BY ORDER OF THE COMMANDING OFFICER OF THE 185th VFS

185th VFS INSTRUCTION MP SOP-3 SEPTEMBER 2008

185th Multiplayer SOP 3 V1.0

– VFR Formation Flying In Departure, Formation Administration and Recovery

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Office of Primary Responsibility: Training Officer

Certified by: CO 185th VFS

Pages: **15**

This document is the part of the 185th Multiplayer SOP series. It is designed to inform all 185th pilots of the standard procedures for VFR Formation Flying in Departure, Formation Administration and Recovery. All members of the 185th VFS should review this document to ensure they are competent in the execution of these procedures when participating in 185th VFS flying.

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INTRODUCTION

Flying professionally is all about being safe. While not everyone in the 185th is a professional pilot that doesn't mean we can't be safe. To be safe you must know what you and those around you are doing. By formalising routine procedures in a reference document like this you make it more difficult for people to unintentionally act unpredictably. This also allows members from different Flights to operate together more effectively as they have common operating procedures.

Multiplayer SOP 3 details 185th SOPs for VFR Formation Flying In Departure, Formation Administration and Recovery. Anyone participating in 185th VFS flying should learn the procedures laid down in this document.

Remember though, this is an SOP, it is only a standard… Flight Leads are always free to deviate from the SOP all they need to do is explain what they are trying to achieve by adding the golden phrase 'Non standard' to the brief.

If any pilot in a Flight is unclear of the procedure to be followed, either SOP or 'non standard', they must ask for clarification during the briefing. Better to get things cleared up on the ground than end up with a mid-air collision.

1. THE DEPARTURE

The procedures for getting into the cockpit are covered in 185th Multiplayer SOPs 1 & 2.

1.1 TAXI

Taxi is started either by a voice order from Lead or when he switches on the landing light. For a landing light taxi start, all pilots in a Flight must be visual and after entering the cockpit all pilots must switch the landing light off if they see Lead do this.

Avoid using a quick burst of afterburner to get yourself moving and always remember to carry out the taxi checks. As a minimum you should check: NWS is enabled, Flight Controls have full and free movement and your brakes before you get up any real speed, better to find you have a brake failure now than run into the back of another aircraft during taxi.

Aircraft taxi in turn, keeping a safe slow speed (no more than 20 knots). A throttle setting of 77%-82% is quite adequate and even that may need to be backed off once rolling.

Keep a good distance behind the aircraft in front, it's a travesty to crash without even getting on the runway, and don't leave your braking to the last second. You're a Falcon4 pilot not a Formula 1 driver! Remember your team mate ahead of you is going to hear your engine if you're too close behind.

He should be concentrating on getting his cockpit checks done for departure not worrying about you running into the back of him. Spacing may however be reduced when holding short of, or entering the runway.

Leads should follow ATC instructions whenever possible, but noting the limitations of ATC within Falcon, it is the responsibility of all pilots to avoid a collision using the see and avoid principle[1]. While on the ground you are required to give way to aircraft to your right, any aircraft on an active runway and any aircraft on final. Remember, AI aircraft may not comply with this SOP so be vigilant at all times and under no circumstances should you enter an active runway unless certain there is no traffic departing or landing.

Unless your Flight is the only one operating from the airbase (in which case Lead can direct the runway in use) all aircraft must use the active runway(s), as declared by ATC.

There are two approved 185th SOPs for the taxi:

1.1.1 TRAIL TAXI

In trail taxi all aircraft taxi with their nose gear on the centre line and keep adequate spacing between aircraft to ensure there is no risk of a collision. For a guide use a minimum of 50 meters or 150ft, which at 10-15 knots is 5-7 seconds behind the aircraft in front. You can also judge the correct distance by ensuring the wingspan of the aircraft in front is approximately half the width of the HUD (see Figure 1).

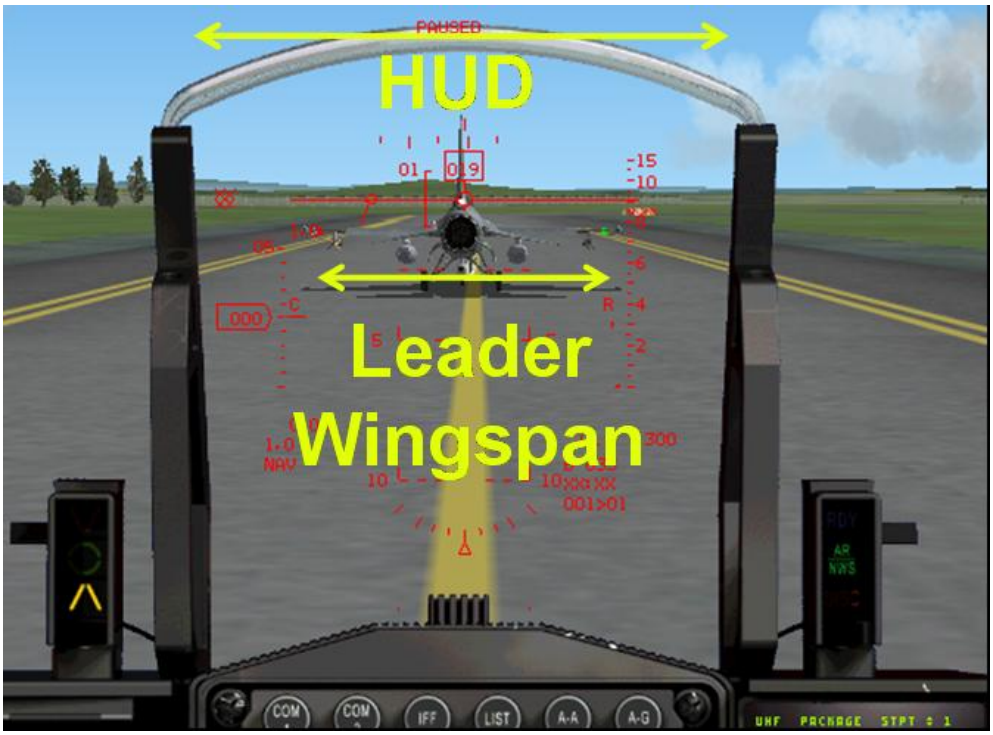

Figure 1 - Trail Taxi

1.1.2 STAGGER TAXI

In a stagger taxi, aircraft put their nosewheel in the centre of either the left or right lane of the taxiway. This allows aircraft to taxi at a closer distance to the aircraft in front, useful when visibility is limited, timings are tight or the airbase is very busy.

[1] Quite simply it is every pilot's responsibility to see other aircraft and avoid them. Do not rely on ATC to provide separation from other aircraft.

Stagger taxi is only to be used when the taxiway is wide enough to ensure sufficient wingtip clearance from obstacles and all aircraft must ensure they remain in their own lane to avoid any risk of collision.

For a guide keep a gap of 30 meters or 100ft. You can also judge the correct distance by ensuring the wingspan of the aircraft in front is approximately 3/4 the width of the HUD (see Figure 2).

The Leader should taxi on the side of taxiway for the direction of turn (i.e. right turn - right side or left turn - left side). Other aircraft in the Flight stagger on opposite sides (e.g. #1 right #2 left #3 right #4 left).

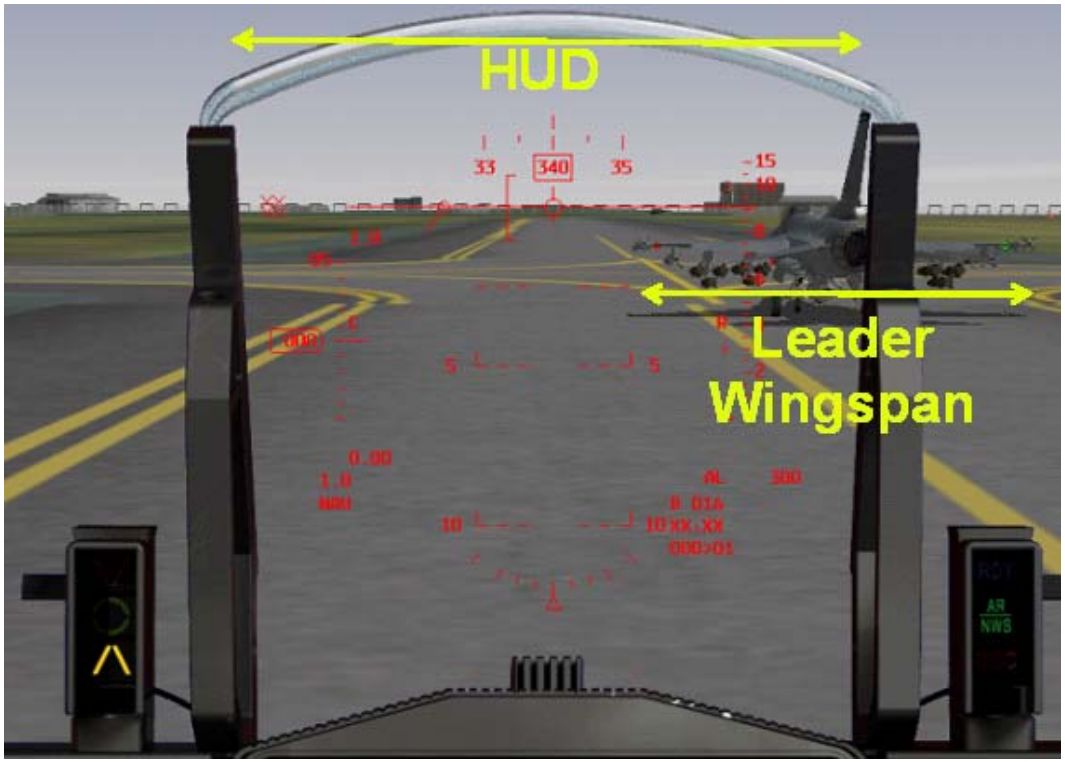

Figure 2 - Stagger Taxi

1.2 LINE UP

SOP line-ups are shown in Figure 3.

No 1 should normally position themselves on the same side of the runway as they occupied on the taxiway, leaving enough room behind them for the Flight to line up. However, if there is a strong wind from one side it's worth No 1 considering using the lane furthest from the wind direction for two reasons, most importantly wake turbulence, but also to avoid No 2 loosing engine performance from No 1's jet efflux temp.

For an Element or Echelon line-up No 2 will be staggered with their head in-line with No 1's main gear (see Figure 4). No 2 must maintain wingtip clearance with lead. If in a three/four echelon line-up, No 3 and No 4 should align helmets of the preceding flight members.

If in a three/four-in-the-slot line-up, No 2 should line-up in Echelon but with sufficient wingtip spacing to allow No 3 and No 4 to establish position without wingtips overlapping. No 3 and No 4 should line up in Echelon with four lining-up where he can see his element mate's cockpit in front of two's vertical stabilizer.

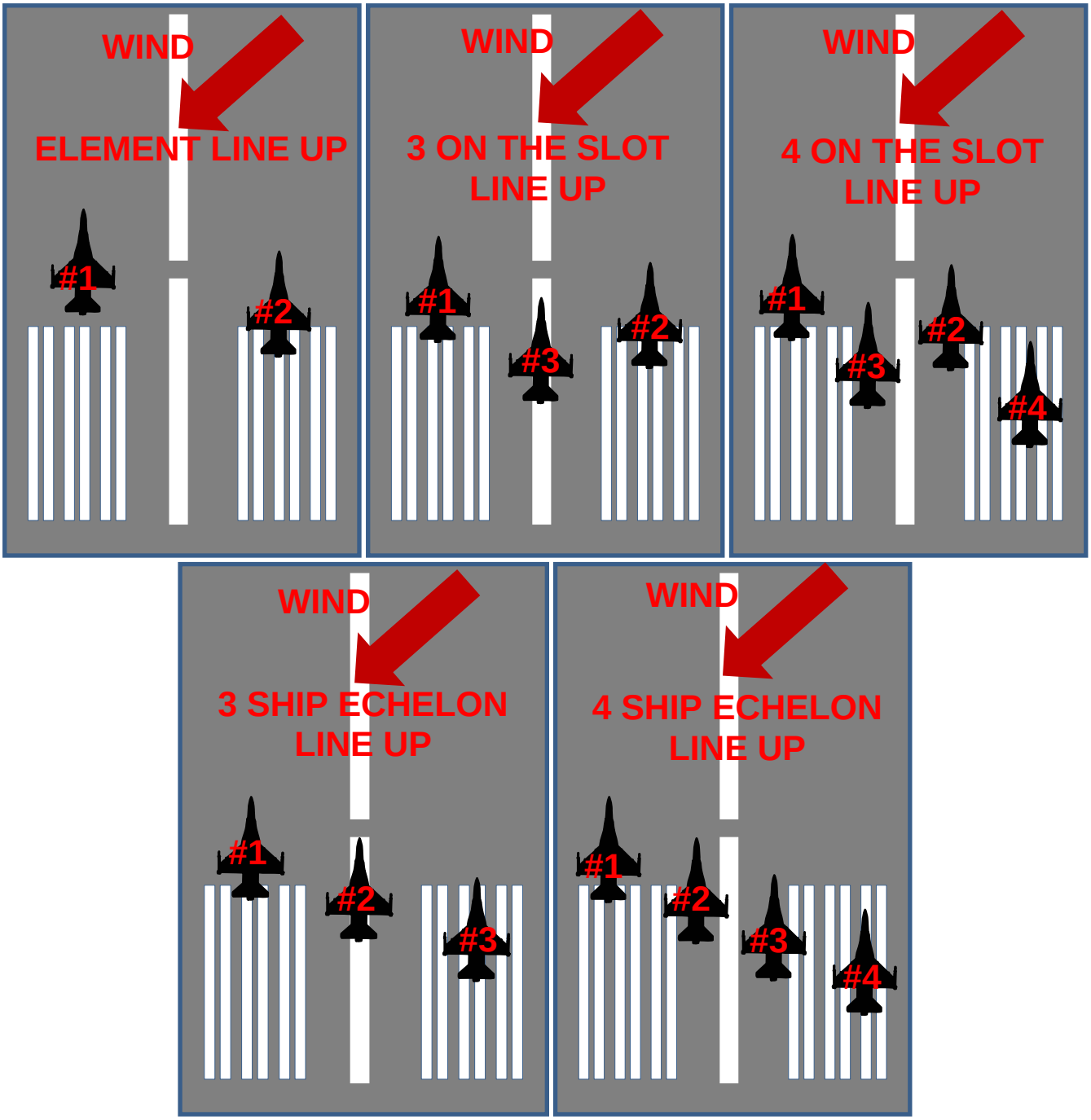

Figure 3 – Aircraft Positions for Formation and Rolling Trail Departures

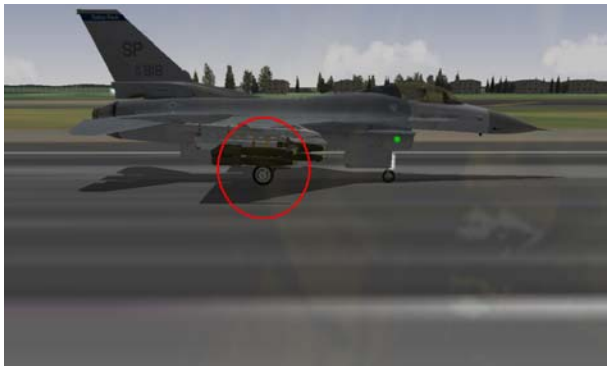

Figure 4 – The Element Line Up Position: View of aircraft in front
(Note the Main Gear is in line so you can only see the one main wheel)

1.3 TAKE-OFF

The take-off is important. A quick, orderly take-off will keep the runway occupied for the minimum period of time, is safe, looks professional and allows the Flight to get airborne with minimal distance between aircraft, aiding a quick rejoin.

On the subject of power settings: In the real world a pilot would make a takeoff calculation for the runway, temperature and altitude. However we can't do this, so instead assume at air to ground takeoff weights a Max-AB power take off is recommended. Note that even at Maximum Take-Off Weight (MTOW), the F-16 will always be able to get airborne using MAX-AB in Falcon on the runway lengths available at the main operating bases.

In the 185th VFS there are two types of SOP take-offs, the Formation take-off and the Trail departure.

1.3.1 THE FORMATION TAKE-OFF

The following rules apply to SOP formation takeoffs:

a. It is a primary responsibility of Lead to ensure the formation take-off is safe. The main danger is the risk of a collision therefore formation takeoffs are restricted to Elements unless there is sufficient runway width to maintain wingtip separation between all aircraft throughout the take-off roll. Remember as a Lead you need to think about what might happen in the event of an aborted take-off.

b. To takeoff in formation, aircraft must be within 2,500 pounds gross weight of each other and symmetrically loaded. Consider symmetrical loading as having symmetrical or near symmetrical store loadings[2].

c. Do not make formation takeoffs when:

- Runway width is less than 125 feet.
- Standing water, ice, slush, or snow is on the runway.
- The crosswind or gust component exceeds 15 knots.
- Visibility is less than 3nm and/or cloud base is lower than 1500 ft above airfield level.

The formation take-off procedure is:

i. Line up as per paragraph 1.2.

ii. On Lead's command **"80%"** aircraft increase the RPM to 80%, check engine parameter are within limits and check over aircraft to their left or right for any visible problems or incorrect configuration. Once these checks are complete, aircraft check in with **"(Callsign) ready"** in Flight order.

[2] e.g. having 2x AGM-65D on one pylon and 2x CBU-87 on the opposite pylon can be considered a near symmetrical load. Having a wing tank on one pylon and an AGM-65 on the opposite pylon is clearly asymmetric. Ultimately it is the Flight Leads responsibility to decide if a loadout is asymmetric or not. If in doubt do not authorise a formation take-off.

iii. On Lead's mark (**"Brakes, brakes, go"**), aircraft go to max-MIL or max-AB as briefed by Lead and release the brakes. Once Lead reaches max-MIL or max-AB they should decrease the thrust a little (not below 40% nozzle open) to give wingmen a small power advantage that will enable them to remain in position.

iv. Wingmen stabilise with wingtip clearance. If they get the jump on lead, they should reduce power slightly to maintain position. The best technique is to concentrate on flying formation from brake release, then match lead's rotation rate.

v. NWS should be disengaged before 70 KIAS with rotate normally between 150-180 KIAS as pre-briefed by Lead. Gear retraction must occur before 300 KIAS to prevent damage.

vi. After take-off is complete each aircraft makes the call **"(Callsign) Airborne"**

vii. If a wingman over runs the leader, they will be directed to assume the lead while continuing the takeoff. If any aircraft must abort, the other members should continue the takeoff. In either case, directional control (staying in the correct position on the runway) is essential to prevent collision.

viii. Normal take-off separation between Elements is a minimum of 10 seconds. When join-up is to be accomplished above the cloud or when carrying live air-to-surface ordnance, take-off interval will be increased to a minimum of 20 seconds.

1.3.2 THE TRAIL DEPARTURE

A trail departure is normally used to get a flight of two or more airborne when conditions won't permit a formation takeoff or rejoin out of traffic. Wet runways, crosswind limits, weapons loads, configuration differences, and low ceilings or poor visibility are normally deciding factors. This SOP only covers a VFR trail departure (minimum visibility 1nm, 300ft cloud base). IFR trail departures are to be flown iaw AFI 11-F16-Vol5.

There are two types of trail departure approved for this SOP. The standard trail departure and the rolling trail departure:

1.3.2.1 The Standard Trail Departure

i. Line up as per paragraph 1.2 ensuring wingtip clearance between all aircraft then pilots check in with **"(Callsign) ready"**.

ii. No 1 release the brakes and sets max-MIL or max-AB for departure. No 2 follows a minimum of 5 seconds later. They are followed by No 3 then No 4 with the same interval.

iii. NWS should be disengaged before 70 KIAS with rotate normally between 150-180 KIAS as pre-briefed by Lead. Gear retraction must occur before 300 KIAS to prevent damage.

iv. After take-off is complete each aircraft makes the call **"(Callsign) Airborne"**

1.3.2.2 The Rolling Trail Departure

If a Trail departure is required but you're in a hurry (e.g. late on Takeoff time) you can conduct a rolling trail departure. Lead can brief a rolling trail departure but he must still check ready before lining up on the active as per steps i and ii below:

i. Just before No 1 enters the runway he should call "**(Flight call sign) confirm ready for departure"**.

ii. If ready for immediate departure the rest of the flight should call 2,3,4 to authorise the lead for an immediate roll. If any of the Flight is not ready the response is **"(Callsign) negative"**. Lead must then conduct a Standard Trail Departure.

iii. Each member lines up in turn and rolls setting Max-MIL or Max-AB for departure with a minimum of 5 second spacing between aircraft.

iv. For this departure you must still use your departure lane as per paragraph 1.2 in case the pilot rolling ahead of you aborts his takeoff.

v. NWS should be disengaged before 70 KIAS with rotate normally between 150-180 KIAS as pre-briefed by Lead. Gear retraction must occur before 300 KIAS to prevent damage.

vi. After take-off is complete each aircraft makes the call **"(Callsign) Airborne"**

2. THE JOIN/REJOIN AND FORMATION ADMINISTRATION

After the take-off the Flight needs to get into formation. Depending on the type of departure used the Flight may be very close or several miles apart. The objective of the join is to get into the briefed formation quickly and safely. For a join below cloud base minimums are 3nm visibility and a 1,500ft ceiling. At night, rejoins below cloud base minimums are 5nm visibility and a 3,000ft ceiling.

2.1 THE JOIN/REJOIN

i. After take-off Lead should establish in the climb to a briefed joining level. He should maintain 300kts in the climb aiming for a pitch angle (on the VV) of 10 degrees. Remember the goal is brevity so there is no requirement to call pitch angles or any other parameter that is not in this SOP or that has been pre-briefed.

ii. Set the power to maintain 300kts and 10 degrees pitch using a minimum of 85% RPM and a maximum of 98% RPM (this will vary depending on weight). At light weights it may be impossible not to exceed 300kts. If this is the case No l selects 85% and raises the nose (maximum of 15 degrees unless briefed). If the speed is still increasing inform the flight by saying **"No 1 unable 300kts"**.

iii. As Lead it is important not use Max-MIL, Max-AB or idle power while in formation to ensure you 'give some' to those in the Flight so they can maintain position.

iv. When Lead approaches the briefed level off height; smoothly level off and set power to maintain 350kts. If unable within the power range 85%-98% then select 85% and let the speed increase until it stabilizes then add 10kts and maintain that speed. The additional 10kts stops you needing to reduce power below 85% to maintain speed.

v. Above Angels 25 350kts will start to be in the transonic range and fuel efficiency will be hit. This is not a worry if you're fat for fuel, however that should never be the case on ops. Above Angles 25 swap to a mach of .85 as this will maintain outside the transonic range in all configurations.

vi. Pilots may delay coming out of AB to help establish a rate of closure on the leader or lead element.

vii. If a turning join-up is to be accomplished, the flight leader will not normally exceed 30 degrees of bank.

viii. Flight members will join in sequence. The SOP re-join formation is either Fingertip (Figures 5 & 6) or Route[3].

ix. For a straight ahead rejoin, the No 2 aircraft will join on the left wing and the Element will join on the right wing unless otherwise briefed. For a turning rejoin, the No 2 will rejoin on the inside of the turn and the Element to the outside. If mission or flight requirements dictate, the Flight Lead will specifically direct the desired formation positions.

x. When joining back with Lead, as you close within visual range for the join; let him know by calling **"(Callsign) Visual"**. (Or if the radio is quiet reassure Lead by calling, for example, **"(Callsign) visual with 3 aircraft"**. This prompts the lead aircraft to respond with useful information for the join. Example, **"Roger Falcon1 is 550kts heading 220 angels 20, clear join fingertip"**. This is the procedure to enable swift accurate and controlled formation joins.

xi. Avoid using smoke in tactical situations for the visual join, the above use of the radar properly called is more tactical. However only use this technique if the current tactical situation is suitable. If it's busy you probably won't be worrying about the rejoin but either way Lead won't appreciate the side tone at a tense moment.

xii. Once all members of the flight have established the briefed formation and called **"In position"** or **"Saddled"**, then increase power slowly and smoothly within the formation range (see paragraph 2.1.iii) and pitch the nose smoothly up for any onward climb.

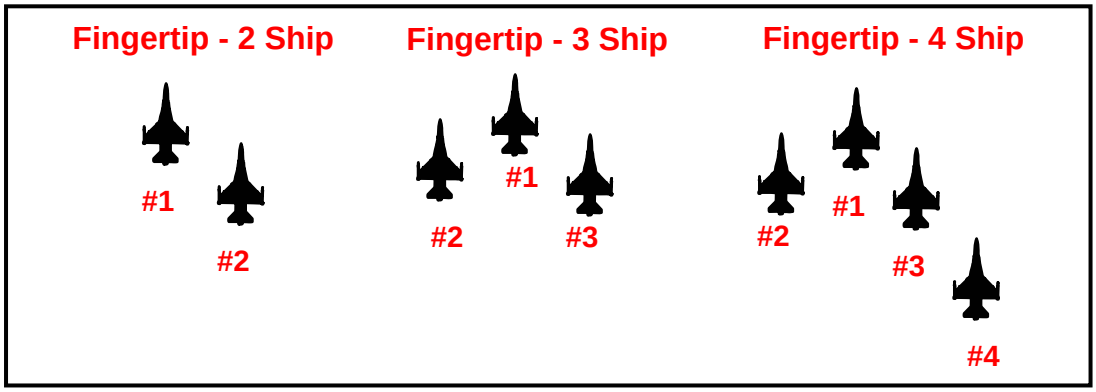

Figure 5 – Fingertip Formation

[3] As per Fingertip but with up to 500ft lateral separation between aircraft. This is a good formation for loose flying where there is a need to go heads in as well as maintain your station.

Figure 6 – Wingman Position Relative to Lead in Fingertip Formation

2.2 FORMATION ADMINISTRATION

i. The secret to being a good formation Lead is to think well ahead of the aircraft. Imagine you are sat in your ejector seat somewhere ahead, where your aircraft will be in 10 nm time. If you stay there and successfully think ahead of the aircraft your ejector seat will become an arm chair. Normally if you forget to do something you can throw the aircraft on its side and rip the wings off in a high g turn. But in formation you're flying a Boeing 747!

ii. As Formation Lead you need to succinctly inform your flight of any climbs or descents and speed changes. For example:

- Climbing = **"(Flight call sign) climbing angels 10"**
- Change speed = **"(Flight call sign) accelerating 550kts"**
- Change heading = **"(Flight call sign) turning right hdg 320… Now"**

iii. It is essential that Lead gives a warning before any turn as they are the only formation manoeuvres that can catch out a flight member who has momentarily gone heads in. Always leave a brief pause before carrying out the manoeuvre you are warning about. The command to carry out any action in a formation is always the last word and is always after a brief pause. For example **"Smoke on, smoke on…GO"** in this case the word Go is the executive command.

iv. If a member of the formation falls out of formation. It is permissible to use MOMENTARY radar to lock on the lead if you call the raygun. Acknowledge the buddy spike with a buddy lock call. If you are going to maintain the radar lock (not STT) to assist in the join, action a Master Arm Safe check for the duration of the buddy lock. There is little worse than forcing Lead to eject due to an unintentional Fox launch!

3. THE RECOVERY, CIRCUIT & LANDING

3.1 THE RECOVERY

3.1.1 Once you're away from the frontline and are FENCE'd out, get your flight to turn off their radars, and call **"(Callsign) nose is cold switches safe"**. This means they won't irradiate you or shoot you.

3.1.2 For the recovery Lead needs to close the formation up safely. The standard SOP recovery formation is close trail (Figure 7). You should be between 1-2 aircraft lengths behind the aircraft in front and slightly below (around 20-30ft). Showboating is not required. There will be room for some aerobatic tight formation flying at some point but not today, today we are all about stable formation recovery. Minimums for a VFR formation approach and landing are 3nm visibility and a 1500ft ceiling. IFR recoveries are to be conducted iaw ATC instructions and local procedures.

Figure 7 – Close Trail Formation: Perspective from Cockpit to Aircraft in Front

3.1.3 When you're sure you are away from danger (ideally at least 30 miles from home plate) call the Flight into close trail for the recovery. Example **"Falcon 4 flight, go close trail"**. At this point the number 2, 3 and 4 confirm with their numbers. Then No 3 and No 4 drop back and watch No 2 move into position. Then No 3 moves in followed carefully by No 4. Each aircraft calls **"In position"** as they reach it. The Flight is now ready to descend to a safe altitude for the recovery.

3.1.4 For the decent reduce power no lower than 85% RPM and push the nose down as required. If the speed builds, accept it, but once stable call the speed and maintain. Lead should avoid the use of airbrake in the decent to leave it available for the Flight. If anyone uses airbrake call it to warn the others. Example **"Falcon 14, boards out"**.

3.1.5 At 30 miles out, Lead should have an image of the runway on the ground ahead. You should have drawn an imaginary line on the ground of where you need to go to get the formation into the Initials Point for the recovery. If you don't, things will get difficult for your flight and you will spend an extra 10 minutes trying to reposition.

3.1.6 To line up for the Initials Point you need to aim for the point 10 nm before the Initials Point, which itself is 3 nm before the runway threshold displaced to the side away from the circuit direction[4] (unless there are two parallel runways in use, in which case fly directly along the runway overhead). This will give you lots of time to gently fine tune the position of the flight for the run in. Call all turns and make as many descents (depending on the terrain) as required to get the Flight down to the circuit height of 1500ft.

3.2 THE BATTLE BREAK JOIN

3.2.1 The battle break join is a tactical circuit join designed to get the Flight back over home plate at high speed and then allow them to decelerate and join the visual circuit.

3.2.2 As you reach the Initials Point Lead will call **"(Flight Callsign) Flight Initials for the Break Runway xx"**, where xx is the active runway.

3.2.3 The run in for the battle break is done at high speed (400-650kts) and you may wish to think about getting down to 500ft or 1000ft to then climb to circuit height during the break turn to downwind.

3.2.4 As in Figure 8 below, Lead should break as he sees fit sometime after passing abeam the threshold. As the lead breaks he calls **"1 one the break"**. The No 2 has the formation lead for 5 secs then he breaks into the circuit calling **"2 on the break"**, then three after 5 secs then 4 after 5 secs.

3.2.5 As you turn onto the downwind leg slow down to downwind speed (300kts) and ensure you are at 1500ft. There is no need for individuals to call downwind as when No 1 is ready to call downwind No 4 may still be breaking but if No 4 has already called the break and there is time for the downwind call then why not, as long as other ATC chatter permits.

3.3 THE OVERHEAD BREAK JOIN

3.3.1 The overhead break is the same as the battle break except it is flown at just over circuit speed. This reason for being slightly faster than circuit speed is you'll scrub some speed on the break.

3.3.2 You fly over the initials point at 350kts. At initials the radio call from Lead is slightly different - **"(Flight Callsign) Flight Initials Runway xx"** instead of "Initials for the break". This is to differentiate to any other circuit traffic that you are coming in slowly rather than fast. Then after flying over the initials point the flight still breaks one by one as they fly the upwind leg just as in a run in and break. You even still call on the break. Downwind is once again at 300kts and 1500ft, so the only difference from the Battle Break is the speed.

3.4 THE DOWN WIND JOIN

3.4.1 The last form of join is the down wind join. This is another way of expediting the landing of the flight. For example, if you are coming in from the North and the airfield is on Runway 34, rather than have to fly outside the circuit for miles to position for a Northerly run using the Battle or Overhead Break; the downwind join allows you to join the circuit from the North. Simply (as per Figure 8) fly into the visual circuit at the beginning of the downwind leg.

[4] All circuits on single runways are left hand unless briefed otherwise by Lead and approved by ATC. For parallel runways use a left hand circuit for the left runway and a right hand circuit for the right runway.

3.4.2 As you join the downwind leg at 300kts and 1500ft, Lead makes the call, **"(Flight Callsign) Flight joining downwind runway xx"**. This lets every one know what you are doing. Then the Lead makes a downwind call saying **"(Flight Callsign) Flight downwind to go around at circuit height"**[5].

3.4.3 At the end of the downwind you could turn finals and land if you were by yourself, however, as you are still in close formation you need to turn finals at circuit height. Next fly around at circuit height and break one by one on the upwind leg, just as in the other joins.

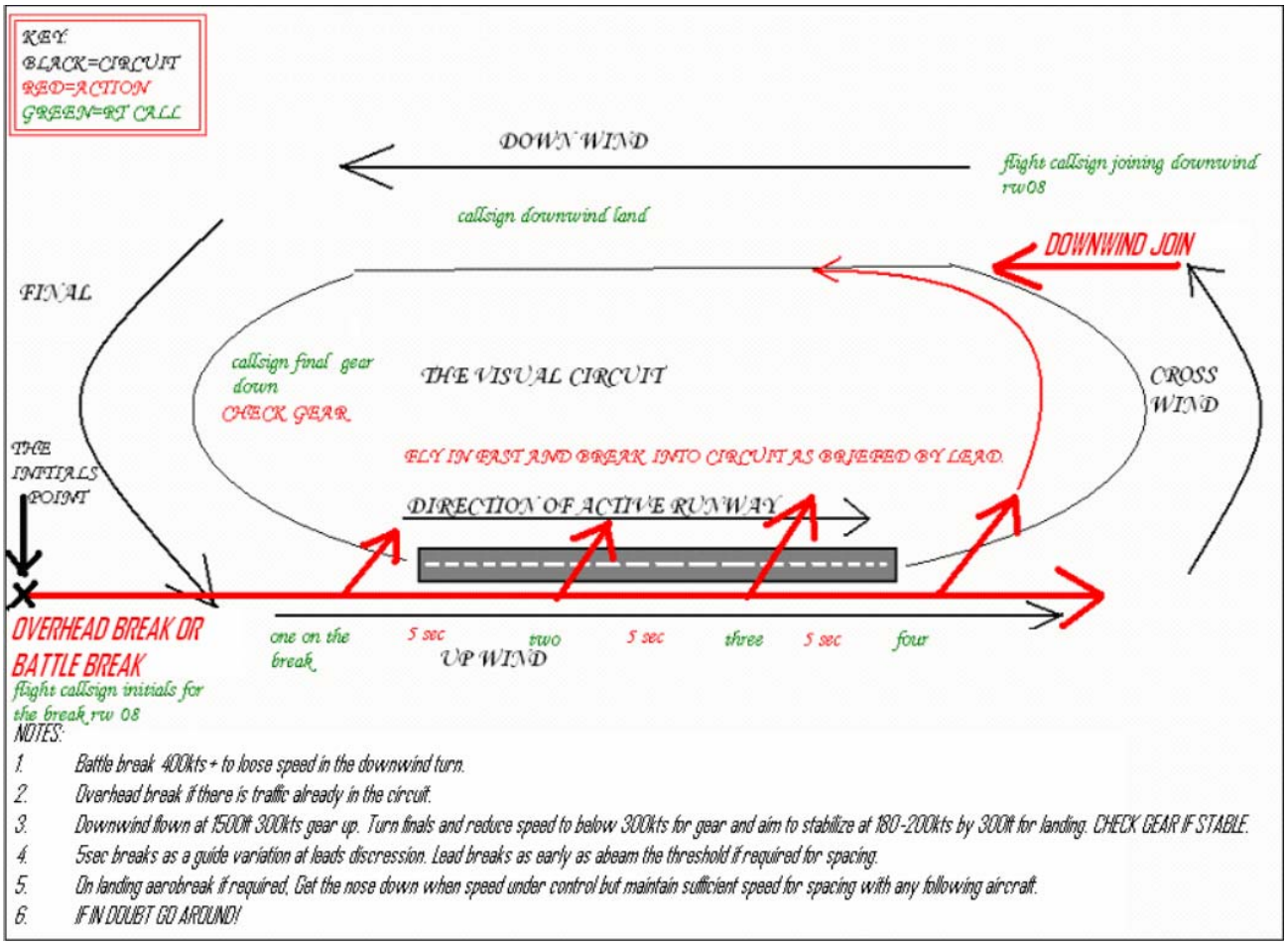

Figure 8 – The Visual Circuit

3.5 LANDING

3.5.1 Now you have used one of these three methods of joining the circuit you are free to stay in the circuit until you need to leave or you land. You fly in the circuit at 300kts and 1500ft. Unless you are turning final in which case put the airbrake out to reduce speed to safely below 300kts, aiming to stabilise at 180-200kts for the landing at the weight-specific speed. When you turn final call **"(Callsign) final Runway xx, gear down"** to keep everyone in the loop. On final try to aim to be stable lined up with the runway no lower than 300ft at 1nm. Only look in to check the gear is down when stable.

3.5.2 If you're landing as part of a formation, Lead may authorise the Flight to land using both lanes of the active runway using the words **"(Callsign final Runway xx, Left/Right Lane, gear down"**. If you hear this then the rest of the Flight should stagger to either the left or right side of the active runway centreline. Example - Lead call Left lane so No 2 lands on the right lane, No 3 on the left and No 4 on the right. If you're on Final and there is still an aircraft on the runway in your lane it is your responsibility avoid a collision.

[5] This call would not be necessary if you were on your own.

If Lead doesn't call Left or Right Lane as part of the final call then only one aircraft at a time is permitted to land on the runway and each aircraft must ensure the runway is clear before they land.

3.5.3 If you're at all unsure about what is happening, if you're not happy with your set up or you're not certain the runway is clear… GO AROUND. The sensible pilot always goes around every now and then, it's nothing to be ashamed of; crashing instead of going around is shameful!

3.5.4 In the circuit if you plan to do something other than land, tell everyone during your downwind call, for example, **"1 downwind touch and go"** or **"1 downwind to overshoot"**.

3.5.5 If you do a touch and go put you main wheels down, apply a suitable power, retract the airbrakes and gently lift off again safely retracting the gear as soon as you are clear of the ground. Then just turn and climb back up to circuit height of 1500ft and maintain 300kts. Stabilise downwind and make another downwind call. VFR minimums for touch and go landings are 1.5nm and a 500ft cloud ceiling.

3.5.6 If you need to leave the circuit at any point just call **"(Flight Callsign) departing the circuit heading xx"**. Example **"Falcon 1 Flight departing the circuit runway heading"** or if you leave as a single aircraft **"Falcon 11 departing the circuit heading North"**. If the rest of the Flight join you then just start controlling the re-join using SOP's.

3.6 TAXI IN, PARK & SHUT-DOWN

3.6.1 Once you've landed exit the runway as directed by either Lead or ATC.

3.6.2 Once clear of the runway make the call **"(Callsign) clear of the active runway xx)"**.

3.6.3 Taxi to the parking apron as directed by Lead or ATC. Comply with the Taxi SOPs as per Paragraph 1.1.

3.6.4 If you have to cross another runway, even if it's not active, ensure it is clear before you enter.

3.6.5 Once you arrive at the parking apron, park the aircraft and shut down as directed by Lead.

3.6.6 SOPs for exiting the cockpit as detailed in 185th Multiplayer SOPs 1 & 2.

4.0 ACKNOWLEDGEMENTS

4.1 Special thanks go Hoot for producing the original draft of this document and to Panther for his valuable input.