NAVAL AIR TRAINING COMMAND

NAS CORPUS CHRISTI, TEXAS **CNATRA P-766 (Rev 04-11)**

FLIGHT TRAINING INSTRUCTION

PRIMARY FORMATION T-6B

2011

DEPARTMENT OF THE NAVY
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Subj: FLIGHT TRAINING INSTRUCTION, PRIMARY FORMATION, T-6B

1. CNATRA P-766 (Rev. 04-11) PAT, "Flight Training Instruction, Primary Formation, T-6B" is issued for information, standardization of instruction, and guidance to all flight instructors and student military aviators within the Naval Air Training Command.

2. This publication is an explanatory aid to the T-6B Joint Primary Pilot Training curriculum, and shall be the authority for the execution of all flight procedures and maneuvers herein contained.

3. Recommendations for changes shall be submitted via CNATRA TCR form 1550/19 in accordance with CNATRAINST 1550.6 series.

4. CNATRA P-766 (New 01-10) PAT is hereby cancelled and superseded.

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Distribution:
CNATRA Website

FLIGHT TRAINING INSTRUCTION

FOR

PRIMARY FORMATION

T-6B

P-766

LIST OF EFFECTIVE PAGES

Dates of issue for original and changed pages are:
Original...0...12 Mar 10 (this will be the date issued)
Revision1…0…25 May 11

TOTAL NUMBER OF PAGES IN THIS PUBLICATION IS 110 CONSISTING OF THE FOLLOWING:

Page No.	Change No.	Page No.	Change No.
COVER	0	6-1 – 6-7	0
LETTER	0	6-8 (blank)	0
iii – x	0	7-1 – 7-19	0
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INTERIM CHANGE SUMMARY

The following Changes have been previously incorporated in this manual:

CHANGE NUMBER	REMARKS/PURPOSE

The following interim Changes have been incorporated in this Change/Revision:

INTERIM CHANGE NUMBER	REMARKS/PURPOSE	ENTERED BY	DATE

SAFETY/HAZARD AWARENESS NOTICE

This course does not require any special safety precautions other than those normally practiced on the flight line.

TERMINAL OBJECTIVE

Upon completion of this course, the student shall be able to direct specified two-plane formation maneuvers in the T-6B aircraft.

INSTRUCTIONAL PROCEDURES

1. This is a flight training course and will be conducted in the Operational Flight Trainer (OFT) and the T-6B aircraft.

2. The student will demonstrate a functional knowledge of the material presented in this Flight Training Instruction (FTI) manual and other various instructional references.

INSTRUCTIONAL REFERENCES

1. T-6B NATOPS Flight Manual

2. Local Standard Operating Procedures (SOP) Instruction

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CHAPTER ONE
INTRODUCTION TO FORMATION

100. INTRODUCTION

The formation syllabus is one of the most challenging and exciting stages in Primary Flight Training. The purpose of this syllabus is for students to learn to recognize and control relative motion and understand the concepts of mutual support and situational awareness with regard to section formation flying. Formation flying is unique to the military; it's what sets us apart from our civilian counterparts. In addition to the ability to concentrate firepower, formation flying also offers the inherent advantages of mutual support and improved command and control. Military aircraft of all types are routinely called upon to perform missions which require aviators to possess basic formation flying skills.

101. FORMATION DEFINED

A formation consists of two or more aircraft flying in proximity to each other with all movements coordinated in unison. The smallest formation unit is a section, which consists of two aircraft; a Leader and a Wingman. Next in size is a division, which consists of three or more aircraft. Adding sections or divisions, as required, makes larger formations. The Leader is commonly referred to as "Lead", while the Wingman is often referred to as "Wing" or "Dash 2" (sometimes written as -2, -3, -4, etc. in larger formations).

102. FLIGHT DISCIPLINE

Lead's responsibilities cover two areas: **Flight Lead (a.k.a. Designated Lead)** and **Formation Lead (a.k.a. Tactical Lead [**in the lead position]**)**. The Flight Lead is ultimately responsible for the safe and orderly conduct of the flight. The Flight Lead may fly in either position (lead or wing position). Formation Lead responsibilities include:

1. Stay clear of traffic, clouds/weather (unless under IFR handling).

2. Remain within the briefed operating area.

3. Comply with local course rules and Air Traffic Control (ATC) instructions.

4. Execute appropriate in-flight checklists.

5. Utilize proper visual and radio communications.

6. Always know where the Wingman is at all times.

7. Remain predictable.

The Formation Lead must be considerate of the Wingman by providing a smooth platform and planning ahead to ensure that signals and maneuvers are not rushed. In addition, the Lead must perform smooth changes in power and attitude. This concept is called “Wingman consideration.”

Wingman responsibilities include:

1. Always keep Lead in sight.

2. Maintain proper position as directed by Lead (flight integrity).

3. Comply with all of Lead’s signals and give a timely response.

4. Backup Lead (i.e., with navigation, communication, etc.).

5. Be prepared to assume the lead at anytime.

Wing is in the proper position when established on the bearing line (defined as the angle aft of Lead’s wing-line) with the proper step-down and lateral distance. Bearing line positions and references will be defined later. Formation flying requires “thinking ahead of the aircraft” and proactive planning. Everything takes a little longer to accomplish in a formation. Common tasks like changing radio frequencies or maneuvering require more time in formation; therefore, Lead will have to plan accordingly. In order to maneuver the flight safely and effectively within the confines of the designated formation area, Lead must first possess a clear understanding of the area boundaries. Additionally, Lead must be able to visualize how a combination of maneuvers can be utilized to guide the flight within those boundaries. Wind speed and direction will affect the flight’s ground track and should be considered. Finally, Lead should be conscious of the sun's position relative to Wing and should limit the Wingman’s exposure to looking into the sun as much as possible.

Keys to Successful Formation Flying:

1. **Relax**; using a light touch on the aircraft controls.

2. Keep the aircraft **trimmed.**

3. **Scan** Lead’s entire aircraft and do not fixate on any one checkpoint.

4. For every correction, there is a corresponding 3 point re-correction. For example, if aft of the bearing line: (1) add power, (2) reduce power approaching bearing line, and (3) re-set power to stabilize on the bearing line.

5. Have fun!

103. RELATIVE MOTION

Essentially, formation flying is nothing more than controlling the relative motion between aircraft. Lead is considered to be fixed, and any movement between aircraft is considered movement of the Wingman in relation to the Lead. In the Contact stage, the horizon is used as the primary attitude reference. In the Instrument stage, an artificial horizon (attitude gyro) is used. In Formation, Lead's aircraft becomes the primary reference for attitude control. Relative motion can be resolved into movement about any one, or combination of all three axes. Horizontal movement (Figure 1-1) can be controlled by using power to move fore/aft and by using aileron to move left/right relative to Lead. Vertical movement (Figure 1-2) is primarily controlled by elevator inputs to climb/descend relative to Lead. Strive to maintain perfect positioning, but understand that Wing will only be there for a fleeting moment. By definition, when Wing is ahead of bearing line, he is "Acute". When Wing is aft of bearing line, he is "Sucked". "Closure" is the relative rate Wing is approaching Lead, and "Opening" is the relative rate Wing is receding from Lead. The farther Wing is away from Lead, the more challenging it is to detect/correct position changes. Good formation flying is the result of anticipation and use of small, timely corrections about all three axes. Always correct for **A**ltitude, **B**earing, then **C**losure/Closeness (referred to as "the **A-B-C**'s of formation").

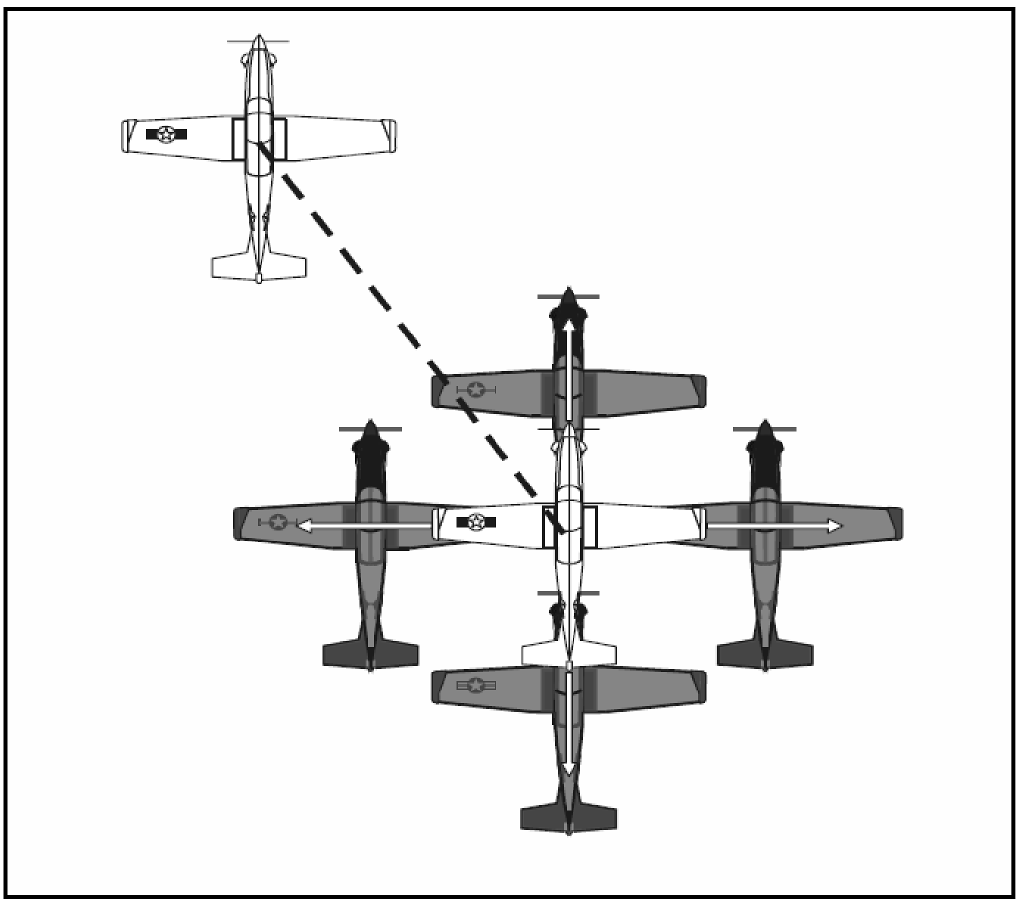

Figure 1-1 Horizontal Movement

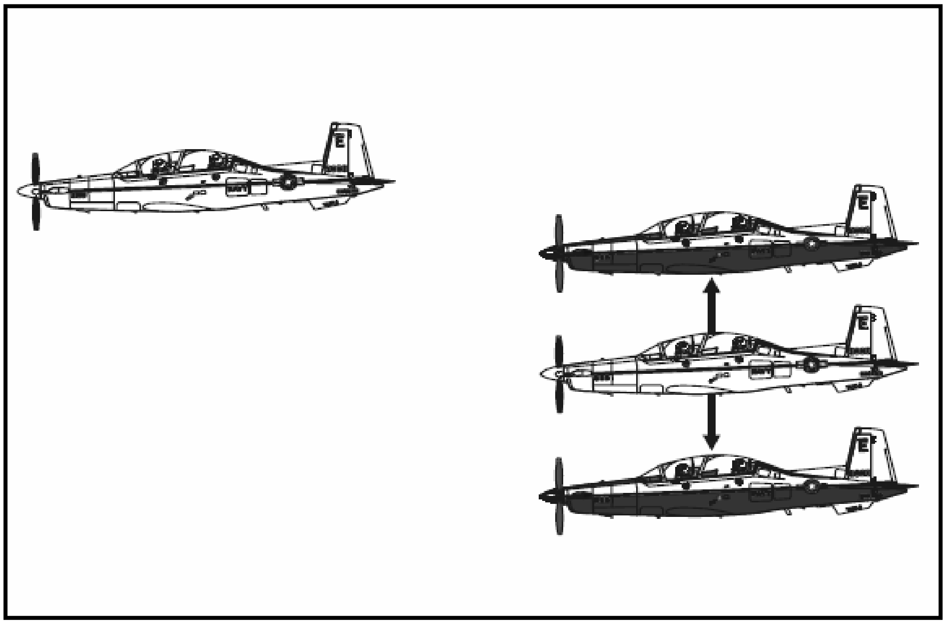

Figure 1-2 Vertical Movement

104. RADIUS OF TURN

Another key to good formation flying is to clearly understand radius of turn and how it relates to controlling position. Because the Lead aircraft acts as the source of all position information, Wing needs to anticipate position corrections in relation to Lead's radius of turn. If Lead turns into Wing's position, Wing will require less power to complete the turn because he is flying a smaller radius of turn. Failing to reduce power will cause Wing to become Acute. When the Lead turns away from Wing's position, Wing will require more power because he is flying a larger radius of turn. Failing to increase power will cause Wing to become Sucked. Radius of turn concepts will be utilized for initial rendezvous, parade turns, breakup and rendezvous, cruise maneuvering, and tail chase.

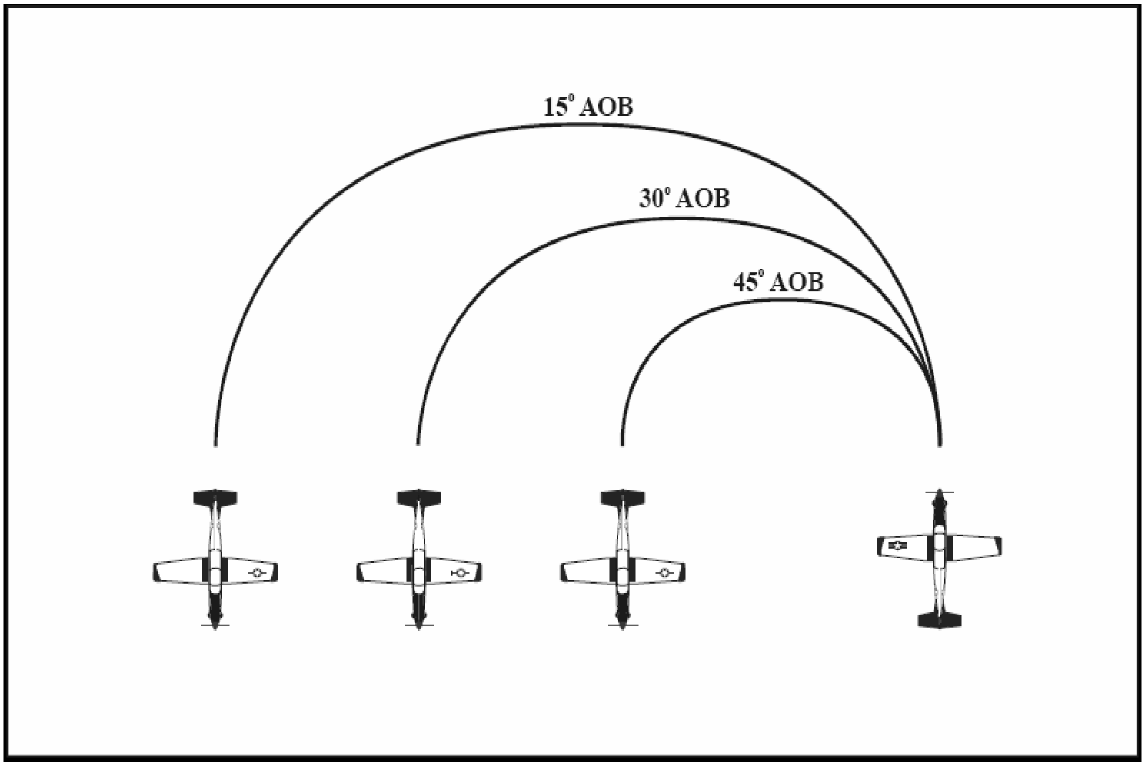

Figure 1-3 Radius of Turn

105. PURSUIT GEOMETRY

The concept of pursuit geometry between aircraft is basic to every maneuver. The type of pursuit can be determined by the aircraft's flight path in relation to the plane of motion of the other aircraft. There are three basic types of pursuit:

1. **Lead Pursuit** (Figure 1-4) is used to decrease nose-to-tail separation. Lead pursuit may be noticed by an aft Line-of-Sight (LOS) movement of Lead's aircraft in Wing's windscreen.

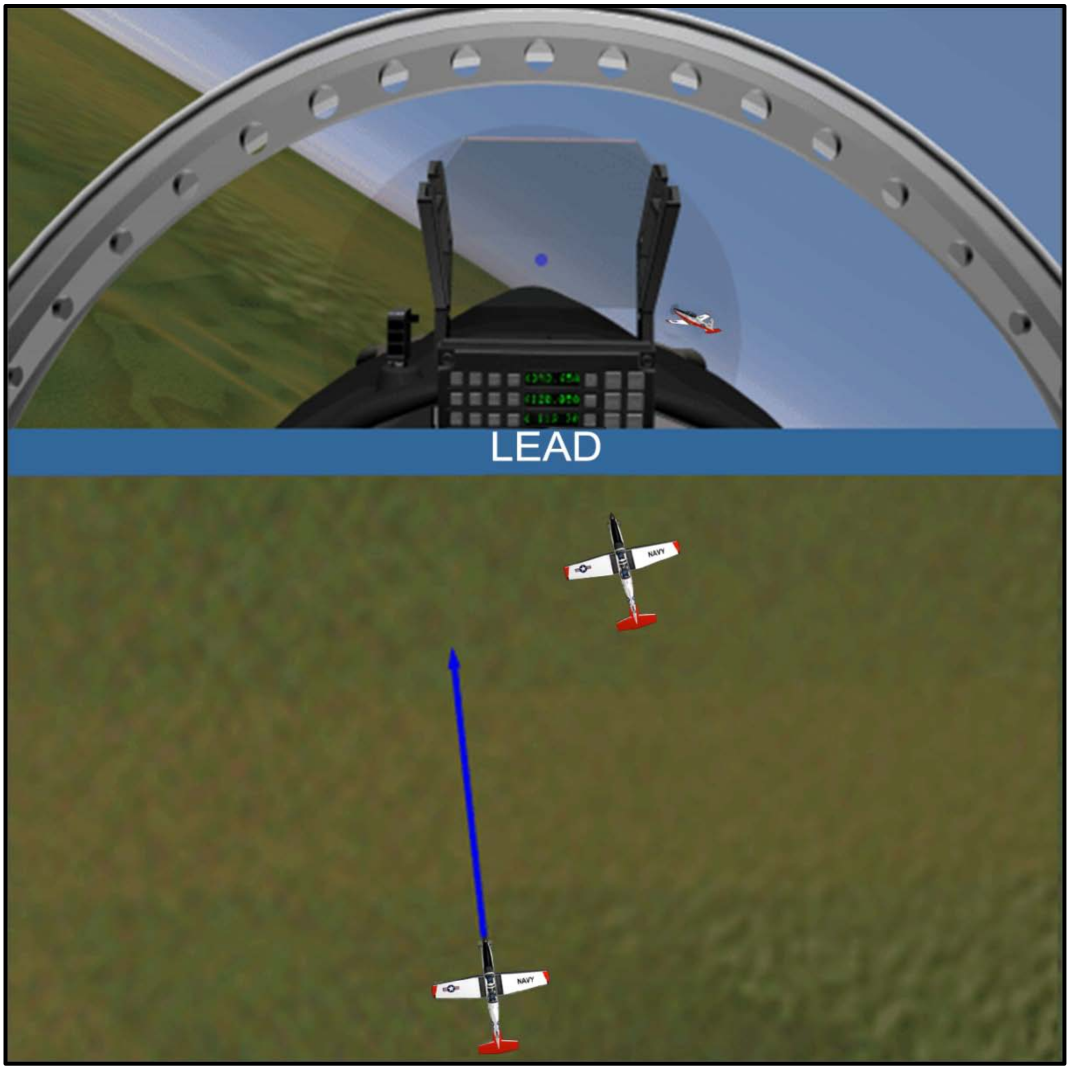

Figure 1-4 Lead Pursuit

2. **Pure Pursuit** (Figure 1-5) is achieved by putting Wing's nose on the other aircraft. While not as rapidly as lead pursuit, pure pursuit can generate closure if both aircraft are at co-airspeed. In pure pursuit, Lead's aircraft will have zero LOS movement in Wing's windscreen.

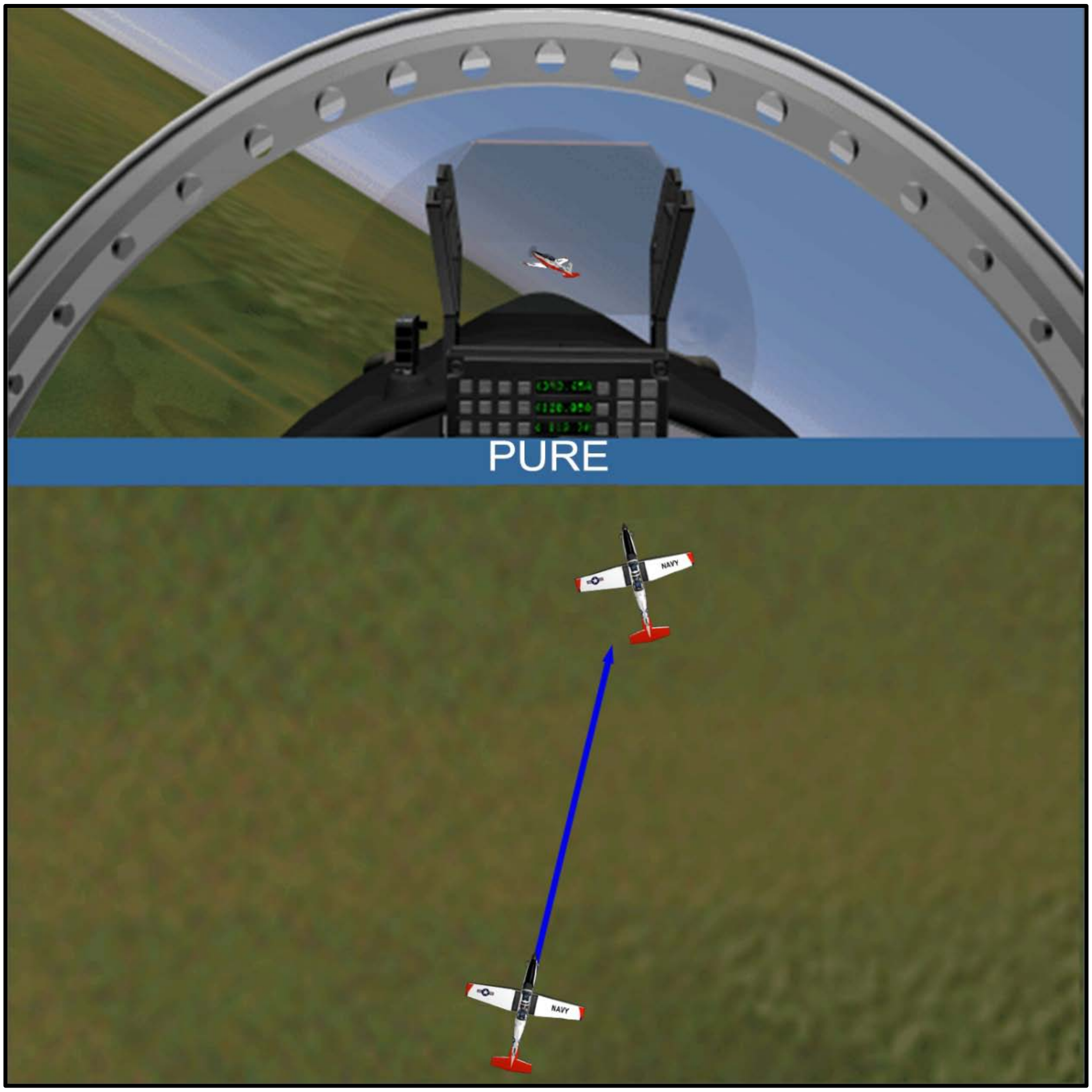

Figure 1-5 Pure Pursuit

3. **Lag Pursuit** (Figure 1-6) is used to maintain or increase nose-to-tail separation. Lag pursuit results in a forward LOS movement of Lead's aircraft in Wing's windscreen.

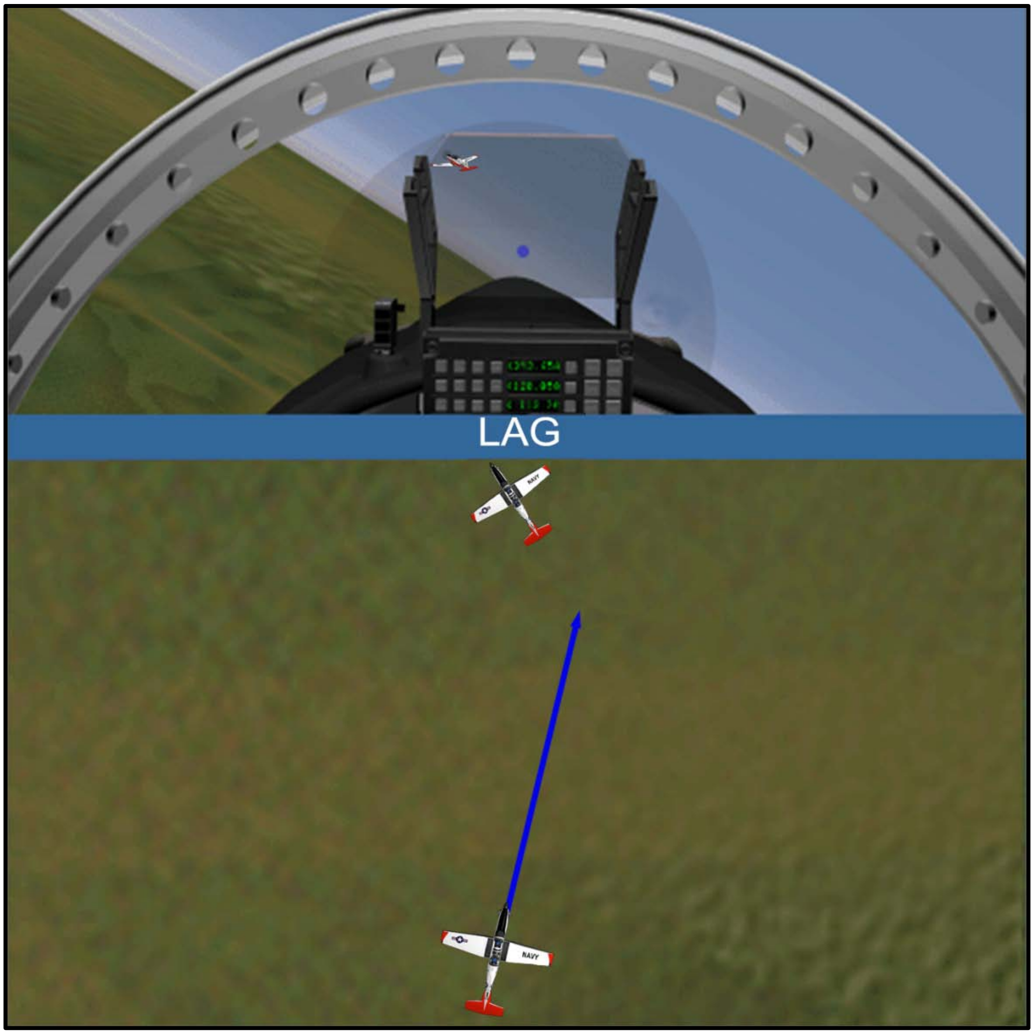

Figure 1-6 Lag Pursuit

106. COMMUNICATION / RADIO CHANNEL CHANGE

Communications in formation are the same as in previous stages with some minor differences. The flight will essentially use two call signs: An official call sign depicted on the flight schedule used to communicate with outside agencies (i.e., ATC, Base, etc.) and a tactical (TAC) call sign selected by the flight for inter-flight communications. Students are encouraged to select a tactical call sign with no more than one or two syllables (i.e., "AXE," "RAIDER," "SWEET").

There are two methods for executing frequency changes. One is through the use of visual signals, and the other is to broadcast the change over the radio. Sometimes, frequencies are pre-briefed to be automatically switched ("Auto Switch") at specific times in the flight or on the ground.

The Lead will conduct all communications with outside controlling agencies and Wing will switch, monitor and back Lead up as necessary. These transmissions should be brief and concise to minimize communication congestion. Lead should give sufficient time for Wing to switch frequencies prior to communicating with the controlling agency. However, if Wing does not respond to the check-in on the new frequency after two attempts, Lead should resume with communications and repeat the switch on the TAC frequency or with visual signals.

Wing must ensure that his "*Two*" responses are deliberate and not too quick. If done too quickly, Lead will only hear a click or a portion of the transmission ("short keying").

Radio frequency changes will take longer in formation, so Lead should plan accordingly. Visual or radio communications within the section must be clear and timely to avoid confusion. The Wingman should have time to acknowledge the signal before the Lead executes any switch.

Radio: Use the radio under Instrument Meteorological Conditions (IMC) conditions and/or anytime there is confusion. It is acceptable to use radios when Wing is in cruise or to ease communication between the flight. Every frequency change in formation, whether on the ground or in the air, is going to be a three-step process:

1. Give the command to switch to the new frequency (visually or by radio).

2. Check-in Wing on the new frequency.

3. Talk to the new agency (if necessary).

"Switch" will be used when Lead desires/requires a frequency change and may be performed over TAC frequency. Positive check-in still applies after switching frequencies.

Example

LEAD: "*Angry, switch 8.*"

WING: "*Two.*"

Both pilots then switch to the new frequency

LEAD: "*Angry.*"

WING: "*Two.*"

NOTE

Brief both a UHF and VHF TAC frequency. Lead and Wing must always have direct communication with each other.

Visual Signal: Lead can initiate the frequency change through the use of a visual signal, but the flight must be in a "stable" condition and the Wingman should be in a position to see the signal. The visual signal can be used both on the ground and airborne. Lead will pass the frequency change by tapping the side of his helmet, followed by sequentially holding up the number of fingers equal to the digits of the frequency being passed. Numbers 6 through 9 are passed with fingers horizontal by indicating the number which, when added to 5, gives the desired number from 6-9. The number zero is indicated by a closed fist. Frequency changes to a preset frequency are passed using the same format. The Wingman will indicate he has received the signal with a head nod or a thumbs-up. Visual signals will generally be given to Wing when in parade. Ensure Wing acknowledges receipt before continuing with the profile.

The Wingman will be expected to make frequency changes while maintaining the proper formation position; mid-air de-confliction is Wing's primary responsibility. Some situations may require Wing to slightly increase lateral separation, if visibility permits, but resume position once the switch is complete. For preset frequency changes, input the new frequency, glance quickly to verify the correct preset frequency, continue with transmissions as appropriate. For manual frequency changes, Wing should enter one frequency digit at a time, while keeping his eyes on Lead. Take quick glances to verify the correct manual frequency.

NOTE

> Execute visual signals high on the canopy, away from the face, in clear view of the Wingman. Some signals may have to be exaggerated for clearer interpretation.

The Formation stage emphasizes proper communication procedures, communication brevity, and teamwork throughout the flight.

Common Errors:

1. Lead does not give Wing enough time to set a new frequency (i.e., checks-in Wing immediately after directing the frequency change).

2. Lead does not provide a stable formation platform for Wing during a frequency change (poor Wingman consideration).

3. Lead "steps" on other transmissions on the new frequency (switch, listen, then communicate).

4. Lead becomes distracted with the check-in procedures and does not respond to critical radio calls.

5. Lead does not check-in Wing on new frequency.

107. FUEL AWARENESS

Knowing the fuel state of both aircraft at all times is essential. The Lead must know the aircraft with the lowest fuel state in the flight for planning purposes. The same information is critical if Wing has to assume the Lead. To determine the flight's fuel state, the Lead passes the fuel-check signal, then Wingman passes his fuel quantity rounded down to the nearest 10 lbs (using visual signals or TAC frequency as briefed), then Lead acknowledges. Lead will then use the lowest fuel state for planning purposes. A couple of terms that need to be discussed are Joker and Bingo. See Section 308 for further fuel and operations check procedures.

JOKER: A predetermined fuel state (above Bingo fuel) at which time the present maneuvers need to be terminated in order to accomplish the remainder of the planned profile and recover normally at or above minimum fuel requirements.

BINGO: A predetermined fuel state at which time the flight needs to immediately commence recovery in order to land with minimum fuel requirements. When either aircraft in the section reaches BINGO fuel, terminate the area profile and commence the recovery phase.

NOTE

Mission priorities and flight conditions may change while airborne (i.e., working area, weather conditions, alternate airfield requirements, etc.). The Section Lead may adjust JOKER and (or) BINGO fuels during flight to accommodate mission conditions.

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CHAPTER TWO
GROUND PROCEDURES

200. INTRODUCTION

Teamwork is an essential element to good formation. Studying, setting up a briefing space, pre-flight, flight, and debrief should all be a team effort. The following ground procedures will be common to all formation flights. Consult local SOP for additional ground procedures required.

201. OUTBOUND

Aircraft issue and preflight will be conducted in the same manner as any syllabus flight. Students should note and record the assigned spot for both aircraft on the flight line. Maintenance will attempt to assign aircraft next to each other on formation sorties. If the aircraft are not parked next to each other, it is imperative to immediately set the briefed TAC frequency once avionics are turned on to facilitate flight status reporting. If problems are encountered on the ground, relay the applicable information to other aircraft via TAC frequency. Both Lead and Wing should then follow Lead's briefed communication sequence.

Set up the communications in accordance with (IAW) local SOP and flight brief.

1. Conduct radio check-in IAW local SOP.

2. All aircraft in the flight will monitor and copy ATC clearances and set the appropriate transponder code and altimeter setting. Wing will set the appropriate squawk and leave the transponder and TCAS in "standby."

202. TAXI

Taxi to the run-up area IAW local course rules. A good rule of thumb is to taxi no faster than a person can walk in the line, and no faster than a person can jog outside of the line. Once Wing is in position, Lead should taxi at a speed that does not force Wing to exceed Taxi speeds to remain in position. Lead should monitor Wing's during taxi and adjust as necessary.

TW-4 aircraft will taxi in a trail position in accordance with local SOP. TW-5 aircraft can either "stagger taxi" or taxi in a trail position where appropriate.

The "staggered" position is set by aligning the forward tip of Lead's horizontal stabilizer over the yellow Canopy Fracturing System (CFS) door, while maintaining no closer than 1 ship length from Lead. Wing will mirror Lead's distance from centerline, which is ideal for Foreign Object Damage (FOD) prevention.

If there is not enough space for a staggered taxi, Wing will utilize the Trail taxi position. Trail is set by Wing taxiing directly behind Lead's aircraft, while maintaining no closer than 1 ship length from Lead. Wing will taxi with enough spacing to avoid a collision in the event of a brake failure.

Lead shall position himself in the run-up area with sufficient spacing to allow for hand signals and visual inspection for both aircraft. Wing should park abeam Lead, with nose wheel centered. **DO NOT OVERLAP** wings.

Each aircraft will individually complete the Overspeed Governor and Before Takeoff Checklists.

When checklists and integrity checks are complete, the Wingman will initiate a “thumbs-up” to the Lead aircraft. Hold this hand signal until receiving a thumbs-up from Lead. This signifies all checklists have been completed satisfactorily and that the other aircraft appears normal. If any of the inspection items are not correct, a “thumbs-down” shall be given to that aircraft, followed by an appropriate hand signal or radio transmission to identify the problem. (See Appendix B for appropriate Visual Signals). This sequence will be continued until both aircraft initiate a thumb’s up.

INTEGRITY CHECK

1. **C**owlings secure
2. **P**anels secure
3. **P**roper strut Extension
4. **T**ire inflation
5. **F**lap position (TO flaps)
6. **A**ntennas secure
7. **N**o visible leaks
8. **L**ights set

Lead will conduct radio changes IAW SOP, then taxi to the hold-short line of the active runway. Conduct required checklist at the hold short line if not already completed in the run-up. Lead will check Wing in on the tower frequency and then call for takeoff for the flight.

CHAPTER THREE
DEPARTURES

300. LINE-UP

Once the section has been given clearance for takeoff, Lead will note the winds from ATIS, tower, and the wind sock and position himself on the appropriate side of the runway.

NOTE

The most time accurate winds come from looking at the wind sock.

Conduct the Line-up Checklist while crossing the hold short line. Each aircraft will take the center of their respective side of the runway. Lead will place his aircraft on the downwind side of the runway, which allows Lead's wake turbulence and propeller wash to blow away from Wing during the takeoff roll. If the winds are reported calm, Lead may take either side of the runway based on departure heading, sun angle, etc. Lead will allow enough room for Wing to turn and taxi forward for alignment. Once Wing is certain which side Lead is taking, Wing will taxi to the center of his side of the runway and move forward until the leading edge of his wing is in line with the trailing edge of Lead's horizontal stabilizer.

WARNING

Wake turbulence or Lead aircraft propeller wash may result in severe degradation of trailing aircraft controllability during takeoff.

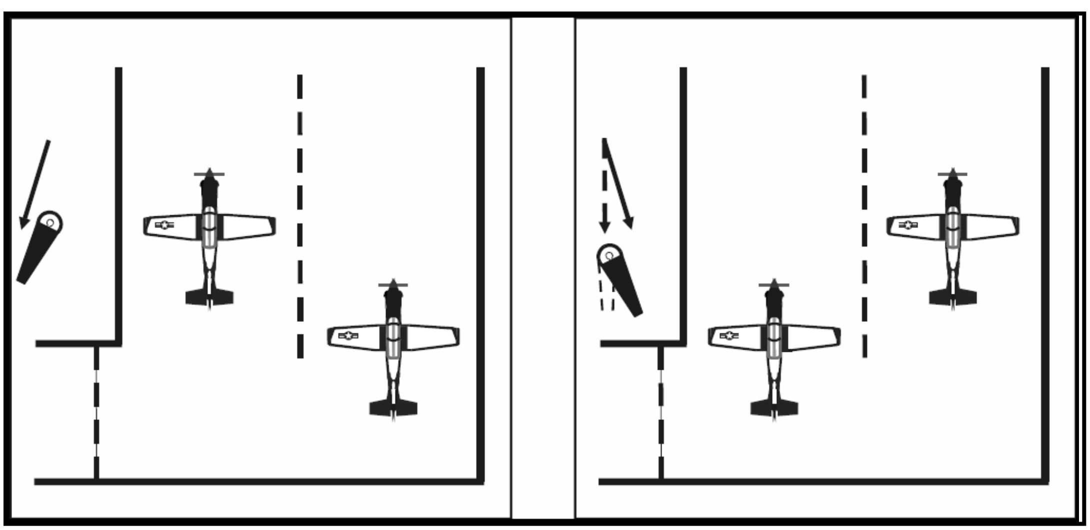

Figure 3-1 Runway Positioning for Takeoff

301. INTERVAL TAKEOFF

Once the section is in position (Figure 3-2) and cleared for takeoff, Lead will pass the run-up signal. Wing will acknowledge with a head nod. Both aircraft will set 30% torque and check for safety of flight items and proper instrument indications (essentially the same checks required for an individual takeoff). When Wing is ready for takeoff, he will do a quick visual inspection of Lead's aircraft, and if he looks good, pass a thumbs-up. Wing must hold this signal until Lead acknowledges. Lead will return the thumbs-up (or thumbs-down as appropriate), look forward, pass the "kiss-off" signal and proceed with a maximum (MAX) power takeoff while maintaining his side of the runway. When the Lead starts his takeoff roll, the Wingman will check his clock and begin his takeoff roll five seconds later, allowing for approximately 1000' separation between aircraft. Make a normal takeoff and climb out.

Figure 3-2 Run-Up and Takeoff

302. INTERVAL ABORT

Many aviators have found themselves in the dirt by second guessing their decision to abort or continue. Make a decision and stick with it! Every abort situation cannot be addressed, but it is critical that abort contingencies be part of the pre-flight brief. When an abort is necessary, simultaneously initiate abort procedures (IAW NATOPS) and transmit intentions. Remember to aviate (maintain control of the aircraft), navigate (remain on your side of the runway tracking down the runway), then communicate (wingman, tower).

If Lead aborts, he shall remain on his side of the runway; Wing will abort behind Lead. Wing's five second interval should allow sufficient spacing to abort behind Lead.

If Wing aborts, he will execute abort procedures (IAW NATOPS), remain on his side of the runway, and once Lead is safely airborne (and Wing's aircraft is safely under control), transmit the abort over the radio.

303. RUNNING RENDEZVOUS

The running rendezvous is used to join a flight while proceeding on course. The running rendezvous is primarily a "power rendezvous," but the Wingman should exploit any turns by Lead using radius of turn advantage (pursuit curves). Each aircraft must comply with prescribed course rules and departure procedures.

Lead: Once safely airborne, perform the After Takeoff Checklist (Gear/ Flaps retracted), turn on course (comply with local course rules for departure), set 80% torque, and maintain 160 KIAS to effect the join. This will translate to approximately 8-10° nose up on the PFD. If a turn is required prior to Wing joining, it will be made at no more than 30º AOB unless directed otherwise. If level-off occurs prior to Wing joining, maintain 160 KIAS. Once Wing is in a stable parade position, Lead may place Wing in the cruise position. Lead will then smoothly set 90% torque and continue the climb out at 160-180 KIAS.

Wing: Once safely airborne, perform the After Takeoff Checklist (Gear/ Flaps retracted), turn on course (comply with local course rules for departure), and adjust angle of bank as necessary to establish the aircraft inside of Lead's turn. Maintain Lead slightly above the horizon while allowing the aircraft to accelerate. Remain on the inside of the turn to assist in closing on Lead. When Lead rolls wings level, there will no longer be the closing advantage provided by radius of turn, so the join-up will now primarily be a function of airspeed differential.

Once Lead has rolled out, Wing will maintain the side he is established on and continue with the rendezvous. An important aspect in a running rendezvous for the Wingman will be setting the appropriate distance abeam with proper step-down. Abeam distance is critical because visual closure cueing is derived from the Lead's aircraft tracking aft on the Wingman's canopy. Closure is most difficult to perceive when approaching from directly behind and may constitute a safety flight hazard if excess closure is developed and not recognized. Concentrate on flying the aircraft on a straight line/heading that projects forward to a point abeam Lead. The proper abeam distance will normally be just outside the HUD combiner glass. Placing Lead just above the horizon will give the appropriate step-down.

Use power to control the closure rate. Any power decrease during a climb will have a greater effect when compared to a level rendezvous. Conversely, any power increase in a climb will have a smaller effect on closure when compared to a level rendezvous. As Wing approaches the bearing line, Lead will appear to track aft with an increasing rate across the canopy. The Wingman should continue to track on a parallel course to the targeted 45° bearing line while maintaining a minimum of 20' of step-down, with closure under control. Strive to make the rendezvous one fluid maneuver. Stopping and starting only delays the rendezvous and increases fuel consumption. Closure rate should be no faster than 10 knots per aircraft length away from Lead, not to exceed 200 KIAS. Once stabilized on the 45° bearing line with 20' of step-down, the Wingman will use coordinated power and control inputs to move into the parade position to complete the maneuver. Initially, closure during the join will be noticed by Lead's aircraft getting bigger in the windscreen with little LOS rate.

Running Rendezvous Common Errors:

Lead

1. Allows airspeed to wander, setting Wing up for an underrun or delaying the rejoin.

2. Loses track of the course rules/departure and does not comply with altitudes and headings (excessive Wingman consideration).

3. Erratic or abrupt level offs and roll rates (lack of Wingman consideration).

Wing

1. Fails to trim for increasing airspeed.

2. Exceeds recommended closure speed.

3. Misjudges relative motion and closure causing stagnation or an underrun.

4. Misjudges relative motion during the underrun resulting in excessive lateral separation.

5. Not maintaining sufficient lateral separation throughout the rendezvous.

Running Rendezvous Keys to Success:

Lead

1. Be a stable platform while complying with course rules departure.

Wing

1. Use proper takeoff interval.

2. Avoid excessive closure rates.

3. Maintain proper step-down at all times.

4. If uncomfortable with the closure rate, execute the underrun procedures.

5. Trim for the increasing airspeed and re-trim after stabilizing in position.

3-4 DEPARTURES

304. RENDEZVOUS UNDERRUN

The underrun procedure is a procedure that allows Wing to get out of an unsafe situation during the rendezvous phase, stabilize clear of Lead, and then safely rejoin. Wing should always approach the rendezvous with a conservative mindset. Wing will initiate an underrun when any of the following situations occur:

1. Excessive closure rate.
2. Anticipating going acute.
3. Lateral separation with proper step-down cannot be maintained.
4. Anytime Wing feels uncomfortable.

The underrun procedure shall be executed as follows:

Lead is wings level:

1. **LOWER** the nose to maintain step-down.
2. Reduce power to **IDLE** (speed brake as required) to avoid passing ahead of Lead.
3. Move further to port/starboard away from Lead to increase **LATERAL** separation.
4. When able, call underrun (*"Angry Two, underrun")*.
5. Rejoin in parade position.

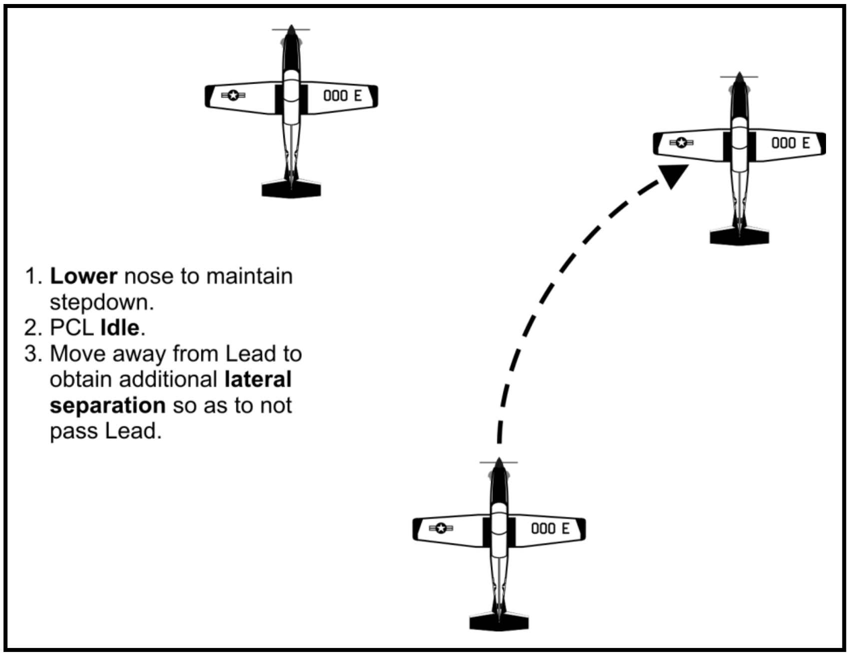

Figure 3-3 Rendezvous Underrun

Lead is in a turn:

1. **LOWER** the nose to obtain step-down.

2. **LEVEL** the wings and move to a position outside the Lead's radius of turn.

3. Reduce power to **IDLE** (as required) to avoid passing ahead of Lead.

4. **SPEED BRAKE** extend (as required).

5. Pass below, behind, and outside Lead's radius of turn.

6. When able, call underrun (*"Angry Two, underrun"*).

7. Rejoin to parade position.

After performing the underrun procedure, with de-confliction established (passing safely beneath, aft, and outside of Lead's radius of turn), expeditiously begin to match Lead's angle of bank, power up, and retract the speed brake (if extended). Avoid getting too long in trail or too far outside Lead's radius of turn. Wing will call underrun when able. Lead is not required to acknowledge this call, but will monitor the underrun and be proactive to ensure safe separation is maintained.

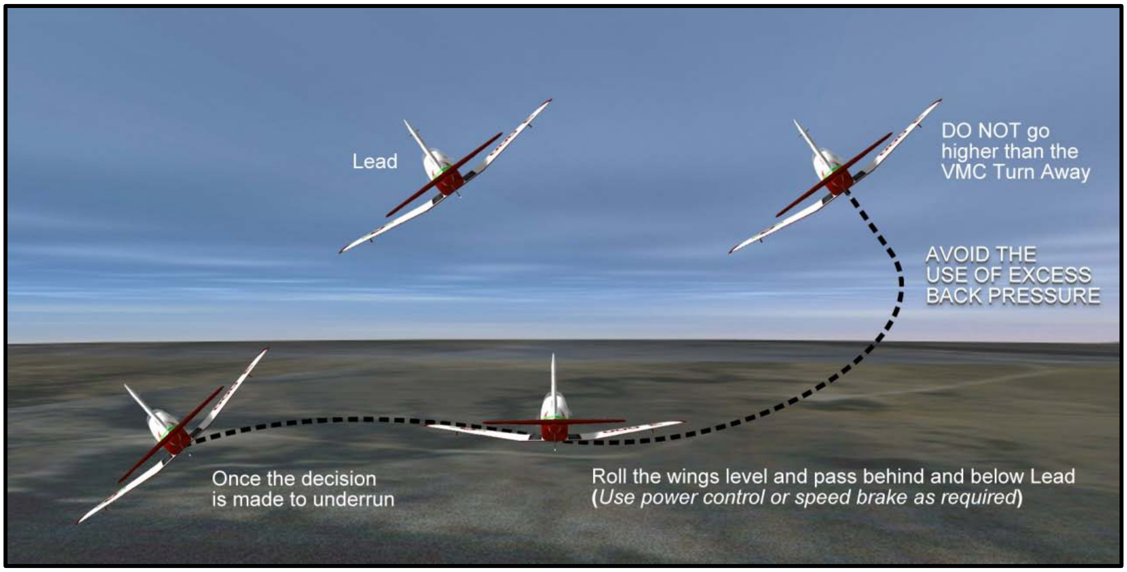

Figure 3-4 Underrun – Lead is in a turn

During the underrun, Wing moves to a stable position by matching Lead's angle of bank and airspeed, with closure under control, while keeping Lead on or above the horizon. Once stable, Wing will execute the join up using airspeed differential to a VFR turn away position, remaining outside of Lead's radius of turn. The Instructor Pilot (IP) may request "*back in*" to return to the inside of Lead's turn to attempt the join-up phase again, if desired.

Example

WING (when able): *"Angry Two, underrun."*

WING: *"Angry Two, request back in"* (only if IP directed).

LEAD: *"Angry Two, cleared back-in."*

Underrun Common Errors:

Wing

1. Fails to initiate underrun soon enough, forcing excessive negative "Gs" or IP intervention.

2. Fails to maintain appropriate step-down during the underrun maneuver.

3. Misjudges relative motion during the underrun, resulting in excessive separation.

Underrun Keys to Success:

1. Recognize an unsafe/unsalvageable situation early.

2. Taking a conservative approach and not pressing a bad situation.

305. SECTION TAKEOFF

The section takeoff has many practical advantages. It is frequently used to expedite departures and alleviates the necessity for a rendezvous in poor weather conditions. Wing will fly formation from brake release to rotation and into the airborne phase.

Restrictions. The following conditions will be met to accomplish a section takeoff:

1. The maximum crosswind component is 10 knots for a dry runway and 5 knots for a wet runway.

2. The flight must have non-precision circling minimums or 1000’ and 3 (basic VFR) if a non-precision approach is not available.

3. No standing water on the runway.

4. Minimum runway width is 150’.

Once cleared onto the runway, each aircraft will complete their Line-up Checklist individually and maneuver to the center of their respective side of the runway.

Lead will position himself on the downwind side of the runway. If winds are calm or straight down the runway, position the Wingman on either side. If IMC conditions are expected and winds are not a factor, it may be desirable to place the Wingman on the outside of the turn.

Once in position, Lead will give the run-up signal and set 30% torque. When the run-up and integrity checks are complete and a thumbs-up is received from Wing, Lead will acknowledge with a thumbs up, straighten his hand with the arm vertical, then drop his arm smoothly in a chopping motion until his arm is parallel to the canopy rail. After the hand reaches the canopy rail, Lead will release the brakes and smoothly set 90% torque (approximately 5 seconds). When Lead’s arm reaches the canopy rail, Wing will release brakes and smoothly add power. Wing will maintain the takeoff bearing with Power Control Lever (PCL) adjustments, and small rudder inputs. If Wing goes acute immediately after brake release, he may lightly tap the brakes one time to maintain position; do not “ride” the brakes during the section takeoff roll.

As the flight approaches 75-80 KIAS, Lead will smoothly rotate to the takeoff attitude. Lead’s goal is to allow 3-4 seconds for complete nose strut extension. This slow rotation rate will allow Wing to observe nose strut extension and match Lead’s rate of rotation. The Wingman should attempt to match Lead’s attitude. As both aircraft reach flying speed, they will become airborne at the same time.

CAUTION

Any time Wing passes the Lead aircraft during the takeoff roll, continue with individual takeoffs on respective sides of the runway. Once safely airborne, Wing will take lateral separation away from Lead, match Lead's configuration, then rejoin.

NOTE

Early detection and correction for changes in relative motion are the keys to performing a good section takeoff.

When safely airborne, Lead will survey Wing to ensure the flight is climbing away from the ground and Wing is in a position to see the gear retraction signal. The Lead pilot will distinctly nod his head forward and then sharply back as a signal to raise the landing gear and flaps (110 KIAS minimum); both pilots will then raise the gear and flaps simultaneously. Wing will maintain a stack level attitude until after gear and flap retraction, then step-down to the appropriate parade checkpoints. The Wingman will pass the "thumbs-up" signal or a head nod to inform Lead that landing gear and flaps are up and locked and Lead's gear and flaps appear up and locked. Lead will return the thumbs-up, acknowledging the same. Students will continue to monitor position and instruments, paying particular attention to airspeed during this phase of flight.

Early lift-off by the Wingman creates a less than ideal situation due to:

1. Close proximity to the ground.

2. Wing's step-up on Lead.

3. Difficulty in keeping Lead in sight.

To keep Lead in sight, avoid abrupt corrections, gain or maintain lateral separation once safely airborne, and relax back stick pressure slightly to reduce the climb rate. As Lead climb's, Wing will match Lead's climb attitude, configuration, reestablish bearing line, and join in parade position. **Do not develop a rate of descent.**

Section Takeoff Common Errors:

1. Both pilots forgetting to accomplish the Line-up Checklist.

2. Lead putting Wing on the wrong side of the runway.

3. Lead forgetting brake release signal (Hand chop).

4. Early and abrupt rotation by Lead.

5. Wing allowing aircraft to fall too far aft.

6. Early rotation by Wing.

306. SECTION ABORT

If either aircraft aborts the takeoff after brake release, maintain lateral control of the aircraft and do not cross the centerline of the runway. The abort is easily recognizable because a rapid line of sight rate/large relative motion will develop between the aborting and non-aborting aircraft. The non-aborting aircraft will get immediate separation by checking MAX power, maintain his side of the runway, and execute an individual takeoff. For this reason, Wing must maintain wingtip clearance when lining up on the runway and throughout the takeoff. The aborting aircraft will execute the NATOPS abort procedure while initially maintaining his side of the runway. The aborting aircraft may take centerline only if positive separation and de-confliction are observed. As Wing, we do not want to execute a sympathetic abort which could result in a dual high-speed abort.

307. INSTRUMENT DEPARTURES

When weather or runway conditions preclude accomplishing a section takeoff, the flight has two options:

1. Lead aircraft will level off below IMC and adjust power to maintain 160 KIAS until the Wing has joined, then adjust power to approximately 90% torque, and start a 180 KIAS climb to VFR on top. It is imperative that Wing maintain section integrity by safely maintaining visual contact. If Wing loses sight of Lead, perform the Lost Sight procedure discussed in the Emergency Procedures section of this FTI.

2. Obtain separate takeoff clearances and coordinate a join-up point above the weather. The Flight Lead will check into the area and await the Wingman. When the Wingman checks in, Lead will be directive and descriptive as to where the rendezvous will take place. This will be done off of a radial/DME fix, FMS point, or VFR checkpoints (if available). Lead will call out the appropriate number at each checkpoint over the TAC frequency. Wing will have to visualize his current position relative to the number called out and acknowledge Lead’s call with *“Two”*. Under these conditions, the running rendezvous may be performed at altitude later in the flight.

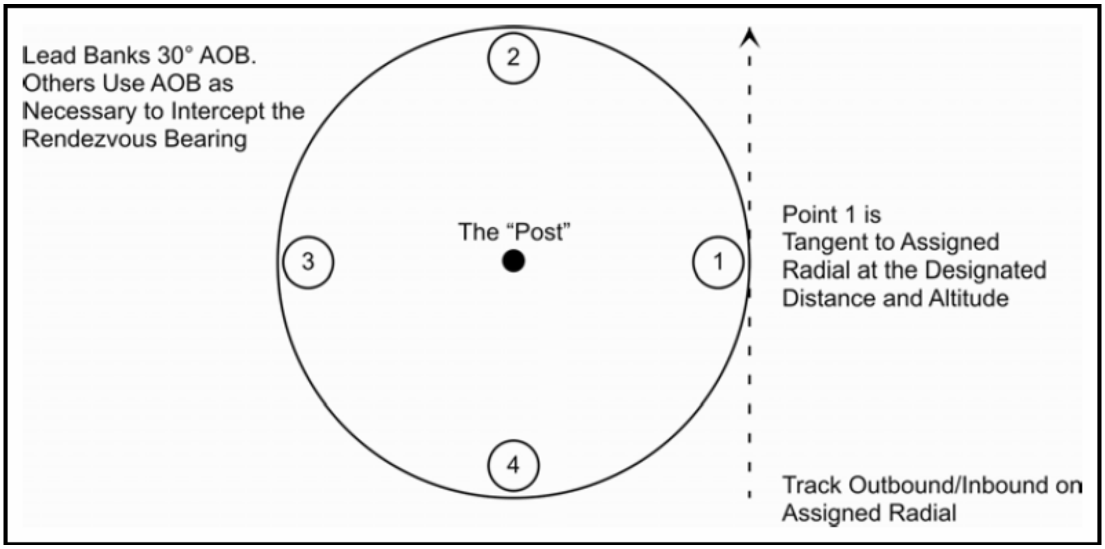

Figure 3-5 Radial Rendezvous

Lead will fly a left, 200 KIAS, 30° AOB turn at the designated altitude. Wing will maintain a minimum of 500’ of vertical separation until inside of Lead’s turn, on bearing, with closure under control. Once Wing is on bearing with closure under control, Lead will clear Wing to elevate to the designated altitude.

NOTE

Follow on communities may refer to this as a TACAN or CV Rendezvous.

308. CLIMB AND LEVEL-OFF

Once joined up and confident that IMC will not be a factor, Wing may be directed to cruise position for transit to the working area. Several factors should be considered when choosing a base altitude and course, to include: remaining in Visual Meteorological Conditions (VMC), airspace restrictions, and traffic avoidance. If on an IFR clearance, comply with all ATC departure instructions.

Climb and Level-Off Common Errors:

Lead

1. Lead being too abrupt with controls and power.

2. Excessive Wingman consideration. Lead allowing Wingman consideration to cause mistakes on the departure (headings, altitudes, radio calls, etc.).

3. Poor radio procedures. Lead forgetting to switch or check-in the Wingman.

Wing

1. Wing taking too long to get into position after takeoff.

2. Wing failing to recognize deviations from parade position, and therefore failing to make timely/appropriate corrections.

3. Wing over controlling the aircraft, causing an unstable parade position.

4. Wing missing radio changes or radio check-ins.

309. FENCE CHECKS

A FENCE Check is required prior to beginning the area profile, and prior to departing the working area. Tactically, a FENCE Check is performed when entering or exiting a hostile area, and is used to ensure aircraft systems are set for combat. In the T-6B, *"FENCE-in"* will be called to initiate the Pre-Stalling, Spinning, And Aerobatic Checklist, and the Operations (OPS) Check. *"FENCE-out"* will be called to initiate the Descent Checklist and Operations Check.

NOTE

The letters in FENCE represent: **F**uel, **E**xpendables, **N**avigation, **C**ommunication equipment and **E**lectronic counter measures.

An Operations Check is initiated by Lead stating *"(TAC call sign), OPS Check,"* and will be conducted IAW NATOPS (with the addition of checking G's). Wing will acknowledge the call, and when complete with his Operations Check, will respond with maximum indicated G's, and current fuel state. Lead will then respond with his G's and fuel. The Three mandatory OPS Checks are:

1. Prior to beginning the area profile (FENCE-in).

2. After the lead change (OPS Check by visual signal or radio call).

3. Prior to departing the area (FENCE-out).

Additional OPS Checks may be accomplished during the sortie as needed. *"Good G"* will be used for G less than 2 (if greater than 2 G, call out indicated G) and fuel will be called, rounded down to the nearest 10 lbs.

Example

LEAD: *"Angry, FENCE-in/out"* or *"Angry, OPS Check."*

WING: *"Two."*

WING: *"Angry Two, good G, 870."*

LEAD: *"Angry One, good G, 860."*

As Wing, accomplish the check one item at a time, checking the position of Lead between each item. Prioritize tasks. Fly formation first, and accomplish checklist items as workload permits. During turns, fly the aircraft and resume the check after the turn is complete.

After the FENCE-in Check, if Wing is in a cruise position, he will be directed back to a parade position by Lead prior to executing the parade sequence. Wing may only rejoin when directed by Lead via a porpoise, radio call, or pat aboard.

Example

LEAD: *"Angry Two, cleared aboard."*

WING: *"Two."*

After leveling-off, Lead will establish a base airspeed of 200 KIAS. This will be the base airspeed for the flight unless otherwise briefed.

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CHAPTER FOUR
SECTION PARADE

400. INTRODUCTION

Some examples of when parade flight might be used are overhead patterns (break), instrument approaches in IMC, flight in congested areas, and exhibition flights.

Parade formation advantages:

1. Provides good visibility between aircraft (i.e., communications and poor weather).

2. Presents a professional military appearance.

Parade formation disadvantages:

1. Formation is less maneuverable than a single aircraft or cruise/tactical formation.

2. Wingman must constantly adjust power, resulting in fatigue and higher fuel consumption.

3. Restricts the Wingman’s lookout doctrine for mutual support.

401. THE PARADE SEQUENCE

Once the section is established in the area and FENCE Checks are complete, begin the parade sequence. The parade sequence is a series of tasks which allow both students the opportunity to practice flying basic formation positions and maneuvers. The following sequence is the suggested parade sequence of events, but may be modified based on mission requirements:

1. (4) Parade Turns with a minimum of 180º per turn

2. Crossunder

3. (4) Parade Turns with a minimum of 180º per turn

4. Crossunder

5. Breakup and Rendezvous Exercise

6. Cruise Maneuvering

7. Tail Chase

8. Lead Change

9. Repeat Sequence

402. PARADE POSITION

Parade position is the basis for all maneuvers in this chapter. It is a fixed position on the left/right 45º bearing from Lead with sufficient wingtip clearance and step-down utilizing the checkpoints described below. To maintain parade position, Wing must remain relaxed and scan the Lead's entire aircraft. By keeping the aircraft trimmed, Wing need only apply slight stick pressures to maintain position. Anticipate and make corrections immediately to minimize the magnitude of errors. The perfect parade position is transitory, and every correction has a corresponding re-correction to ensure **A**ltitude (step-down), **B**earing line, and **C**loseness **(**the **A-B-C**s**)** are correct.

Figure 4-1 Parade Position

Parade Checkpoints:

1. The 45° bearing line is recognized by placing the exhaust stack below and tangent to the leading edge of the wing at the midpoint, with the lower UHF antenna over the inboard aileron cutout on the opposite wing, and the edge of the prop arc on the pitot tube. Bearing line corrections can be made with both aileron (lateral) and power (forward/aft). The result is that the Wingman should attempt to allow all relative motion to occur diagonally along a bearing line relative to the Lead.

2. Proper step-down is achieved when Lead's inboard exhaust stack is fully visible and touching the bottom (tangent) wing. If there is excessive step-down, a space between the

exhaust stack and the wing will exist. Conversely, if there is excessive step-up, the stack will be either masked by the wing or will be visible above the wing. Step-down/up is corrected by forward/aft stick and a corresponding power correction to offset the decrease or increase in speed as needed.

Figure 4-2 Excessive Step-up

403. PARADE TURNS

Once the flight has arrived in the working area, and Wing is in parade position, Lead will take the Wingman through a series of parade turns. Parade turns are defined as 30-45º angel of bank (AOB) turns for a minimum of 180° heading change, which may be adjusted for area constraints or environment (i.e., sun angle, clouds, etc.).

Turns Away From the Wingman:

There are two parade positions for the Wingman on turns away from the Lead. The first is the **VMC** position, in which Wing will match the Lead's AOB and roll about his own longitudinal axis. The second is the **IMC** position, in which Wing rolls about the Lead's longitudinal axis and maintains the standard parade sight picture.

VMC: As Lead rolls into bank, Wing will match Lead's rate of roll, immediately add some power to avoid initially going sucked, and rotate about his own longitudinal axis. To help the transition from straight and level to the turn away picture, match Lead's roll rate while placing the underside of Lead's fuselage on the horizon. The CFS door will be tangent to the trailing edge of the wing on the respective side, and the lower UHF antenna will still be in line vertically with the inboard (opposite wing) aileron cutout. Bearing line shift may be recognized by Lead’s canopy masking the wing. Going acute will mask more of the rear cockpit, and going sucked will expose more of the front cockpit. Once the turn is established, Wing is now on a longer radius of turn than Lead, and requires a slight increase in power, aileron, and back stick to maintain position. To make corrections, use a combination of aileron and back stick pressure to maintain relative closeness, holding Lead's fuselage on the horizon. Power should be used to move forward or aft towards the bearing line. As Lead initiates the rollout, Wing must anticipate it and take out the corrections used to establish the turn away position. Wing will rollout, matching Lead’s roll rate, turning about Wing’s own longitudinal axis at a rate that allows him to maintain proper lateral spacing. Wing will reduce power as necessary for the decrease in radius of turn. Wing will make small corrections to reestablish position after the rollout is complete.

IMC: In contrast to VMC turns away, during IMC turns away the Wingman rotates about Lead's longitudinal axis, matching Lead's rate of roll, while maintaining the same parade position checkpoints. The IMC turn away initially requires more power than the VMC turns away and more aft stick because the Wingman's relative position is above Lead in addition to being outside Lead's radius of turn. If power is not added when entering the turn, Wing will go sucked. Conversely, when the Wingman rolls out of the IMC turn away, he will initially require a larger power reduction than the roll-out for the VMC turn away.

Figure 4-3 VMC Turn away from Wingman

Turns into Wing:

As Lead rolls into an angle of bank, Wing will roll about the Lead's longitudinal axis, match Lead’s angle of bank, lower the nose slightly while reducing power, matching Lead's roll rate, and maintaining the same parade check points. Once established, **maintain the same parade references as straight and level flight**. The difference between turns into Wing is that the Wingman is on a slightly shorter turn radius than Lead. If Wing is flying the same airspeed as Lead, but with a shorter turn radius, he is going to turn through space slightly faster than Lead and will tend to get ahead of the bearing line (acute). Wing must initially reduce power a small amount to maintain position, and then adjust power to hold position. When Lead rolls out, Wing will need to add a small amount of power while pulling the nose up slightly to maintain the parade checkpoints. This procedure is used for both IMC and VMC turns into.

Figure 4-4 Turn into Wingman

Turns Away From the Wingman Common Errors:

1. Same Lead common errors as during turns into Wingman.

2. Wing fails to match Lead's bank angle and maintain step-down.

3. Wing is slow to add power and gets sucked.

4. Wing fails to maintain relative closeness and drifts away from Lead.

5. Wing fails to reduce power on rollout sufficiently to prevent becoming acute.

6. Wing fails to pick up the parade references and rolls out with excessive step-down.

Turns into Wing Common Errors:

Lead

1. Fails to clear the area visually prior to commencing a turn.

2. Fails to maintain altitude and constant AOB in the turn.

3. Rolls into or out of turn abruptly or ratchet into or out of turn (i.e., stops roll at 10-20° AOB on the way to 30-45°).

4. Overshoots the rollout heading or exceeds parade rate of roll.

5. Ballooning during reversals.

Wing

1. Fails to rotate about Lead's longitudinal axis to maintain proper step-down.

2. Fails to reduce power slightly to take into account the shorter turn radius during turns into and becoming acute.

3. Fails to add sufficient power upon roll out to prevent becoming sucked.

404. CROSSUNDER

A formation must be flexible to achieve maximum maneuverability; therefore, the Lead must be able to change the position of the Wingman within the formation. The crossunder is a maneuver where the Wingman moves laterally from a parade position to the corresponding opposite side of Lead while maintaining proper step-down and nose-to-tail clearance. The “U” type crossunder is a three-step maneuver in which the Wingman will slide down and back, slide across to other side, then up and forward to the new parade position.

Lead: Lead will check the Wingman in position, clear the area, keep the formation clear of obstructions and ensure the maneuver can be completed within the area limits. The Lead will then give the crossunder signal, while maintaining a steady platform as Wing is executing the crossunder.

Wing: Wing will acknowledge the crossunder signal with a head-nod, and stabilize in the parade position prior to commencing the maneuver. Wing should cross under using straight lines. First down and aft, stabilize, straight across to the other side (keep Lead’s exhaust stacks in sight and tangent to the forward wing line while crossing under), stabilize, then move forward and up into parade position. Throughout the crossunder, keep relative motion slow and controlled.

1. Observe the signal Lead passes and acknowledge with a quick head-nod.

2. Stabilize in the parade position.

3. Increase step-down by adjusting stick and power to slowly drift aft and achieve nose to tail separation by placing the UHF antenna over the wing dihedral bend (a.k.a. the straight edge).

4. Once stabilized with proper step-down and nose to tail separation, make a slight wing dip towards Lead and observe him tracking slowly (rate should be no faster than a walking pace) to the other side while keeping the exhaust stacks tangent to the forward wing line.

5. A slight power increase will be required due to heading differential. Adjust power as necessary to move straight across to the other side.

NOTE

At no time should Wing's nose be under any part of Lead's aircraft.

6. Arrest lateral motion with a slight wing dip toward Lead approaching the opposite bearing line, then stabilize.

7. Use slight back stick pressure while adding power as required, move the aircraft up and forward into the parade position on the new side of Lead. Re-establish the parade references.

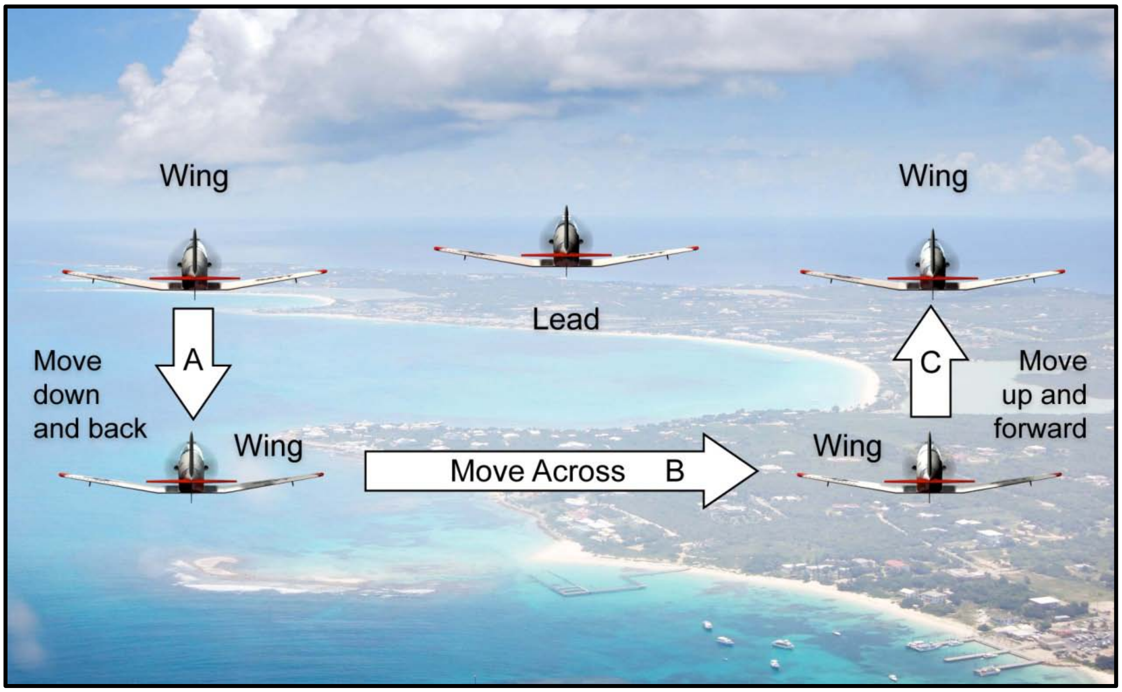

Figure 4-5 Crossunder

Crossunder Common Errors:

Lead

1. Fails to maintain a steady platform due to poor basic aircraft control.

Wing

1. Fails to stabilize momentarily in each position prior to moving on to the next position.

2. Fails to adjust power, allowing aircraft to drift aft or under Lead.

3. Uses excessive bank angle during crossunder, causing excessive crossing rate.

4. Fails to maintain proper step-down during crossunder maneuver.

5. Stopping cross early, before checkpoints are achieved on the opposite side.

405. 180 DEGREE BREAKUP AND RENDEZVOUS

The breakup and rendezvous (B&R) is used to practice a co-altitude, co-airspeed re-join. The breakup establishes the interval for the rendezvous. The Rendezvous is an exercise using pursuit curves to maintain a desired bearing line to affect a rendezvous, when an airspeed advantage is not present.

Lead: Prior to initiating the maneuver, Lead must ensure the maneuver can be accomplished from the present heading. Lead should turn a minimum of 180° during the breakup turn, but may require more or less based on weather or area constraints. B&R's may be initiated with Wing on either the left or right side. Lead is responsible for maintaining situational awareness on Wing's position and ensuring break turns are performed away from Wing.

Lead will:

1. Ensure proper flight parameters are set.

2. Check that Wingman is in position.

3. Check the break direction is clear.

4. Give the Breakup and Rendezvous signal.

5. Ensure the Wingman acknowledges the signal.

6. Give the Kiss Off signal and break away from Wing.

Lead will perform a level break away from Wing for a minimum of 180° using MAX power and Gs to maintain 200 KIAS. After rollout, Lead will wait for Wing's call, *"(TAC call sign) Two, ready,"* signifying that Wing is established in trail and ready to begin the rendezvous. Lead will then perform a 45º AOB "wing flash" in the desired direction of turn, then establish a 30º AOB turn on altitude at 200 KIAS. Lead will continue to clear the area and monitor Wing for a safe rendezvous. Once Wing is stabilized in a VMC parade turn away, Lead will roll out and repeat the sequence (as needed).

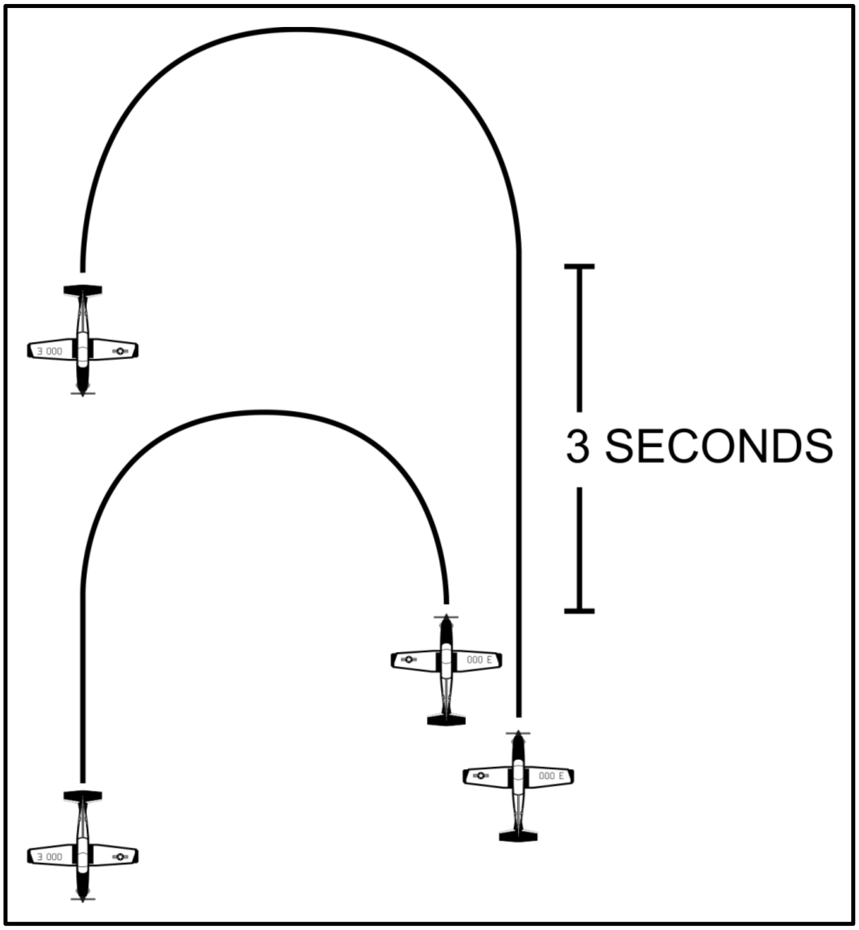

Figure 4-6 Break-up

Wing: Wing will break with a 3 second interval using MAX power, keeping Lead on the horizon, and using pursuit curve principles to maintain 800-1000' in trail. Usually, Wing will maintain Lead at their 11 o'clock or 1 o'clock position during the breakup turn. Once Lead is established straight and level, Wing will expeditiously orient in trail (with a slight step-up to avoid prop wash), stabilize at 200 KIAS, then call *"(TAC call sign) Two, ready"*. When Lead gives a *"wing flash"* and moves slightly outside the HUD combiner glass, maneuver to the inside of Lead's radius of turn (lead pursuit) using 30-45º AOB, placing Lead on the horizon. Maintain this turn until the top of Lead's vertical stabilizer bisects the midpoint of the opposite wing (this is the visual reference for the 60º bearing line). Wing should anticipate intercepting the 60º bearing line by reducing his AOB slightly prior to reaching the bearing line to avoid going acute. When Wing arrives on the 60º bearing line, match Lead's AOB and align fuselages. Maintain 200 KIAS throughout the rendezvous until the join-up phase.

Wing must now use the concepts of radius of turn and pursuit curves in relation to bearing line to affect closure and to complete the rendezvous. Wing should hold Lead on the horizon while making small changes in AOB to maneuver along the 60º bearing line. When Wing is within one to two wingspans of Lead, execute the join-up phase.

As Wing approaches Lead on the 60º bearing line, Wing will see more detail on Lead's opposite wing (rivets, aileron hinges, etc.). Wing needs to monitor closure, because as Wing approaches Lead, any corrections with angle of bank will take effect quickly. If Wing becomes "hung/stagnates" on the bearing line, and airspeed is 200 KIAS, add a small amount of power as necessary to regain closure.

The join-up phase of the rendezvous begins at the point where one to two T-6B wingspans will no longer fit between Wing and Lead. The join-up phase should be at a slow and controlled rate of motion (i.e., Wing should close at a walking pace and be able to stop and freeze the aircraft at any point). If closure is slightly fast (running pace), Wing may need to begin the join-up phase early (two wingspans out). Execute the join-up phase by simultaneously:

1. Lowering the nose to establish **step-down** (exhaust stack tangent to the leading edge of the near wing).

2. Adjust power to maintain **nose-to-tail separation** (Wing's nose should at no time be under Lead's aircraft).

3. Adjust angle of bank to **establish the aircraft directly behind Lead's aircraft.**

4. After stabilizing momentarily behind Lead's tail, move out and up to the VMC turn away position in one fluid movement by adjusting angle of bank to cross laterally beneath and behind Lead, and using pitch and power to move forward and up into position. Wing needs to ensure sufficient lateral separation from Lead is attained prior to moving forward and up into position.

Figure 4-7 60 DEG Bearing Line

ALTITUDE: Wing must hold Lead **on the horizon** throughout the rendezvous. If Lead's aircraft is **below** the horizon, Wing is high and should descend to put Lead on the horizon. If Lead's aircraft is **above** the horizon (a large amount of sky between Lead's aircraft and the horizon), Wing is low and should climb to put Lead on the horizon. Remember that increases or decreases in attitude will affect airspeed, and thus affect position relative to the bearing line. When approaching the join-up phase, the tip of the vertical stabilizer will appear to move up toward the wingtip. Correct altitude is still maintained by keeping Lead on the horizon.

BEARING: Hold the top of Lead's vertical stabilizer at the midpoint of Lead's opposite wing. If Wing is ahead of the bearing line or "acute," there will be space between Lead's wingtip and vertical stabilizer. Being "acute" is caused by Wing having too much AOB and will result in excessive closure. In this case, Wing should correct back to the 60º bearing line by **decreasing** bank angle. Be aware that this will result in a temporary increase in closure until fuselages are aligned. If excessively acute or acute in close, this closure may result in unsafe separation between Lead and Wing, requiring an underrun. If Wing is behind the bearing line or "sucked," Lead's vertical stabilizer will be inboard of the midpoint. Being "sucked" is caused by Wing holding too shallow of an AOB and will result in insufficient closure. In this case, Wing should correct back to the 60º bearing line by **increasing** bank angle. A good rule of thumb for corrections is the "STICK TO STAB" method. For example, in a left hand orbit, if the vertical stabilizer moves to the right of the midpoint, the stick goes right to correct back to the desired bearing line. Conversely, if the vertical stabilizer moves left of the bearing line (sucked), the stick goes left to correct. For a right hand orbit, the opposite is true.

CLOSURE: Wing will ensure 200 KIAS is expeditiously set prior to the wing flash from Lead. After the wing flash, Wing will concentrate on maintaining the 60º bearing line and a safe closure rate relative to Lead's aircraft. Wing will maintain 200 KIAS until:

1. The join-up phase begins.

2. An underrun is required.

3. Hung/stuck/stagnating on the bearing line as a result of airspeed.

NOTE

If an underrun is needed, execute the procedure IAW section 304 (Rendezvous Underrun).

Figure 4-8 Sucked Position (Left Orbit)

Figure 4-9 Acute Position (Left Orbit)

Breakup and Rendezvous Common Errors:

Lead

1. Fails to monitor Wing during the rendezvous.

2. Fails to clear for the formation during the breakup and rendezvous.

3. Fails to maintain airspeed, bank angle, and altitude during the rendezvous.

Wing

1. Fails to maintain airspeed.

2. Fails to hold Lead on the horizon during the rendezvous.

3. Flies through bearing lines and becomes acute.

4. Confuses the proper bank angle corrections.

5. Uses large corrections to the bearing line and never stabilizes.

6. Fails to anticipate corrections and overshoots the bearing lines without stabilizing.

7. **ACCEPTS AN UNSAFE SITUATION AND DOES NOT INITIATE AN UNDERRUN!**

406. CRUISE FORMATION

Cruise is a fluid position that can be flown on either side of Lead without directed crossunders and allows Lead maximum flexibility to maneuver the section as required. It is commonly used during enroute formation and provides maneuverability. The cruise formation position reduces Wingman workload, provides better lookout capabilities, and is more fuel efficient for the Wingman. When used as an administrative position (enroute phase), Wing can use power as well as pursuit curves to maintain position. Mild turns may only require a power change with no associated pursuit curve change to maintain position. When conducting cruise maneuvering as part of the parade profile, Wing will maintain cruise position by using pursuit curves (lead, lag, and pure) and lift vector placement at a constant power setting.

Cruise Position: The cruise position is defined as a 60° cone (Figure 4-11) between Lead’s left and right 60º bearing lines, with approximately 20’ of step-down and three to six plane widths between aircraft. Visual references for the cruise position when wings level are: the forward tip of the ventral fin over the inboard aileron cutout on the opposite wing, maintaining the exhaust stack below and tangent to the leading edge of the wing at the midpoint of the wing, and keeping the edge of the prop arc on the pitot tube (as in parade). The cruise position will be utilized to the maximum extent possible, based on the advantages listed above (i.e., enroute transit to and from the established working area, etc.).

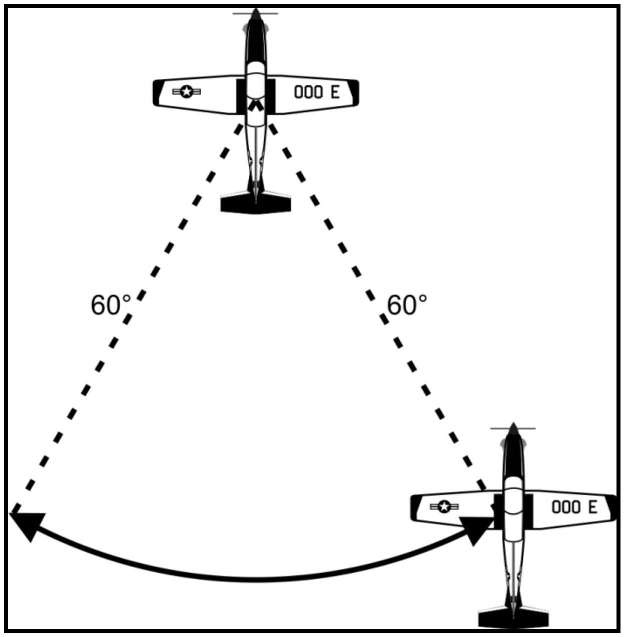

Figure 4-10 Cruise Position (60 Degree Cone)

407. CRUISE MANEUVERING

Cruise maneuvering will build on the two dimensional fundamentals learned while adding the challenge of maneuvering in the vertical plane as well. During VMC parade turns into and away, Wing was limited to one side or the other from Lead while conducting level turns. Power was either increased (parade turn away) or decreased (parade turn into) to prevent Wing from going sucked or acute relative to Lead’s 45° bearing line. In contrast, cruise maneuvering will use a fixed power setting, but Wing will now have the ability to change sides as required, using radius of turn principles (lead, lag, or pure pursuits) to maintain the 60° cruise bearing line. During dynamic maneuvering, the cruise position references may not always be visible. To ensure sufficient step-down during dynamic maneuvering, Wing should attempt to keep Lead in the top half of the windscreen while maneuvering.

In cruise maneuvering, Lead is restricted to no more than 120° AOB and no less than 1G. Wing will need to maneuver within the cruise cone to maintain proper cruise spacing, but should strive to work toward the 60º bearing line (Lead’s 5 or 7 o’clock position). Nose-to-tail is primarily maintained by varying radius of turn through the use of pursuit curves. If Wing uses lead pursuit (by putting his nose in front of Lead’s aircraft), nose-to-tail separation will decrease, since Wing is moving to a turn circle with a smaller radius than Lead’s turn circle. Conversely, if Wing uses lag pursuit (by putting his nose behind Lead’s aircraft), nose-to-tail separation will increase since Wing is moving to a turn circle with a larger radius. Pure pursuit can be recognized by zero LOS or movement of Lead across Wing's windscreen. Corrections to fix separation are temporary, in that a "bid" to lead or lag is rarely held for more than a couple seconds before the desired spacing is achieved.

NOTE

Cruise maneuvering wingovers are different than Contact FTI wingovers, in that Lead must maintain positive G throughout the maneuver to give wing sufficient G authority to maneuver in the cone. Do not "float" the turn in an attempt to roll out on an exact heading or altitude.

Parade to Cruise

Lead

1. Pass the cruise signal with an alternating pointing thumb over each shoulder.

2. Once the signal is acknowledged, smoothly adjust power to 80% torque (above 10K), 70% torque (below 10K).

3. Maintain a stable platform until Wing is established in the cruise position.

4. Once Wing calls, *"(TAC call sign) Two, ready,"* Lead may begin maneuvering.

Wing

1. Acknowledge Lead's cruise signal with a head nod.

2. Use initial airspeed differential and small heading changes to slide to the 60º bearing line into the cruise position. This may require a small power reduction, coordinated with a small aileron input away from Lead.

3. Approaching the cruise position, reset power to 80% torque (above 10K), 70% torque (below 10K).

4. Call, *"(TAC call sign) Two, ready,"* to begin maneuvering.

NOTE

80% torque (above 10K), 70% torque (below 10K) will be set by both aircraft prior to beginning cruise maneuvering. Although torque will change with altitude, the PCL will not be adjusted from this initial setting.

LEVEL CRUISE TURN INTO WING

With power fixed in both aircraft, a turn into Wing will immediately shift the 60° bearing line aft, forcing Wing into an acute position. Wing's position coupled with Lead's rate of maneuver, will determine how aggressively Wing will have to correct to regain or maintain the bearing line. If Wing was already acute prior to Lead's turn, Wing will require a more aggressive lag towards Lead's 6 o'clock position. If sucked, Wing may not require any lag, but rather pure or even lead pursuit. Approaching the 60° bearing line, Wing must now overbank and increase G (as required) to align fuselages. If done correctly, Wing should be able to use minor lag maneuvers to maintain the same side with only minor corrections to the inside of the turn.

LEVEL CRUISE TURN AWAY FROM WING

Just the opposite is true with fixed power and a turn away. The bearing line on the side of Wing will shift forward, placing Wing into a varying sucked position. Wing's position at the time of the turn (already sucked, in position, acute), and Lead's bank angle and turn rate, will determine how much and how fast Wing will have to correct to regain or maintain the bearing line. If Wing is already sucked prior to Lead's turn, Wing will have to aggressively maneuver to the inside of the turn in a lead pursuit towards Lead's 12 o'clock position to close any distance. If acute, maintaining a lag position is warranted until the bearing line on the inside of Lead's turn catches up, at which time Wing will overbank to the inside of Lead's turn while increasing G (as required) to align fuselages.

VERTICAL TURNS/REVERSALS

If Wing is sucked during a nose high turning into/away maneuver, use pure/lead pursuit to the inside of Lead's turn. This, in addition to Lead's aircraft decelerating at a slightly faster rate than Wing, will cause the closure needed to regain the bearing line. Once the bearing line is achieved, increase AOB and G (as required) to align fuselages.

If Wing is acute during a nose high turning into/away maneuver, use lag pursuit until the proper distance is achieved, then overbank with G (as required) to the inside of Lead's turn and align fuselages.

During nose low maneuvers, realize that the aircraft with the first/greater nose low will accelerate faster and away from the other aircraft. As Wing, this could cause an uncomfortable acute position forcing an aggressive lag maneuver or a knock-it-off (KIO).

Cruise to Parade

Lead

1. Lead calls (or Wing requests), *"Terminate."*

2. Remain predictable, roll wings level as energy state permits, reset normal cruise airspeed, and attain a level flight attitude.

3. Signal Wing to move into parade by gently “porpoising” the aircraft. If a turning rejoin is desired, Lead will enter a 30° AOB turn in the desired direction and maintain a constant altitude at 200 KIAS.

4. Provide a stable platform while Wing returns to the parade position.

Wing

1. Observe Lead's roll out, and maintain the cruise position on the side presently established.

2. Note Lead's signal to move into the parade position (assume that if Lead is straight and level for any amount of time, he wants Wing to join).

3. For a running rendezvous, join to the parade position on the side presently established. If a turning rendezvous is directed, maneuver to a parade position on the inside of the turn using airspeed differential and radius of turn to affect the closure.

Common Errors:

Lead

1. Fails to give Wing enough time to stabilize in the cruise position before commencing maneuvers.

2. Fails to monitor Wing's position during the turns (visual lookout).

3. Rough airwork (ratcheting the wings).

4. Fails to maintain positive G (unloading).

Wing

1. Allows excessive separation to develop without establishing lead pursuit to fix spacing.

2. Slow use lag pursuit during turns into and gets acute.

3. Using PCL to maintain position with a power differential rather than pursuit curves.

4. Fails to maintain proper step-down.

Keys to Success:

1. After Wing is established in the cruise position, Lead may conduct the first turn into the Wingman to better enable him to firmly establish his position.

2. If Wing is out of position, Lead should give a turn into instead of a turn away.

3. Wing needs to anticipate turns and use lead, lag, or pure pursuit to maintain position inside of Lead's turn.

408. TAIL CHASE EXERCISE

Students will learn, through the IP's demonstration of lead, lag and pure pursuit, the basics of how flight paths relate to each other in dynamic maneuvering. Students will also gain an appreciation for proper body positioning and how this will aid them in keeping the Wingman in sight. In the tail chase portion of the parade sequence, the Lead may start his maneuvering with steep turns and reversals. It should include at least one fairly level turn to allow the Wingman to demonstrate lead, lag and pure pursuit in a relatively benign environment. Eventually, these will be followed by some wingovers and barrel rolls to increase situational awareness (SA) in a dynamic flight regime.

The **G "warm-up" (G-warm)** will be performed in conjunction with the breakup, prior to tail chase. Once Wing is in the parade position, Lead will give the signal for tail chase. The tail chase signal is the forefinger and thumb extended into a "cocked pistol" (Appendix B). Wing will acknowledge with a head nod, while maintaining a parade position. Lead slowly advances PCL toward MAX power, descends slightly (as needed), and accelerates to a minimum of 220 KIAS. At 220 KIAS, Lead will give the kiss-off signal and perform a MAX power break away, using 4-5G's for a minimum of 180° of turn. Wing will break with a 3 second interval, using MAX power and 4-5G's to arrive in position for tail chase. Then call, *"(TAC call sign) Two, ready."* During tail chase, Wing will strive to maintain 800-1000' in trail and offset to the 5 or 7 o'clock position from Lead. Wing will maintain position using lead, lag, and pure pursuit principles similar to cruise maneuvering outlined in section 407.

NOTE

MAX power (above 10K) or 90% torque (below 10K) will be set by both aircraft upon rollout from the G-warm. Although torque will change with altitude, the PCL will not be adjusted from this initial setting.

Tail Chase Maneuvering: The objective of tail chase is to demonstrate the effects of pursuit curves on nose-to-tail distance in more dynamic environment than cruise maneuvering. In the tail chase portion of the parade sequence, the Lead will start his maneuvering with steep turns and reversals. It should include at least one fairly level turn to allow the Wingman to demonstrate lead, lag and pure pursuit in a relatively benign environment. These will be followed by maneuvers such as wingovers, barrel-rolls, clover leafs, cuban eights, and loops. Throughout tail chase maneuvering, aircraft will avoid less than 1G, more than +5G's, and fly no slower than 120 KIAS. If deviations are outside these limits, they may lead to an unsafe situation, and a *"knock-it-off"* (KIO) may be required.

NOTE

Split-S and immelman will not be performed during tail chase.

After the *"terminate"* call, Lead will remain predictable, smoothly reduce power to maintain 200 KIAS, and turn as necessary to expedite the join. Lead will clear Wing aboard as stated below. If performing a running rendezvous, Wing will use airspeed differential to join in parade position on the right side, in anticipation of the Lead change. If performing a turning rendezvous, Wing will establish himself on the inside of Lead's radius of turn and conduct the rendezvous IAW Section 405 (Breakup & Rendezvous). Because this is an administrative rendezvous, Wing may use airspeed differential/power to affect the join, not to exceed 10 KIAS of overtake.

Example (rejoin communications)

LEAD: *"(TAC call sign) Two, cleared aboard."*

WING: *"Two."*

409. TERMINATE AND KNOCK-IT-OFF PROCEDURES

There are times during a formation flight when any member of the flight may see a need to terminate maneuvering. Depending on the urgency of the situation, the formation may utilize the words *"terminate"* or *"knock-it-off"* (KIO). Typically, *"terminate"* is used when the desired learning objectives have been met or to cease maneuvering for a non-safety related situation. Wing will request (or Lead will direct) a terminate IAW the example below. KIO is used when safety of flight is an issue, such as an emergency, traffic threat, or a crewmember has G-locked due to poor Anti-G Straining Maneuver (AGSM) execution. Either aircraft can initiate a KIO. When either of these calls are made, Lead will maneuver in a predictable manner to a safe flying attitude (typically recovering to straight-and-level flight or into a shallow AOB as required). Lead will then be directive with subsequent intentions. As with all communications in the aviation environment, it is critical to use the proper format when making these calls.

Example (Terminate initiated by Lead)

LEAD: *"Angry, terminate."*

LEAD: *"Angry One, terminate."*

WING: *"Angry Two, terminate."*

Example (Terminate initiated by Wing)

WING: *"Angry Two, request terminate."*

LEAD: *"Angry terminate, Angry One, terminate."*

WING: *"Angry Two, terminate."*

Example (KIO)

LEAD or WING: *"Angry, knock-it-off."*

LEAD: *"Angry One, knock-it-off."*

WING: *"Angry Two, knock-it-off."*

NOTE

The pilot calling the KIO should state the reason if able, such as range (minimum), area boundary, blind, traffic, etc. Lead may give a reference heading for the flight.

410. LEAD CHANGE PROCEDURE

The lead change is a maneuver designed to effect a safe and efficient change of the formation lead with the least possible degradation to flight integrity. The lead change must be executed smoothly, so there is a crisp, instantaneous exchange of Lead and Wing roles and responsibilities. If at any time there is confusion by either aircrew about who has the lead, utilize the radios to identify the Lead (use aircraft side numbers to identify the Lead aircraft).

A lead change may be executed when the Lead aircraft has radio or navigation equipment problems that hamper his ability to lead the flight in a safe and orderly manner. In the Training Command, the lead change is normally performed for practice. Prior to passing the lead change signal to the Wingman, the Lead will ensure that the flight is clear of other aircraft and weather, and that the flight will be able to remain in the operating area during the lead change. The Lead passes the lead change signal to the Wingman. If the Wingman accepts the lead, he passes the acceptance signal and assumes responsibility for the flight while maintaining airspeed, altitude, and the present heading. The new Wingman **must** keep his eyes on the new Lead. Flying wing from this position is challenging because Wing is looking over his shoulder. Do not let your head movement affect stick movement; rotate your head, not your upper body.

Lead Change Signal

1. Lead will establish the section in a location where the lead change has enough room to be executed and Wing has enough time to orient himself in the area.

2. Lead will check Wing in parade position on the right side (conduct a crossunder if necessary).

3. Lead will initiate the lead change signal by patting the right side of his helmet three times with his left hand while looking forward.

4. Following the three pats, Lead will pass the lead by simultaneously turning his head and pointing his left hand at Wing.

5. Wing will accept the lead by patting his helmet on the left side once, then he will simultaneously give a single chopping motion and look forward. If Wing shakes off the signal or does not acknowledge the signal, Lead will maintain the lead position and repeat the lead change signal.

Lead Change Procedure

1. Establish approximately 20' wingtip clearance by using a slight wing dip away from the new Lead.

2. Arrest lateral motion with a slight wing dip toward the new Lead.

3. Establish step-down by simultaneously lowering the nose and reducing power until the AOA probe is approximately on the orange and white paint separation.

4. Begin a smooth aft transition keeping the AOA probe on the orange and white until the pitot tube arrives at the orange and white line. Continue aft until the parade checkpoints align.

5. When stable on the 45° bearing line, drive up into a normal parade position.

NOTES

1. The new Lead will turn on the Transponder and TCAS after accepting the lead. After a lead change is completed and Wing is in a stable parade position, Wing will turn the transponder and TCAS to standby.

2. Lead changes will normally be conducted on the right; however, they may be performed on the left with the use of the radio.

CAUTION

There can be no confusion of who is the new Lead. If in doubt, clarify who has the lead on the radios.

Common Errors:

1. Lead does not initiate the Lead change in a good position in the area (i.e., with sufficient space in the area, pointing at a recognizable landmark).

2. Wing fails to get correct lateral separation from Lead (i.e., flies in front of Lead or gets excessively wide).

3. Wing misses lead change signal.

4. Wing slides aft prior to establishing step-down.

5. Wing slides aft too quickly (i.e., Wing reduces power too much).

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CHAPTER FIVE
SECTION RECOVERY

500. INTRODUCTION

Once training in the working area is complete, conduct the recovery phase. This will generally be a VMC recovery via local course rules for the break entry. Weather permitting, Lead should keep the formation in the cruise position to maximize lookout and maneuverability. Approaching the initial VFR entry point, Lead will direct Wing to the parade position with enough time to get stabilized prior to the break. Lead will then give Wing the appropriate visual signal (three second or fan break) and conduct the break with clearance from tower.

After landing, Lead will clear the hold-short line and allow enough space for Wing to clear the runway as well. Once clear of the hold-short, both aircraft will automatically switch to ground frequency. Lead will check Wing in and contact ground. The formation will taxi back to parking in accordance with local SOP/Course Rules.

501. RECOVERY OVERVIEW

Upon completion of training in the working area, the flight will be ready to initiate the recovery phase. This phase will consist of the following:

1. Fuel check

2. Radio channel changes to include ATIS

3. Descent

4. Request ATC for appropriate entry

5. Required checklist(s) and briefs

6. Break/Instrument approaches

NOTE

> It is acceptable and recommended for Lead to direct Wing to obtain ATIS, then pass the information to Lead on the TAC frequency when requested.

During the recovery phase, Lead may elect to use the speed brake to increase descent rates or decelerate the formation. The following procedures apply anytime lead desires to use the speed brake. The speed brake is a drag device, and is therefore less effective as the airspeed is reduced below slow cruise. If Wing is in parade position, it is imperative that lead maintains a stable platform and is clear about his intended use of the speed brake to preclude any closure issues between Lead and Wing. The following procedures apply:

Parade Extension (using visual signals)

LEAD: Passes speed brake hand signal IAW Appendix B.

WING: Acknowledge signal with a head nod, or IAW Appendix B.

LEAD: Simultaneously give a head nod and extend speed brake.

Parade Retraction (using visual signals)

LEAD: Passes speed brake hand signal IAW Appendix B.

WING: Acknowledge signal with a head nod, or IAW Appendix B.

LEAD: Simultaneously give a head nod and extend speed brake.

Parade Extension (using the radios)

LEAD: *"(TAC call sign), standby speed brake."*

LEAD: *"speed brake, now."*

Parade Retraction (using the radios)

LEAD: *"(TAC call sign), standby speed brake."*

LEAD: *"speed brake, now."*

Extending/retracting the speed brake will induce pitch changes which may need to be counteracted. No signals/communications are required when using the speed brake with Wing in the cruise position.

502. THE BREAK

There are two methods of executing the break: 1) three second break, 2) fan break.

Three (3) Second Break

This is the standard break. At the appropriate time, Lead will kiss the Wingman off and execute the break, just as it was executed in the Contact stage. After three seconds have elapsed, the Wing will break (Lead will be approximately abeam). With adequate separation, each aircraft will make its own *"180"* and *"full stop"* calls. The Wingman shall mimic the Lead's call. The flight will rejoin on deck after crossing the hold-short and taxi back as a flight.

Fan Break

The next method is a fan break, initiated at the appropriate time by Lead giving the "follow me" signal to Wing. After the signal is given, Lead will execute a smooth roll towards 45° AOB at a rate which the Wingman can match. The Lead will leave his power set through 90° of turn before pulling the PCL (idle-10%) and extending the speed brake. The Wingman will match Lead's roll rate but will pull the PCL (idle-10%) and extend the speed brake at the beginning of the maneuver to create separation. Again, with adequate separation, each aircraft will make its own *"180"* and *"full stop"* calls. The Wingman shall mimic the Lead's call. The flight will rejoin on deck after crossing the hold-short and taxi back as a flight.

503. SECTION APPROACHES

The Section approach is used to expedite the recovery or for mutual support during certain emergencies. The key to a good formation approach is for Lead to fly a smooth, accurate instrument or visual approach, and for Wing to be proactive about maintaining position and complying with signals.

Prior to conducting a section approach, there are many tasks that must be accomplished. Plan ahead, everything takes longer to accomplish in a formation. Consideration should be given to the approach, missed approach, and the procedures for separating the flight on final. In the event of a missed approach, unless specific instructions were given, execute the published procedure using normal hand signals.

The following should be carefully planned and accomplished prior to Final Approach Fix (FAF) or glide path intercept (not necessarily in this exact order):

1. Bring the Wingman into parade.

2. Slow the flight down.

3. Configure the flight.

Although these tasks appear simple at first glance, they may become task saturating when adding the appropriate visual signals and combining required Instrument Navigation (INAV) briefings and checklists. Study, planning, and practice (chair flying) will greatly improve performance in this phase of flight.

NOTES

1. All turns will be made using IMC parade position (i.e., keep the same checkpoints as straight-and-level parade). In IMC, it is imperative that the Wingman maintain section integrity by safely maintaining visual contact.

2. To fly a section approach, weather must be at or above circling minimums, or 1000/3, if no circling minimums are published.

3. Wing will always mirror Lead's configuration and be ready to assume the lead.

Usually, the flight will receive radar vectors to the final approach course. If VMC, configure at an appropriate time, but no later than the FAF. If operating VFR on top, Lead should give consideration to configuring the section prior to penetrating IMC. If in IMC conditions and not already configured, consider using the radios to call for the gear extension. Ideally, the flight should transition to BAC (gear down, flaps takeoff [TO]) no later than 30º prior to the final approach course or five miles from the FAF. Both crews will check for proper configuration (Gear down, flaps TO) and give a thumbs-up, head nod, or use the radios. Lead should then position the formation on extended runway centerline 1 to 3 miles from the runway. Lead should then fly a normal final (Figure 5-1) at 120 KIAS, and Wing will fly IMC parade position until Lead detaches Wing.

Figure 5-1 Instrument Approach Position

504. SIMULATED NORDO APPROACH

During a simulated section NORDO approach, Lead will fly a visual straight-in or instrument approach. Wing will be kissed off at 1 mile from the end of the runway during VMC, and prior to the Missed Approach Point (MAP) or Decision Height (DH) during simulated IMC.

At 1 mile, Lead will give the Wingman the land signal, point to the runway, and when acknowledged, kiss off Wing (this signifies he is cleared to land/detach). Lead will smartly take a cutaway to the appropriate side of the runway, maintain pattern altitude, and monitor Wing. Lead will remain in the gear down, TO flap configuration at Wing's 10/2 o'clock position until he sees Wing climbing away after the touch and go. At that point, lead will clean up the aircraft and slowly accelerate to 160 KIAS at pattern altitude.

Wing will perform a normal touch and go, clean up, and call *"(TAC call sign) Two, visual"* on TAC frequency. Lead will respond *"(TAC call sign) Two, cleared aboard,"* at which time Wing will perform a running rendezvous. Once Wing is aboard, Lead will execute the missed approach/climbout instructions. If lead starts a turn, Wing will use the inside of the turn to join.

505. TAKING SPACING ON FINAL

Straight-in Approach

Once Lead has the runway in sight, he should confirm that the Wingman is visual by pointing at the runway. Wing should confirm visual with the runway with a head nod. Lead should detach Wing as early as possible by giving the kiss off signal or transmitting, *"(TAC call sign) Two, detach."* Lead will fly a TO flap approach, and if required, may accelerate slightly to build spacing between aircraft (do not exceed 150 KIAS). After receiving the kiss off, Wing should reduce power, set landing flaps, and establish and maintain a minimum of 1500' of separation between aircraft. Wing should use airspeed differential (no slower than on-speed AOA, 10.5 units) and maneuvering geometry (small S turns) to obtain separation. Both aircraft must take extreme care to avoid a flap/gear overspeed during the final segment of the approach. Wing should wave-off if he does not have at least 1500' of spacing from Lead. Both aircraft will maintain runway centerline through the landing rollout.

Circling Approach

Once Lead has the runway environment in sight, he should confirm the Wingman is visual with the runway. Lead detaches Wing once he commences circling by giving the kiss off signal or transmitting, *"(TAC call sign) Two, detach."* Lead will fly a TO flap approach, and if required, may accelerate slightly to build spacing between aircraft. After the kiss off, Wing should reduce power, set Landing flaps, and establish a minimum of 1500' of separation between aircraft. Wing should use his airspeed differential and maneuvering geometry to obtain separation during the circle to land. Enough separation should occur to allow for normal landings on centerline.

NOTE

> Wing has the option of using TO flaps for the approach and landing if deemed necessary due to winds or required spacing. Lead has the option of using LDG flaps as required for weather/runway conditions.

506. SECTION MISSED APPROACH

Any time a missed approach is required prior to detaching Wing, Lead will pass the climb signal, then slowly advance power while rotating to establish a positive rate of climb. With a positive rate of climb established, Lead will execute the gear retraction just like a section takeoff. Once both aircraft are clean, Lead will look to Wing for a head nod, indicating both aircraft are clean and continue with the missed approach/climbout instructions.

If an active duty runway is to be crossed after landing (i.e., a parallel runway), Lead will wait until Wing has cleared the duty runway and is positioned on the taxiway with Lead prior to requesting clearance to cross from the tower. Each aircraft will perform individual After Landing Checklists once clear of the hold-short line. Once Lead has positively checked Wing in on ground frequency, Lead will direct Wing to contact base. Once Wing has checked in with base, he will switch back to the TAC frequency and report back up to Lead.

CHAPTER SIX
EMERGENCIES

600. INTRODUCTION

There are additional considerations when handling emergency situations in formation. As Lead, remember to take into account all actions that will affect the Wingman. As Wingman, maintain situational awareness at all times and be ready to assist as requested.

In formation, the greatest immediate threat during an emergency is a midair collision within the flight. The threat of a midair collision can be alleviated by communicating and taking additional separation (weather permitting) as appropriate.

A rule of thumb for handling formation emergencies is, "**the bleeder is the leader**": the emergency aircraft will have the lead, and the non-emergency aircraft will assume the chase position and provide mutual support. There are many exceptions to this rule, i.e., the emergency aircraft experiencing communication or navigation problems. In some extreme cases, such as an engine failure, a lead change may be impractical, and the emergency aircraft may simply have to fall out of the formation.

Backup assistance can be extremely helpful and may include: reading checklists, locating nearest suitable divert airfields, communication/coordination, exterior aircraft inspection, and/or providing a stable platform for reference. Avoid the tendency of trying to assist too much; this is referred to as, "jumping in the emergency aircraft's cockpit." Be prepared to offer assistance when **requested** by the emergency aircraft. The type of assistance required may vary, however, quick and accurate communication between aircraft is key to the successful handling of any emergency.

Within this FTI, procedures for some specific emergency situations have been expanded upon. Remember that mid-air collision is the biggest threat. Good communication is paramount. The good aircraft should be ready to assist or take the lead when requested. And no flight manual or set of procedures are a substitute for common sense and sound judgment. Compound emergencies, number of aircraft in the flight, available facilities, and adverse weather may require modifications to the sections below.

NOTE

> If one aircraft experiences an in-flight emergency, use the proper individual's call sign/tail number to prevent confusion with ATC.

601. AIRCRAFT MAINTENANCE PROBLEMS ON DECK

If either aircraft in the section needs to ground abort or is delayed by a maintenance problem, try to call the other aircraft to notify them of your status and when you expect to be ready to taxi. If you are required to take the spare aircraft, have a maintenance problem, or break the normal routine, be careful and thorough, and do not rush checklists.

602. ABORTS

Specific formation abort procedures are referenced in Chapter 3 "Interval/Section Abort" procedures.

603. RADIO FAILURES (NORDO)

Radio failure in a formation can produce a potentially confusing and hazardous situation. If NORDO (No Radio), all radios have failed. The formation should maintain VMC and conduct the following procedures:

Section Flights: Gain the attention of the other aircraft (whether Lead or Wing). Pass the appropriate signal for down transmitter/receiver as appropriate. Conduct a lead change, if required, using visual signals. The NORDO aircraft will initially be placed in the lead position to troubleshoot and attempt to re-establish radio communications. If radio contact cannot be re-established, the aircraft with the good radios shall be placed in the lead position to lead the flight home. The good aircraft will inform approach and tower that Wing is NORDO and coordinate for ALDIS lamp signals. If Lead experiences a radio failure after the VFR entry point for the runway in use, a lead change **will not** be conducted. Lead will pass the appropriate visual signal and Wing will handle communications, inform tower that Lead is NORDO, and coordinate for ALDIS lamp signals.

Troubleshooting: Before executing NORDO procedures, check all connections (Helmet/Seat), ensure that the appropriate frequency is selected/channelized (UFCP), check volumes (Audio Panel), check switches (audio panel), try front and aft cockpits radios (if dual), attempt radio communications on both the UHF and VHF radio's to include the back-up VHF radio. Make sure that the troubleshooting aircraft is given the Lead position initially to ease the workload on the NORDO aircrew.

NOTE

Aircrew may also try Guard on the survival radio located in their vest.

604. INADVERTENT IMC

If a formation flight inadvertently enters IMC conditions, the flight Lead will transition to an instrument scan. Wing will maintain a good IMC parade position on Lead. The Lead should determine the best way to exit the clouds. If unable to return to VMC, ensure proper terrain clearance, contact ATC to pick up an IFR clearance, and coordinate for further action.

605. WINGMAN LOST SIGHT

If Wing loses sight of Lead in IMC, Wing will simultaneously:

1. Transition to an Instrument Scan.

2. Call, *"(TAC call sign) Two, lost sight,"* while executing the following procedures:

Straight and Level: Wing will smoothly turn away from Lead for a 30º heading change, time for 30 seconds, then parallel Lead's heading. Lead will transmit his exact heading and altitude (*"Knight One, heading 270 at 5500 feet*"). Lead will direct a rejoin or coordinate for a separate squawk for the Wingman as appropriate.

Turns: If in a turn, the aircraft on the outside of the turn will roll wings level and transmit his exact heading and altitude. The aircraft on the inside of the turn will maintain bank angle and continue the turn to the assigned heading, but no less than a 30º heading change. After 30 seconds of timing, the aircraft that was on the outside of the turn will turn to the assigned heading. Lead will direct a rejoin or coordinate for a separate squawk for the Wingman as appropriate.

Climbs: If lost sight occurs while in a climb, Wing will level off, state altitude, and execute applicable lost sight procedures (either straight and level, or in a turn). The Lead will continue climbing to the assigned altitude, but not less than 500' beyond lost sight altitude, then coordinate with ATC if more altitude is required. Lead will direct a rejoin or coordinate for a separate squawk for the Wingman as appropriate.

Descents: Wing will level off, state altitude, and execute applicable lost sight procedures (either straight and level, or in a turn). Lead will continue descent to last assigned altitude, but no less than 500' beyond lost sight altitude, paying close attention to terrain clearances. Lead will direct a rejoin or coordinate for a separate squawk for the Wingman as appropriate.

Instrument approach inside the Final Approach Fix (FAF): If Wing goes lost sight inside the FAF, Wing will expeditiously turn away (as defined above) from Lead to ensure separation, while simultaneously transitioning to an instrument scan and calling *"(TAC call sign) Two, lost sight*." Lead will inform ATC as soon as possible and continue with the approach. Once separation is ensured, Wing will climb to the FAF altitude (or glideslope intercept altitude), proceed to the MAP, and perform the Missed Approach Procedure, unless a new clearance is received from ATC (declare an emergency if required). Wing will ensure that Approach Course guidance is maintained until reaching a Minimum Safe Altitude (MSA) for the approach flown or as directed by ATC.

606. BLIND PROCEDURES

In the event Wing loses sight of Lead in VMC, Wing will immediately call, *"(TAC call sign) Two, blind, (altitude).*" If Lead is visual, he will direct Wing's eyes toward Lead's position, referencing a clock position (high/level/low) from Wing, while ensuring de-confliction (visual aircraft has de-confliction responsibility). After each successive call by Lead, Wing will continue to call either "***blind***," if Lead is still not in sight, or "***visual***," if Lead is in sight. If Wing calls "***visual***," Lead will be directive to either conduct a rendezvous, or continue training.

Example

WING: *"Angry Two, Blind, 8000 feet."*

LEAD: *"Angry One, visual at your left 10 o'clock, level."*

WING: *"Angry Two, visual."*

If Lead unexpectedly loses sight of Wing in VMC, Lead should maneuver predictably and transmit *"(TAC call sign) One, blind, (altitude)."* If Wing is visual, he will direct Lead's eyes toward Wing's position, referencing a clock position (high/level/low) from Lead, while maintaining de-confliction. In situations where Lead expects to be blind (i.e. straight ahead running rendezvous), Lead may request Wingman's position via radio call (*"(TAC call sign) Two, say posit"*), without calling blind.

If **both** aircraft call *"**blind**,"* proceed as follows:

Lead: Transmit altitude, maneuver predictably, and be directive to ensure a minimum of 500' of altitude separation, without flying through Wing's altitude. Clear the flight path and determine a prominent visual landmark to use as a rejoin point (FMS point or a radial/DME fix). Confirm the rendezvous point with Wing. Proceed direct to the rendezvous point, establish a 30º angle-of-bank left orbit at 200 KIAS. Lead will continue to clear and attempt to regain visual with Wing. When Wing calls "*Visual*," Lead will direct a rejoin.

Wing: Lag Lead's last known position and clear the flight path. Follow all directive instructions from Lead. Once Lead has determined a rendezvous point, proceed direct to that point. When Lead is in sight, transmit *"(TAC call sign) Two, visual*." Lead will be directive for the rendezvous. Once Wing is cleared to rejoin, conduct the rendezvous IAW Section 405 (B&R).

During maneuvering, Wing may become blind for a short time due to the sun. If this occurs, Wing will call *"blind sun"* and lag Lead's last know position. Lead will monitor Wing and call *"continue,"* if de-confliction can be maintained or *"(TAC call sign), knock-it-off,"* if Wing is not in sight and de-confliction cannot be maintained. Wing will call *"visual"* as soon as Lead is re-acquired.

NOTE

TCAS will not be used as a primary means to rejoin the flight, but may be used as a tool to assist in the rejoin.

607. SECTION PRECAUTIONARY EMERGENCY LANDING (PEL)

After the emergency (PEL) aircraft has taken the lead (if necessary), he will turn to intercept the Emergency Landing Pattern (ELP). Wing will transition to a chase position, help clear for the formation, back the PEL aircraft up (as requested), and monitor the PEL aircraft's performance (i.e., altitude, airspeed, VSI, etc.). The emergency aircraft will maneuver and configure as appropriate prior to High Key, while Wing flies the chase position and matches the PEL aircraft's configuration. Lead may elect to kiss-off Wing at any time. If the PEL aircraft elects to keep Wing in a chase position through the ELP, Wing should wave off when directed by Lead, but no lower than 300' AGL. During the waveoff, Wing should keep his eyes out for other aircraft and be careful not to overspeed the gear or flaps.

NOTE

The chase position is defined as a 30-60° bearing line cone out to approximately 500' spacing. The Chase aircraft should maneuver in this cone as needed to keep Lead in sight. Avoid positions below and behind the emergency aircraft.

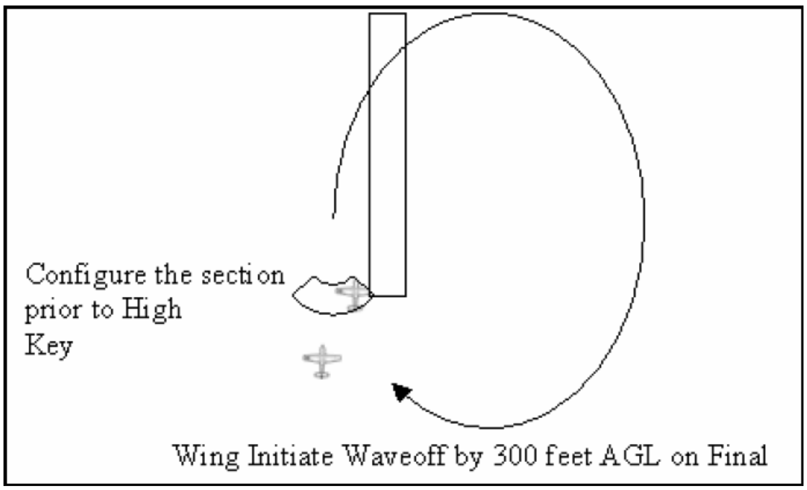

Figure 6-1 Section PEL Profile

608. UNSAFE LANDING GEAR INDICATIONS

The following procedures are provided in addition to those outlined in the T-6B NATOPS Flight Manual.

Unsafe Gear on Takeoff

Lead or Wing: The aircraft with the unsafe indication should notify the other aircraft and ATC, climb to an emergency orbit or delta pattern (IAW local course rules). Coordinate with Wing (the chase aircraft) to get an airborne landing gear inspection. The chase aircraft will follow the distressed aircraft to the emergency orbit or delta pattern and assist as necessary. If on a solo flight, the solo without the gear problem will depart the field and reenter as a single aircraft IAW course rules.

NOTE

SOLOS WILL NOT JOIN UP at any time to inspect gear.

Unsafe Gear Prior to Landing

Lead or Wing: The aircraft with the unsafe indication(s) should climb to the emergency orbit or delta pattern, making the appropriate radio calls to tower, Wing and/or the chase aircraft. The chase aircraft will follow the distressed aircraft to the emergency orbit or delta pattern and assist as necessary. If on a solo flight, the solo without the malfunction will make a normal landing.

NOTE

Emergency aircraft may elect to have Wingman/chase aircraft, base, or RDO help read checklists and help troubleshoot.

609. AIRBORNE LANDING GEAR INSPECTION

Consideration should be given to using a discrete radio frequency between aircraft (i.e., Base, Common) to avoid excessive communication chatter, and avoid confusion. The inspection should be conducted at a minimum of 2000' AGL. Cockpit-to-cockpit communication should include, at a minimum, any changes in configuration, airspeed, or altitude of the aircraft being inspected. The inspecting aircraft should keep the other aircraft informed of his current position, intended movements, and should not take undue risks while inspecting the landing gear.

NOTE

Students **SHALL NOT** be in control of the aircraft during the landing gear inspection.

610. MIDAIR/AIRBORNE DAMAGED AIRCRAFT/BIRDSTRIKE

Aircraft will follow procedures established in the current T-6B NATOPS Flight Manual. A midair collision is an inherent risk when flying formation. Midair's can be either minimal or catastrophic, and can be within the section or external to the flight.

If severe damage occurs, the aircraft may go into out of control flight (OCF). Delaying ejection in an attempt to recover the aircraft may be futile and place the aircrew out of the ejection envelope.

If minimal damage occurs, both aircraft should communicate, separate, maintain visual contact with each other, and not rejoin as a flight. Lead will immediately be directive and start working a de-confliction plan between the two aircraft. Aircraft shall ensure lateral separation using ground references, distance measuring equipment (DME) and/or altitude separation. If possible, Lead should consider coordinating individual chase aircraft in the area to help out. After all appropriate emergency checklists are complete, a game plan should be developed to get both aircraft on the deck safely.

If a single aircraft in the formation is damaged (i.e., bird strike), the damaged aircraft will communicate (if able), climb to a safe altitude, assume Lead and assess damage. If damage to aircraft or aircrew prevents forward visibility, a controlled ejection may be the only option. The good aircraft will assume the chase position and assist as necessary.

611. DOWN AIRCRAFT PROCEDURES

If an aircraft within the flight has to eject, the other aircraft will assume the responsibilities of On Scene Commander and execute the appropriate checklists. If it is an aircraft external to the flight, responsibility for coordinating the search and rescue (SAR) effort should go to the aircraft (not necessarily in the order below):

1. First on scene, highest situational awareness.

2. Aircraft with the highest fuel state.

3. Designated Flight Lead (if applicable).

4. Senior member in the flight.

5. Aircraft with the crash aircraft and/or remaining members of the flight in sight.

6. Most capable SAR asset.

The aircraft assuming On Scene Commander shall remain on station until relieved by a more capable SAR asset, reaches Bingo, or has an emergency. Although aiding the downed aircrew is important, the safe, orderly conduct of the rescue is equally as important. A thorough handover should be conducted prior transferring On Scene Commander responsibilities to another aircraft.

NOTE

Never give out names over the radio. Limit communication to call sign and number of observed chutes.

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CHAPTER SEVEN
TACTICAL FORMATION

700. INTRODUCTION

The Navy's tactical doctrine for Air-to-Air Combat has at its heart, a "section" operating in "combat spread". This chapter will introduce the student to the basics of tactical formation (TACFORM), and how sections maneuver in combat spread.

701. CONCEPTS AND DEFINITIONS

Communications

In this stage of training, a "varsity" approach is taken when it comes to inter-flight communications. Wing will be expected to keep up. Radio frequency changes, at Lead's discretion, may be made without positive check-in or check-out. In close formation, Lead may back up the switch with hand signals or simply look to Wing for a nod affirming that he heard the frequency change. In this stage, COMM1 and COMM2 may be referred to as "PRI" (primary) and "AUX" (auxiliary), respectively.

Responsibilities

The Flight Lead (Lead) is responsible for all navigation, external communications, mission/training objectives, and is the default for all tactical decisions. The Wingman (Wing) is responsible for **maintaining sight** and **staying in position**. Both aircraft are responsible for good lookout doctrine, internal communications, and flight safety.

Combat Spread

The traditional Wingman combat spread position is 1-2 Nautical Miles (NM) abeam the Lead with at least 1000-1500' of step-up. Due to the T-6's smaller size and turn radius, its combat spread position is reduced to an abeam distance of 1/4 NM (.3 DME) with 200' of step-up. At this distance, the T-6 viewed from the side should be roughly the same length as the flash guard (vertical card that sticks up from the wingtip and blocks the strobe light). The IP/student will be able to see the white spot on the side (but not a star), and discern that there are 2 people in the cockpit. Wing will fly slightly sucked and keep Lead just forward of the leading edge of the Wing to maintain sight.

Lookout Doctrine

An effective lookout doctrine is the cornerstone of mutual support, requiring each pilot to develop and employ a thorough visual scan pattern inside and outside of the cockpit. Coordinated scan patterns between Lead and Wing in combat spread ensure maximum visual coverage while allowing sufficient reaction time to engage a threat. The threshold of visual detection depends on numerous factors, such as aspect, environmental conditions, etc. Starting with the eyeball as the primary sensor, focus on a distant point (cloud formation, terrain feature, etc.) to give a depth of vision from one mile out to infinity. This greatly aids in detection of potential threats at distance before they get close enough to become a factor.

The Lead and Wingman's primary scan regions (Figure 7-1) start 30° outside of the formation, sweeping through the formation to the aft visual limit (75% of the time). Visual search beyond 30° outside the formation is a secondary responsibility for both Lead and Wing (25% of the time). Do not limit this scan to just the horizon, but include both above and below the horizon, such that the combined scan of both aircraft cover as much 3-dimensional airspace surrounding the section as possible.

Directly behind each aircraft is a small unseen area (to that specific pilot) referred to as the "**blind cone**." In combat spread, each aircraft's scan covers the other aircraft's blind cone, so as to cover each other's 6 o'clock. However, there is still a **mutual** blind area formed at the intersection of each aircraft's visual limit, behind and between the section, determined by the lateral separation between aircraft.

Good lookout doctrine is useless, however, if members of the flight are not communicating and working as a team.

Angle-Off-Tail (AOT)

Angle-Off-Tail is the position relative to an aircraft's longitudinal axis, with 0° being off the aircraft's tail and 180° being off the aircraft's nose. Intermediate angles between 0-180° are not specific to just the top, bottom or sides of an aircraft. That is, any AOT can be described at any one point around an aircraft. Do not mistake Bearing Line for AOT. Bearing Line is measured from an aircraft's 3/9 Line, aft with increasing degrees.

Line of Sight (LOS)

Line of sight is the line from a pilot's eyeball to the object that is being looked at. LOS **rate** describes how an object appears to move across the canopy.

Closure

Closure is the rate at which separation between two aircraft is decreasing. A negative closure is described as separation that is increasing or "opening".

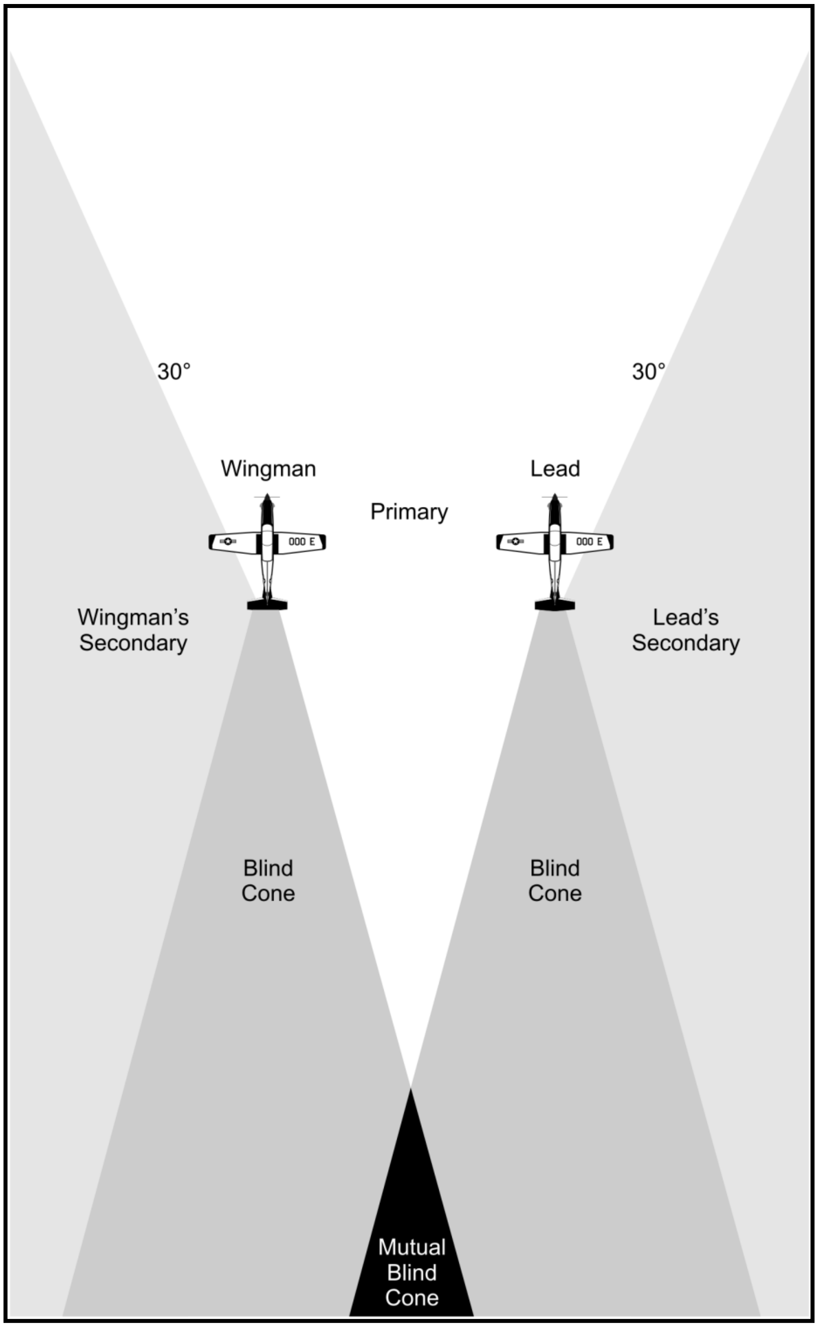

Figure 7-1 Lookout Responsibilities

Yardstick

Yardstick is the term for the air-to-air distance between aircraft. In the T-6B, students will incorporate the TCAS as well as eye ball calibration to maintain required distance.

PADS

PADS is an acronym for the starting parameters of an engagement or maneuver: **P**osition, **A**ltitude, **D**istance, **S**peed.

702. ADMINISTRATION

Administration (ADMIN) encompasses the non-tactical portions of the brief and flight. The following paragraphs describe the major portions of ADMIN.

Preflight/Start/Marshal/Taxi/Takeoff

These procedures are outlined in local SOP and are standardized.

703. INITIAL RENDEZVOUS

Join into parade position as briefed by Lead. Lead may clear Wing in cruise position immediately, however, Wing is responsible for moving back in parade as appropriate for weather.

704. PUSHING TO SPREAD

Lead will brief Wing when he wants to "push" the flight from spread from cruise. This is signaled by Lead pushing his palm out and away. Wing will initially increase power, take a cut away, and establish a climb. Lead will then use power appropriately (reference one knot of excess airspeed for every degree of heading differential) to establish a 10-20° cut away above 200 KIAS. Wing will continue to look at Lead and as he drives out towards spread. Hold this heading differential until achieving a lateral separation of 0.3 DME and 200' of step-up, then turn to parallel Lead. Wing will anticipate shedding the excess airspeed as he comes back to parallel Lead's heading.

Commons errors:

1. Taking too aggressive of a cut away and going sucked.

2. Taking too little of a cut away for the excess airspeed and either going acute or never getting out to the appropriate abeam distance.

705. G-WARM

A G "warm-up" (G-warm) shall be executed prior to the executing TACFORM maneuvering. The flight will conduct two 90° turns (total 180°), so that the flight will end up on the original heading (Figure 7-2). This may not always work due to area constraints or weather, so listen closely to Lead's calls. Ideally, the flight will complete the G-warm while transiting to the working area. The G-warm will be initiated with the Wingman in spread or as close to it as the course rules and altitudes allow. With the Wingman in spread at 200 KIAS, Lead will initiate the first 90° turn with, *"(TAC call sign), G-warm left/right."* With a minimum of 200 KIAS, Wing responds with, *"Two"* or *"Standby"* if not ready. When ready, both aircraft will set MAX power, roll and pull 3G's for 90° of heading change in the direction called. If the first turn is away from Wing, he will adjust his turn so as to be at Lead's 6 o'clock. The goal is to have enough energy by the start of the second turn, so adjust nose as required to ensure at least 200 KIAS, then reset the nose to level. At this point, whichever aircraft is in trail will make a *"visual"* call to indicate that he is established at the other aircraft's 6 o'clock.

Lead will initiate the second turn with, *"(TAC call sign), G-warm right/left"* (opposite the direction of the first turn). Wing will respond with *"Two"*. The section will then execute a 5G turn for 90° of heading in the direction called. There is a potential for a mid-air if the trail aircraft floats the second turn. Once both aircraft are on the original heading, Wing will call, *"(TAC call sign) Two, visual,"* and Lead will call, *"(TAC call sign), visual"*. The only time Wing should lose sight of Lead in a G-warm is when it is initiated into Wing. In this case, do not call *"blind"* when Lead goes to trail. If at any other time Wing loses sight of Lead, he will immediately call *"blind."*

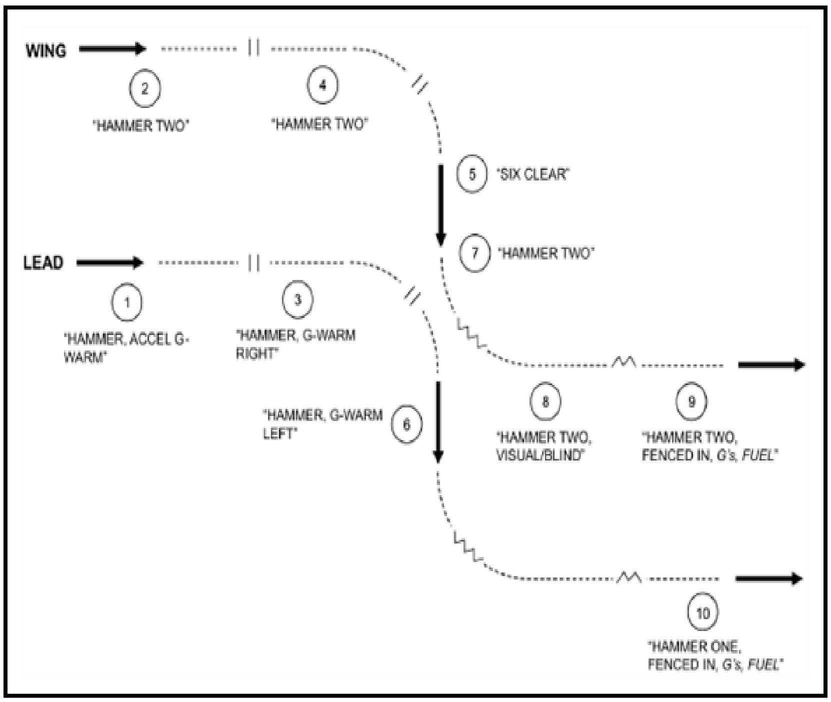

Figure 7-2 G-Warm (Away from Wingman)

Commons errors:

1. Not flying the required airspeed.

2. Not initiating turns in a timely manner (not listening).

3. Either aircraft floating the turn.

4. Not pulling the required G's.

5. Losing sight.

706. MAINTAINING POSITION

Flying in combat spread is especially challenging due to the relatively large separation and difficulty in discerning relative motion between aircraft. A disciplined inside/outside scan is crucial to recognizing deviations, but the real key to staying in position is good airwork. In early stage TACFORM flights, the student may use the heading bug. In later stage flights, the student may not have the benefit of using the heading bug and must develop the ability to look at Lead's aircraft to determine the parallel heading. Finally, changes in altitude are fairly easy to recognize using the altimeter and looking at Lead's aircraft against the horizon.

707. POSITION CORRECTIONS

There are three variables the student must correct for to maintain position in spread. In order of priority:

1. Bearing line

2. Abeam distance

3. Altitude

A few rules of thumb to follow:

1. Always lead acute. Wing should be accelerating back to 200 KIAS before hitting the bearing line.

2. Always lead altitude corrections. Start level-offs prior to reaching the required altitude.

3. Never lead sucked. Wing should drive all the way up to the bearing line from a sucked position before climbing and decelerating. Do not turn to parallel Lead before driving out to the required distance.

Bearing line is the most important and most difficult deviation to fix. When not abeam Lead, Wing must alter his down range travel (DRT) with respect to Lead. DRT can be altered by simply speeding up or slowing down, but this requires liberal use of the PCL and speed brake, which wastes fuel. The preferred option is trade altitude/airspeed and vary flight path geometry as required. Specifically, in the case of decreasing DRT, add step–up and execute a series of turns (flight path geometry) to shorten up the relative distance traveled. Doing so can slow DRT more expeditiously than simply using one or the other. Use the PCL and speed brake sparingly to fine tune corrections, only if necessary.

Correcting an Acute Position

Correcting for acute position (Figure 7-3) is not as simple as correcting for sucked positions. Varying magnitudes of deviations will give rise to different correction methods. For slightly acute positions (~10°), simply trade a little airspeed for altitude (climb), then take the slight disadvantage in airspeed and "slide back" toward bearing line. Before arriving on bearing (always lead an acute position), push the nose over and descend back on altitude. Wing will slide the rest of the way back as he accelerates in the descent, hopefully arriving on bearing at 200 KIAS. This correction can be accomplished without touching the PCL. Wing can get back in position a little more expeditiously by using flight path geometry (2G turns for 10-20° of heading) to correct back to the bearing line. A disadvantage of this method is that Wing tends to bleed some airspeed unless power is added. An even more expeditious option is to couple both methods described above. With a 2G pull, take an oblique, nose high (~5-10°), decelerating cut (~10-20°) away from Lead, then assess the bearing line. When half of the deviation is taken out, overbank and pull 2G's nose low (~5-10°) and into Lead (~10-20°). If executed properly, Wing will arrive on bearing at 200 KIAS. As abeam distance and altitude are last priorities, Wing can continue to fix these after arriving on bearing as needed.

Correcting a Sucked Position

Whereas acute positions are the most difficult to fix, sucked positions are generally the easiest to fix. It is simply a matter of trading altitude (potential energy) for airspeed. If sucked, push the nose over to gain airspeed. Take the extra airspeed "along the bottom" and drive forward to the bearing line. Upon reaching the desired bearing line (never lead a sucked position), pull up and climb back to the desired altitude. This abrupt pull up will rapidly start the climb and deceleration. If executed properly, Wing will arrive back on bearing and altitude at 200 KIAS.

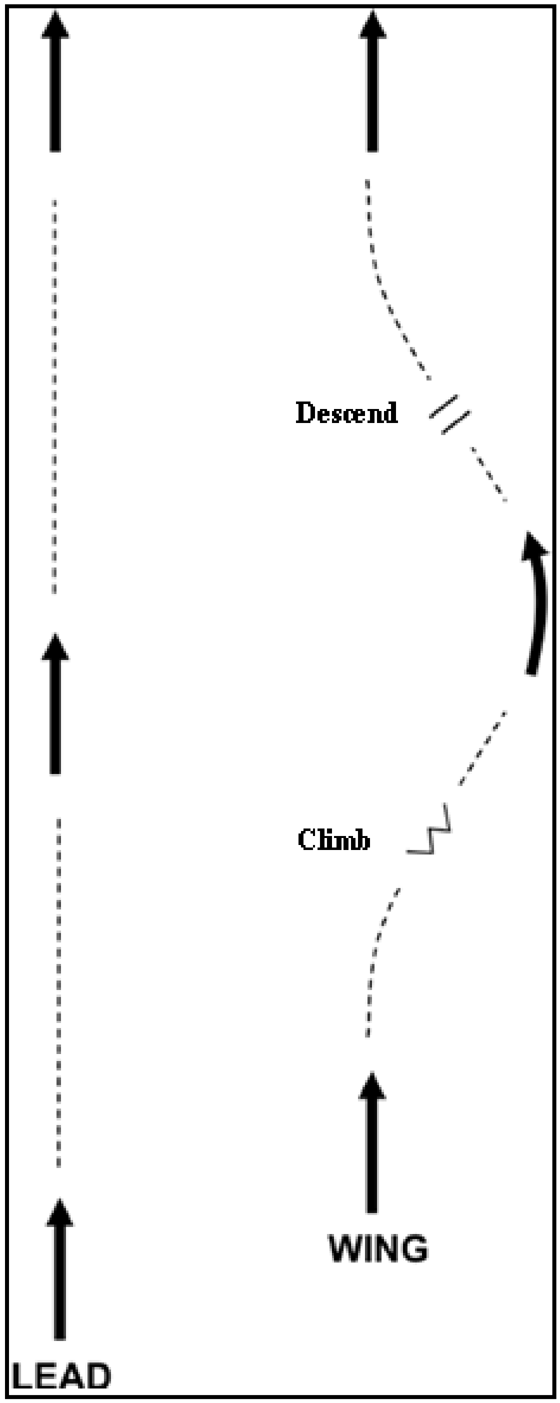

Figure 7-3 Acute Correction

ABEAM DISTANCE CORRECTIONS

These are simple. Add a few knots of airspeed and take a cut into or away from Lead. As a rule of thumb, add as many knots as degrees of heading change.

ALTITUDE CORRECTIONS

With all other variables solved, add power and set nose attitude to maintain 200 KIAS for a climb. For a descent, pull power and/or use the speed brake briefly so as not to accelerate too much. For an even more rapid descent, add some brisk ‘S’ turns to control DRT.

708. CHECK TURNS

Lead will roll into a 30° AOB turn for 30° or less of heading change at 200 KIAS. These turns instantly place Wing acute or sucked, requiring aggressive bearing line corrections. As will be the case for all the turns in TACFORM, Lead will not start the maneuver until Wing acknowledges Lead’s call:

Example

LEAD: *“Hammers, check left, 250.”*

WING: *“Two, 250.”*

Check Turns into Wing

Check turns into the Wingman (Figure 7-4) require corrections similar to that of an acute position described earlier. As soon as Lead rolls into the turn, make an oblique, 2G, 5-10° nose high turn to 30° past the new heading away from Lead. Lead will then be well aft (initially 45-60°) of wing line. Notice that because the Wingman is now high, wide and slow (~150-180 KIAS), the bearing line will start drifting toward Wing from behind. When Lead’s aircraft approaches 20-30° aft of the wing, reverse to make an over-banked, 2G, 5-10° nose low turn, 30° past the new heading into Lead. The bearing line should continue to approach Wing from behind as he accelerates downhill. If executed correctly, Wing will be accelerating back to 200 KIAS while correcting back to the required abeam distance and altitude. Wing can then simply level-off and turn to parallel the new heading. Check turns into the Wingman can be one of the most difficult corrections to master.

Common Errors:

1. Floating (less than 2G) the “cuts” (turns) away and into Lead.

2. Not taking a “cut” back into Lead, but rather turning to the new heading. This leads to a high, wide and acute position.

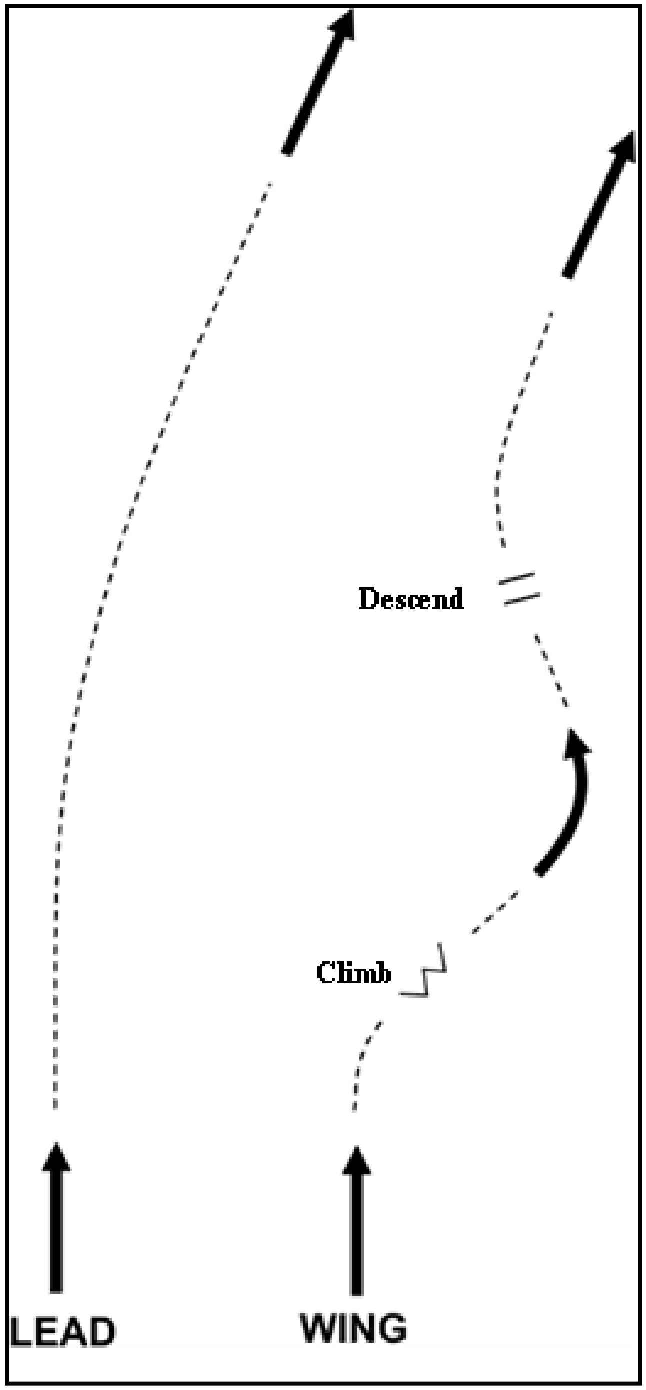

Figure 7-4 Check Turn into Wingman

Check Turn Away from Wing

For a check turn away from Wing, make a quick turn to the new heading while aggressively lowering the nose to gain airspeed. This is one situation where Wing can justify bringing the PCL up aggressively to expedite acceleration. With excess airspeed (~50 knots), Wing will reset torque. Now simply keep the extra airspeed gained to drive forward to the bearing line. Once on the bearing line, aggressively climb back to altitude and recapture 200 KIAS. Because Wing has turned aggressively to the new heading, he will find his abeam distance collapsing as the turn progresses, ending up tight as Lead rolls out. This should be a simple fix as Wing is climbing back to altitude on the bearing line. As the turn progresses, Wing may find himself hitting the bearing line before or after Lead rolls out. If Lead rolls out before the Wingman hits the bearing line, Wing will be seeking 200 KIAS as he gets back on altitude. If Lead has not rolled out by the time the Wingman hits the bearing line, Wing will have to keep extra airspeed to stay on bearing around the outside of the turn. If this is the case, anticipate Lead rolling out so Wing can lose the extra airspeed he had on the outside of the turn to prevent from being fast and going acute once Lead rolls out.

709. SHACKLES

Shackle turns (Figure 7-5) allow the Lead to redress the section (get Wing back into position) and swap sides. Both aircraft begin a level turn toward each other for 45° of heading change, adding power as necessary to maintain 200 KIAS. Both aircraft roll out with the flow heading on the 45° benchmark and wait for the pass while sanitizing the section's mutual blind cone. Roughly 2 seconds after the pass, turn back to the flow heading. Ideally, if both aircraft reverse back to the flow heading at the same time, the Wingman will come out of the turn on bearing line. This rule of thumb only works when with all other parameters met, so do not rely on it if airwork is poor or Wing was out of position in the first place. Abeam distance after the turn is determined by the amount of time that passes after the cross and before the section reverses back to the flow heading. As stated, a shackle can be used to help the Wingman regain the bearing line from either a sucked or acute position. If the Wing starts out a little sucked, he may elect to turn 45° but reverse earlier, after the pass. If the Wingman is really sucked, he can turn less than 45° or not at all. If the Wing starts out a little acute, he can turn 45°, but wait longer after the pass to reverse back to the flow heading. If the Wingman is really acute, he can turn greater than 45° initially. Since a shackle is a cooperative maneuver, Wing should not blindly throw out a correction without assessing what Lead might be trying to accomplish.

Common Errors:

1. When in position and shackling straight ahead, Wing turns passed the 45° benchmark.

2. Not scanning airspeed and getting either too fast or too slow.

3. Waiting too little or too long after the pass to turn back to the flow heading.

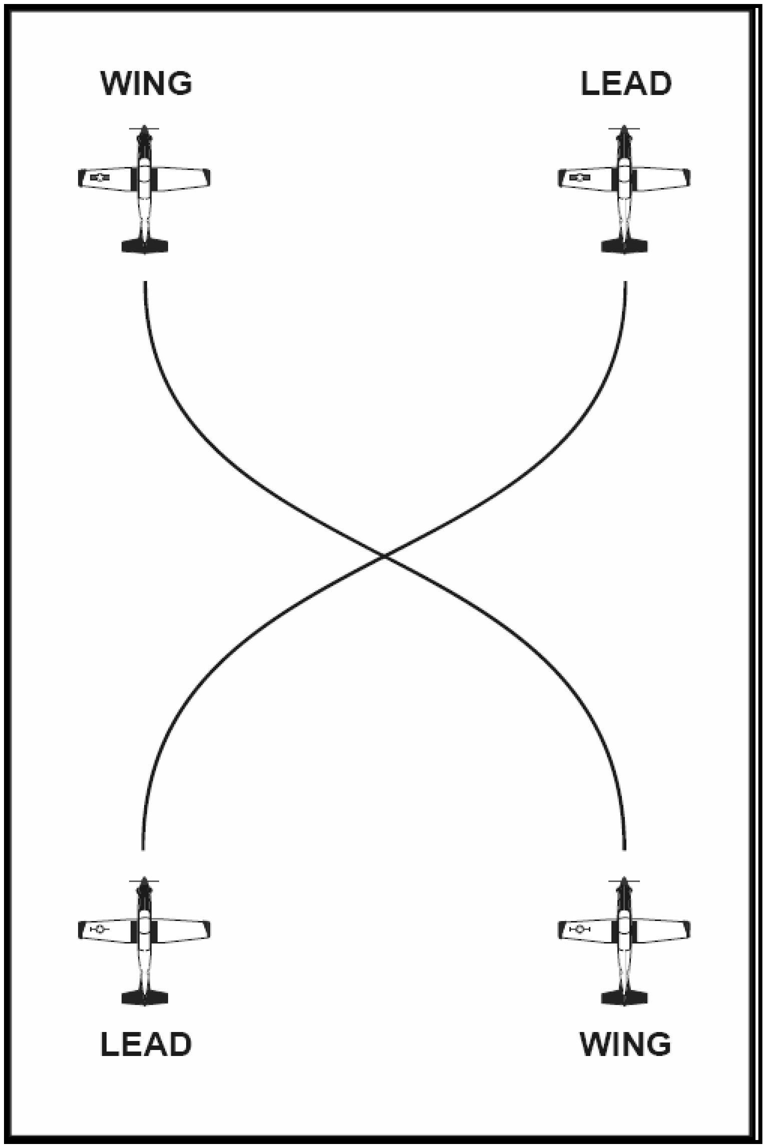

Figure 7-5 Shackle

710. TAC TURNS

The TAC turn is an engaging turn where flow heading changes by 90° and the aircraft swap sides of the formation. With a TAC turn, the section can be maneuvered very rapidly to engage a threat from the abeam position. This turn will be performed by adding MAX power and G as necessary to maintain 200 KIAS. At the completion of the turn, Wing should be back in spread on the opposite side at 200 KIAS.

TAC Turn into Wing

Initially Wing will drive straight (Figure 7-6) as Lead starts his turn into the Wingman. Wing will begin the turn in the same direction as Lead just prior to being able to look down his intake. About halfway through the turn, Wing should pick up Lead over his shoulder as he rolls wings level with Lead on or very close to the bearing line.

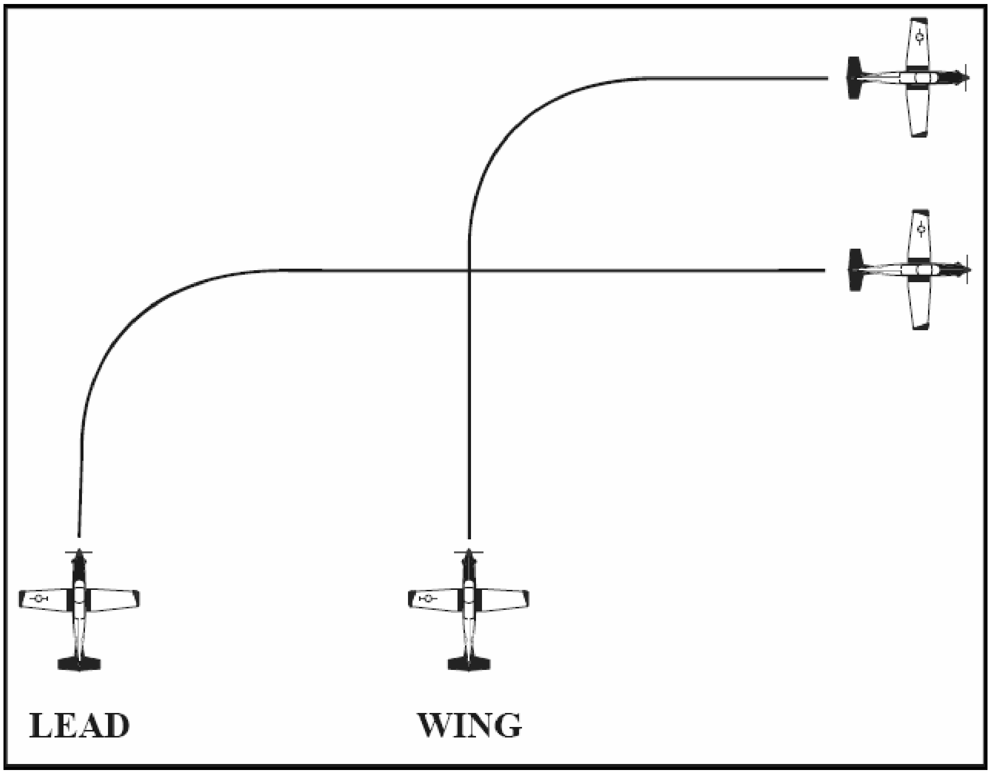

Figure 7-6 TAC Turn into Wingman

TAC Turn Away from Wing

Immediately begin the turn (Figure 7-7) into Lead. He will maintain heading while waiting for the Wingman's aircraft to approach nose on. At the appropriate time, Lead will start his turn. Wing will arrive at the new heading as Lead is about halfway through his turn.

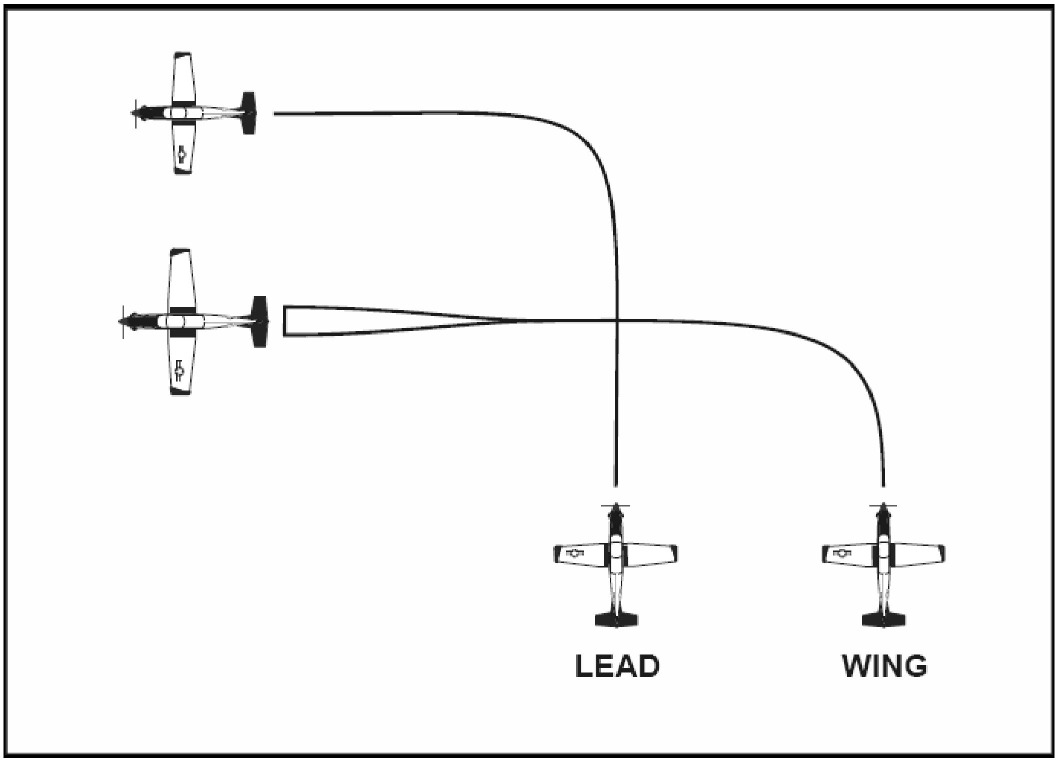

Figure 7-7 TAC Turn Away from Wing

Common Errors:

1. Turning the wrong way.

2. Not maintaining 200 KIAS during the turn.

3. Not adjusting the pull.

711. IN-PLACE TURNS

The In-Place turn is an engaging turn that changes flow heading by 180° and aircraft swap sides of the formation. Both aircraft should begin and finish their turn at the same time. An in-place turn is used to engage a bandit that is behind the section. These turns will be performed at MAX power and G to maintain 200 KIAS. At the completion of the turn, Wing should be back in spread on the opposite side at 200 KIAS.

In-Place Turn Away from Lead

Immediately after responding to the initiating call, Wing will turn away from Lead (Figure 7-8) by adding MAX power and G to maintain 200 KIAS. After roughly 135° of turn, Wing will look for Lead to appear over his shoulder to assess the bearing line. Since in place turns take twice as long to accomplish as do TAC turns, poor airwork from Wing will result in amplified deviations after the turn is complete. Think ahead as the turn is progressing to assess required corrections.

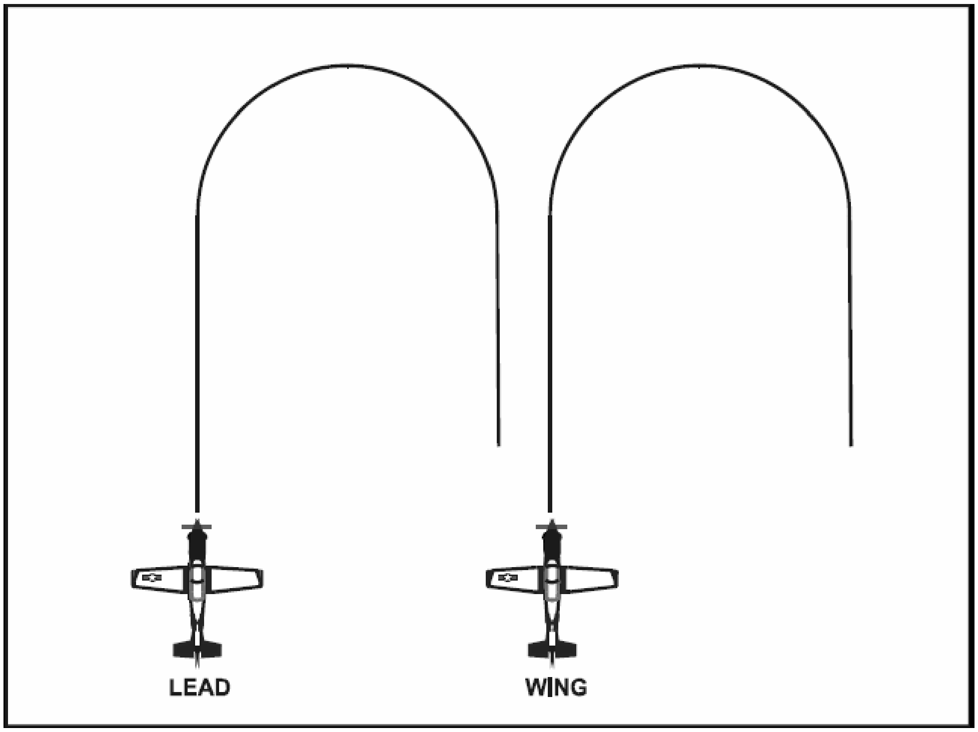

Figure 7-8 In-Place Turn Away from Lead

In-Place Turn into Lead

After responding to the initiating call, Wing will immediately turn into Lead adding MAX power and G to maintain 200 KIAS. Wing's first "check point" in the turn will be after 90° of turn. Wing will need to assess if he is leading or lagging Lead's heading (turn rate) and whether or not he is offset to the "outside" or "inside" of Lead's turn. If Wing is lagging Lead's turn rate or appears to be outside of his turn, Wing will need to "wrap up" the turn while lowering the nose. Only a slight pull is required to catch up. If Wing is leading Lead's turn rate or appears to be inside of his turn, Wing will need to relax the turn a comparable amount. Be mindful that when Wing wraps up or relaxes the turn, he is going to induce abeam distance errors. Anticipate this and plan the required correction out of the turn.

CAUTION

If Wing floats/relaxes too much, a potential midair could result due to the Wingman being belly up. It is imperative that Lead monitors Wingman position as soon as he is visual.

NOTE

As a safety note, do not descend out of altitude at any time during an in place turn into Lead.

Common Errors:

1. Turning the wrong way.

2. Not pulling 10-11 units or maintaining 200 KIAS during the turn.

712. CROSS TURNS

The Cross Turn (Figure 7-9) is a hard turn using MAX power and G to maintain 200 KIAS. The aircraft will cross each other's flight paths with a minimum of 500' separation and change flow heading by 180°. Out of turn, the aircraft are on the same relative side of the formation (if starting on the left, finish on the left). Additional communication is needed for de-confliction since the aircraft make a relatively close pass.

Lead will initiate the cross turn with, *"Hammers, cross turn, Lead low."* Wing will be the high aircraft so he will respond with *"Two high"*. As Wing begins to utter the word *"high,"* he should already be rolling to execute a level, hard turn into Lead. Lead will execute an identical turn into the Wingman though slightly nose low. Both aircraft will end up turning for 180° to the new flow heading. The "cross" will occur just prior to each aircraft's 90° of turn. Wing should be right on top of Lead, slightly outside of Lead's radius of turn. The degree to which Wing goes nose low is predicated on being no closer than 500' above Lead at the pass. Once the pass is safely assured, Wing should overbank, approximately to 135°, allowing his aircraft to accelerate in a nose low slicing turn. Wing should end up about 1,000' below Lead with about 50 knots of excess airspeed. If the section started out at 0.3 NM separation prior to the cross turn, the Wingman should end up on bearing but wider than usual. Therefore, Wing should continue to turn 30° or so past the new flow heading in the direction of Lead, using the excess airspeed to stay on bearing until the abeam distance decreases back to 0.3 NM. Wing can then parallel the new flow heading while correcting back to altitude and 200 KIAS.

If Wing is blind out of the cross turn, he should immediately turn to parallel the new flow heading, but not climb through Lead's altitude. Once the Wingman is visual, he can proceed with correcting back to the proper abeam distance and altitude.

The preceding paragraph assumed that Wing was on bearing after 180° of turn. Typically, Wing ends up sucked so he will have to drive forward to the bearing line after he corrects for abeam distance. Once Wing hits the bearing line with proper distance, he then climbs back up to altitude. Should Wing show up acute after 180° of turn (assuming visual), he can start climbing early while he still has a cut into Lead in order to fix abeam distance.

Common Errors:

1. Not "talking while turning" at the start, resulting in Wing being outside of Lead's turn.

2. Overbanking too much and too early, causing a "close" pass with Lead.

3. Overbanking late, resulting in a lack of enough excess airspeed to correct for abeam distance.

4. Not maintaining 10-11 units throughout the turn.

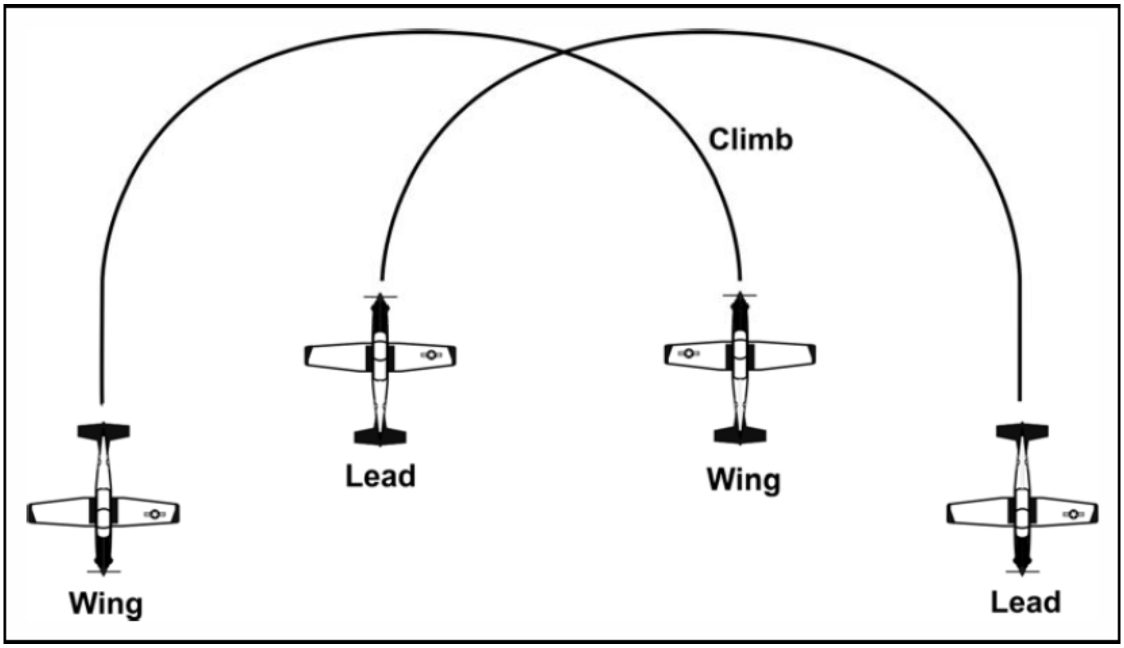

Figure 7-9 Cross Turn

713. UNCALLED TURNS

TAC Turns

Lead will give a wing flash in the direction the turn needs to be executed, and then roll back to wings level. Only after Lead is wings level will either aircraft begin to maneuver. If unsure which way Lead gave the wing flash (environmental factors may make it hard to discern), assume a TAC turn away from Wing. If incorrect, it will be readily apparent and Wing can quickly reverse and catch up.

In-Place Turn

An uncalled in-place turn can only be performed away from the Wingman. Lead will give a wing flash, then immediately commence a 180° turn away from Wing.

CAUTION

If Wing floats/relaxes too much for a Lead correction, a potential midair could result due to the Wing being belly up. It is imperative that Lead monitors Wing's position as soon as he is visual.

714. LEAD CHANGE

The lead change is a maneuver designed to effect a change of the formation Lead with the least possible effect on flight integrity. Prior to passing the lead change signal, Lead will ensure the flight will remain clear of other aircraft, weather, and stay in the working area (if established in a working area). Lead changes may be done visually or over the radio.

1. **Lead**. For a visual lead change, the Lead pilot will pat his helmet three times and point to Wing, signaling, *"you have the Lead."* If the Wingman is not prepared to assume the lead, he will immediately reply with the "negative" shake of the head (shake it off). Lead will then clear the area, give the Wingman a chance to stabilize, and then attempt to pass the lead again. After the Lead has passed the lead (visual signal), the old Lead will not shift his view from the new Lead unless the lead change is refused. For a radio lead change, the Lead aircraft will simply make the following radio call:

Example

LEAD (old): "*Raider Two, you have the lead on the left/right*."

LEAD (new): "*Roger, Raider Two has the lead on the left/right.*"

LEAD (old): "*Two.*"

2. **Wing**. After receiving the visual lead change signal, Wing (new Lead) will pat his helmet once, then point and look forward. If receiving a radio lead change, Wingman simply states, *"(TAC call sign), has the lead on the left/right."* Once the new Lead (old Wingman) accepts the Lead, he will squawk, *"ALT, TCAS-ON"* while the new Wingman (old Lead) squawks, *"STBY, TCAS-OFF"*. Lead should then begin a good VFR scan pattern, set 200 KIAS, maintain a solid platform, and orient himself in the area. Do not attempt to make any corrections for altitude or heading until the new Wingman has arrived in the parade position.

3. For obvious safety reasons, there can be no confusion as to who is in the Lead. With this in mind, the visual lead change occurs exactly when the new Lead pilot points forward. Radio lead changes happen exactly when the new Lead finishes stating, *"(TAC call sign), has the lead on the left/right"*.

NOTE

If in doubt about who has the lead, quickly and accurately use the radio!

715. FORMATION SEQUENCE OVERVIEW

Once established in the working area, the formation sequence may be commenced. Both the Lead and the Wingman are responsible for completing the following maneuvers.

TAC Formation Recommended Sequence

1. Fuel check

2. Take Spread

3. G-warm / FENCE Check

4. Called tactical turns (student decides order of turns)

    a. Check turns

    b. Tactical turns

    c. In-place turns

    d. Cross turns

    e. Shackle

5. Uncalled tactical turns

    a. Tactical turns

    b. In-place turns

6. Lead change

    a. Repeat sequence (minus G-warm)

    b. Repeat any portion to meet MIF at IP’s discretion

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APPENDIX A
GLOSSARY

ABC’s: Term used to prioritize corrections while in formation. Altitude, Bearing, then Closure or Closeness.

Abeam: A position, either on the left or right side, which is 90º off the longitudinal axis of the aircraft.

Acute: A condition in which the Wingman is positioned forward of a designated bearing line.

Bandit: Term used for a hostile aircraft.

Bearing: Angle off the nose of an aircraft used for position reference.

Bearing Line: An imaginary line drawn aft from Lead's 3/9 line. Measured as angular difference between the Wingman's aircraft and Lead's 3/9 line (i.e., being established on the 60º bearing line means the Wingman is offset 30º from Lead's 6 o'clock position).

Bingo: A predetermined fuel state informing the flight that an aircraft is at a fuel state where he needs to recover at the planned destination in order to land with minimum fuel requirements at the planned recovery base.

Blind: A term used to communicate visual contact is lost with a member of the formation while maneuvering in VMC (opposite of “Visual”).

Bogey: Term used for an aircraft with unknown intent. Once identification can be made, these aircraft will normally then be classified as either friendly or bandits.

Break: The portion of the landing pattern where an aircraft executes a decelerating turn to downwind.

Break-Up: A maneuver utilized to separate the formation aircraft and establish them in trail or column.

Check Six: A visual lookout to check the aircraft or formation’s 6 o’clock position for other aircraft (i.e., bogeys or bandits).

Checkpoint: A selected point or set of points, on the Lead aircraft, which are utilized by the Wingman to determine relative position.

Closure: The rate at which an aircraft reduces range on another aircraft.

Crossunder: A maneuver utilized to change the position of the Wing aircraft from one side of the Lead to the other.

Cruise Formation: A formation which allows the Wingman more flexibility, providing better lookout capabilities and additional fuel efficiency for the Wingman.

Cutout: A visual checkpoint on the T-6B referring to the outermost or innermost corner of that portion of the wing that has been cut out to allow installation of the aileron.

Dash Two, Dash Three, etc.: A term used to refer to successive Wingman in a formation.

Division: Flight of three or more aircraft.

Fence Check: FENCE Checks in tactical platforms are checks that need to be completed prior to crossing a predetermined point to ensure all combat systems are functioning properly prior to entering combat. The letters in FENCE represent: **F**uel, **E**xpendables, **N**avigation, **C**ommunication equipment and **E**lectronic counter measures.

Flight Integrity: The ability of the Wingman to maintain the proper relative position while the formation is performing maneuvers.

HEFOE: A method of signaling system failure when NORDO, using hand signals during the day or a flashlight at night.

Hung on the Bearing: A condition during the rendezvous where the Wing aircraft ceases to continue closing on the Lead aircraft (a.k.a. stagnating on bearing).

IFR Parade: A formation used when a section is penetrating clouds or during an instrument approach.

Joker: A predetermined fuel state (above Bingo fuel) informing the formation that a flight member is at a fuel state whereas the present maneuver needs to be terminated in order to accomplish the remainder of the planned profile, recover normally, landing at or above minimum fuel requirements at the planned recovery base.

Kiss Off: The signal Lead gives prior to detaching Wing from the flight.

Knock-It-Off: A radio call used by a flight member to alert the formation to cease maneuvering. This radio call should be preserved as an "unexpected stop and attention getter" and may be initiated by any flight member.

Lag Pursuit: A maneuver used by Wing when Lead is in a turn to increase nose-to-tail separation and range. Wing maneuvers to the outside of Lead's turn by pointing the nose of the aircraft behind Lead's tail.

Lead Pursuit: A maneuver used by Wing when Lead is in a turn to decrease nose-to-tail separation and range. Wing maneuvers to the inside of Lead's turn by pointing the nose of the aircraft in front of Lead.

Lost Sight: A term used by the Wingman to communicate that he has lost visual contact with the Lead aircraft during IMC conditions.

New Six: This is the formation's new 6 o'clock position at the conclusion of a tactical turn or maneuver. Checking this position will normally be assigned to a specific crewmember during a tactical turn, to maximize visual lookout opportunities and enhance visual lookout doctrine.

Nose-To-Tail: The distance from the nose of the Wing aircraft to the tail of the Lead aircraft.

Old Six: This is the formation's current or old 6 o'clock at the conclusion of a tactical maneuver or turn. Checking this position will normally be assigned to a specific crewmember during a tactical turn, to maximize visual lookout opportunities and enhance visual lookout doctrine.

Parade Position: Fixed position on the 45º bearing line on either the left or right side of the Lead aircraft with proper step-down and wingtip separation.

Parade Rate of Roll: Roll rate in which 30º AOB is achieved after 30º of heading change.

Plane of Motion: An imaginary plane defined by the aircraft's flight path.

Playmate: A term used when referencing aircraft participating in your formation.

Prop Arc: A visual checkpoint on the T-6B referring to the outermost portion of the circle created by the tips of the propeller blades in motion.

Pure Pursuit: A maneuver used to follow Lead's flight path in a turn. Wing maneuvers by pointing the nose of the aircraft directly at Lead. Nose-to-tail separation and range will decrease slightly but with a slower closure rate than lead pursuit.

Relative Motion: Any movement of the Wingman's aircraft in relation to the Lead's.

Running Rendezvous: A rendezvous used to join a flight together while continuing on course after takeoff.

Section: The basic flying unit used in formation consisting of two aircraft.

Section Penetration: Two aircraft executing an instrument approach in formation.

Section Takeoff: Two aircraft taking off simultaneously in formation.

Shake Off: A visual signal (negative head shake) given by the Wingman to indicate he is not prepared to execute the next maneuver or required action.

Stack: A visual checkpoint on the T-6B, referring to the trailing edge of the exhaust stacks.

Stable/Stabilize: Being stable means being in control and able to complete the maneuver safely within the pilot's capabilities. Stabilize does not mean stop. It means under control.

Step-Down: The vertical distance below Lead's wing.

Step-Up: The vertical distance above Lead's wing.

Sucked: A condition in which the Wingman is positioned aft of a designated bearing line.

Tail Chase: An exercise designed to demonstrate the concepts of lead, lag, and pure pursuit while dynamically maneuvering the section.

Terminate: A radio call (normally initiated by the Flight Lead) to terminate an exercise or maneuvering. This differs from the knock-it-off (KIO) call in that it is anticipated/expected (i.e., after cruise maneuvering).

Trail: A formation pattern where the Wing is directly behind the Lead aircraft.

Turn Circle: The flight path described by an aircraft in a turn.

Turn Radius: The distance between an aircraft's flight path and the center of the turn circle.

Turn Rate: Change in heading expressed in degrees per second at which an aircraft is turning.

Underrun: A maneuver that allows the Wing aircraft to pass below, behind, and outside the Lead's radius of turn in the event that the rendezvous becomes unsafe.

Visual: A term used to communicate positive visual contact with an aircraft in the formation, or any friendly aircraft (opposite of "Blind").

APPENDIX B
VISUAL SIGNALS

Signal	Meaning	Response
Thumbs-up or head nod	Affirmative	As appropriate

Signal	Meaning	Response
Thumbs-down or head shake	Negative--do not understand	As appropriate

Signal	Meaning	Response
Hand held up, clenched fist, palm forward	Wait (on deck)	As appropriate

Figure B-1 General Signals

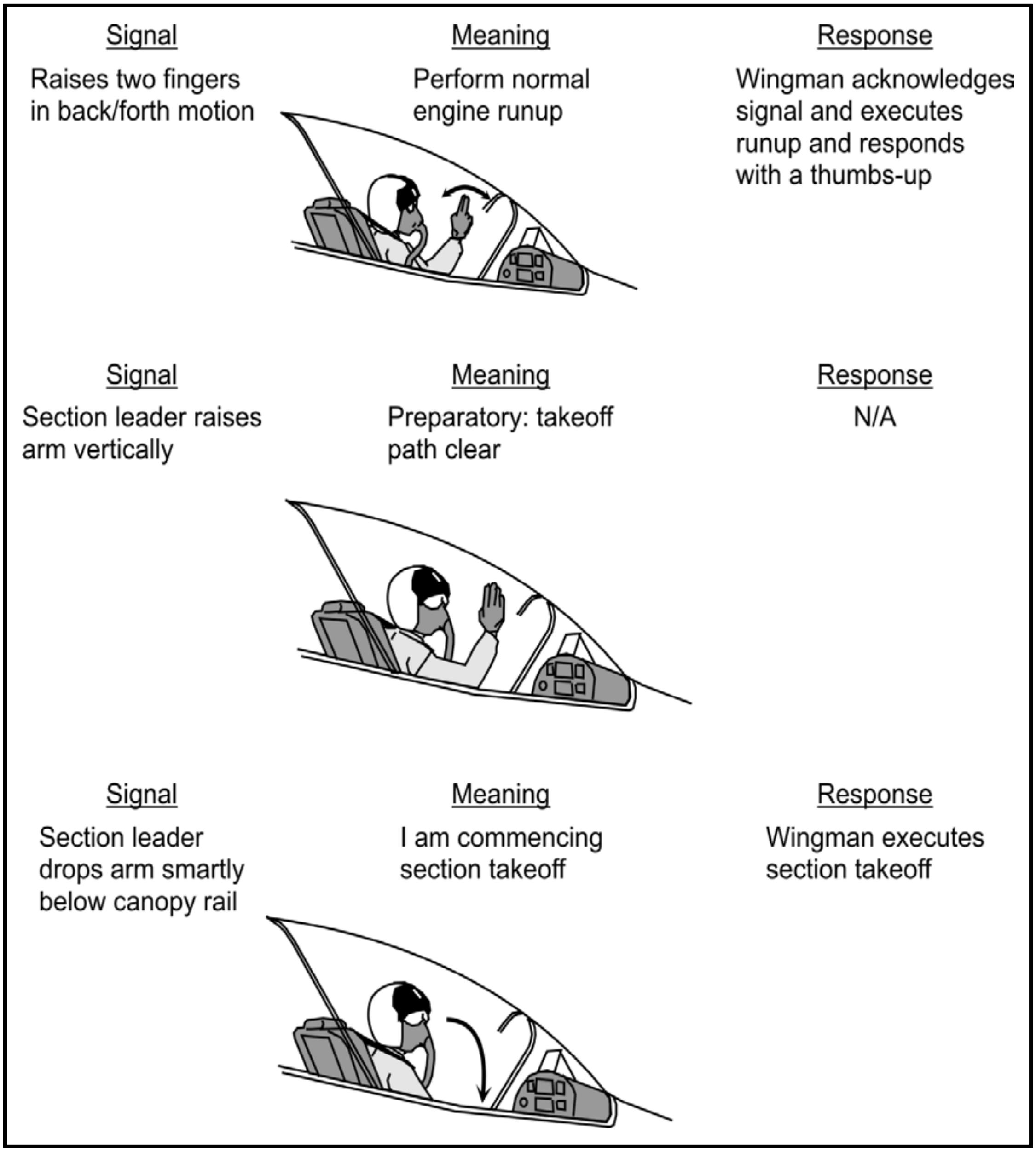


Figure B-2 Takeoff Signals

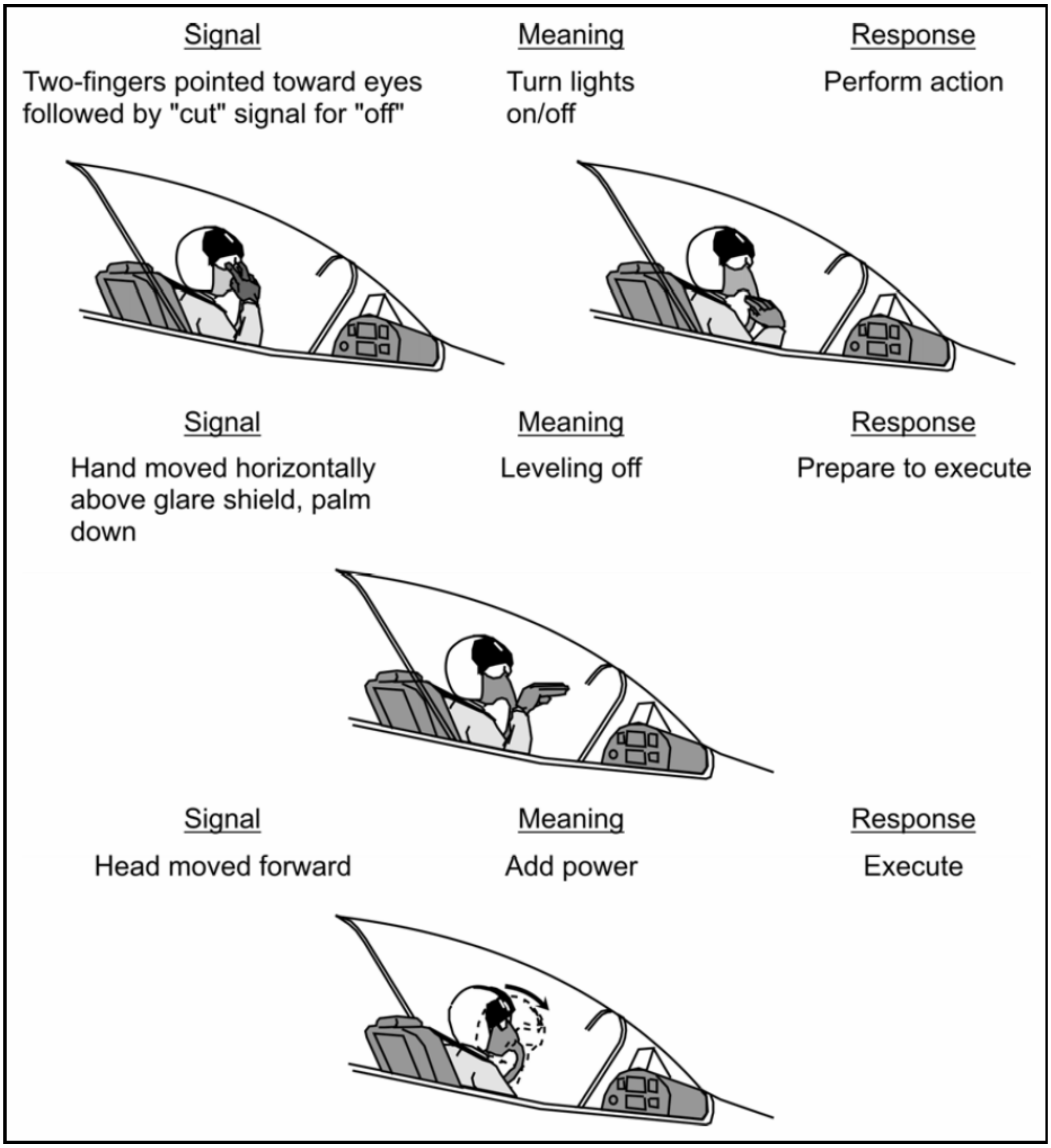
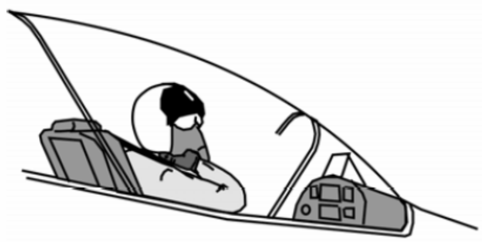
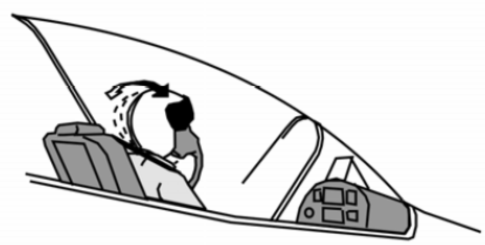


Figure B-3 General Airborne Signals (1)

Signal	Meaning	Response
Choking motion with hand, then point to wingman	Turn IFF off	Turn IFF to STBY/OFF



Signal	Meaning	Response
Head nodded right/left	I am turning right/left	Prepare to execute



Signal	Meaning	Response
Open hand held up, fingers together, moved in fore-and-aft sawing motion (by lead)	Roll out of turn	Wingman prepare to execute

Figure B-4 General Airborne Signals (2)

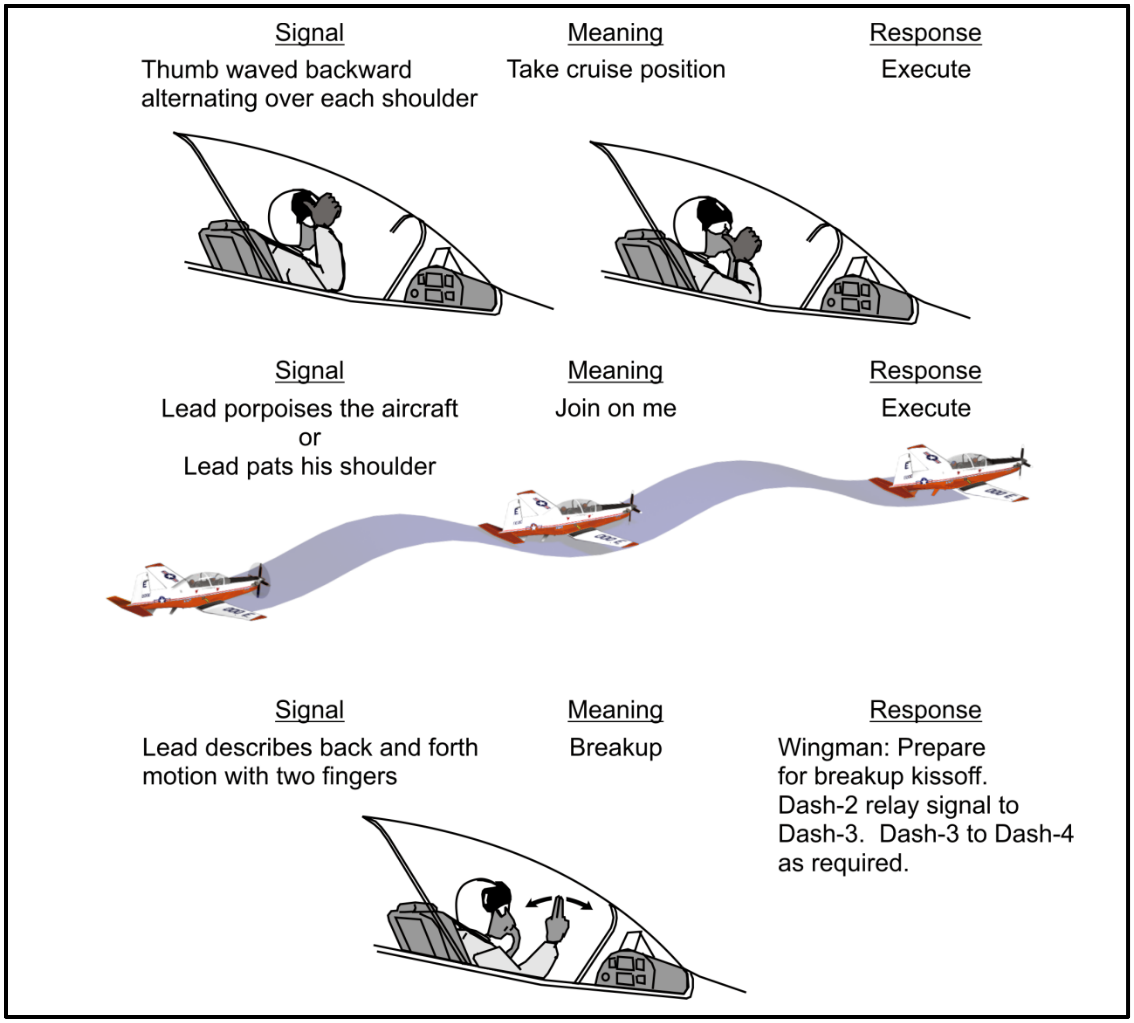


Figure B-5 General Airborne Signals (3)

Signal	Meaning	Response
Lead holds up right/left forearm vertically with clenched fist	Wingman crossunder to right/left	Execute

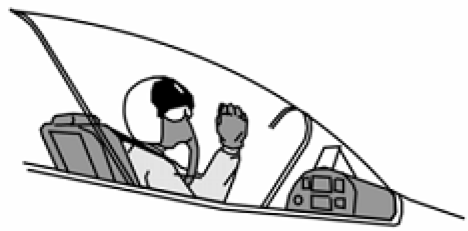


Figure B-6 General Airborne Signals (4)

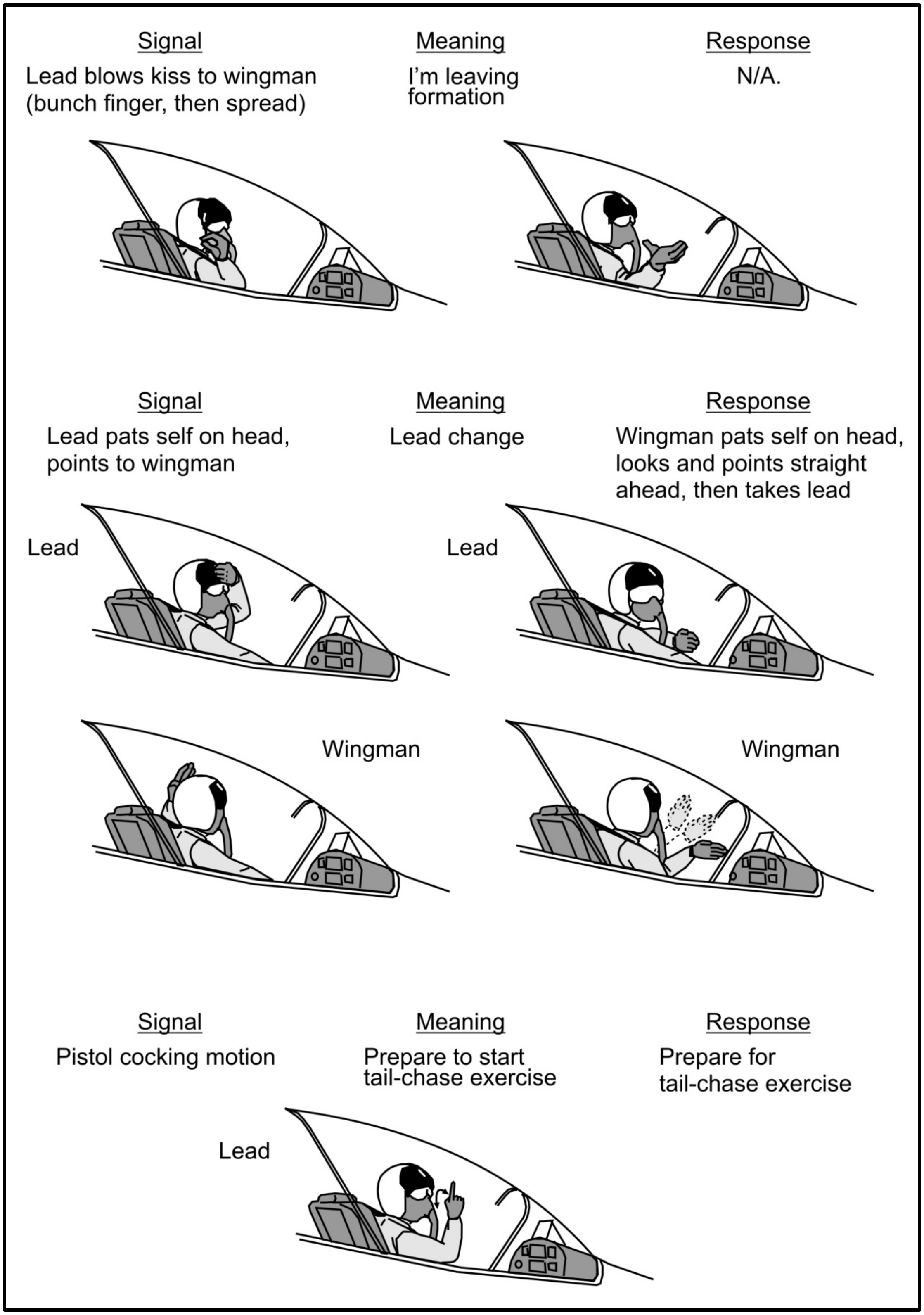


Figure B-7 General Airborne Signals (5)

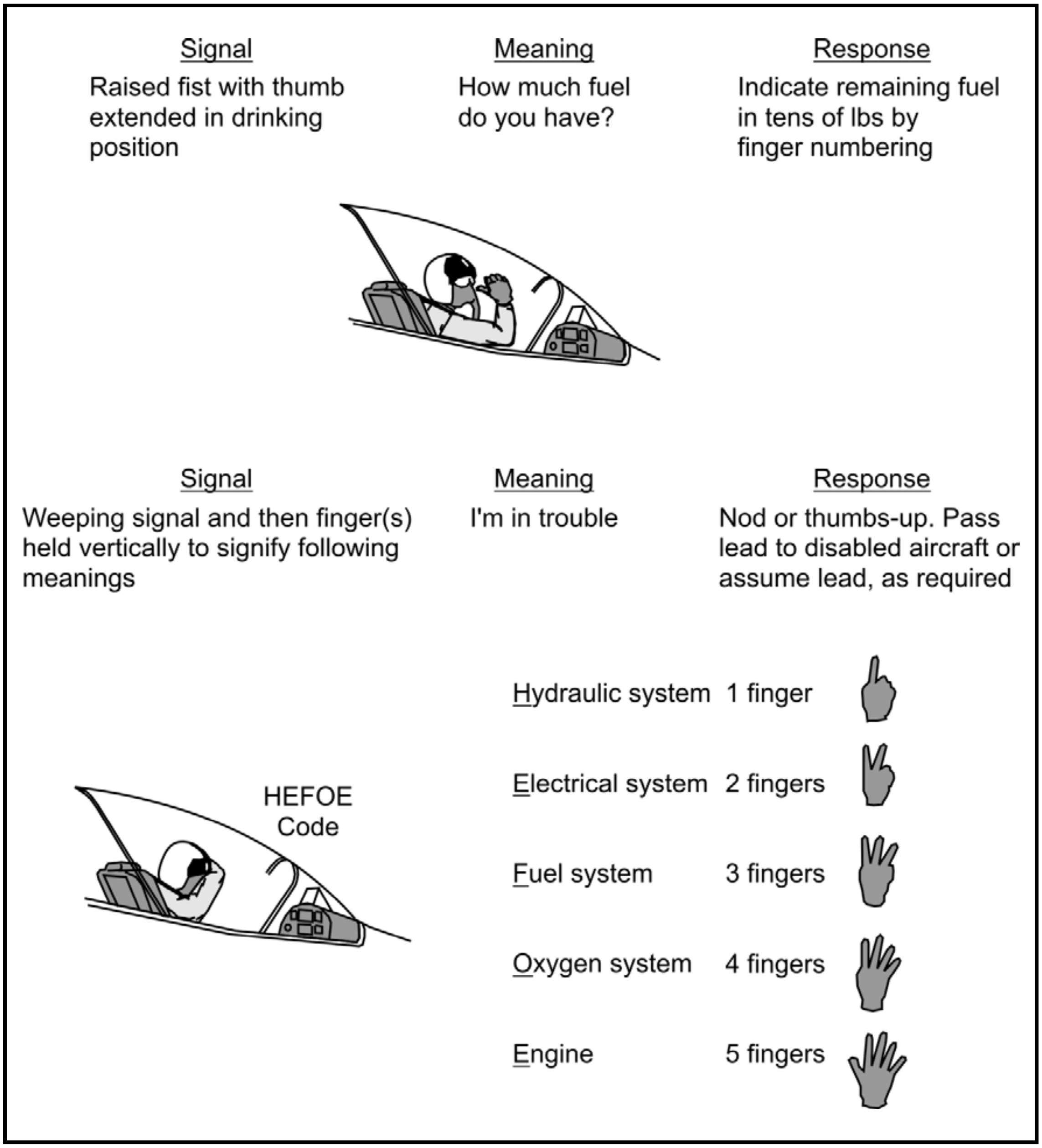


Figure B-8 General Airborne Signals (6)

Signal	Meaning	Response
Hand opened flat and palm down, simulating dive or climb	I am going to descend/climb	Prepare to follow suit

Signal	Meaning	Response
Head moved backward	Reduce power	Execute

Signal	Meaning	Response
Open and close four fingers and thumb	Extend/retract speed brake, as appropriate	Repeat signal. Execute when lead nods head or fans speed brake in or out

Signal	Meaning	Response
Hand cupped behind ear, listening	Next signal will be a question	As appropriate

Figure B-9 General Airborne Signals (7)

Signal	Meaning	Response
Rotary movement of clenched fist as if cranking wheels, followed by nod	Raise/lower gear and flaps/slats	Execute at nod

Signal	Meaning	Response
Point to runway	Landing runway in sight	Prepare to detach

Signal	Meaning	Response
Pats palm on glare shield then kisses off wingman	You land	Kiss off and land

Figure B-10 Approach Signals