NAVAL AIR TRAINING COMMAND

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FLIGHT TRAINING INSTRUCTION

FORMATION FLIGHT

TH-73A

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1. CNATRA P-484 (New 06-22) PAT, “Flight Training Instruction, Formation Flight, TH-73A," is issued for information, standardization of instruction, and guidance to all flight instructors and student aviators within the Naval Air Training Command.

2. This publication will be used as an explanatory aid to support the flight training curriculum. It will be the authority on the execution of all flight procedures and maneuvers herein contained.

3. Recommendations for changes shall be submitted via the electronic Training Change Request (TCR) form located on the Chief of Naval Air Training (CNATRA) website.

4. CNATRA P-484 (New 06-22) PAT is a new publication.

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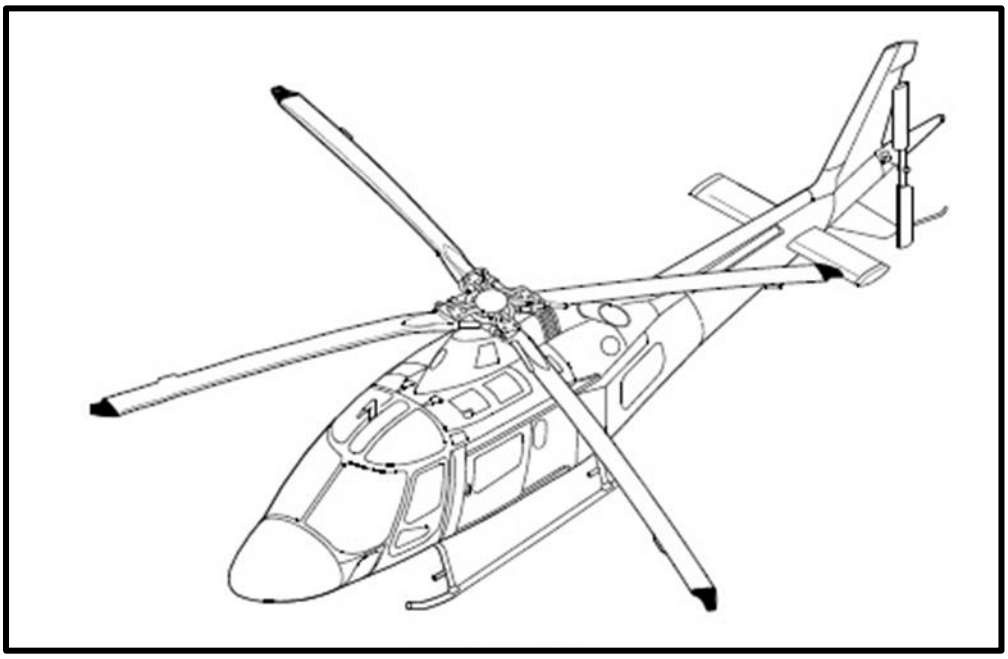
FLIGHT TRAINING INSTRUCTION

FOR

FORMATION FLIGHT

TH-73A



LIST OF EFFECTIVE PAGES

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TOTAL NUMBER OF PAGES IN THIS PUBLICATION IS 92 CONSISTING OF THE FOLLOWING:

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CHANGE SUMMARY

The following changes have been previously incorporated into this document.

CHANGE NUMBER	REMARKS/PURPOSE

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INTERIM CHANGE NUMBER	REMARKS/PURPOSE	ENTERED BY	DATE

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INTRODUCTION TO FORMATION FLIGHT

100. INTRODUCTION

This chapter introduces Student Naval Aviators (SNAs) to the fundamentals of formation flying. The formation syllabus builds on the formation skills learned in Primary Flight training and provides SNAs with a basis of helicopter formation knowledge that will carry forward to fleet mission requirements.

101. FORMATION TERMINOLOGY

The number of aircraft in a formation varies based on mission requirements. A Section is two aircraft in formation, and a Division is three or four aircraft. If a Division has four aircraft, it is subdivided into two Sections. A formation of more than four aircraft constitutes a Flight.

Specific terms describe each aircraft within the flight as well as certain leadership roles amongst the pilots. Every formation has a chain of command. In a Section, one aircraft commander is designated the Section Leader and is responsible for the mission accomplishment. The Section Leader provides guidance for the conduct of the flight via a mission brief and in-flight instructions. All other pilots in the formation are responsible to the Section Leader in carrying out instructions and ensuring mission success. Larger formations may include several Section Leaders, Division Leaders, and a Flight Leader. Leadership positions within the formation are designated prior to mission planning, identified on the flight schedule, and adhered to during the flight unless a pilot becomes incapacitated and is unable to carry out their responsibilities.

Lead refers to the first aircraft in the section. Wing applies to the other aircraft in the section. These titles are positional and may change throughout the flight. The Section Leader will not always be in the Lead aircraft. In training, aircraft trade back and forth between Lead and Wing so that both SNAs can practice flying formation. The Section Leader may elect to fly in the Wing aircraft during operational missions to focus on running the mission rather than navigating. Regardless of position in the flight, the Section Leader is responsible for the ultimate success or failure of the mission.

102. POSITION AND RELATIVE MOTION

Formation flying is nothing more than controlling the relative motion between aircraft. To maintain a fixed position, there can be no relative motion between aircraft. To maneuver safely around Lead, Wing must carefully control the direction and rate of relative motion. Lead is considered fixed, and any movement between aircraft is considered the movement of Wing in relation to Lead. Because Lead is the primary reference for all of Wing's movement, Lead must be as stable as possible.

Wing's position in relation to Lead is described in terms of step-up, bearing, and distance (Figure 1-1). Step-up provides vertical separation between Lead and Wing by providing Wing a slightly

higher altitude than Lead. Bearing and distance are used to describe Wing's position relative to Lead in a horizontal plane.

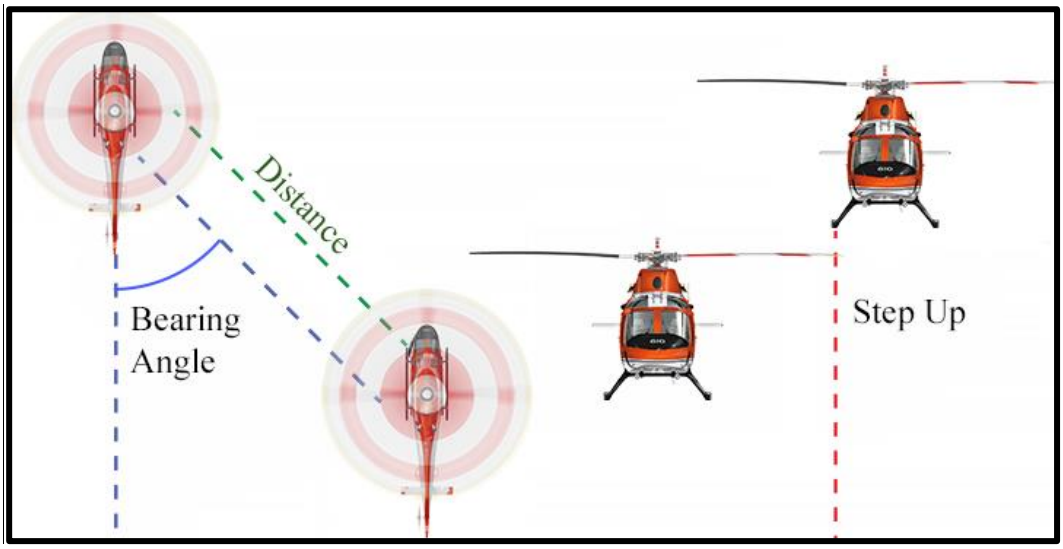

Figure 1-1 Bearing, Distance, and Step Up

103. LEAD AND WING RESPONSIBILITIES

As the name suggests, Lead is primarily responsible for leading the flight. These responsibilities include navigating the flight and making all external radio calls. Additionally, Lead must provide a stable platform and be aware of Wing's position at all times. Wing awareness is critical. Part of Lead's navigation responsibility is to ensure that the entire flight remains within the working area and does not transit through any restricted airspace.

Wing's primary responsibility is to maintain safe separation from Lead. Additionally, Wing must back Lead up in navigation and external radio calls. At Training Wing Five, Wing will initiate all maneuvers over the radio. Lead will respond and execute the prescribed maneuver.

Both Wing and Lead are responsible for the overall safety of the flight. Both aircraft must aid each other in avoiding obstacles, traffic, clouds, or other hazardous weather.

104. FORMATION COMMUNICATION

Clear, concise communication is essential for effective aircraft employment, particularly during formation flights. Communication should be kept as brief as possible but still convey the necessary information. This keeps the formation frequencies clear so that vital information can be passed to the entire flight in a timely manner. To aid in keeping frequencies clear, aircraft in formation use a cadence to respond to directions from within the flight. For example, if the lead aircraft in a Division transmitted, *"Skeeter Flight, break right,"* each member of the flight would respond in a measured cadence such as *"Skeeter 2," "Skeeter 3", "Skeeter 4."* The cadence speeds communication because it informs pilots when to talk and, more importantly, when to listen. All pilots should practice sound communication brevity and cadence. They should listen and respond appropriately to those transmissions that pertain to them.

1-2 INTRODUCTION TO FORMATION FLIGHT

External communications are accomplished with agencies or individuals outside the Section. The Section's external call sign will always be the Section Leader's side number, regardless of which aircraft is in the Lead position. When contacting an agency for the first time, include the number of aircraft in the formation and type of aircraft. For example, *"Mobile Approach, Eight-ball 610, flight of two TH-73s, with request."* All subsequent external radio communications with the same agency will utilize the Section's external call sign followed by the words *"and flight"* to alert the agency that more than one aircraft is associated with the call sign. For example, "Mobile Approach, Eight-ball 610 and flight request vectors to final for the ILS runway 15, full stop, with information Whiskey."

Internal communications are accomplished amongst aircraft in the formation. In the fleet, the external call sign is the same as the internal call sign. For example, a flight using "Skeeter 04" as an external call sign would use "Skeeter Flight" as the internal call sign. However, in the training command, each Section chooses its own internal call sign to avoid confusion when Sections from the same squadron are operating on the same common area frequency. Internal call signs should be two syllables and easy to pronounce. They shall be professional. The Section Leader has the right to veto any inappropriate or unsuitable internal call signs.

Using the internal call sign "Skeeter," the aircraft leading out from the home field will be "Skeeter 1," the second aircraft will be "Skeeter 2," and so on. Aircraft will retain these internal call signs throughout the flight, regardless of which aircraft is in the Lead. When one aircraft directs the other to take an action, the other aircraft will respond using the internal call sign. For example, if the Lead aircraft states, *"Skeeter flight, push button 4,"* the Wing aircraft would respond, "Skeeter 2" or "Skeeter 1," depending on their internal call sign.

105. RADIO CHECK-IN PROCEDURES

Each formation flight begins with a standardized radio check-in to ensure all radios are functioning properly and that all aircraft are ready to continue with the briefed timeline. The lead aircraft initiates the check-in at the designated time. All other aircraft respond with their internal call signs. At South Whiting, Wing will respond to the UHF check-in with aircraft state, souls, and fuel on board.

Example:

Lead – *"Skeeter flight, check-in Victor."*
Wing – *"Skeeter 2"*
Lead – *"Skeeter flight, check-in Uniform."*
Wing – *"Skeeter 2, up and ready, two souls, 900 pounds."*

106. FREQUENCY CHANGES

There are two ways to accomplish a frequency change: a positive switch and an automatic switch.

1. Positive Switch

Initiate positive switches via a radio call. The lead aircraft may direct a positive switch, or it may come as instruction from an external agency, such as Clearance Delivery, Tower, or Approach Control. Utilizing a positive switch ensures all crews hear and comply with the instructions and prevents aircraft from becoming lost among the frequency changes.

Example:

Lead – *"Skeeter flight, push ground."*
Wing – *"Skeeter 2"*
[All aircraft switch to the ground frequency.]
Lead – *"South Ground, Eight-ball 610, flight of two, taxi…"*

2. Automatic Switch

An automatic frequency change occurs at a specific time, location, or action specified in the brief. For example, upon reaching Point Fish, all aircraft will switch to the formation area frequency without direction from lead. This method requires more detailed planning. It depends on every member of the flight taking detailed notes and paying close attention during the flight.

Example:

Lead – *"South Ground, Eight-ball 610, flight of two, taxi…"*
Ground – *"Roger, Eight-ball 610 and flight, taxi to spot…"*
Lead – *"Eight-ball 610 and flight, taxi to spot…"*
[The section taxis as instructed. When lead is 200' prior to the hold short line, both aircraft switch to tower frequency.]
Lead – *"South Tower, Eight-ball 610, flight of two, holding short…"*

Following a frequency change, the flight may or may not conduct a check-in on the new frequency. If a check-in is to be conducted over the radio, it is briefed as a positive check-in. If a check-in will not be conducted, it is briefed as a negative check-in.

3. Check-ins

Check-ins are used on base and common traffic frequencies, such as the formation area common. They are conducted in a similar manner to the initial check-in at the beginning of the flight.

Example:

[All aircraft automatically switch to channel 17 at Point Fish.]
Lead – *"Skeeter flight, check-in Uniform."*
Wing – *"Skeeter 2."*

Check-ins are not conducted on Air Traffic Control (ATC) frequencies to avoid cluttering busy frequencies. When conducting a frequency change, the lead aircraft assumes all the aircraft in the flight have made the switch to the new frequency. The above example of aircraft executing an automatic switch also shows a frequency changes without a check-in. Emergencies are an exception to the no check-in rule. If the flight is experiencing an Instrument Meteorological Condition (IMC) related emergency, particularly Inadvertent IMC (IIMC), the Section Lead will conduct a check-in following the frequency change to Approach.

The type of switch (positive or automatic) has no bearing on whether or not a check-in will be conducted. The only thing that determines a check-in is the new frequency. All switches and check-ins must be covered during the brief. Each frequency change must be delineated as either positive or automatic, followed by either "with a check-in" or "without a check-in."

107. BREVITY CODES

In a congested communications environment, aviators must keep all radio transmissions short while ensuring that everyone on the frequency understands the transmission. Brevity codes allow pilots to convey a great deal of meaning using a simple one- or two-word phrase. These brevity codes are standardized throughout the military to alleviate confusion and provide a common knowledge of critical information during tactical operations. They reduce the time required to transfer information without reducing the quality of information. For example, instead of saying, "I need you to send me the GPS time," a pilot using brevity codes would say, *"Send a Mickey."*

Pilots are required to memorize all applicable brevity terms. Brevity codes are published in the Multi-Service Brevity Manual, MCRP 3-30B.1/NTTP 6-02.1 (Figure 1-2). Individuals should not invent their own brevity codes as it may lead to confusion in critical situations. SNAs should be familiar with the following brevity terms that may be used during training flights.

ABORT	Cease Action/Attack/Event/Mission.
BASE (+/- Number)	Reference Number used to Indicate Such Information as Headings, Altitude, Fuels, etc.
(System) BENT	System Indicated is Inoperative, Cancelled by SWEET.
BINGO	Pre-briefed Fuel State Needed for Recovery.
BLIND	No Visual Contact With FRIENDLY Aircraft/Ground Position. Opposite of VISUAL.
BUSTER	Fly at Maximum Continuous Speed (Military Power).
BUTTON	Radio Channel Setting.
CHECK (Number) LEFT/RIGHT	TURN (Number) Degrees Left or Right and Maintain New Heading.
CLOSING	Decreasing Separation.
CONTACT	Acknowledges sighting of a Specified Reference Point (Either* Visually or via Sensor).
FEET WET/DRY	Flying Over Water/Land.
FRIENDLY	Positively Identified Friendly Aircraft, Ship, or Ground Position.
FUEL STATE (Time)	A Helicopter's Fuel Quantity, Expressed in Hours and Minutes, Before Having to make a Controlled Emergency Landing.
HOLDING HANDS	Aircraft in Visual Formation.
HOME PLATE	Home Airfield or Ship.
JOKER	Fuel State Above BINGO at Which Separation or Event Termination Should Begin.
KICK (Frequency)	Change Radio or Data Link to a Specified Net or Frequency, Typically Used for an Unplanned Change. Also see PUSH.
KNOCK IT OFF	Cease all Air Combat Maneuvers/Attacks/Activities/ Exercises (Training Use Only).
LAME DUCK	An Aircraft in a Minor State of Emergency.
LOOKING	Aircrew Does Not Have the Ground Object, Reference Point, or Target in Sight (Opposite of CONTACT).
OPENING	Increasing Separation.
PIGEONS (Bearing, Range)	Magnetic Bearing and Range to HOMEPLATE.
PLAYMATE	Cooperating Aircraft.
POPEYE	Flying in Clouds or Area of Reduced Visibility.
PUSH (Channel)	Switch to Designated Frequency; No Acknowledgement Required.
SWEET	Equipment Indicated is Operating Efficiently. Cancels BENT.
TERMINATE	In Training, Cease Local Engagement Without Affecting the Overall Exercise.
VISUAL	Slighting of a FRIENDLY Aircraft, Ground Position, or Ship. Opposite of BLIND.

Figure 1-2 Excerpts from the Multi-Service Brevity Manual

108. LOOKOUT PROCEDURES

Each member of a flight crew has an assigned sector of lookout responsibility. Within the limitation of aircraft configuration, the combination of all sectors should provide an overlapping 360-degree Field of View (FOV) (Figure 1-3). A clock code designates horizontal lookout sectors with 12 o'clock oriented on the nose of the aircraft. Vertical sectors shall be designated with reference to the aircraft's perceived horizontal reference plane:

- HIGH is above the aircraft.
- LOW is below the aircraft.
- LEVEL is approximately level with the aircraft.

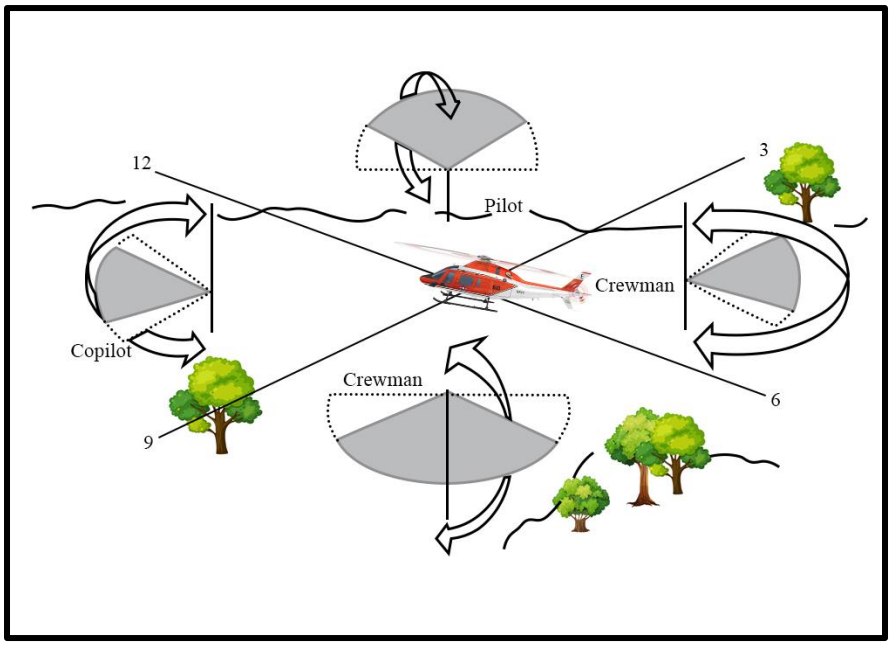

Figure 1-3 Lookout Responsibilities

Individual lookout sectors and responsibilities shall not be modified or relaxed when a helicopter is in a formation. Safety of flight depends on several sets of eyes scanning the same or overlapping sectors. Each crewmember is responsible for the safety of the entire formation, not just an individual aircraft. Clock codes for a formation shall be referenced from lead's 12 o'clock position.

Any pilot that observes a hazard, be it an obstacle, traffic, or an enemy position, must immediately inform the entire flight of the location and type of hazard. If aircrew is on board, they must immediately inform the pilots to relay the information to the rest of the formation. Traffic calls shall be expressed as the relative bearing in clock code and altitude in relation to the aircraft's horizontal reference plane.

Example:

Lead – *"Skeeter flight, fixed-wing traffic, two o'clock high."*
Wing – *"Skeeter 2, visual."*

109. FORMATION RENDEZVOUS

Typically, a flight of aircraft takes off in formation, but there may be some cases in which the flight must join up while airborne. Aircraft may depart a ship separately, or a rendezvous may be required following a loss of visual contact. There are two ways to constitute a flight in the air: a Running Rendezvous and a Carrier Rendezvous.

1. Running Rendezvous

The Running Rendezvous is performed en route, usually shortly after takeoff when the aircraft are close together. Lead maintains a pre-briefed heading, altitude, and airspeed. Wing uses differential airspeed to catch up to lead and join the formation.

2. Carrier Rendezvous

Carrier Rendezvous are used when the aircraft have become separated, or the flight needs to remain in an area for some time. For example, Wing may need to land in a Landing Zone (LZ) while Lead orbits nearby. After taking off from the LZ, Wing would use a Carrier Rendezvous to rejoin Lead.

During a Carrier Rendezvous, Lead orbits in a constant Angle of Bank (AOB), allowing Wing to use radius of turn catch lead and join the formation.

CHAPTER TWO
FORMATION EMERGENCIES

200. INTRODUCTION

When an aircraft in formation has an emergency, it affects every aircraft in the formation, not just the one experiencing the emergency. Formations must work together to ensure the emergency aircraft gets on the ground safely In Accordance With (IAW) NATOPS procedures. The good aircraft crew may aid emergency aircraft by relaying information to Base or ATC, reading checklists over the radio, or looking for a suitable landing site. Depending on the nature of the emergency, the emergency aircraft commander may elect to change positions in the formation. For some emergencies, the emergency aircraft may take the lead. For others, the emergency aircraft may assume a wing position and allow the good aircraft to lead them home. It is up to the emergency crew to determine which position in the formation they would like to take.

201. LOST AIRCRAFT COMMUNICATIONS

If one aircraft in a Section experiences a lost communications (lost comm) situation, the crew should gain the attention of the other crew and alert them to their status. Due to the width of the rotor, helicopters are rarely able to fly in close enough formation to pass hand signals, so lost comm must be indicated by a change in aircraft configuration, such as flashing position lights or turning off the anti-collision lights. Lost comm lighting configurations are usually determined by squadron or wing Standard Operating Procedures (SOP) and shall be discussed in the mission brief.

If the lost comm aircraft is Wing, the crew should pull abeam the lead aircraft and place the aircraft in the lost comm lighting configuration. Lead will acknowledge the situation, usually by mirroring the lost comm lighting configuration. Wing will then return to its position. If Lead is the lost comm aircraft, the crew will place the aircraft in the lost comm configuration. Wing will move abeam the lost comm aircraft and assume the lead. If possible, the good comm aircraft should always be placed in the lead position. Specific lost comm lead change procedures are delineated in (CHAPTER Four).

If an aircraft experiences a lost comm emergency, training will be terminated immediately. The flight will return to South Whiting or an appropriate airfield. Lead will inform all controlling agencies that Wing is experiencing a lost comm emergency and will coordinate a landing and taxi clearance.

202. INADVERTENT INSTRUMENT METEOROLOGICAL CONDITIONS

A flight of helicopters entering a cloud or low visibility environment is considered an emergency situation and should be avoided. Helicopters cannot fly close enough formation to remain in position while in IMC, so the flight must immediately dissolve when the aircraft can no longer maintain safe visual separation.

IIMC maneuvers allow the aircraft to safely gain separation. There are three types of IMC maneuvers based on the surrounding terrain: the Fan Break, the Blue Water IIMC procedure,

and the Mountainous Terrain IIMC procedure. Each type has advantages and disadvantages, but all are designed to allow the crews to gain safe separation as quickly as possible.

1. **Fan Break**

The Fan Break is the most commonly used IIMC break up maneuver (Figure 2-1). It allows flights of multiple aircraft to gain safe separation while avoiding obstacles and terrain.

a. When the flight encounters IIMC, any aircraft calls *"Popeye"* over the radio.

b. Lead calls a base heading and altitude that will keep the flight clear of obstacles and terrain.

c. Wing turns 20 degrees away from the base heading and climbs to 200 feet above the base altitude. Lead turns to the base heading and climbs to the altitude as required.

d. Additional aircraft in the formation turn and climb as appropriate. Dash 3 turns 40 degrees away from base heading and climbs to 400 feet above the base altitude. Dash 4 turns 60 degrees away and climbs to 600 feet above the base altitude.

e. At the completion of the turns, the Section/Division Leader will conduct a check-in. Each aircraft will respond with status (IMC/VMC) and fuel state. The Section Leader will direct the conduct of the remainder of the flight.

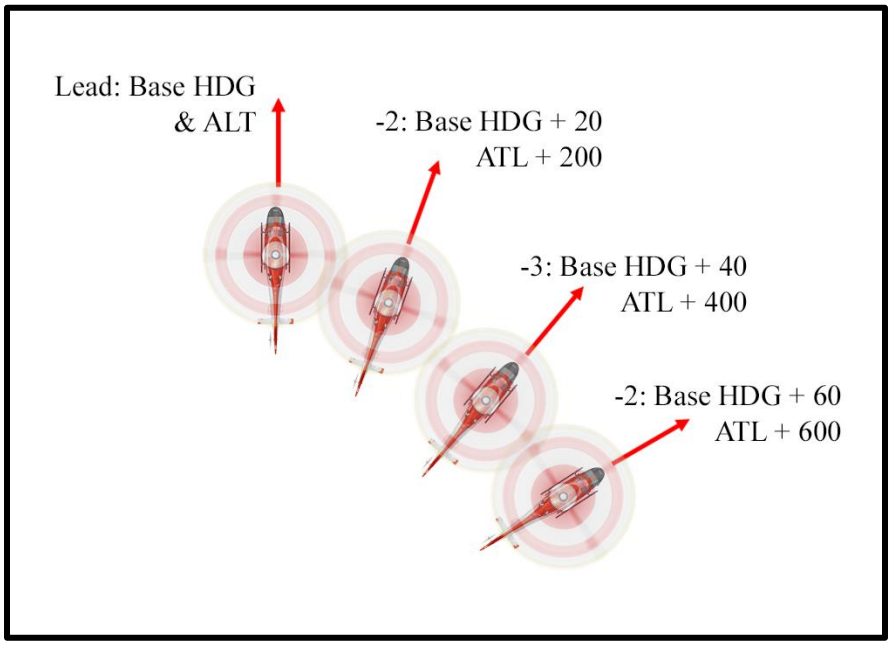

Figure 2-1 Fan Break

2. Blue Water IIMC Procedure

The Blue Water IIMC procedure is used over areas with no obstacles or terrain, such as the open ocean (Figure 2-2). It provides more separation than the Fan Break but does not allow for any formation greater than a section.

a. When the flight encounters IIMC, either aircraft calls *"Popeye"* over the radio.

b. Wing will turn away from the lead aircraft reporting their side and direction of turn. For example, *"Skeeter flight, popeye, right side, right turn."*

c. Lead will respond with the base altitude and heading. Wing will continue the turn and climb to 200 feet above the base altitude.

d. When Wing passes through 90-degrees of turn past the base heading, Wing reports, *"passing through the 90."*

e. Upon hearing Wing's call, Lead will begin a turn in the opposite direction. Both aircraft continue the turn to 170 degrees relative to the base heading or until reaching VMC.

f. At the completion of the turns, the Section Leader will conduct a check-in. Each aircraft will respond with aircraft status (IMC/VMC) and fuel state. The Section Leader will direct the conduct of the remainder of the flight.

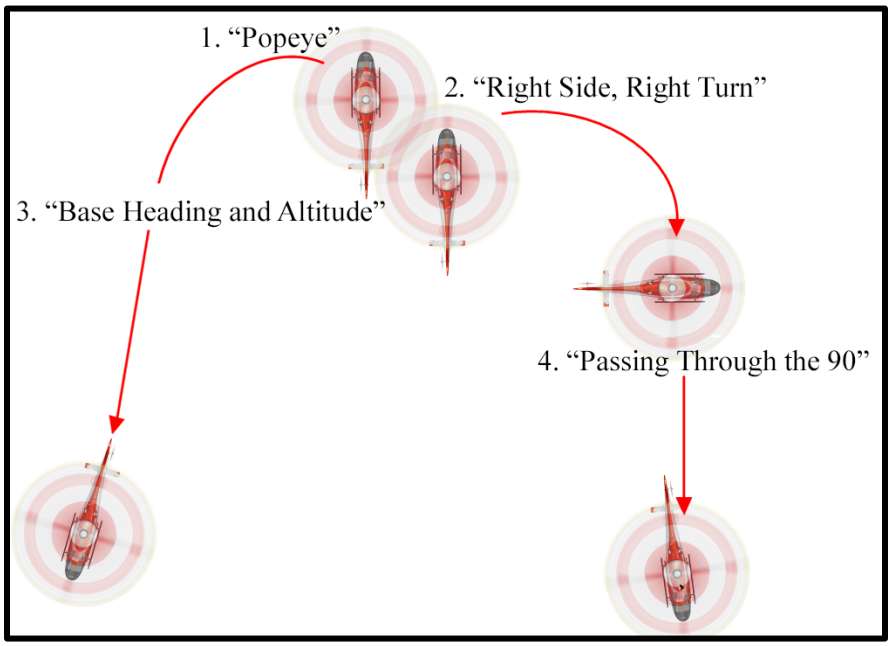

Figure 2-2 Blue Water IIMC Procedure

3. Mountainous Terrain IIMC Procedure

The Mountainous Terrain IIMC procedure is used in areas where maneuvering space is limited, such as a narrow valley or an area with several high mountain peaks (Figure 2-3). Unlike the Fan Break and Blue Water IIMC procedure, the Mountainous Terrain uses varying airspeeds to gain lateral separation instead of turns. This allows all aircraft to maintain a safe heading while gaining separation. However, the Mountainous Terrain procedure requires more planning and places a greater workload on the PAC. It should only be used when necessary.

a. When the flight encounters IIMC, any aircraft calls *"Popeye"* over the radio.

b. Lead calls a base heading, altitude, and airspeed.

c. Wing turns to the base heading while climbing to 200 feet above the base altitude and slowing 20 Knots Indicated Airspeed (KIAS) below the base airspeed. Lead maneuvers to the base heading, altitude, and airspeed as required.

d. Additional aircraft in the formation climb and slow as appropriate. Dash 3 climbs 400 feet above the base altitude and slows to 40 KIAS below the base airspeed. Dash 4 climbs 600 feet above the base altitude and slows to 60 KIAS below the base airspeed.

e. At the completion of the climbs, the Section/Division Leader will conduct a check-in. Each aircraft will respond with aircraft status (IMC/VMC) and fuel state. The Section Leader will direct the conduct of the remainder of the flight.

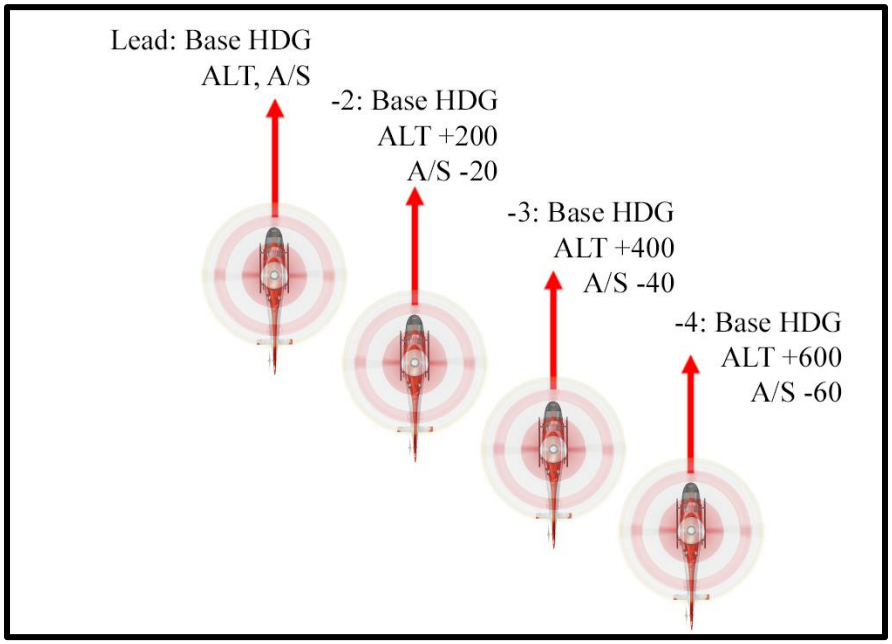

Figure 2-3 Mountainous Terrain IIMC Breakup

2-4 FORMATION EMERGENCIES

Regardless of which breakup procedure is used, it will terminate in one of three cases:

4. **Case 1**

Both aircraft VMC. Join up is at the discretion of the Section Leader. Usually, the lead aircraft will establish an orbit around a ground reference point at the base altitude and Wing will join up on Lead using a Carrier Rendezvous. For a VMC join up, Wing shall remain 200 feet above base altitude until visual contact with lead is established. The flight may continue or return to base at the discretion of the Section Leader.

5. **Case 2**

One aircraft IMC, one aircraft VMC. The Section Leader will conduct a positive switch to Approach with a check-in. The IMC aircraft will coordinate with ATC, and once under positive control, the flight will be dissolved. Both aircraft will return to base separately.

6. **Case 3**

Both aircraft are IMC. The Section Leader will conduct a positive switch to Approach with a check-in. The Section Leader will coordinate with approach, and once both aircraft are under positive control, the flight will be dissolved. Both aircraft will return to base separately.

203. LOSS OF VISUAL CONTACT

If Wing loses sight of Lead, it creates an extremely dangerous situation, and action must be taken immediately. If the PAC on the controls loses site of Lead, they shall verbalize it immediately. If the PNAC still has Lead in sight, the PNAC may take the controls and return the aircraft to a safe position where both pilots have visual contact with Lead.

If both pilots have lost sight of Lead, Wing will announce that they are blind using their own external call sign and side number, *"Lucky 608, Blind."* Wing will then turn away from Lead's last known position and climb 200 feet above Lead's last known altitude. The Section Leader will then coordinate a Carrier Rendezvous between aircraft similar to the one used during Case 1 IIMC.

204. INDIVIDUAL AIRCRAFT EMERGENCIES

When one aircraft in a formation experiences an emergency or systems failure, the crew shall let the Section Leader know as soon as it is safe to do so. As the mission commander, the Section Leader must know if any aircraft in the flight is compromised in any way.

As with any emergency, all troubleshooting shall be accomplished by the PNAC. The PAC must focus on flying. This is particularly important while flying in formation. If the Wing PAC is distracted by troubleshooting, they may not recognize an unsafe position or an excessive rate of closure, resulting in a midair collision. During a few emergencies, particularly those involving flight controls, it is prudent to place the emergency aircraft in the lead. This decreases the PAC's workload and allows the PAC to assist the PNAC in troubleshooting, if necessary. However,

where the emergency aircraft goes in the formation is situationally dependent and at the emergency aircraft Pilot In Command (PIC) discretion.

The non-emergency aircraft crew must be ready to assist the emergency aircraft. This might include communicating and coordinating with external agencies, relaying information to base, searching for suitable Precautionary Emergency Landing (PEL) fields, or even reading checklists. Although they must be prepared to help, the non-emergency pilots must let the emergency crew dictate what help is required. Avoid leaping onto the radios with helpful advice unless it is specifically requested.

During an emergency, the non-emergency aircraft must allow the emergency aircraft room to maneuver. If Lead has an emergency, Wing should gain extra separation. If Wing has the emergency, Lead should fly as straight and level as possible to give Wing a stable platform. Once the emergency has been stabilized, the non-emergency aircraft will determine their position in the flight.

On-Scene Commander

If an aircraft in the Section has an emergency and elects to PEL or suffers an engine failure, the PIC of the remaining aircraft becomes the On-Scene Commander. The On-Scene Commander's responsibility is to contact the appropriate agencies, communicate with the downed crew if possible, assist the Crash Crew in finding the site, and keep other air assets out of the area. At Training Wing Five, the On-Scene Commander's tasks are outlined in the On-Scene Commander's checklist, located in the In-Flight Guide (Figure 2-4).

If the Section comes across a downed aircraft, the Section Leader will be the On-Scene Commander. The Section Leader may keep Wing in the area and have them climb to act as a radio relay or dissolve the flight and send Wing out of the area.

ON-SCENE COMMANDER CHECKLIST
1. Set Bingo Fuel. 2. Record Pertinent Information: a. Fire b. Survivors Seen c. Assistance Currently as Scene d. Access to Zone Via Aircraft and Ground Vehicles e. Determine GPS Coordinates 3. Notify NASWF ODO – UHF 233.7 – Relay information, including GPS Coordinates. If ODO unavailable, relay information to either Whiting Tower. 4. Contact Approach Control Agency for that sector and declare an emergency. Relay information. Inform them you will be on UHF 282.8 and monitoring VHF and UHF Guard Frequencies. 5. Switch to UHF 282.8 – SAR Common Frequency to coordinate as On-Scene Commander. NASWF ODO, Crash Crews, and other rescue ground and air assets will all monitor this frequency. 6. Assign aircraft to assist / Lead Crash Crew to scene as necessary. 7. Control traffic in and around the scene. 8. OSC designates and briefs his/her relief.

Figure 2-4 On-Scene Commander Checklist

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CHAPTER THREE
CRUISE FORMATION

300. INTRODUCTION

This chapter introduces students to the cruise position. It also introduces procedures to control relative motion and maintain a constant position in relation to Lead. Students will learn what it means to be sucked and acute, and how to correct these errors.

301. THE CRUISE POSITION

There are three types of formation: Cruise, Parade, and Combat Cruise. Use Parade formation when aircraft are required to fly in close proximity, and maximum maneuverability is not required. Use Combat Cruise for transiting long distances in a combat environment, as it allows for maximum maneuverability. Parade and Combat Cruise are discussed in detail later in the syllabus. The Cruise position is the most common type of formation because it allows both Lead and Wing the freedom to maneuver while keeping the Section together in a cohesive unit.

Maneuver Description. Cruise is the formation position used as a basis for the formation maneuvers as well as section takeoffs and landings. In Cruise, Wing maintains 10 feet of step-up, three rotor diameters of distance, and the 30-degree bearing line on either side of Lead (Figure 3-1).

Application. In addition to formation maneuvers, Cruise is used to transit long distances in a non-threatening environment. The position is loose enough to allow Lead the flexibility to maneuver as necessary, including climbs, descents, and sharp turns. It also minimizes Wing's workload and conserves fuel by reducing the number of small collective adjustments required to remain in position.

1. Procedures

    a. The cruise position is defined as ten feet of step-up, on the 30-degree bearing line and at three rotor diameters of separation from blade tip to blade tip. Wing is free to operate on either side of Lead but should not be extended for periods of time in the trail position.

    b. Ten feet of step-up is maintained by placing Lead's rotor hub slightly below the horizon, approximately one–two inches or one–three finger widths.

    c. The 30-degree bearing is measured from Lead's six o'clock position, which is defined as the zero-degree bearing. The 30-degree bearing is attained by lining up the near aft cross tube base with the far forward cross tube base, forming a V between the cross tubes.

    d. In the TH-73A, three rotor diameters provide approximately 100 feet of separation between rotor tips. One hundred feet is also the distance between parking spots at South Whiting Field. To maintain three rotor diameters distance, the pilot should just

be able to read the BUNO printed on Lead's tail. With practice, pilots can judge three rotor diameter distances based on how large Lead appears in the windscreen.

e. Cruise formation can be flown at any airspeed. Formation maneuvers are flown at 100 KIAS. At all other times, Cruise formation will be flown IAW course rules.

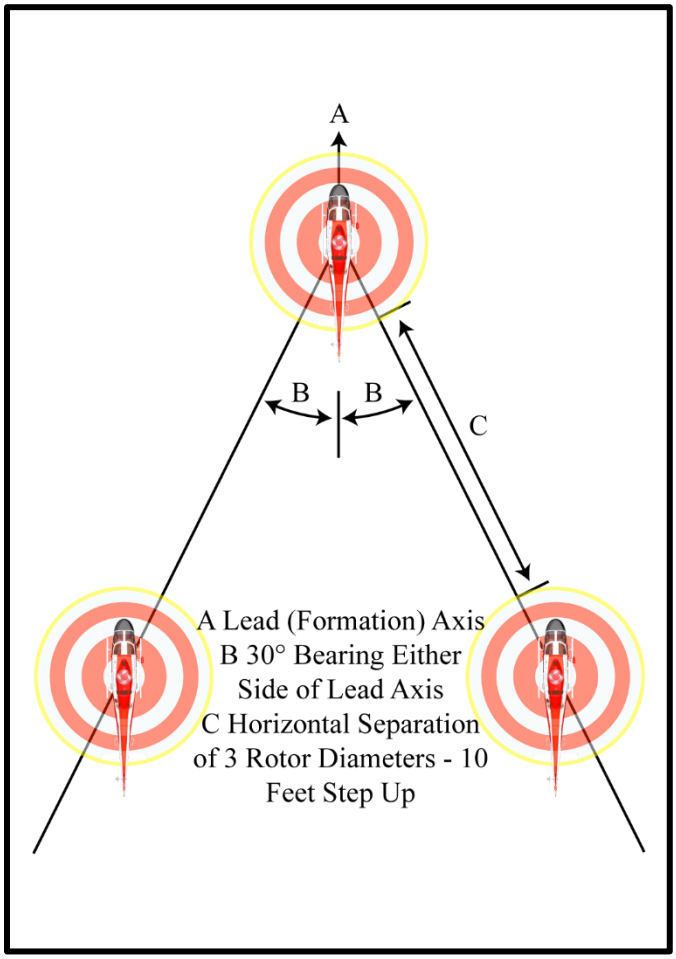

Figure 3-1 Cruise Formation

2. Amplification and Technique

a. Remain relaxed and maintain a light touch on the aircraft controls.

b. Use small, smooth control inputs to maintain position. Flying formation in a helicopter is much like hovering at 100 KIAS. Instead of referencing the ground and surrounding terrain, Wing references Lead but uses the same constant, controlled inputs to remain in a stable position. The key to good formation is anticipation and small, timely corrections about all three axes, just like a hover.

c. Keep the helicopter in trim. It is very difficult to make fine corrections and maintain the position if the aircraft is not trimmed.

d. The Wing PAC shall keep Lead in their scan but avoid staring at one fixed point. Scan different checkpoints on Lead one at a time interspersed with a few seconds of taking in Lead's aircraft as a whole. The PAC must also glance inside from time to time, particularly to scan the ball and ensure the helicopter is in balanced flight.

3. Common Errors and Safety Notes

a. Maintain balanced flight while in formation. Wing PACs tend to kick the ball out and point the nose of the helicopter at Lead. To prevent this, the PAC must frequently scan the ball. Additionally, PACs must remember to turn their heads to look at Lead instead of turning the entire aircraft.

b. When flying in the Cruise Position, all aircraft are operating as a single unit. Lead is responsible for navigating, including keeping Wing away from obstacles and out of restricted airspace. Wing is responsible for maintaining position relative to Lead. However, both aircraft are responsible for the overall safety of flight. Every pilot must speak up immediately if they observe a potential hazard.

c. Lead must be especially alert for traffic and obstacles. Formations are less maneuverable than single aircraft. Formation evasive action must be taken sooner than as a single aircraft.

4. CRM

a. The Wing PNAC must perform all copilot duties so that the PAC can remain focused outside. The PNAC must have an especially vigilant scan because the PAC will be focused on Lead and may not notice traffic or obstacles.

b. During formation flight, CRM must be practiced between aircraft in addition to within individual cockpits. Just as the PNAC backs the flying pilot up in a single ship event, so must Wing support Lead. Wing should back Lead up in navigation, radio calls, and other mission-essential tasks.

c. Lead must maintain good Basic Air Work (BAW). If Lead's air work is erratic and involves many abrupt changes, Wing will have difficulty staying in position and executing maneuvers.

302. MAINTAINING POSITION

Cruise position is maintained through continuous small movements of both the collective and cyclic. When Lead is in a turn, Wing can utilize radius of turn to maintain position as well. Flying formation is not about maintaining a perfect position all the time. Rather, it is about making the constant small inputs necessary to correct back toward perfection. When making adjustments, use three-part corrections:

- Make the corrective input to initiate movement.
- As the helicopter approaches the desired position, take the corrective input out to stop the movement.
- Add about half of the input back in to stabilize in the new position.

Every correction will require a two-part re-correction to maintain the desired position.

1. Sucked

Wing is said to be sucked when it is behind the bearing line. There are two ways to return to the bearing line in straight and level flight: increase power and accelerate back to the bearing line or turn slightly away from Lead and return to the bearing line (Figure 3-2).

To accelerate back to the bearing line, Wing must pull in a little power and move the cyclic slightly forward. The power enables the helicopter to accelerate while the forward cyclic ensures that the helicopter accelerates instead of climbing. Approaching the bearing line, Wing must take the excess power out and adjust the controls as necessary to stabilize in the new position. To turn outboard back to the bearing line, Wing makes a small cyclic input away from Lead. This introduces a slide away from Lead that brings Wing back onto the bearing line. Approaching the bearing line, Wing must make a small cyclic input in the opposite direction to stop the slide and adjust the controls as required to stabilize on the bearing line. When turning outboard back to the bearing line, the pilot may elect to increase power and accelerate slightly to prevent Wing opening too much distance from Lead.

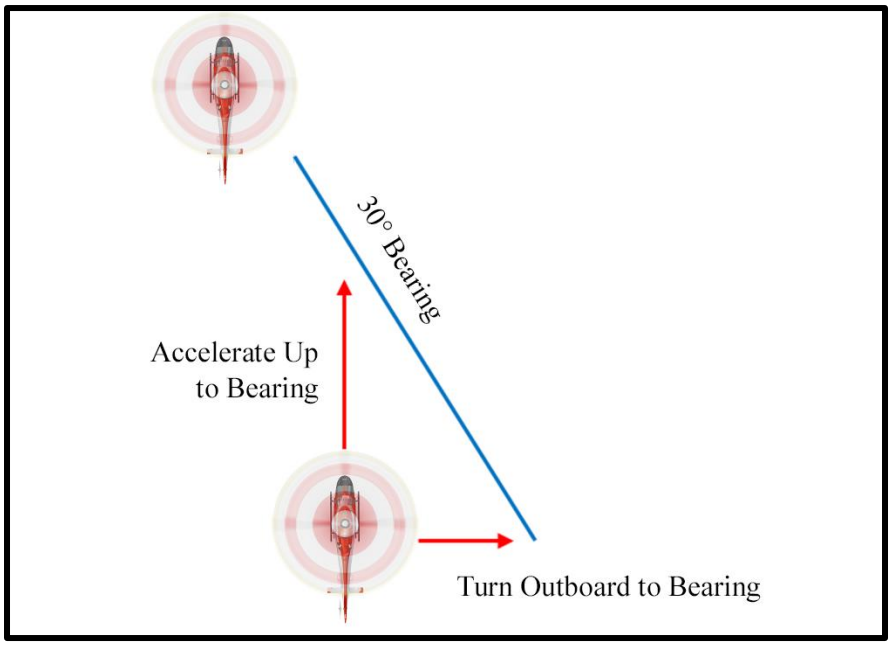

Figure 3-2 Correcting a Sucked Position

2. Acute

Wing is said to be acute when it is ahead of the bearing line. There are two ways to return to the bearing line in straight and level flight: decrease the power and decelerate back to the bearing or turn toward Lead and return to the bearing (Figure 3-3).

To decelerate back to the bearing, Wing must decrease the power and move the cyclic slightly aft. The decrease in power allows the helicopter to decelerate while the aft cyclic ensures that the helicopter decelerates instead of climbing. Approaching the bearing, Wing must increase power to stabilize in the new position. When sliding back to the bearing, Wing may elect to introduce a small amount of cyclic toward Lead to prevent opening too much distance from Lead.

Turning inboard to return to the bearing line from an acute position seems counterintuitive and can be uncomfortable for students learning helicopter formation for the first time. Turning inboard should only be used when there is sufficient distance between Wing and Lead. This technique is often used to correct for acute bearing and excessive distance simultaneously.

To turn inboard back to the bearing line, Wing makes a small cyclic input toward Lead. This introduces a slide toward Lead that brings Wing back to the bearing line. Approaching the correct bearing, Wing must make a small cyclic input in the opposite direction to stop the slide and stabilize on the bearing line.

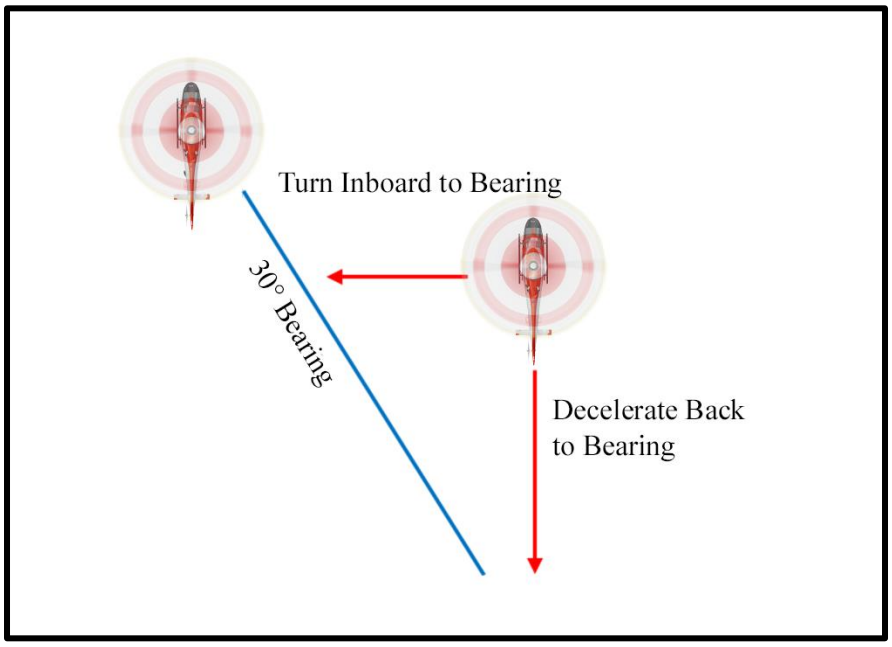

Figure 3-3 Correcting an Acute Position

3. Distance

To correct for distance, Wing must slide along the bearing line using a combination of collective and cyclic inputs. If Wing is too far from Lead, Wing must increase power and add a small cyclic input forward and toward Lead. The increase in power causes the helicopter to accelerate. The forward cyclic ensures that the helicopter accelerates instead of climbing while the lateral cyclic input maintains the helicopter on the bearing line instead of accelerating ahead of it. Approaching the correct distance, the pilot must make small opposite inputs to stabilize in the new position.

If Wing is too close to Lead, Wing must decrease the power and add a small cyclic input aft and away from Lead. The decrease in power allows the helicopter to decelerate. The aft cyclic ensures that the helicopter decelerates instead of descending while the lateral cyclic input maintains the helicopter on the bearing line instead of decelerating behind it. Approaching the correct distance, the pilot must make small opposite inputs to stabilize in the new position.

In Cruise, Wing should strive to maintain the correct distance. As the distance between Lead and Wing increases, it is more difficult to detect and correct position changes. As counterintuitive as it sounds, it is more difficult to fly formation from an increased distance than it is from the correct distance.

Any time Wing is scanning or correcting distance; they must be cognizant of the closure rate. The closure rate is the speed at which the distance between Wing and Lead is decreasing. An excessive closure rate places the formation in a dangerous position. For this reason, distance corrections should always be accomplished in a smooth, methodical manner.

4. Combining Distance and Bearing Corrections

When Wing needs to correct for both bearing and distance, those corrections can sometimes be made using a single maneuver. For example, if Wing is both sucked and close, Wing can turn away from Lead to correct for bearing. The outboard turn will also introduce an increased distance between Wing and Lead, thus correcting both problems. Similarly, Wing can turn towards Lead to correct for bearing if Wing is both acute and too far. The inboard turn will also decrease the distance between Wing and Lead, correcting both problems.

5. Step-Up

Step-up is usually corrected by adjusting the collective. If Wing is low, the pilot should increase collective to initiate a slight climb. Approaching the desired step-up, the pilot should reduce the collective to stabilize. The pilot should avoid gaining step-up by using aft cyclic. The nose-up attitude induced by aft cyclic may make it more difficult to maintain visual contact with lead as the helicopter climbs.

If Wing is high, the pilot should decrease the collective to initiate a slight descent. Approaching the desired step-up, the pilot should increase the collective to maintain the desired position. The PAC should avoid pushing the nose forward to lose excessive step-up. The nose-down attitude will cause the helicopter to accelerate very slightly and may decrease the distance between Wing and Lead.

3-6 CRUISE FORMATION

303. RADIUS OF TURN

When Lead is in a turn, Wing can use radius of turn to maintain and regain position. Wing uses a different AOB from Lead to create a different turning radius. The difference in turning radius allows Wing to open or close distance and vary the bearing line without large collective adjustments. Avoiding large power changes conserves fuel and ensures that both aircraft arrive in the objective area with an equal fuel load. Radius of turn can be used from the outside or inside of Lead's turn and frequently includes a crossover from one side to the other.

If Wing is sucked or long, Wing can turn to the inside of Lead and close the distance or return to the bearing line (Figure 3-4). This technique works regardless of whether Lead is turning toward or away from Wing. If Lead turns away, Wing can crossover behind Lead to gain the advantage of being on the inside of the turn.

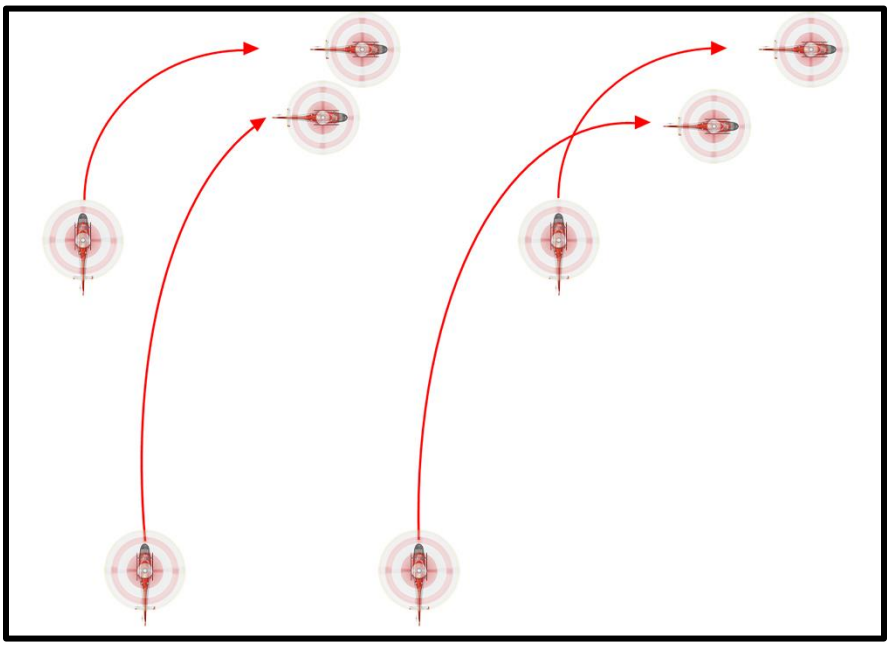

Figure 3-4 Using Radius of Turn to Correct for Excessive Distance or a Sucked Position

If Wing is acute or close, Wing can utilize the outside of Lead's turn to open distance or regain the bearing line (Figure 3-5). This technique works regardless of whether Lead is turning toward or away from Wing. If Lead turns toward Wing, Wing can crossover behind Lead to use an increased radius of turn, thus increasing the distance between the two aircraft.

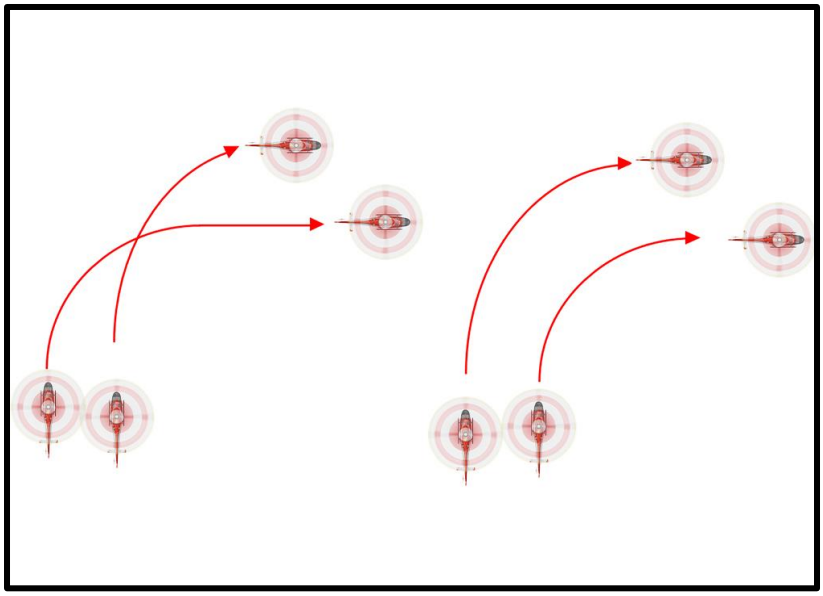

Figure 3-5 Using Radius of Turn to Correct for a Close or Acute Position

In addition to correcting back to the correct position, radius of turn can be used to maintain position as Lead maneuvers (Figure 3-6). This technique preserves fuel and maintains safe separation between Wing and Lead. When Lead executes a long turn toward Wing, Wing can crossover to the outside about halfway through the turn. This enables Wing to maintain the 30-degree bearing line without making a large power reduction to remain on the inside of the turn. When Lead turns away from Wing, Wing can crossover to the inside about halfway through the turn. This enables Wing to maintain the 30-degree bearing line without the significant power increase required to remain on the outside of Lead's turn.

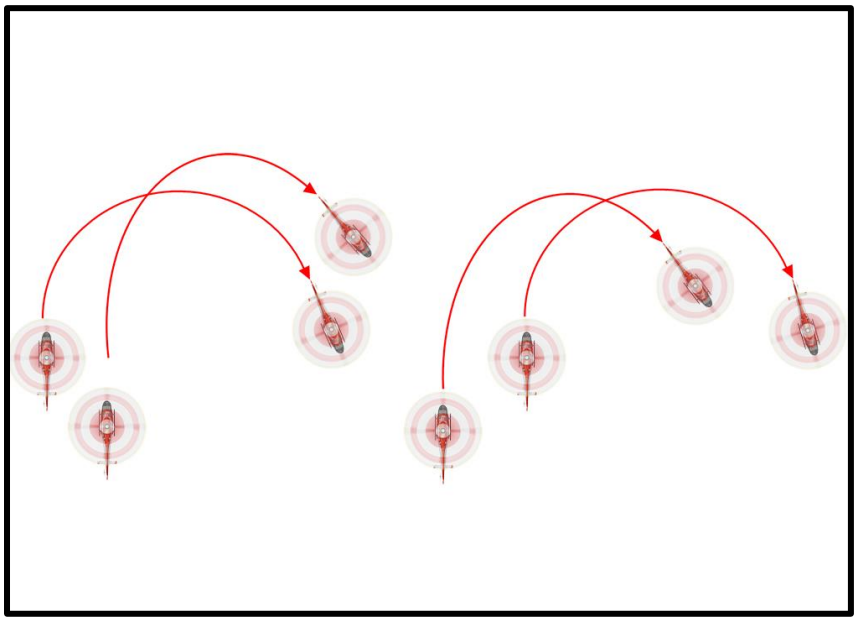

Figure 3-6 Using Radius of Turn to Maintain Position during Turns

CHAPTER FOUR
FORMATION MANEUVERS

400. INTRODUCTION

The chapter describes all the formation maneuvers practiced at South Whiting Field, including those maneuvers that are instructor demonstration only. The maneuvers at altitude, such as crossovers, cruise turns, and climbs and descents are designed as drills to practice radius of turn and the other skills necessary for students to fly a safe, successful section landing.

401. SECTION TAXI

Maneuver Description. In a section taxi, Wing joins Lead on the flight line and taxis in trail at about one rotor diameter distance.

Application. The section taxi enables formation to transit around the airfield as a unit using the same call sign and taxi clearance.

1. Procedures

    a. Lead checks in Wing on UHF and VHF frequencies and then contacts Base. Following one turn in ATIS, Lead makes the initial ground call for both aircraft in the section.

        – *"South Whiting Ground, Factory-hand 610, flight of two, wingman's side number 608, taxi VFR to the East, 2+30, 2 souls each aircraft from spots B6 and C8, with information Zulu."*

    b. Both Lead and Wing must know the other aircraft's position on the ramp prior to taxi. If necessary, determine a specific join-up, also called a marshalling plan. This is especially important if Lead and Wing are far apart or Wing is between Lead and the takeoff spot.

    c. When the section is formed, Wing follows Lead to the takeoff spot. Wing should maintain a comfortable distance behind Lead, approximately one rotor diameter.

2. Amplification and Technique

    a. Wing should take care not to taxi too close to Lead to avoid Lead's downwash. Taxiing in Lead's downwash will make it difficult for Wing to maintain a stable hover and may require excessive amounts of power.

    b. Consider telling the plane captain that the aircraft is part of a Section, which position (Lead or Wing) the aircraft will be taking, and where the other aircraft in the Section is located. This aids the plane captain in determining when the aircraft can takeoff and taxi out of the line in the correct order.

3. Common Errors and Safety Notes

   a. Lead taxis too quickly or does not wait for Wing to takeoff and join up.

   b. Wing taxis too far behind Lead, allowing other aircraft to cut between them and split the section.

4. CRM

   a. The Lead PAC makes all radio calls for the formation.

   b. Wing makes all automatic frequency changes at the appropriate time.

402. SECTION TAKEOFF

Maneuver Description. The section takeoff allows two aircraft to transition to forward flight in formation.

Application. Section takeoffs are the most efficient way for a formation to depart and are used on nearly every formation flight.

1. Procedures

   a. After receiving a takeoff clearance from Tower, Lead notes the windsock and positions the aircraft on the downwind side of the runway. Wing follows Lead onto the runway and assumes the Cruise position on the upwind side of the runway (Figure 4-1).

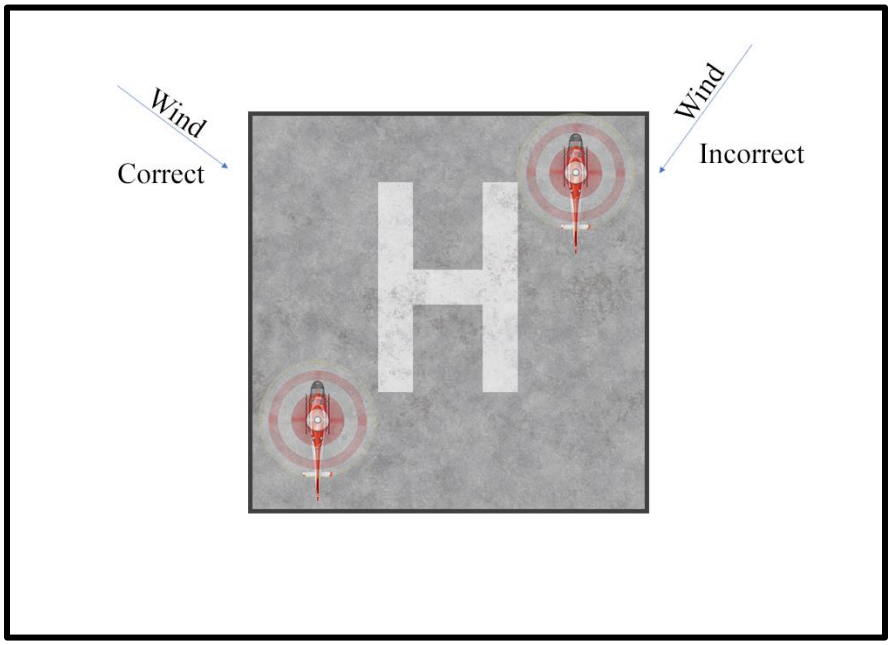

Figure 4-1 Wing's Position Relative to the Wind

b. When in position, both aircraft perform a clearing turn. The clearing turn is accomplished by both aircraft turning 45-degrees toward each other. The pilot on the inboard side of the formation inspects the integrity of the other aircraft and clears their respective side of the section, including the area above and behind. The outboard pilot checks the instruments and Engine Instruments and Crew Alerting System (EICAS). When the pilots have completed their checks, they will indicate that they are ready by turning on the landing and taxi lights.

c. After the ready signal, both aircraft pedal turn back to the takeoff heading. Lead commences a normal transition to forward flight. Wing follows Lead's transition to forward flight while gaining step up and assuming the Cruise position.

2. Amplification and Technique

a. Lead must follow the normal transition to forward flight procedures and avoid gaining excessive altitude at low airspeed. Following a normal profile avoids putting Wing in the caution avoid region of the Height-Velocity (H-V) Diagram and prevents Wing from needing an excessive amount of power to stay in position.

b. Wing must anticipate Lead's transition to avoid being left behind. As soon as Wing sees Lead's tail start to rise, Wing should bring in power to begin their transition to forward flight.

c. Wing must be cognizant of their altitude and airspeed to avoid extended periods of time in the caution/avoid range of the H-V Diagram.

d. Wing shall be established in the cruise position before executing any maneuvers.

3. Common Errors and Safety Notes

a. Lead makes rapid power changes or operates at a continuous high-power setting, leaving Wing behind. Lead must be considerate of Wing by making smooth, controlled control inputs and operating at a moderate power setting.

b. Wing fails to anticipate Lead's transition and gets left behind or entangled in Lead's downwash. When Lead moves the cyclic forward to begin the transition to forward flight, the most obvious indication is the tail rising as the nose pitches down. By watching Lead's tail, Wing will better anticipate Lead's takeoff and avoid being left behind.

c. Wing drifts laterally toward Lead due to a narrow scan, focusing solely on Lead. Wing should actively scan both Lead and the takeoff lane relative to Lead to maintain a solid cruise position during takeoff.

4. CRM

    a. The Lead PAC makes all radio calls for the formation.

    b. Lead and Wing conduct a section clearing turn, indicating their readiness by turning on the taxi and landing lights.

403. CROSSOVER (STRAIGHT AND LEVEL FLIGHT)

Maneuver Description. During a crossover, Wing moves from one side of Lead to the other by way of four distinct positions. In normal cruise, Wing switches sides at will. However, when executing the crossover maneuver, Wing will announce the first crossover.

Application. The crossover maneuver allows Wing to switch sides safely while in Parade Formation. The crossover was adapted to the cruise position to teach students to control relative motion while maneuvering around Lead.

1. Procedures

    a. Wing initiates the maneuver by announcing, *"Skeeter flight, crossover."* Lead acknowledges by responding, *"Skeeter flight, roger, crossover"* prior to Wing commencing the maneuver.

    b. Lead clears the flight and maintains constant heading, altitude, and airspeed. Crossovers are conducted at 100 KIAS (Figure 4-2).

    c. Wing increases step-up to 20 feet while maintaining bearing and distance. Twenty feet of step-up on the 30-degree bearing line is indicated by Lead's far skid tow just touching the bottom of the fuselage. Wing stabilizes in the 20 feet step-up position (Figure 4-3).

    d. After stabilizing, Wing begins a slide to cross Lead's tail by introducing a small cyclic input toward Lead and then returning to wings level. The input should last long enough to gain a small angular distance from Lead's heading, causing Wing to slide behind Lead. Wing must increase power and input a small amount of forward cyclic to increase airspeed. This prevents Wing from falling behind Lead as they crossover.

    e. Wing shall maintain 20 feet of step-up while crossing behind Lead. Lead should slide across Wing's windscreen just above the instrument panel. Twenty feet of step-up can be maintained by dragging Lead's upper tail fin across Lead's Main rotor mast.

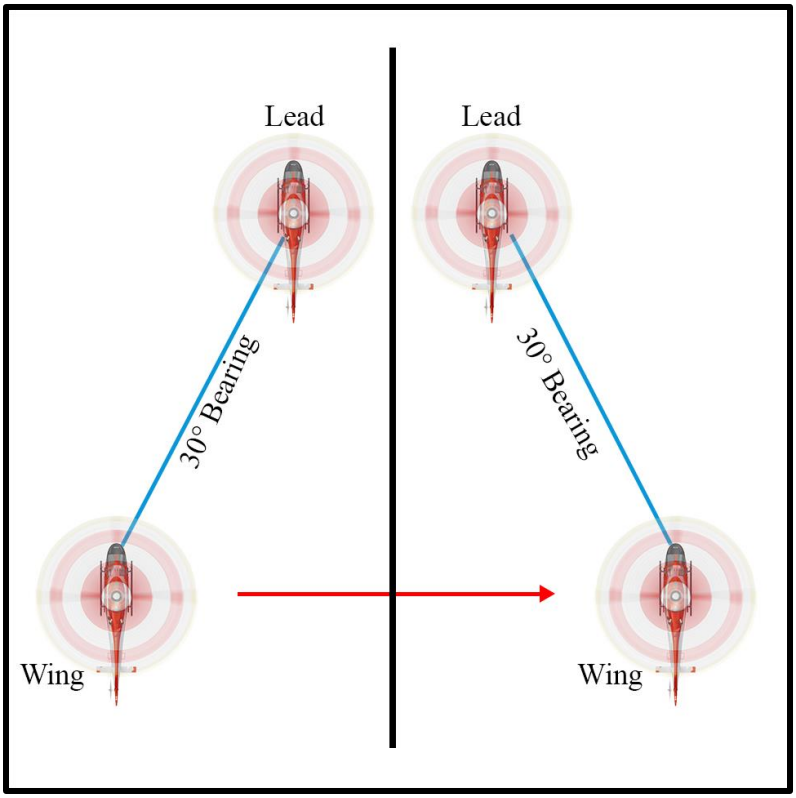

Figure 4-2 Lead Position during Crossover

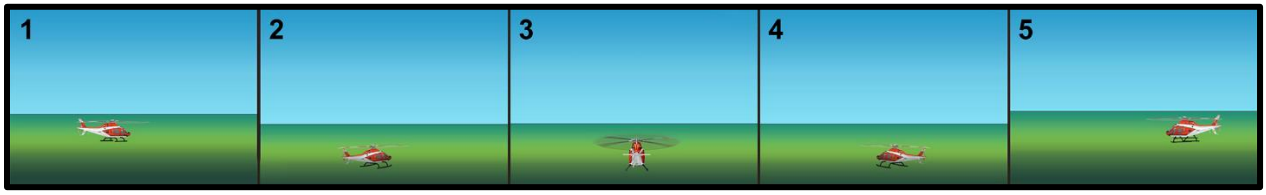

Figure 4-3 Wing Position during Crossover

f. Approaching the opposite 30-degree bearing line, Wing reduces power and makes a momentary cyclic input toward Lead to stop the slide.

g. After stabilizing in the 20 feet step-up position, Wing reduces power to descend to the cruise position.

2. Amplification and Technique

a. Wing need only make the "crossover" radio call once. The maneuver may be repeated as many times as necessary without further radio calls.

b. Wing will not maintain three rotors of distance while crossing over. Wing should cross from one side to the other in a straight line relative to Lead. As Wing passes directly behind Lead, the distance between the two aircraft will decrease slightly and then increase again as Wing assumes the opposite 30-degree bearing.

c. Wing must ensure they slide all the way to the opposite 30-degree bearing line. There is a strong tendency to stop the slide early and descend into a close, sucked position.

d. Lead must provide a stable platform. The more Lead maneuvers, the more difficulty Wing will have remaining in position.

3. Common Errors and Safety Notes

a. Wing must maintain sight of Lead at all times during the crossover. Excessive step-up may cause Wing to lose sight of Lead.

b. Poor power and cyclic control during the crossover will result in excessive aft drift from Wing.

c. Wing may attempt to maintain the same distance from Lead throughout the maneuver resulting in an arc around Lead's tail instead of a straight-line crossover. Wing must bring in a small amount of power and forward cyclic to maintain the proper distance from Lead.

404. CRUISE TURNS

Maneuver Description. During cruise turns, Lead maintains a constant AOB turn while Wing utilizes radius of turn to maneuver around Lead. Both aircraft maintain a constant power setting throughout the maneuver.

Application. Radius of turn is used throughout formation flying to maintain position without adjusting power. The cruise turn maneuver allows Wing to practice using radius of turn principles in a controlled environment (Figure 4-4).

1. Procedures

a. Wing initiates the maneuver by announcing, "*Skeeter flight, cruise turns*." Lead acknowledges by responding, "*Skeeter flight, roger, cruise turns*" prior to commencing the maneuver. Lead should acknowledge Wing's radio call but should not begin the maneuver until the section is in an area with sufficient space to complete the maneuver.

b. Lead clears the flight, checks that the torque is appropriate for 100 KIAS, and smoothly rolls into a 20-degree AOB turn in either direction. Lead maintains altitude with cyclic and keeps a constant power setting. Cruise turns are commenced at 100 KIAS, but airspeed may decrease slightly as Lead establishes the turn. Airspeed should be not be allowed to decay below 80 KIAS.

c. Lead continues the 20-degree AOB turn until Wing calls for a reversal by stating, *"Skeeter flight, reversal."* Lead reverses the turn to 20-degree AOB in the opposite direction. Lead maintains the turn until Wing calls for the next maneuver.

d. Wing maintains the cruise position using radius of turn and flowing from the inside of Lead's turn to the outside and back. As Lead initiates the turn, Wing varies the AOB as necessary to maintain the 30-degree bearing line. If Wing is on the inside of the turn, maintaining the 30-degree bearing causes Wing to close with Lead so that Wing is forced to slide outside Lead's turn. If Wing is on the outside of Lead's turn, maintaining the 30-degree bearing causes Wing to open distance from Lead so that Wing is forced to move to the inside of Lead's turn.

e. Wing continues to flow outside and inside Lead's turn while maintaining a constant power setting. On the inside of the turn, Wing can maintain the 30-degree bearing by placing the tip of the horizontal stabilizer at the base of where the tail boom meets the fuselage. On the outside of the turn, Wing can maintain the 30-degree bearing by placing the edge of the horizontal stabilizer at the top of where the tail boom meets the fuselage.

f. To maintain step-up, Wing keeps Lead's rotor hub in the same position as in cruise: one to two inches below the horizon.

g. When on the inside of Lead's turn, Wing adjusts the AOB to maintain the 30-degree bearing until approaching three rotors distance. At three rotors, Wing levels the wings to flow to the outside of Lead's turn until reading the outside 30-degree bearing. Wing adjusts the AOB to maintain the outside 30-degree bearing until reaching five to seven rotors distance. Approaching five – seven rotors, Wing increases AOB to move inside of Lead's turn and repeats the process.

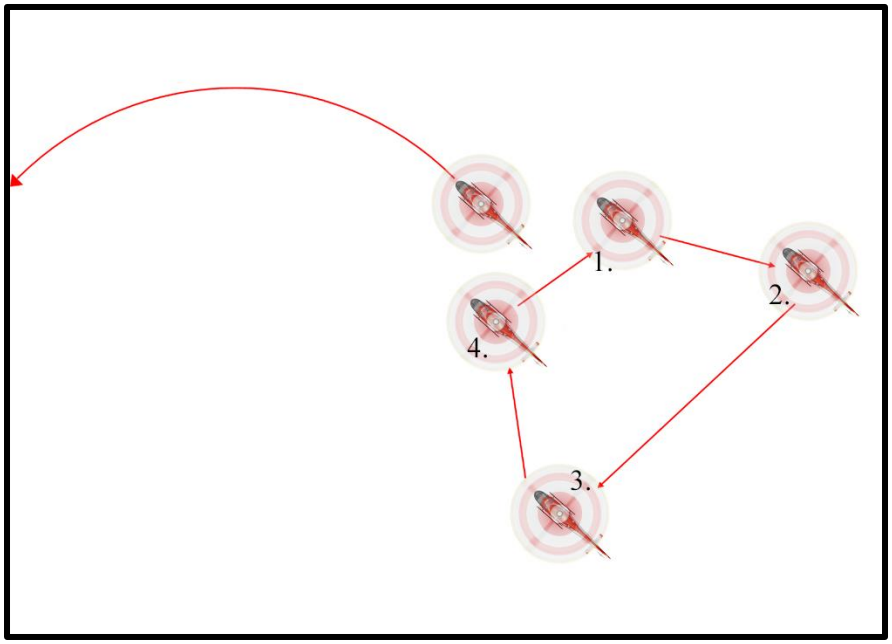

Figure 4-4 Cruise Turns

2. Amplification and Technique

   a. Cruise turns are a smooth maneuver with a constant power setting. There is no call for radical or excessive cyclic inputs.

   b. Wing must anticipate reaching the 30-degree bearings and make an appropriate AOB correction to stabilize in the correct position.

   c. Wing cannot match Lead's AOB and expect closure or separation to occur. If Wing just matches Lead's AOB, Wing will eventually wind up in trail and simply follow Lead around in a circle.

   d. Once established on either the inside or outside 30-degree bearing line, Wing will usually need to maintain a smaller AOB than Lead to stay on the bearing line. The smaller AOB represents a larger radius of turn, thus resulting in closure or separation.

3. Common Errors and Safety Notes

   a. For Wing to perform the maneuver, Lead must present a stable platform throughout the maneuver while utilizing a constant power setting. Prior to commencing the maneuver, Lead should verbalize "check torque" over Internal Communication System (ICS) as a verbal reminder to verify that the current torque setting will maintain 80–100 KIAS in a 20-degree AOB turn.

   b. Lead must constantly clear the flight throughout the maneuver.

c. Lead should initiate the turns smoothly and maintain balanced flight. It is very difficult to fly correct formation off an aircraft out of balanced flight. Lead should maintain altitude using cyclic inputs only, not collective.

d. Wing must maintain proper step-up throughout the maneuver. Excessive step-up can result in loss of visual contact with Lead.

e. Wing must maintain balanced flight to effectively use radius of turn.

f. After stabilizing, Wing must maintain the bearing line. If Wing becomes too sucked, separation will not occur. If Wing becomes acute, particularly on the inside, the closure rate may become excessive, placing the flight in a dangerous situation.

405. CLIMBS AND DESCENTS

Maneuver Description. During climbs and descents, Lead maintains a constant Rate of Climb (ROC) or descent and a shallow AOB turn. Wing maintains cruise position taking care to climb on the inside of the turn and descend on the outside of the turn.

Application. Climbs and descents hone a skill used during en route formation flight and the formation landing pattern. When a turn is not required, Wing matches Lead's power to maintain position. When turning in a climb or descent, Wing should use radius of turn principles to maintain position and alleviate extra power requirements.

1. Procedures

   a. Wing initiates the maneuver by announcing, "*Skeeter flight, climbs, and descents*." Lead acknowledges by responding, "*Skeeter flight, roger, climbs and descents*" prior to commencing the maneuver. Lead should not acknowledge Wing's radio call until the section is in an area with sufficient space to complete the maneuver.

   b. Lead clears the flight, including the airspace above the flight and smoothly increases power for a 500 Feet per Minute (fpm) climb while rolling into a 10–15 degrees AOB turn. Lead reverses the turn to 10–15 degrees AOB in the opposite direction at least once during the climb. Climbs and descents are usually conducted for 1,000 feet of altitude change but may be abbreviated to avoid IMC.

   c. At the top of the climb, Lead stabilizes for a few seconds in straight and level flight. Lead then smoothly decreases power for a 500 fpm descent while rolling into a 10–15 degrees AOB turn. Lead reverses the turn to 10–15 degrees AOB in the opposite direction at least once during the descent. All climbs and descents are accomplished at 100 KIAS.

   d. Wing maintains the cruise position throughout the climb and descent. As soon as they recognize Lead's climb, Wing increases power to match Lead's climb rate and gains the inside of the turn as soon as possible. When Lead reverses the turn, Wing should slide to the inside of the turn on the other side.

e. As soon as they recognize Lead's descent, Wing decreases power to match Lead's descent rate and moves to the outside of the turn as soon as possible. When Lead reverses the turn, Wing should slide to the outside of the turn on the other side.

2. Amplification and Technique

a. During a climb, Wing has a lower power requirement if they are on the inside of the turn. Since Wing is on the inside of the turn, they do not need to travel as far as Lead does so they can maintain a lower airspeed. The lower airspeed gives Wing more excess power with which to climb. Cruise turns provide an opportunity for students to practice maintaining position using a combination of radius of turn and power changes.

b. Being on the outside of the turn in a descent allows Wing more room to maneuver and prevents Wing from becoming trapped inside Lead's radius of turn.

c. Wing must anticipate power changes and transition to a climb or descent without delay. Any delay will cause Wing to fall behind into a sucked position.

d. Both aircraft must scan the ball frequently and remain in balanced flight. It is difficult to fly correct formation off a helicopter that has the ball out during a turn. As Wing, flying in unbalanced flight will increase the power requirement in the climb and make the maintain position more difficult.

3. Common Errors and Safety Notes

a. Prior to commencing a climb and descent, Lead must ensure the section is clear of all surrounding airspace. A portion of the Eastern Formation area is under the Whiting Class C shelf, so before beginning the climb, Lead must ensure that the section is outside of 10 Distance Measuring Equipment (DME) from the Whiting TACAN.

b. Lead must present a stable platform and clear the formation continuously around the turn.

406. BREAKUP AND RENDEZVOUS

Maneuver Description. During a breakup and rendezvous, the flight gains separation via two separate 180 degree turns, resulting in Wing in trail of Lead. Lead will then initiate a turn. Wing will use a combination of radius of turn and power management to return to the cruise position.

Application. The breakup portion of the maneuver mimics the breakup used by sections to gain separation prior to landing at an airfield or on the boat. The rendezvous portion allows the students to practice using radius of turn in a carrier style rendezvous.

1. Procedures

a. Wing initiates the maneuver by announcing, "*Skeeter flight, breakup, and rendezvous*." Lead acknowledges by responding, "*Skeeter flight, roger, breakup and*

rendezvous" prior to commencing the maneuver. Lead should not acknowledge Wing's radio call until the section is in an area with sufficient space to complete the maneuver.

b. After clearing the formation and receiving the ready signal (Wing stating "*Skeeter, ready right/left side*" over the radio), Lead commences a 30- degree AOB turn away from Wing. Lead will maintain altitude, airspeed, and 30 degrees AOB through 180-degrees of turn.

c. As Lead breaks, Wing adopts an integrated scan and focuses on their own BAW. When Lead passes through 45 degrees bearing from Wing's nose, Wing commences a 30-degree AOB turn in the same direction as Lead for 180-degrees of turn. The 45-degree bearing can be identified when Lead passes through the doorframe between the windscreen and the pilot doors on either side.

d. After both aircraft have completed their 180-degree turns, the formation will be in an extended trail position with approximately 800–1,000 feet of separation. Wing will reacquire Lead and maneuver to place Lead on the horizon.

e. When established in trail and ready to begin the rendezvous, Wing signals Lead by stating the flight's internal call sign and keying the radio twice, *"Skeeter, (click) (click)."*

f. Upon hearing Wing's signal, Lead turns in either direction to commence the rendezvous. Lead begins the turn by flashing to 20 degrees AOB momentarily and then stabilizing at 10 degrees AOB. Lead will maintain 100 KIAS and 10 degrees AOB for 180-degrees of turn.

g. Wing immediately turns inside Lead's turn and uses radius of turn to affect the join up. Wing establishes themselves on Lead's 45-degree bearing and maintains the bearing using AOB. Wing uses only small power changes to maintain 100 KIAS. The 45-degree bearing line can be difficult to judge at a distance, but if Wing points the nose of the aircraft at Lead's sliding door, they will be close to the 45-degree bearing and can make finer adjustments as the distance decreases. During this portion of the maneuver, Wing maintains Lead just below the horizon.

h. Approaching three rotor diameters, Wing slides back to the 30-degree bearing line, gains step-up, and adjusts power and AOB as necessary to stabilize in the cruise position on the inside of the turn.

2. Amplification and Technique

a. Both aircraft must focus on BAW during the breakup phase. Since the aircraft have split up, Wing can stop focusing on Lead and adopt an integrated scan. If either aircraft fails to maintain 30-degrees AOB throughout the turn, Wing will have difficulty getting established in the trail position.

b. As Wing closes during the rendezvous, they may adjust airspeed to affect a timely

join-up. Generally, 100 KIAS works well to allow Wing to slide into position just as Lead rolls out. If Wing accelerates above 100 KIAS, they must be prepared to decelerate to join on Lead on the inside of the turn.

c. When Wing is established on the 45-degree bearing, Wing must reduce the AOB to increase their radius of turn and allow closure. This may require that Wing level the wings or even turn toward Lead for a few seconds. If Wing becomes too acute, large, rapid control inputs will be required to achieve cruise position.

3. Common Errors and Safety Notes

a. As Wing approaches three rotor diameters, they must achieve 10 feet of step-up to allow for a safe overrun if necessary. Proper step-up is achieved by keeping Lead's rotor hub one to two inches below the horizon.

b. If closure rates become uncomfortable or excessive, Wing should not hesitate to execute and overrun.

407. OVERRUN

Maneuver Description. During an overrun, Wing transitions to the outside of Lead's turn during a rendezvous.

Application. Overruns can be used to move Wing into a safe position following a rendezvous if Wing approaches Lead with an excessive closure rate. It allows Wing to remain clear of Lead, avoiding potential midair collisions. Additionally, pilots may approach a rendezvous with the intention of executing an overrun to establish themselves in the cruise position on the outside of the turn.

1. Procedures

a. As Wing approaches Lead, Wing increases power to achieve 20 feet of step-up and levels the wings. Leveling the wings allows Wing to slide to the outside of Lead's turn.

b. Upon reaching the outside of Lead's turn, Wing adjusts power and cyclic as necessary to stabilize in the cruise position.

c. After Wing has completed the maneuver and established a safe position, Wing announces, *"Skeeter flight, Overrun"* over the radio.

2. Amplification and Technique

a. Wing must gain the 20 feet of step-up using power, not aft cyclic. If Wing uses cyclic to climb, they may lose sight of Lead due to the nose-up pitch attitude.

b. The 20 feet of step-up uses the same benchmarks as the Crossover: far skid toe touching the fuselage and anti-collision light passing through the middle of Lead's main rotor hub.

3. Common Errors and Safety Notes

a. As soon as a closure rate becomes uncomfortable, Wing should not hesitate to execute an overrun.

b. Never underrun Lead or pass below Lead.

c. Wing must not lose sight of Lead during the overrun. If Wing loses sight of Lead, the flight shall execute Loss of Visual Contact procedures.

408. LEAD CHANGE

Maneuver Description. The Lead Change transfers the lead position from one aircraft to another.

Application. In training, Lead Changes are conducted so that both students can practice flying as Wing. In the fleet, Lead Changes may be done due to mission requirements or because Wing has moved in front of Lead during dynamic Tactical Formation (TACFORM) maneuvering. All Lead Changes require precise communication between aircraft, usually over the radio. However, Lead Changes can be conducted via visual signals, such as changing the aircraft configuration.

1. Procedures

a. Wing initiates the maneuver by announcing *"Skeeter flight, Lead Change."* Lead acknowledges by responding, *"Skeeter flight, roger, Lead Change."*

b. Both aircraft ensure that the pilot on the inboard side of the section is the PAC. Lead maintains a constant heading, airspeed, and altitude. Wing increases the lateral separation and increases airspeed to move abeam Lead.

c. Approaching the abeam position, Wing transmits, *"Factory-hand 608 in position for the lead."* When Wing is abeam, and Lead has visual contact with Wing, Lead states, *"Factory-hand 608, you have the lead."* The new Lead replies, *"Roger, Factory-hand 608 has the lead."*

d. The new Wing drifts back to the 30-degree bearing while maintaining lateral separation. The new Lead maintains a constant heading, altitude, and 100 KIAS while Wing stabilizes in the cruise position.

e. The Lead Change on Deck is executed the same way, except in a taxi. Lead can remain on deck or in a stable hover while Wing gains safe lateral separation and taxis past Lead. Like the Lead Change at altitude, the PAC must be the pilot on the inboard side of the formation. The radio calls remain the same. After the Lead

Change, the new Lead will taxi far enough forward to place Wing on the 30-degree bearing.

2. Amplification and Technique

   a. Wing should not delay when making the first radio call. If Wing makes the call late, they may be ahead of Lead before the Lead Change is complete. Practicing the radio calls on the ground while walking past one another will greatly improve lead changes in the aircraft.

   b. As soon as the Lead change is complete, the new Lead must focus away from the new Wing and concentrate on aviating for the section.

   c. The new Wing must anticipate the 30-degree bearing line to avoid drifting into a sucked position.

   d. Following a Lead Change on Deck, Wing may elect to switch sides to gain the proper upwind position from Lead. To switch sides and remain in the lane, both aircraft will pedal turn 90 degrees toward each other. After ensuring safe lateral separation, they will taxi past each other, placing Wing on the correct side. When both aircraft are established, they will pedal turn back to the takeoff direction. Lead will turn 270 degrees in order to maintain sight of Wing throughout the turn and guarantee tail rotor clearance.

3. Common Errors and Safety Notes

   a. Neither aircraft should rush a Lead Change. Wing must avoid rapid closure rates and must maintain sight of Lead until the Lead Change is complete.

   b. Relative motion should not stop during the maneuver. If relative motion stops, both PACs may be staring at the other aircraft while holding an abeam position. Not only is this not the correct cruise position, but it is also very dangerous. Two pilots flying form of each other's aircraft tend to drift toward each other, creating an unrecognized closure rate.

409. FORMATION LANDINGS

Maneuver Description. Section Landings enable the flight to conduct pattern work and landings simultaneously. Wing uses radius of turn principles practiced during cruise turns and the skills utilized during climbs and descents to maintain position on Lead's upwind side throughout the pattern. The pattern is flown at 500 feet and 80 KIAS. Approaches may terminate in a hover or a no-hover landing.

Application. Section Landings enable the Section Lead to maintain formation integrity all the way to the ground. The ability to land in formation is vital to all assault support mission because it enables the pilots to best support the ground element's Scheme of Maneuver.

1. Procedures

    a. When complete in the working area, Wing initiates the maneuvers by announcing *"Skeeter flight, Section Landings."* Lead acknowledges by saying, *"Skeeter flight, roger, Section Landings,"* and then proceeds to the appropriate OLF via course rules.

    b. Radio calls at the OLF remain the same as singles ship operations except for the splitting call. When Lead makes the splitting call, the PAC must include the Wingman's side number as well. *"Harold, Factory-hand 610 and flight, wingman side number 608, splitting to the right, FRM4002A."*

    c. Throughout the pattern, Lead utilizes the normal approach procedures in the Familiarization FTI.

    d. In the crosswind turn, Lead will climb at a normal 70 KIAS. Wing crosses over once, roughly 90 degrees through the turn. The pattern crossover should be similar to the maneuver Wing conducted when Lead reversed the turn during climbs and descents. As soon as Lead rolls out of the turn, Wing must adjust power to maintain position in straight and level flight without the aid of radius of turn.

    e. In the downwind, Wing will be on the upwind side of Lead in the cruise position. Wing remains in that position until Lead begins to descend. Wing maintains the cruise position on Lead's upwind side throughout the descending turn to final by crossing over once approximately 90 degrees through the turn. When Lead rolls out on final, Wing must adjust power immediately to maintain position without using radius of turn.

    f. At approximately 100 feet Above Ground Level (AGL) on final, Wing should begin to divide their scan between Lead and the landing lane. At approximately 50 feet AGL, Wing should start to pick out a specific landing point. At 25 feet AGL, Wing should confirm their landing point based on Lead's trajectory and then focus on landing the aircraft safely. Wing should maintain step up until very short final to allow Lead room to maneuver or wave-off if necessary.

2. Amplification and Technique

    a. Lead must make smooth, controlled power inputs throughout the pattern and strive to remain predictable. The smoother and slower Lead's control inputs, the easier it will be for Wing to remain in position. This includes shooting a shallow enough glideslope that Wing is not required to make sudden power or pitch attitude changes to remain in position. Lead should attempt to conduct the approach with a consistent deceleration rate from the time the section rolls out on final until landing. This will ensure that Wing does not need to make any radical control movements on final.

    b. As Lead turns to final, Wing must utilize both power and radius of turn to remain in position. Wing must be aware of what power changes will be needed as they crossover. For example, if Wing is crossing over to the inside of Lead's turn, they will have the advantage of a shorter distance to fly. However, Lead is also

descending and decelerating, so Wing may need a large power reduction to remain in position without getting ahead of Lead. When Lead rolls out, Wing will need to bring in a great deal of power to maintain position because they will no longer have the advantage of radius of turn. Likewise, if Wing is crossing over to the outside of Lead's turn, Wing will need more power and airspeed to maintain position because they have further to fly. When Lead rolls out, Wing will have to reduce power to avoid overtaking Lead.

c. Because of the intricacies of maintaining position while turning final, Wing must always be aware of how much energy is on the aircraft. Is airspeed high or low? Does Wing have too much step up, creating an excess of potential energy? On final, how will Wing adjust the aircraft's energy state to roughly match Lead's? If Wing is in a high energy state as Lead rolls out on final, Wing must dissipate that energy by reducing power and slowing down to stay in position. If Wing is in a low energy state, Wing must be ready to adjust enough power to stay in position without overtaking Lead.

3. Common Errors and Safety Notes

a. A wave-off shall be conducted anytime an unsafe situation develops. Unsafe situations include, but are not limited to, obstacles or traffic in the landing lane, Wing overtaking Lead on final, or Wing losing sight of Lead in a turn.

b. On final, Wing must avoid Lead's downwash to prevent excessive power requirements close to the ground.

c. Wing must keep Lead in sight at all times throughout the pattern. If Wing loses site of Lead, Wing shall execute a wave-off.

410. FORMATION HIGH-SPEED APPROACHES

Maneuver Description. During a high-speed approach, the formation remains at 80 KIAS until reaching 100 feet AGL on final. At 100 feet, both aircraft decelerate until achieving the desired glideslope. Section High-Speed Approaches may terminate in a hover or no-hover landing.

Application. The Section High-Speed approach allows the student to practice energy management while in close proximity to another aircraft.

1. Procedures

a. Wing initiates the maneuver by announcing, *"Skeeter flight, Section High-Speeds."* Lead acknowledges by stating, *"Skeeter flight, roger, Section High-Speeds."* Prior to the downwind, Lead will make the traffic call required by the Rotary-Wing Operating Procedures (RWOP) prior to high-speed approaches.

b. The section will conduct a normal takeoff and downwind. From abeam the downwind field boundary, Lead will begin a descending turn to arrive on final at 100 feet and 80 KIAS.

c. At 100 feet, Lead levels off by raising the collective and adding a small amount of forward cyclic to maintain 80 KIAS. Lead delays for two seconds at 100 feet and 80 KIAS to allow Wing time to stabilize in position at 100 feet. Lead will then lower the collective and add aft cyclic to slow the helicopter while maintaining 100 feet until intercepting a steep approach profile at an airspeed conducive to a no hover landing. As the helicopter slows below translational lift, the pilot must add power to maintain 100 feet.

d. When on the steep approach glideslope, Lead will adjust the nose attitude forward to stop the deceleration and continue to a no hover landing.

e. As Lead turns to final, Wing maintains cruise position using radius of turn and power as necessary. Wing crosses over approximately 90 degrees through the turn to maintain Lead's upwind side. Since Lead is not decelerating on the turn to final, Wing's crossover will resemble the crossover utilized during climbs and descents.

f. On final, Wing should establish the cruise position as soon as possible with a similar energy state to Lead. When Lead begins the deceleration, Wing decelerates as well. Wing will need to make a greater power reduction than Lead to avoid overtaking Lead as the helicopters slow. During the deceleration, Wing should maintain Lead in a constant position in the windscreen. As Wing slows below translational lift, they must add power to avoid sinking below Lead.

g. When Lead's nose rocks forward, Wing intercepts their own steep approach profile and scan for an intended landing point. At 25 feet, Wing scans Lead and matches their rate of descent. Wing then focuses on executing their own no-hover landing.

2. Amplification and Technique

a. Just as with Section Approaches, Lead must make smooth control inputs. If Lead makes rapid, abrupt control inputs, particularly during the deceleration, Wing will struggle to maintain position.

b. Lead must use power to level off at 100 feet. If Lead uses aft cyclic to maintain altitude, they will begin to slow down prior to the deliberate deceleration.

c. After decelerating, both aircraft must bring in power to maintain 100 feet. Without additional power, Lead will settle and be unable to achieve the desired steep approach. If Wing does not add power, they will settle below Lead and may fly into Lead's downwash, causing an increase in power required.

3. Common Errors and Safety Notes

a. Lead must pause at 100 feet prior to initiating the deceleration. This allows Wing time to bleed off any excess energy and stabilize in the cruise position. If Lead does not pause, Wing will likely pull abeam or even pass Lead during the deceleration.

b. During the deceleration, Wing must maintain separation from Lead. If Wing constantly scans Lead, there is a strong tendency to drift toward Lead. To avoid this, Wing should scan Lead and occasionally look forward down the landing lane to avoid lateral drift.

411. SECTION WAVE-OFF

Maneuver Description. In a Section Wave-off, aircraft from a formation discontinue an approach, either as individual aircraft or in formation.

Application. Section Wave-offs are to be used anytime an unsafe situation develops during an approach. This can be due to an obstacle in the landing lane or Wing losing sight of Lead during the approach or getting into an unsafe position. The Section Wave-off shall be executed when someone, either external or internal to the flight, directs the entire section to discontinue their approach.

1. Procedures

   a. When any person, either internal or external to the flight, calls for a wave-off, both aircraft initiate the maneuver.

   b. Lead and Wing make the appropriate internal radio calls.

   c. Lead and/or Wing PACs increase collective to arrest the rate of descent and establish a 70 KIAS, 500 fpm ROC.

   d. When established in the climb, Lead makes the external radio call.

   e. Wing maintains cruise position throughout the maneuver. If Wing waves off single ship, Wing will establish safe lateral separation from Lead and execute a climb out, making their own radio calls.

2. Amplification and Technique

   – There are three scenarios in which a wave-off may be called.

      i. Scenario 1: When someone external to the section makes the wave-off call. Lead will make the internal call, *"Skeeter flight, wave-off."* Wing will echo the internal call, *"Roger, Skeeter flight, wave-off."* Both aircraft execute the wave-off and Lead will make the external call, *"Harold traffic, Factory-hand 610 and flight, waving off lane three."*

      ii. Scenario 2: Someone internal to the section calls for a wave-off. The other aircraft will echo the internal call. Both aircraft will wave off and Lead will make the external call.

      iii. Scenario 3: Wing waves off single ship. Wing will make one call using their own side number and the side on which they will be passing Lead, *"Factory-*

hand 608 waving off, right side." Lead will continue to a landing. When established in the climb, Wing will make the appropriate traffic call using their own side number, *"Harold traffic, Factory-hand 608 waving off, lane 3."*

3. Common Errors and Safety Notes

   a. When executing a wave-off, the PAC should be the pilot with the greatest Situational Awareness (SA). If Wing is executing a wave-off single ship, the crew may consider transferring controls to the pilot nearest Lead to ensure safe lateral separation.

   b. When executing a section wave-off, Wing must remain in cruise position. Lead should make smooth control inputs and avoid any rapid increase in power to avoid making it more difficult for Wing to remain in position.

412. PARADE FORMATION

Maneuver Description. Parade formation is flown on the 45-degree bearing with 10 feet of step up and one rotor diameter of lateral separation.

Application. Parade formation is used when Wing must fly a fixed bearing off Lead in close proximity. It is often used when entering and leaving congested airspace or when arriving and departing from a ship. Parade formation will be demonstrated by the instructor only and shall be discussed in the brief or specifically announced over the radio.

1. Procedures

   a. Wing initiates the maneuver by stating, *"Skeeter flight, parade"* over the radio. Lead acknowledges by responding, *"Roger, Skeeter flight, parade."*

   b. Wing adjust the controls as necessary to achieve the 45-degree bearing with 10 feet of step-up and one rotor diameter of lateral separation.

   c. The 45-degree bearing is recognized by placing the aft sliding door seal above the top of the far forward cross tube. Ten feet of step-up is maintained by keeping Lead's rotor head 1–2 inches below the horizon.

2. Amplification and Technique

   – In parade formation, Lead and Wing are too close for Wing to use radius of turn. To remain in position, Wing must rely on adjusting power.

3. Common Errors and Safety Notes

   a. Wing must be prepared to adjust power quickly to avoid becoming excessively sucked or acute. Since Wing cannot rely on radius of turn, Wing must make larger power adjustments to remain in position when rolling into and out of a turn.

   b. If Wing's position becomes uncomfortable, Wing should execute an overrun or decrease power to gain increased separation between aircraft.

413. HOME-FIELD BREAK

Maneuver Description. During the home-field break, Lead and Wing use large AOB turns to gain separation prior to entering the landing pattern. The maneuver results in Wing landing in trail of Lead.

Application. The home-field break is used anytime a formation must gain separation prior to landing. The break is frequently used when operating at a ship because helicopters cannot land in formation on a ship deck.

1. Procedures

    a. Lead will request the home-field break prior to entering Class C airspace.

    b. The section shall maneuver to attain 300 feet AGL and 100 KIAS prior to crossing the approach end of the runway. Wing will maintain parade formation on the opposite side of the break turn. At South Whiting, all breaks shall turn away from the control tower.

    c. As the section crosses the intended point of landing, Lead will break away from Wing by executing a level turn to arrive in the downwind at 300 feet AGL and 70 KIAS.

    d. As Lead passes through Wing's 45-degree bearing, Wing will break in the same direction as Lead. When Wing has completed the 180 degree level, decelerating turn, the formation will be in an extended trail position.

    e. At the abeam position, each aircraft will individually execute a normal approach to the intended point of landing. Wing will land in trail of Lead.

2. Amplification and Technique

    – As Wing rolls out of final, they must be cognizant of how much energy is on the aircraft. If Wing is carrying too much energy in the form of airspeed or altitude, they may overtake Lead on final.

3. Common Errors and Safety Notes

    – The PAC shall not exceed NATOPS AOB limitation when conducting the home-field break.

414. SECTION IIMC

Maneuver Description. Section IIMC is a breakup maneuver that allows formation aircraft to gain separation in the event that the flight enters a cloud or other area of reduced visibility. The instructors will demonstrate an IIMC scenario in the simulator with the student on the controls.

Application. Formations never plan to enter IMC, but it may happen for one of several reasons including clouds, rain, smoke, fog, blowing dust, or snow. Every formation must be prepared to

execute one of the IIMC procedures delineated in CHAPTER Two. The procedure to be used shall be described during the section brief.

1. Procedures

    a. When IMC is encountered, either aircraft calls "*Popeye*" over the radio.

    b. Both aircraft execute the IIMC procedure that was briefed during the formation brief.

    c. Following the breakup procedure, the Section Leader will conduct a check-in. The Section Leader will determine the course of the rest of the flight based on which of the three cases described in Chapter Two (page 2-5) the flight is in and the ambient conditions.

2. Amplification and Technique

    – IIMC procedures may change depending on the mission and flight location. All members of the flight must pay close attention to the brief during the coordinating instructions to ensure they understand which IIMC procedure will be used during the flight.

3. Common Errors and Safety Notes

    a. For any IIMC procedure to be effective, Lead must respond to a *"Popeye"* call immediately with a base heading and altitude. Any delay may cause confusion and place the flight in a dangerous position.

    b. Avoid rapid maneuvering when IIMC. Abrupt turns and pitch changes may cause the pilots to become spatially disoriented, particularly if they have not fully transitioned to an instrument scan.

415. LOSS OF VISUAL CONTACT

Maneuver Description. The loss of visual contact procedure is a breakup procedure that can be used if Wing loses sight of Lead. The instructors will demonstrate the loss of visual contact procedure.

Application. Wing may lose sight of Lead at any time, particular during dynamic maneuvers such as pattern work or overruns. Loss of visual contact is especially common when Wing has too much step-up.

1. Procedures

    a. Wing loses sight of Lead and calls, *"Skeeter Two, blind"* over the radio. Wing will climb 200 feet above Lead's last known altitude.

b. Lead calls out a base altitude and initiates a join-up by establishing themselves in an orbit over an identifiable ground reference point. The orbit should be 15–20 degrees AOB in either left- or right-hand turns.

c. Wing climbs to 200 feet above the base altitude, and maneuvers join on Lead.

d. When Wing has joined up in the cruise position, Wing will announce, *"Factory-hand 608, holding hands, left/right side."* The flight will then continue with the mission.

2. Amplification and Technique

a. When joining Lead, Wing should use radius of turn to close the distance in a carrier style rendezvous.

b. Wing shall maintain 200 feet of altitude separation until obtaining visual contact with Lead.

3. Common Errors and Safety Notes

– Loss of visual contact most commonly occurs due to excessive step-up, particularly when crossing Lead's tail. To avoid loss of visual contact, pilots must maintain the prescribed amount of step up for the maneuver.

416. LOST COMMUNICATION PROCEDURES

Maneuver Description. The lost communication procedures allow aircraft in the flight to communicate a lost comm situation to each other and transfer the lead if necessary. To avoid confusion when describing a lost comm situation, the aircraft in the Section are referred to as the Good Comm and Lost Comm aircraft instead of Lead and Wing.

Application. A communications failure can happen to any aircraft in the flight. It is necessary to have a specific plan detailing how to put the Good Comm aircraft in the lead to lead the flight back home.

1. Procedure

a. Upon realizing that they are lost comm, the Lost Comm aircraft will switch to the Lost Comm Lighting Configuration (flashing position lights) to signify "I am lost comm."

b. If Lead is the Lost Comm aircraft, they will slow to gain Wing's attention. If Wing is the lost comm aircraft, they will gain lateral separation and pull abeam to gain Lead's attention.

c. Once recognized, the Good Comm aircraft will mirror the lost comm lighting configuration signifying "I understand you are lost comm. I have the lead."

d. The Lost Comm aircraft will return to the normal lighting configuration to signify "You have the lead."

e. The Good Comm aircraft will return to the normal lighting configuration to signify "I have the lead."

2. Amplification and Technique

a. If Wing is the Good Comm aircraft, they will pull abeam Lead as they mirror the lost comm lighting configuration. After the Lost Comm aircraft has passed the Lead to the Good Comm aircraft, they will accelerate forward to take the Lead. The Lost Comm aircraft will fall back into the cruise position.

b. If Wing is the Lost Comm aircraft, they will maintain the abeam position until the Good Comm aircraft has confirmed that they will retain the Lead. Wing will then slide back to the cruise position.

c. During a Lost Comm situation, the pilots on the inside of the formation should be the PAC. On the inside, the PAC has a much better view of the other aircraft in the abeam position. The PNAC should be the pilot manipulating the position light switch to flash the lights.

3. Common Errors and Safety Notes

a. All pilots must maintain high SA during a Lost Comm situation. Both aircraft should expedite the procedures to not prolong both aircraft flying abeam each other.

b. Following the lead change, the PAC of the Good Comm aircraft must look forward and focus on aviating. If the PAC of the Good Comm aircraft continues to look at the Lost Comm aircraft, the PAC has a tendency to drift toward the other aircraft, particularly in the abeam position.

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CHAPTER FIVE
THE FORMATION BRIEF

500. INTRODUCTION

The Formation Brief is the Section Leader's opportunity to communicate their plan to every participant in the flight. The brief must cover every aspect of the flight in such detail that a member of the audience who had no part in the planning and has never flown in the area can successfully accomplish the mission. Briefs must be conveyed with confidence. The brief sets the tone for the flight. If the Section Leader displays confidence, competence, and a solid knowledge of the plan, the flight will have faith that the Section Leader knows what he or she is doing and will follow their direction. If the Section Leader does not conduct a good brief, members of the formation may be confused and will second guess the Section Leader's plans and decisions.

501. FORMATION FLIGHT PLANNING

Formation flight planning shall be conducted in the same manner as Terrain Flights (TERF). Planners should pay particular attention to formation ground operations. If the flight is a stop-over away from South Whiting, the Section Leader must develop a detailed plan for how the section will taxi into the ramp, where the aircraft will refuel (including whether it will be hot refuel or cold refuel), where the aircraft will park while the aircrew pays, whether or not the aircraft will shut down, and how the flight will rejoin and taxi out to the runway after refueling. Confusion in the ramp environment can be a huge point of friction for formation flights, so the Section Leader must develop a plan and brief it to every member of the flight.

Students shall prepare a smart pack for each formation flight. At a minimum, the smart pack shall include a cover sheet, a route card, a bingo route card, and a LZ diagram. For those formation flights not conducting a navigation route, the route card shall include:

- The route to the Formation Area
- A 1+15 delay in the Formation Area
- The route to the OLF
- A 0+20 delay at the OLF
- The return route to South Whiting

The Bingo route card for those flights shall be planned from the furthest point in the Formation Area to a course rules entry point and then to South Whiting. On formation navigation flights, the Bingo route shall be planned from the point furthest from any fuel source to the nearest fuel source. Bingo routes shall be calculated using maximum range airspeed given the forecasted ambient conditions. In addition to a smart pack, the PIC should be provided with a weight and balance and grade card. They should be placed with a smart pack, but not stapled to it.

All pages of the smart pack shall be numbered in the same manner as was used during TERFs. On each smart pack, highlight the crewmember's name to which the smart pack belongs. The edges of the smart pack should be aligned and trimmed so that every page is the same size and neatly stapled.

502. CONDUCT OF THE BRIEF

Formation flights use the same SMEAC (Situation, Mission, Execution, Administration and Logistics, and Command and Signal) format used during TERFs with a few additions to accommodate formation considerations. Formation students shall divide the brief into two sections. The first student shall cover the Situation through Scheme of Maneuver. The second student covers Coordinating Instructions through the end of the brief. Typically, the student who briefs the first half will fly as Lead first during the flight. Each flight, the students shall alternate who conducts which portion of the brief.

Formation partners must work together to become proficient at both halves of the brief. They should practice their briefs separately and in front of each other. Students should provide constructive feedback to help each other refine their briefs and provide the best presentation possible. During the brief, the non-speaking student should sit or stand to the side of the speaker. The non-speaking student should pay attention and look at the briefer. It is extremely impolite for the second speaker to be studying their notes or their phone instead of paying attention to the brief.

The remainder of the chapter provides guidance on what should be said during a formation brief. The italicized sections are examples, and students may vary the exact wording at their discretion, with a few exceptions. Those topics that cover emergency procedures or contingencies shall be recited verbatim, including IIMC, Lost Contact, Aborts, Wave-offs, and Lost Communications. The verbatim requirements are encapsulated in brackets [verbatim].

503. SITUATION

The Situation begins with an introduction. The first briefer shall introduce both briefers, so there is no reason for the second student to reintroduce themselves when they begin their portion of the brief.

> *"Attention to brief. I am ENS Johnson and this is 2nd Lt Inzerillo. Please hold all questions to the end."*

Following the introduction, the briefer conducts a time hack. Just as with the TERF flights, the briefer should obtain an accurate time from the Naval Observatory Master Clock prior to the brief.

> *"Time Hack: In one minute, the time will be 0600 local… Thirty seconds to hack… Then seconds to hack… 5, 4, 3, 2, 1, hack. At the hack, the time was 0600. If anyone requires an additional time hack, see me after the brief."*

Do not continue the brief until the time hack is complete.

Give the aircraft assignment and parking spot for each aircraft in the Section. If either aircraft is a hot-seat, state where the hot seat will occur.

> *"Capt Fusco and ENS Johnson will be in aircraft 610 on spot B6. LCDR Lopez and 2nd Lt Inzerillo will be in aircraft 608 on C10."*

Identify the Section Leader for the flight as well as the external and internal call signs.

> *"The section leader today is Capt Fusco in aircraft 610. Our external call sign will be Lucky 610. The internal call sign is Skeeter flight."*

The smart pack inventory ensures that every member of the flight has every mission product. It also affords the briefer the time to make any last-minute changes. Any pen and ink changes should be briefed during the smart pack inventory.

> *"Page one of four is the cover sheet. Page two of four is the route card. Page three of four is the bingo route card. Page four of four is the LZ diagram. Pen and ink changes to page four: the calculated HIGE power is 65%, calculated HOGE power is 76% torque."*

List all the maps or charts to be used for the flight.

> *"The map required for the flight is the Pensacola 1:250,000 JOG-A."*

Obtain current and forecast weather prior to the brief. Brief the weather as well as the weather requirements for the flight. If the flight involves an LZ or airfield that does not have weather observations or forecast, use Terminal Aerodrome Forecast (TAF) from a nearby airfield.

> *"Current weather is broken at 2,500, overcast at 3,000 with ten statute miles of visibility and winds variable at 4 knots. Forecasted weather in the area predicts 3,000 broken, winds 260 at 15 knots with scattered thunderstorms. The weather required for the flight is 600 and 1."*

SLAP Data shall be briefed on all night flights. Brief the solar and lunar events that may affect the flight, such as sunset, End of Evening Nautical Twilight (EENT), moonrise, moonset, and percent illumination. Brief the azimuth and elevation angles of the moon and discuss any significant impacts they may have on the flight.

> *"Sunrise today was at 0554; sunset is at 1953. The moon is at 8% illumination. Moonrise is at 0811, and moonset is at 2209. At takeoff, the moon will be low on the horizon at 275^{0} azimuth and 18^{0} elevation. We will see shadowing on the East side of terrain and other objects."*

504. MISSION

State the complete mission, including the who, what (task), when, where, and why (purpose). The why is the most important part of the mission brief. It should clearly indicate the reason the mission is taking place.

"At 1100 local, HT-28 will launch two TH-73As in order to safely complete a FRM4002A."

505. EXECUTION

The Execution portion of the brief describes the commander's intent for accomplishing the mission. It consists of the Concept of Operations, Control Measures, Obstacles to Flight, Scheme of Maneuver, and Coordinating Instructions.

1. Concept of Operations

The concept of operations gives a general overview of the mission. It provides the audience with a broad sweep of the operation from start to finish. Describe the point of departure, area of operations, and mission in a sentence or two.

"Both aircraft will launch from NAS South Whiting to conduct training in the Eastern Formation Area. Landings will be conducted at LZ Harold. The flight will recover to NAS South Whiting at the completion of training."

2. Control Measures

The control measures are those features that define the working area for the mission, including boundaries, airspace, and LZs. Boundaries can be natural or manmade features and should be linear features that are readily identifiable from the air. Large highways, rivers, and coasts make excellent boundaries.

"Control measures: Boundaries – Our working area today is bounded on North by Highway 4 and the 270 radial of Crestview VORTAC. The Eastern boundary is the Crestview 180 radial. The Southern boundary is Highway 90 and the Western boundary is a North/South line drawn from Harold OLF to the town of Munson."

Describe any regulatory airspace in the vicinity of the operating area, including the lateral and vertical limits of the airspace. If the route transits through any airspace, brief how the flight will coordinate entry. For Class C airspace, include the feature that defines the center and the dimensions of the airspace. Brief any Restricted, Prohibited, or noise-sensitive areas in the vicinity of the route.

"Airspace – We will be transiting in and out of Whiting's Class C airspace today. It is centered around the Whiting TACAN, has a 5 nm inner core from the surface to 4200 feet MSL and an outer shelf at 5 – 10 NM from 1400 – 4200 feet MSL. We will exit and enter the Whiting Class C via course rules. A portion of the outer shelf overhangs the Eastern Formation Area. To avoid climbing into the Class C, we will ensure that we are outside of 10 nm prior to beginning climbs and descents."

"Restricted Areas – The Eglin Restricted Area 2915A is located south of HWY 90 from the surface to unlimited. We will avoid the restricted area by remaining North of Highway 90."

List the LZs that will be used during the mission. Do not go into detail about the LZs during the control measures. The detailed LZ brief occurs during the Scheme of Maneuver.

"Our Landing Zones today are LZ Harold and South Whiting Field."

3. Obstacles to Flight

This is a general discussion of obstacles and how to avoid them. Individual obstacles will be briefed during the Scheme of Maneuver. At a minimum, the obstacles brief shall include power-lines, towers, aircraft, and birds. Discuss any areas where other aviation traffic is expected and how the flight will mitigate that traffic.

"Obstacle Avoidance – Our best defense is to maintain an active VFR scan and call out all obstacles using a clock code based on Lead's 12 o'clock and state the action necessary to avoid the obstacle."

"Power-lines – There are multiple power-lines running through the operating area today, particularly in the area between Point Racetrack and LZ Harold. In the formation area, we will be well above the power lines. When transiting course rules to Harold we will avoid the power-lines by maintaining the proper course rules altitude."

"Towers – We will offset from any towers, understanding that we have to avoid the guidewires as well as the towers themselves. Lead will be cognizant of Wing's position to avoid placing Wing too close to a tower. Wing will strive to maintain a position on the opposite side of Lead from the obstacle."

"Aircraft – There may be other formations operating in the formation area. We will de-conflict with this traffic over formation common. There may be civil aircraft operating in the area, particularly near the Crestview VORTAC and in the vicinity of Highway 90. We will keep a constant see-and-avoid scan and turn away from any traffic that becomes a threat."

"Birds – We will make control inputs as required to avoid a bird strike, but maintain awareness of the other aircraft's position while maneuvering."

4. Scheme of Maneuver

The Scheme of Maneuver is the most important part of the brief. This is where the briefer gives a detailed description of the conduct of the mission. The Scheme of Maneuver starts with a timeline of preflight actions and continues until the aircraft have shut down, and the mission is debriefed.

Begin the Scheme of Maneuver with the sequence of events from preflight to takeoff. Brief the specific time the crew should preflight, start the aircraft, and taxi. If the aircraft is a hot-seat, brief the time the crew should expect to meet the aircraft and where the hot-seat will occur. Build the timeline backward from the expected takeoff time the same way the timeline was built for a TERF flight.

"We are a hot-seat today. Our expected hot-seat time is 1040. We will walk at 1020 and hot-seat at 1040. Check-in will be at 1045 on VHF 121.95 and UHF button 7. After the outbound call to Base, we will conduct a positive switch to button three via one turn in ATIS. We will taxi at 1055 for an 1100 takeoff. Wing will taxi in trail."

Course rules to the operating area or route shall be briefed in the same detail as a TERF route. Use the FALCON acronym to avoid forgetting some aspects of the flight.

a. Formation: Course rules are conducted in cruise formation unless the instructor is demonstrating the parade position. If the section is conducting a navigation route, Wing will move to combat cruise as the section approaches checkpoint one of the route.

b. Airspeed/Altitude: Brief any airspeed or altitude changes along course rules or the route.

c. Lighting: Brief the lighting scheme to be used throughout the flight. If it does not change, lighting only needs to be briefed at the beginning of the Scheme of Maneuver. During NVG flights, lighting should be briefed every time the lighting condition changes.

d. Communications/Squawk: Brief all radio frequency and transponder code changes throughout the flight. For all frequency changes, indicate whether it will be a positive switch or an automatic switch. If it is an automatic switch, specify where exactly the switch will occur. Always brief whether or not a check-in will follow the frequency change.

   – *"At Point Fish, we will conduct an automatic switch to button 17, formation common, followed by a check-in." or "After departing Harold, we will conduct a positive switch to button four, Tower, via one turn in ATIS; without a check-in."*

e. Obstacles and Terrain: Discuss any features that might be a hazard to the aircraft. This includes towers, power-lines, aircraft, and birds. Brief each obstacle individually as it occurs on the route and the plan to avoid it. Many pilots combine obstacles with the navigation and NVG considerations to provide a logical, chronological flow along the route.

f. Navigation/NVG Considerations: Navigation shall be briefed for every checkpoint, including the direction of turn to a clock position, backup heading, time, and expected distance to the next checkpoint.

For those flights that utilize a formation working area, brief the sequence of events that the section will conduct.

"Working area – The sequence of events today will be Crossovers, Cruise Turns, Climbs and Descents, Breakup and Rendezvous with Overruns as required, and a Lead Change.

5-6 THE FORMATION BRIEF

Following the Lead Change, we will repeat the sequence of events minus the Lead Change."

If the section is conducting a navigation route, the route shall be briefed in the same manner as a TERF flight route as discussed in the TERF Flight FTI.

At the completion of the working area sequence of events or the route, brief course rules to the LZ. The course rules shall be briefed in the same level of detail as the route using the FALCON acronym.

The LZ brief is a detailed description of the LZ using the SWEEP format (Size/Slope/Surface/Suitability, Winds, Elevation, Egress Route, and Power). The SWEEP format covers the pertinent information to operate safely in and around an LZ.

"LZ Harold is a roughly one mile by one mile T-shaped grass field. There are four landing lands, each with at least one gravel landing spot. The terrain is bumpy but suitable for a section of TH-73As. Winds are expected from the West at 15 knots. The LZ is 159 feet MSL. Our egress on a wave-off is straight ahead. Departures are made to the Northeast corner. Our power required at the LZ is 65% torque to HIGE and 76% torque to HOGE."

Actions in the LZ begin with procedures on how to enter the landing pattern and where the flight expects to conduct pattern work. The anticipated landing points should be based on the forecasted winds and expected landing direction. Actions in the LZ also include a detailed plan for what types of approaches and landings will be conducted and who will be on the controls. Any time the section is conducting a type of approach for the first time, the sequence will be instructor/instructor, instructor/student, and student/student.

"We will approach LZ Harold from the East and circle to split the field for a course of 270. We will split to the left and take the highest numbered lane available. The first landing will be a section landing. Wing will then call for High-Speed Approaches. We will conduct a minimum of three High-Speed Approaches. Time permitting the flight may conduct additional normal or high speed approaches. The high speed approaches will be conducted instructor/instructor, instructor/student, and student/student. Upon completion of the pattern work, Wing will call for RTB. The section will taxi to re-split, traffic permitting, and depart via the Northeast corner."

The final portion of the Scheme of Maneuver covers the course rules back to South Whiting. The course rules shall be covered in the same detail as the rest of the route, including how the flight will maneuver to land at South Whiting and which landing spot will be utilized. If the flight will conduct the home-field break, it needs to be discussed during the return to Whiting. Brief all details up to and including the shutdown or hot-seat such as taxi, refueling, and parking location. Although this information may be obvious when operating at South Whiting, it becomes vital when operating away from home field.

5. Coordinating Instructions

The second briefer should take over, starting with coordinating instructions. Coordinating instructions cover the contingencies for unplanned situations and issues that may arise during the

flight. In formation flights, many of the contingencies are emergencies. Therefore, at Training Wing Five, several of the coordinating instructions are treated as emergency procedures and briefed verbatim.

The Emergencies and System Failures section gives a broad description of how the section will react if an aircraft experiences an emergency. It is not intended to address specific emergencies. Detailed emergency procedures are covered during individual NATOPS briefs.

> *["Emergencies will be considered actual unless prefaced with the word "simulated." Aircraft emergencies will be handled internally, notifying the other aircraft when safe to do so. The degraded aircraft will determine which aircraft will be in the Lead position. The Section Leader will determine the conduct of the remainder of the flight."]*

For IIMC, Students may brief whichever procedures they choose. They should select the most appropriate procedure based on where the section will be operating. The following is the verbatim procedure for the Fan Break. If a different procedure is selected, substitute the appropriate instructions and parameters for that procedure.

> *["If the flight encounters IIMC and Wing has sight of Lead, Wing will maintain position. If Wing loses sight of Lead, Wing will call 'Skeeter Flight, Popeye' and immediately turn 20 degrees away from Lead. Lead will roll wings level and call base heading and altitude. Wing will continue their turn to 20 degrees from the base heading and commence a climb to 200 feet above base altitude. If either aircraft regains VMC, they will remain VMC. The section leader will commence a check–in with status and fuel state. At this point one of three cases will exist:]*

All three cases shall be briefed.

> *["Case 1: Both aircraft VMC. Aircraft will execute a join up over a specified ground reference point as dictated by Lead. Lead will establish a 10 – 15^0 angle of bank orbit over the reference point. Wing shall maintain 200 feet above base altitude until visual contact with Lead is established. Once join up is initiated Wing may descend as appropriate. Section Leader will direct the remainder of the flight."]*

> *["Case 2: One aircraft VMC/One aircraft IMC. The Section Leader will call for a positive switch to Approach with a check–in. The IMC aircraft will contact approach, informing them of the situation and obtaining a discrete squawk. Once the IMC aircraft is under positive control, the section is dissolved and each aircraft will RTB separately."]*

> *["Case 3: Both aircraft IMC: The Section Leader will call for a positive switch to Approach with a check–in. The Section Leader will inform Approach of the situation and obtain two discrete squawks. Once both aircraft are under positive control, the section is dissolved and each aircraft will RTB separately."]*

Loss of Visual Contact is briefed IAW the procedure.

> *["If Wing loses sight of Lead, Wing will maneuver as necessary to gain safe separation and call 'Skeeter flight, Blind.' Lead will base altitude and communicate a join-up per*

"Case 1" under inadvertent IMC. If Wing goes Blind in the pattern, it is a mandatory wave-off for Wing. Lead will continue to landing."]

If an aircraft in a section goes Lost Comm, the aircraft are referred to as the "Good Comm" and "Lost Comm" aircraft to avoid confusion during the lead change. After the lead change is complete, the aircraft will again be referred to as Lead and Wing. Students will use their hands to indicate where the aircraft are in relation to each other and which lighting condition they are displaying.

["For the purposes of demonstration, palms down indicates normal lighting configuration. Palms up indicates the lost comm lighting configuration."]

["If Lead experiences a total radio failure, Lead will switch to the lost comm lighting configuration and slow to 65 KIAS to gain Wing's attention.

The good comm aircraft will gain safe lateral separation and move abeam the lost comm aircraft, then switch to the lost comm lighting configuration to signify, 'I understand you are lost comm, I am in position for a lead change.' The lost comm aircraft will return to the normal lighting configuration to signify, 'You have the lead.' The good comm aircraft will then return to the normal lighting configuration to signify, 'I have the lead.' The lost comm aircraft will then slide back to the 45º bearing. The flight will proceed as necessary, returning to base if possible."]

["If Wing experiences a total radio failure, Wing will switch to the lost comm lighting configuration, gain safe lateral separation and move abeam Lead to signify, 'I am lost comm.' The good comm aircraft will then switch to the lost comm lighting configuration to signify, 'I understand you are lost comm, I will retain the lead.' The lost comm aircraft will then return to the normal lighting configuration to signify, 'You have the lead.' The good comm aircraft will return to the normal lighting configuration to signify, 'I have the lead.' The lost comm aircraft will slide back to the 45º bearing. The flight will proceed as necessary, returning to base if possible."]

The disorientation procedures take advantage of CRM between the two aircraft. "Magellan" is a brevity code indicating that an aircraft is disoriented or thinks the other aircraft is disoriented.

["If either aircraft becomes disoriented, they will call 'Skeeter Flight, Magellan.' The other aircraft will communicate heading and distance to the next checkpoint. If Lead passes a checkpoint without calling the point, steers off the route more than 1 NM on a 1:250,000 and 500 meters on a 1:50,000, maintains a heading deviation of 15 degrees, or +or- 1 minute timing deviation, Wing will communicate 'Skeeter Flight, Flight Magellan' with heading and distance to the next checkpoint. If both aircraft are disoriented, the flight will orbit present position and altitude using standard rate turns. They will utilize all assets in the aircraft to become reoriented. Once reoriented, the flight will continue."]

Downed aircraft procedures are conducted IAW the On-Scene Commander's Checklist.

["If an aircraft within the section goes down, the remaining aircraft commander will assume the duties of On-Scene Commander and execute the On–Scene Commander

Checklist. If the flight encounters a downed pilot and/or aircraft, the Section Leader will assume the duties of On–Scene Commander and execute the On-Scene Commander Checklist. The other aircraft will remain clear until tasked by the On-Scene Commander. We will stay on station until reaching our bingo state or we are relieved by a more suitable SAR asset."]

The aborts section delineates what to do if an aircraft in the flight aborts a section takeoff.

["If an aircraft aborts prior to takeoff, the PAC will notify the other aircrew as soon as possible. On takeoff, if Lead aborts, Wing will abort with Lead if it is safe to do so. If not, Wing will continue to take off, enter a downwind and land clear of Lead. If Wing aborts, Lead will continue to takeoff, enter a downwind and land clear of Wing."]

Brief the three wave-off scenarios. Emphasize who makes the internal and external calls during each scenario.

["All wave-offs are mandatory regardless of who makes the call. All calls for a section wave-off shall be repeated verbatim by each crew. The three scenarios are:

Scenario 1: When someone external to the section makes the wave-off call, Lead will make an internal call. Wing will echo the internal call, and both aircraft will wave-off. Once safe to do so, Lead will make the external call.

Scenario 2. Someone internal to the section may call for a section wave-off. The other aircraft will echo the internal call and both aircraft will wave-off. Once safe to do so, Lead will make the external call.

Scenario 3. If Wing waves off, Wing will make an external call using their own side number. Lead will continue to a landing.]

506. ADMINISTRATION AND LOGISTICS

This paragraph delineates the administration and logistics information necessary to complete the mission, including flight duration and fuel requirements. The mission fuel is the fuel required to complete both student events and land at the destination airfield with NATOPS minimum fuel.

"We will call outbound for 2+00. Mission fuel is 700 pounds. Bingo from the farthest point in the area is 125 pounds. Bingo from the OLF is 150 pounds."

507. COMMAND AND SIGNAL

The Command and Signal portion of the brief covers the chain of command for the flight. In a section, the chain of command is very simple, but in large flights with different Type/Model/Series (TMS) of aircraft, the chain of command can become complex. Command and Signal also review the communication plan for the flight. Again, the comm plan for a section is usually simple but grows in complexity with the size of the mission and number of participants.

1. Chain of Responsibility

The Chain of Responsibility delineates the chain of command. Since the only person in the chain of command in a section is the Section Leader, the briefer does not need to repeat the information and can simply state, *"previously briefed."*

2. Call signs

Call signs may also be referred to as "previously briefed."

> *"Command and Signal: Chain of responsibility – Section Leader, as previously briefed. Call signs – Internal and external call signs are as previously briefed."*

3. Communications

The communications section reiterates the communications plan for the flight.

> *"Lead will make all external calls using the Section Leader's side number. Wing will initiate all maneuvers. Anyone can make a safety of flight call."*

Preset/Manual frequencies review radio frequencies that will be used during the flight. Since the communication for a section in flight school is simple, the briefer may simply state,

> *"All preset and manual frequencies are as per the coversheet."*

If the briefer elects to reference the coversheet for all frequencies, he or she must ensure that all the frequencies to be used during the flight actually appear on the coversheet.

Frequency changes remind the audience of how frequency changes will occur and when check-ins will be conducted.

> *"All changes will be positive switches unless over an automatic change point. All switches will require a check-in unless on ground and tower."*

During NAVAIDS/GPS, the briefer will review the NAVAIDS to be used during the flight, including air-to-air TACAN frequencies, as well as any specific GPS waypoints. Like radio frequencies, if the briefer states that NAVAIDS are as per the coversheet, he or she must ensure that the NAVAID frequencies are on the coversheet.

> *"NAVAIDS are as per the coversheet. The Section Leader's TACAN will be tuned to 29Y. The other aircraft's TACAN will be tuned to 92Y. Both aircraft TACANs will be in air-to-air transmit/receive mode. We will load the formation area into the GPS to help us remain oriented while in the area."*

4. Terminology

The terminology reviews specific terms that may be used during the flight to indicate an unsafe situation. The review ensures that every member of the flight understands what each phrase

means and the course of action that will be taken if someone in the flight states Terminate or Knock it off.

> *["Terminate can be called by any aircrew to discontinue a maneuver by stating 'Skeeter flight, terminate.' The flight will abort the maneuver, reset, communicate as necessary, and continue with remaining maneuvers when able."]*

> *["Knock-it-off can be called by any aircrew following a safety of flight occurrence that distracts or prevents the continuation of training. By calling "Skeeter flight, Knock-it-Off,' the flight will be discontinued, and the respective IPs will ferry the aircraft back as a section. Debrief of the occurrence shall occur once on deck."]*

Hard decks describe a no-lower-than altitude in the working area. They are based on the traffic below the flight, such as Orange Route traffic operating below the Eastern Formation Area or limits defined in the RWOP or Master Curriculum Guide (MCG).

> *["The Hard Deck in the Formation Area for today's flight is 1000' MSL. Outside the Formation Area, we will adhere to all course rules altitudes."]*

5. ID and Recognition

ID and Recognition reiterate the transponder codes that will be used throughout the flight. It also explains who will carry the squawk for the flight and what will happen if the flight is dissolved. The briefer should also review the transponder codes that will be used throughout the flight. The briefer may state that the transponder codes are "as briefed," but only if he or she has done a thorough job covering them during the Scheme of Maneuver.

> *"The Section Leader will squawk the appropriate code in the ALT mode. The other aircraft will squawk the appropriate code in standby. If the flight is dissolved or separated for any reason, each aircraft will squawk the appropriate code in the ALT mode. Transponder codes throughout the flight are as previously briefed."*

6. Visual Signals

Visual Signals refers to any non-verbal communication that will occur between aircraft. Since most helicopters are rarely close enough to utilize hand and arm signals, visual signals are usually aircraft configurations that indicate specific states. For example, during assault support missions, aircraft may indicate that their passengers are loaded, and they are ready to depart by turning their position lights on steady bright. However, at Training Wing Five, visual signals are limited to the lost comm lighting configuration and ready signals. If the briefer has ensured that all visual signals are printed in the notes section of the coversheet, he or she may state,

> *"Visual Signals are as per the cover sheet."*

7. Debrief

State where and when the debrief will occur. All members of the flight should attend the debrief to address any safety of flight issues or lessons learned. Following the section debrief, individual crews will conduct their own debriefs.

"The flight will debrief as a section outside the Paraloft following shutdown."

508. NATOPS BY EXCEPTION

After completing the mission brief, continue with the NATOPS by exception to cover all remaining items not already addressed. This is not a rehash of the entire brief. If an item has already been discussed, there is no need to state "previously briefed," just move on to the next item. The NATOPS by exception covers those items that are cockpit specific, such as how individual crews will react to IIMC (level the wings, level the nose, center the ball…), control transfers, and cockpit lookout doctrine. It is an opportunity to discuss specific PAC and PNAC responsibilities within the cockpit.

If the instructors have two formation flights in one day, they may split the briefs so that only one instructor is present at each mission brief. In this case, the instructors may elect to wait until both mission briefs are complete and divide up into individual crews to conduct the NATOPS by exception. This allows all the students to conduct a NATOPS with their own instructors. In the fleet, NATOPS by exception briefs are always conducted as individual crews with all aircrewmen present as well.

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CHAPTER SIX
FORMATION NAVIGATION

600. INTRODUCTION

This chapter introduces the SNA to the fundamentals of tactical formation flying. The procedures provide a foundation for the tactical formation flying utilized during fleet missions.

601. TACTICAL FORMATIONS

Tactical formations utilize wider separation and grant each aircraft within the Section greater freedom of movement, which gives the Section Leader greater flexibility in controlling the flight. The greater separation reduces the Wing PAC workload and allows the Wing pilots to better back up Lead in navigation and other mission tasks. The freedom of movement allows Wing to take full advantage of radius of turn principles, thus conserving fuel, so the Section arrives in the objective area at the same time on station.

Fleet squadrons utilize two types of tactical formation: Combat Cruise and Combat Spread. At Training Wing Five, SNAs will only practice Combat Cruise.

602. COMBAT CRUISE

Maneuver Description. Combat Cruise is the most frequently used tactical formation because it maximizes flexibility amongst the flight. In Combat Cruise, Wing may fly anywhere on an arc from 10 degrees forward of abeam on the left to 10 degrees forward of abeam on the right with four to six rotor diameters of separation (Figure 6-1). There is no step-up in Combat Cruise. Safe separation is maintained through lateral distance.

Application. Combat Cruise is used for long transits in a combat environment. It allows each aircraft in the flight maximum flexibility to respond to threats along the route. It also minimizes Wing fuel consumption by using radius of turn to maintain position instead of relying on large power changes.

1. Procedures

    a. The combat cruise position is defined as anywhere along an arc between 10 forward of abeam on either side, four to six rotor diameters distance, and a level altitude.

    b. The optimum position for Wing is on the 45-degree bearing line with five rotor diameters of separation and a level altitude with Lead.

    c. During turns, Wing maintains longitudinal separation using radius of turn. Upon rollout, Wing maintains the optimum position to support Lead.

    d. When maneuvering around Lead, Wing may vary the distance between the two aircraft to maximize the advantages of radius of turn. However, Wing should never approach Lead closer than four rotors during Combat Cruise.

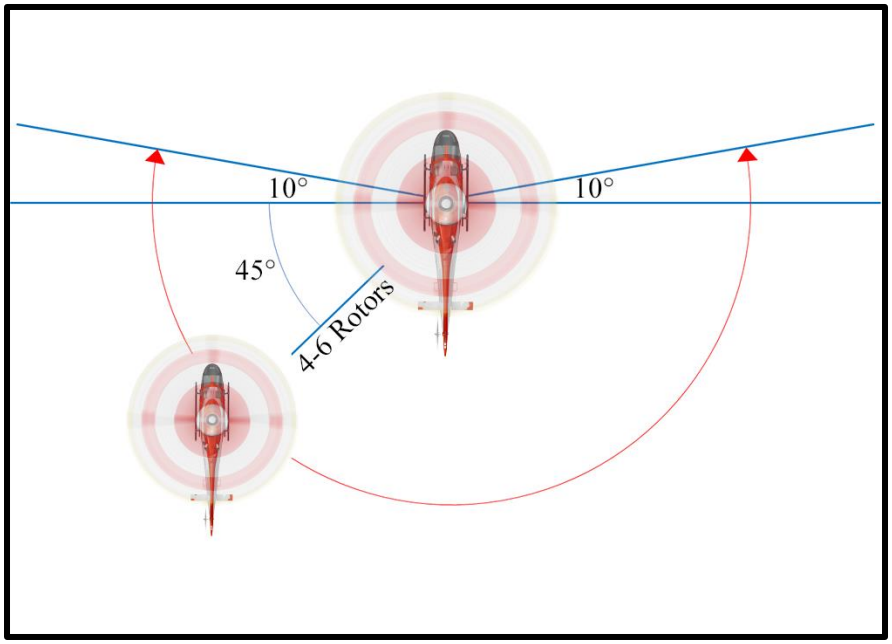

Figure 6-1 Combat Cruise

2. Amplification and Technique

   a. Tactical formation is an extremely dynamic environment that requires a thorough understanding of the radius of turn principles introduced in CHAPTER Three. Without using radius of turn, Wing will struggle to maintain position and burn significantly more fuel than Lead.

   b. Wing has a great deal of freedom when operating in Combat Cruise, but Wing's ultimate goal should be to place themselves where they can best assist Lead in completing the mission. This means Wing may place themselves on the opposite side of Lead from obstacles or restricted airspace, so Lead does not need to worry about keeping Wing clear. It may also mean placing Wing between Lead and areas of potential threat in order to aid Lead in spotting and prosecuting the enemy.

   c. During the brief, the Section Lead may specify where Wing should be during certain phases of flight. For example, when on final to the LZ, the Section Lead may dictate that Wing take a position on the left side of Lead to facilitate landing in the formation expected by the ground element.

3. Common Errors and Safety Notes

   a. Wing shall avoid delaying within 30 degrees of Lead's tail. With no crewmen on board, the trail places Wing in Lead's blind spot. Additionally, rates of closure are

difficult to judge from the six o'clock position. Wing may inadvertently reduce separation to an unsafe distance without realizing it.

b. Wing must be particularly alert toward Lead's maneuvering during Combat Cruise, especially when Wing is forward of the 45-degree bearing line. The Wing PNAC should keep the Wing PAC appraised of upcoming sharp turns so that the PAC can place the aircraft in a suitable position to maneuver around Lead during the turn. Wing should avoid being ahead of the 45-degree bearing as the flight approaches a hard turn.

4. CRM

a. The Wing PNAC is responsible for navigating throughout the flight. The PNAC should be alerting the PAC to checkpoints as they pass and upcoming turns so the PAC can prepare. Good CRM enhances turn anticipation, which enables Wing to better use radius of turn to remain in position.

b. As in cruise formation, CRM exists between cockpits during Combat Cruise. Although Lead is primarily responsible for navigation, Wing should be backing Lead up along the route. Additionally, Wing should be backing Lead up with radio calls and other mission essential tasks, such as maintaining a vigilant lookout for obstacles and threats.

603. FORMATION NAVIGATION

The Lead PNAC is primarily responsible for navigating the flight. Formation navigation follows the same procedures outlined in the TERF Flight Stage.

The Lead PAC is primarily responsible for aviating safely and making external radio calls for the Section. The Wing PAC is primarily responsible for maintaining safe separation and placing the Wing aircraft in the best position to support Lead.

The Wing PNAC provides secondary navigation for the Section and provides critical route information to the PAC. This information may include checkpoint identification, direction, and severity of the next turn, and rollout information that allows the PAC to maintain an external scan during high AOB turns.

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CHAPTER SEVEN
NVG FORMATION

700. INTRODUCTION

This chapter introduces SNAs to the fundamentals of formation flying in the night environment with the aid of NVGs. The NVG formation syllabus builds on the skills learned during day formation and NVG familiarization events, and provides SNAs with a basis of knowledge that will carry forward to fleet mission requirements.

701. POSITION AND RELATIVE MOTION

NVG formation flight is approached differently, uses different visual references than day formation flight, and has additional considerations. Flying in formation while wearing NVGs requires special considerations due to the limited FOV and poor distance estimation of NVGs. Generally speaking, formations will fly tighter and maneuver less as light levels decrease. A thorough understanding of NVG limitations dictates a more conservative approach regarding closure rates. In low light ambient conditions, a Wingman should stay close enough to the lead aircraft to recognize any attitude, altitude, or airspeed changes. Greater distances reduce the visual cues needed to effectively maintain position and judge closure rates.

1. Cruise Formation

Due to the restricted 40 degree FOV of the NVGs, cruise formation is defined as the 20-degree bearing instead of the normal 30 degrees. The slightly sucked position allows the PAC to see both the lead aircraft and the terrain in the aircraft's flight path within the NVG FOV (Figure 7-1), thereby reducing scan requirements and increasing scan efficiency. Crews should be aware that flying in this position may make it difficult to judge distance and closure rates since they will look at the lead aircraft's rear aspect. If Wing maintains a position more acute than the 30-degree bearing, the Wing PAC must exercise a vigilant scan forward to identify obstacles on the route of the flight and then scan back to Lead.

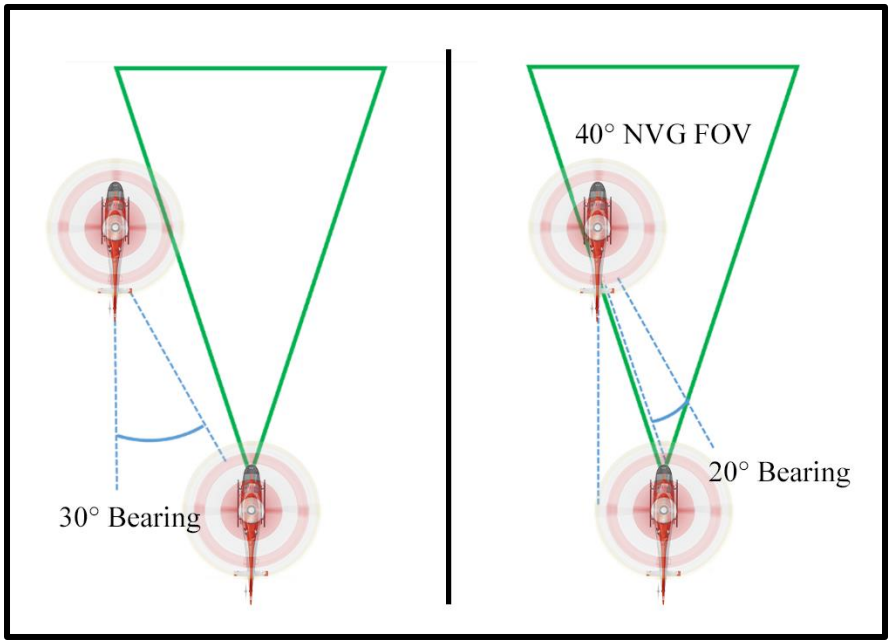

Figure 7-1 Day vs. Night Cruise Formation

2. NVG Formation Separation

The distance between an aircraft in formation at night should be reduced as the illumination decreases. Under low illuminations, the formation should be fluid (one to three rotor diameters) to allow Wing to detect cues from Lead more easily. As light levels increase, the flight may increase the separation between aircraft as the mission dictates while still maintaining visual acuity on Lead. Figure 7-2 depicts the relationship between the available illumination and appropriate formation spacing.

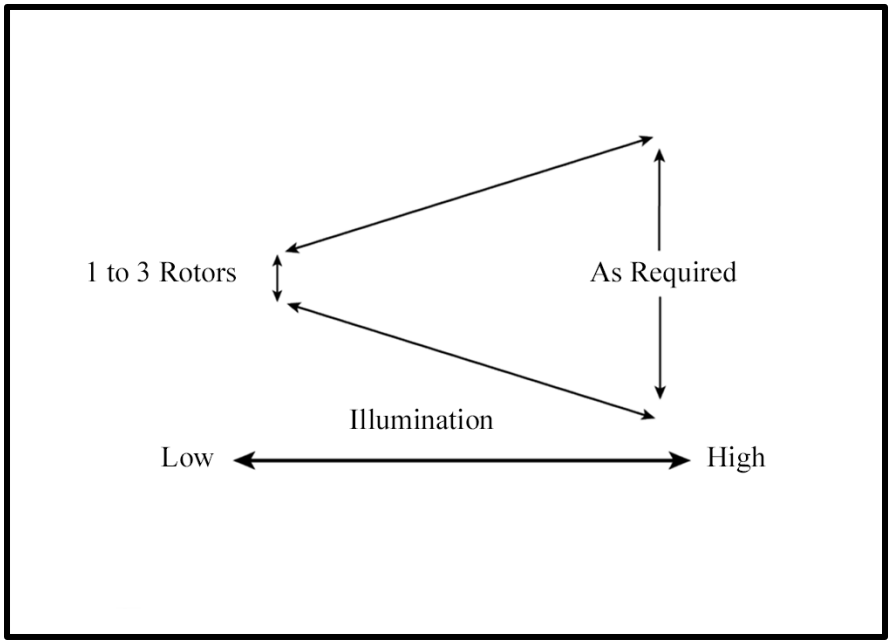

Figure 7-2 Formation Spacing vs. Light Level

3. Step-Up versus Step-Down

Night formation operations near cultural lighting or a low-angle moon may impair Wing's ability to acquire or reference Lead visually. Lead's external lights may begin to blend in with the cultural lighting, even if it is several miles away. The greater the lateral separation, the more difficult it is for Wing to determine Lead's aspect. Wing may consider flying a step-down position in these situations by placing Lead above the horizon and above the clutter caused by cultural lighting. Flying step-down allows Wing to highlight Lead to maintain visual contact better. However, Wing must maintain adequate lateral separation when flying step-down because it is difficult to determine vertical separation when Lead is higher than Wing.

702. FORMATION RENDEZVOUS

Conducting an in-flight rendezvous while conducting NVG formation operations requires careful planning and briefing. Identifying closure rates, distances, and direction of travel is difficult when using NVGs. The preferred join-up method at night is on deck at an airfield. If an in-flight join-up must be executed, Wing should establish 200–300 feet of step-up or step-down until close enough to establish a controlled distance and bearing from Lead. Only then should Wing move up or down into position.

703. FORMATION MANEUVERS

1. AOB/Severity of Maneuver

Because of the increased potential for disorientation on NVGs, rapid roll rates to high AOBs are not recommended unless dictated by terrain or threat avoidance. Flight maneuvers using NVGs

should be smooth, measured, and coordinated to reduce the chance of inducing Spatial Disorientation (SD).

2. Lead Changes

At night, Lead Changes are conducted via radio calls in the same manner as during the day. If a lost communication Lead Change must be accomplished at night, the lost communication aircraft will indicate their condition by flashing the position lights. Only the PNAC shall manipulate the position light switch.

704. CREW RESPONSIBILITIES

Given the challenges of operating in the night environment and during periods of reduced visibility, the fundamentals of crew coordination become even more important, particularly when flying in the wing position.

1. PAC

Due to the reduced FOV when using NVGs, the PAC must maintain a more aggressive outside scan while still scanning key flight performance instruments. All other cockpit duties should be left to the PNAC. Common distractions that may occur include consulting maps and navigation aids or attending to system malfunctions. The PAC must trust the PNAC to accomplish these tasks, as diverting the PAC's attention from Lead and the outside scan has often proved fatal. A quick glance inside at performance instruments from time to time is necessary, but the primary scan should be on Lead and the outside environment. Aggressive maneuvering should be minimized, and aircraft control should be slower and more predictable than during day VFR flying.

2. PNAC

The PNAC should be extra vigilant in handling all cockpit duties (controlling radios, monitoring aircraft systems, and navigation). A competent PNAC allows the PAC to focus on flying the aircraft and leave other tasks to the rest of the crew.

705. BRIEFING NIGHT CONSIDERATIONS

When conducting an NVG formation event, the brief must contain:

- Weather information
- Solar/Lunar Almanac Prediction (SLAP) data
- Coordinating instructions as they pertain to NVG flight

When briefing NVG considerations along the route of flight, reference the weather information and SLAP data to help describe the appearance of each checkpoint. Consider where the Moon will be in relation to the horizon and the checkpoint. Will the Moon be in the pilot's faces? Will

there be shadowing that might mask a checkpoint? If the weather is overcast, how will that affect Wing's ability to see Lead?

When briefing emergency procedures and hazards for the flight, crews should address situations that may cause Wing to become disoriented. Some scenarios may include Wing climbing into a cloud layer before Lead due to their stepped up position or the Wing PAC failing to transition to an effective instrument scan if visual contact with Lead is lost.

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APPENDIX A
GLOSSARY

Acute - A circumstance in which Wing is forward of the desired bearing line.

Automatic Switch – A radio frequency change that occurs without a specific verbal instruction. Automatic switches may be predicated on a specific time, location, or action.

Bearing – The angle between Wing and Lead as measured from Lead's 6 o'clock position.

Blue Water IMC Procedure – An IIMC procedure in which both aircraft turn 170º away from each other and Wing climbs to a predetermined altitude above Lead.

Breakup and Rendezvous – A maneuver in which Lead and Wing gain separation through separate, consecutive 180º turns in the same direction. Wing rejoins Lead using radius of turn while Lead maintains a constant angle of bank for a 180º turn.

Brevity Codes – Short words or phrases with specific, standardized meanings that are used to condense radio calls on congested frequencies.

Carrier Rendezvous – A formation join up wherein Lead maintains a constant altitude, airspeed, and angle of bank. Wing maneuvers as required to use radius of turn to join the formation.

Check-in – A radio call and response to ensure that every member of the flight is on the correct frequency. Initial check-ins are conducted at the beginning of every formation flight to confirm that all aircraft radios are functioning correctly.

Climbs and Descents – A maneuver in which Wing maintains position using both power and radius of turn while Lead executes constant rate climbs and descents.

Combat Cruise – A tactical formation that maximizes the flexibility of individual aircraft within the formation. Combat Cruise is characterized by level altitude, 4-6 rotor diameters of separation, and any bearing from 10º forward of abeam on either side of Lead.

Crossover – A maneuver in which Wing transits from one side of Lead to the other in controlled increments. Lead maintains straight and level flight.

Cruise – The position from which formation maneuvers are accomplished. It is defined as 10 feet of step-up, three rotor diameters of distance, and the 30º bearing.

Cruise Turns – A maneuver in which Wing maintains the 30º bearing using radius of turn while Lead maintains a constant angle of bank.

Distance – The length of space between the tip of Lead's blades and the tip of Wing's blades, usually measured in rotor diameters.

Division – Three or four aircraft flying in formation. Divisions of four aircraft are typically subdivided into two, two-aircraft sections.

Division Leader - The pilot in command of a division. The Division Leader is usually the pilot in command of his or her aircraft, but does not necessarily fly in the Lead position.

External Call sign – The call sign all members of a formation use when communicating with agencies, entities, or individuals outside the formation.

External Communication – All communication accomplished with agencies, entities, or individuals outside of a formation.

Fan Break – A maneuver in which all aircraft gain separation after inadvertently entering instrument meteorological conditions. Lead will maintain a base heading and altitude. All other aircraft will turn away from Lead and climb above the base altitude, determined by their position in the formation.

Formation – A group of two or more aircraft flying in close proximity under the same call sign.

Formation High Speed Approaches – A maneuver in which two helicopters conduct a high speed approach simultaneously.

Formation Landings – A maneuver in which two or more helicopters conduct an approach and landing simultaneously. Wing remains in the cruise position throughout the maneuver.

Flight – Five or more aircraft flying information. Flights are typically subdivided into division and sections, depending on the mission and the makeup of the flight.

Flight Leader - The pilot in charge of a flight. The Flight Leader is usually the pilot in command of his or her aircraft, but does not necessarily fly in the Lead position.

Hard Deck – A no lower than altitude during a specific phase of flight.

Home-field Break – A maneuver in which Lead and Wing use consecutive, steep angle of bank turns to gain separation prior to landing. At the completion of a home-field break, Wing will land in trail of Lead. At Training Wing Five, the Home-field Break is an instructor demonstration item only.

Internal Call sign – The call sign used by aircraft when communicating within a formation. Individual internal call signs include the aircraft's position in the flight at the time of takeoff, e.g., Skeeter 1, Skeeter 2, etc.

Internal Communication – All communication accomplished within a formation of aircraft.

Knock It Off – A brevity code that stops all training due to a safety of flight concern or some other hazard. Following a Knock It Off call, the formation will return to base.

Landing Zone Diagram (LZ Diagram) – A visual depiction of the landing zone, landing plan, and surrounding terrain that supports the mission commander's scheme of maneuver.

Lead – The aircraft at the head of a formation.

Lead Change – A maneuver in which the Lead aircraft switches positions in formation with the Wing aircraft.

Loss of Visual Contact – A situation in which Wing has lost sight of Lead.

Mountainous Terrain IIMC Procedure – An IIMC procedure in which altitude and differential airspeed are used to gain separation instead of formation aircraft turning away from one another.

On-Scene Commander – The pilot who controls the airspace surrounding a downed aircraft.

Overrun – A maneuver in which Wing crosses to the outside of Lead's turn during a rendezvous. Overruns are used when Wing has an excessive closure rate on Lead or any other unsafe situation develops.

Parade Formation – A close formation used to transit in and out of congested airspace. Parade formation is defined as 10 feet of step-up, one rotor diameter of distance, and the 45º bearing line. At Training Wing Five, parade formation is an instructor demonstration maneuver only.

Position – Wing's location as referenced from Lead, defined in terms of step-up, bearing, and distance. Position may also refer to an aircraft's overall spot in formation, i.e., Dash Two (-2), Dash Three (-3), etc.

Positive Switch – A radio frequency change that occurs following a specific verbal instruction. The instruction may come from within the formation or from an outside entity.

Radius of Turn – A maneuver in which Wing uses varying angles of bank instead of power adjustments to maintain or return to the desired position.

Relative Motion – The movement between two moving objects as referenced from each other.

Running Rendezvous – A formation join up wherein Lead maintains a constant altitude, heading, and airspeed while Wing uses differential airspeed to catch up and join the formation.

Section – Two aircraft flying in formation.

Section Leader – The pilot in charge of a section. The Section Leader is usually the pilot in command of his or her aircraft, but does not necessarily fly in the Lead position.

Section Takeoff – A maneuver in which two aircraft transition to forward flight simultaneously. Wing maintains the cruise position throughout the maneuver.

Section Taxi – A maneuver in which two aircraft taxi together under the same ground clearance. Wing maintains approximately one rotor diameter distance from Lead.

Section Wave-off – A maneuver in which either or both aircraft in a section execute a wave-off following an aborted landing.

Smart Pack – A series of documents created during flight planning to aid the crews in successfully completing the mission.

SMEAC – Situation, Mission, Execution, Administration and Logistics, and Command and Signal. The briefing format prescribed by Joint Planning Doctrine. This briefing format is used at Training Wing Five and for most fleet missions.

Step-Up – The vertical distance between Lead and Wing.

Sucked – A circumstance in which Wing is aft of the desired bearing line.

SWEEP – Size/Slope/Suitability/Surface, Winds, Elevation, Egress/Obstacles, Power Available/Power Required. An acronym used to brief a landing zone and to conduct a real time evaluation of a landing zone prior to landing.

Terminate – A brevity code used to stop a maneuver. After terminate has been called and the formation has been reset, the flight may continue.

Wing – Any aircraft in a formation that is not in the lead position. When there is more than one wing aircraft, each aircraft is referred to by position, i.e., Dash Two (-2), Dash Three (-3), etc.

APPENDIX B
BLANK COVER SHEET

HT-X (CALLSIGN)				
JULIAN DATE: XXX		MISSION: XXXXXXXX		EXTERNAL C/S: XXXXX
A/C	SPOT	C/S	AIRCREW	MPTS

TIMELINE	EVENT	VHF	UHF	NOTES

BN	AGENCY	FREQ	BN	AGENCY	FREQ

METRO				BINGO
SR:	MR:	EENT:	HLL:	(LOCATION)
SS:	MS:	ILLUM:	LLL:	LBS
ATIS:				
ATIS: |				

LOC	HIGE	HOGE	END Q / AS	RNG Q / AS	MSA / HDG
TAKEOFF			/	/	
HAROLD			/	/	

NOTES

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APPENDIX C
TW-5 BRIEFING GUIDE

SITUATION

- Introduction
- Time Hack
- Aircraft Assignment(s)
  - Lead/Single Ship: A/C _____on Spot_____
  - Wing: A/C _____on Spot_____
- Section Leader (Formation only) _____
- Call Sign
  - External Callsign: _____
  - Internal Callsign (Formation only): _____
- Smart Pack Inventory
- Maps/Charts
- Weather
  - Current_____
  - Destination_____
  - Required_____
- SLAP
  - Sunset_____ EENT_____
  - Moonrise_____
  - Moonset_____
  - %Illum_____
  - Sun / Moon Azm/Ele_____
  - Shadowing_____

MISSION

- At _____ L, HT-8/18/28 will launch a single/two TH-73A(s) in order to safely complete a _____.

EXECUTION

- Concept of Operations
- Control measures
  - Boundaries
  - Airspace
  - Restricted Areas
  - Noise Sensitive Areas
  - LZs
- Obstacles to flight
  - Avoidance
  - Powerlines
  - Towers
  - Aircraft
  - Birds
- Scheme of Maneuver
  - Preflight at _____ (time)
  - Start Checklist _____
  - Check-in (Formation only) _____
  - Taxi _____
  - Takeoff _____
  - Course Rules NASWF → Route/Working Area
  - Route
    - F = Formation
    - A = Airspeed/Altitude
    - L = Lighting
    - C = Comms/Squawks
    - O = Obstacles
    - N = Navigation/NVG Considerations
  - Working Area
    - Sequence of Events
  - Route/Working Area → LZ

  - LZ
    - S
    - W
    - E
    - E
    - P
  - Actions in the LZ
  - RTB
- Coordinating Instructions
  - Emergencies & Systems Failures
  - IIMC
    - Safe Heading_____
    - Safe Altitude_____
  - Loss of Visual Contact (Formation only)
  - Lost Comm
  - Disorientation Procedures
  - Downed Aircraft (Formation only)
  - Aborts (Formation only)
  - Waveoffs (Formation only)

ADMINISTRATION & LOGISTICS

- Flight duration_____
- Fuel
  - Mission_____
  - Bingo_____

COMMAND & SIGNAL

- Chain of Responsibility (Formation only)
  - Section Leader
- Callsign(s)
- Communications
  - Preset/Manual Frequencies
  - Frequency Changes (Formation only)
  - NAVAIDS/GPS
- Terminology (Formation only)
  - Terminate
  - Knock-It-Off
  - Hard deck
- ID and Recognition
  - Transponder
- Visual Signals (Formation only)
- Debrief

NATOPS BY EXCEPTION

APPENDIX D
FORMATION COMMUNICATION SCRIPT

GROUND

LEAD (121.95):	"*Skeeter flight, check-in Victor."*
WING (121.95):	"*Skeeter Two."*
LEAD (BASE UHF):	*"Skeeter flight, check-in Uniform."*
WING (BASE UHF):	"*Skeeter Two, up and ready, two souls, 750 pounds."*
LEAD (BASE UHF):	"*Skeeter one, up and ready, two souls 780 pounds. Break. Base, Eight-ball 610 and 608 outbound to the Eastern Formation Area with Johnson and Inzerillo."*
LEAD (BASE UHF):	"*Skeeter flight, push button three via one turn in ATIS."*
WING (BASE UHF):	"*Skeeter Two."*
LEAD (CH 3 UHF):	"*South Whiting Ground, Eight-ball 610, flight of two, wingman side number 608, taxi VFR to the East 2+30, two souls each aircraft from spots B6 and C10, with information Whiskey."*

TAXI

LEAD (CH 4 UHF):	"*South Tower, Eight-ball 610, flight of two, number one holding short of spot one, Able departure."*

COURSE RULES OUTBOUND

LEAD (CH 17 UHF):	"*Skeeter flight, check-in Uniform."*
WING (CH 17 UHF):	*"Skeeter Two."*

FORMATION AREA

WING (CH 17 UHF):	*"Skeeter flight, crossovers/cruise turns/climbs and descents/breakup and rendezvous/lead change"*
LEAD (CH17 UHF):	*"Skeeter flight, roger, crossovers/cruise turns/climbs and descents/breakup and rendezvous/lead change"*
WING (CH17 UHF):	*"Skeeter flight, section landings."*
LEAD (CH17 UHF):	*"Skeeter flight, roger, section landings."*

COURSE RULES TO OLF

LEAD (CH 17 UHF):	*"Skeeter flight, push button 12."*
WING (CH 17 UHF):	*"Skeeter One."*
LEAD (CH 12 UHF):	*"Skeeter flight, check-in Uniform."*
WING (CH 12 UHF):	*"Skeeter One."*
LEAD (CH 12 UHF):	*"Harold, Eight-ball 610, flight of two, Point Racetrack inbound."*

OLF

LEAD (CH 12 UHF): *"Harold, Eight-ball 610 and flight, wingman side number 608, splitting to the left, FRM4002A."*
WING (CH 12 UHF): *"Skeeter flight, High Speeds."*
LEAD (CH 12 UHF): *"Skeeter flight, roger, High Speeds."*
LEAD (CH 12 UHF): *"Traffic, Eight-ball 610 and flight, Section High Speed Approaches, lane two."*
WING (CH 12 UHF): *"Skeeter flight, RTB."*
LEAD (CH 12 UHF): *"Skeeter flight, roger, RTB."*

COURSE RULES TO KNDZ

LEAD (CH 12 UHF): *"Harold, Eight-ball 610 and flight, departing."*
LEAD (CH 12 UHF): *"Skeeter flight, push button five."*
WING (CH 12 UHF): *"Skeeter Two."*
LEAD (BASE UHF): *"Skeeter flight, check-in Uniform."*
WING (BASE UHF): *"Skeeter Two."*
LEAD (BASE UHF): *"Base, Eight-ball 610 and flight, 10 minutes out for the next students."*
LEAD (BASE UHF): *"Skeeter flight, push button four via one turn in ATIS."*
WING (BASE UHF): *"Skeeter Two."*
LEAD (CH 4 UHF): *"South Tower, Eight-ball 610, flight of two, Point Juniper with information Charlie, request home-field break."*
WING (121.95 VHF): *"Skeeter flight, parade."*
LEAD (121.95 VHF): *"Skeeter flight, roger, parade."*
LEAD (CH 4 UHF): *"South Tower, Eight-ball 610, flight of two, Point Cypress for spot four, request home-field break."*

TAXI

LEAD (CH 3 UHF): *"South Ground, Eight-ball 610, flight of two, clear of spot four for the pits."*

WAVE-OFF

Scenario One

EXTERNAL CALL: *"Formation traffic in lane two, wave-off."*
LEAD (CH 12 UHF): *"Skeeter flight, wave-off."*
WING (CH 12 UHF): *"Skeeter Two."*
LEAD (CH 12 UHF): *"Harold Traffic, Eight-ball 610 and flight waving off left side, lane two."*

Scenario Two

LEAD (CH 12 UHF): *"Skeeter Flight, wave-off."*
WING (CH 12 UHF): *"Skeeter Two."*
LEAD (CH 12 UHF): *"Harold Traffic, Eight-ball 610 and flight waving off left side, lane two."*

D-2 FORMATION COMMUNICATION SCRIPT

Scenario Three

WING (CH 12 UHF): *"Skeeter Two waving off left side."*
LEAD (CH 12 UHF): *"Skeeter One."*
WING (CH 12 UHF): *"Harold Traffic, Eight-ball 608 waving off left side, lane two."*

IIMC

Fan Break

WING (UHF): *"Skeeter Two, Popeye, right side."*
LEAD (UHF): *"Skeeter flight, 060, 1000 feet."*
WING (UHF): *"Skeeter Two."*

Blue Water Operations

WING (UHF): *"Skeeter Two, Popeye, right side."*
LEAD (UHF): *"Skeeter flight, 060, 1000 feet."*
WING (UHF): *"Skeeter Two, passing through the 90."*

Mountainous Terrain

WING (UHF): *"Skeeter Two, Popeye, right side."*
LEAD (UHF): *"Skeeter flight, 060, 5000 feet."*
WING (UHF): *"Skeeter Two."*

Case One

LEAD (UHF): "*Skeeter flight, check-in."*
WING (UHF): *"Skeeter Two, VMC, 1+20, visual."*
LEAD (UHF): *"Skeeter One, VMC, 1+30. I'll orbit over the fishponds until you're holding hands."*
WING (UHF): *"Skeeter Two."*
WING (UHF): *"Skeeter Two, holding hands."*

Case Two

LEAD (UHF): *"Skeeter flight, check-in."*
WING (UHF): *"Skeeter Two, IMC, 1+20, visual."*
LEAD (UHF): *"Skeeter One, VMC, 1+30. Switch Pensacola Approach 124.85."*
WING (UHF): *"Skeeter Two."*
LEAD (124.85 VHF): *"Skeeter flight, check-in."*
WING (124.85 VHF): *"Skeeter Two."*
WING (124.85 VHF): *"Pensacola Approach, Eight-ball 608,flight of two, six miles Southwest of the Crestview VORTAC. We need an IFR pickup immediately for an approach to South Whiting."*
WING (124.85 VHF): *"Roger Eight-ball 608. Squawk 0132."*
LEAD (UHF): *"Skeeter flight is dissolved."*
WING (UHF): *"Roger, Skeeter flight dissolved."*

Case Three

LEAD (UHF): *"Skeeter flight, check-in."*
WING (UHF): *"Skeeter Two, IMC, 1+20, visual."*
LEAD (UHF): *"Skeeter One, IMC, 1+30. Switch Pensacola Approach 124.85."*
WING (UHF): *"Skeeter Two."*
LEAD (124.85 VHF): *"Skeeter flight, check-in."*
WING (124.85 VHF): *"Skeeter Two."*
LEAD (124.85 VHF): *"Pensacola Approach, Eight-ball 610, flight of two, wingman side number 608, six miles Southwest of the Crestview VORTAC. Both aircraft need separate IFR pickups immediately for approaches to South Whiting."*
LEAD (124.85 VHF): *"Roger, Eight-ball 610 squawk 5547 and Eight-ball 608 squawk 0132."*
LEAD (UHF): *"Skeeter flight is dissolved."*
WING (UHF): *"Roger, Skeeter flight dissolved."*

LOSS OF VISUAL CONTACT

WING (UHF): *"Skeeter Two, blind."*
LEAD (UHF): *"Skeeter One. I'll orbit over the sawmill until you're holding hands."*
WING (UHF): *"Skeeter Two."*
WING (UHF): *"Skeeter Two, holding hands."*

ABORT

Lead Aborts

LEAD (CH 4 UHF): *"Skeeter flight, abort."*
WING (CH 4 UHF): *"Skeeter Two."* (if safe for Wing to abort) or *"Skeeter Two, continuing."* (if unsafe for Wing to abort)
LEAD (CH 4 UHF): *"South Tower, Eight-ball 610 and flight aborting takeoff."* Or *"South Tower, Eight-ball 610 aborting takeoff single ship. Eight-ball 608 continuing takeoff."*
WING (CH 4 UHF): *"South Tower, Eight-ball 608 request downwind to land spot one in trail of Eight-ball 610."* (If Wing continues.)

Wing Aborts

WING (CH 4 UHF): *"Skeeter flight, abort."*
LEAD (CH 4 UHF): *"Skeeter One, continuing."*
WING (CH 4 UHF): *"South Tower, Eight-ball 608 aborting single ship."*
LEAD (CH 4 UHF): *"South Tower, Eight-ball 610 request downwind for a full stop.*