloader vehicles, carrying 18 missiles each (boxed in sets of three) that supports a battery of four TELARs. A target can be brought under fire both with one missile as well as a volley of two missiles. This system is also air transportable.

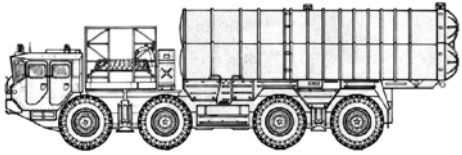
Russian SAM System SA-10b/GRUMBLE

		Missiles SA-10b in canisters on-board	Typical Combat Load 4
SYSTEM System Designation: S-300PMU Alternative Designations: SA-10b GRUMBLE (NATO) Date of Introduction: 1985 Proliferation: At least 8 countries Primary Components: 1- Launch vehicle with command shelter (5P85SU) 2 -Launch vehicles without command shelter (5P58DU) 1- FLAP LID B Target engagement radar ARMAMENT TEL: Name: 5P85SU or 5P58DU (see NOTES) Time Between Launches (sec): 3 Reload Time (min): INA Crew: 6 Fire on Move: No Emplacement Time (min): 5 Displacement Time (min): < 5 Missiles Fired Simultaneously: 12 (2 per target) Targets Tracked Simultaneously: 6 Automotive Performance: Chassis: MAZ-7910 (8x8) Engine: D12A-525 V-12 water cooled Horsepower: 525 Cruising Range (km): 650 Speed (km/h): Max. Road: 60 Weight (kg): 20,000 Dimensions (m): Length: 9.4 Width: 3.1 Height: 3.7	Missile: Name: 5V55RUD Range (km): Max. Launch Range: 90 Min. Range: 5 Altitude (m): Max. Altitude: 27,000 Min. Altitude: 25 Speed (m/sec): Max Target: 1,200 Max SAM: 2,100 Dimensions: Length (m): 7 Diameter (mm): 450 Weight (kg): In Canister: 2,100 Guidance: Track-Via-Missile (TVM) Warhead Type: HE Fuze Type: Contact Warhead Weight (kg): 133 VARIANTS SA-10a: Semi-fixed version deployed on trailers. SA-10c: Improved, longer range (150 km), TOMBSTONE radar, expanded C². HQ-10/HQ-15: Chinese licensed copy of SA-10. HQ-9/FT2000: Chinese based on S-300PMU (SA-10b). SA-N-6: Russian naval version. For additional information on variants and options, see SA-10c (next page).	ASSOCIATED RADARS Radar: Name: 30N6 NATO Designation: FLAP LID B Function: Target Engagement Unit Associated With: Firing battery Detection Range (km): 90 km Interception Altitude (m): 25 and higher Target Speed (km/h): 4,200 Targets Engaged Simultaneously: 6 Missiles Guided Simultaneously : 12 Frequency (GHz): 10 Frequency Band: I/J Radar: Name: 76N6 NATO Designation: CLAM SHELL Function: Low Altitude Search and Acquisition Unit Associated With: Battalion/regiment Detection Range (km): @ 1,500 feet altitude: 93 @ 3,000 feet altitude: 120 Targets Tracked Simultaneously: 180 low level targets Resolution of Target Radar Cross Section (RCS): .02 m² @ 1,400 kts Frequency (GHz): INA Frequency Band: I Radar: Name: INA NATO Designation: BIG BIRD Function: Target Detection/Command Guidance Unit Associated With: Regiment Frequency (GHz): 3.3 Frequency Band: F	

NOTES

The missiles (5V55R) are in a sealed transport launch canister and do not need to be tested or adjusted during their service life of 10 years. They are launched vertically by the canister without turning the launcher toward the target. Each battery has one 5P85SU launcher vehicle with a command shelter mounted behind the cab and one or two 5P58DU launcher vehicles without the command shelter. Two missiles are normally fired at each target increasing probability of hit. The line drawing is of the 5P58DU TEL (without the command shelter).

Russian SAM System SA-10c GRUMBLE (export variant)

	Missiles SA-10c in canisters on-board TEL or trailer launcher	Typical Combat Load 4
SYSTEM System Designation: S-300PMU1 Alternative Designations: SA-10c Date of Introduction: 1990-93 Proliferation: At least 4 countries Primary Components: 83M6E automated C² system, consisting of the Baykal-1E or 54K6E battle management CP vehicle, and 64N6E radar vehicle. The system can control up to 6 missile complexes (72 missiles, against 36 targets). System also has vehicles and technical support facilities. 90Zh6E missile complex, with 30N6E radar, battalion CP, and up to 12 5P85SE launcher vehicles or 12 5P85TE trailer launchers. Complex includes vehicles (e.g., trucks, UAZ-452T2 survey vehicle) and equipment. 48N6E air defense missile ARMAMENT Trailer Launcher and TEL Name: 5P85SE TEL, in ground force units 5P85TE trailer launcher for site defense Missiles per launcher: 4 Reaction Time: 8-10 sec Time Between Launches (sec): 3 Reload Time (min): INA Crew: 4-6 Fire on Move: No Emplacement Time (min): 5 TEL 30 trailer launcher Displacement Time (min): < 5 (est) TEL INA trailer launcher Automotive Performance: For TEL, see SA-10b. The 5P85TE trailer launcher is normally towed by a KRAZ-260B 6x6 truck.	Missile: Name: 48N6E Type: Single-Stage, solid-fuel Launch Mode: Vertical launch Range (km): Max. Launch Range: 150 Max Range TBMs: 40 Targets .5-1 km high: 28-38 Min. Range: 5 Altitude (m): Max. Altitude: 27,000 Min. Altitude: 10 Speed (m/sec): Max Target: 2,800 Max SAM: 1,900-2,000 Dimensions: Length (m): 7.5 Diameter (mm): 519 Weight (kg): In Canister: 2600 Guidance: Track-Via-Missile Warhead Type: Frag-HE Fuze Type: radio command Warhead Weight (kg): 145 VARIANTS SA-10b: See previous page. SA-10c: Upgrades C², missiles, and radars. It is a more mobile system with an engagement range increase to 150 km. Forces may use a mix of earlier and later assets. Favorit: Later improved system with upgraded C² (83M6E2 and 90Zh6E2), radars (6N6E2 and 30N6E2), and the 48N6E2 missile. Engagement range is 200 km. Recent L6LE all-altitude target designation upgrade radar vehicle can replace CLAM SHELL.	ASSOCIATED RADARS Radar: Name: 64N6E NATO Designator: INA Function: Surveillance radar Unit: Brigade, 3-6 90Zh6E complexes (bns), total 18-72 launchers Mobility: Vehicle-mounted Detection range (km): 200 Number of Targets detected: up to 200 Targets for Simultaneous Lock and Track: 100 Frequency Band: INA, 3-D phased array Radar: Name: 30N6E NATO Designation: INA Function: Multifunction - Illumination, guidance, and automatic tracking Unit: 90Zh6E complex (battalion), 2-6 fire units, total 6-12 launchers Mobility: Vehicle-mounted Detection Range (km): 150 Targets Engaged Simultaneously: up to 6 Missiles Guided Simultaneously: up to 12 Frequency Band: INA 3-D phased array Radar: Name: 76N6 (optional supplement to 90Zh6E) NATO Designation: CLAM SHELL Function: Low Altitude Search and Acquisition Unit Associated With: Battalion Mobility: Mounted atop 40V6 trailer tower Antenna station is on a 5T58 truck Operation: Station can operate 500m from radar. Emplacement time (hrs): 1-2 Detection Range (km): @ 500 m altitude: 90 @ 1,000 m altitude: 120 Targets Tracked Simultaneously: up to 180 Target Generation Time/Target (sec): 3 Resolution of Target RCS: .02 m² @ 1400 kts Frequency Band: I-band 3-D radar

NOTES

Ground force brigade structure probably differs, with 3-4 battalions and 18-36 total launcher vehicles (vs 36-72 for area defense brigade).

The 83M6E automated C² system can be used with other AD missile system complexes, such as SA-5, earlier SA-10, and SA-11. With this C² and compatible nets, this system can be used as the base for an integrated air defense system. The 83M6E (Baykal-1E) system can also pass pass detections directly to the Rubezh-2M air intercept control net.

The missiles (48N6E) are launched vertically by the canister without turning the launcher toward the target. Two missiles are normally fired at each target increasing probability of hit.

The Osnova-1E integrated air defense system C² vehicle can process 120 targets at a time. It can simultaneously sort out aircraft ECM (with the AKUP-22 system) and pass up to 80 targets to Baikal-1E or other AD missile systems, as well as up to 60 targets to Rubezh-2M.

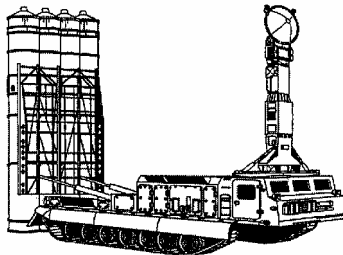
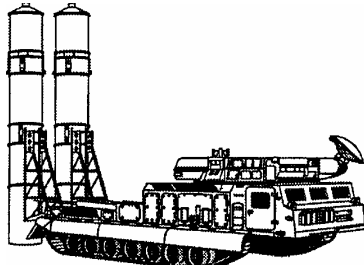
Russian SAM System SA-11/GADFLY

	Weapons & Ammunition Types Launch rails, Total TELAR Loader-launcher	Typical Combat Load 4 8
SYSTEM Alternative Designations: BUK-M1 Date of Introduction: 1979/ 83 for -M1 Proliferation: At least 5 countries Description: Crew: 4 Combat Weight (mt): 32.34 for TELAR 36 or less for all Chassis: For CP, TELARs, launcher-loader, radars, GM-569 armored, tracked TELAR: Length (m): 9.3 Height (m): 3.8 travel/7.72 deployed Width (m): 3.25 Automotive Performance: Engine Name, Type: 700-hp diesel Cruising Range (km): 500 Speed (km/h): Max. Road: 65 Max with launchers ready: 30 Fording depth (m): 1 APU: Yes for TELARs, LL, radars, CP Radio: INA Protection: Armor protection: Small arms (est) NBC Protection System: INA ARMAMENT Launcher: Name: 9A310M1 Reaction Time (min): 0.25-0.5 0.1 for low-flyers Time Between Launches (sec): 3 Reload Time (min): 13 Fire on Move: No Emplacement time from march (min): 5 Emplace time, reposition (sec): 20 for a 100-200 m survivability move. TEL does not have to be lowered and locked down. Displacement Time (min): 5	Missile: Name: 9M38M1 Range (m): Max. Range: 36,000 Min. Range: 3,000 Altitude (m): Max. Altitude: 22,000 Min. Altitude: 15 Dimensions: Length (m): 5.55 Diameter (mm): 400 Weight (kg): 690 Max target speed (m/s): 830 Max missile Speed (m/s): 1,200 Propulsion: Solid fuel Guidance: RF command, inertial correction, Semi-active radar homing Warhead Type: Frag HE Fuze Type: Proximity RF Warhead Weight (kg): 70 Warhead lethal radius (m): 17 PROTECTION/COUNTERMEASURES Jam ECCM: Noise jam 240-330 w/MHz Passive Jam ECCM: 3 Packets/100m Measures: One launcher operates radar, while others are passive. Other guidance modes reduce radar illumination time. IFF: Pulse-doppler FIRE CONTROL Sights: TV optical auto-tracker Acquisition range (km): 20 Navigation systems: Available on all Radar: Name: 9S18M1/SNOW DRIFT Function: Battery target acquisition radar Description: Armored tracked chassis with phased array radar and dipole antenna Detection range (km): 100-160 Range precision (m): 400 Detection altitude (km): 25 Frequency: INA	Radar: Name: FIRE DOME Function: Launcher tracker, illuminator Detection Range (km): 80 (2 m²) 100 (3 m²) Targets tracked: 1 Frequency: 6-10 GHz Frequency Band: H/I OTHER VEHICLES: Support: Name: 9A39M1 Function: Launcher-loader vehicle Missile load: 8 Reload Time (min): 15 Fire on Move: No Emplacement Time (min): 5 C² Vehicle: Name: 9S470M1 Function: Battery Command Post Data links: Wire and radio AD net, and can link to SA-10/Osnova integrated net. Targets tracked: 15 (6 assigned to TELs) Other support equipment: TM-9T229 Transporter vehicle, maintenance vehicles, mobile test unit. VARIANTS BUK: Original system used unsuccessful TUBE ARM, replaced by SNOW DRIFT BUK-M1-2: Export-based upgrade with, adaptation of SA-17/9M317 SAM to BUK launcher system. Orion passive radar system can also be added. Range extends to 45 km. New 9A310M1-2 launcher vehicle with a phased array radar permits launcher multi-target missions. SNOW DRIFT upgrade available. Software/ECM upgrades are included.

NOTES

The 9K37M1 complex consists of a CP vehicle, TA radar, 6 TELARs, 3 launcher-loaders, and 48 missiles. A battery can engage up to 6 targets (up to 12 missiles) simultaneously. Launcher-loader can launch missiles on TELAR command when necessary. The TELARs can be located 5-10 km apart and operate autonomously. Target types include helicopters, fixed-wing aircraft, UAVs, anti-radiation missiles, and cruise missiles.

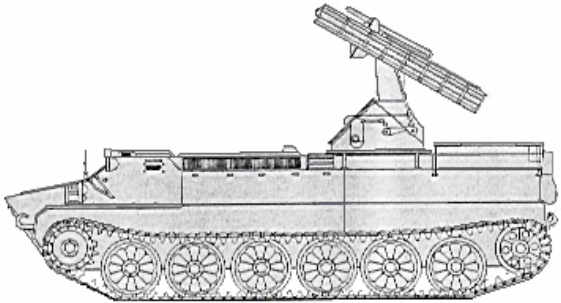
Russian SAM System SA-12a and SA-12b

		Missiles SA-12a canisters on TELAR SA-12b canisters on TELAR	Typical Combat Load 4 2
SA-12a/GLADIATOR on 9A83 TELAR	SA-12b/GIANT on 9A82 TELAR		
SYSTEM System Designation: Antey S-300V Date of Introduction: 1982 Proliferation: At least 6 countries Primary Components: System consists of Battalion CP vehicle, 12-24 TELARs or (heavy or light) launcher-loaders, and radars. ARMAMENT TELARs: Crew: 4 Name: 9A82, GIANT 9A83, GLADIATOR Reaction Time (sec): 40 alert to operation 15 missile launch Time Between Launches (sec): 1.5 Reload Time (min): INA Brigade missile load: 96-192 (4-8/TELAR) Fire on Move: No Emplacement/displacement time (min): 5 Navigation equipment: FCS embedded Onboard fire control: Illumination radar on 9A83 Launcher-Loader Vehicles (LLVs): Name: 9A84, for GIANT 9A85, for GLADIATOR Function: Primary role is to reload missiles on TELARs. Vehicles use same chassis, but replace the radar with a crane. If there is insufficient reload time, LLVs can launch. NOTE: All of the vehicles have onboard navigation, an APU, and communications equipment to minimize response/set-up time. Automotive Performance: Chassis: 9M83 and 9M82 are on MT-T (Type 830) heavy tracked chassis Engine: 525-hp Diesel Cruising Range (km): 450 Max. road speed (km/h): 50 Weight (mt): 48 Dimensions (m): Length: 12.3 LLVs and 9A85, 14.5 9A82 Width: 3.38 Height: 3.78	MISSILES Name: 9M82 (aka GIANT, Zur-1) Type: Two-Stage, solid-fuel Primary Target: TBMs-IRBMs Launch Mode: Vertical launch Range (km): Max. Range: 40 TBMs 100 aircraft Min. Range: 13 Altitude (km): Max. Altitude: 25 TBMs, 30 aircraft Min. Altitude: 2 TBMs, 0.025 aircraft Speed (m/sec): Max Target: 3,000 Max SAM: 2,400 Dimensions: Length (m): 8.5 Diameter (mm): 800 Weight (kg): 4,600 Guidance: inertial, radar semi-active homing (SAH) Warhead Type: Focused Frag-HE Fuze Type: radio command or proximity Warhead Weight (kg): 150 Name: 9M83 (aka GLADIATOR, Zur-2) Type: Two-Stage, solid-fuel Primary Targets: Dual - aircraft/missiles Launch Mode: Vertical launch Range (km): Max. Launch Range: 80 Max Range TBMs: 30 Min. Range: 6 Altitude (km): Max. Altitude: 25 Min. Altitude: 0.025 Speed (m/sec): Max Target: 3,000 Max SAM: 1,700 Dimensions: Length (m): 7.0 Diameter (mm): 800 Weight (kg): 2,400 Guidance: inertial, radar SAH Warhead Type: Focused Frag-HE Fuze Type: radio command or proximity Warhead Weight (kg): 150	COMMAND AND CONTROL Name: 9S457-1 Function: Command Post tracked vehicle Unit: Brigade, links to up to 4 9S15 Targets Detected: 200 Targets tracked: 70, 24 assigned at a time ASSOCIATED RADARS Name: 9S15 NATO Designator: BILL BOARD Function: Search radar Unit Associated with: Brigade Mobility: Tracked vehicle-mounted Detection range (km): 10-250 Range accuracy (m): 250 Sweep: 360° in 6-12 sec Number of Targets tracked: up to 200 Frequency Band: F (3-4GHz), phased array ECCM: Operation in jamming to 1kW/MHz at 200 km Name: 9S19 NATO Designation: HIGH SCREEN Function: Sector search and track, TBMs Unit Associated With: Brigade Mobility: Tracked vehicle-mounted Detection Range (km): 200 Targets Tracked: 16-20 based on jamming Frequency Band: INA 3-D phased array Name: 9S32-1 NATO Designation: GRILL PAN Function: Missile guidance station, remotely controls TELAR illumination radars Unit: Battery, receives mission from CP Mobility: Tracked vehicle-mounted Detection Range (km): 150, 140 automatic Targets Tracked Simultaneously: up to 12 Missiles Guided Simultaneously : up to 6 Frequency Band: INA 3-D phased array VARIANTS Antey-2500: In 5 units around Moscow, upgrade system with 9M82M and 9M83M missiles offers increased velocity, range and altitude, and counter-stealth protection.	

NOTES

The system can be linked into integrated air defense net, and can employ C2/radar assets noted for SA-10c (e.g., Osnova-1 automated complex). A battery can have 1-2 SA-12b TELARS and 2-4 SA-12a TELARS. A brigade can have 2-4 batteries. The structure is flexible. When launcher-loaders are used to launch missiles, illumination radars on nearby TELARs will guide the missiles.

Russian SAM System SA-13b/GOPHER

	Weapons & Ammunition Types 9M333 missiles Ready Reload 7.62-mm MG RPK	Typical Combat Load 8 4 4 INA
SYSTEM Alternative Designations: Strela-10M3, 9K35M3 Date of Introduction: 1981 Proliferation: At least 22 countries Description: Crew: 3 TELAR: 9A34M3 or 9A35M3 vehicle Chassis: MT-LB Combat Weight (mt): 12.3 Length (m): Launch position: 6.45 Travel position: >6.45 Height (m): TAR up: 3.8 TAR down: 2.22 Width (m): 2.85 Automotive Performance: Engine Type: V-8 diesel Cruising Range (km): 500 Speed (km/h): Max. Road: 61.5 Max Swim: 6 Radio: INA Protection: NBC Protection System: Yes ARMAMENT Launcher: Name: INA Dimensions: INA	Length (m): INA Diameter (mm): INA Weight (kg): INA Reaction Time (sec): 7-10 Time Between Launches (sec): <5 Reload Time (min): 3 Fire on Move: No, stop or short halts Emplacement Time (min): 0.67 Displacement Time (min): <1.0 Missile: Name: 9M333 Range (m): Max. Range: 5,000-7,000 Min. Range: 800 Altitude (m): Max. Altitude: 3,500 Min. Altitude: 10 Dimensions (mm): Length: 2,223 Diameter: 120 Weight (kg): 42 Missile Speed (m/s): Up to 800/517 average Propulsion: Single-stage solid propellant Guidance: Photo contrast or dual IR homing Warhead Type: HE with fragmenting rod Fuze Type: Laser proximity/contact Warhead Weight (kg): 5 Self-Destruct (sec): 29 Auxiliary Weapon: Caliber, Type, Name: 7.62-mm MG, RPK Rate of Fire (rd/min): 150 practical 600 cyclic, in bursts Loader Type: 40/75-rd magazine	Ready/Stowed Rounds: INA Elevation (°): INA Fire on Move: Yes FIRE CONTROL Sights w/Magnification: Electro-optical/Infrared system: Range: INA IFF: 1RL246-10-2/PIE RACK (RF) Radar: Name: 9S86/SNAP SHOT Function: Range only Detection Range (km): 10 Tracking Range (km): N/A Frequency: INA Frequency Band: INA VARIANTS Missile Variants: Strela-10M has uncooled lead sulphide (PbS) IR seeker. Strela-10M2 has uncooled PbS seeker or cooled indium antimonide Mid-IR single-mode seeker. Czech SNAP SHOT radar: Version with height adjustment capability, and improved automation and communications SAVA: Yugoslav variant of Strela-10M/SA-13a on a BVP M80A IFV chassis. Strijela-10Croat: Croatian variant with a TAM 150.B 6x6 vehicle chassis, TV-based fire control and thermal night sight.

NOTES

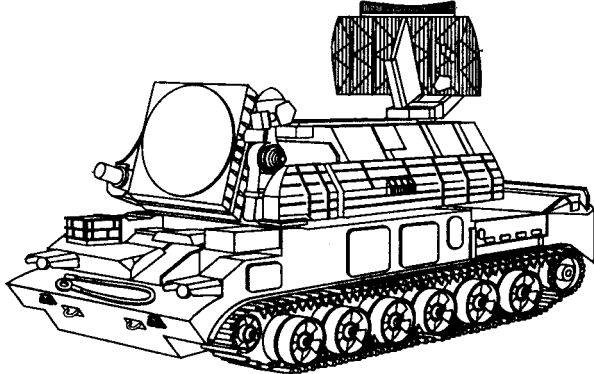
Associated equipment includes a 9V915M maintenance vehicle, 9I11 external power supply system, and a 9V839M test vehicle. The DOG EAR battery acquisition radar has an MT-LBu tracked chassis, operates in F and G band, and provides 80 km detection and 35 km tracking.

The battery set uses centralized digital target warning net; but each launcher must individually acquire and launch against targets. One of the four launchers (9A35M/TELAR-1) has a 9S16/FLAT BOX -B passive radio DF system (range to 30 km). In a battery set, the TELAR-1 can pass data to the other launchers (9A34M/TELAR-2). The TELARs have a gasoline-powered APU.

The launcher module can be installed on other vehicles, such as BRDM-2. The launcher permits electro-mechanical aiming, and lock-on automatic slewing to track target. Launcher elevation (°) is -5 to +80. Maximum target speed is 420 m/s.

The MT-LB hull offers only 7 mm of protection, versus twice that for the SA-9 BRDM-2. However, the SA-13 tracked chassis improves mobility, increasing capability for dispersion and survivability. The SA-13 can launch SA-9 SAMs, and can mix the SAMs.

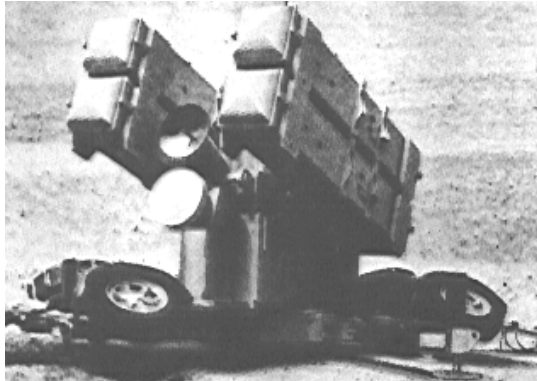
Russian SAM System SA-15b/GAUNTLET

	Weapons & Ammunition Types ready missiles	Typical Combat Load 8
SYSTEM Alternative Designations: 9K331 Tor-M1 Date of Introduction: 1990 Proliferation: At least 5 countries Description: Crew: 3 TLAR: 9A331 combat vehicle Chassis: GM-355 Combat Weight (mt): 34 Length (m): 7.5 Height (m): 5.1 (TAR up) Width (m): 3.3 Automotive Performance: Engine Type: V-12 diesel Cruising Range (km): 500 Speed (km/h): Max. Road: 65 Radio: INA Protection: NBC Protection System: Yes	ARMAMENT Launcher: Name: INA Dimensions: INA Length (m): INA Diameter (mm): INA Weight (kg): INA Reaction Time (sec): 5-8 Time Between Launches (sec): (see NOTE) Reload Time (min): 10 Fire on Move: Yes Emplacement Time (min): 5 Displacement Time (min): Less than 5 Missile: Name: 9M331 Range (m): Max. Range: 12,000 Min. Range: 100 Altitude (m): Max. Altitude: 6,000 Min. Altitude: 10 Dimensions (mm): Length: 2,900 Diameter: 235 Weight (kg): 167 Missile Speed (m/s): 850 Propulsion: INA Guidance: Command Warhead Type: Frag-HE Fuze Type: RF Proximity Warhead Weight (kg): 15 Self-Destruct (sec): INA	FIRE CONTROL Sights w/Magnification: Electro-optical (EO) television system: Range: 20 km IFF: Yes Radar: Name: INA Function: Target Acquisition Detection Range (km): 25 Tracking Range (km): INA Frequency: INA Frequency Band: H-band Doppler Radar: Name: INA Function: Target Tracking and Guidance Detection Range (km): INA Tracking Range (km): 25 Frequency: INA Frequency Band: K-band Doppler, Phased Array VARIANTS SA-N-9: Naval version

NOTES

SA-15b is designed to be a completely autonomous air defense system (at division level), capable of surveillance, command and control, missile launch and guidance functions from a single vehicle. The basic combat formation is the firing battery consisting of four TLARs and the Rangir battery command post. The TLAR carries eight ready missiles stored in two containers holding four missiles each. The SA-15b has the capability to automatically track and destroy 2 targets simultaneously in any weather and at any time of the day.

Italian Aspide Mk 1 SAM System (with Skyguard AA Gun-Missile Battery)

 Aspide 4-canister configuration		Weapons & Ammunition Types Launch canisters Total missiles	Typical Combat Load 4/6 (depending on configuration) 12
SYSTEM Alternative Designations: Skyguard system Date of Introduction: 1986. Proliferation: At least 18 countries LAUNCHER Description: Towed 4/6 canister launcher Name: INA Reaction Time (sec): 11 Time Between Launches (sec): INA Fire on Move: No Number of fire channels: 2 Emplacement Time (min): 15 ARMAMENT Missile: Name: Aspide Range (km): Max. Range: 15+ Min. Range: 0.75 Altitude (m): Max. Altitude: 6,000+ Min. Altitude: 10 Dimensions: Length (m): 3.65 Diameter (mm): 203	Weight (kg): 230 Missile Speed (m/s): 650 Velocity (mach): 2.0 Maneuver capability (Gs): 35-40 Propulsion: Solid fuel booster Guidance: J-band radar semiactive homing. Seeker also can be used in home-on-jam mode. Warhead Type: Frag-HE Fuze Type: Proximity and contact Warhead Weight (kg): 33 FIRE CONTROL Onboard Fire Control: Tracker and illuminator radars, I/J-band Off-carriage Fire Control Electro-optical system: SEC-Vidicon TV tracking system Laser rangefinder	Radar: Name: Skyguard Mk II (SW) Function: (1) Fire control search and (2) track, I-band, doppler Detection Range (km): INA Tracking Range (km): 25 Tracking Capability: 1 target, 1-2 missiles Frequency: 8-20 GHz Frequency Band: J, doppler illuminator Rotation Rate/min: 60 Mean Power (W): 200 VARIANTS Amoun: Egyptian Aspide/Sparrow system Aramis: Brigade SAM system with 6-canister launcher. Spada: Italian Air Force launcher version. Sparrow: System from which Aspide is derived, and is interchangeable in the launcher. LY-60: Chinese ground/naval variant	

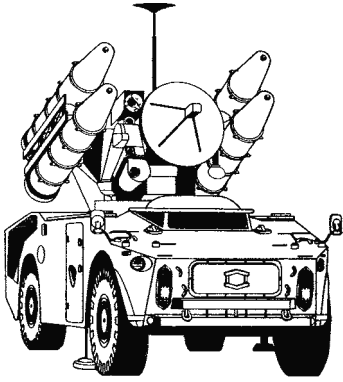
NOTES

GPS is used for surveying systems in position. Skyguard connection link is 1,000-m cable link or 5000-m radio link.

The system can also be used with Supergiraffe AD battalion EW radar.

Other missile systems can be used with Skyguard system instead of Aspide. They include ADATS, ASRAD, AIM-7E/Sparrow, SAHV-IR, and Chinese LY-60.

European SAM System Crotale 4000

		Weapons & Ammunition Types R440 missile canisters	Typical Combat Load 4
SYSTEM Alternative Designations: TSE 5000 Date of Introduction: 1971, 4000 in 1988 Proliferation: At least 9 countries Description: Data is for vehicle w/launcher TELAR: P4R 4x4 Crew: 2 launcher vehicle Combat Weight (mt): 15.0 Length (m): 6.22 Height (m): 3.41 Width (m): 2.72 Automotive Performance: Engine Type: INA Cruising Range (km): 600 Max. Road Speed (km/h): 70 Fording depth (m): 0.68 Radio: INA Protection: Armor protection (mm): 3-5 NBC Protection System: No ARMAMENT Launcher: Name: Crotale Weight (mt): INA Set-up time (min): 5 Reaction Time (sec): 6.5 Time Between Launches (sec): 2.5 Reload Time (min): 2 Fire on Move: No	Missile: Name: R440 Range (m): Max: 10,000 Max, slow movers: 14,600 Min. Range: 500 Altitude (m): Max. Altitude: 5,000 Min. Altitude: 15 Dimensions (mm): Length: 2890 Diameter: 150 Weight (kg): 84, 100 with canister Missile Speed (m/s): 750 Maneuver capability (Gs): 27 Propulsion: Solid propellant motor Guidance: RF CLOS Warhead Type: Focused frag-HE Warhead Weight (kg): 15 Lethal radius (m): 8 FIRE CONTROL Sights w/Magnification: Day Camera: TV tracker, low elevation Range (km): 14.0 Optical sight: back-up binocular tracker Day/Night Camera: Thermal, optional v Field of view (°): 8.1/2.7 Elevation (°): 5.4/1.8 Range (km): 19.0 Missile Tracker: IR, for remote control IFF: Yes, on ACU (See Notes)	Radar: Name: Mirador IV pulse doppler Function: Surveillance Antenna rotation rate (rpm): 60 Detection Range (km): 18.5 Altitude coverage (m): 0 - 4,500 Target Detection: 30 targets per rotation Multiple target tracking: 12 targets. Frequency Band: E Radar: Name: INA, on launcher vehicle Function: tracking Targets tracked: 1 Missile guidance, simultaneous: 2 Detection Range (km): 17 Altitude coverage (m): 0 - 5,000 Frequency (GHz): 12-18 Frequency Band: J, monopulse Associated radar: I-band (8-10 GHz) command VARIANTS System is mounted on vehicles, shelter, ships Crotale 1000: Initial version with cable link. Crotale 2000: Variant with TV and IFF. Crotale 3000: Variant has TV auto-tracker. Crotale 4000: Variant with radio data link and thermal sight option Crotale Improved: Has new radar Cactus: SA variant for SAHV-3 missile. FM-80/HQ-7: Chinese variant. Shahine: Upgrade has R460 15-km missile on AMX-30 tank chassis. Shahine 2 features radar range increase to 12.0 , M3.5 velocity, and 5-m minimum altitude (slow movers). Thales Crotale: Upgrades for French air force and navy variants and Saudi variants.	

NOTES

The all-weather system is deployed in platoons. A platoon includes an Acquisition and Coordination Unit (ACU) vehicle and 2-3 "firing units" (launcher vehicles). A battery includes two platoons. Battery reloads are delivered on trucks. An ACU uses the same P4R chassis with the surveillance radar, IFF interrogator, battle management computer, digital RF datalink, and VHF radios. With the RF datalink, interval can be up to 10 km between ACUs, and up to 3 km between ACU and launcher vehicles.

An off-chassis remote control system can be used to guide the missile.

European SAM System Crotale-New Generation

 XA-181 SAM Launcher Vehicle	Weapons & Ammunition Types VT-1 missile canisters	Typical Combat Load 8
SYSTEM Alternative Designations: Crotale-NG, XA-181 (Finnish SAM Launcher vehicle) Date of Introduction: 1991-92 Proliferation: At least 5 countries, all variants Description: Data is for vehicle w/launcher TELAR: XA-181 is XA-180 (PASI) 6x6 APC with Crotale NG launcher system Crew: 4 Combat Weight (mt): 23.0 launch-ready Length (m): 7.35 Height (m): 2.3 for vehicle hull +2-3 m (est) Width (m): 2.9 Automotive Performance: Engine Type: 240-hp diesel Cruising Range (km): 800 Max. Road Speed (km/h): 80 Swim capability: No Radio: INA Protection: Armor protection: 6-12 mm NBC Protection System: Yes ARMAMENT Launcher: Name: VL-VT-1 Weight (mt): 4.8 Reaction Time (sec): <6 Time Between Launches (sec): 1-2 Reload Time (min): 10 Fire on Move: No	Missile: Name: VT-1 Range (m): Max. Range: 11,000 Min. Range: 500 Altitude (m): Max. Altitude: 6,000 Min. Altitude: 5 Dimensions (mm): Length: 2300 Diameter: 170 Weight (kg): 75 Missile Speed (m/s): 1,250 Maneuver capability (Gs): 35 Propulsion: Solid propellant motor Guidance: RF CLOS Warhead Type: Focused frag-HE Fuze Type: Proximity Warhead Weight (kg): 14 Lethal radius (m): 8 FIRE CONTROL Sights w/Magnification: Day Camera: Mascot, CCD TV Field of view (°): 2.4 Elevation (°): 1.8 Range (km): 15 Night Camera: Castor, thermal Field of view (°): 8.1/2.7 Elevation (°): 5.4/1.8 Range (km): 19 Missile Tracker: IR missile localiser on the CCD camera IFF: Yes	Radar: Name: TRS 2630 Function: Surveillance Antenna: Planar Detection Range (km): Aircraft: 20 Hovering rotary wing aircraft: 11 Altitude coverage (m): 0-5000 Multiple target tracking: Automatic track-while-scan for up to 8 targets. Frequency (GHz): 2-3 Frequency Band: S ECCM: Low sidelobes, wide-band frequency agility, search on the move capability Radar: Name: INA Function: Engagement, tracking Detection Range (km): 30 Frequency (GHz): 35 Frequency Band: Ku ECCM: Wideband frequency agile VARIANTS System is designed to fit on a modular pod, on ships, and for variety of chassis. They include APCs, e.g., M113, Korean IFV, Piranha 10x10, and the XA-180 as noted Russian Fakel VL-VT-1 launcher upgrade gives VT-1 hypervelocity missile (HVM) vertical 40-m rise before pitch-over to target. Pegasus: South Korean system with a different missile

NOTES

The modular all-weather system includes acquisition, tracking, firing and computer units integrated on one vehicle, for management by a single system operator.

Russian SAM Radar System LONG TRACK



SYSTEM

Alternative Designations: INA

Date of Introduction: IOC 1967

Description: Twenty-five foot high single conventional parabolic mesh reflector antenna with multiple stacked feeds that is vehicle mounted.

Functions: Early warning radar, surveillance and target acquisition

Chassis: A modified version of the AT-T heavy tracked transporter or truck mounted.

Mobility: On/off road capable mobility is very good. The LONG TRACK was the first highly mobile early warning radar. The antenna is folded for transport.

ADA Unit Level: Employed at both battalion and brigade levels

Frequency Band: E- band, 2.6 GHz

Sweep Rate (rpm): 15

Effective Range (km): >150

Effective Altitude (km): 30

Track Targets on Move: No

Emplacement Time (min): INA

Displacement Time (min): INA

Associated SAMs: SA-4/GANEF, SA-6/GAINFUL, SA-8/GECKO

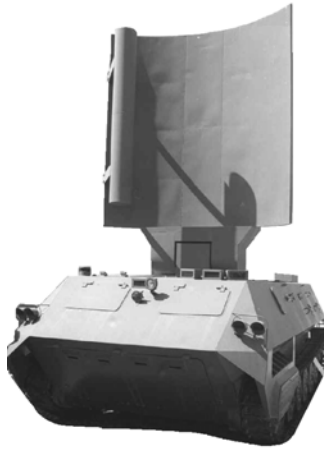
VARIANTS

Polish **Jawor** (circa 1965) and Polish **Farm Gate** (Truck mounted).

Exports: Restricted outside of former Warsaw Pact.

NOTES None

Russian SAM Radar System TUBE ARM



SYSTEM Alternative Designation: INA Date of Introduction: Circa 1983 Description: Eighteen foot high cut parabolic cylindrical antenna that is track vehicle mounted. Functions: Acquisition and surveillance Chassis: MT-LBu tracked vehicle Mobility: On/off road capable mobility is very good. Associated SAMs: SA-11 GADFLY ADA Unit Level: Employed at both battalion and brigade levels Frequency Band: H/I bands	Sweep Rate: INA Effective Range (km): INA Effective Altitude (km): INA Track Targets on Move: INA Emplacement Time (min): INA Displacement Time (min): INA VARIANTS None known Exports: None known due to problems with entire SA-11 system. Follow-on/Replacement systems: 9S18M1 "SNOWDRIFT"
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NOTES

This radar was originally developed for the SA-11/GADFLY. As a result of problems with the TUBE ARM surveillance radar, the 9S18M1 SNOWDRIFT radar was developed to replace it.

Swedish SAM Radar System Giraffe



SYSTEM

Alternative Designations: See Variants

Date of Introduction: 1992

Proliferation: Various configurations in at least 18 countries

Description: Radar has a broadband fully coherent travelling-wave-tube (TWT) transmitter, and a vertically polarized parabolic reflector antenna lifted on an elevating arm. Hydraulic elevating arm height is 13m, 7m for Giraffe 50AT and HARD.

Crew: INA

Chassis: The most mobile systems are Giraffe 50AT and Hard, on a Swedish Haggglunds Bv208 All Terrain Tracked Carrier, with an articulated chassis. It is a diesel-engined variant of Bv206.

Data for Giraffe 50AT chassis (Bv208)

Weight (kg): 6.34, INA with arm

Length (m): 6.9, INA with arm

Width (m): 1.9

Height (m): 2.4 for chassis, INA with arm

Engine Type: 125-hp Mercedes Benz OM Diesel

Cruising Range (km): 330

Max. Road Speed (km/h): 50

Mobility: Off road mobility is very good on tracked chassis, off-road speed is slightly reduced due to arm.

Fording Depth (m): Amphibious; however, arm may affect it.

Emplacement Time (min): INA

Displacement Time (min): INA

Associated AD systems: RBS70, RBS90, RBS 23/BAMSE, Stinger, Rapier, Mistral, AA guns, and any other air defense systems with compatible C² networks.

ADA Unit Level: Employed to support short-range and medium-range firing units and air defense and coastal defense networks.

RADAR CAPABILITY

Functions: Early warning, surveillance, acquisition and tracking, and for combat control center

Features: Radar is designed to operate in a ground clutter and ECM environment. The signal processor uses digital MTI doppler processing, with current ECCM, such as automatic jumps to avoid jammed frequencies, and extracts jammer bearings from display. Radar has automatic target detection and tracking.

Specifications:

Frequency Band: G-band, except for HARD (H/I-band)

Sweep Rate (rpm): Antenna rotates 60 rpm.

Effective Range (km): Number in name denotes range in km. Thus, Giraffe 50AT range is 50 km.

Resolution 0.1 sq m target (km): 20-25

Effective Altitude (km): Low flying targets, up to 12 (depending on target resolution and aspect)

Track Targets on Move: No

VARIANTS

Giraffe (PS-70/R): Original system for use with RBS70, with 40 km surveillance, 20 km target designation range.

Giraffe 40: Truck-mounted system for AA guns and MANPADS support nets.

Giraffe 50: System featured above, with reduced detection and reaction time, and better clutter resistance.

Giraffe 75 (PS-90): Truck-mounted medium-range system, which can control up to 20 fire units.

Giraffe 100: Truck-mounted long-range variant employs the Sea Giraffe 150 radar.

Coastal Giraffe: Coastal defense variant.

Giraffe AD: Medium-range variant focused on ECCM and C².

Giraffe CS: Short-range and coast defense variant.

HARD (PS-91): Short-range variant on Bv-208 chassis. The H/I-band operating frequencies provide low probability of intercept (LPI).

NOTES

It can be mounted in various vehicle configurations, such as tracked vehicle, wheeled APC, or truck, and can be ship-mounted. Fixed site versions are also available.

The radar net can alert the missile firer and assign sector on a plotting board within the sight unit for RBS-70 and RBS-90 MANPADS.

Chapter 8

Engineer and Logistics

This chapter provides the basic characteristics of selected *engineer equipment* and *logistics vehicles*. *Engineer equipment* covers, in order, obstacle- and route-clearing vehicles, mine-laying systems, and mineclearing systems. It does not include engineer equipment designed primarily for civil engineering or construction in the rear areas. Also not included is dredging and gap crossing equipment. Data sheets addressing some of these systems will be sent with the next supplement to this guide.

The second category—*logistics vehicles*, provides the basic characteristics of selected trucks readily available to the OPFOR. It includes a representative vehicle from the light, utility, medium, and heavy truck categories. Later updates of this guide will include data on a wider selection of trucks, trailers, vans and other logistical equipment.

Questions and comments on data listed in this chapter should be addressed to:

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Land Mine Primer

The widespread use of landmines on today's battlefields results from a combination of mass production, plastic mines, improved battlefield delivery systems, and development of sophisticated fuzing. Advances in mass-production techniques and the associated reduction in per-item cost along with its simplicity of manufacture and automated production make landmines extremely attractive for terrain denial. Another technological improvement affecting landmines is the widespread use of plastic. Metal detectors are ineffective for locating plastic-cased mines unless the manufacture intentionally places a mass of metal in the mine. Remotely delivered mines have expanded capability for changing the tempo of battle. Development of various fuze arming and triggering options have increased mine usefulness in warfare.

1. Types of Minefields. The five basic types of OPFOR minefields are antitank (AT), antipersonnel (AP), mixed, decoy, and antilanding. AT minefields are the primary type of OPFOR engineer obstacle and serve to destroy or disable armored vehicles. They are primarily established in belts consisting of multiple rows on avenues that are favorable for tanks in front of the forward edge and on the flanks. Where difficult terrain is available, minefield belts will be tied into terrain obstacles to reduce the mine requirement. The OPFOR sets up conventional AP minefields on the forward edge of friendly defensive positions, in front of AT minefields, or along dismounted avenues of approach. Mixed minefields consist of both AP and AT mines. Decoy minefields are a significant form of deception to slow movement or deceive as to true unit locations. Antilanding minefields prevent landings by amphibious, airborne, or heliborne assault forces.

Minefields can also be categorized by their technical method of activation—uncontrolled, controlled, and intelligent minefields. Controlled minefields consist of landmines with electronic switches giving the operator (controller) control over the operational status of the minefield. The operator can change the status of the landmines either by a direct hardwire link or by radio. An entire minefield can be emplaced and turned on or off, as necessary to best support friendly operations. On a smaller scale, select passages in a conventional minefield can contain controllable landmines, allowing for the option of clearing safe lanes for friendly use. The addition of selectable anti-removal and self-destruct features to controlled mines enhances flexibility and overall effectiveness.

Intelligent minefields are far-term concepts, with no foreign systems projected for fielding prior to 2008. They are still in the developmental stage and will have all the advantages of controlled landmines but also will use two-way communications. They will be composed of "wide area coverage" mines.

2. Types of Mines. Mines may be AT/anti-vehicle, AP, antihelicopter, or area mines. They may also be defined by the manner in which they are emplaced such as scatterable (remote), or side-attack (generally AT or anti-vehicle) or their area coverage. As noted earlier for minefields, the OPFOR makes distinctions between controlled mines (command-operated by hard wire or radio linkage) and uncontrolled mines.

a. Antitank. Conventional antitank mines, such as the TM-62 AT mine, are those that are emplaced either by hand or by mechanical means. These will continue to be the primary landmine threat throughout the foreseeable future. They are readily available to armies and insurgency groups worldwide and are cheap and effective. These mines are normally buried just below the surface of the ground but can be surface laid or buried with up to 30 cm of cover.

Antitank mines can vary in size from as small as 1.4 kg for a scatterable mine (PTM-1S) to over 20 kg for a side attack mine (TM-83). The category of antitank mines includes side-attack and anti-vehicle mines.

(1). Side-attack. Commonly called “off-route mines”, side-attack mines are an integral part of the adaptive battlefield and date back to the LGM trip-wire AT mines of the Vietnam War era. Today there are at least 18 different side-attack mines in use by 22 countries. Ten more side-attack mines are under development. Within the next few years these weapons will have proliferated to every combat environment.

Side-attack mines are autonomous weapons that attack vehicles from the side as the vehicles pass by. Current developments in side-attack landmines use mature technology from other weapon programs. For example, a shoulder-fired AT weapon placed on a tripod and fitted with an IR sensor can kill moving targets up to 100 meters away. Current warhead technology in these weapons can allow penetration of up to 950 mm of rolled homogeneous armor. Since side-attack landmines have increased areas of coverage, the number required to hinder mobility of enemy forces is greatly reduced. Uses for these landmines include harassment throughout the area of operation and reinforcement of conventional minefields to make "cleared" lanes unsafe. SOF and security patrols can also use these mines to economically cover multiple avenues of approach, alert on enemy encroachments, and trigger time-sensitive kill zones.

(2). Anti-vehicle. Many smaller antitank mines, or larger antipersonnel mines, have been developed (or modified) to severely damage or destroy vehicles other than tanks with a few pound of high explosives or fragmentation. These may be either trucks or lightly armored combat support vehicles such as BTRs.

b. Antipersonnel. On the battlefield, the modern AP mine is used to:

- Inflict personnel casualties.
- Hinder soldiers in clearing AT minefields.
- Establish defensive positions.
- Deny access to terrain.

Antipersonnel landmines injure by either blast or fragmentation. The small antipersonnel mine contains no more than a pound (usually only a few ounces) of high explosive. Blast injures by the force of the charge. The loss of a foot or a leg is the common result. Fragmentation mines contain hundreds to thousands of pellets. Plastic-cased landmines pepper their victims with small particles of plastic that are not detectable with x-rays, making complete cleansing of wounds extremely difficult and increasing the risk of infection and amputation.

c. Antihelicopter. The modern attack helicopter, with increasing agility and weapons payload, is able to bring enormous firepower to bear on enemy forces. To counter this threat, a new type of mine—the antihelicopter mine—is being developed. By borrowing technologies from the side-attack and wide-area landmines, antihelicopter mines may make use of acoustic fuzing to locate and target potential low-flying targets at significant distances. Their multiple-fragment warheads are more than capable of destroying light-skinned, nonarmored targets at closer ranges.

A simple antihelicopter mine can be assembled from an acoustic sensor, a triggering IR sensor, and a large directional fragmentation mine. More advanced mines use a fairly sophisticated data processing system to track the helicopter, aim the ground launch platform, and guide fire the kill mechanism toward the target. As the helicopter nears the mines, the acoustic sensor activates or cues an IR or MMW sensor. This second sensor initiates the mine when the helicopter enters the lethal zone of the mine. A typical large fragmentation warhead is sufficient to damage soft targets, such as aircraft. Alternate warhead designs include high-explosive warheads and single or multiple explosively formed penetrators.

d. Area Coverage. The terms “area” and “wide area” mines are often confusing and misleading. Mines classified as area mines range from antipersonnel “bouncing Betty” mines to side-attack mines, directional fragmentation mines “claymores”, and possibly antihelicopter mines. Wide area coverage mines with sophisticated fuzing and possibly a limited communications capability are weapons of the future and have not been fielded.

3. Emplacement or Delivery Methods. In the past landmines generally were placed manually one at a time. Mass mine delivery and distribution systems permit the rapid placement of large quantities of mines. Landmine emplacement vehicles are designed to automatically arm and bury a landmine every 3-10 meters. Landmines also may be placed with artillery, rockets, or aircraft at a rate of hundreds, even thousands, of mines per minutes.

Emplacement means may be manual, mechanical, or remote. Manual emplacement is not possible when there is little time or during high-speed maneuver operations. Therefore, mechanical and remote means are more prevalent.

a. Manual. The OPFOR manually emplaces minefields when—

- There is no contact with the enemy.
- Mechanical minelayers are unavailable.
- It is inadvisable to use mechanical minelayer because of terrain restrictions.

b. Mechanical. OPFOR engineers rely extensively on mechanized minelayers. These can bury or surface-lay AT mines. The layout of mechanically emplaced minefields is the same as those emplaced by hand. Mines can also be emplaced by helicopters or vehicles with the use of chutes (slides). Mine chutes can also be used to assist manual burial emplacement or to surface-lay mines.

c. Scatterable Mines. The US calls them “scatterable mines”, other countries call them “remotely-delivered”. Whatever you chose to call them they are landmines, laid without regard to classical patterns, which are designed to be delivered by aircraft, tube artillery, multiple rocket launchers, missiles, ground vehicles, or they can be hand-thrown. Scatterable mines are not a standard item except in well-equipped armies of the world. While the number of countries possessing scatterable mines continue to increase, there will continue to be many areas of the world where scatterable mines are not a threat through the far term.

Minefield emplacement is progressing from manually and mechanically emplaced minefields to the more flexible and dynamic remotely, scatterable minefield. The ability to remotely deliver mines allows a rapid response with thousands of landmines at any point on the battlefield. Since many scatterable landmines feature self-destruct and antidisturbance fuzing, they are well suited for operations that deny terrain for a specific period. After the allotted time has expired, the terrain can once again be used by friendly forces. Scatterable mines may be delivered by the following methods.

(1) Artillery. Multiple rocket launchers are the primary means of remote minelaying. The principal advantage of MRL mine delivery is its ability to quickly emplace large minefields in a single volley, while minimizing exposure to enemy targeting and weapon systems. Both AP and AT mines can be delivered by artillery (which may include cannon and mortar rounds).

(2) Ground Vehicles. Within recent years the trend has been to mount scatterable-mine dispensers on ground vehicles. Both AP and AT mines can be launched from ground vehicles. This also gives the engineers the ability to re-seed or reinforce an obstacle without entering the minefield itself.

(3) Infantry. Lower level OPFOR infantry units may employ man-portable remote mine dispensers. These man-portable dispensers, weighing only a few pounds, are ideal for installing small, defensive, AP or AT minefields. Infantry-fired ground dispensers allow low-level units to remotely emplace minefields to protect their fighting positions, flanks, and boundaries between units, or to cover firing lines and gaps in combat formations. They can quickly close breaches in existing protective minefields and increase the density of mines on armor avenues of approach.

(4) Aerial. Both AT and AP minefields can be laid using aerial minelaying systems. Bombers and fighter-bombers can lay remotely delivered minefields in the operational depths. Ground-attack aircraft lay these minefields in the enemy’s tactical depths.

Helicopter minelaying systems are used to emplace small mine belts or large barrier minefields in the execution of army or division offensive or defensive maneuver plans. This type of aerial minelaying is normally conducted over friendly territory—along flanks or in rear areas. When supporting an airborne or air assault landing, helicopters may lay mines on enemy territory. Helicopter mine chutes are a tool available to even low-technology helicopter forces for installation on a variety of helicopters by low echelon maintenance units and rapidly dispensing conventional anti-tank mines in areas inaccessible to even rapidly moving ground vehicles.

Placement of a limited number of side-attack or conventional AT/AP mines along likely movement routes allows the OPFOR to harrass traffic, slow movement rates, cause casualties, and affect enemy morale.

4. Fuzes. Some types of fuzes, such as pressure fuzes, are used in both AT and AP mines while other fuzes tend to be linked more to specific types of mines. For example, acoustic sensors are generally used with antihelicopter and advanced off-route mines while magnetic, tilt-rod, or seismic fuzes are used with AT mines. Most AT mines are detonated by the pressure of a vehicle driving over a buried mine or by the movement of a tilt rod attached to the mine. Pressure and tilt-rod AT mine fuzes are being replaced or complemented by mines with magnetic, optical, seismic, and acoustic influence mines.

Some mines have a second fuze well to facilitate the installation of a anti-handling fuze. Conventional antihandling devices and target-sensing fuzes have evolved into sophisticated booby traps, which virtually assure grievous injury or death to the deminer. Some landmines may be detonated by metal detectors; others explode when their fuzes detect light when lifted from the ground. One version of the “Bouncing Betty” is activated by an array of seismic detectors.

Other mines, for example the US M18A1, will accommodate a variety of fuzes, including tripwire and command detonation. Other mines, especially antihelicopter mines use a combination of sensors/fuzes to acquire the helicopter and initiate the mine when the helicopter enters the lethal zone.

a. Pressure. The pressure fuze is the most common type of fuzes for both AT and AP mines. It may require only a few ounces pressure to active the mine or as much as several hundred pounds.

b. Trip Wire. Also called pressure release, these fuzes may be attached to a thin wire stretched across a path or route. When the victim or vehicle passes and breaks the wire, the mine is detonated. Trip wires are used mainly with AP and side-attack mines.

c. Magnetic. Most armored vehicles contain a large quantity of steel and therefore create large magnetic disturbances that signal their presence to a magnetic influence fuzed landmine.

d. Optical. An optical fuze, using a small infrared or ultra-violet transmitting diode on a surface-placed landmine, sends a detonation signal with it senses light reflecting from the hull of a tank.

e. Radar. A small micro-electronic radar can sense the underside of a tank by the magnitude and location of the radar reflection.

f. Seismic. Mines can be equipped with sensors that detect the vibrations caused by the weight and track movement of tanks or by the noise they make.

g. Acoustic. When a system approaches, antihelicopter or advanced off-route mines use an acoustic sensor to activate or cue an IR, seismic, or MMW sensor.

h. Infrared. IR sensors are generally used against vehicles, ground and aerial.

Mines the US soldier is "most likely to encounter" on the adaptive battlefield

Anti-Tank Mines

Name	Country of Manufacture	Number of User Countries	Emplacement Method	Armor Penetration (mm)/ Kill Mechanism	Effective Range (meter)	Detectability/ Composition	Anti-Handling	Fuze Type/ Self Neutralize	Explosive Type & Weight/Total Weight (kg)	Comment
Scatterable										
PTM-3	FSU	12+	remote-surface: UMZ, helicopter, PKM portable	70 mm: penetrates tank belly & destroys running gear		visual mine detectors cause detonation plastic	yes	proximity, magnetic self-destruct: yes-16 to 24 hrs	TG-40: 1.8 kg Total: 5 kg	
PTM-1S/ PGMDM	FSU	17+	remote-surface: UMZ, MRL, aircraft, PKM portable	track breaker on contact/ blast	1	visual plastic	no	contact, pressure neutralize: yes-0 to 24 hrs	PVV-12S liquid plastic: 1.4 kg	similar to German AT-1
Manual, Mechanical, and Chute Emplaced										
TM-62M/ P/B/D	FSU Poland Bulgaria	30+	manual mechanical chute	27 RHAE blast	1	varies: M: metal-easy P: plastic B: caseless D: wood	Not built in	pressure (200 kg) magnetic seismic	Trotyl, RDX & aluminum/7 kg Total: 8.5 kg	
TM-57	FSU Bulgaria China Iraq	29+	manual mechanical chute	blast	1	easy sheet metal	yes	pressure (00/2.5/5-6 kg) delay-armed, tilt rod, pull (booby trap) neutralize: no	TNT or TGA 60/24/16: 6.0 kg Total: 8.47 kg	
TM-46/ TMN-46	FSU Germany Bulgaria Egypt (M/71) Israel (No. 6)	28+	manual mechanical	blast	1	easy sheet metal	TMN-46 yes	pressure (180/132 kg), tilt rod neutralize: no	TNT, amatol/5.7 kg Total: 2.9 kg	
PT-Mi-Ba-III	Czech	17 + terrorist groups	manual mechanical chute	blast defeats known belly armor	1	plastic/bakelite (metal in fuze only-2.9 gr)	yes with RO-4 fuze	pressure (200 kg) self-destruct or neutral: no	TNT/7.2 kg Total: 9.9	
Mk 7	United Kingdom	16+	manual	blast	1	easy metal	yes	pressure (150 kg), tilt rod available	TNT/8.9 kg Total: 13.6	
TMD-B	FSU Namibia	16+	manual	blast	1	difficult with hand held detectors - wood	possible	pressure (200-500 kg) self-destruct or neutral: no	TNT/9.0 kg Total: 9.7	
TMA-3	Former Yugoslavia	13	manual mechanical	blast	1	very difficult with hand held detectors plastic coating	yes	pressure (180 kg) self-destruct or neutral: no	cast TNT/6.5 Total: 7.0	

Anti-Tank Mines (continued)

Name	Country of Manufacture	Number of User Countries	Emplacement Method	Armor Penetration (mm)/ Kill Mechanism	Effective Range (m)	Detectability/ Composition	Anti-Handling	Fuze Type/ Self Neutralize	Explosive Type & Weight/Total Weight (kg)	Comment
M19	US Chile Iran South Korea Turkey	13	manual	blast	1	difficult with hand held detectors plastic	yes	pressure (182 kg)	COMP B/9.53 kg Total: 12.56	
TMK-2	FSU	13+	manual	250 RHA belly attack plate charge	1	easy metal	possible	tilt rod (8-12 kg) self-destruct or neutral: no	TG-50, TNT Total: 12.5	
PRB M3/ A	Belgium	12	manual	blast	1	very difficult with hand held detectors plastic	yes	pressure (250 kg)	RDX/TNT 6.5 Total: 6.8	
Side-Attack (Antitank and Anti-vehicle) Mines										
Name	Country of Manufacture	Number of User Countries	Emplacement Method	Armor Penetration (mm)/ Kill Mechanism	Effective Range (meter)	Detectability/ Composition	Anti-Handling	Fuze Type/ Self Neutralize	Explosive Type & Weight/Total Weight (kg)	Comment
TM-83	FSU	13+	manual	100 RHA EFP	50	visual case metal	possible	IR & seismic, or breakwire	explosive 9.6 Total: 20.4 kg	
LMG	FSU	13+	manual	rocket propelled shaped-charge	27	visual metal	no	Tension (1 kg), trip-wire neutralize: no	TNT: 3.2 kg Total: 10 kg	
Panzer-faust	Germany	1	manual	700 rocket propelled shaped-charge	150	visual metal	no	IR & acoustic, seismic, breakwire		SIRA sensor package
MIACHAF F1	France UK (L14A1) Netherlands (NR 29)	4+	manual	70 RHA @ 40 m shaped-charge	80	visual metal	no	breakwire, command, IR influence neutralize: no	Hexolite: 7 kg Total: 12 kg	
PARM 1 (DM-12)	Austria Germany UK Sweden Finland	5+	manual	600 rocket propelled shaped-charge	40	visual metal	no	neutralize: 20, 40, 60 days	Total: 10 kg	
PK Mi-PK	Czech	1+	manual	50 RHA 5-EFPs	30	visual metal	possible	contact wire	explosive: 5.5 Total: 12	

Anti-Personnel Mines

Name	Country of Manufacture	Number of User Countries	Emplacement Method	Kill Mechanism	Effective Range (m)	Detectability/Composition	Anti-Handling	Fuze Type/ Self Neutralize	Explosive Type & Weight/Total Weight (kg)	Comments
Scatterable										
PFM-1S	FSU	12+	remote-surface (UMZ, MRL, helicopter, PKM portable)	blast	1	visual plastic	no	pressure (5 kg) Self-destruct: 85% over 40 hr	liquid plastic-VS-6D: 40 g Total: 70 g	copy of US BLU-43B
POM-1S	FSU	12+	remote-surface (UMZ, helicopter, PKM portable)	fragmentation	4	visual	yes	tripwires, Self-destruct	100 g Total: 750 g	copy of US BLU-42B
POM-2S	FSU	12+	remote-surface (UMZ, helicopter, PKM portable)	fragmentation	16	visual, readily	no	tripwires (.2 kg) Self-destruct: 4 to 100 hr	TNT: .14 kg Total: 1.6 kg	
Manual, Mechanical, and Chute Emplaced										
PMN	FSU China Iraq	32+	manual chute	blast	1	readily-plastic case metal in fuze & cover	cannot be disarmed/	pressure plate-very sensitive (8-25 kg) self-neutralize: no	TNT: 237 g Total: .55 kg	most common AP mine
MON 100	FSU Bulgaria	27+	manual	directional fragmentation 400 pieces	100=width of kill zone @ 100 m= 6.5-9.5	metal case	possible but not likely	electric command, tension-release self-neutralize: no	TNT: 2 kg Total: 5 kg	also effective against lightly armored vehicles
OZM-4	FSU	26+	manual	bounding fragmentation (.6-.8 m above ground)	15	readily detectable case cast iron	possible	tripwire (2-5 kg), electrical, pressure, tension release self-neutralize: no	Total: 5 kg	
MON 200	FSU Bulgaria	25+	manual	directional fragmentation 900 pieces	200=width of kill zone @ 200 m= 10.5-14.5	visual metal case	possible but not likely	electrical, self-neutralize: no	TNT: 12 kg Total: 25 kg	also effective against lightly armored vehicles
PMD-6	FSU Namibia Serbia	24+	manual	blast	1	detectable wood metal in fuze	possible	pressure, tripwire (1 kg) self-neutralize: no	TNT: 200 g Total: .4 kg	
MON 50	FSU	23+	manual	directional fragmentation 485 pieces	width of kill zone @ 50 m=45	visual plastic case	possible	electric command, tripwire, tension, tension release self-neutralize: no	RDX: 700 g Total: 2 kg	copy of US M18A1 claymore

Antipersonnel Mines (continued)										
Name	Country of Manufacture	Number of User Countries	Emplacement Method	Kill Mechanism	Effective Range (meter)	Detectability/ Composition	Anti- Handling	Fuze Type/ Self Neutralize	Explosive Type & Weight/Total Weight (kg)	Comments
POMZ-2M	FSU China (Type 59) North Korea Germany	22+	stake mine manual	fragmentation	4	visual, detector cast iron	possible	tripwire (1 kg force)	TNT: 75 g Total: 1.77 kg	
M18A1/ Claymore	US South Korea (K440) Pakistan (P5 Mark I) Iran Chile South Africa (Shrap- nel mine No. 2) FSU (MON-50)	22+	manual	directional steel fragments	50	visual plastic case	possible	electric command, tripwire, tension, tension release	C4: 680 g Total: 1.60 kg	
M14	US India (M-14) Vietnam (MN-79 & MD 82B)	20+	manual	blast	1 contact	very difficult with hand-held detector plastic body (only metal is steel striker tip)	possible	pressure (9-16 kg)	TNT: 29 g Total: .099 kg	
Antihelicopter										
Name	Country of Manufacture	Number of User Countries	Emplacement Method	Armor Penetration (mm)/ Kill Mechanism	Effective Range (meter) Maximum /Minimum	Detectability/ Composition	Target Velocity (m/s)	Fuze Type/	Warhead Type/Total Weight (kg)	Status
AHM-200	Bulgaria	1	manual	10 @ 100 m	max 200	visual		combined acoustic & Doppler SHF	Total weight: 35 kg	in production
HELKIR	Austria	1	manual	6 @ 50 m 2 @ 150 m		visual		dual acoustic & IR	Total weight: 43 kg	in production
TEMP-20	Russia	0	manual		detection 1,000 max 200	visual	100	dual acoustic & IR	Total weight: 12 kg	development
AHM	UK	0	manual remote		200/50	visual		dual acoustic & IR	multiple EFP	development

Russian Antitank Mine TM-62M/P/B/D



SYSTEM

Alternative Designations: None

Date of Introduction: 1960

Proliferation: Over 30 countries

Description:

Shape: Circular

Color: Olive Green

Case Material: (see VARIANTS)

Length (mm): 110

Height (mm): 101.8

Diameter (mm): 320

Total Weight (kg): 8.5

DETECTABILITY

Ready: Varies. The TM-62M (metal case) is readily detectable. Other variants are much more difficult. Of the TM-62 series antitank mines and fuzes, the TM-62P (plastic) is the most difficult to detect.

EXPLOSIVE COMPOSITION

Type: Trotyl, RDX and aluminum power

Weight: 7.5 to 8.3

Booster: Yes

Type: Pentryt

Weight (gr): 0.75

FUZE

Types: Pressure, seismic, magnetic

Safety Device: Delay arming, transport clip

Name: MVCh-62 (most common)

Type: Pressure

Actuation Force (kg): 200 /150 to 550

Resistant to Explosive Neutralization: Yes

Name: VM-62Z

Type: Seismic

Name: MVZ-62

Type: INA

Name: MVN-62

Type: INA

Name: MVN-80

Type: Proximity

Name: MVP-62

Type: Proximity

PERFORMANCE

Armor Penetration (mm): 27

Effect: Blast

Effective Range (m): 1

Emplacement Method: (see NOTES)

Manual

Mechanical

Chute

Burial Depth:

Maximum: 20

Minimum: None

Techniques of Employment: (see NOTES)

Controllable (remotely detonated): Yes, may use the Russian UMP-2 Controlled AT Minefield Set

Antihandling Device: Possible, however, no secondary fuze well or AD features. A special AD (MS-3) is used under AT mines.

Self-Destruct: No

Detonation Height: N/A

Underwater Emplacement: Limited duration capabilities when used underwater.

DELIVERY PLATFORMS (examples)

Tracked minelaying vehicle GMZ/GMZ-2/3

Towed mechanical minelayer PMR-3 and PMZ-4

Helicopter (with VMP-2 minelayer)

VARIANTS

TM-62M: Metallic case

TM-62P: Plastic case

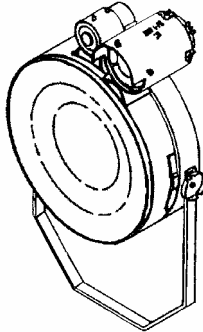
TM-62B: Caseless

TM-62D: Wooden

NOTES

TM-62 mines can be emplaced in integrated explosive barriers or in homogeneous minefields. They may be employed singly or in groups as part of an explosive antitank barrier. TM-62 mines are placed in accordance with former Soviet doctrine, which dictates a normal density of one mine per meter of front.

Russian Side-attack Antitank Mine TM-83



SYSTEM Alternative Designations: None Date of Introduction: INA Proliferation: At least 13 countries Description: Shape: Cylinder Color: Olive green Case Material: Metal Length (mm): INA Height (mm): 400 Diameter (mm): 250 Total Weight (kg): 20.4 DETECTABILITY Ready: Visual EXPLOSIVE COMPOSITION Type: TG40/60 Weight (kg): 9.6 Booster: INA	PERFORMANCE Armor Penetration (mm): 100 Effect: EFP, side-attack Effective Range (m): 50 Emplacement Method: Manual Controllable (remotely detonated): Yes, (100-m cable) Antihandling Device: Possible Self Destruct: 30 days VARIANTS None FUZE Types: 2-color IR sensor , seismic, or MVZ-7 breakwire Number of Fuze Wells: 1 Actuation Force (kg): N/A Resistant to Explosive Neutralization: Yes
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NOTES

The TM-83 is a high-explosive antitank mine. It is basically a plate charge mounted on a stand. The mine uses seismic sensors to identify approaching targets and to turn on the dual IR sensor. When a valid target passes into the field of view of the sensor, the warhead is fired. The plate is formed into a slug which is propelled by the explosive, destroying the target. The seismic sensor is stored on the back of the mine and is connected by an electronic cable. It can also be fired electronically. The mine may be mounted on a tripod, the storage box, or tree, etc.

Austrian Antihelicopter Mine HELKIR



SYSTEM

Alternative Designations: None
Date of Introduction: In current production
Proliferation: At least 1
Description:
 Shape: Rectangular
 Color: Green
 Case Material: Metal
 Length (mm): INA
 Height (mm): INA
 Diameter (mm): INA
 Total Weight (kg): 43

DETECTABILITY

Ready: Visual

EXPLOSIVE COMPOSITION

Type: INA
Weight: 20

FUZE/SENSOR

Types: Dual, acoustic, and IR
Number of Fuze Wells: INA
Resistant to Explosive Neutralization: Yes

PERFORMANCE

Armor Penetration (mm): 6 @ 50 m or 2 @ 150 m
Effect: Directed fragmentation
Effective Range (m): 150
Target Speed (km/h): 250
Emplacement Method: Manual
Controllable (remotely detonated): Yes
Antihandling Device: Yes
Self-Destruct: INA

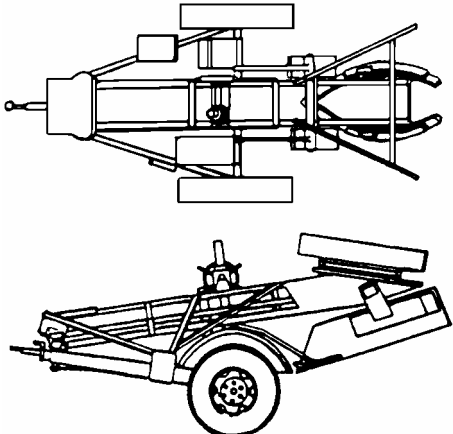
VARIANTS

None

NOTES

The HELKIR antihelicopter mine is designed to engage nap-of-the-earth targets. The sensor is a dual acoustic-IR. The acoustic sensor listens for a valid noise input and turns on the IR sensor. The IR sensor is located coaxially to the warhead. When a hot IR signature is detected, the warhead is functioned.

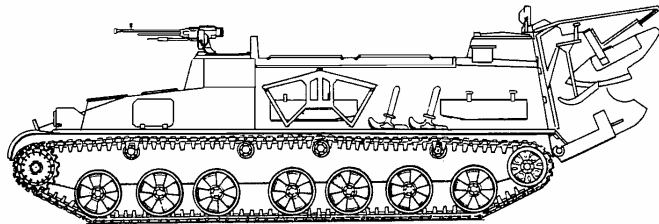
Russian Towed Mechanical Minelayer PMR-3

	Mine Types Mines TM-44 TM-46 TM-57 TM-62 Series TM-72 TMD-B	Typical Combat Load (varies, see Prime Mover)
SYSTEM Alternative Designations: INA Date Of Introduction: INA Proliferation: At least 17 countries Description: Crew: 6 (commander, driver, four operators) Weight (mt): 1.3 Length (m): 5.6 Height (m): 2.7 Width (m): 2 Prime Mover: 6x6 ZIL-131 truck (200 mines) or 4x4 URAL-375D (350 mines) or BTR-152 (120 mines)	MINELAYING EQUIPMENT Operating Speed (km/h): Burying: 2 to 3 Surface Laying: 4 to 10 In Snow: INA Minelaying Rate (min): 10 to 12 Minelaying Pattern: Straight line Mine Spacing (m): 3 to 4 Mine Capacity: Prime-mover dependent Max Burial Depth (cm): 20 VARIANTS PMZ-4: Lays controlled minefields; uses the same mines as the PMR-3 with the exception of the controllable minefield and cable-laying options; uses the UMP-2 Controlled AT Minefield Set	

NOTES

The PMR-3, shown above, (and the similar PMZ-4) consists of a single chute and a plow attachment. Although both systems look similar at first glance, there are significant differences. Most notably, is the addition of a cable layer on the PMZ-4, used for the laying controlled minefields and the absence of the conveyer-belt chain drive on the wheels. Additionally, the PMZ-4 is more automated and must be hand loaded only. The towed-minelayers are used in sections of three or four and operate 20 to 40 meters apart with each minelayer laying a straight-line row. The mines in different rows are staggered with the distance between mines depending on whether the mines are pressure-initiated or full-width attack (influenced or tiltrod fused).

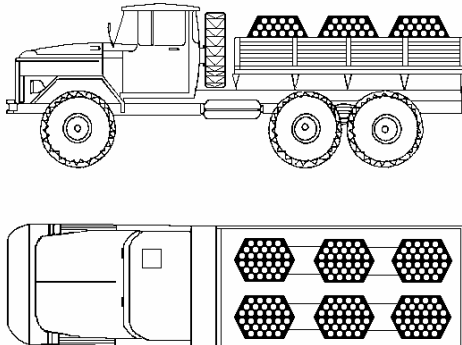
Russian Tracked Minelaying Vehicle GMZ-3

	<table><tr><th>Mine Types</th><th>Typical Combat Load</th></tr><tr><td>Mines TM-57 w/fuze MVZ-57 TM-62 series w/fuzes TM-46 TMD-B MV4-62 MVP-62 & w/prox fuze MVN-80</td><td>208</td></tr><tr><td>7.62-mm PKT MG</td><td>3,000</td></tr></table>	Mine Types	Typical Combat Load	Mines TM-57 w/fuze MVZ-57 TM-62 series w/fuzes TM-46 TMD-B MV4-62 MVP-62 & w/prox fuze MVN-80	208	7.62-mm PKT MG	3,000
Mine Types	Typical Combat Load						
Mines TM-57 w/fuze MVZ-57 TM-62 series w/fuzes TM-46 TMD-B MV4-62 MVP-62 & w/prox fuze MVN-80	208						
7.62-mm PKT MG	3,000						
SYSTEM Alternative Designations: INA Date of Introduction: GMZ series-1963 Proliferation: Former Soviet Union Description: Crew: 3 (see NOTES) Chassis: Based on the SA-4 (GANEF) SAM Weight (mt): 28.5 Length (m): 8.62 Height (m): 2.7 Width (m): 3.25 Ground Clearance (mm): 470 Gradient (°): 30 Fording Depth (m): 1 Vertical Step (m): .7 AUTOMOTIVE Engine: 4 cyl, 513 hp, multi-fuel diesel Cruising Range (km): 500 Speed (km/h): On Road: 60 Off Road: 30 Fuel Capacity (liters): INA Night Driving Equipment: Yes, TVNE-4B for the driver and K-3A for the vehicle commander (and PKT) Navigation Equipment: (see NOTES) Radio: R-123 NBC Protection System: Yes Smoke Screening System: VEES, plus 6 81-mm launchers, 3 on each side.	MINELAYING EQUIPMENT Operating Speed (km/h): Burying: 6 Surface Laying: 16 In Snow: 10 Minelaying Pattern: Straight line or staggered Mine Spacing (m): 5 and 10 Burial Depth (mm): Ground: 120 Snow: 500 Length of Single-row Minefield (m): Percussion Fuzes: 1,000 Proximity Fuzes: 2,000 Mine Capacity: 208 Mine Weight (kg): up to 12 Time Required to Load Minelayer with One Basic Mine Load (min) (7 men): 15 to 20 Men required to Load Minelayer with Mines: 7 (squad) Time Required to Load Minelayer with Crew Only (m): 60 Time from Travel to Operating Position (min): Automatic: Up to 2 Manual: Up to 8 ARMAMENT Some GMZ may be armed with either the 12.7 or the 14.5 machineguns. Main Armament: Caliber, Type, Name: 7.62-mm PKT MG Mount Type: Cupola (GMZ-3) Max Effective Range (m): Day: 2,000 Night: INA Fire on Move: Yes Rate of Fire (rd/min): Practical: 250 Cyclic: 650 VARIANTS GMZ: (shown above) GMZ-2: (see NOTES)						

NOTES

The crew of the GMZ-3 consists of three people—the vehicle commander, driver-mechanic, and the minelayer operator. The commander and driver are located in the forward section while the operator compartment is located in the rear portion of the vehicle. The vehicle commander operates the 7.62-mm PKT machinegun. The GMZ-3 has a digital navigation system allowing precise topographic tie-in of the minefield being laid. The previous model minelayer (GMZ-2) was not designed for the employment of mines with proximity fuzes.

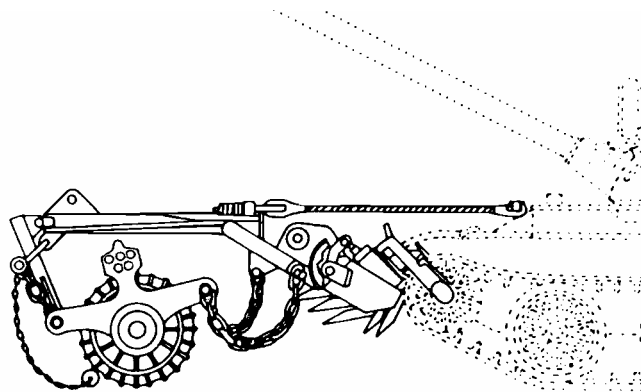
Russian Scatterable Minelaying System UMZ

	Mine Types Mines PFM-1 PFM-1/S POM-1 (S) POM-2S PTM-1S (PGMDM) PTM-3	Typical Combat Load (varies with type of mine—see below)
SYSTEM Alternative Designations: Multipurpose Minelayer Date of Introduction: INA Proliferation: Former Soviet Union Description: Crew: 2 (driver and operator) Chassis: ZIL-131 Truck (see VARIANTS) Weight (mt): Without Mine Load: 8.3 With Mine Load: 10 Length (m): 7.1 Height (m): 2.5 Width (m): 3 Ground Clearance (mm): 330 AUTOMOTIVE Engine: V8, 150 hp, gas Cooling: Water Cruising Range (km): 525 Speed (km/h): 80 Gradient (°): 30 Fording Depth (m): 1.4 Vertical Step (m): .53 Night Vision Equipment: Yes, PNV-57E Navigation Equipment: INA Radio: R-159	MINELAYING EQUIPMENT Operating Speed (km/h): 10 to 40 Distance Mines Launched from Vehicle (m): 30-60 Minefield (m): Length: 1,000 to 1,200 Depth: 30 to 120 Max Length of Minefield with One Basic Load (m): AP, PFM-1S: 3,200 AP, POM-2: 5,000 AT, PTM-3: 600 Length of Triple-Row Minefield (m): 150 to 1,500 depending on mine type Mine Capacity: From 180 to 11,520 depending on the type of mine Number of Mines in One Basic Load: AP, PFM-1S: 11,520 AP, POM-2: 720 AT, PTM-3: 180 Time Required to Load Minelayer (hr) (2 men): 1.5 to 2 Time from Travel to Operating Position (min): 5 VARIANTS Although primarily mounted on the ZIL-131, the UMZ minelaying system has been observed mounted on several different carriers such as a modified MTLB-U chassis or on a PT-S tracked amphibious personnel carrier.	

NOTES

While the UMZ, scatterable, mine system has been disclosed as the likely replacement for the GMZ-series, mechanical mineplanters, it probably will supplement the role formerly held by the GMZ. The UMZ consists of three launchers mounted on each side of the vehicle for a total of six mine launchers per vehicle. Each full turn launcher is hexagonally shaped and contains 30 launch tubes totaling 180. It can fire the mines to one or both sides, or to the rear. Both AP and AT mines are launched from the 140-mm launch tubes. The UMZ uses the same mine canisters as the PKM system. Depending on the position of the launch tubes, one-, two-, or three-lane mine fields can be laid.

Russian Tank-Mounted Mineclearing Roller-Plow KMT-5



SYSTEM

Alternative Designations: INA
Date of Introduction: 1960s
Proliferation: At least 20 countries

Description:

Weight Total (kg): 7,500
Roller Section: 2,265
Plough: 420
Length (m): 3.2
Width (m): 4
Ditch Crossing (m): 2.5

System Components: Two plows (KMT-4) and two sets of three rollers

MINECLEARING EQUIPMENT

Type: Roller and plow
Platform: Mounted on T-54, T-55, T-62, other medium tanks
Form: 3 rollers x 2
Number of Rollers Per Set: 2
Total Number of Rollers: 6
Mine Removal Speed (km/h): 8-12
Cleared Lane Width, each (mm): 810 x 2
Mineclearing Track Width (mm): 810
Installation Time (min): 30 to 45

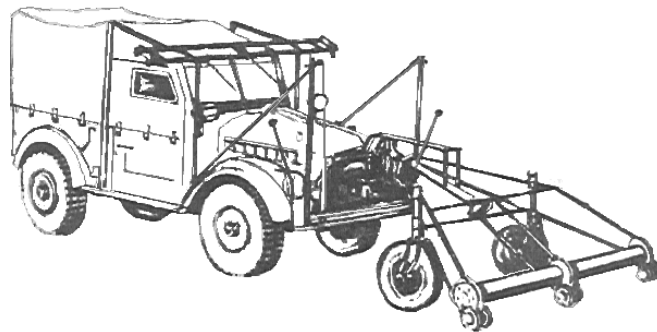
NOTES

The KMT-5M mine roller-plow is very flexible, since it allows for either the plows or the rollers to be used. The rollers function satisfactorily against mines equipped with simple pressure fuzes, but other mines will defeat this equipment. However, the roller-plow combination also allows the tank to counter more sophisticated fuzes with plows designed to uncover or push mines aside. The plows and rollers cannot work simultaneously.

The KMT-5M also includes a luminous lane-marking device for night operations. Because plows and rollers do not clear the area between them a "dogbone" or light chain with rollers is stretched between the roller sections to defeat tilt-rod mines. Quick disconnects allow the operator to drop either plows or rollers or both; otherwise, the crew can remove the system in 8 to 13 minutes. All current medium tanks have fittings for attaching mineclearing equipment.

There is one plow per tank platoon and one roller per company. For tanks newer than the T-55/62 the plows are no longer carried in the engineer company, but are permanently mounted on the tank. Therefore the engineers need only to transport the rollers. One KrAZ-255B truck (with KM-61 crane) or two ZIL-131 trucks can carry one KMT-5M.

Russian Vehicle-Mounted Mine Detector DIM



SYSTEM

Alternative Designations: None

Date Of Introduction: Pre-1975

Proliferation: Widespread

Description:

Crew: 2

Prime Mover: UAZ-469/69 or other light 4x4 vehicles

Components:

- Detection system
- Pneumatic system
- Electronic system

CAPABILITIES

Operating (scan) Speed (km/h): 10

Mounting/dismounting Time (min): Up to 7

Detection Ability: Can detect metallic mines in roadways, airfields, and other flat terrain.

Max Detection Depth (cm): 25

Max Detection Depth While Fording (cm): 70

VARIANTS

None

NOTES

The DIM is a large pulse-induction mine-detection device mounted to a light 4x4 truck. The detection element fastens to a frame on the front of the vehicle. When a mine is detected, the vehicle breaking system is engaged and the clutch is disengaged. The full-width detection head, located 2.6 meters from the vehicle's front wheels to provide stopping distance, is divided into six components to pinpoint mine location. The electronic system also displays which component of the mine-detector head the mine is under. It also has attached rollers so that the head does not come in contact with ground objects. Cross-country capability is very limited, therefore the DIM is generally used for clearing prepared surfaces. The detection equipment swings upward to ride on the top of the vehicle cab for traveling. When needed it is swung forward to rest on two wheels.

Explosive Charge Minefield Breaching Systems

Minefield breaching explosive line charge systems are in use throughout the world. They provide the maneuver commander a method to expeditiously breach antitank or antipersonnel minefields. Once identified on the battlefield however, these systems generally become the priority target. Some systems, single or double line, are mounted on tanks while others are mounted on trailers, armored vehicles, and trucks. Some other systems are man-portable. The larger vehicle-, and trailer- mounted systems are designed to clear lanes through minefields/obstacles, large enough for the passage of ground combat vehicles. Man-portable (infantry) systems clear passage for at least one person to transit. The explosive filled lines are usually connected to a launcher by a cable, fired over a minefield (within which it lands) and then detonated to create a breach through the minefield. Standoff between the explosive charge and launcher varies. For instance, the Japanese CX has a standoff of 800 meters from the launcher.

Truck or Trailer Mounted Minebreaching Systems

Motorized and infantry units may have either wheeled or towed antitank minebreaching systems. While some of these systems can be dismantled, most are fired from the back of cargo trucks or from trailers. Minefield beaching systems are organic to the Combat Engineer Company of the Engineer Battalion. See FM 100-63, for additional information. A typical "truck-mounted explosive minefield breaching system" is the FSU UR-83P (below).

Name	Country of Origin	Chassis	System (or Shell) Weight (kg) Overall: Rocket: Explosive Explosive/m	Range (m)	Length (m)	Standoff (m)	Effectiveness Lane Width (m): Lane Length (m) Lane clearing time (min)	Type Launcher / Nr Line Charges	Rocket Diameter (mm)	Operators	Explosive-Type/nr/ Notes
UR-83P	FSU	Truck (ZIL-131) or trailer	Dimensions (m) (ready for launch) Length: 1.5 Width: 1.5 Height: 2.6 Launcher Wt (kg): Total: 230 Packaged: 360 Charge: 1,380	440	114		LL: 115 LW: 6 Assembly time by engr sqd (min): 90	Line UZP-83 charge		2	portable dismountable
Type 81	CH	EQ-240 Truck chassis	Loaded: 5,112 Unloaded: 4,082 Exp: unk Exp/m: unk	3,000	na	2,900 +	LL: 60+ LW: 10+	10 tube	2,530	3	HE, FAE ea round clears 18 m radius in AP.

The Type 81 mineclearing rocket system consists of a 10-tube launcher mounted on the rear of a modified EQ-240 chassis. Rockets are loaded manually by three persons. Although it is uncertain, warheads for this system are filled with conventional HE, FAE or a combination of both. The Chinese have stated that this system is effective against AP mines, but its effectiveness against AT mines is unknown. The range of this system is 3,000 meters, which provides the system with a maximum standoff of approximately 2,900 meters. Each round clears an 18-meter radius within an AP minefield. It is not known whether this is for the FAE or high-explosive warhead. The Type 1987 has 24 launch tubes and is mounted on a Type 59/69 tank chassis.

Tracked-Vehicle-Mounted Systems

Systems mounted on the rear of tanks increase the survivability of the platform and therefore increase the likelihood that it may be successfully employed prior to its destruction. The use of a tracked chassis as the launch carrier gives the system the same mobility and maneuverability on the battlefield as mechanized units; however, use of these systems does not allow tanks or mechanized vehicles to conduct a "Blitzkrieg" type rush across the minefield. Systems found in armor and mechanized divisions will generally be mounted on tracked vehicles due to mobility requirements. Although these minefield breaching systems may (or may not) be mounted on tanks they do not belong to the maneuver commander. They are engineer assets and are found in rather limited numbers. Two of these systems are in the Mineclearing Platoon, Mine Warfare Company, Division Engineer Company, Engineer Battalion, of a mechanized/armored division, engineer brigade, or Corps. Further information on these elements can be found in FM 100-60.

Tracked-Vehicle-Mounted Systems											
Name	Country of Origin	Chassis	System (or Shell) Weight (kg) Overall: Rocket: Explosive Explosive/m	Range (m)	Length (m)	Standoff (m)	Effectiveness Lane Width (m): Lane Length (m) Lane clearing time (min)	Type Launcher /Nr Line Charges	Rocket Diameter (mm)	Crew	Explosive Type/nr/ Notes
Type 84	CH	Tank or other armored vehicle	OA: 800 Rocket: unk Exp: 400 Exp/m: 5	300	80	200	LL: 60 LW: 5	1	unk	unk	Line charge
The Type 84 mounts in a box on the rear of a tank or other vehicle. Inside the box is a rocket in a launch rail attached to the box lid, an 80-meter-long explosive hose, and a drag chute. The rocket pulls the explosive hose over the minefield or other obstacle, arming the fuze in flight. After a short delay, the hose explodes leaving a cleared path. The box is automatically discarded after firing. With a published range of 300 meters and a length of 80 meters, the standoff of the system is estimated to be approximately 200 meters.											
Type 762	CH	Type 83, 152-mm tracked howitzer	OA: unk Rocket: 760 Exp: 400 Exp/m: 3	1,000	130	800-900	LL: 130 LW: 12-22	2	425	unk	line charge. 32 charges 12 kg ea
The Type 762 is a twin-rail rocket launcher mounted on a Type 83, 152-mm tracked howitzer chassis. It carries two 425-mm GSL 211 mineclearing rockets. The warhead on GSL 211 rockets contain an explosive line charge that is extracted during flight. The line charge is composed of 32 fixed-interval explosive charges, each weighing 12 kg. When the explosive charge is at a specific height above the minefield, specially designed detonation fuzes at the head and tail of the line charge activate and simultaneously detonate the charges. The system is equipped with an ordinary rangefinder with questionable accuracy; it is uncertain how the system will perform when deployed over a minefield.											
SVO	CZ	BMP-1	Shell size: Length (mm): 1,457 Dia (mm): 246 Weight (kg): 42				LL: 100-120 LW: 5 Time btwn rounds (sec): 2.5	24 explosive rockets			fuze initiation rod length (m): .3

The Czech Republics SVO is an armored, tracked, mineclearing vehicle used for combat breaches of AT and mixed minefields. The breach is conducted by the launching of mineclearing shells in a specific pattern in order to detonate all the mines along a pathway through the minefield. The entire system is contained in a modified BMP-1 chassis. The turret on the chassis has been removed and exchanged for a rocket firing platform. The firing platform contains 24 launch rods angled at different elevations and deflections in order to provide full warhead coverage for a path through the minefield. The front half of the compartment is for storing and launching the warheads, the other is the operator's position. The shells fit over the 24 launch rods and are projected into the air by the initiation of explosive cartridges. Piezoelectric fuzes located at the base of the fuze extension rods detonate the shells .3 meters above the ground. The SVO reportedly has a 95% probability of initiating single impulse, nonblast resistant, pressure-fuzed mines.

UZ-67	FSU	2S1 mod	weight (kg): 2,400		93	200 and 350	LL: 75-80 LW: 6 Time: 3-5	2	unk	2	basic load of 2 line charges
UZ-77	FSU	2S1 mod	unk		93	200 & 500 water: 200	LL: 80-90 LW: 6 Time: 3-5	2	unk	2	basic load of 2 line charges

Man-Portable Rocket Propelled Line Charges

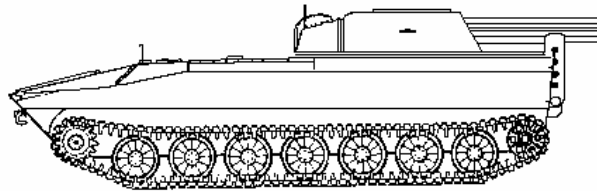
Many countries and some insurgent groups produce small (1 or 2 man-portable) explosive line charges with a wide variety of capabilities and performance. Mechanized infantry units normally do not have these since the tracked vehicles clear a way for the dismounted infantry. The basis of issue of these systems for use by dismounted (or regular) infantry units is generally three per infantry battalion; nine per brigade/regiment; 27 per division. They are used only in the primary avenue of attack (or as a deception). Battlefield employment dictates that the line is fired and detonated. The infantry then moves as quickly as possible (probably under fire) along the cleared path ensuring they do not step on any uncovered/ unexploded mines. The line charges are usually carried by one or more soldiers therefore the overall weight of the charges is important. The bullet trap line charge delivery methods realizes a significant weight savings by eliminating the additional weight of a rocket. The soldier simply uses his standard issue weapon to deliver the detonating cord/hose across the minefield. This places limitations on the length and weight of the delivered charge. A typical "infantry explosive minefield breaching system" is the FSU ZRP-2. It is a mine demolition charge designed to blast lanes through AP minefields. The ZRP-2 consists of a detonating cable, powder rocket engine, connecting cable, fuze, braking cord, launching table, launching device, anchor and carrying pack. The charge is launched into an AP minefield with the aid of launching device UP-60 from a position prepared on the ground surface. The charge is detonated remotely by a mechanical fuze. The charge is straightened in the minefield manually with the braking cord while the fuze retarder is burning.

ZRP-2 (FSU) Mine demolition charge	
Type	extended, single-line, made of detonating cable DKR-150A
Weight of set (kg)	50 packaged, 34 in pack
Crew, men	1 or 2
Length of charge (m)	60
Charge launching range (m)	140-160
Size of passage through AP minefield (m)	55 length x 0.4 width
Launch preparation time (min)	5

Infantry Line Charges				
Name	Country	Delivery Method	Explosive Weight (kg/m)	Length (m)
Type 73	China	Rocket	2.40	106
Type 74	China	Rocket	2.40	100
Type 81	China	Rocket	0.10	100
Type 84	China	Rocket	0.40	28
ODMIRA-60	Czech Rep	Rocket	NA	60
FATEH-1	Egypt	Rocket	0.42	120
Comet No 3001	Germany	Rocket	0.10	72
Comet No 3010	Germany	Rocket	0.57	53
Ladder 80	Germany	Rocket	NA	70
Unknown	Iraq	Bullet trap	NA	40
POMINS I	Israel	Bullet trap	0.27	50
POMINS II	Israel	Rocket	NA	50
Type 70	Japan	Rocket	1.41	136
Unknown	North Korea	Rocket	NA	180
Clap/M	Pakistan	Rocket	0.05	300
M/60	Sweden	Rocket	NA	150
Unknown	South Africa	Rocket	NA	35
Unknown	South Africa	Rocket	NA	120
RAMBS	UK	Bullet Trap	0.02	40
RAMBS 2	UK	Bullet Trap	unknown	60
ROMANS	UK	Rocket	unknown	50

8-6.6

Russian Tracked Mineclearing Vehicle MTK-2



SYSTEM

Alternative Designations: UR-77 mineclearing vehicle, M1979
Date of Introduction: 1981
Proliferation: FSU and former Warsaw Pact armies

Description:

Crew: 2 (commander-operator, driver-mechanic)
 Chassis: Based on the 2S1
 Weight (mt): 15.5
 Length (m): 8.4
 Height (m): 3.1
 Width (m): 2.8

System Components: Vehicle and two mineclearing charges

AUTOMOTIVE

Cruising Range (km): 500
Speed (km/h):
 On Road: 60
 Off Road: 30
 Water: 5
NBC Protection System: Yes
Smoke Screening System: No

MINECLEARING EQUIPMENT

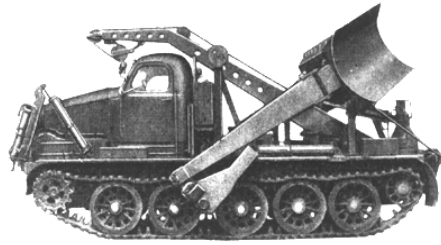
Type: Explosive line
Charges Used: UZP-77, UZ-67
Length of Charge (m): 93
Length of Charge Feed (m):
 UZP-77: 200 and 500
 UZ-67: 200 and 350
Size of Lane in AT Minefield (m):
 Width: Up to 6
 Length (UZP-77): 80-90
 Length (UZ-67): 75-80
Breaching Time (min): 3 to 5

VARIANTS (INA)

NOTES

The MTK-2 clears lanes in minefields by using rocket propelled charges. The charges are launched onto the minefield and then detonated by the vehicle commander-operator from within the vehicle. The charge can be fired on land or in the water.

Russian Tracked Route-Clearing Vehicle BAT-M



SYSTEM

Alternative Designations: Dozer

Date of Introduction: 1967

Proliferation: Widespread

Description:

Crew: 2

Chassis: AT-T heavy tracked artillery tractor

Weight (mt): 26

Length Overall (m): 10

Height Travel (m): 3.5

Width Overall (m): 4.7

Clearance (mm): 425

Gradient (°): 30

Trench Crossing (m): 1.57

Fording Depth (m): .7

Vertical Step (m): 1

Time from Travel to Operating Position (min): 5 to 7

AUTOMOTIVE

Engine: V12, 415 hp, diesel

Cruising Range (km): 500

Speed (km/h): 35

Navigation Equipment: No

NBC Protection: Yes

Radio: INA

BLADE

Width (m): 4.8

Blade Rate (m³/hr): 250

Operating Speed (km/h): 10

ROTARY CRANE

Capacity (mt): 2

VARIANTS

BAT

BAT-2: Based on MT-T artillery tractor

NOTES

The BAT tractor dozer is a AT-T heavy tractor with a large dozer blade mounted at the front of the hull. It is designed for general engineer use, road and trail clearing and construction. The BAT-M is an improved model (over the BAT) and is electrohydraulic, whereas the BAT is electropneumatic. The BAT-M also has a hydraulic crane, and the dozer blade can be swung to the rear improving the vehicle's load distribution when in travelling mode.

Russian Armored Route-Clearing Vehicle BAT-2



SYSTEM

Alternative Designations: None
Date of Introduction: 1981
Proliferation: At least 2 countries.
Description:
 Crew: 2+8
 Engineer Capacity: 8
 Chassis: MT-T
 Weight (mt): 39.7
 Length Overall (m): 9.64
 Height Travel (m): 3.69
 Width Overall (m): 4.2
 Clearance (mm): 430
 Gradient (°): INA
 Trench Crossing (m): 2.7
 Fording Depth (m): 1.3
 Vertical Step (m): .8

AUTOMOTIVE

Engine: V-64-4 multi-fuel diesel, 700 hp
Cruising Range (km): 500
Speed (km/h): 60
Navigation Equipment: INA
NBC Protection: Yes
Radio: INA

BLADE

Width (m): Variable. Mounted vertically in front and over the crew cab when not in use.
 Bulldozer Position: 4.5
 Road Clearing/building: 4.2
 Grading: 4.1-4.35

Operating Depth (solid and frozen soil) (m): .5

Operating Speed (km/h):

Road Building:
 Ground Unobstructed: 6-8
 Ground with Trees ≤ 30 cm: 2-3
 Snow: 8-15
 Hourly Capacity (m³/hr):
 Ditch Digging: 200-250
 Filling in Ditches, Craters, etc: 350-450

CRANE

Capacity (mt): 2
Boom Length (m): 7.3

WINCH

Capacity (mt): 25
 Cable Length (m): 100

VARIANTS

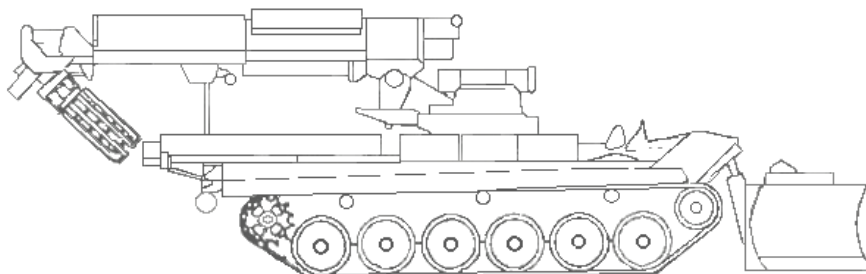
None

NOTES

The BAT-2 is a follow-on to the BAT and BAT-M dozers, but better fits the classification of armored route-clearing vehicle rather than that of a high-speed armored dozer. Its cab is fully armored and it is designed to operate in the forward areas of the battlefield. The windows in the front, sides, and rear are bullet-proof further enhancing battlefield survivability.

The ability to carry an eight-man engineer squad facilitates its role in the movement support detachment. Other BAT-2 missions include road building, obstacle, (stone and wood) removal, and snow removal operations. The vehicle is also designed to operate in urban terrain and as an NBC vehicle. Storage areas for engineer supplies have been designed into the vehicle. The BAT-2 has a crane, a ripper, and a winch.

Russian Obstacle Clearing Vehicle IMR-2M



SYSTEM

Alternative Designations: N/A

Date of Introduction: 1982

Proliferation: FSU and former Warsaw Pact armies

Description:

Crew: 2

Chassis: T-72A

Weight (mt): 44.3

Length (traveling) (m): 9.55

Height (traveling) (m): 3.68

Width (traveling) (m): 3.73

Gradient (°): 25

Fording Depth (m): 1.2

System Components: Multipurpose dozer equipment, boom, treadway mine exploder

AUTOMOTIVE

Engine: 12 cyl, 840 hp, diesel

Cruising Range (km): 500

Speed (km/h): 60

Night Driving Equipment: Yes

Radio: R-173 radio, R-174 intercom

NBC Protection System: Yes

Smoke Screening System: INA

BLADE

Can be used as a dozer, grader and V-blade, vertical plane skew ability.

Operating Speed (bulldozer) (km/h): 8-12

Earth Displacement (m³/hr): 300

Lane Clearing Rate (km): .35

ALL-PURPOSE TOOL

Trench Digging (1.1 to 1.3m deep)(m³/hr): 8-10

Pit Digging (up to 2.5m deep) (m³/hr): 12-16

BOOM

Capacity (mt): 2

Reach (m): 8.4

MINE SWEEPING SPEED (km):

AT pressure mines: 6-15

Tilt Rod mines: 7

VARIANTS

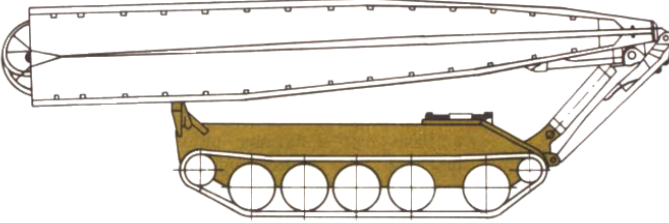
IMR: The IMR is a NBC-protected, combat engineer vehicle based on the T-54/55 tank chassis. It is fitted with an articulating dozer blade and a telescoping crane that fits a number of attachments.

IMR-2: Equipped with mine sweepers and mine-clearing extended charges. Line drawing is of IMR-2.

NOTES

The IMR-2M differs from the IMR-2 in that the IMR-2M has no line-launched mineclearing charge. The IMR-2M has more armor, hydraulic equipment and a scraper-ripper.

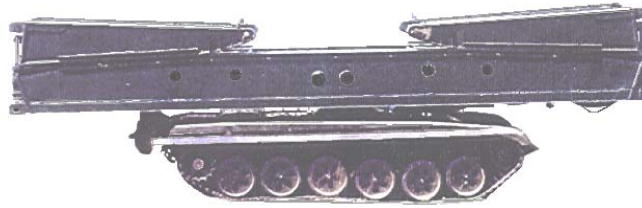
Czechoslovak Armored Vehicle-Launched Bridge MT-55A

	
SYSTEM Alternative Designations: None Date of Introduction: 1970 Proliferation: At least 20 countries. Description: Crew: 2 Chassis: T-55A Tank (modified) Weight (mt): 36 Length with Bridge (m): 9.90 Height with Bridge (m): 3.35 Width with Bridge (m): 3.30 Ground Clearance (mm): 425 Gradient (°): 30 Fording Depth (m): 1.4 Vertical Step (m): .7 Trench (m): 2.7 VARIANTS None	AUTOMOTIVE Engine: V-12 Diesel, 580 hp Cruising Range (km): 690 Speed (km/h): Max Road: 32-35 Average Cross-Country: 16-20 Radio: R-123 Self-Entrenching Blade: No NBC Protection System: Yes Smoke Equipment: Vehicle engine exhaust smoke system. BRIDGE Type: Scissors Capacity (mt): 50 Width of Obstacle (m): 17 Width (m): 3.3 Length Opened (m): 18 Weight (kg): 6.5 Emplacement Time (min): 2 Displacement Time (min): 5-6

NOTES

The MT-55A has a gap measuring device and infrared equipment for bridge-laying at night. It can also launch the MT-72 bridge.

Russian Armored Vehicle-Launched Bridge MTU-72

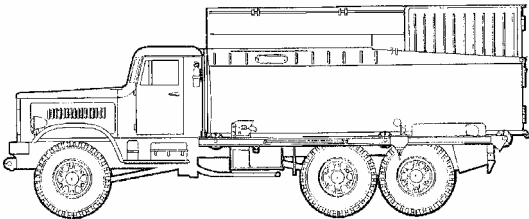
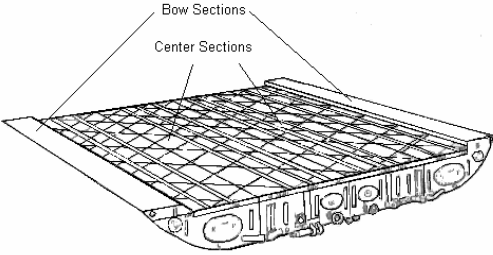


SYSTEM Alternative Designations: None Date of Introduction: 1974 Proliferation: At least one country. Description: Crew: 2, Commander and driver Chassis: T-72S Weight (mt): 40 Length with bridge (m): 11.64 Height with bridge (m): 3.38 Width with bridge (m): 3.46 Ground Clearance (mm): 49 Gradient (°): 31 Side Slope (°): 22 Fording Depth (m): 1.2 Vertical Step (m): .85 Trench (m): 2.8 VARIANTS None	AUTOMOTIVE Engine: 840 hp Diesel Cruising Range (km): 500 Speed (km/h): Max Road: 60 Max Off-Road: 45 Average Cross-Country: 35 Radio: R-173 and R-134 Self-Entrenching Blade: Yes NBC Protection System: Yes Smoke Equipment: Vehicle engine exhaust smoke system. BRIDGE Type: Cantiliver Capacity (mt): 50 Width of Obstacle (m): 18 Width (m): 3.55 Length Opened (m): 20 Weight (kg): 6,400 Emplacement Time (min): 3 Displacement Time (min): 8
---	--

NOTES

The crew is armed with a light machine gun, a submachine gun, and hand grenades for protection.

Russian Heavy Folding Pontoon Bridge PMP

 Ramp Bay Unit on Kraz 255B	
SYSTEM Alternative Designations: Ribbon bridge Date of Introduction: 1961 Proliferation: Over 20 countries. Description: Crew: See Assembly Data Chassis: Kraz-255B BRIDGE Type: Pontoon Total Length of Bridge (m): 227 Capacity/Load Class (mt): 60 Roadway Width (m): 6.5 Working Party: Varies - approx. 65 for full bridge set. See RAFT ASSEMBLY DATA Material: SKhL-4 steel Pontoons in Set: See NOTES Bridge/center: 32 Ramp/shore: 4 Bridge Pontoons: Weight (kg): 6,790 Length (m): Unfolded: 6.75 Folded: 6.75 Width (m): Unfolded: 8 Folded: 5 Depth Unfolded (m): Bow Section: .9 Center Section: .7 Folded: 2	Ramp Pontoons Weight (kg): 7,252 Length (m): Unfolded: 5.6 Folded: 5.6 Width Unfolded (m): River End: 7.3 Shore End: 7 Folded: 3.1 RAFT ASSEMBLY DATA 40-Ton Raft-Bridge Pontoons: 2 Overall Deck Length (m): 13.5 Assembly Time (min): 8 Working Party (est.): 6 60-Ton Raft-Bridge Pontoons: 3 Overall Deck Length (m): 20.3 Assembly Time (min): 10 Working Party (est.): 9 80-Ton Raft-Bridge Pontoons: 4 Overall Deck Length (m): 27 Assembly Time (min): 12 Working Party (est.): 12

NOTES

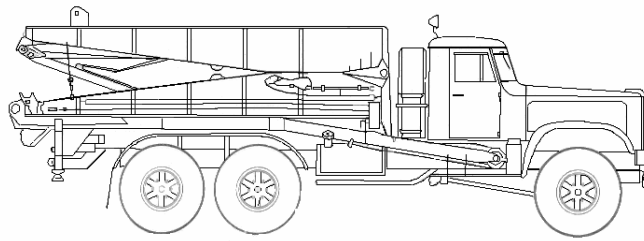
Although the complete PMP ribbon bridge set consists of 32 center pontoons and 4 ramp pontoons, the normal bridge unit consists of a half-set (one complete bridge) made up of 16 center and 2 ramp pontoons. Each 4-section is launched from the Kraz-255B. It automatically unfolds upon entering the water. The sections then lock in place to form a bridge unit 6.75 meters long and 8 meters wide. Normally, all the units are launched simultaneously. They join together parallel to the near shore to form a continuous roadway. The roadway then swings across the water obstacle; powerboats (6 per half-set) hold it in place on the designated centerline.

Engineers can use the full 36-pontoon set to construct 227 meters of bridge. They may also configure it as 40- to 170-ton rafts. A half-set gives the capability to construct 119 meters of 60-ton bridge, 191 meters of 20-ton bridge, or rafts. Under ideal conditions assembly speeds of 7 meters of bridge per minute can result. This bridge can be built in streams with a velocity of up to 2 meters a second (approx. 7 km/h).

Russian Heavy Folding Pontoon Bridge PMP continued

RAFT ASSEMBLY DATA continued 110-Ton Raft-Bridge Ramp Pontoon: 1 Bridge Pontoons: 5 Overall Deck Length (m): 39.3 Assembly Time (min): 15 Working Party (est.): 18 170-Ton Raft-Bridge Ramp Pontoon: 1 Bridge Pontoons: 8 Overall Deck Length (m): 59.6 Assembly Time (min): 15 Working Party (est.): INA AUXILIARY EQUIPMENT Powerboats or tracked amphibians: 12 LAUNCH SEQUENCE 1. The travel locks are disengaged, the pontoon carrier backs to the edge of the water, brakes sharply, and then the pontoon slides over the carrier roller system into the water where it unfolds almost immediately. 2. The pontoon is then stiffened by activating six locking devices.	3. Once the pontoons have been launched and stiffened they are interconnected parallel to the near shore to form a continuous strip of roadway. 4. This roadway is then swung across the water obstacle and held in place by powerboats. Whenever possible the launching operations are done along a continuous shoreline permitting all pontoons to be launched at the same time. If necessary, the bridge can be built on a small frontage using the successive raft system. This slows construction time. RETRIEVAL For retrieval the launch operation is reversed. The pontoon carrier backs to the water's edge, an integral jib is unfolded from the truck bed, and two cables are strung from the winch (located behind the driver's cab) through the jib pulleys, around the pontoon retrieving guides, and secured to the pontoon retrieval studs. The winch simultaneously folds and lifts the pontoon to the truck bed. The jib is then folded back into the truck bed, and the pontoon is winched over the roller system and secured. The whole procedure takes but a very few minutes.
---	---

Russian Truck-Mounted Scissors Bridge TMM



SYSTEM

Alternative Designations: Mechanized Bridge, Scissors Bridge

Date of Introduction: 1964

Proliferation: At least 20 countries

Description:

Crew: See working party

Chassis: Modified KrAZ-214 (6 × 6), 7,000 kg, or KrAZ-255B (6 × 6), 7,500 kg, and KrAZ-260 trucks.

Weight (mt): 19

Length with bridge (m): 9.3

Height with bridge (m): 3.15

Width with bridge (m): 3.2

Ground Clearance (mm): 360

Gradient (°): 0

Fording Depth (m): 1

BRIDGE

Type: Truck-mounted scissors

Capacity/Load Class (mt): 60

Material: Low alloy steel

Width (m):

Unfolded: 3.8

Folded: 3.2

Weight (kg): 4.24

Pier: (TMM on KrAZ-255)

Height (m):

Min: 1.7

Max: 3.21

Ground Area (m²/pier): 2.4

Weight (m): 1.15

Lowering Method: Cable release

Raising Method: Hand winch

Locking Method: Manual

ASSEMBLY DATA

Spans in Set: 4

Length of 1 Span (m):

Unfolded: 10.5

Folded: 5.2

Total Length of Bridge (m): 42

Obstacle Span (m):

Span: 9.4

Depth: 3

Roadway Width (m):

Closed: 3.2

Extended: 5.2

Assembly Time (min): 20-40

1 Span: 8-15

4 Spans: 30-60

Recovery Time (min): Same as assembly

Working Party: 3 per span/12 total

VARIANTS

TMM-3: KrAZ-255B 6 × 6 improved bridgelaying mechanism.

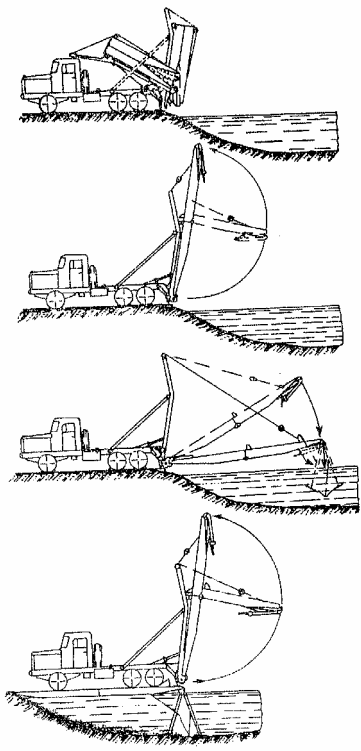
TMM-6: MAZ-543 8 × 8 truck with 17 m bridge spans (unfolded).

NOTES

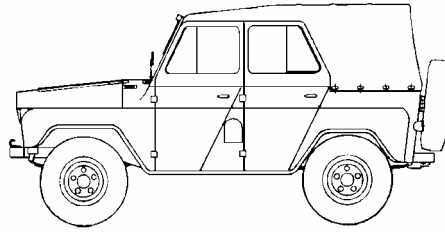
The TMM is a multiple-span, trestle-supported, scissors-type, treadway bridge. One bridge set comprises four 10.5 meter, spans carried on, and launched from specially modified trucks. Spans fold in half for transport. Three of the spans have integral-mounted adjusted (1.7 to 3.2 meters) trestle legs, while the fourth (far-shore) span has none.

During travel, the trestles can fold beneath the scissors plan. A launching girder mounted on the truck bed launches the TMM hydraulically over the tailgate. Assisted by winch cables and pulleys, the girder raises, unfolds, and emplaces the span with the folding trestle legs. If necessary the TMM can be laid underwater. This requires about 50% more emplacement time.

Russian Truck-Mounted Scissors Bridge TMM continued

	LAUNCH SEQUENCE 1. Truck backs into position. 2. A hydraulic launching girder raises the folded span to the vertical position. 3. The span is straightened by a cable/winch system, and then is lowered with the integral trestle legs swinging into position. 4. Once the lowering operation is completed, the cables are disconnected, the launching girder is brought to travel position, and the truck moves off.
--	---

Russian 0.6 mt 4 x 4 Utility Truck UAZ-469



SYSTEM

Alternative Designations: INA

Date of Introduction: 1973

Proliferation: Widespread

Description:

Troop Capacity: 2 in front, 5 in rear

Weight (mt):

Gross Vehicle Weight: 2.4

Curb: 1.6

Length Overall (m): 4

Height Overall (m): 2

Width Overall (m): 1.8

Payload on/off Highway (kg): 600

Number of Axles: 2

Ground Clearance (mm): 300

Turning Radius (m): 6.5

Wheels:

Size (in): 8.40x15

Central Tire Pressure Regulation System: No

Run Flat: No

AUTOMOTIVE

Engine: Inline 4, 70 hp, gasoline

Cooling: Water

Cruising Range (road) (km): 730

Speed (km/h): 100

Fuel Capacity (liters):

Left Tank: 39

Right Tank: 39

Towing Capability (kg):

Off Highway: 850

On Highway: 850

Gradient (loaded) (°): 60

Fording Depths (m): .58

Trench Crossing Width (mm): INA

CARGO SPACE

Height (mm): 400

Width (mm): 1,400

Length (mm): 1,000

Cargo Bed Area (m²): 1.6

VARIANTS

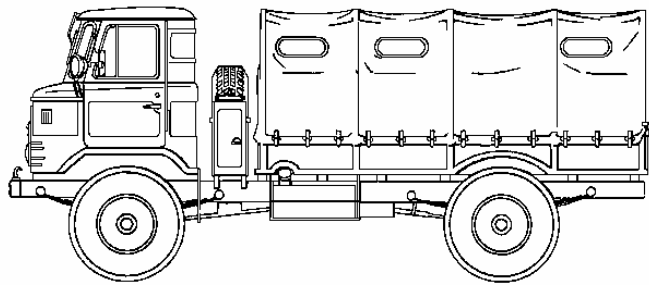
UAZ-469B: Export; lower off-road performance

Ambulance: 1 stretcher patient and 1 attendant

NOTES

The UAZ-469 replaces the earlier UAZ-69.

Russian 2 mt 4 x 4 Cargo Truck GAZ-66



SYSTEM

Alternative Designations: INA
Date of Introduction: 1964
Proliferation: Widespread

Description:

Troop Capacity: 3 in cab, 18 in rear
Weight (mt):
 Gross Vehicle Weight: 5.8
 Curb: 3.6
Length Overall (m): 5.65
Height Overall (m): 2.44
Width Overall (m): 2.32
Payload on/off Highway (kg): 2,000
Number of Axles: 2
Ground Clearance (mm): 315
Turning Radius (m): 10
Wheels:
 Size (in): 12x18
 Central Tire Pressure Regulation System: Yes

AUTOMOTIVE

Engine: V8, 115 hp, gasoline
Cooling: Water
Cruising Range (road) (km): 875
Speed (km/h): 95
Fuel Capacity (liters):
 Left Tank: 105
 Right Tank: 105
Towing Capability (kg):
 Off Highway: 2,000
 On Highway: 2,000
Gradient (loaded) (°): 39
Fording Depths (m): .8

CARGO SPACE

Height (mm): 890
Width (mm): 2,050
Length (mm): 3,330
Cargo Bed Area (m²): 6.8

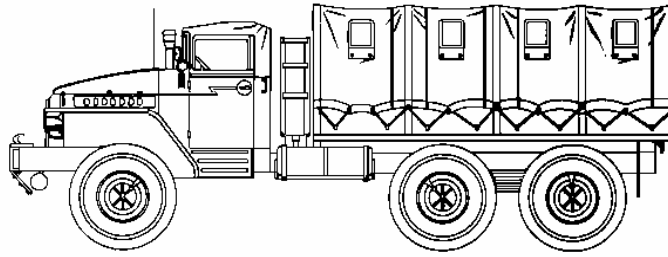
VARIANTS

GAZ-66B: Canvas-top cab for air transport or airdrop
GAZ-66A: Steelcab
Numerous other variants for various duties.

NOTES

Besides functioning as a general cargo carries, the GAZ-66 is used as a prime mover for 120-mm mortar. The DDA-66 variant is an NBC decontamination truck.

Russian 4.5 mt 6 x 6 Cargo Truck Ural-375D



SYSTEM

Alternative Designations: INA

Date of Introduction: 1965

Proliferation: Widespread

Description:

Troop Capacity: 3 in cab, 24 in rear

Weight (mt):

Gross Vehicle Weight: 13.2

Curb: 8.4

Length Overall (m): 7.36

Height Overall (m): 2.68

Width Overall (m): 2.67

Number of Axles: 3

Ground Clearance (mm): 410

Turning Radius (m): 10.8

Side Slope (°): 32

Vertical Step (mm): 800

Gradient (loaded) (°): 65

Fording Depths (m): 1.49

Trench Crossing Width (mm): 875

Wheels:

Size (in): 14x20

Central Tire Pressure Regulation System: Yes

Run Flat: INA

AUTOMOTIVE

Engine: V8, 180 hp, gasoline

Cooling: Liquid

Cruising Range (road) (km): 650

Speed (km/h): 75

Fuel Capacity (liters):

Main Tank: 300

Aux Tank: 60

Towing Capability (kg):

Off Highway: 5,000

On Highway: 10,000

CARGO SPACE

Height (mm): 872

Width (m): 2.43

Length (m): 3.9

Cargo Bed Area (m²): 9.5

VARIANTS

URAL-375: Observation hatch and unimproved powertrain

URAL-375E: Decontamination vehicle

URAL-375N: 2,000 kg additional payload

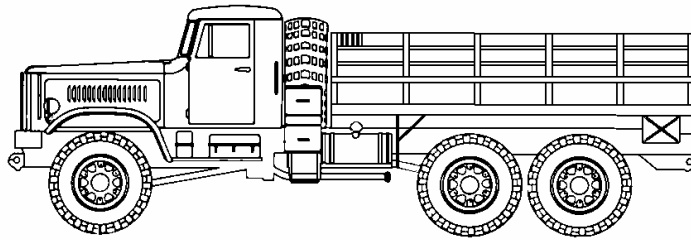
URAL-375S: Truck-tractor

URAL-375T: Equipped with winch

NOTES

Besides functioning as a general cargo carrier, the Ural-375D is used as a prime mover for light and medium artillery. The Ural-375 chassis also serves as a base for the BM-21 MRL, POL tankers, vans, and cranes. The Ural-4320 began to replace the Ural-375D around 1978.

Russian 7.5 mt 6 x 6 Cargo Truck KrAZ-255B



SYSTEM

Alternative Designations: INA

Date of Introduction: 1967

Proliferation: Widespread

Description:

Troop Capacity: 3 in cab, 16 in rear

Weight (mt):

Gross Vehicle Weight: 19.7

Curb: 12

Length Overall (m): 8.64

Height Overall (m): 2.94

Width Overall (m): 2.75

Payload (kg): 7,500

Number of Axles: 3

Ground Clearance (mm): 360

Turning Radius (m): 14

Wheels:

Size (in): 20x21

Central Tire Pressure Regulation System: Yes

Run Flat: INA

AUTOMOTIVE

Engine: V8, 265 hp, diesel

Cooling: Water

Cruising Range (road) (km): 850

Speed (km/h): 70

Fuel Capacity (liters):

Right Tank: 165

Left Tank: 165

Towing Capability (kg):

Off Highway: 10,000

On Highway: 50,000

Gradient (loaded) (°): 30

Fording Depths (m): 1

CARGO SPACE

Length (m): 4.56

Width (m): 2.5

Height (m): .92

Cargo Bed Area (m²): INA

VARIANTS

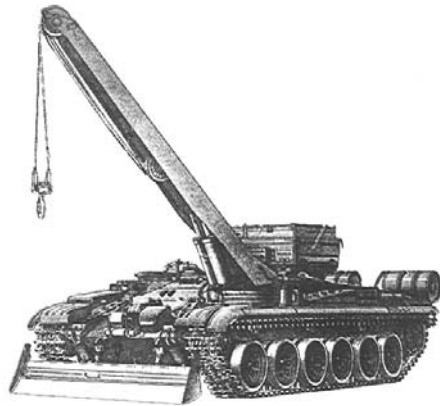
KrAZ-258: Tractor-truck

Numerous other variants for various duties.

NOTES

Primarily designed as a cargo truck, the KrAZ-255B is also used as a prime mover for various equipment including a tank-transporter trailer and PMP pontoon bridge.

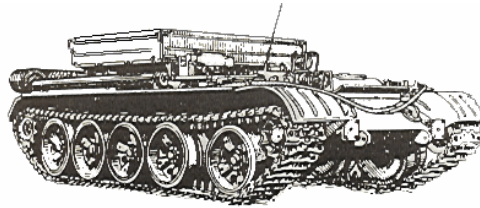
Russian Armored Recovery Vehicle BREM-1

	Weapons & Ammu- nition Types 12.7-mm AD MG	Typical Combat Load 840
SYSTEM Alternative Designations: None Date of Introduction: 1984 Proliferation: At least 5 countries. Description: Crew: 3 (see NOTES) Chassis: T-72 tank Weight (mt): 41 Length Overall (m): 7.98 Height Travel (m): 2.45 Width Overall (m): 3.46 Clearance (mm): 457 Gradient (°): 30 Trench Crossing (m): 2.8 Fording Depth (m): 1.2 Vertical Step (m): .85 AUTOMOTIVE Engine: V-12 Multi-fuel Diesel, 840 hp Cruising Range w/external tanks (km): Dirt Road w/o Towed Vehicle: 650 Dirt Road Towing Vehicle: 220-430 Highway w/o Towed Vehicle: 700 Speed (km/h): Max Highway: 60 Dirt Road: 45 Towing Tank on Dirt Road: 12 Smoke Equipment: Vehicle engine exhaust smoke system (VEESS). Four smoke grenade launchers may be fitted. NBC Protection: Yes Radio: R-123 BLADE Width (m): 3.1	CRANE Capacity (mt): 2 m Extension: 19 4.4 m (max) Extension: 3 Boom Length (max) (m): 4.4 WINCH Capacity (mt): Line Pull: 25 With Blocks: 100 Cable Length (m): 200 Auxiliary Winch: Capacity (line pull) (kg): 530 Cable Length (m): 400 TOWING Capacity (mt): 50 Towing Rods: Two 1.68 m Two 5.5 m Hydraulic Jack Capacity (mt): 30 ARMAMENT Caliber, Type, Name: 12.7-mm, AD MG NSV-T Mount Type: Cupola Max Effective Range (m): AA: 1,500 Ground: 2,000 Fire on Move: Yes VARIANTS None	

NOTES

The BREM-1 is designed to tow damaged tanks from the battlefield to damaged vehicle collection points. It has a crew of three—commander, driver, and mechanic. Instead of a turret it has a rectangular platform on top of the hull for work and loading.

Russian Armored Recovery Vehicle T-54-T



SYSTEM

Alternative Designations: BTS-2 (Medium Tank Towing Vehicle-2)

Date of Introduction: 1965

Proliferation: At least 50 countries

Description:

Crew: 3 to 5

Chassis: T-54

Weight (mt): 36

Length (m): 7.5

Height (m): 1.9

Width (m): 3.27

Clearance (mm): 264

Gradient (°): 31

Trench Crossing (m): 2.7

Fording Depth (m):

Unprepared: 1.4

With Snorkel: 5.5

Vertical Step (m): .8

AUTOMOTIVE

Engine: V-12 Diesel, 520 hp

Cruising Range (km): 400

Speed (km/h): 48

Smoke Equipment: Vehicle engine exhaust smoke system.

NBC Protection: No. (see VARIANTS)

Radio: INA

CRANE CAPACITY (mt): 1

TOWING CAPACITY (mt): At least 40

ARMAMENT

None

VARIANTS

There are numerous variants based on T-54 and T-55 chassis each with differing equipment modifications.

T-54 (A): Former East German manufacture. Push/pull bar at front, 1 mt crane, NBC equipment, no winches or spades.

T-54 (B): Former East German manufacture. Similar to T-54 (A). Tow cables brackets at hull rear, hull front protective plate, snorkel. No winch or spade.

T-54 (C): Former East German manufacture. Heavy-duty crane, snorkel.

NOTES

The T-54-T armored recovery vehicles are based on modified chassis of the T-54 medium tank. The recovery vehicle variants have a crane able to lift up to 3 mt, a loading platform, and a spade on the rear of the vehicle. They can mount a snorkel for deep fording. Performance figures are the same for the T-54 (and T-55) tanks. They replaced older tank recovery vehicles based on the T-34 chassis.

Chapter 9

Rotary-Wing Aircraft

This chapter provides the basic characteristics of selected rotary-wing aircraft readily available to the OPFOR. Both FM 100-60, *Armor- and Mechanized-Based Opposing Force: Organization Guide*, and FM 100-63, *Infantry-Based Opposing Force: Organization Guide*, use descriptors to indicate aircraft capabilities. In each manual, a substitution matrix enables the trainer to structure OPFOR air support requirements as required by capability rather than specific type.

Rotary-Wing Aircraft, covers systems classified as light, attack, utility, multi-role, and transport aircraft. Multi-role aircraft are able to support missions across each of the categories. This chapter encompasses many aircraft which may have a dual civil/military history. It does not include however, aircraft designed and used primarily for civil aviation.

The sampling of systems was selected because of wide proliferation across numerous countries or because of already extensive use in training scenarios. Additional data sheets addressing other widely proliferated helicopter systems will be sent with further supplements to this guide.

Because of the increasingly large numbers of variants of each aircraft, only the most common variants produced in significant numbers were addressed. If older versions of helicopters have been upgraded in significant quantities to the standards of newer variants, the older versions were not addressed.

The munitions available to each aircraft are mentioned, but not all may be employed at the same time. The weapon systems inherent to the airframe are listed under armament. The most probable weapon loading options are also given, but assigned mission dictates actual weapon configuration. Therefore, any combination of the available munitions may be encountered.

Questions and comments on data listed in this chapter should be addressed to:

CPT (P) Blake Burslie
DSN: 552-7922, Commercial (913) 684-7922
e-mail address: burslieb@leavenworth.army.mil

European Light Helicopter BO-105

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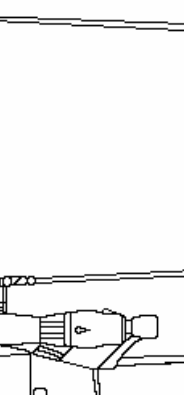
NOTES

Available munitions are shown above; not all will be employed at the same time, mission dictates weapons configuration. External stores are mounted on weapons "outriggers" or racks on each side of the fuselage. Each rack has one hardpoint. This helicopter is produced by the Eurocopter Company. It was formed as a joint venture between Aerospatiale of France, and Daimler-Benz Aerospace of Germany. Other missions include: direct air support, antitank, reconnaissance, search and rescue, and transport. Clamshell doors at rear of cabin area open to access cargo area. Cargo floor has tiedown rings throughout.

NOTES

Available munitions are shown above; not all will be employed at the same time, mission dictates weapons configuration. External stores are mounted on weapons racks on each side of the fuselage. Each rack has one hardpoint. Other missions include: direct air support, antitank, reconnaissance, observation, and light utility.

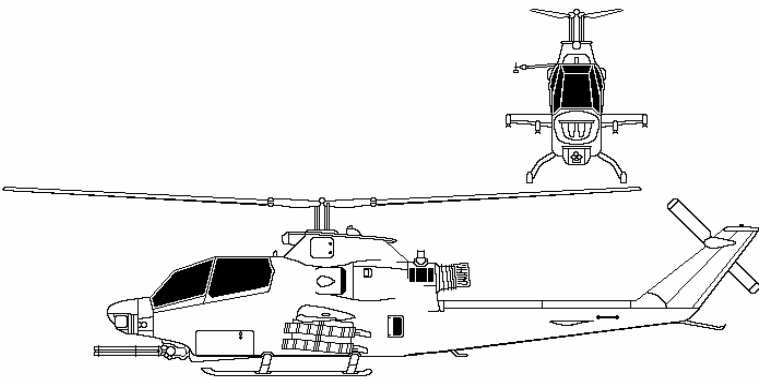
French Light Helicopter SA-341/GAZELLE

 		Weapon & Armament Types 7.62-mm MG or 20-mm GIAT M.621 cannon or 2x 7.62-mm AA-52 FN MG pods Other Loading Options 2.75-in rocket pods (7 ea.) 68-mm SNEB rocket pods (12 ea) 57-mm rockets (18 ea.) HOT ATGM AT-3 SAGGER ATGM AS-11 ASM, or AS-12 ASM SA-7 GRAIL AAM MISTRAL AAM	Combat Load 100 1,000 2 2 2 4-6 4 4 or 2 2 2
	SYSTEM Alternative Designations: SA-342 Date of Introduction: 1973 Proliferation: At least 23 countries Description: Variants in “()” Crew: 1 or 2 (pilots) Blades: Main rotor: 3 Tail rotor: 13 (fenestron enclosed in tail) Engines: 1x 590-shp Turbomeca Astazou IIIB turboshaft Weight (kg): Maximum Gross: 1,800 (SA 341), 1,900 (SA 342K), 2,000 (SA 342L/M) Normal Takeoff: 1,800 Empty: 998 Speed (km/h): Maximum (level): 310 Cruise: 270 Ceiling (m): Service: 4,100 (SA 341), 5,000 (SA 342) Hover (out of ground effect): 2,000 (SA 341), 2,370 (SA 342) Hover (in ground effect): 2,850 (SA 341), 3,040 (SA 342) Vertical Climb Rate (m/s): 12.2 Fuel (liters): Internal: 445 Internal Aux Tank: 90 Additional Internal Aux Tank: 200 Range (km): Normal Load: 670 (SA 341), 735 (SA 342) Dimensions (m): Length (rotors turning): 11.9 Length (fuselage): 9.5 Width: 2.0 Height: 3.1 Main Rotor Diameter: 10.5 Tail Rotor Diameter: 0.7 Cargo Compartment Dimensions (m): Floor Length: 2.2 Width: 1.3 Height: 1.2 Standard Payload (kg): Internal load: 750 External on sling only: 700 Transports 3 troops or 1 litter, or cargo. Survivability/Countermeasures: IR signature suppressor on engine exhaust. ARMAMENT Most Probable Armament: SA 341F: A GIAT M.621 20-mm cannon is installed on starboard side of some aircraft. Rate of fire is selectable at 300 or 740 rpm. SA 341H: Can carry 4x AT-3 ATGMs, and 2x SA-7, or 128-mm or 57-mm rockets, and 7.62-mm machinegun in cabin. SA 342K: Armed antitank version with 4-6x HOT ATGMS. SA 342L: Either rocket pods or machineguns. SA 342M: Armed with 4-6x HOT antitank missiles, and possibly fitted with Mistral air to air missiles.	AVIONICS/SENSOR/OPTICS The SA 342M has a roof-mounted stabilized direct view/infrared/laser sight to allow night firing of HOT ATGMs. Night/Weather Capabilities: The aircraft is NVG compatible; and by its instruments, avionics, autopilot, and nav computer, is capable of flight in day, night, and instrument meteorological conditions. VARIANTS AS 341 Gazelle: Developed by Aerospatiale in France. Others were built in the UK by Westland, and in Yugoslavia. SA 341B/C/D/E: Production versions for the British military. Used in training and communications roles. SA 341F: Production version for the French Army. Upgraded engine to Astazou IIIC. SA 341H: Export variant. SA 342K: Armed SA 341F with upgraded 870-shp Astazou XIVH engine, mostly exported to the Middle East. SA 342L: Export light attack variant with Astazou XIVM engine. SA 342M: Improved ground attack variant for the French Army. Similar to SA 342L, but with improved instrument panel, engine exhaust baffles to reduce IR signature, navigational systems, Doppler radar, and other night flying equipment.	

NOTES

Available munitions are shown above; not all will be employed at the same time, mission dictates weapons configuration. External stores are mounted on weapons "outriggers" or racks on each side of the fuselage. Each rack has one hardpoint. Other missions include: attack, antitank, antihelicopter, reconnaissance, utility, transport, and training. The bench seat in the cabin area can be folded down to leave a completely open cargo area. Cargo floor has tiedown rings throughout.

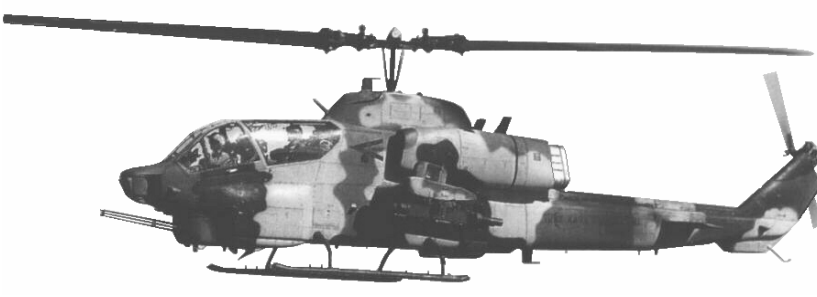
United States Attack Helicopter AH-1F/COBRA

		Weapon & Ammunition Types 20-mm 3x barrel Gatling gun Other Loading Options TOW missile pods (4 each) 2.75-in Hydra 70 rocket pods (19 each) 7.62-mm 6x barrel rotary MG pods	Combat Load 750 0-2 2-4 0-2
SYSTEM Alternative Designations: Hueycobra, Bell 209 Date of Introduction: 1986 (AH-1S) Proliferation: At least 11 countries Description: Crew: 2 (pilots in tandem seats) Blades: Main rotor: 2 Tail rotor: 2 Engines: 1x 1,800-shp AlliedSignal Engines T-53-L-703 turboshaft Weight (kg): Maximum Gross: 4,535 Normal Takeoff: 4,524 Empty: 2,993 Speed (km/h): Maximum (level): 315 Cruise: 227 Max "G" Force: INA Ceiling (m): Service: 3,720 Hover (out of ground effect): INA Hover (in ground effect): 3,720 Vertical Climb Rate (m/s): 8.5 Internal Fuel (liters): 991 Range (km): Normal Load: 610 With Aux Fuel: N/A Dimensions (m): Length (rotors turning): 16.3 Length (fuselage): 13.6 Width (including wing): 3.2 Height: 4.1 Main Rotor Diameter: 13.4 Tail Rotor Diameter: 2.6 Cargo Compartment Dimensions: negligible Standard Payload (kg): 1,544	Survivability/Countermeasures: Infrared signature suppressors mounted on engine exhaust. Radar warning receivers, IFF, Infrared jammer, chaff and flares. Armored cockpit. ARMAMENT The chin-mounted turret accepts Gatling-type guns ranging from 7.62-mm to 30-mm. Some aircraft have been modified to accept Stinger missiles (air-to-air Stinger or ATAS). 20-mm 3x barrel Gatling gun, M197: Range: (practical) 1,500 m Elevation: 21° up to 50° down Traverse: 220° Ammo Type: AP, HE Rate of Fire: burst 16±4, continuous 730±50 Most Probable Armament: AH-1G: Either 2x 7.62-mm miniguns with 4,000 rounds or 2x 40-mm grenade launchers with 300 rounds (one each is possible) in chin turret. Also on underwing hardpoints, 2.75-in. FFAR, minigun pods, or 20-mm automatic cannons. AH-1S: M197, 3x barrel 20-mm Gatling gun in chin turret. Also on underwing hardpoints, 8x BMG71 TOW antitank missiles, and 2x 2.75-in FFAR rocket pods. AVIONICS/SENSOR/OPTICS The TOW missile targeting system uses a telescopic sight unit (traverse 110°, elevation – 60°/+30°), a laser augmented tracking capability, thermal sights and a FLIR to allow for acquisition, launch, and tracking of all types of TOW missiles in all weather conditions.	The Cobra also uses a digital ballistic computer, a HUD, Doppler nav, and a low speed air data sensor on the starboard side for firing, and has in-flight boresighting. Available Israeli-made upgrades include an integrated FLIR with laser rangefinder, GPS, automatic boresighting, and the ability to fire both TOW II and Hellfire missiles. Night/Weather Capabilities: The AH-1 is fully capable of performing its attack mission in all weather conditions. VARIANTS Most older Cobra variants still in operation have been upgraded to the AH-1F standard. Also produced in Romania and Japan under license from Bell Textron in the U.S. AH-1G: Initial production model in 1966 AH-1S: Upgraded 1960s produced aircraft in late 1980s to the standard TOW carrying version. AH-1P: A set of AH-1S aircraft fitted with composite rotors, flat plate glass cockpits, and NVG capabilities. AH-1E: A set of AH-1S aircraft upgraded with the Enhanced Cobra Armament System incorporating the universal turret, 20-mm gun, automatic compensation for off-axis gun firing, and weapon management system. AH-1F: Current standard Cobra. Also referred to as the "Modernized Cobra". Incorporated all past upgrades. AH-1J/-1T/-1W: See separate AH-1W entry.	

NOTES

Available munitions are shown above; not all may be employed at one time. Mission dictates weapon configuration. External stores are mounted on underwing external stores points. Each wing has two hardpoints for a total of four stations. A representative mix when targeting armor formations would be eight TOW missiles, two 2.75-in rocket pods, and 750x 20-mm rounds. The gun must be centered before firing underwing stores. Additional missions include direct air support, antitank, armed escort, and air to air combat. Armored cockpit can withstand small arms fire, and composite blades and tailboom are able withstand damage from 23-mm cannon hits and small arms fire. The composite blades and tailboom are able to withstand damage from 23-mm cannon hits.

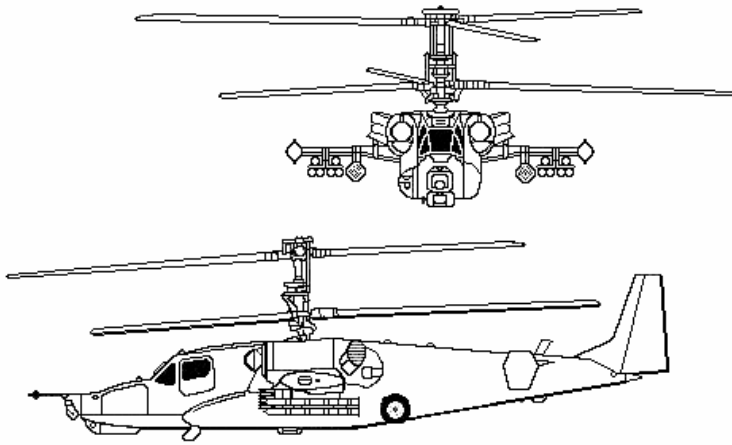
United States Attack Helicopter AH-1W/SUPERCOBRA

		Weapon & Ammunition Types	Combat Load
		20-mm 3x barrel Gatling gun	750
		Other Loading Options	
		Hellfire missile pods (4 each)	0-2
		TOW missile pods (4 each)	0-2
		2.75-in Hydra 70 rocket pods (19 each)	2-4
		Sidewinder or Sidearm missiles	2
		External fuel tanks (liters)	291/378
SYSTEM Alternative Designations: Seacobra, Supercobra, Bell 209 Date of Introduction: 1986 Proliferation: At least 3 countries Description: Crew: 2 (pilots in tandem seats) Blades: Main rotor: 2 Tail rotor: 2 Engines: 2x 1,775-shp General Electric T-700-GE-401 turboshaft Weight (kg): Maximum Gross: 6,700 Normal Takeoff: 6,700 Empty: 4,670 Speed (km/h): Maximum (level): 350 Cruise: 270 Max "G" Force: +2.5 to -0.5 g Ceiling (m): Service: 5,703 Hover (out of ground effect): 915 Hover (in ground effect): 4,270 Vertical Climb Rate (m/s): 4.0 Internal Fuel (liters): 1,150 Range (km): Normal Load: 590 With Aux Fuel: N/A Dimensions (m): Length (rotors turning): 17.7 Length (fuselage): 14.7 Width (including wing): 3.3 Height: 4.2 Main Rotor Diameter: 14.7 Tail Rotor Diameter: 3.0 Standard Payload (kg): 1,740		Survivability/Countermeasures: Infrared signature suppressors mounted on engine exhaust. Radar and laser warning receivers, IFF, Infrared jammer, missile warning system, chaff and flares, and rotor brake. Armored cockpit. ARMAMENT 20-mm 3x barrel Gatling gun, M197: Range: (practical) 1,500 m Elevation: 21° up to 50° down Traverse: 220° Ammo Type: AP, HE Rate of Fire: Burst 16±4, continuous 730±50 Most Probable Armament: AH-1W: M197, 3x barrel 20-mm Gatling gun in chin turret. Also on underwing hardpoints, 8x TOW or Hellfire antitank missiles (or four of each), and 2x 2.75-in FFAR rocket pods. AIM-9 Sidewinder or AIM-123 Sidearm missiles provide air-to-air capability. AVIONICS/SENSOR/OPTICS The missile targeting system uses a telescopic sight unit (traverse 110°, elevation -60°/+30°) with two magnifications/fields of view, a laser augmented tracking capability, TV, video recorder, thermal sights, FLIR, Doppler navigation, and a digital ballistic computer for acquisition, launch, and tracking of all TOW or Hellfire missiles in all weather conditions. The helmet-mounted display integrates NVGs with missile targeting and gun turret. The system allows the aircraft to self-designate targets.	
		Night/Weather Capabilities: The AH-1 is fully capable of performing its attack and armed escort missions in all weather conditions from land- or sea-based launching platforms. VARIANTS Most older AH-1J and AH-1T Seacobra variants still in operation have been upgraded to the AH-1W standard. AH-1J: Initial twin engine AH-1 variant fielded in the early 1970s. AH-1T: Upgraded engines and powertrain system for improved performance. This minimally expanded rotor system and overall dimensions of the AH-1J. AH-1RO: Construction of a variant of the aircraft may occur in the near future in Romania. Talks are ongoing between IAR industries and Bell Textron. It may be produced under the name "Dracula". AH-1Z/-1(4B)W: Four-bladed variant called the "King Cobra" or "Viper" that contains an integrated digital cockpit, and has better flight performance. AH-1P/-1E/-1F: See separate AH-1F entry.	

NOTES

Available munitions shown above; not all may be employed at one time. Mission dictates weapon configuration. External stores are mounted on underwing external stores points. Each wing has two hardpoints for a total of four stations. A representative mix when targeting armor formations is eight TOW or Hellfire missiles (sometimes four of each missile is loaded), two 2.75-in rocket pods, and 750x 20-mm rounds. The gun must be centered before firing underwing stores. Additional missions include direct air support, antitank, armed escort, and air to air. Armored cockpit can withstand small arms fire, composite blades, tailboom, and fuel tanks withstand 23-mm cannon hits. This aircraft costs approximately \$10.7 million which is considered inexpensive when compared to other modern attack helicopters, but it's performance is similar. Therefore many nations consider this aircraft as a possible candidate for fielding in attack helicopter squadrons.

Russian Attack Helicopter Ka-50/HOKUM

		<table><tr><th colspan="2">Weapon & Ammunition Types</th><th>Combat Load</th></tr><tr><td>1x 2A42 30-mm cannon</td><td></td><td></td></tr><tr><td>HE-Frag</td><td></td><td>250</td></tr><tr><td>AP</td><td></td><td>250</td></tr><tr><td>Total</td><td></td><td>500</td></tr><tr><th colspan="3">Other Loading Options</th></tr><tr><td>AT-16 VIKhR ATGM (6 each)</td><td></td><td>2</td></tr><tr><td>80-mm rockets (20 each)</td><td></td><td>2</td></tr><tr><td>Twin 23-mm gun pods</td><td></td><td>940</td></tr><tr><td>500-kg bombs</td><td></td><td>4</td></tr><tr><td>AA-11/ARCHER AAM</td><td></td><td>2</td></tr><tr><td>External fuel tanks (liters)</td><td></td><td>500</td></tr></table>	Weapon & Ammunition Types		Combat Load	1x 2A42 30-mm cannon			HE-Frag		250	AP		250	Total		500	Other Loading Options			AT-16 VIKhR ATGM (6 each)		2	80-mm rockets (20 each)		2	Twin 23-mm gun pods		940	500-kg bombs		4	AA-11/ARCHER AAM		2	External fuel tanks (liters)		500
Weapon & Ammunition Types		Combat Load																																				
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500-kg bombs		4																																				
AA-11/ARCHER AAM		2																																				
External fuel tanks (liters)		500																																				
SYSTEM Alternative Designations: Black Shark, Werewolf Date of Introduction: N/A Proliferation: Preproduction. An initial fielding plan is for 2 per year for 14 years. Description: Crew: 1 (pilots, 2 in Ka-52) Blades: Main rotor: 6 (2 heads, 3 blades each) Tail rotor: None Engines: 2x 2,200-shp Klimov TV3-117VK turboshaft Weight (kg): Maximum Gross: 10,800 Normal Takeoff: 9,800 Empty: 7,692 Speed (km/h): Maximum (level): 340 (est.) Cruise: 270 Sideward: 100+, Rearward: 100+ Turn Rate: unlimited Max "G" Force: +3 to +3.5 g Ceiling (m): Service: 5,500 Hover (out of ground effect): 4,000 Hover (in ground effect): 5,500 Vertical Climb Rate (m/s): 10 Fuel (liters): Internal: INA External Fuel Tank: 500 ea. (max 4x) Range (km): Maximum Load: INA Normal Load: 460 With Aux Fuel: INA Dimensions (m): Length (rotors turning): 16 Length (fuselage): 15.0 Width (including wing): 7.34 Height (gear extended): 4.93 Height (gear retracted): 4 Main Rotor Diameter: 14.5	Cargo Compartment Dimensions: Negligible Standard Payload: External weapons load: 2,500 kg on 4 under-wing stores points. Survivability/Countermeasures: Main rotors and engines electrically deiced. Infrared signature suppressors can be mounted on engine exhausts. Radar warning receivers, IFF, chaff and flares. Armored cockpit and self-sealing fuel tanks. Pilot ejection system. (see NOTES) ARMAMENT 30-mm Automatic Cannon, 2A42: Range: effective 3,000 m Elevation: -45° to +10° Traverse: ±15° Ammo type and rate of fire is selectable by pilot (HE or AP, 350 or 600) Most Probable Armament: (shown above) HOKUM A/N: Fuselage-mounted 30-mm cannon on right side, 80-mm rockets, AT-16 VIKhR ATGMs. HOKUM B: Same as above. ATGM, AT-16/VIKhr: Guidance: Laser Beam Rider SACLOS Range: 10,000 m Warhead: HEAT Penetration: 900 mm Effective against ground & air targets at converging speeds to 800 km/h. ATGM racks can depress to 12°.	AVIONICS/SENSOR/OPTICS The HOKUM uses a low-light level TV or thermal sighting, a laser range-finder (10 km), FLIR, air data sensor, and digital datalink which interface with a fire control computer, an autopilot, a helmet sighting system and HUD for target location, acquisition, designation, and firing. Night/Weather Capabilities: This aircraft's avionics package ensuring a full day/night, all weather capability. If it is to be employed at night in an attack role, it must be fitted with a night targeting pod. This pod includes a FLIR, a millimeter wave radar, and an electro-optical sight takes up one of the underwing pylons. The Ka-50N, and Ka-52 are capable of performing attack missions in day/night, and all-weather conditions. The French companies Thomson-CSF, and Sextant Avionique offer nav/attack systems, which can be fitted to export variants. VARIANTS Ka-50A/HOKUM A: Standard direct air support variant. Ka-50N/HOKUM N: Night attack variant fitted with a nose-mounted FLIR. The cockpit is fitted with an additional TV display, and is NVG compatible. Ka-52/HOKUM B: The "Alligator" is a side-by-side, two-seat cockpit variant of the Ka-50. The gross weight of the aircraft is greater, so the performance is marginally degraded. But airframe characteristics, dimensions, and armaments are relatively similar. It includes a mast-mounted millimeter wave radar covering the front quadrant only. It is used as an attack aircraft, and as a trainer for the Ka-50.																																				

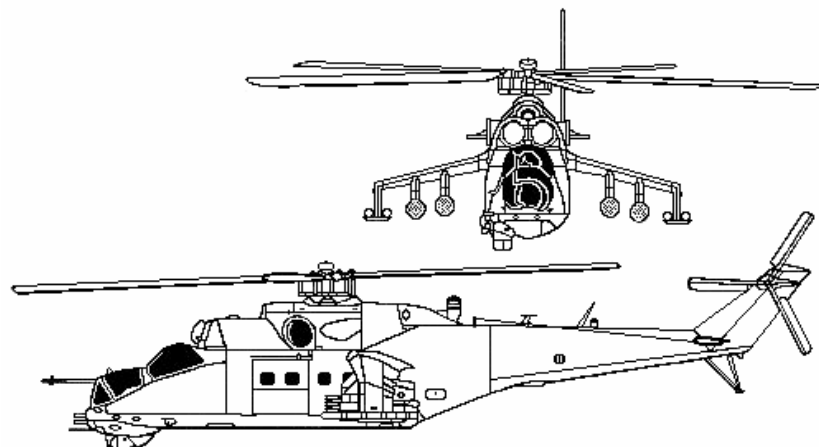
Russian Attack Helicopter Ka-50/HOKUM continued

NOTES

This aircraft is not fielded. Only a handful of prototypes exist, and it has not yet been approved for full-scale production.

The fully armored pilot's cabin can withstand 23-mm gunfire, and the cockpit glass 12.7-mm MG gunfire. The Zvezda K-37-800 pilot ejection system functions at any altitude. Available munitions are shown above; not all may be employed at one time. Mission dictates weapons configuration. External stores are mounted on underwing external hardpoints. Each wing has two hardpoints for a total of four stations. A typical mix for targeting armor formations is 12x AT-16 ATGMs, 500x 30-mm cannon rounds, and 2x 20-round pods of 80-mm folding fin unguided rockets. It was designed for remote operations, and not to need ground maintenance facilities for 2 weeks. The 30-mm cannon is the same as on the BMP-2. The firing computer will turn the aircraft to keep the gun on target. A coaxial counter-rotating rotor system negates the need for a tail rotor and its drive system. Because of this, this aircraft is unaffected by wind strength and direction, has an unlimited hovering turn rate, and gives a smaller profile and acoustic signature, while allowing a 10-15% greater power margin. The airframe is 35% composite materials with a structural central 1m² keel beam of kevlar/nomex that protects critical systems and ammunition. The HOKUM is fully aerobatic. It can perform loops, roll, and "the funnel", where the aircraft will maintain a concentrated point of fire while flying circles of varying altitude, elevation, and airspeed around the target.

Russian Attack Helicopter Mi-24/HIND

		<table><tr><th>Weapon & Ammunition Types</th><th>Combat Load</th></tr><tr><td>1x twin 30-mm gun or 12.7-mm 4 barrel turret gun</td><td>750 1,470</td></tr><tr><td colspan="2">Other Loading Options</td></tr><tr><td>AT-2C or AT-6C ATGMs</td><td>2-12</td></tr><tr><td>80-mm S-8 rocket pods (20 ea.)</td><td>2-4</td></tr><tr><td>57-mm S-5 rocket pods (32 ea.)</td><td>2-4</td></tr><tr><td>GSh-23L twin 23-mm MG pods</td><td>940</td></tr><tr><td>250-kg bombs</td><td>4</td></tr><tr><td>500-kg bombs</td><td>2</td></tr><tr><td>External fuel tanks (liters)</td><td>500</td></tr></table>	Weapon & Ammunition Types	Combat Load	1x twin 30-mm gun or 12.7-mm 4 barrel turret gun	750 1,470	Other Loading Options		AT-2C or AT-6C ATGMs	2-12	80-mm S-8 rocket pods (20 ea.)	2-4	57-mm S-5 rocket pods (32 ea.)	2-4	GSh-23L twin 23-mm MG pods	940	250-kg bombs	4	500-kg bombs	2	External fuel tanks (liters)	500
Weapon & Ammunition Types	Combat Load																					
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SYSTEM Alternative Designations: INA Date of Introduction: 1976 (HIND D) Proliferation: At least 34 countries Description: Crew: 2 (pilots in tandem cockpits) Blades: Main rotor: 5 Tail rotor: 3 Engines: 2x 2,200-shp Klimov TV3-117VMA turboshaft Weight (kg): Maximum Gross: 11,500 Normal Takeoff: 11,100 Empty: 8,500 Speed (km/h): Maximum (level): 335 Cruise: 295 Max "G" Force: 1.75 g Ceiling (m): Service: 4,500 Hover (out of ground effect): 1,500 Hover (in ground effect): 2,200 Vertical Climb Rate (m/s): 15 Fuel (liters): Internal: 1,840 Internal Aux Tank (in cabin): 1,227 External Fuel Tank: 500 ea. Range (km): Normal Load: 450 With Aux Fuel: 950 Dimensions (m): Length (rotors turning): 21.6 Length (fuselage): 17.5 Width (including wing): 6.5 Height (gear extended): 6.5 Main Rotor Diameter: 17.3 Tail Rotor Diameter: 3.9 Cargo Compartment Dimensions (m): Floor Length: 2.5 Width: 1.5 Height: 1.2	Standard Payload: Internal load: 8 combat troops or 4 litters External weapons load: 1,500 kg External load (no weapons): 2,500 kg Survivability/Countermeasures: Main and tail rotors electrically deiced. Infrared signature suppressors can be mounted on engine exhausts. Radar warning receivers, IFF, Infrared jammer, rotor brake, chaff and flares. Armored cockpit. ARMAMENT Loaded combat troops can fire personal weapons through cabin windows. 12.7-mm 4x Barrel Machinegun, YaKB-12.7: Range (m): (practical) 1,500 Elevation/Traverse: 20° up to 60° down/ 120° Ammo Type: HEFI, APT, Duplex, DuplexT Rate of Fire (rpm): up to 4,500 (pilot selectable) OR 30-mm Twin Barrel Cannon, GSh-30K: Range (m): (practical) 4,000 Elevation/Traverse: None (rigidly mounted) Ammo Type: HEFI, HEI, APT, APE, CC Rate of Fire (rpm): 300, or 2,000 to 2,600 Most Probable Armament: (HIND F pictured) HIND D: Turret-mounted 4-barrel 12.7-mm Gatling type machinegun, 57-mm rockets, AT-2C/SWATTER ATGMs. HIND E: Turret-mounted 4-barrel 12.7-mm Gatling type machinegun or twin barrel 23-mm turret gun, 57-mm rockets, AT-6C/ SPIRAL ATGMs. HIND F: Fixed 30-mm twin gun on the right fuselage side, 57-mm rockets, AT-6C/ SPIRAL ATGMs.	AVIONICS/SENSOR/OPTICS The ATGM targeting system uses a low-level light TV, a laser designator, FLIR, air data sensor, and a missile guidance transmitter. Night/Weather Capabilities: HIND D versions are primarily daytime aircraft only. Some HIND E and Mi-35 series export versions have upgraded night and weather capabilities, better avionics, weather radar, autopilot, HUD, GPS, NVG compatibility, more armor, and an increased weapons load provided by the French company Sextant Avionique. VARIANTS Nearly all of the older HIND A, B and C variants have been upgraded or modified to the HIND D or E standard. Mi-24D/HIND D: Direct air support. Mi-24V/HIND E: Direct air support. Most proliferated version. Mi-24P/HIND F: Direct air support. The fixed twin gun cut the turret profile, and empty weight to 8,200 kg, while boosting maximum gross weight to 12,000 kg. Mi-24R/HIND G-1: NBC sampling. It has mechanisms to obtain soil and air samples, filter air, and place marker flares. Mi-24K/HIND G-2: Photo-recon, and artillery spotting. Has a camera in cabin, gun, rocket pods, but no targeting system. Mi-25: Export version of the HIND D. Mi-35: Export version of the HIND E. The Mi-35M has a twin barrel 23-mm gun. Mi-35P: Export version of the HIND F.																				

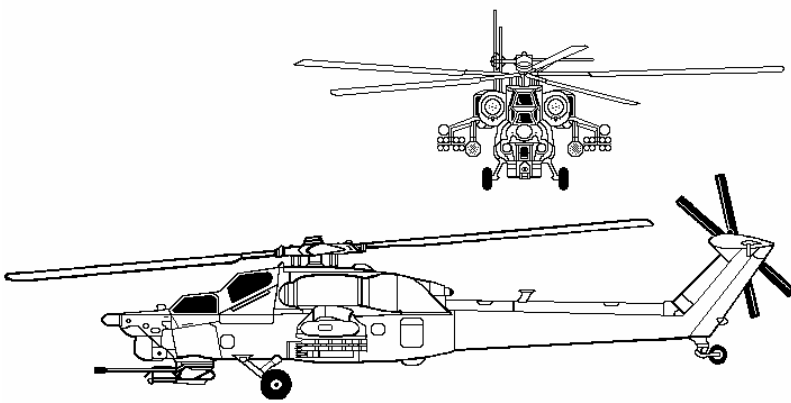
Russian Attack Helicopter Mi-24/HIND continued

NOTES

Available munitions are shown above; not all may be employed at one time. Mission dictates weapon configuration. External stores are mounted on underwing external stores points. Each wing has three hardpoints for a total of six stations. A representative mix when targeting armor formations would be eight AT-6 ATGMs, 750x 30-mm rounds, and two 57-mm rocket pods. Additional missions include direct air support, antitank, armed escort, and air to air combat. The aircraft can store an additional ammunition basic load in the cargo compartment in lieu of carrying troops. Armored cockpits and titanium rotor head able to withstand 20-mm cannon hits. Every aircraft has an overpressurization system for operation in a NBC environment.

The HIND's wings provide 22% to 28% of its lift in forward flight. In a steep banking turn at slower airspeeds, the low wing can lose lift while it is maintained on the upper wing, resulting in an excessive roll. This is countered by increasing forward airspeed to increase lift on the lower wing. Because of this characteristic, and the aircraft's size and weight, it is not easily maneuverable. Therefore they usually attack in pairs or multiple pairs, and from various directions.

Russian Attack Helicopter Mi-28/HAVOC

		Most Common Armament: 1x 2A42 30-mm cannon 4x AT-6/SPIRAL or 4x AT-9/ATAKA ATGMs 4x 80-mm rocket pod or 4x 57-mm rocket pod Other Loading Options: Twin 23-mm gun pods 500-kg bombs External fuel tanks 2x AA-16/GIMLET or 2x AA-18/ GROUSE AAM	Combat Load: 300 4 ea 20 ea 16 ea 940 4 2 ea
SYSTEM Alternative Designations: N/A Date of Introduction: N/A Proliferation: Preproduction. No fielding plan due to funding constraints. Only a few prototypes of each model have been constructed. Description: Crew: 2 pilots in tandem cockpits Blades: Main rotor: 5 Tail rotor: 4 (in "X" configuration) Engines: 2x 2,200-shp Klimov TV3-117VMA turboshaft Weight (kg): Max Gross: 11,500 Normal Takeoff: 10,400 Empty: 7,000 Speed (km/h): Max (level): 300 Cruise: 260 Sideward: 100, Rearward: 100 Turn rate: 60°/second Max "G" Force: -.5 to +3.7 g Ceiling (m): Service: 6,000 Hover (out of ground effect): 3,600 Hover (in ground effect): INA Vertical Climb Rate (m/s): INA Fuel: (liters) Internal: 1,900 Internal Aux Tank: N/A External Fuel Tank: INA Range: (km) Max Load: INA Normal Load: 475 With Aux Fuel: 1,100	Dimensions: (m) Length (rotors turning): 21.2 Length (fuselage): 16.8 Width (including wing): 4.9 Height: 4.7 Main Rotor Diameter: 17.2 Tail Rotor Diameter: 3.8 Cargo Compartment Dimensions: Negligible Standard Payload: 3,640 kg on 4 underwing stores points. Survivability/Countermeasures: Main rotors and engines electrically deiced. Infrared signature suppressors can be mounted on engine exhausts. Radar warning receivers, pressurized cockpit, IFF, chaff, decoys and flares. Armored cockpit and self-sealing fuel tanks. Pilot ejection system (see NOTES). ARMAMENT 30-mm Automatic Cannon, 2A42: Range: Effective 3,000 m Elevation: -40° to +13°, Traverse: ±110° Ammo Type: HE, or AP Rate of Fire: 300 or 800 Most Probable Armament: HAVOC A/N: Chin-mounted 30-mm gun, 80-mm rockets, 16x ATGMs. ATGM, AT-6/SHTURM: Guidance: SACLOS RF Range: 5,000-7,000 m (variant dependant) Warhead: Tandem HEAT Penetration: 700-950 mm (variant dependant) ATGM, AT-9/ATAKA: Guidance: SACLOS RF Range: 6,000 m Warhead: Tandem HEAT Penetration: 1,000 mm	80-mm Folding Fin, Unguided Rocket, S-8: Range: 2 to 3 km Warhead: AP or HE 20 rockets per pod, 2 pods carried SENSOR/OPTICS The HAVOC uses optical magnification, a laser designator, HUD, a pair of FLIR sensors, and a targeting radar for target engagement. Night/Weather Capabilities: The Mi-28A is primarily a daylight only aircraft. The Mi-28N has avionics upgrades, and the use of night-vision goggles allows a day/night, all-weather mission capability. VARIANTS Mi-28N: Known as the "night version". This version features an integrated rotor-hub radar for both targeting and navigation, a full autopilot, an inertial navigation system, and an optical, thermal, and low-light level TV helmet targeting system for target engagement. Night vision goggles are employed. The engines are upgraded to 2x 2,500-shp Klimov TV3-117SB3 turboshaft, and the transmission and rotor blades are more efficient. This accounts for the added avionics weight, and increases the armament basic load to 500x 30-mm cannon rounds, 16x AT-9 or AT-16 VIKhR ATGMs, 2x rocket pods, and up to 4x air-to-air missiles. The aircraft's systems allow for the orchestration of group combat actions through datalinks.	

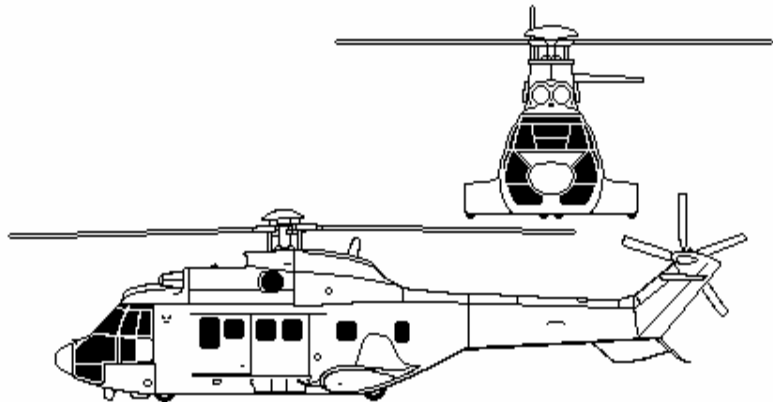
Russian Attack Helicopter Mi-28/HAVOC continued

NOTES

This aircraft is not fielded. Only a handful of prototypes exist, and it has not yet been approved for full-scale production.

Although this aircraft is routinely compared to the U.S. AH-64 Apache, it is much larger and less maneuverable than its U.S. counterpart. The cockpit glass is bulletproof to 12.7-mm rounds, and resistant to fragmentation from 20-mm shells. The armored cockpit frame is made of titanium, steel, and ceramic. It can also withstand hits of 20-mm shells at a minimum. Rotor blade-tip pitot tubes give speed and drift information for targeting at low airspeed. The HAVOC has a high altitude ejection system that jettisons wings and cockpit doors while the crew jumps to safety with parachutes. It has a "technical compartment" which accommodates two persons. This is used to evacuate a crew from a downed aircraft. Available munitions are shown above; not all may be employed at one time. Mission dictates weapon configuration. External stores are mounted on underwing external hardpoints. Each wing has two hardpoints for a total of four stations. A typical mix for targeting armor formations is 16x ATGMs, 300x 30-mm cannon rounds, and 2x 20-round pods of 80-mm rockets. The 30-mm cannon is the same as on the BMP-2. A helmet sighting system turns the cannon in the direction the pilot is looking. However, the cannon is usually fired in the stowed position only.

European Utility Helicopter AS-532/COUGAR

		Weapon & Ammunition Types 7.65-mm MG Other Loading Options 20-mm twin gun pods 68-mm rocket pods (22 each) 2.75-in rocket pods (19 each) External fuel tanks (liters)	Combat Load 2 2 2 600
SYSTEM Alternative Designations: AS 332 Super Puma, SA 330 Puma Date of Introduction: 1981 Proliferation: At least 38 countries Description: Variants in “()” Crew: 2 (pilots) Blades: Main rotor: 4 Tail rotor: 5, 4 (U2/A2) Engines: 2x 1,877-shp Turbomeca Makila 1A1 turboshaft Weight (kg): Maximum Gross: 9,000 (Mk I), 9,750 (Mk II) Normal Takeoff: 8,600 (Mk I), 9,300 (Mk II) Empty: 4,330 (UC/AC), 4,460 (UL/AL), 4,760 (U2/A2) Speed (km/h): Maximum (level): 275 (Mk I), 325 (Mk II) Cruise: 270 Ceiling (m): Service: 4,100 Hover (out of ground effect): 1,650 (Mk I), 1,900 (Mk II) Hover (in ground effect): 2,800 (Mk I), 2,540 (Mk II) Vertical Climb Rate (m/s): 7 Fuel (liters): Internal: 1,497 (UC/AC), 2,000 (UL/AL), 2,020 (U2/A2) Internal Aux Tank: 475 ea. (4x Mk I, 5x Mk II) Range (km): Normal Load: 620 (UC/AC), 840 (UL/AL), 800 (U2/A2) With Aux Fuel: 1,017 (UC/AC), 1,245 (UL/AL), 1,176 (U2/A2) Dimensions (m): Length (rotors turning): 18.7-19.5 (U2/A2)	Dimensions continued (m): Length (fuselage): 15.5 (UC/AC), 16.3 (UL/AL), 16.8 (U2/A2) Width: 3.6-3.8 (U2/A2) Height: 4.6 Main Rotor Diameter: 15.6-16.2 (U2/A2) Tail Rotor Diameter: 3.1-3.2 (U2/A2) Cargo Compartment Dimensions (m): Floor Length: 6.5 (AC/UC), 6.8 (UL/AL), 7.9 (U2/A2) Width: 1.8 Height: 1.5 Standard Payload (kg): Internal load: 3,000 External on sling only: 4,500 Transports 20-29 troops or 6-12 litters (variant dependant), or cargo. Survivability/Countermeasures: Main and tail rotor blades electrically deiced. A radar warning receiver is standard, while a laser warning receiver, missile launch detector, missile approach detector, infrared jammer, decoy launcher, and flare/chaff dispensers are optionally available. ARMAMENT The Mk I variants may employ 2x 7.65-mm machine guns on pintle-mounts in the cabin doors when employed in a transport role. Most Probable Armament The armed versions have side-mounted 20-mm machineguns and/or axial pods fitted with 68-mm rocket launchers. AVIONICS/SENSOR/OPTICS Night/Weather Capabilities: The aircraft is NVG compatible, and through its instruments, avionics, full autopilot, and nav computer, is capable of operation in day, night, and instrument meteorological conditions.	VARIANTS SA 330 Puma: Developed in the late 1960s by Aerospatiale in France. Others were built in the UK, Indonesia, Romania. AS 332 Super Puma: Differs from the SA 330 Puma through an improved rotor system, upgraded engines, stretched fuselage, and a modified nose shape. The Cougar name was adopted for all military variants, and in 1990, all Super Puma designations were changed from AS 332 to AS 532 to distinguish between civil and military variants. The “S” denotes military, “A” is armed, “C” is armed-antitank, and “U” is utility. The second letter represents the level of “upgrading”. AS-532 Cougar UC/AC Mk I: The basic version with a short fuselage to carry 20 troops. AS-532 Cougar UL/AL Mk I: This version has an extended fuselage, which allows it to carry 25 troops and more fuel. It is also capable of carrying an external load of 4,500 kg. AS-532 Cougar U2/A2 Mk II: This 1992 version is the longest variant of the Cougar line. It has an improved Spheriflex rotor system with only 4x tail rotor blades, and 2x 2,100-shp Turbomeca Makila 1A2 turboshaft engines that allow an increased cargo carrying capability. It can transport 29 troops or 12 litters, or an external load of 5,000 kg. Primarily used for combat search and rescue, and as an armed version. It may be armed additionally with a 20-mm cannon or pintle-mounted .50 caliber machine guns.	

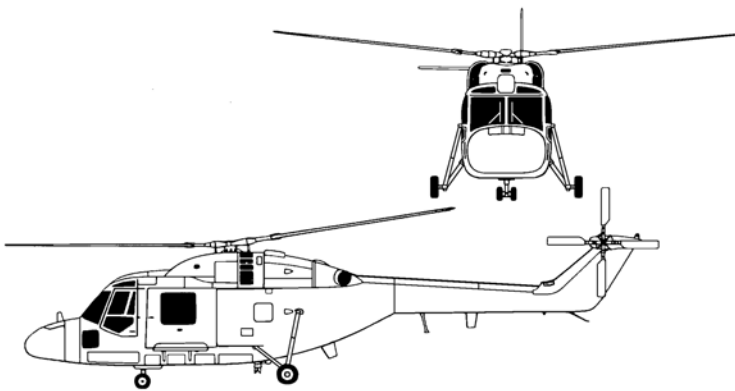
NOTES

This helicopter is produced by the Eurocopter company. It was formed as a joint venture between Aerospatiale of France, and Daimler-Benz Aerospace of Germany. Additional missions include: VIP transport, electronic warfare, and anti-submarine warfare.

		Weapon & Ammunition Types 2x 7.62-mm or 1x 12.7-mm MG Other Loading Options AT-2C or AT-3 ATGMs 57-mm rocket pods (16 each) 80-mm rocket pods (20 each) 250-kg bombs 500-kg bombs 12.7-mm MG pod Twin 23-mm gun pods Additional fuel tanks (liters)	Combat Load 4-6 4-6 2 4 2 2 1,830
SYSTEM Alternative Designations: Mi-8MT HIP H Date of Introduction: 1981 (as Mi-17) Proliferation: At least 22 countries Description: Crew: 3 (2x pilots, 1x flight engineer) Blades: Main rotor: 5 Tail rotor: 3 Engines: 2x 1,950-shp Isotov TV3-117MT turboshaft Weight (kg): Maximum Gross: 13,000 Normal Takeoff: 11,100 Empty: 7,100-7,370 (variant dependant) Speed (km/h): Maximum (level): 250 Cruise: 240 Ceiling (m): Service: 5,000-5,700 (variant dependant) Hover (out of ground effect): 1,760 Hover (in ground effect): 1,900-3,980 (variant dependant) Vertical Climb Rate (m/s): 9 Fuel (liters): Internal: 445 Internal Aux Tank: 915 ea. External Fuel Tank: Port Tank: 745 Starboard Tank: 680 Range (km): Normal Load: 495 With Aux Fuel: 1,065	Dimensions (m): Length (rotors turning): 25.4 Length (fuselage): 18.4 Width: 2.5 Height: 5.7 Main Rotor Diameter: 21.3 Tail Rotor Diameter: 3.9 Cargo Compartment Dimensions (m): Floor Length: 5.3 Width: 2.3 Height: 1.8 Standard Payload (kg): Internal load: 4,000 External on sling only: 3,000 Transports 24 troops and cargo, or armaments on 6x external hardpoints. Survivability/Countermeasures: Main and tail rotor blades electrically deiced. Infrared jammer, chaff and flares. ARMAMENT Loaded combat troops can fire personal weapons through cabin windows from inside cabin. Most Probable Armament: HIP H: Fitted with 2x 7.62-mm machineguns or possibly 2x 23-mm GSh-23 gun packs in cabin, 57-mm rockets, and AT3/SAGGER ATGMs.	AVIONICS/SENSOR/OPTICS Night/Weather Capabilities: The Mi-17 is equipped with instruments, avionics, Doppler radar, and a fully functioning autopilot for operation in day, night, and instrument meteorological conditions. VARIANTS Mi-17: A mid-life upgrade of the widely proliferated Mi-8 HIP H medium assault/transport helicopter. Initially, only the export version was known as the Mi-17. The only visible differences between this variant and the older Mi-8s is that the tail rotor is on the portside rather than the starboard side, and crew armor plating. Mi-17P: A descendent of the HIP K airborne jamming platform characterized by large rectangular antennas along the aft fuselage. Mi-17I/-17M/-17V: Also known as Mi-8MTV , and a descendent of the HIP H. The engines are upgraded to 2x 2,070-shp Klimov TV3-117VMAs to allow greater rates of climb and hover ceilings, yet performance characteristics remain virtually unchanged from the baseline Mi-17. Mi-8: See separate entry.	

Available munitions are shown above; not all may be employed at one time, mission dictates weapon configuration. External stores are mounted on weapons racks on each side of the fuselage. The Mi-17 has six external hardpoints. Additional missions include; attack, direct air support, electronic warfare, airborne early warning, medevac, search and rescue, and minelaying. Interior seats are removable for cargo carrying. The rear clamshell doors open, an internal winch facilitates loading of heavy freight. Floor has tie down rings throughout. The aircraft carries a rescue hoist capable to 150 kg. The Mi-17 is capable of single-engine flight in the event of loss of power by one engine (depending on aircraft mission weight) because of an engine load sharing system. If one engine fails, the other engine's output is automatically increased to allow continued flight. See also Mi-8.

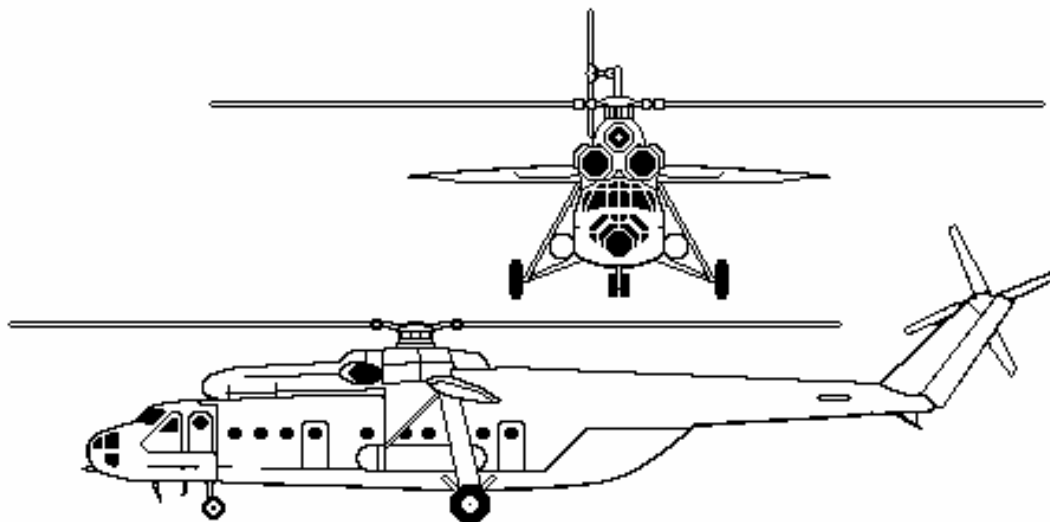
United Kingdom Multi-role Helicopter LYNX

		Weapon & Ammunition Types	Combat Load
		Other Loading Options	
		20-mm MG	2
		2x 7.62-mm AA-52 FN MG pods	2
		12.7-mm machinegun pod	2
		20-mm GIAT Minigun pods	2
		2x Antitank missile pods (4 each)	8
		2x AAM pod	2
		2x 68-mm or 2.75-in rocket pods (18 or 19 each)	36 or 38
SYSTEM Alternative Designations: Battlefield Lynx, Super Lynx, Light Battlefield Helicopter, AH-1 Date of Introduction: 1977 Proliferation: At least 11 countries Description: Variants in "()" Crew: 2 (pilots) Blades: Main rotor: 4 Tail rotor: 4 Engines: 2x 900-shp Rolls Royce Gem 42-1 turboshaft, 2x 1,260 LHTEC CTS800-4N turboshaft (Mk 9) Weight (kg): Max Gross: 4,535, 5,126 (Mk 9) Normal Takeoff: 2,658, 3,496 (Mk 9) Empty: 2,578 Speed (km/h): Max (level): 289 Cruise: 259, 285 (Mk 9) Sideward: 130, Rearward: INA Max "G" Force: +2.3 to -0.5 Ceiling (m): Service: INA Hover (out of ground effect): 3,230, 5,126 Hover (in ground effect): 3,660 Vertical Climb Rate (m/s): 7 Fuel (liters): Internal: 985 Aux fuel: 696 Range (km): Normal Load: 630 With Aux Fuel: 1,342 Dimensions (m): Length (rotors turning): 15.2 Length (fuselage): 13.2 Width: 3.8, 3.0 (Mk 9) Height: 3.7 Main Rotor Diameter: 12.8 Tail Rotor Diameter: 2.2, 2.4 (Mk 9)		AVIONICS/SENSOR/OPTICS Night/Weather Capabilities: The aircraft is NVG compatible, and through its instruments, avionics, autopilot, and doppler navigation system, is capable of operation in day, night, and instrument meteorological conditions. VARIANTS Developed under a partnership between predominantly Westland of the United Kingdom, and Aerospatiale of France. Listed below are the primary, most proliferated variants used by ground forces. Many others exist in small numbers for ground and naval forces. Lynx AH. Mk 1: The basic army general purpose and utility version. This aircraft has skid-type landing gear. Most have been converted to Mk 7 format. Lynx AH. Mk 7: Also known as AH 1 . Upgraded British army version, some with improved main rotor blades. Reverse-direction tail rotor to reduce noise signatures and improve performance. This aircraft has skid-type landing gear. Lynx AH. Mk 9: Also known as Super Lynx or Light Battlefield Helicopter . Implemented tricycle-type landing gear, improved rotor blades, and upgraded engines to increase performance. Mostly used in tactical transport role, with no ATGM launch capability. Battlefield Lynx: Export version of Lynx AH. Mk 9 that can be armed with ATGMs.	
ARMAMENT The Lynx employed by ground forces can be equipped with two 20-mm cannons mounted externally to permit 7.62-mm machineguns to be fired from the cabin. Two fuselage pylons allow for external stores. Most Probable Armament The armed versions have side-mounted 20-mm machineguns and 8x HOT/Hellfire/TOW ATGMs. An additional load of 8 missiles can be carried in the cabin. Army variants equipped for TOW missiles have a roof-mounted sight (over the left-hand pilot's seat) with IR and thermal capabilities for firing. Optional equipment allows for target magnification, LLLTV, cameras, and IR searchlight.			

NOTES

This aircraft was designed to be both a transport and an attack aircraft. Additional missions include: VIP transport, search and rescue, mine-laying, and anti-submarine warfare. Squadrons are aligned along aircraft models. Available munitions are shown above; not all may be employed at one time. Mission dictates weapon configuration. External stores are mounted on two points. Each fuselage side has one pylon allowing for a single gun pod or missile rack. The Lynx is capable of single-engine flight in the event of loss of power by one engine (depending on aircraft mission weight) because of an engine load sharing system. If an engine fails, the other's output is increased to allow continued flight.

Russian Transport Helicopter Mi-6/HOOK

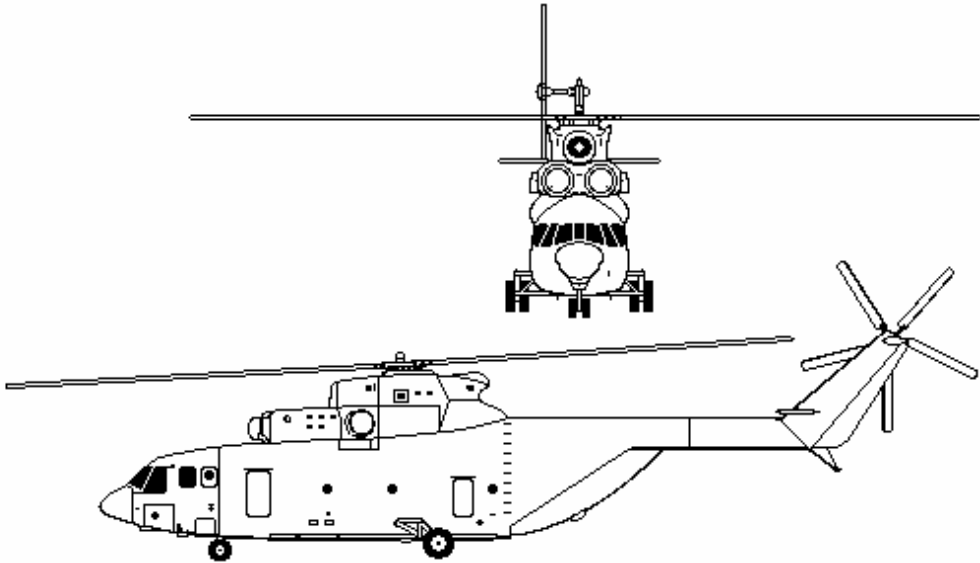


SYSTEM Alternative Designations: INA Date of Introduction: 1961 Proliferation: At least 15 countries Description: Crew: 5 (2x pilots, 1x navigator, 1x flight engineer, 1x radio operator) Blades: Main rotor: 5 Tail rotor: 4 Engines: 2x 5,500-shp Soloviev D-25V (TV-2BM) turboshaft Weight (kg): Max Gross: 42,500-46,800 Normal Takeoff: 40,500 Empty: 27,240 Speed (km/h): Max (level): 300 Cruise: 250 Ceiling (m): Service: 4,500 Fuel (liters): Internal: 6,315 Internal Aux Tank: INA External Fuel Tank: 3,490	Range (km): Max Load: 620 With Aux Fuel: 1,000 km Dimensions (m): Length (rotors turning): 41.7 Length (fuselage): 33.2 Width (including wing): 15.3 Height: 9.9 Main Rotor Diameter: 35.0 Tail Rotor Diameter: 6.3 Cargo Compartment Dimensions (m): Floor Length: 12 Width: 2.65 Height: Variable from 2.0 to 2.5 Standard Payload: Internal: 12,000 kg with rolling takeoff External: 8,000 kg at hover Transports over 65 troops, or 41 litters, or 1x BRDM-2 scout car, or 1x BMD, or 1x GAZ truck, or 1x 7,500 liter POL truck or 12,000 liters in soft bladders. Survivability/Countermeasures: Main rotor blades electrically deiced. Tail rotor blades have internal anti-icing fluid. ARMAMENT Some aircraft used for tactical missions have a 12.7 mm machinegun in the nose.	AVIONICS/SENSOR/OPTICS Night/Weather Capabilities: The avionics and navigational package, and a fully functioning autopilot allow for day/night all-weather operation. VARIANTS Mi-6A/-6T/HOOK A: Basic civil and military transport version. Mi-6VKP/HOOK B: Airborne command post variant. Mi-6VUS/HOOK C: Developed airborne command post. Also known as Mi-22. Mi-6AYaSh/HOOK D: Airborne command post with possible side-looking airborne radar fairing. Mi-6S: Medevac variant. Mi-6TZ: Tanker variant.
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NOTES

Removable stub wings, when installed, are fixed at a 15° incidence relative to the longitudinal axis. They provide 20% of the total lift in forward flight. Aircraft production ended in 1981. Aircraft has hydraulically actuated rear clamshell doors and ramp, provisions for internal cargo tie-down rings, an 800 kg capacity internal winch system in cargo compartment, floor capacity is 2,000 kg/m², and a central hatch in the cabin floor for sling loads.

Russian Transport Helicopter Mi-26/HALO

		
SYSTEM Alternative Designations: INA Date of Introduction: 1983 Proliferation: At least 5 countries Description: Crew: 5 (2x pilots, 1x navigator, 1x flight engineer, 1x loadmaster) Blades: Main rotor: 8 Tail rotor: 5 Engines: 2x 11,400-shp Lotarev D-136 turboshaft Weight (kg): Maximum Gross: 56,000 Normal Takeoff: 49,500 Empty: 28,240 Speed (km/h): Maximum (level): 295 Cruise: 255 Ceiling (m): Service: 4,500 Hover (out of ground effect): 1,800 Hover (in ground effect): 4,500 Vertical Climb Rate: INA	Fuel (liters): Internal: 11,900 Range (km): Maximum Load: 800 Normal Load: INA With Aux Fuel: 1200 km Dimensions (m): Length (rotors turning): 40 Length (fuselage): 33.5 Width: 8.2 Height: 8.1 Main Rotor Diameter: 32 Tail Rotor Diameter: 7.6 Cargo Compartment Dimensions (m): Floor Length: 12 Width: 3.3 Height: variable from 2.9 to 3.2 Standard Payload: Internal or external load: 20,000 kg Transports over 80 troops, 60 litters, or 2x BRDM-2 scout cars, or 2x BMDs, or 1x BMP or, 1x BTR-60/70/80 or, 1x MT-LB. Survivability/Countermeasures: Main and tail rotor blades electrically deiced. Infrared signature suppressors on engines. Infrared jammers and decoys; flares. Self-sealing fuel tanks.	ARMAMENT None AVIONICS/SENSOR/OPTICS Night/Weather Capabilities: The avionics and navigational package, a Doppler weather radar, and a fully functioning autopilot allow for day/night all-weather operation. VARIANTS Mi-26MS: Medical evacuation version. Mi-26T: Freight transport. Mi-26TZ: Fuel tanker with an additional 14,040 liters of fuel in 4x internal tanks and 1,040 liters of lubricants, pumped through 4x 60-meter long refueling nozzles for refueling aircraft, and 10x 20-meter long hoses for refueling ground vehicles. Fuel transfer rate is 300 liters/minute for aviation fuel, and 75-150 liters/minute for diesel fuel. The refueling system can easily be removed to allow the aircraft to perform transport missions.

NOTES

The HALO A has no armament. The load and lift capabilities of the aircraft are comparable to the U.S. C-130 Hercules transport aircraft. The length of the landing gear struts can be hydraulically adjusted to facilitate loading through the rear doors. The tailskid is retractable to allow unrestricted approach to the rear clamshell doors and loading ramp. The cargo compartment has two electric winches (each with 2,500 kg capacity) on overhead rails can move loads along the length of the cabin. The cabin floor has rollers and tie-down rings throughout. The HALO has a closed-circuit television system to observe positioning over a sling load, and load operations. The Mi-26 is capable of single-engine flight in the event of loss of power by one engine (depending on aircraft mission weight) because of an engine load sharing system. If one engine fails, the other engine's output is automatically increased to allow continued flight.

Chapter 10

Fixed-Wing Aircraft

This chapter provides the basic characteristics of selected fixed-wing aircraft readily available to the OPFOR. Both FM 100-60, *Armor- and Mechanized-Based Opposing Force: Organization Guide*, and FM 100-63, *Infantry-Based Opposing Force: Organization Guide*, use descriptors to indicate aircraft capabilities. In each manual, a substitution matrix enables the trainer to structure OPFOR air support requirements as required by capability rather than specific type.

Fixed-Wing Aircraft, generally covers the systems that will affect the planning and actions of the tactical-level ground maneuver force, and aircraft commonly employed by the OPFOR when in close proximity to enemy ground forces. Therefore, fighters and long-range bombers are not addressed unless they are routinely employed in training scenarios. This chapter classifies aircraft as strike, ground-attack, multi-role, and transport aircraft. Multi-role aircraft are able to support missions across each of the categories. This chapter encompasses many aircraft which may have a dual civil/military application. It does not include, however, aircraft designed and used primarily for civil aviation.

This sampling of systems was selected because of wide proliferation across numerous countries or because of already extensive use in training scenarios. Additional data sheets addressing other widely proliferated aircraft will be sent with further supplements to this guide.

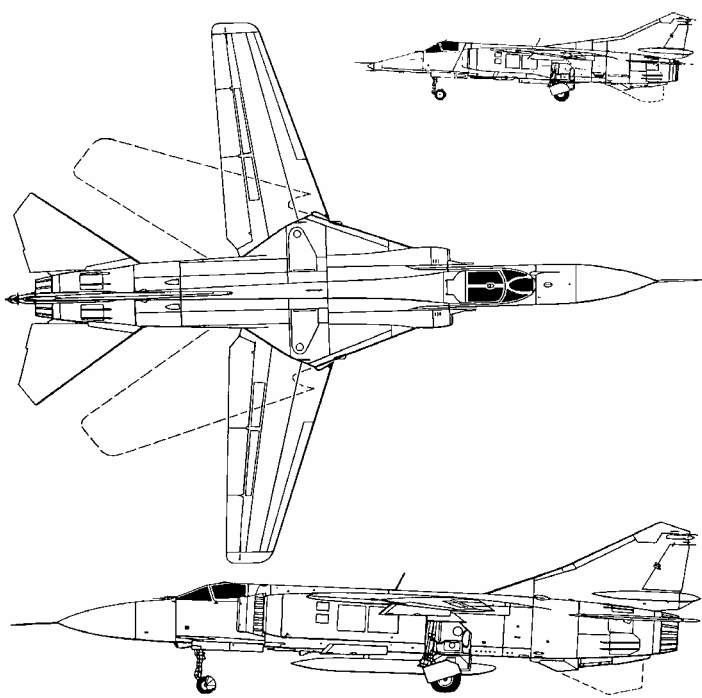
Because of the increasingly large numbers of variants of each aircraft, only the most common variants produced in significant numbers were addressed. If older versions of airplanes have been upgraded in significant quantities to the standards of newer variants, the older versions were not addressed.

The munitions available to each aircraft are mentioned, but not all may be employed at the same time. The weapon systems inherent to the airframe are listed under armament. The most probable weapon loading options are also given, but assigned mission dictates actual weapon configuration. Therefore, any combination of the available munitions may be encountered.

Questions and comments on data listed in this chapter should be addressed to:

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e-mail address: burslieb@leavenworth.army.mil

Russian Strike Aircraft MiG-23/FLOGGER

		<table><tr><th>Weapon & Ammunition Types</th><th>Combat Load</th></tr><tr><td>23-mm Gsh-23L twin gun or 23-mm 6x barrel Gsh-6-23 gun</td><td>200 260</td></tr><tr><td colspan="2">Other Loading Options</td></tr><tr><td>240-mm S-24 rockets (1 each) or 80-mm S-8 rocket pods (20 ea) or 57-mm S-5 rocket pods (32 ea)</td><td>4</td></tr><tr><td>AS-7/KERRY ASM or AS-10/KAREN ASM or AS-12/KEGLER ASM or AS-14/KEDGE ASM</td><td>4</td></tr><tr><td>2x AA-7 APEX or AA-8/APHID AAM launchers</td><td>2</td></tr><tr><td>Gun Pods</td><td></td></tr><tr><td>External fuel tanks (liters)</td><td>800</td></tr><tr><td>50-kg, 100-kg, 250-kg, or 500-kg unguided and guided bombs</td><td></td></tr></table>	Weapon & Ammunition Types	Combat Load	23-mm Gsh-23L twin gun or 23-mm 6x barrel Gsh-6-23 gun	200 260	Other Loading Options		240-mm S-24 rockets (1 each) or 80-mm S-8 rocket pods (20 ea) or 57-mm S-5 rocket pods (32 ea)	4	AS-7/KERRY ASM or AS-10/KAREN ASM or AS-12/KEGLER ASM or AS-14/KEDGE ASM	4	2x AA-7 APEX or AA-8/APHID AAM launchers	2	Gun Pods		External fuel tanks (liters)	800	50-kg, 100-kg, 250-kg, or 500-kg unguided and guided bombs	
Weapon & Ammunition Types	Combat Load																			
23-mm Gsh-23L twin gun or 23-mm 6x barrel Gsh-6-23 gun	200 260																			
Other Loading Options																				
240-mm S-24 rockets (1 each) or 80-mm S-8 rocket pods (20 ea) or 57-mm S-5 rocket pods (32 ea)	4																			
AS-7/KERRY ASM or AS-10/KAREN ASM or AS-12/KEGLER ASM or AS-14/KEDGE ASM	4																			
2x AA-7 APEX or AA-8/APHID AAM launchers	2																			
Gun Pods																				
External fuel tanks (liters)	800																			
50-kg, 100-kg, 250-kg, or 500-kg unguided and guided bombs																				
SYSTEM Alternative Designations: MiG-27, Bahadur, or Valiant (Indian variant) Date of Introduction: 1972 Proliferation: At least 23 countries Description: Variants in () Crew: 1 (pilot) Appearance: Wings: High-mount, variable, tapered Engines: One in fuselage Fuselage: Long and tubular, with box-like intakes and large, swept belly-fin Tail: Swept-back, tapered with angular tip, swept, tapered flats mounted on fuselage Engines: 1x 28,660-shp Soyuz/Kachaturrov R-35-300 (MiG-23)/ or 1x 25,335-shp R-29B-300 (MiG-27) turbojet with after-burner Weight (kg): Max Gross: 17,800 (MiG-23)/ 20,700 (MiG-27) Normal Takeoff: 14,840 (MiG-23)/ 18,900 (MiG-27) Empty: 10,200 (MiG-23)/11,908 (MiG-27) Speed (km/h): Max (at altitude): Mach 2.35 (MiG-23)/ Mach 1.7 (MiG-27) Max (sea level): Mach 1.2 Takeoff/Landing Speed: 315/270 Max “G” Force (g): +8.5 g (MiG-23)/ +7.0 (MiG-27) Ceiling (m): Service (clean): 18,600 With External Stores: INA	Vertical Climb Rate (m/s): 240 Fuel (liters): Internal: 4,250 (MiG-23)/ 5,400 (MiG-27) External: Up to 5x 800 liter tanks Range (km): Max Load: 1,500 With Aux Fuel: 2,500 Combat Radius: 1,150 Takeoff Run/Landing Roll (m): Prepared Surface: 500/750 (MiG-23)/ 950/1,300 (MiG-27) Dimensions (m): Length: 16.8 (MiG-23/ 17.1 (MiG-27) Wingspan: 14.0 extended, 7.8 swept Height: 4.8 (MiG-23)/ 5.0 (MiG-27) Standard Payload (kg): External: 3,000 (MiG-23)/ 4,000 (MiG-27) Hardpoints: 5 (MiG-23)/7 (MiG-27) Survivability/Countermeasures: Pressurized cockpit with zero/130 ejection seat, infrared and radar jammer, radar warning receiver, decoy, chaff and flares. Armored cockpit on MiG-27 ARMAMENT The MiG-23 has a twin gun, and the MiG-27 has a 6x barrel Gatling gun. 23-mm twin gun, Gsh-23L: Range (m): (practical) 2,500 Elevation/Traverse: None (rigidly mounted) Ammo Type: HEFI Rate of Fire (rpm): 9,000	23-mm 6x barrel gun, Gsh-6-23: Range (m): (practical) 2,500 Elevation/Traverse: None (rigidly mounted) Ammo Type: HEFI Rate of Fire (rpm): 9,000 AVIONICS/SENSOR/OPTICS The MiG-23 has an acquisition and tracking radar, IR sensor, and Doppler nav system. The MiG-23B and MiG-27 series have a flattened nose section which houses a laser rangefinder/designator, TV sighting system, and a target tracker instead of the radar to attack ground targets. Night/Weather Capabilities: The MiG-23 is capable of attacking air targets day or night. The MiG-27 is capable of attacking ground targets in day, night, and poor weather conditions. VARIANTS MiG-23M/-23MF/-23MS/FLOGGER B: Standard interceptor, and first production variant. Export version is FLOGGER E. MiG-23U/-23UM/-23UB/FLOGGER C: A tandem seat combat and trainer variant. MiG-23B/-23BN/-23BN/-23BK/FLOGGER F/and FLOGGER H: Export fighter/ bomber variant with Gsh-23 twin barrel gun, and tapered nose. Evolved into MiG-27.																		

Russian Strike Aircraft MiG-23/FLOGGER continued

MiG-23ML/-23P/-23MLD/FLOGGER G and FLOGGER K: Primary production variant. Similar to FLOGGER B. MiG-27K/FLOGGER D: Ground-attack variant with internal 6x barrel 23-mm gun. Appearance differs by tapered nose. MiG-27D/FLOGGER J: Appearance differs by a long downward-sloping, pointed nose. Can be fitted with a three-camera recon pod. MiG-27M/-27L: Export versions built by Hindustan Aeronautics in India.		
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NOTES

Inset line-drawing shows nose and intake differences of the MiG-27. This difference allows for a laser rangefinder/target designator. The sweep wing is capable of three angles: 16, 45, and 72 degrees. The ventral fin on the bottom rear of the fuselage folds for takeoff and landing. Up to five external fuel tanks can be carried on the MiG-23, and four on the MiG-27, but the MiG-27 can also be fitted for aerial refueling. Available munitions are shown above; not all may be employed at one time. Mission dictates weapons configuration. External stores are mounted on underwing and underbody hardpoints. Each wing has one point, two points are under the intakes along the fuselage, and the center fuselage attachment point gives five total stations. The MiG-27 then adds two more bomb racks under the wings for a total of seven stations.

10-7

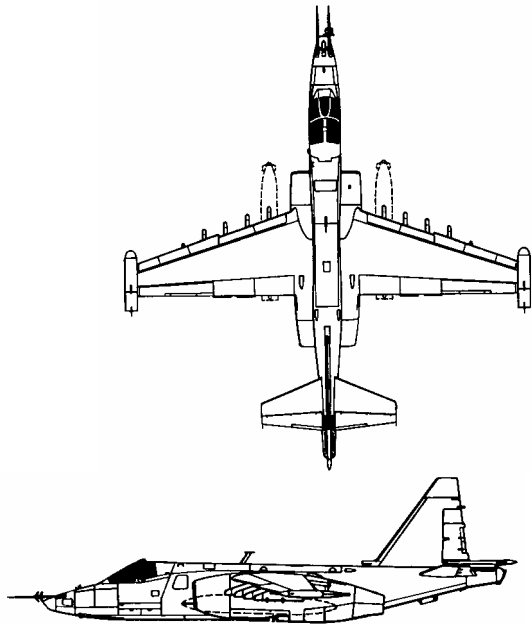
Russian Ground-Attack Aircraft Su-17/FITTER continued

Su-17UM/-22U/FITTER E: Two-seat trainer with components of Su-17M. Su-17/FITTER G: Combat-ready two-seat trainer variant of FITTER H. Export version is Su-22, with Tumansky engine. Su-17/-17M3/FITTER H: Increased pilot visibility by drooping the aircraft nose, and incorporated an internal Doppler-nav and laser rangefinder. Reconnaissance version called Su-17M3R. Su-17M4/-22M4/FITTER K: Fighter-bomber. Essentially same as above, but with an additional air intake. Employs digital navigation and attack avionics. Su-22/FITTER F: Export version of FITTER D with Tumansky engine. Su-22/-22M3/FITTER J: Similar to FITTER H, but with increased internal fuel capacity.		
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NOTES

The mid-wing pivot point of the sweep wings allows for positions of either 28, 45 or 62 degrees. Up to four external fuel tanks can be carried on wing pylons and under the fuselage. When under-fuselage tanks are carried, only the two inboard wing pylons may be used for ordnance. Available munitions are shown above; not all may be employed at one time. Mission dictates weapons configuration. External stores are mounted on underwing and underbody hardpoints. Each wing has two points, and the fuselage has four attachment points for a total of eight stations. Gun pods can be mounted to fire rearward.

Georgian/Russian Ground-Attack Aircraft Su-25/FROGFOOT

		Weapon & Ammunition Types 30-mm twin barrel Gsh-30-2 gun Other Loading Options AT-16 VIKhR ATGM (8 each) 23- or 30-mm GSH gun pods 57-mm S-5 rocket pod (32 ea) or 80-mm S-8 rocket pod (20 ea) AS-7/KERRY ASM or AS-10/KAREN ASM or AS-14/KEDGE ASM or AS-11/KILTER ASM or AS-17/KRYPTON ASM AA-8/APHID or AA-10/ALAMO 50-kg to 500-kg bombs External fuel tanks (liters)	Combat Load 250 16 260 ea 8 8 8 2 4,000 kg 800/1,150
SYSTEM Alternative Designations: Gratch, Rook Date of Introduction: 1980 Proliferation: At least 15 countries Description: Crew: 1 (pilot) Appearance: Wings: High-mount, tapered back Engines: Both along body, under wings Engines: 2x 4,000-shp Ryzhov (Soyuz/Tumansky) R195 Turbojet Weight (kg): Maximum Gross: 17,600 Normal Takeoff: 14,500 Empty: 9,525 Speed (km/h): Maximum (at altitude): 880 Maximum (sea level): 950 Maximum Attack Speed: 690 Cruise: 700 Takeoff/Landing Speed: 220 Max "G" Force (g): +6.5 g Ceiling (m): Service (clean): 7,000 With External Stores: 5,000 Vertical Climb Rate (m/s): 72 Fuel (liters): Internal: 3,660 External: 3,762	Range (km): Maximum Load: 500 With Aux Fuel (2 tanks): 640 Combat Radius: 556 Takeoff Run/Landing Roll (m): Prepared Surface: 550/600 Unprepared Surface: 650/750 Max Load: 1,200 Dimensions (m): Length: 15.5 Wingspan: 14.5 Height (gear extended): 4.8 Standard Payload (kg): External: 4,400 or 6,400 (Su-25T) Hardpoints: 10 underwing, w/500 kg ea Survivability/Countermeasures: Armored cockpit and engines, zero/100 km/hr ejection seat, self-sealing fuel tanks, and strengthened flight control linkages. IFF, infrared jammer, radar warning receiver, chaff and flares. ARMAMENT 30-mm 2x barrel gun, Gsh-30-2: Range (m): (practical) 4,000 Elevation/Traverse: None (rigid mount) Ammo Type: AP, HE, CC Rate of Fire: Burst 50	AVIONICS/SENSOR/OPTICS The targeting system incorporates a LLLTV, integrated navigation and aiming system, active bomb sight, and laser rangefinder/designator. The aircraft uses an INS, GPS, and Doppler navigation. Night/Weather Capabilities: The Su-25 is fully capable of performing its direct air support mission in day, night, and poor weather conditions. VARIANTS Early Su-25s had 2x Soyuz/ Gavrillov R95SH engines. Most now upgraded. Su-25A/-25K: Initial variant, and export. Su-25B/-25UB/-25UBK/-UBP: A two-seat combat aircraft, naval version, and trainer. Su-25T/-25TM/-25TK: Developed from the Su-25UB. Height changed to 5.2 m to hold avionics and extra fuel. All with R195 engine for increased range, ceiling, and load. Other characteristics generally similar. Upgraded targeting, acquisition, and countermeasures. Su-39: Export variant of Su-25T.	

NOTES

Available munitions are shown above; not all may be employed at one time. Mission dictates weapons configuration. External stores are mounted on underwing hardpoints. Each wing has five points for a total of ten stations. A representative mix when targeting armor formations would be 16x AT-16 ATGMs, two rocket pods, two 23-mm gun pods, 250x 30-mm rounds, and two AA-8s. The titanium cockpit is invulnerable to 20-mm cannon fire, and 30-mm fire from oblique angles. The aircraft can carry a self-contained maintenance kit in 4 underwing pods. Also the engines can operate on any type of fuel likely to be found in the forward-operating areas, including diesel and gasoline. This allows the crew to operate from unprepared airfields for extended periods of time.

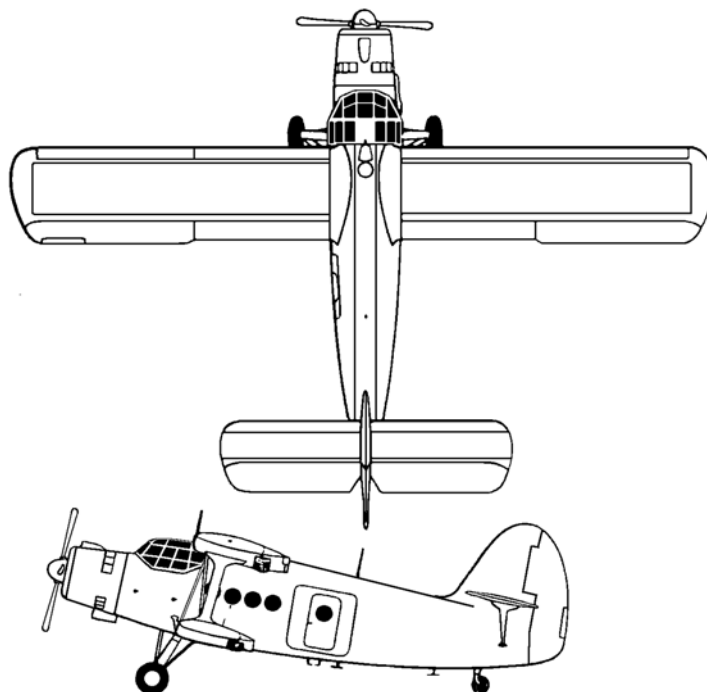
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Russian Multi-role Aircraft Su-27/FLANKER continued

NOTES

The Su-27 is primarily an all-weather interceptor/fighter aircraft used for air defense. It is also capable of performing ground attack missions. It is highly maneuverable because of a fly-by-wire control system which automatically restricts aircraft angles of attack and maximum G-loads during flight. External fuel tanks can be carried on some variants, and some are fitted for aerial refueling, but these are generally naval versions rather than air defense or strike versions. Available munitions are shown above; not all may be employed at one time. Mission dictates weapons configuration. External stores are mounted on underwing and underbody hardpoints. Each wing has two points, and an additional rail on the wingtip. Two points are under the intakes along the fuselage, and two are centrally located underneath the fuselage near the centerline and between the intakes for a total of ten stations.

Russian Transport Aircraft An-2/COLT

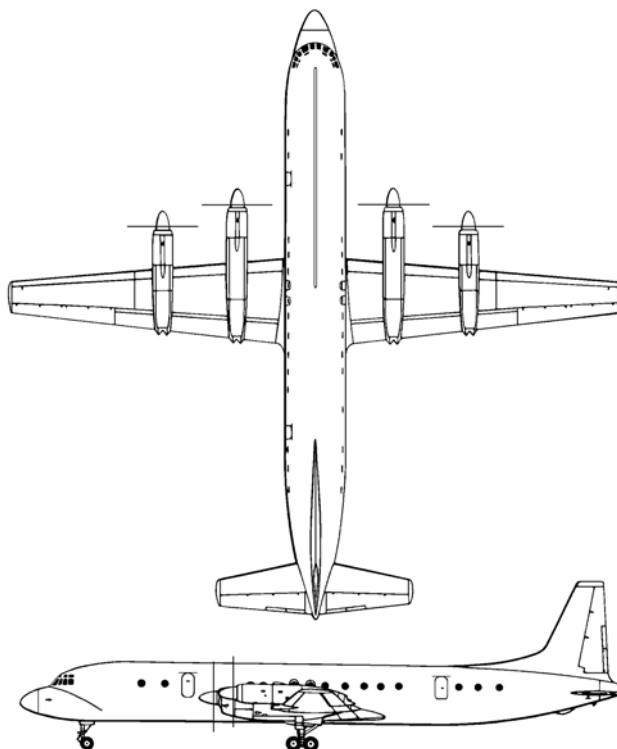


SYSTEM Alternative Designations: INA Date of Introduction: 1948 Proliferation: At least 32 countries Description: Crew: 2 (pilots) Appearance: Wings: Biplane and rectangular-shaped with curved tips, one high-mount and one low mount (shorter), braced by struts Engines: One mounted in nose Fuselage: Short, thick, with blunt nose Tail: Tapered with round tip, rectangular, low-mounted flats Engines: 1x 1,000-shp Shevetsov Ash-62 or PZL Kalisz Ash-62IR 9-cylinder radial piston driving a four-bladed, variable-pitch propeller. Weight (kg): Max Gross: 5,500 Normal Takeoff: INA Empty: 3,450 Speed (km/h): Max: 258 Min: 90 Cruise: 185 Takeoff/Landing Speed: 85 Max "G" Force (g): -1.0 to +3.7 Ceiling (m): Service (clean): 4,400 Vertical Climb Rate (m/s): 3.0	Fuel (liters): Internal: 1,200 External: None Range (km): Max Load: 900 Takeoff Run/Landing Roll (m): Prepared Surface: 150/170 Unprepared Surface: 200/185 Max Load: INA Dimensions (m): Length: 12.7 Wingspan: 18.2 Height: 4.0 Cabin Dimensions (m): Floor Length: 4.1 Width: 1.6 Height: 1.8 Standard Payload (kg): Internal: 1,500 Transports 12 troops or paratroops, or 6 liters. Survivability/Countermeasures: None ARMAMENT Some early prototypes experimented with single 12.7-mm or 23-mm machineguns, and unguided aerial rockets. None produced.	AVIONICS/SENSOR/OPTICS Flight avionics only. Night/Weather Capabilities: The An-2 is capable of flight under day and instrument meteorological conditions. VARIANTS This aircraft was originally built in Russia. Now it is produced in China and Poland. An-2D/-2TD: Specially modified for parachute training and special operations. An-2P/-2T/-2TP: Passenger and general transport variants. An-2V/-2M/-4: Seaplane variant with floats in place of main landing gear. An-3: This variant employs an upgraded 1,450-shp Glushenkov TVD-20 turboprop engine, and a larger three-bladed propeller. This allows for an increased takeoff weight of 5,800 kg. Y-5/C-5: Chinese-built version, and Chinese export nomenclature.
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NOTES

The wings and elevators are fabric-covered, while the fuselage is metal. This aircraft can operate from unimproved airfields, and is noted for short takeoff and landing capabilities, and ruggedness. Its low acoustic signature and slower speeds allow for stealthy operation. Cabin contains tip-up seats which can be easily folded to allow space for cargo. Skis or pontoons can be employed on the main landing gear struts.

Russian Transport Aircraft IL-18/COOT



SYSTEM

Alternative Designations: IL-20, IL-22

Date of Introduction: 1959

Proliferation: At least 5 countries

Description:

Crew: 5 (2x pilots, 1x navigator, 1x radio operator, 1x flight engineer)

Appearance:

Wings: Low-mounted and tapered with blunt tips

Engines: Four mounted on wings and extending forward

Fuselage: Round, cigar-shaped, tapered at rear with rounded nose

Tail: Tapered with square tip, fuselage-mounted, tapered flats

Engines: 4x 4,250-shp Ivchenko AI-20M turboprop driving 4x four-bladed, reversible-pitch propellers.

Weight (kg):

Max Gross: 64,000 (D)/61,200 (E)

Empty: 35,000 (D)/34,610 (E)

Speed (km/h):

Max: 675

Min: INA

Cruise: 625

Takeoff/Landing Speed: INA

Max "G" Force (g): INA

Ceiling (m):

Service (clean): 10,000

Operating Altitude: 8,000-10,000

Vertical Climb Rate (m/s): INA

Fuel (liters):

Internal: 30,000 (D)/23,700 (E)

External: None

Range (km):

Max Load: 4,000 (D)/3,200 (E)

Normal Load: 6,500 (D)/5,200 (E)

Takeoff Run/Landing Roll (m):

Prepared Surface: 1,300 (D)/850

Unprepared Surface: INA

Dimensions (m):

Length: 35.9

Wingspan: 37.4

Height: 10.2

Cabin Dimensions (m):

Floor Length: 24.0

Width: 3.2

Height: 2.0

Standard Payload (kg):

Internal: 13,500

Transports 122 troops or 20 ELINT operators.

Survivability/Countermeasures:

None

ARMAMENT

None

AVIONICS/SENSOR/OPTICS

Flight avionics only.

Night/Weather Capabilities:

The aircraft is capable of flight under day, and instrument meteorological conditions.

VARIANTS

This aircraft was originally designed as a civilian transport aircraft, but has been adapted for military uses.

IL-18D: Has a center fuel tank for longer flight duration and extended range.

IL-18E: Variant without center fuel tank.

IL-20/COOT A: Unarmed strategic electronic intelligence/ reconnaissance and surveillance aircraft. The airframe is essentially the same as the IL-18D, but a cylinder containing a possible side-looking airborne radar is mounted under the fuselage forward of the wing. Smaller containers on the forward sides of the fuselage house possible cameras and sensors. Many small antennas are located under the fuselage.

IL-22/COOT B: An airborne command post variant of the IL-18D airframe.

Chapter 11

Command and Communications Systems

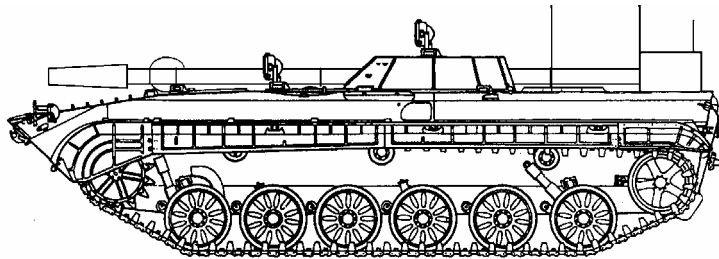
Command systems in the WEG will initially be limited to command vehicles, such as the listed BMP-1KSh.

This chapter provides basic characteristics of selected tactical communications systems either in use or readily available to the OPFOR. This selection of radios is not intended to be complete; rather, it is representative of the types and capabilities that are currently fielded or available. Radio tables are divided into two sections, single channel and frequency hopping systems. Later updates of this chapter will include information on additional categories of communications systems.

Radio data was provided by Mr. Eric L. Berry, e-mail: berrye@leavenworth.army.mil. Questions and comments on data listed in this chapter should be addressed to:

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Russian Command and Staff Vehicle BMP-1KSh

	Weapons & Ammunition Types Stowed 7.62-mm MG	Typical Combat Load 2,000
SYSTEM Alternative Designations: BMP M1978 Date of Introduction: 1976 Proliferation: At least 3 countries Description: Crew: 3 Troop Capacity: N/A Combat Weight (mt): 13.0 Chassis Length Overall (m): 6.74 Height Overall (m): 2.07 Width Overall (m): 2.94 Ground Pressure (kg/cm²): 0.57 Automotive Performance: Engine Type: 300-hp Diesel Cruising Range (km): 550 Speed (km/h): Max Road: 65 Max Off-Road: 40-45 Average Cross-Country: INA Max Swim: 7 Fording Depth (m): Amphibious Radio: R-130 HF, R-107, R-111 VHF, R-123/173 VHF Protection: Armor, Turret Front (mm): 19-23 Applique Armor (mm): N/A Explosive Reactive Armor (mm): Available Active Protective System: N/A Mineclearing Equipment: N/A Self-Entrenching Blade: N/A NBC Protection System: Collective Smoke Equipment: VEES	ARMAMENT Main Armament: Caliber, Type, Name: 7.62-mm (7.62x 54R) MG, PKM , stowed Rate of Fire (rd/min): 250 practical / 650 cyclic, 2-10 round bursts Loader Type: Belt-feed (100-rd belts) Ready/Stowed Rounds: INA Elevation (°): INA Fire on Move: No ATGM Launcher: N/A Firing Ports: None SIGHTS Type: INA Sighting range (m): 1,500 Magnification: INA Night Sights Available: Yes VARIANTS BMP-1KShM: Variant has upgraded radios. MP-31/IV31 and 9S743 use different radio configurations. MAIN ARMAMENT AMMUNITION Caliber, Type, Name: 7.62-mm API, API-T Maximum Aimed Range (m): 1,500 Max Effective Range (m): Day: 1,000/400-500 on the move Night: INA Tactical AA Range: INA Armor Penetration (mm): 8 (RHA) at 500 m Other Ammunition Types: Light Ball/Ball-T, Heavy Ball	

NOTES

For stationary long-range transmissions, HAWK EYE 10-meter folding antenna is removed from carrying case on right side of vehicle and inserted into antenna base, which extends forward from the turret. The trunnions and motor from the base vehicle (BMP-1) gun are used to operate the antenna base. The antenna can then be elevated mechanically to a vertical position.

Other Electronics: R-102 automatic calling device, 1T-219M secure speech device, TNA-1inertial navigation, 1G11N gyrocompass. On the hull rear is a generator to operate the radios.

Options are spall liners, air conditioning, and a more powerful engine. A French SNPE explosive reactive armor (ERA) kit and others are available for use. Additional armor application may jeopardize amphibious capability.

Tactical Single Channel Radios

Radio	Country of Origin	Description	Frequency Range (MHz)	Channel Spacing (KHz)	Number of Channels	Range (km)	Power Output
PRC-105/A	Iran	Man-portable VHF radio	36-76	25	1,600		0.6/2.5/5 W
PRC-110	Iran	Man-portable HF radio with 10 pre-set channels	1.6-29.999	100	284,000		5/20 W
PRC-1077	USA	Man-portable VHF radio. PRC 1077/GRC-160 (low power) and PRC 1077/VRC-46 (high power) vehicular models.	30-88	25	2,320		Man-portable: 100m/2/5 W Vehicular: 100m/2/5/50 W
PRC/VRC-4600	Turkey	Modular family of VHF/FM radios Embedded encryption	30-76	25 or 50	920 or 1,840	40 w/30W variant	2.5 W manpack PRC-4620 2.5/10/30 W vehicular VRC-4622 2.5 W tank set VRC-4621 (w/companion 12.5/10/30 W VRC-4623)
R-107	FSU	Provides tactical, manportable FM HF/VHF voice communications	20-52	25	1,281	6 w/1.5-m whip, 15 w/2.7-m rod or 40-m wire, 25 w/raised long wire	1 W
R-123M	FSU	Vehicle-mounted tactical FM HF/VHF communications	20-51.5	25	1,261	20 w/4-m whip (moving) 50 w/10-m telescoping mast	20 W
R-130	FSU	Vehicle-mounted AM HF voice and CW communications	1.5-10.99 transmit 1.0-10.99 receive	10	950	50 w/4-m whip, 75 w/10-m whip or sloping wire, 350 w/symmetrical dipole	10-40 W
R-148	FSU	Lightweight FM VHF manportable transceiver.	37.0-51.95	50	300	5 w/1.5-m whip	1.1-2.1 W
R-171M	FSU	Vehicle-mounted FM VHF communications. Capable of 16 kbits/s data transmission.	30.0-75.999	INA		35-80 claimed	100 W
R-173	FSU	Tactical FM VHF communications	30-76	1		20 w/3-m whip	30 W

Tactical Single Channel Radios (continued)

Radio	Country of Origin	Description	Frequency Range (MHz)	Channel Spacing (KHz)	Number of Channels	Range (km)	Power Output
RU-3	FRY	Man-portable VHF radio. Digital data up to 2.4 kbit/s, digital voice up to 16 kbit/s. 40 preset channels.	30-79.975	25	2,000	7	0.3/3 W
SFH-41	Sweden	Chameleon tactical hand-held single-channel and FH radio. Receives single-or FH signals and automatically selects FH reply. 12.5, 25, or 50 hps.	148-174	25 or 30	INA	INA	2/5 W
TRC350	France	Man-portable HF/SSB radio. Encryption capability. Vehicular-model TRC331, 20 W.	1.5-30	100	285,000	INA	2 W reduced power 10 W average in data mode 15 W morse, 20 W SSB voice
Type 889	China	Tactical FM VHF voice comms. Capable of 16 kbits/s data transmission in wideband mode and connected to a digital terminal set.	20.0-49.975	25 or 50	1,200 or 600	30 w/2.85-m (probable) whip, narrow band, and high-power mode	3 or 20 W
VRC-90	China	Vehicular VHF/FM radio. 16 kbit/s data capability.	30-87.975	25	2,320		0.2/3.5/50 W
XV3088	Germany	Man-portable VHF pouch radio. 9 pre-set channels. Maybe vehicular-mounted. 2.4 kbit/s data transmission.	30-87.975	25	2,320	500 meter remote.	0.2/5 W 25/50 W with power amp.

Tactical Frequency Hopping Radios

Radio	Country of Origin	Spread Spectrum Radio Description	Frequency Range (MHz)	Channel Spacing (KHz)	Number of Channels	Power Output
ACV46	South Africa	Vehicular VHF FH. 99 preset channels, embedded encryption. Remote operation by wire up to 2 km	30-87.975	25	INA	INA
ACM48	South Africa	Man-portable VHF radio. Embedded encryption, data.	30-87.975	12.5 or 25	INA	0.4/4 W
ART 2000	Iran	Man-portable or vehicular VHF FH radio with 100+ hps. May be remoted up to 3 km.	30-88	25	2,320	0.1/3 W
JAGUAR-U	United Kingdom	Tactical UHF FH radio, with man-portable, airborne, and mobile/ground station capabilities. Embedded encryption in FH mode.	225-400	25	7,000	Man-portable: 10mW/4W. Airborne: 10mW/4W/15W. Mobile: 10mW/4W/50W.
JAGUAR-V	United Kingdom	Man-portable or vehicle-mounted VHF frequency hopping combat net radio, 100 hps. Compatible w/ conventional 25/50 KHz channel-spaced radios. Operates in nine 6.4 MHz sub-bands or full-band 58 MHz. May be remote -operated by wire to 4 km. Embedded encryption	30-88	25	2,320	Man-portable: 10 mW and 5 W. Vehicle-mounted: 20 and 50 watts
Leprechaun	USA	Hand-held FH VHF radio. Embedded encryption.	30-88	INA	INA	5 W
LVP 235	India	VHF radio available in FH or fixed-frequency models. Projected 100-150 hps over full band. Embedded encryption.	30-88	INA	INA	5 W
PANTHER 2000-V	United Kingdom	VHF FH radio with man-portable, vehicular, and airborne versions. 8 pre-programmable channels. May be remoted up to 4 km. Narrow band: 9 hop bands of 6.4 MHz with 256 channels. Wideband: 58 MHz band with 2320 channels. 100 hps. Embedded encryption.	30-108	25	3,120	Man-portable 20W Vehicular 20W/50W Airborne 20W
PRC-73B	Yugo-slavia	Man-portable VHF FH radio with 100-200 hps over 5 MHz band.	30-90	INA	2,400	5 W
PRC-117A	USA	Man-portable VHF FM FH radio. Uses KY-57 VINSON encryption	30-89.975	25	2,400	0.1/1/10 W
PRC-119	USA	Man-portable VHF FM FH radio. 8 programmable single-channel and 6 frequency-hopping pre-set channels. Integrated voice and data secure communications.	30-88	INA	2,320	4.5 W

Tactical Frequency Hopping Radios (continued)

Radio	Country of Origin	Spread Spectrum Radio Description	Frequency Range (MHz)	Channel Spacing (KHz)	Number of Channels	Power Output
PRC-130	USA	Man-portable HF FH radio with 10 hps. Embedded encryption.	2.0-30	INA	280,000	5/20/100 W
PRC-710	Israel	Hand-held FH VHF radio, embedded encryption.	30-88	25	2,320	5 W adjustable
PRC 1080	USA	Hand-held FH VHF radio. Embedded encryption, 9 preset channels.	30-87.975	25	2,320	Selectable 100 mW-2W
PRC/VRC-9600	Turkey	Man-portable or vehicular-mounted VHF FH with 100-200 hps. Capable of burst-data transmission. Embedded encryption.	30-88	25	3,120	5 W man-portable 5/50 W vehicular
RAVEN 2V	United Kingdom	Man-portable, hand-held, vehicular, or base station VHF FH radio. Capable of burst-data transmission, data-rate adapter. Voice/data encryption, remote operation. Expected hop rate approx 150 hps.	30-88	25	2,320	Vehicular 50 W
RU-5	Yugoslavia	Man-portable VHF/FM FH radio. Embedded encryption. Up to 16 kbit/s data transmission. Full-band hop set at approx. 100 hps. 10 pre-set channels.	30-87.975	25	2,320	0.5/5 W
SCIMITAR-H	United Kingdom	Vehicular-mounted HF FH radio. Burst-data transmission capability. Wire-remote up to 3 km. Embedded encryption.	1.6-30	100	284,000	20 W man-portable, 100/400 W vehicular-mounted.
SCIMITAR-V	United Kingdom	Man-portable or vehicular VHF FH radio with 150-250 hps over 58 MHz band. Embedded encryption.	30-88	25	2,320	0.1/5/50 W
SEM 173-193 CNR System	Germany	Modular series of VHF CNR radios, with the SEM 173 transceiver as the common unit. Remote operation up to 4 km. Embedded encryption. SEM 173 man-portable; SEM 173 V vehicular SEM 183 vehicular; SEM 193 vehicular SEM 183/193 dual station; SEM 193/193 dual station	30-108	12.5 or 25	3,120 or 6,240	SEM 173, 183 0.05/0.5, 5 W. SEM 193, 183/193 0.05/0.5/5/50 W.
StarCom	Sweden	Man-portable and vehicular FH VHF radio. Embedded encryption, remote operation by wire up to 6 km.	30-87.975	25	2,320	Man-portable 5 W Vehicular 5/50 W

Chapter 12

Unmanned Aerial Vehicles

This chapter provides the basic characteristics of selected unmanned aerial vehicles (UAVs) either in use or readily available to the OPFOR. Therefore, the UAVs discussed in this chapter are those likely to be encountered by U.S. forces in varying levels of conflict. The selection of UAVs is not intended to be all-inclusive, rather a representative sampling of various military capabilities.

UAVs come in various types, sizes, and levels of complexity, each having their own niche over the battlefield. For example, fixed-wing, propeller-driven platforms excel in endurance and range; jet-propelled UAV's trade endurance for speed; and rotary-wing UAVs can carry relatively large payloads.

UAVs are also referred to as drones or remotely piloted vehicles (RPVs) depending on their flight control. An on-board computer with the flight plan programmed into it prior to the mission controls drones. RPVs use a data link to a ground control station where the pilot/operator controls the flight manually. Many modern UAVs are capable of operating in either manner.

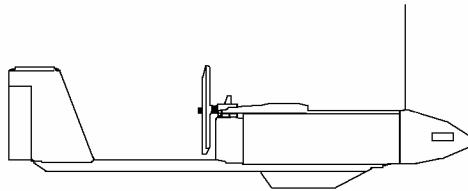
Questions and comments on data listed in this chapter should be addressed to:

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e-mail address: williamw@leavenworth.army.mil

French Unmanned Aerial Vehicle Fox AT1



SYSTEM

Alternative Designations: ASPIC AT

Date of Introduction: 1988

Proliferation: France, United Nations, and civilian customers

Description:

Engines: 1 x Limbach 22 hp L 275 E two-cylinder, two-stroke, air-cooled

Propulsion: 2-blade push propeller

Weight (kg):

Takeoff: 90

Fuel and Payload (combined): 30

Speed (km/h):

Maximum (level): 216

Cruise: 145

Ceiling (m):

Maximum: 3,000

Minimum: 30

Fuel (liters): INA

Endurance (hr): 1.5

Range (km):

RPV Mode: 50

Relay/Programmed Mode: 100

Dimensions (m):

Wing Span: 3.6

Length (fuselage): 2.75

Height: 0.25

Launch Method: Hydraulic or sandow ramp.

Recovery Method: Parachute

Landing Method: skid

Maximum Flights Per Aircraft: INA

Survivability/Countermeasures: INA

SENSOR/OPTICS

Payload Type: CCD color video or infrared cameras, thermal analyzers, high definition line scanners, NBC and meteorological sensors.

Television field of view: INA

IR Linescan:

Length: INA

Resolution: INA

VARIANTS:

Fox AT2 UAV

Fox TX Electronic Warfare UAV

Fox TS1 Target Drone

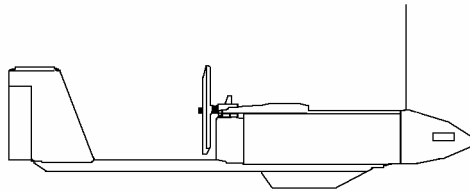
Fox TS3 Target Drone

Mini-Fox Target Drone

NOTES

The Fox AT1 UAV is one of a family of low-cost UAVs designed by the French firm CAC SYSTEMES. Each UAV system is composed of a transportation and launching system, a ground control station (GCS) mounted on a 4x4 truck frame, and four UAVs. The Fox AT1 is launched from a mobile launching catapult (transportation and launching system) that is mounted on a trailer with transportation compartments for 4 UAVs. Normally two of the four UAVs are equipped with CCD cameras for daytime missions and the remaining two are FLIR equipped for nighttime missions. Upon mission completion the UAV can be reserviced and available for another mission in less than 30 minutes. The Fox AT1 is capable of carrying 15 kilograms of various payloads. Additionally, two underwing pods allow for four loads to be carried and dropped. Normally the GCS consist of a crew of three personnel: pilot, observer, and a technician. However, two people can deploy the UAV system and have it available for operation in less than 20 minutes. The guidance and control consists of an UHF data link with four proportional and eight numeric channels, of which four control the autopilot. Telemetry is through a 12-channel data link.

French Unmanned Aerial Vehicle Fox AT2



SYSTEM

Alternative Designations: None

Date of Introduction: 1988

Proliferation: France, United Nations, and civilian customers

Description:

Engines: 1 x Limbach 22 hp L 275 E two-cylinder, two-stroke, air-cooled

Propulsion: 2-blade push propeller

Weight (kg):

Takeoff: 135

Fuel and Payload (combined): 60

Speed (km/h):

Maximum (level): 216

Cruise: 145

Ceiling (m):

Maximum: 3,000

Minimum: 30

Fuel (liters): INA

Endurance (hr): 5

Range (km):

RPV Mode: 50, 100, 150 (200 as an option)

Relay/Programmed Mode: 350

Dimensions (m):

Wing Span: 4.0

Length (fuselage): 2.75

Height: 0.25

Launch Method: Hydraulic or sandow ramp.

Recovery Method: Parachute

Landing Method: Airbag

Maximum Flights Per Aircraft: INA

Survivability/Countermeasures: INA

SENSOR/OPTICS

Payload Type: Panoramic CCD color Camera, Low Light Television (with zoom), IR linescan CAMELIA camera, SAR camera, FLIR, multi-sensor gimball platform (IR and visible), etc.

Television field of view: INA

IR Linescan:

Length: INA

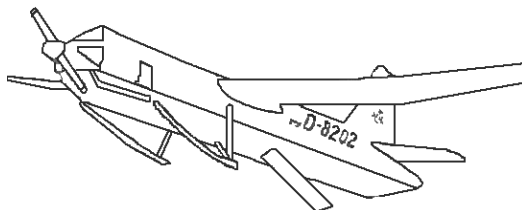
Resolution: INA

VARIANTS: None

NOTES

The Fox AT2 UAV is one of a family of low-cost UAVs designed by the French firm CAC SYSTEMES. Each UAV system is composed of a transportation and launching system, a ground control station (GCS) mounted on a 4x4 truck frame, and four UAVs. The Fox AT2 (like the Fox AT1) is launched from a mobile launching catapult (transportation and launching system) that is mounted on a trailer with transportation compartments for 4 UAVs. Normally two of the four UAVs are equipped with CCD cameras for daytime missions and the remaining two are FLIR equipped for nighttime missions. Upon mission completion the UAV can be reserviced and available for another mission in less than 30 minutes. The Fox AT2 is capable of carrying 30 kilograms of various payloads. Additionally, two underwing pods allow for two loads to be carried and dropped. Normally the GCS consist of a crew of three personnel: pilot, observer, and a technician. However, two people can deploy the UAV system and have it available for operation in less than 20 minutes. The guidance and control consists of an UHF data link with four proportional and eight numeric channels, of which four control the autopilot. Telemetry is through a 12-channel data link.

Chinese Unmanned Aerial Vehicle D-4



D-4 UAV with reusable solid rocket booster prior to jettison after take off

SYSTEM

Alternative Designations: ASN-104/105

Date of Introduction: 1985

Proliferation: At least 1 country

Description:

Engines: 1x -30 hp HS-510 four-cylinder, two-stroke gasoline air-cooled piston

Propulsion: 2-blade wooden push propeller

Weight (kg):

Takeoff: 140

Fuel and Payload (combined): INA

Speed (km/h):

Maximum (level): 205

Cruise: 150

Ceiling (m):

Maximum: 3,200

Minimum: 100

Fuel (liters): INA

Endurance (hr): 2

Range (km):

RPV Mode: 60

Relay/Programmed Mode: 100 (est.)

Dimensions (m):

Wing Span: 4.3

Length (fuselage): 3.3

Height: 0.9 (excluding skids)

Launch Method: Solid rocket booster on a zero length launcher.

Recovery Method: Parachute (nonsteerable)

Landing Method: 2 spring loaded skids

Maximum Flights Per Aircraft: INA

Survivability/Countermeasures: INA

SENSOR/OPTICS

Payload Type: Panoramic Camera, Low Light Television (with zoom) and IR linescan

Television field of view: INA

IR Linescan:

Length: INA

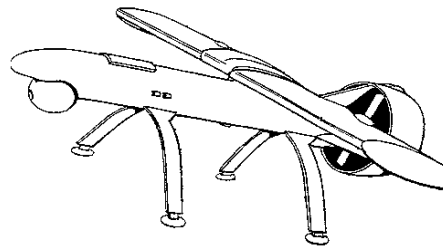
Resolution: INA

VARIANTS: None

NOTES

The D-4 UAV is launched from a zero-length launcher using a solid rocket booster that is jettisoned after take-off.

Russian Unmanned Aerial Vehicle Shmel-1



SYSTEM Alternative Designations: Bumblebee Date of Introduction: 1991 Proliferation: At least 2 countries Description: Engines: 1x 32-hp Samara/Trud (Kuznetsov) P-032 two-cylinder, two-stroke gasoline Propulsion: 3-blade shrouded pusher propeller Weight (kg): Takeoff: 130 Fuel and Payload (combined): 70 Speed (km/h): Maximum (level): 180 Cruise: 140 Ceiling (m): Maximum: 3,000 Minimum: 50 Fuel (liters): INA Endurance (hr): 2 Range (km): RPV Mode: 60 Relay/Programmed Mode: 120 (est.) Dimensions (m): Wing Span: 3.25 Length (fuselage): 2.78 Height: 1.10	Launch Method: Rocket-assisted catapult Recovery Method: Parachute (nonsteerable) Landing Method: 4 spring loaded landing legs Maximum Flights Per Aircraft: 10 to 20 Survivability/Countermeasures: The engine and propeller are enclosed in a shrouded ring that serves the purpose of reducing noise as well as reducing the surface reflection and heat signature. SENSOR/OPTICS Payload Type: Television and IR linescan Television Field of View: 3° to 30° (zoom) IR Linescan: Length: 3 to 4 times aircraft altitude Resolution: 3 milliradians VARIANTS: None	LAUNCH VEHICLE Designation: BTR-D Alternative Designations: BMD M1979 Description: Crew: 2 Combat Weight (mt): 6.7 Chassis Length Overall (m): 5.88 Height w/o Launch unit (m): 1.67 Width Overall (m): 2.63 Automotive Performance: Engine Type: 240-hp Diesel Cruising Range (km): 500 Speed (km/h): Max Road: 61 (est.) Max Off-Road: 35 (est) Average Cross-Country: INA Max Swim: 10 (est.) Fording Depth (m): Amphibious Radio: R-123 Protection: Armor, Turret Front (mm): "Antibullet" (7.62-mm) NBC Protection System: Yes Smoke Equipment: None
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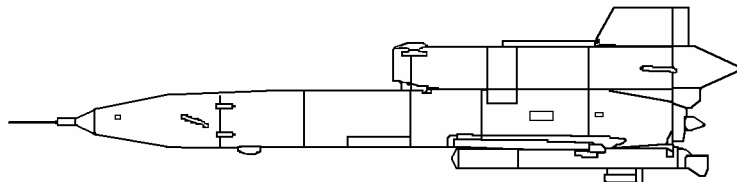
NOTES

The Shmel-1 is part of a complex called the STERKH, which is probably an acronym of unknown expansion. The STERKH complex consists of a launcher, a support/maintenance vehicle, and at least one (probably as many as three) aircraft. The Yakolev Design Bureau designed the STERKH.

The transporter-launcher-controller (TLC) has positions for two UAV operators and is capable of controlling two Shmel-1's simultaneously. Automatic pre-launch monitoring, launch, flight control, and displaying of the received data is conducted from the TLC. The display in the TLC indicates aircraft position overlaid onto the television image. Given the system's digital downlink, the IR image could also be recorded on magnetic tape or displayed on a video monitor. However, the data is almost certainly recorded on electronic medium for playback. The description of the system may indicate a problem involving the inability of the operator to translate aircraft coordinates to those of the targets being located. A laser rangefinder or designator could easily accomplish this, but such a capability is not indicated for the Shmel-1. The current system requires coordinate conversion from map association or photographic interpretation with a laser capability to be added later.

The area coverage of the sensor payload is excellent. Analysis indicates that the camera, at an altitude of 1500 meters and a field of view of 30°, can image an area of approximately 500,000 m² or a circle with a radius of 400 meters. The IR linescan at the same altitude would see a strip approximately 5,100 meters long and 4.5 meters wide. Ground resolution would decrease significantly at the ends of the scan. At a nominal speed of 120 km/h and flying the maximum altitude, the aircraft could observe a maximum of 192 km²/h with the television system or 1,200 km²/h with the IR linescan.

Russian Unmanned Aerial Vehicle TU-143 Reys



SYSTEM

Alternative Designations: DR-3

Date of Introduction: 1973

Proliferation: At least 7 countries

Description:

Engines: 1x – TRD TR3-117 turbojet

Propulsion: Jet

Weight (kg):

Takeoff: 1,600

Fuel and Payload (combined): 1,540

Speed (km/h):

Maximum (level): 940

Cruise: 850

Ceiling (m):

Maximum: 5,000

Minimum: 50

Fuel (liters): 190

Endurance (minutes): 25

Range (km):

RPV Mode: N/A

Relay/Programmed Mode: 360

Dimensions (m):

Wing Span: 2.24

Length (fuselage): 8.06

Height: 1.54 (excluding skids)

Launch Method: Solid rocket booster on a mobile transporter-erector-launcher (TEL)

Recovery Method: Parachute (nonsteerable)

Landing Method: 3 retractable skids (tricycle gear)

Maximum Flights Per Aircraft: 10

Survivability/Countermeasures: INA

SENSOR/OPTICS

Payload Type: Panoramic Camera, Low Light Television and radiation detection equipment

Television field of view: INA

IR Linescan:

Length: INA

Resolution: INA

VARIANTS: None

NOTES

The DR-3 normally operates at a reconnaissance depth of 150 km and is preprogrammed prior to each mission. It is launched from a mobile TEL using a solid rocket booster (that is jettisoned after take-off) in tandem with the turbojet engine. The DR-3 uses its onboard navigation and guidance control to cruise at preset altitudes (four total) between 50 to 2,000 meters. Prior to landing, a drogue chute is deployed to slow the speed of the DR-3 prior to deployment of the main recovery parachute. A braking rocket engine (located in the fuselage) is activated at an altitude of approximately 1.8 meters to soften the landing on the “tricycle landing gear”. The DR-3 reconnaissance payload normally consists of two versions (besides the radiation detection version). The first version consists of an AP-402M aerial camera with Zima-M IR-reconnaissance equipment. The second payload consists of an AP-402M aerial camera with an Aist-M TV system. The camera film is removed and processed in a data processing station upon completion of the mission. However, data from both the TV and radiation detection equipment is downlinked in real-time to the ground control station.

Israeli Unmanned Aerial Vehicle Hermes 450S



SYSTEM

Alternative Designations: INA

Date of Introduction: INA

Proliferation: At least 1 country, selected for testing by another

Description:

Engines: 52 hp gasoline UEL

AR-80-1010 rotary engine

Propulsion: 2-blade pusher propeller

Weight (kg):

Takeoff: 450

Payload (combined): 150

Speed (km/h):

Maximum (level): 175

Cruise: 130

Ceiling (m):

Maximum: 7,000

Minimum: INA

Fuel (liters): INA

Endurance (hr): 20

Range (km):

RPV Mode: 200

Relay/Programmed Mode: INA

Dimensions (m):

Wing Span: 10.5

Length (fuselage): 6.1

Height: 2.36, body diameter 1.7

Launch Method: Wheeled take-off

Recovery Method: Conventional landing

Landing Method: 3-wheeled, w/arrest cable

Maximum Flights Per Aircraft: INA

Survivability/Countermeasures:

Light composite structure, low radar signature

SENSOR/OPTICS

Payload Type: Four stabilized sensor pods

Sensor Pod: MOSP, high end

Television day/night, autotracker, auto-scan

Sensor Pod: FSP-1 mid-high end

FLIR with 3-FOV telescope

Sensor Pod: POP, low-mid-range

CCD Television day and/or night

Sensor Pod: ESP-600C, low end

Television, color, day only

Other options: MTI radar and SAR

VARIANTS: None

FLIGHT CONTROL

Control System:

Ground Control Station (GCS) vehicle

Flight control Method:

Pre-programmed or in-flight re-program

NOTES

An available option is DGPS automatic take-off and landing. Recommend that this option is played in simulations.

Chapter 13 Theater Missiles

The trend among military forces for acquisition of theater missiles has expanded with the growth of regional rivalries and the strategy of using long-range strike capability to gain regional leverage. Theater missiles can be categorized among two types—theater ballistic missiles (TBMs) and cruise missiles. They are launched from ground launchers, aircraft, or naval vessels. These systems are designed for deep strike missions—beyond those of close battle assets. Because of the high cost and limited numbers of these systems compared to artillery, they will be used against high-priority targets at critical phases of a conflict, or against political targets. Selected OPFOR forces with limited numbers of missiles may hold them in a separate missile unit at echelons above the supported ground force commander. Those missiles may be used for purposes other than execution of military strike missions. Where missiles are subordinate to the ground force commander, they will be used as another strike asset to support his plan.

The OPFOR cruise missiles can be launched from ground launchers or naval platforms. Air-launched cruise missiles (ALCMs) are treated as munitions in aircraft chapters. Foreign ground and sea-launched cruise missiles are generally employed in an anti-ship role. However, applications may be developed for use against ground targets. Such systems can be addressed in future WEG updates.

The TBMs employ a high-atmosphere or exo-atmospheric ballistic trajectory to reach the target. That trajectory is easier to track than a cruise missile flight profile; however, the TBM can deliver a high-lethality payload a long distance quickly, and for most of its trajectory, it cannot be intercepted by even state-of-the-art anti-ballistic missiles (ABMs). These missiles are launched from ground launchers or naval platforms. Ground launchers include—

- Fixed ground launchers (usually associated with hardened underground sites).
- Mobile launch complexes with dozens of vehicles and significant set-up time.
- Trailer launchers.
- Highly mobile transporter-erector-launchers (TELs).

Launchers vary from older systems with simple modifications, to specialized vehicles designed for operation in all types of terrain. Newer launchers may incorporate improved mobility to reduce vulnerability to location by terrain analysis and intelligence preparation of the battlefield.

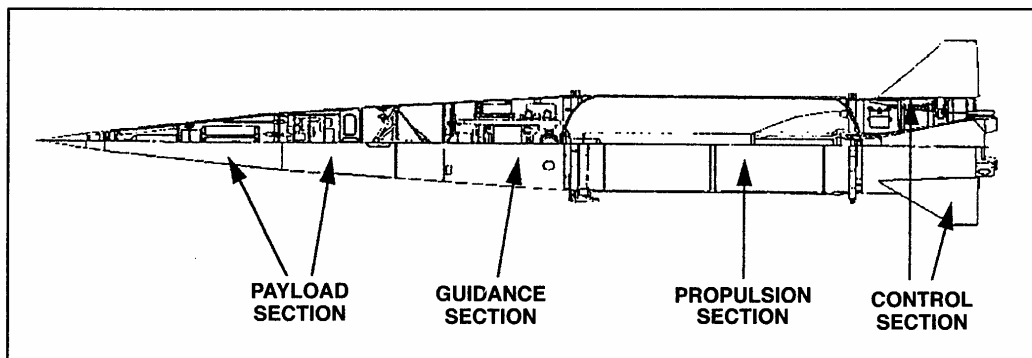
The missile system is selected for a mission based on its ability to reach the target within targeting timelines, and its ability to deliver effective lethality on the target. Improved heavy multiple-rocket launcher systems with course correction and increased-lethality warheads have replaced TBMs as preferred strike systems against selected deep targets. For instance, a Russian 9A52 MRL can deliver twelve 300-mm rockets 70-90 km with precision and minimal preparation time. However, a modern TBM can deliver twice the payload a farther distance with better precision against critical heavy targets.

Keys for timely delivery include target location, fire mission calculation and transmission, launcher and missile responsiveness, reload time, and move times. Therefore, modern missile system support equipment can include computerized fire control and location/navigation systems (such as global positioning systems), as well as dependable and secure communications.

The most critical component of a theater ballistic missile system, which differentiates system capabilities and limitations, is the missile. Missiles are generally classified according to their range—

- Short-range ballistic missile (SRBM), 0-1,000 km.
- Medium-range ballistic missile (MRBM), 1,001-3,000 km.
- Intermediate-range ballistic missile (IRBM), 3,001-5,500 km.

Various approaches are used to improve range, such as lengthening missiles for increased fuel and longer burn time, improving motors (in the propulsion section), using more efficient solid fuel motors, and employing smaller and lighter warheads. Below is an example of a modern missile (the Russian Tochka-U SRBM) and its major components.



The warhead (within the payload section) is the munition, the lethality mechanism which is selected for that strike mission and around which the system is designed. Many countries acquired ballistic missiles specifically to deliver weapons of mass destruction (WMD) against civilian targets such as urban centers. For such a mission, a less accurate system with a large payload capacity is sufficient for the mission. A substantial proportion of SRBM and some MRBM designs are copies or variants of the former-Soviet SCUD-B/SS-1c. Although these systems lack accuracy and responsiveness of some the newer systems, they can deliver large lethal payloads against fixed targets or targets whose limited mobility permits them to be stationary long enough for the TBMs' operational timelines.

A number of newer TBM designs with improved range, accuracy and operational considerations have been fielded. Modern warhead developments include separating warheads, multiple warheads, maneuvering reentry vehicles (RVs), varied lethal and electronic warhead fills, warhead buses (varied submunitions), precision navigating and homing warheads, and warheads with

countermeasures (penaids). Separating and maneuvering warheads, penaids, and other technical measures will further challenge the capability of theater missile defense assets to prevent strikes against priority targets.

Operational timelines include launcher emplacement and survey times, mission transmission time, missile preparation time (which includes aiming), launch sequence, displacement time, move to a hide/transloading point, then move to the next launch point. Target location, command and control, and fire mission transmission times are separate. Often the launcher will be emplaced with some launch preparation steps completed and ready for a mission. These steps may sacrifice accuracy for reduced exposure time. More modern launchers will have a minimal preparation time between emplacement and execution of a fire mission.

After a launch, the launchers will displace as quickly as possible (often <5 minutes) to reduce the possibility of detection and tracking, and to avoid strikes from specially-assigned counter-missile assets and units. To assure survivability of these expensive long-range weapons, the forces will employ tactical countermeasures and, where possible, use rapid emplacement and autonomous operations to reduce losses. Some forces employ technical countermeasures to add increased survivability of the launcher and increased probability of missile/warhead success. Countermeasures include improved coatings and camouflage patterns and nets, underground hides/facilities, decoys, and secure communications. These measures are intended to degrade the enemy's detection, targeting, impact or effectiveness kill, and lethality effects.

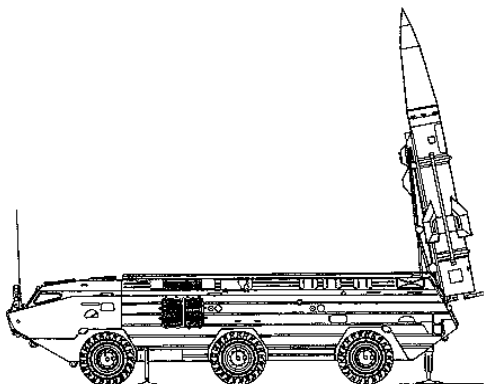
State-of-the-art TBMs can cost more than a million dollars each. If the systems are not accurate enough, or if the enemy has ABM capabilities, those TBMs may not have a high assurance of success, and may not be a factor in the OPFOR plan. The OPFOR may limit its missile requirement to systems used to gain regional political leverage by targeting civilian targets. Thus, budgetary, political, and military considerations affect TBM decisions. Given the budget limitations and systems costs which have impacted most military forces in the last decade, the OPFOR will likely have a mix of older and newer systems and selected upgrades. Systems featured in this chapter are the more common systems, or represent the spectrum of missile systems which can threaten US Army forces or interests within an operational environment.

Questions and comments on data in this specific update should be addressed to Tom Redman, DSN: 552-7925, e-mail: redmant@leavenworth.army.mil. Otherwise, TBM analyst is:

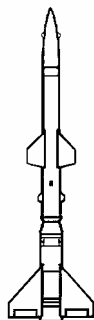
Dr. Don Madill

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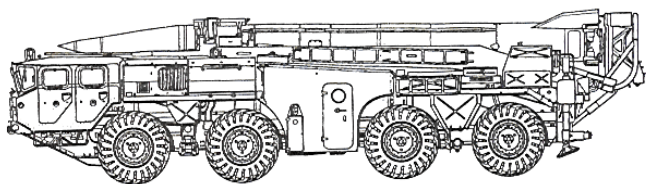
Tochka-U/SS-21



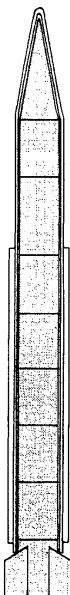
B610 / CSS-8



M-11/ CSS-7



SCUD-B / SS-1c



Nodong-1



DF-3 / CSS-2

Foreign Theater Ballistic Missiles

System Type	SRBM	SRBM	SRBM	SRBM	SRBM	SRBM	SRBM	MRBM	IRBM	Technologies & Trends
Name/ NATO Name Designator	Tochka-U SCARAB SS-21 Mod 2	B610 / M-7 CSS-8	SCUD-B SS-1c	SCUD-B SS-1c Mod 2	M-11/ DF-11 CSS-7	SCUD-C SS-1d	M-9/DF-15 CSS-6	Nodong-1	DF-3 CSS-2	More SCUD variants
Producing Country	Russia	China	Russia North Korea	Russia	China	Russia North Korea	China	North Korea	China	Technology Transfer
Proliferation (countries)	At least 6	At least 2	At least 20	At least 1	At least 2	At least 5	At least 1	At least 1	At least 2	Increased proliferation
Type Launcher	TEL	TEL	Fixed, TEL	Fixed, TEL	TEL	Fixed, TEL	TEL	TEL	Fixed, Mobile complex	Mobile/decoy launchers
Propulsion	Single-stage Solid	Single-stage (est) Solid	Single-stage Liquid	Single-stage Liquid	Single-stage Solid	Single stage Liquid	Single-stage Solid	Single-stage Liquid	Single-stage Liquid	Non-ballistic trajectory
Range Min-Max (km)	20-120	50-150	50-300	300	50-300	500	200-600	170-1,300	1,500-3,000+	Increased range
Guidance	Inertial	Inertial	Inertial	Inertial IR homing	Inertial	Inertial	Inertial	Inertial	Inertial	Multi-sensor Homing
Accuracy (m)	50	150	1,000	50	300	<800	600	4,000	2,000-2,500	Improved Guidance
Payload (kg)	480	190	1,000	600	800	700	500-600	770	1,500-2,150	Separating multiple RVs
Warheads	HE, Chem, Nuc, ARM, EMP, Submunitions	HE, Chem	HE, Chem, Nuc	Separating HE, Nuc	Separating HE, Nuc poss Chem	HE, Chem	Separating. HE, Nuc poss Chem Poss Fuel-Air Submunitions	HE, Chem poss Nuc	HE, Nuc, or 3 separating reentry vehicles (RVs)	Cluster, Volumetric, Submunitions BW warheads, ARM, EMP
Comments	TEL is amphibious	Modified SA-2 SAM Tracked TEL	Technology widely used	Requires compatible IR imagery	Possible export or technology export to other countries		SCUD-B variant Russia limited production	SCUD-B variant ND-2 IRBM variant Poss export	Variants with varied warheads and ranges Towed launcher Lengthy prep time	Autonomous operation Pen aids/ Counter-measures Reduced prep/displace times

13-6

Chapter 14 Equipment Upgrades

Armed forces worldwide employ a mix of legacy systems and selected modern systems. In the current era characterized by constrained military budgets, the single most significant modernization trend impacting armed forces worldwide is upgrades to legacy systems. Other factors impacting this trend are:

- A need for armed forces to reduce force size, yet maintain overall force readiness for flexibility and adaptiveness
- Soaring costs for modern technologies, and major combat systems
- Personnel shortages and training challenges
- Availability of a wide variety of upgrade packages and programs for older as well as newer systems
- New subsystem component technologies (lasers, GPS, imaging sensors, microcircuits, and propellants) which permit application to platforms, weapons, fire control systems, integrated C2, and munitions old and new, and
- An explosion of consortia and local upgrade industries which have expanded worldwide and into countries only recently introduced to capitalism.

The upgrade trend is particularly notable concerning aerial and ground vehicles, weapons, sensors, and support equipment. From prototype, to low-rate initial production (LRIP), to adoption for serial production, minor and major improvements may be incorporated. Few major combat systems retain the original model configuration five or more years after the first run. Often improvements in competing systems will force previously unplanned modifications. Upgrades enable military forces to employ technological niches to tailor their force against a specific enemy, or integrate niche upgrades in a comprehensive and well-planned modernization program. Because of the competitive export market and varying requirements from country to country, a vehicle may be in production simultaneously in many different configurations, as well as a dozen or more support vehicle variants fulfilling other roles. In light of this trend, OPFOR equipment selected for portrayal in simulations and training should not be limited to the original production model of a system, rather a version of the system that reflects the armed force's strategic and modernization plans and, as well as likely constraints that would apply.

The adaptive OPFOR will introduce new combat systems and employ upgrades on existing systems to attain a force structure which supports its plans and doctrine. Because the legacy force mix and equipment were historically selected earlier in accordance with plans and options, upgrades vs costly new acquisitions will always be an attractive option. A key consideration is the planned fielding date. For this document, OPFOR time frame is current to near-term. Thus,

only upgrades currently available (or marketed, with production capability and fielding expected in the near term), are considered. Also, system costs and training and fielding constraints should be considered.

The following tables describe selected upgrades available for system modernization. The lists are not intended to be comprehensive. Rather, they are intended to highlight major trends in their respective areas. For instance, for armored combat vehicles, the focus is on upgrades in mobility, survivability, and lethality.

The category of survivability upgrades includes countermeasures (CM). The CM upgrades can apply not only to systems targeted initially in specific branches (tanks, IFV, and air defense guns), but, in time, to other systems subject to similar threats based on availability of the applications. An example of this is the proliferation of smoke grenade launchers to artillery and air defense vehicles.

Implementation of all upgrade options for any system is generally not likely. Because of the complexity of major combat systems and need for equipment subsystem integration and maintenance, most force developers will chose a mix of selected upgrades to older systems, as well as limited purchases of new and modern systems. Please note that systems featured in this document may be the original production system or a variant of that system. On data sheets, the **VARIANTS** section describes other systems available for portrayal in training and simulations. Also, equipment upgrade options (such as night sights) and different munitions may be listed, which allow a user to consider superior or inferior variants. Within the document chapters, multiple systems are listed to provide other substitution options. Of course there are thousands of systems and upgrade options worldwide which could be considered by an adaptive OPFOR.

An OPFOR trainer has the option to portray systems or upgrade packages not included in the OPFOR Worldwide Equipment Guide, to reflect an adaptive thinking OPFOR. In future WEG updates, we will expand on the upgrade tables with names descriptions of upgrade options and specific systems applications which have been noted. Our functional area analysts are available to assist OPFOR users in selecting reasonable upgrade options for system configuration in specific force portrayals. Questions and comments on tables and data in this chapter should be addressed to the POC for each chapter impacted by the below tables.

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OPFOR ANTITANK WEAPON UPGRADES

GRENADE LAUNCHER	TOWED AT GUN	GROUND ATGM LAUNCHER
Take-apart launchers/disposable launch tubes	Auxiliary propulsion unit for local movement	Manportable/ground launch and shoulder launch
Tripod, bipod, pintel mount for vehicles/ground	Take-apart capability for lighter guns	Take-apart launcher and sub-systems
Ballistic computer/laser rangefinder sights	Improved gun and recoil system	Pintel mount for variety of vehicles/platforms
Image intensifier/thermal night sights	Ballistic computer/laser rangefinder sights	1st or 2nd generation thermal night sights
Larger, more lethal disposable grenade launchers supplement grenadier launches at critical times.	MMW radar target tracker FCS	Extended range missile
Improved reusable sights for disposable launchers	Image intensifier/thermal night sights	Soft-launch for use from bunkers and buildings
Counter-charge for firing inside buildings	Automated battle management system with graphic flat panel display	Launcher countermeasures (CM), such as reduced noise, smoke, flash
Reduced noise, smoke, and flash signature	Indirect fire rounds/FCS for fire support role	SACLOS Guidance CCM, e.g., pulsed codes
Tandem shaped-charge (HEAT) warhead	Increased DF range, new tank/AT gun rounds	Increased ATGM velocity/reduced flight time
Thermobaric Frag-HE warhead	Improved more lethal APFSDS-T round	New guidance modes: Semi-active laser-homing Fiber-optic guided missile (FOG-M) guidance Fire and forget imaging infrared seeker
Dual-purpose (HE/AT) longer range rounds	Tandem HEAT round	Larger warhead/tandem warhead HEAT ATGM
HE longer range rounds	Improve Frag-HE round and DPICM submunition	Sensor-fuzed EFP/HEAT top-attack
Multi-purpose (HE/AT/anti-bunker) rounds	Canister/flechette round	Thermobaric HE warhead, for new applications Changeable warheads
Guided (SAL-H) grenades	New type lethalties (DPICM submunition, etc.)	
Improved AT and dual-purpose rifle grenades permit riflemen to supplement grenade launchers.	Gun-launched ATGM (100 mm+)	
<u>UPGRADE PRIORITY</u> Computer/LRF FCS II night sights Tandem AT grenades, HE/DP grenades, thermobaric grenades	<u>UPGRADE PRIORITY</u> APU and take-apart for lighter guns Improved gun and recoil system Improved sights, 1st gen thermal night sights Automated battle management system Improved ammunition, inc ATGM.	<u>UPGRADE PRIORITY</u> Take-apart launcher, with pintel mount Improved 1st gen thermal night sights SACLOS CCM Reduced signature Improved ATGMs (tandem HEAT, etc.)

OPFOR LIGHT ARMORED VEHICLE UPGRADES

COMBAT SUPPORT VEHICLE	APC/IFV	ATGM LAUNCHER VEHICLE
Used for a variety of roles, e.g., light infantry (less than squad), and support vehicles. Most are light, 4x4 wheeled, van or jeep-type; but auxiliary wheel, 6x6, tracked versions exist. Included are motorcycles and 4x4 fast-attack vehicles (similar to recreational dune buggies). Central tire inflation system and/or run-flat tires GPS hand-held or bracket mount Ford capability, swim capability desired Add-on light armor, mine protection desired CM, such as multi-spectral smoke grenades Laser warning receiver desired 7.62-14.5-mm machine gun or 20-40-mm automatic grenade launcher main weapon Remote or overhead weapon station (RWS/OWS) Individual weapons, RPG, MANPADS, or ATGM launcher for secondary weapons Daysight and II or thermal night sight Add encrypted voice and digital data capability. Graphic display battle management system UPGRADE PRIORITY Light armor and smoke grenade launchers Remote MG or auto grenade launcher Day/night (thermal sights), RPG GPS, secure comms	Must be able to carry a squad Higher horsepower diesel engine GPS and inertial land navigation, graphic display battle management system, IFF Swim or deep ford (due to armor increases) Add-on armor, ERA, and improved mine protection. Fire and blast suppression CM, e.g., multi-spectral smoke grenades, LWR Firing ports (or forego due to armor increases, use periscopes or side and rear view cameras) <u>IFV</u>: 20-100 mm gun, 2-plane stabilization, and 2-man turret. Upgraded FCS: Cdr's independent viewer, 2-plane stabilized TV sights, 1 - 2 gen FLIR. Improved secondary MG or grenade launcher with improved sights (integrated, high-angle, night). Additional remote MGs/AGLs for high-angle fires security. Improved KE, HEAT, Frag-HE rounds, ATGMs <u>APC</u>: Includes truck/light vehicle conversions Remote weapon station or 1-man turret with high-angle-of fires 7.62-23 mm MG, grenade launcher (some with 20-30-mm auto-cannon and ATGM launcher) UPGRADE PRIORITY Add-on armor, ERA, LWR, new grenades Add auto grenade launcher, upgrade ATGM, and KE round to APFSDS. FCS, stabilized sights, Imp 1st gen FLIR	Use <u>APC/IFV</u> wheeled/tracked chassis or <u>tank</u> chassis, with mobility and protection upgrades CM, e.g., multi-spectral smoke grenades, LWR 1-2 man turret, or turretless design <u>alternative design</u>: 1-5 pedestal/turret or mast-elevated ATGM launchers Autoloader or manual loader under armor FCS with commander's independent viewer, 2-plane stabilized sights, TV, and target tracking. Use 1st or 2nd gen FLIR Side and rear-view cameras Graphic display battle management system Multiple ATGM launch and targeting capability Improved ATGMs, as noted in above table, or RF, laser-beam rider, SAL-H/IIR ATGMs 7.62-12.7-mm MG secondary arms <u>Most common ATGM vehicles</u> are combat support vehicles with pintel-mount ATGM launcher, see above table for ground launcher. Recent development: motorcycle with sidecar and pintel-mount ATGM launcher UPGRADE PRIORITY Autoloader/multiple ATGM launcher (APC/IFV/tank version), single manual for others Stabilized sights and 1st gen thermal sights Improved ATGMs

RECONNAISSANCE VEHICLE	LIGHT TANK/ASSAULT GUN/SP AT GUN	MAIN BATTLE TANK
<u>Light recon vehicle:</u> Combat support vehicle with light armor and TV, thermal sights, Add encrypted voice and digital data capability <u>Combat recon vehicle:</u> See IFV upgrades, e.g.: 20-100 mm gun with 2-plane stabilization, and 2-man turret. Improved secondary MG or automatic grenade launcher and sights. CM, e.g., multi-spectral smoke grenades, LWR Upgraded FCS: Cdr's independent viewer, 2-plane stabilized TV camera sights, 1 - 2 gen FLIR Elevated battlefield surveillance radar/TV/FLIR sensor suite with TV, encrypted voice, and digital data transmission capability GPS and inertial land navigation, and graphic display battle management system, IFF Improved KE, HEAT, HE rounds, and ATGMs Manportable SAM (MANPADS) <u>Sensor vehicle:</u> APC/IFV or combat support vehicle and mast-mounted sensor pod: radar, thermal and TV Encrypted voice SATCOM/digital data systems UPGRADE PRIORITY Add higher HP diesel engine Add-on armor, ERA, LWR, new grenades Imp 1st gen FLIR, gunner and commander, Add auto grenade launcher, upgrade ATGM, and KE round to APFSDS. Elevated sensor suite and transmission capability.	Distinction among heavy recon, infantry fire support, assault gun, light tank has blurred APC/IFV chassis with increased armor and higher horsepower diesel engine. GPS and inertial land navigation, graphic display battle management system, IFF Swim or deep ford capability Add-on armor, ERA, improved mine protection, fire and blast suppression. CM, e.g., multi-spectral smoke grenades, LWR Side and rear-view cameras for security 76-125 mm tank gun with 2-plane stabilization, Improved MG or auto grenade launcher, sights FCS with commander's independent viewer, 2-plane stabilized sights, TV, and target tracking. Use of 1st or 2nd generation FLIR. Side and rear-view cameras Improved KE, electronic fuzed Frag-HE, and tandem HEAT rounds Gun-launched ATGMs (100+ mm) UPGRADE PRIORITY Add higher HP diesel engine Add-on armor, ERA, LWR, new grenades Imp 1st gen FLIR, gunner and commander, Larger stabilized gun, gun-launch ATGM, and KE round to APFSDS.	Higher horsepower diesel engine Add-on reserve fuel tanks GPS and inertial land navigation, graphic display battle management system, IFF Deep ford snorkel capability Add-on armor and ERA, improved mine and turret protection, fire and blast suppression. CM suite, including multi-spectral smoke grenade mix, LWR, VEES capability Tank gun with 2-plane stabilization Improved remote-firing MG, high-angle AD sights FCS with commander's independent viewer, 2-plane stabilized sights, TV, and target tracking. Use of 1st or 2nd generation FLIR. Side/rear-view security cameras Improved KE, electronic fuzed Frag-HE, and tandem HEAT rounds Gun-launched antitank guided missiles (100+ mm) UPGRADE PRIORITY Add higher HP diesel engine Land navigation and deep ford snorkel Add-on armor, ERA, CM suite Imp stabilization and FCS, 1st gen FLIR, Remote MG, Imp ammo (sabot, Frag-HE, and HEAT) Gun-launch ATGM.

ARTILLERY RSTA/C2 SUPPORT	TOWED AND SELF-PROPELLED CANNON	MULTIPLE ROCKET LAUNCHER
Automated secure digital joint C2 network with SATCOM, linking artillery, air, EW, and reconnaissance units Integrated artillery recon vehicle with sensor mast Automated battle management equipment use for towed and SP guns, mortars and MRLs Navigation system with GPS/inertial update, linked to automated net Reconnaissance strike and fire complexes Forward air controllers linked to artillery units Artillery links to selected special purpose forces Phased array counter-battery radars, networked to automated artillery net, with increased range, lower probability of error, windows-based man-machine interface Acoustic vehicle detection and location Target-acquisition UAVs, networked to artillery net Artillery surveillance vehicles with ground surveillance radars, sensor suite and networked Observation teams with goniometers, thermal sights, digital comms, and laser target designators <u>UPGRADE PRIORITY</u> Integrated artillery recon vehicle, sensor mast Reconnaissance strike and fire complexes Target-acquisition UAVs, networked Observation teams, radars, acoustic sensors	Conventional munitions, e.g., controlled fragmentation, multi-option fuzes, special munitions, and propellant s (modular propellants) Artillery delivered high precision munitions (ADHPM) e.g., SAL-H, sensor-fuzed, course corrected, and terminally homing projectiles <u>Self-Propelled:</u> Automated fire control with barrel cooling and thermal warning systems Auxiliary power unit Mobility and weight improvements Muzzle velocity analyzer CM, such as smoke grenade launcher and LWR Upgrade to 52-caliber cannon for longer range <u>Towed:</u> Addition of auxiliary propulsion unit On board technical fire control computer Reduced weight and emplace/displace times Muzzle velocity analyzer permanently connected to on-board technical fire control computer Upgrade to 52-caliber cannon for longer range <u>UPGRADE PRIORITY</u> Mobility and weight improvements On-board navigation and fire direction systems Use of modular propellant Procurement of ADHPM Overall range and accuracy improvements	Mobility and weight improvements, truck-based launchers which conceal the MRL signature Rapid emplace-displace and response capabilities CM, such as smoke grenade launcher and LWR On-board computer-based fire direction and land navigation systems, which permit autonomous launcher, platoon ,and battery operations Tube-launched UAVs linked to the launchers and to the fire control network for real-time acquisition Extended-range rockets Improved lethality/range conventional munitions Computer-based fire control system for electronically-fuzed rockets Artillery delivered high precision munitions (ADHPM), such as sensor fuzed. Course-corrected rockets Special munitions, such as FASCAM and chemical warhead rockets Mine clearer and fuel-air explosive rocket MRLs <u>UPGRADE PRIORITY</u> Autonomous/ semi-autonomous launcher Countermeasures Improved munitions, e.g., extended range, DPICM and thermobaric ADHPM, e.g., sensor-fuzed munitions and course corrected rounds or rockets

AIR DEFENSE GUN/GUN-MISSILE SYSTEM	MANPORTABLE AIR DEFENSE SYSTEM	SURFACE-TO-AIR MISSILE
<u>Light AD vehicle:</u> Combat support vehicle with light armor and TV, thermal sights, Add encrypted voice and digital data capability, and overhead launcher turret <u>Armored AD vehicle:</u> See IFV upgrades, e.g.: improved armor, and suspension, 2-man turret CM, e.g., multi-spectral smoke grenades, LWR Upgraded FCS: Cdr's independent viewer, 2-plane stabilized TV gunner sights, FLIR, multi-mode targeting (TV/radar, day/night modes). Improved target acq radar, longer range, low probability of intercept. Reduced radar mean-time to detect and system response time Links to AD network, encrypted voice, digital data transmission capability, computer display GPS and inertial land navigation, IFF Improved multiple MGs/autocannons to 40 mm or cannons to 100 mm, with stabilized guns with fire on the move capability Improved rounds, e.g., electronic-fuzed HE, APFSDS-T, and frangible rounds MANPADS or multi-stage AD missiles with ACLOS radar dual and multi-band seekers Kinetic-energy missiles with sabots, for use in AD role, and against ground vehicle targets <u>UPGRADE PRIORITY</u> Improved day/night optics and radar Automated secure links to AD network Improved multiple stabilized guns, rounds Improved missiles and guidance	Vehicle, ground platform, helicopter mounts Thrust-vectoring capability All-aspect engagement capability Strap-on imaging infrared or thermal sights Early warning datalinks and alert display boards for mount on launcher Upgraded IFF capabilities Missiles in disposable launch tubes Improved missiles and seeker heads with better counter-countermeasure resistance Uncooled seeker heads, wider FOV Increased range Improved warheads and blast/frag effects, base fuzing of propellant for increased blast Improvements in aerodynamics, fuels, and materials, for increases in speed, reduced smoke signature, maneuverability, and accuracy Integrate with anti-helicopter mines <u>UPGRADE PRIORITY</u> Improved sights and warning display boards Strap-on II/FLIR Improved seekers, warheads, propulsion Uncooled seeker heads, wider FOV Flare rejection capability	Improved vehicle or platform launcher for rapid emplacement/displacement CM, e.g., multi-spectral smoke, LWR Upgraded FCS: 2-plane stabilized TV gunner sights, 1 - 2 gen FLIR, multiple target engagement capability, All-weather fire control, multi-mode targeting, with TV and radar, day and night. Improved EW and target acq radars, longer range, low probability of intercept, and signal processing in radars Reduced radar mean-time to detect, and system response time Links to AD network, encrypted voice, digital data transmission capability, computer display GPS and inertial land navigation, and graphic display battle management system, IFF Missiles with SACLOS, ACLOS radar, IR or multi-band terminal seekers, more lethal warheads, longer range, maneuverability with improved counter-countermeasure resistance Vertical missile launch <u>UPGRADE PRIORITY</u> Improved FCS with day/night optics and radars, and multi-target capability and modes Automated secure links, digital AD network Improved missiles and guidance CM protection from jamming and ARMs

OPFOR AERODYNAMIC SYSTEM UPGRADES

ROTARY-WING AIRCRAFT	UNMANNED AERIAL VEHICLE (UAV)	THEATER BALLISTIC MISSILE (TBM)
Older airframes and utility helicopters can be upgraded sensors and weapons Western upgraded avionics, fire control computers, sights, and technology readily available to retrofit into existing older airframes Many new aircraft being built with cost controls to make entice new markets in developing nations. Emerging belief in upgrade of existing platforms rather than developing new airframes, primarily due to financial constraints Development of quieter, more efficient main and tail rotor blades and engines to increase aircraft performance Digital data-linking with ground systems and air defense networks Increased use of millimeter wave, FLIR, and NVG technologies to allow greater night/ weather weapons delivery and mission completion Service life extension programs Improved weapons and munitions, including ATGMs, air-to-service missiles, and precision bombs <u>UPGRADE PRIORITY</u> MMW, FLIR, and NVG technologies Upgraded avionics Service life extension programs	Extend operational radius and endurance Reduce sensor-shooter timeline Enhanced third-generation image intensifiers and second-generation thermal imagers may be available to limited countries. Multiple sensors will be employed on the same platform for enhanced target detection under all-weather conditions and may be linked to weapon delivery platforms. Integrated laser target designators for smart munitions in priority target areas Multiple sensors for chemical and biological agents will be employed on this platform and may be linked to comms platforms. Precision attack variants, such as anti-radiation UAVs for radar attack <u>UPGRADE PRIORITY</u> Extend operational radius and endurance Obtain improved EO capability Reduce sensor-shooter timeline Laser target designator integration	Improved launcher (swim capability, multiple missile capability, reduced signature) Reduced preparation time, emplace and displace times, shoot and scoot operation Automated secure digital C2 network, linking with artillery, air, EW, and reconnaissance units Navigation system with GPS/inertial update, linked to automated net Autonomous operations or increased interval Launcher countermeasures: decoys, missile non-ballistic launch trajectory Missile countermeasures (e.g., non-ballistic trajectory, penetration aids, separating warhead, multiple maneuvering re-entry vehicles) Extended range missiles Improved smokeless propellant Multi-sensor or other improved homing with increased accuracy (<50 m CEP) Advanced munitions (cluster munitions, FAE/thermobaric munitions, biological, electro-magnetic pulse, anti-radiation missiles), larger payloads <u>UPGRADE PRIORITY</u> Improved smokeless propellant Separating warhead and larger payloads Survivability countermeasures.

Countermeasures

Countermeasures (CM) are survivability measures which a force can employ to preserve the readiness of assets and personnel by degrading the enemy's RSTA and weapons effectiveness. These measures often fit within the US Army term CCD (camouflage, concealment and deception) or within the OPFOR term C3D (camouflage, cover, concealment and deception). However, assets used in deception operations are addressed as a subset of Information Warfare (IW), and are directed at the operational-strategic level. Decoys used by tactical units within branch operations are designed to aid survivability, and are considered to be countermeasures. Countermeasures can take the form of tactical CM (or reactive measures), or they can be technical CM. Because of the equipment focus of this document, it will not address tactical measures. Countermeasures for use on aircraft will be discussed at a future time.

Modern forces will upgrade systems with selected countermeasures. Many CM noted are intended to protect combat vehicles from antiarmor sensors and weapons. Although the below CM can be used to counter precision weapons, many were developed for use against conventional weapons. Several factors must be considered when selecting countermeasures.

- Some countermeasures can affect a variety of sensors and weapons capabilities. Others are more technology-specific, and may not be fielded until that technology is identified as a threat. They can be grouped by threat to be countered, such as artillery CM or ATGM CM. Driven by threatening weapons technologies, military forces may initiate a short-response program to fabricate or purchase countermeasures for rapid fielding. The R&D process has led to the development of counter-countermeasures, intended to negate the effects of CM. However, at some level, these are also CM. To avoid confusion on labeling, these will also be called countermeasures.
- Although a variety of countermeasures are now marketed, high costs for some CM may restrict availability within limited budgets. Thus OPFOR users should consult the POC as noted below for assistance in selecting CMs for a specific system.
- Countermeasure development may be restricted due to resource, technology, and fabrication limitations, which vary by country and time frame. Budget limitations may limit fielding of feasible and valuable countermeasures, or will compel the selection of less capable countermeasures.
- When countermeasures are added to a vehicle or within close proximity, they must be mutually compatible and compatible with other subsystems. Thus issues such as electromagnetic interference and self-blinding with smokes must be considered.

Questions and comments on countermeasures for specific BOSs should be addressed to the respective chapter POC. Questions concerning data in this chapter should be addressed to:

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LETHALITY COMPONENT VERSUS COUNTERMEASURE RESPONSES

Intent of this table is to assist in selection of CM and understanding the categorization for use in upgrade schemes. Many of the more widely-fielded countermeasures are designed to degrade a variety of sensors and munitions, for minimal upgrade cost. Thus, countermeasure types may be repeated under several functions. Because new technologies are emerging rapidly, and systems are finding applications which can place them in several CM types, the placement of CMs can be somewhat arbitrary. Use against artillery vs ATGMs vs ground vehicle weapons will vary.

Capability to Be Degraded	Type of Countermeasure
Detection and location	Camouflage: nets, paints, fasteners for added natural materials Cover: entrenching blades, hole-blast device, underground facilities Concealment: screens, skirts, thermal engine covers, scrim, other signature reduction Deformers, engine exhaust diversion, other signature alteration measures Aerosols: smoke and flares, water spray systems Decoys, clutter, and acoustic countermeasures Counter-location measures: GPS jammers, laser and radar warning systems
C2/sensor-shooter links	See Information Warfare (IW) Chapter
Platform or weapon	Counterfire: directional warning systems, laser radars, for rapid response Directed energy weapons (DEW), such as high-energy lasers System prioritization for hard-kill, e.g., anti-helicopter mines (See Ch 7)
Weapon sensors and fire control	CCD as noted above. Directed energy weapons, such as low-energy lasers (LEL) Electro-optical countermeasures (EOCMs)
Submunition dispensing/activation	Global positioning system (GPS) jammer Fuze (laser/IR/RF), RF barrage jammers, acoustic jammers
Precision munition and submunition sensors	CCD as noted above. False-target generator (visual, IR, RF/acoustic) Electromagnetic mine countermeasure system, to pre-detonate or confuse Fuze jammers (laser/IR/RF), RF barrage jammers, acoustic jammers
Munition/submunition in-flight, and its effects	Sensors to detect munitions: MMW radars, RF/IR/UV passive sensors Air watch and air defense/NBC warning net, to trigger alarm signal Active protection systems, for munition/submunition hard kill Cover, additional armor to reduce warhead effects
Other system effects	Miscellaneous CM (See below)

COUNTERMEASURES AGAINST SENSORS

Type Countermeasure	Countermeasure	Example	Application
Camouflage	Camouflage nets Camouflage paints, IR/radar/and laser-absorptive materials/paints Fasteners, belts for attaching natural materials	Russian MKS and MKT Salisbury screen rubber epoxy Chinese "grass mat" set	Variety of vehicles Variety systems Uniforms and vehicles
Cover	Natural and manmade cover, civilian buildings Entrenching blade to dig in vehicles Hole-blast devices for troop positions, spider holes Underground facilities, bunkers, firing positions	Tree cover, garages, underpasses T-80U tank, BMP-3 IFV, 2S3 arty Hardened artillery sites, bunkers	TELs, vehicles, troops IFVs, tanks, SP arty Infantry, SOF Iraqi and NK sites
Concealment	Screens, overhead cover for infantry (conceal IR/visible signature) Canvas vehicle cover, to conceal weapons Thermal covers, vehicle screens Scrim, side skirts and skirting around turret	Colebrand netting Cover on Chinese Type 90 MRL Kintex thermal blanket over engine French "Ecrim" track cover scrim	Infantry, weapon, sensor Truck-based weapons For combat vehicles Combat vehicles
Deformers/ signature modification	"Wummels" (erectible umbrellas to change/conceal shape/edges) Exhaust deformers (redirect exhaust under/behind vehicle) Engine and running gear signature modification (change sound) IR/radar deformers (in combination with RAM and RAP, etc)	Barracuda RAPCAM/TOPCAM Russian exhaust deflectors Track pads, road wheel/exhaust change Cateyes, Luneberg lens	Vehicles, sites, weapons Combat vehicles Tracked, other vehicles Tracked, other vehicles
Aerosols	Visual suppression measures, smokes, WP rounds Multi-spectral smokes for IR and or MMW bands, Flares, chaff, WP, to create false targets, disrupt FLIR Toxic smokes (irritants to disrupt infantry and weapons crews) Water spray systems (to reduce thermal contrast)	Smoke generators, fog oil, S-4, RPO-D ZD-6 Smoke grenades (visual/IR) WP rounds, Galix 6 flare system, Adamsite and CN in smoke mix Add-on kits for vehicles	Blinding, screening Vehicle protection Combat vehicles, arty Smoke generators Recon, C ² , AD, arty
Decoys	Clutter (civilian/military vehicles, structures, burning equipment) Low to high-fidelity (multi-spectral) decoys Radar/IR decoy supplements (to add to visual/fabricated decoys) Acoustic countermeasures (to deceive reconnaissance, sensors)	Log site, truck park, tank farm, derricks Barracuda decoys, Corner reflectors, KFP-1-180 IR heater Acoustic tape/speaker systems	Artillery, combat vehicles Vehicle/site decoys Vehicles, sites
Counter-location measures	Degrade GPS by jamming to reduce precision location capability Jam radars/IR sensors Laser, IR, and radar warning systems (to trigger move/CM)	Aviaconversia GPS jammer SPN-2 truck-borne jammer set Slovenian LIRD laser warner	Infantry and others tactical/operational area Combat vehicles

COUNTERMEASURES AGAINST WEAPONS AND WEAPON SENSORS

Type Countermeasure	Countermeasure	Example	Application
Added protection (supplements to armor in reaction to specific capability)	Armor supplements (ERA, screens, bar or box armor, sand bags) Armor skirts over road wheels Mine rollers, plows and flails Vehicle belly armor, raised or redesigned belly design, skirt Vertical smoke grenade launchers (to counter PGM top attack)		
EOCM	Use EOCMs such as IR jammer/IR searchlights to redirect ATGM	KBCM infrared CM system	Combat vehicles
False-target Generators	Acoustic jammers and directed acoustic countermeasure Laser false-target generator (against semi-active laser homing) Electromagnetic mine countermeasure system, counters fuzes	In development, can be improvised In development	To distract acoustic seekers Combat vehicles
Jammers	Altimeter jammer (counters submunition dispersion altimeter) Fuze jammers (to spoof RF proximity fuzes on munitions) Incoherent infrared jamming (to jam IR fuzes on munitions)	SPR-1 armored ECM vehicle	High priority sites, CPs etc.
Active countermeasures	Active protection systems, for munition hard kill. Directed energy weapons Directed MGs	Arena hard-kill system ZM-87 low energy laser weapon	Tanks, recon vehicle, IFVs AT, AD systems
Counterfire/Threat response warners	Directional warning system (locate laser/radar, to direct weapons) Employ sensors (RF/IR/UV - to detect munitions) Acoustic directional systems (to detect munitions) Laser radars (laser scanner to locate optics and direct weapons) Directed energy weapons (against optics) Anti-helicopter mines (against aircraft) Employ air watch/security, AD, NBC, nets to trigger alarm signal Dazzle grenades (temporarily blind personnel)	Star-burst grenades	Infantry
Miscellaneous CM	Optical filters to degrade effect of battlefield lasers. Pulse code/thermal CCM beacons on SACLOS ATGMs (to counter EOCM)		

