NAVAL AIR TRAINING COMMAND

NAS CORPUS CHRISTI, TEXAS **CNATRA P-483 (NEW 04-23)**

FLIGHT TRAINING INSTRUCTION

LAND LOGISTICS

TH-73A

2023

DEPARTMENT OF THE NAVY
CHIEF OF NAVAL AIR TRAINING
250 LEXINGTON BLVD SUITE 179
CORPUS CHRISTI TX 78419-5041

CNATRA P-483
N714
26 Apr 23

CNATRA P-483 (New 4-23)

Subj: FLIGHT TRAINING INSTRUCTION, LAND LOGISTICS, TH-73A

1. CNATRA P-483 (New 4-23) PAT, "Flight Training Instruction, Land Logistics, 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) Web site.

4. CNATRA P-483 (New 4-23) PAT is a new publication

S. A. COREY
By direction

Releasability and distribution:
This instruction is cleared for public release and is available electronically only via Chief of Naval Air Training Issuances Web site,
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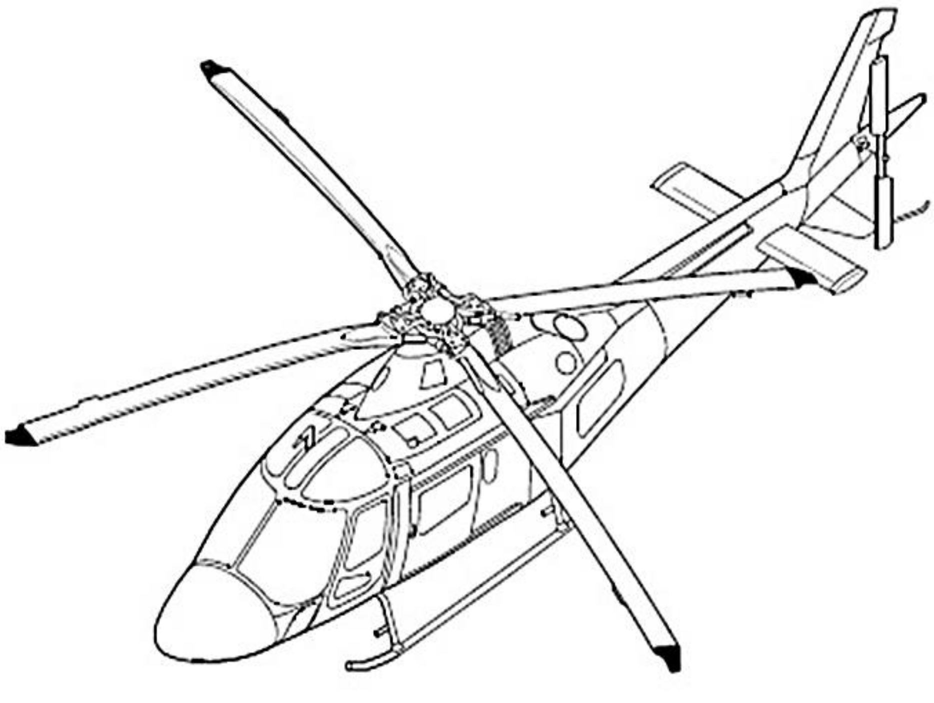
FLIGHT TRAINING INSTRUCTION

FOR

LAND LOGISTICS

TH-73A

P-483



LIST OF EFFECTIVE PAGES

Dates of issue for original and changed pages are:
Original…0…26 Apr 23

TOTAL NUMBER OF PAGES IN THIS PUBLICATION IS 60 CONSISTING OF THE FOLLOWING:

PAGE NO.	CHANGE NO.	PAGE NO.	CHANGE NO.
COVER	0		
LETTER	0		
iii – viii	0		
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3-18 (blank)	0		
	0		

CHANGE SUMMARY

The following changes have been previously incorporated into this document.

CHANGE NUMBER	REMARKS/PURPOSE

The following interim changes have been incorporated into this change/revision:

INTERIM CHANGE NUMBER	REMARKS/PURPOSE	ENTERED BY	DATE

INTRODUCTION

This Flight Training Instruction provides you amplifying information covering Confined Area Landings (CAL), Dynamic Flight Maneuvers, Pinnacle Landings, Hoisting Operation, and External Load Operations. The objective of logistical operations is to show the versatility of helicopter operations within the fleet and various mission capabilities.

SCOPE

This publication contains maneuvers introduced in the logistics stage of rotary training in the Advanced Multi-Service Pilot Training System Curriculum (CNATRAINST 1542.186 series); however, it does not contain maneuver descriptions previously covered in other Flight Training Instruction (FTI) publications. It is your responsibility to have a thorough knowledge of the contents within all FTIs.

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CHAPTER ONE
LAND LOGISTICS AND PLANNING CONSIDERATIONS

100. INTRODUCTION

Helicopters provide unique capabilities due to their ability to fly at low airspeeds and hover. The outlined Land Logistics maneuvers are fundamental to the objective area in a variety of rotary-wing missions, including Search and Rescue (SAR), Tactical Recovery of Aircraft and Personnel (TRAP), Medical Evacuations (MEDEVAC), Casualty Evacuation (CASEVAC), Direct Action (DA)/Assault Support, Aerial Firefighting, and Shipboard Operations.

The dynamic maneuvers in this document focus on mission fundamentals. They require an enhanced awareness of the helicopter's capabilities and limitations as well as appropriate pilot inputs. When performing these maneuvers, the helicopter may be operating with reduced power margins and within the avoid area of the Height-Velocity (H-V) diagram. Thorough preflight planning will provide an understanding of how close to operating limits the helicopter will operate during flight. In all cases, power management needs to be a major consideration in the safe and effective operation of the helicopter. The pilot must maintain awareness of the power margins, specifically the difference between power available and power required. Therefore, it is necessary to conduct preflight calculations and constantly reevaluate the environment, wind speed, wind direction, obstacles, and terrain throughout the flight.

101. PREFLIGHT PLANNING CONSIDERATIONS

Preflight planning is the foundation of safe and effective mission accomplishment. Flights must be conducted within the bounds of Naval Air Training and Operating Procedures Standardization (NATOPS) operating limits and Standard Operating Procedures (SOP).

Preflight planning and in-flight power checks are designed to reduce the risk of the power required exceeding the power available. They are also designed to prevent an exceedance of any other limitations such as Engine Compressor Speed (N1), Free Turbine Speed (N2), Inter-Turbine Temperature (ITT), or Torque (TQ). The power checks are conducted to determine the power available and the power required. The power available is the power the engine can produce given the ambient conditions. The power required is the power the engine will need to provide to accomplish the planned operation.

During preflight planning, refer to NATOPS for the expected power required to Hover In Ground Effect (HIGE) and Hover Out of Ground Effect (HOGE) in the forecast conditions at the intended place of operations. This chart is shown in Figure 1-1. The power required calculations shall account for any additional weight, including an external load or additional crewmembers. HIGE and HOGE flight profiles are used to determine power required because they are the flight profiles that demand the most power.

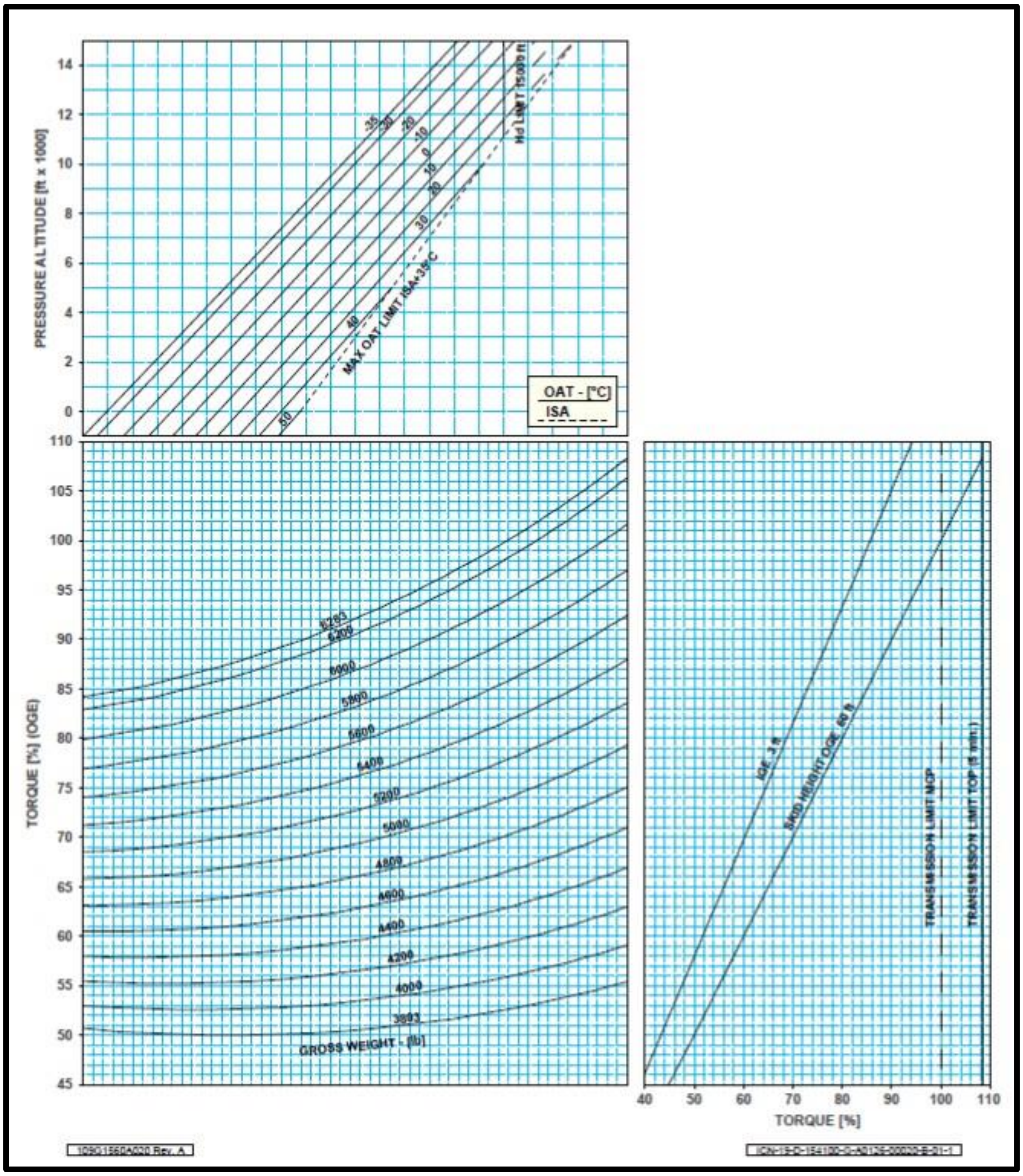

Figure 1-1 HIGE/HOGE Chart

Power available is expressed in TQ in the NATOPS performance chart as shown in Figure 1-2 below. It is the power the engine can produce without exceeding a limit at a given Density Altitude (DA) and must be calculated prior to flight. Depending on the ambient conditions, the TH-73A may be TQ or ITT limited. Power available for the expected ambient conditions must be retrieved from the appropriate NATOPS chart.

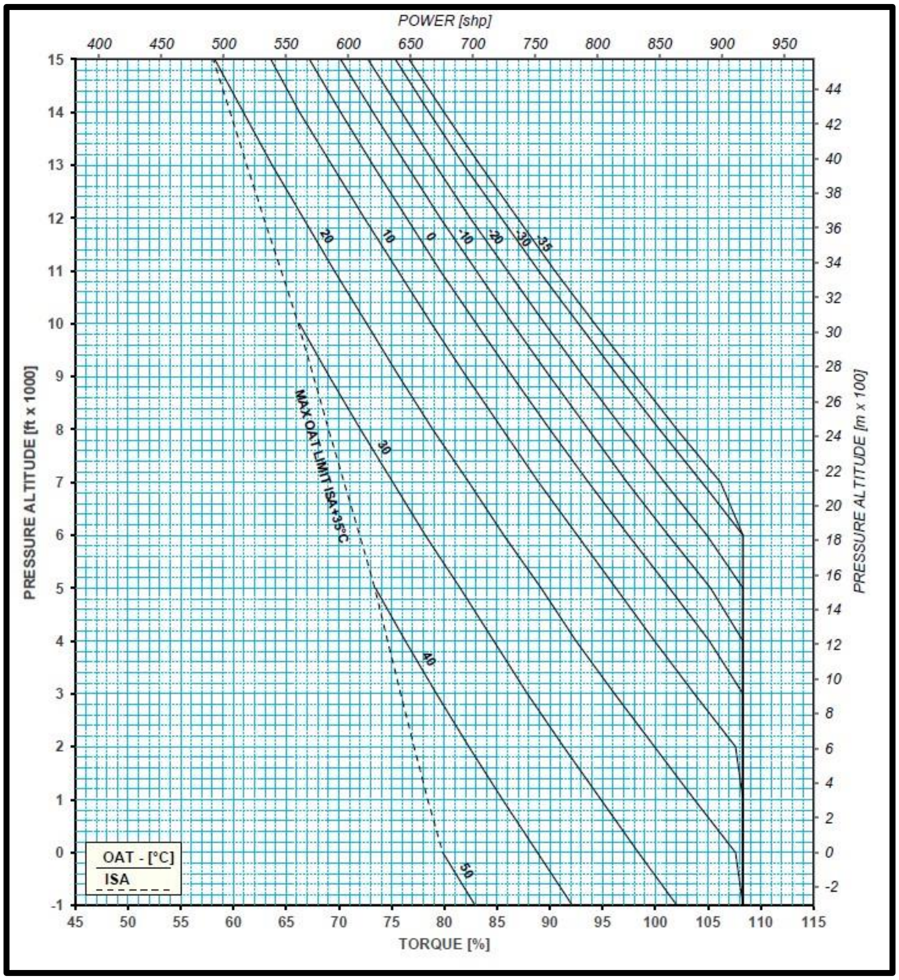

Figure 1-2 Power Available Chart – Take Off Power

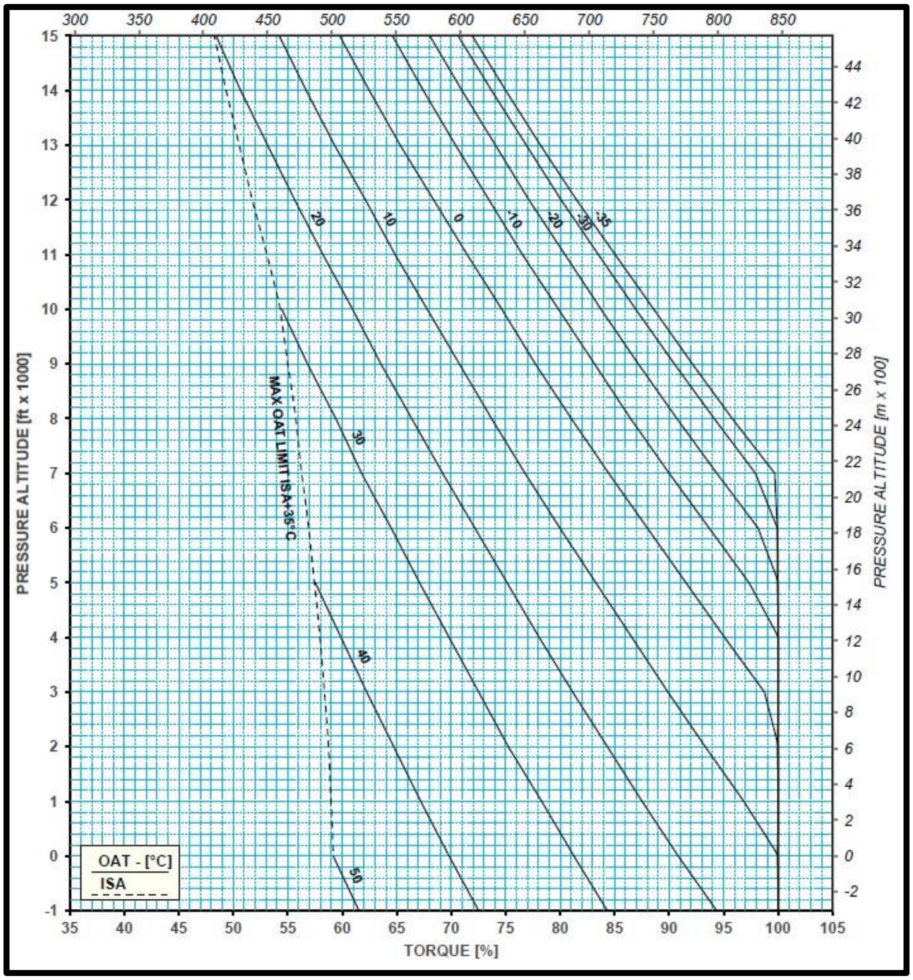

Figure 1-3 Power Available Chart – Maximum Continuous Power

Additionally, the crew will need to ensure that the helicopter will remain within the weight and balance limits throughout the flight. This is especially true when conducting hoist operations, as the lateral Center of Gravity (CG) will shift significantly to the right and up when a load is on the hoist or two aircrewmen are on the same side of the cabin. Refer to Figure 1-3, also in the NATOPS, when calculating limits.

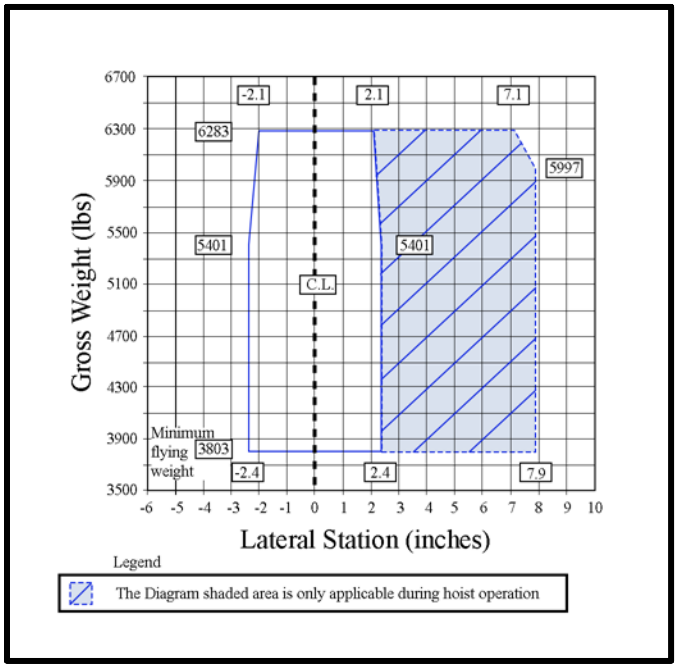

Figure 1-4 CG Calculation Chart
Lateral CG Limits (Shaded area applicable only during hoist operation)

102. IN FLIGHT CONSIDERATIONS

It is important to remember concepts from familiarization flights, such as the effect of maneuvers on power requirements and helicopter limitations. A left pedal or left roll input will increase TQ requirements. A right pedal or right roll initially decreases TQ requirements.

Land logistics maneuvers include increased operations on the backside of the power required curve and smaller power margins than maneuvers practiced in the familiarization stage of training. Always calculate power required based on the location at which the operations will be conducted and under expected environmental and helicopter conditions to determine the correct power needed to complete the mission.

103. H-V RELATIONSHIP

The helicopter will operate in the avoid areas of the H-V diagram for an extended time during the maneuvers performed in Land Logistics. The crew must know the required actions in the event of a power loss during logistics maneuvers based on flight profile and external load considerations. Intentions must be clearly stated in the brief. All crewmembers must communicate clearly throughout the flight.

104. OVERSPEED PREVENTION

During all maneuvers, monitor N2 and main rotor speed (NR) for potential over-speed when operating with the collective near the full down position, and with less than 20 percent TQ. A deceleration, flare, or turn will result in an increase in NR when combined with low collective settings. The increase in N2/NR is proportional to the aggressiveness of the maneuver.

At airspeeds below 60 Knots Indicated Airspeed (KIAS), an increase in collective coupled with a nose-up attitude is more effective at slowing the helicopter than lowering the collective to minimum pitch. In this condition, the lift vector is pointed aft, which slows the helicopter and assists in maintaining N2/NR in operating limits. At speeds above 60 KIAS, the N2/NR increase is much more significant. A rapid nose up input especially above 80 KIAS may result in an overspeed. Keeping sufficient TQ applied to the rotor head and avoiding rapid nose up maneuvers above 80 KIAS will minimize the risk of an NR overspeed.

105. FLIGHT WITH AIRCREW AND CREW RESOURCE MANAGEMENT

Flights in almost all fleet helicopters are flown with a minimum of one aircrewman, in addition to the pilot and copilot. In advanced helicopter training, an aircrewman will be a member of the crew on specific flights. These highly skilled individuals complete unique mission-specific tasks that contribute to the successful completion of the mission. They provide a wealth of knowledge that can ensure mission accomplishment. They assist in Landing Zone (LZ) reconnaissance and help maintain obstacle clearance during all phases of flight. During Pinnacle, CAL, Hoisting, and External Load Operations, the aircrewman is a critical member of the crew that observes and relays vital information to the pilots.

Communication

Communication between the pilots and aircrewmen is critical. As you are first learning to work with an aircrewman, err on the side of talking too much as opposed to not talking enough. As you progress in your career, you will find a balance between what needs to be said and what is inherently understood. The communication procedures outlined in the maneuver descriptions provide a standardized minimum of what to say in the helicopter. These communications are not all-inclusive but are a good starting point for Crew Resource Management (CRM) while executing Land Logistics maneuvers. Additional calls may be necessary to increase SA for all crewmembers. As with any crew, coordination, clarity, brevity, and standardized terminology are keys to successful communication.

Good communication starts with informing your crew of your intentions. Too much information to and from the aircrewmen may result in distraction and loss of SA; likewise, too little information will do the same. Keep concise communication flowing, but state only what is relevant, especially when in a critical phase of flight (i.e., low altitude or dynamic maneuvering). You will have to be more descriptive when referencing items both internal and external to the helicopter. Incorporate clock position call-outs instead of using cardinal directions when possible. The aircrewmen will be moving around the cabin and do not have instruments to determine heading.

CRM

Land Logistics flight events incorporate aircrewmen and require more intensive use of CRM than previous flights. Aircrewmen are valuable assets in the helicopter and are integral members of the crew. In the fleet, they perform mission-critical tasks that pilots cannot complete, including maintenance and troubleshooting, defensive and/or offensive weapons employment, hoist operations, cargo, personnel logistics, navigation assistance, and spatial disorientation prevention/recovery.

Incorporate the aircrewmen in all decisions and maneuvers. They can build SA of what is happening externally or internally to the helicopter. Additionally, have them break out their Pocket Checklist (PCL) to follow along during emergencies to ensure no steps are missed. After completing a maneuver, the aircrewman will assist the Instructor Pilot (IP) in debriefing you, including a critique of your CRM.

Aircrewman Responsibilities

Aircrewmen are responsible for helicopter obstacle avoidance (main and tail rotor), load monitoring, and hoist operations during Land Logistics. Aircrewmen often have better visibility and can assist the pilots with the rate of closure calls to the intended point of landing for the helicopter or external loads. The maneuver descriptions outline each crewmember's responsibilities as well as standard terminology and communication procedures. Adherence to standardized procedures is the backbone of CRM and facilitates safe mission accomplishment.

Land Logistics events will introduce the roles of each crewmember during the Land Logistics maneuvers. Understanding the roles, the value added by an aircrewman, and applying these concepts to in-flight CRM is critical to the success of these events.

106. LANDING ZONE CONSIDERATIONS

The evaluation of an LZ begins in the brief using satellite imagery to determine LZ surface composition and identify obstacles and hazards. While in flight, any changes to the LZ brief are typically briefed by an aircrewman during a real-time reconnaissance pass of the LZ. A proper LZ brief allows a crew to identify landing and takeoff hazards. Use the acronym SWEEP (Size, Winds, Elevation, Egress, and Power) to remember the components of an LZ brief in most rotary-wing communities. Although SWEEP is the most commonly used LZ brief, tactical situations may prevent using SWEEP due to time or threat requirements. Refer to Figure 1-5 for an example LZ.

Figure 1-5 CAL in Northwest Quadrant of Site X

107. SWEEP

During the evaluation of an LZ, use SWEEP to consider the following:

1. **S**ize, Slope, Suitability, and Surface

   a. The size will help the crew determine what kind of profile to fly and the power requirements expected. Additionally, the size determines how many helicopters can land in the zone at one time.

   b. Determine the overall slope of the surface. Slope landings have their own procedures and helicopter-specific requirements. A landing with one skid (or wheel) may be required if a more suitable LZ does not exist. CRM responsibilities increase during other than normal landing procedures such as slope or one skid/one wheel. A landing may not be possible if the slope is too steep. Slope landings are not practiced in the TH-73A.

c. Suitability and surface conditions of an LZ are important to note. If an LZ has loosely packed dirt, sand, or snow, brownout or a whiteout condition may occur on final and degrade or eliminate external visual cues. If an LZ surface is muddy or soft, there is a risk of a skid getting stuck causing dynamic rollover if a takeoff is attempted.

2. **W**inds

a. Determine local direction and speed using a windsock or other visual cues (i.e., grass, smoke, water, flags). To the maximum extent practical, approaches should be made into the wind or with a headwind component to reduce power requirements.

b. In the training environment, all approaches shall be planned with a headwind component. Identify and account for potential loss of wind effect due to obstructions such as trees or buildings. Note possible hazardous wind conditions (i.e., a vertical wind component). This is especially important in mountainous terrain.

3. **E**levation

– During preflight planning, use the elevation of the intended LZ to calculate the power available and power required. In flight, the elevation may necessitate a recalculation or reassessment of the power available, based on environmental or helicopter changes (i.e., gross weight, DA, humidity, etc.), especially when operating under high, hot, and/or heavy conditions.

4. **E**gress/Obstacles

a. Discuss any obstacles to landing and egress prior to landing. Ideally, the egress direction should be into the wind and in the same direction as the approach. Similar to landing, an egress into the wind will help reduce power requirements. However, a direct headwind is often not possible based on obstructions. In this case, plan an egress with as great a headwind component as possible.

b. If an egress straight ahead is not possible, a right turn out will require less TQ than a left turn. The crew will also identify any potential forced landing areas that could be used in the event of an emergency.

5. **P**ower Required versus Power Available

a. Compare power required and power available to verify a proper 10 percent power margin can be maintained. Your power required is the HIGE/HOGE requirement at an LZ elevation and is calculated prior to flight for expected conditions.

b. Power required shall be updated in flight if any factor differs significantly from those used in preflight planning (i.e., increased gross weight due to extra fuel/cargo on board or higher DA).

c. Power available shall be checked during the in-flight SWEEP checks if not already accomplished. Remember that your power available (TQ) may be limited by other helicopter parameters, such as ITT. Be careful to monitor all the performance instruments, especially the parameter limiting the power available.

108. POWER AVAILABLE

Power calculations are an important part of preflight planning. In flight, power checks are used to verify these calculations and identify any issues prior to conducting operations with smaller power margins. The aircrew may elect to pull power until reaching a maximum continuous limit. The power assurance checks conducted on the first event of the day also verify that the engine is providing the correct power. These power checks will assist the crew in identifying any issues with the helicopter's ability to produce power before attempting any maneuvers. The maximum continuous limit reached first will most likely be ITT or TQ in the TH-73. However, N1, N2, NR, airspeed, or electrical load limits, may also be the limiting parameter depending on operating conditions.

109. POWER REQUIRED CHECK

Application: For logistics missions, an additional in-zone operational power check is conducted to cross-check calculated and actual power requirements prior to conducting any CAL, Pinnacle, Hoisting, or External Load Operations. This power check allows the crew to identify any unexpected changes in conditions (heavier external load, higher DA) and verify a proper power margin is available.

1. Procedures

   a. Determine Pressure Altitude (PA) and operating weight.

   b. Use the Hover TQ Required Chart (Figure 1-6) in the PCL to determine baseline HIGE/HOGE power required.

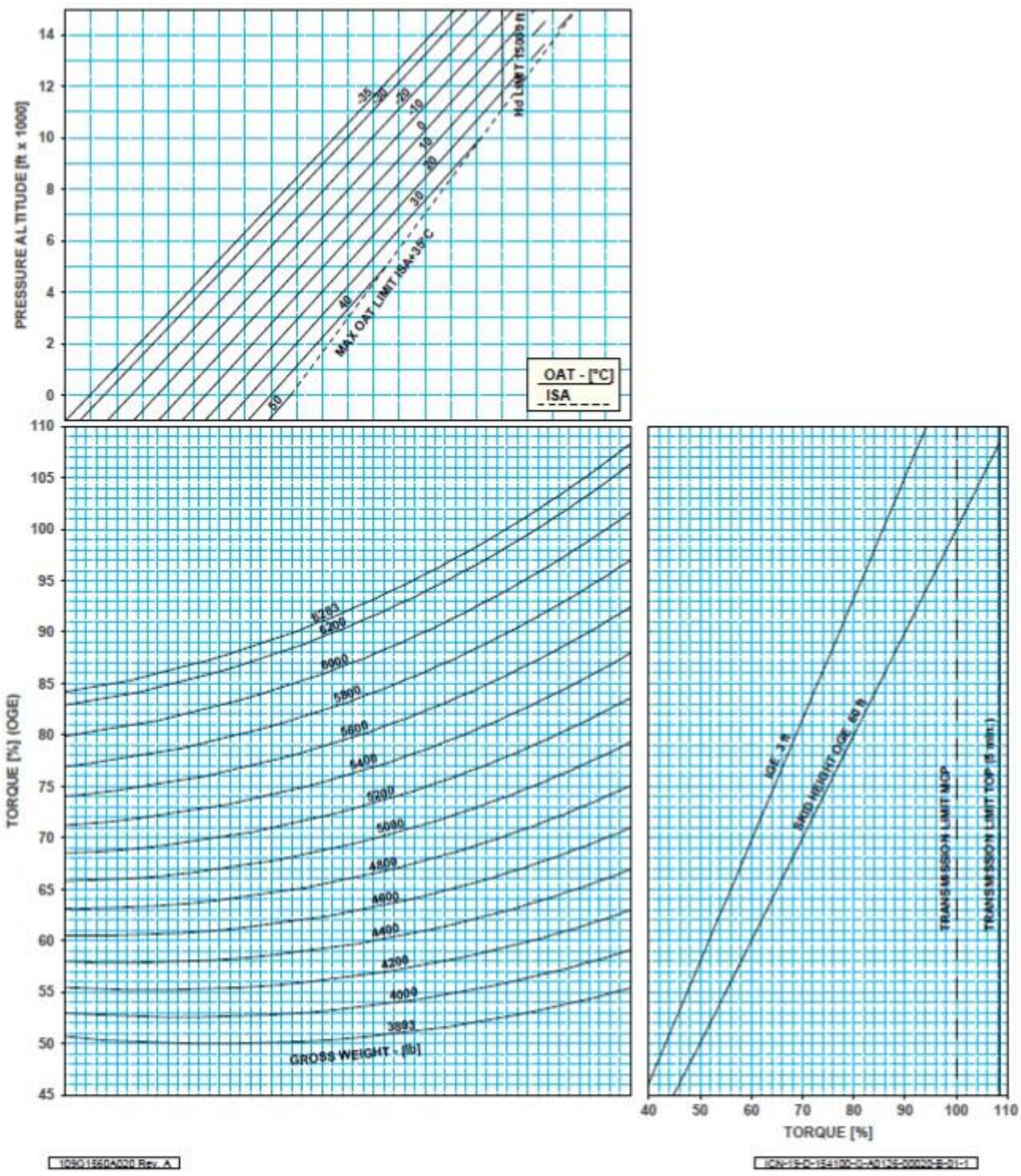

Figure 1-6 Hover TQ Required Chart

c. Pull into a five-foot hover for a HIGE or 50-foot hover for a HOGE.

d. Check power required and compare with calculations to verify accuracy.

2. Amplification and Technique

a. To determine the HIGE/HOGE requirements of the helicopter, you will need the helicopter's base weight. Add the crew complement and current fuel load. The sum of the base weight, crew, and fuel provides the current operating weight.

b. Determine current PA by setting the barometric altimeter to 29.92 and reading the indicated altitude.

c. The PA and temperature provide the crew with a dry DA to determine the power required. If humidity is above 40 percent, the aircrew may use the 40 percent rule learned in aerodynamics:

$$DA\ (\text{corrected for relative humidity } (RH) > 40\%) = DA\ (\text{chart}) + 100'(RH - 40\%)/10\,\%$$

d. The calculations give you the power required for a HIGE in a no-wind condition. However, a headwind component will reduce power requirements. At 60 feet, your power required to hover may be less than the calculated power required for HOGE or even HIGE if the helicopter is high enough and far enough from obstacles to be experiencing wind effect.

3. Common Errors and Safety Notes

a. Hovering with a tailwind component will increase the power required and should be avoided.

b. If the actual power required during the operational check exceeds the calculated power required, do not continue with the planned operations until determining the cause. While errors in calculation or environmental variables differing from those used in preflight planning may account for the discrepancy between actual and calculated power required, the cause may be a higher than expected helicopter gross weight. Determine the cause of the difference between power required and power available before attempting any maneuvers.

c. Conducting a power check in a hover at 60-foot Above Ground Level (AGL) requires operating in the avoid area of the H-V diagram.

CHAPTER TWO
HELICOPTER LZ OPERATIONS

200. INTRODUCTION

The skills taught and refined during helicopter LZ operations focus on understanding the helicopter maneuvering, control, and CRM required to land in different areas. CRM between pilots and the aircrewman plays a vital role that cannot be understated. The aircrewman can see parts of the helicopter and areas that neither pilot can see. Additionally, the crew must understand the relationship between power required and power available at any point in the maneuver to ensure safe and efficient mission execution.

201. QUICK STOP

Maneuver Description. The quick stop is a coordinated deceleration of the helicopter from a faster than normal approach airspeed while maintaining constant heading and altitude.

Application. The quick stop enables the pilot to develop the control coordination required to decelerate the helicopter as quickly as possible while keeping the helicopter within a safe flight envelope.

1. Procedures

    a. Maintain 500 feet AGL and accelerate to 100 KIAS on the downwind.

        i. Ensure clearance in the landing pattern from traffic; make a radio call to ensure de-confliction.

        ii. Plan to arrive at altitude before accelerating to 100 KIAS.

    b. At the downwind field boundary, begin a descending turn towards the course line and maintain balanced flight. Use the following verbal procedures:

        i. "**Trim**" – Depress the Force Trim (FTR) button.
        ii. "**Power**" – Reduce power to begin a descent.

        iii. "**Pedal**" – Adjust pedal to keep the aircraft in balanced flight.

        iv. "**Push**" – Push the cyclic forward to maintain 100 KIAS in the descent.

        v. "**Turn**" – Clear the aircraft left and right, and then begin the descending, decelerating turn.

        vi. "**Trim**" – Use pedals to center the ball and cyclic trim to maintain attitude.

    c. Arrive at the 90-degree position at 300 feet AGL and 100 KIAS.

d. Intercept the course line at 100 KIAS and continue to descend to 50 feet AGL. Establish crosswind corrections as necessary.

– Ensure safe obstacle clearance before descent.

e. Stabilize momentarily at 50 feet AGL, 100 KIAS, and then coordinate collective reduction and aft cyclic to slow the aircraft while maintaining constant heading and altitude.

i. Be deliberate and smooth with collective reduction; ensure N2/NR remain in limits.

ii. Reducing power before applying aft cyclic will help prevent ballooning.

f. Slow to 45 KIAS airspeed.

– Maintain scan to hold altitude at 50 feet AGL.

g. Recover by coordinating increased collective and forward cyclic while maintaining constant heading and altitude.

h. Accelerate to 70 KIAS and resume a normal climb.

2. Amplification and Technique

a. Close attention is required to maintain airspeed through turn to final; consider use of the FTR cyclic button to trim nose attitude.

b. Use power to level off at 50 feet AGL; keep an outside scan to determine altitude.

c. Maintaining a minimum of 20 percent torque will allow the aircraft to decelerate but will maintain enough load on the rotor head so as not to over-speed NR.

d. Approaching 45 KIAS, anticipate the need for increased power and forward cyclic to maintain altitude and airspeed.

e. The more the collective is lowered in coordination with aft cyclic inputs, the faster the aircraft will decelerate. If collective is not lowered enough, the aircraft may not slow to 45 KIAS prior to the upwind field boundary.

3. Common Errors and Safety Notes

a. Reducing collective with high forward airspeed, especially greater than 80 KIAS, will cause N2/NR to rise; ensure coordinating controls to prevent an overspeed.

b. Avoid the common tendency to let the airspeed get excessively slow during the recovery.

c. Avoid tendency to descend or balloon on entry due to poor cyclic and collective control coordination.

d. The quick stop shall be initiated by the middle of the field.

e. Safe obstacle clearance shall be maintained throughout the entire maneuver.

202. HIGH SPEED APPROACH

Maneuver Description. The high speed approach enables the pilot to make a safe transition from high speed low-level flight to a steep approach terminating in a hover or no hover landing.

Application. The high speed approach is a maneuver used to develop the coordination to safely land the helicopter from an approach with a high rate of speed.

1. Procedures

a. Maintain 500 feet AGL and accelerate to 100 KIAS on the downwind.

i. Ensure clearance in the landing pattern from traffic; make a radio call to ensure de-confliction.

ii. Plan to arrive at altitude before accelerating to 100 KIAS.

b. At the downwind field boundary, begin a descending turn towards the course line and maintain balanced flight. Use the following verbal procedures:

i. "**Trim**" – Depress the FTR button.

ii. "**Power**" – Reduce power to begin a descent.

iii. "**Pedal**" – Adjust pedal to keep the aircraft in balanced flight.

iv. "**Push**" – Push the cyclic forward to maintain the 100 KIAS attitude.

v. "**Turn**" – Clear the aircraft left and right, and then begin the descending, decelerating turn.

vi. "**Trim**" – Use pedals to center the ball and cyclic trim to maintain attitude.

c. Arrive at the 90-degree position at 300 feet AGL and 100 KIAS.

d. Intercept the course line at 100 KIAS and continue the descent to 50 feet AGL. Establish crosswind corrections as necessary.

– Ensure safe obstacle clearance before descent.

e. Stabilize momentarily at 100 KIAS and 50 feet AGL, then coordinate down collective and aft cyclic to slow the helicopter. Maintain constant heading and altitude.

i. Be deliberate and smooth with collective reduction; do not allow N2/NR to over-speed.

ii. Avoid tendency to balloon by reducing power before applying aft cyclic.

f. Coordinate cyclic and collective to continue the deceleration to arrive at a steep approach glideslope with 50 feet AGL and approximately 15–20 Knots Ground Speed (KGS).

– Intercept a steep approach (15–30 degrees) glideslope and refer to steep approach procedures.

g. Terminate the approach in a hover or no hover landing.

2. Amplification and Technique

a. Close attention is required to maintain airspeed through turn to final; consider use of the FTR cyclic button to trim nose attitude.

b. Use power to level off at 50 feet AGL; keep an out scan to determine altitude.

c. Adjust the Rate of Descent (ROD) and rate of closure to arrive over the intended point of landing at zero groundspeed and hover altitude.

d. Cyclic, collective, and directional control pedals must be coordinated to slow the helicopter while maintaining a constant heading and altitude. The pilot must anticipate the distance required to decelerate the aircraft and establish the helicopter on a steep approach glideslope to the intended point of landing.

3. Common Errors and Safety Notes

a. See the “Common Errors and Safety Notes” under “QUICK STOP” (Quick Stop 419).

b. Do not fail to maintain 100 KIAS until beginning the deceleration.

c. Do not descend below 50 feet AGL on final.

d. Do not fail to momentarily stabilize at 100 KIAS and 50 feet AGL.

e. Do not allow the aircraft to balloon.

f. Avoid failure to maintain heading and ground track.

g. Avoid too shallow of a glideslope for a steep approach. This is usually due to attempting to intercept the glideslope with too much airspeed. Ensure the helicopter has a groundspeed commensurate (less than 20 KGS) for a proper steep approach profile at 50 feet AGL.

h. An excessively nose high attitude at low altitude may result in the tail skid contacting the ground, which may cause serious structural damage to the aircraft. Ensure nose attitude is less than 10 degrees passing 10 feet.

i. The nose attitude of the aircraft, once established on the steep approach glideslope, may be well above a normal steep approach due to the rapid deceleration required to perform this maneuver correctly. Anticipate arrival on the glideslope with a higher nose attitude than normal. Maintain 50 feet AGL until established on the glideslope.

203. DYNAMIC LANDING APPROACHES

Dynamic Landing Approaches (DLA) are used to expeditiously transition the helicopter from the tactical en route environment to the landing profile in a safe and efficient manner. This is accomplished through power and energy management. The following three patterns are designed to assist the Pilot at Controls (PAC) in transitioning to a landing, depending on orientation to the LZ and wind direction.

TERF routes are designed to make effective use of cover and concealment afforded by terrain. These routes are generally planned to align the helicopter close to the desired landing direction to facilitate flow into the LZ; however, this may not always be possible. Pilots will select the appropriate type of approach based on obstacles, the shape of the zone, and the heading of the last leg leading to the LZ.

204. 360-DEGREE OVERHEAD APPROACH

Application: The 360-degree overhead approach may be used when the LZ is acquired after the helicopter is nearly on top and the heading is into the wind. Refer to Figure 2-1 for the approach.

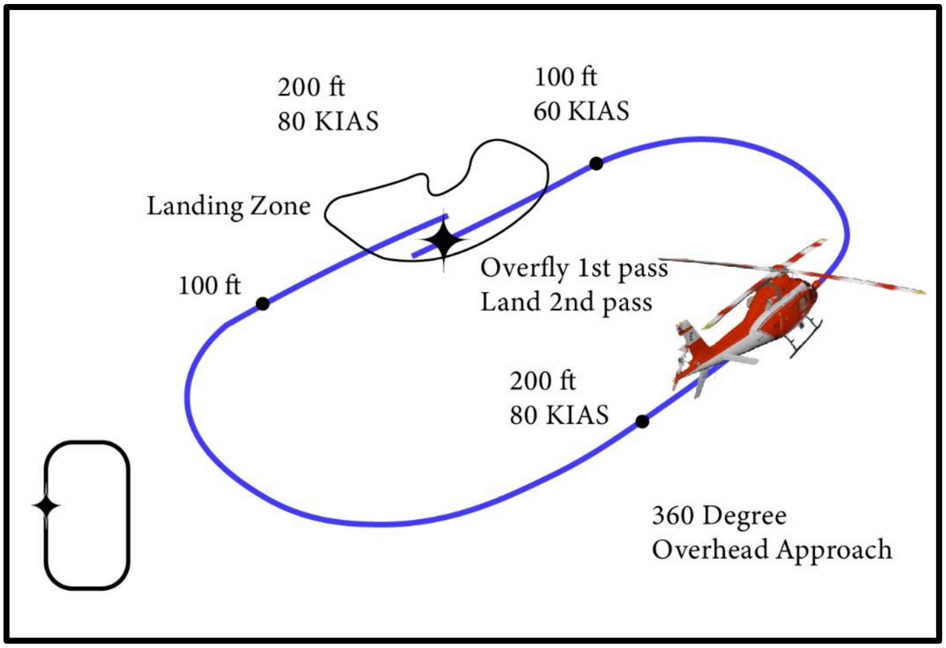

Figure 2-1 360-Degree Overhead Approach

– **Procedures**

a. Complete an LZ evaluation.

b. From a takeoff, execute the downwind turn no lower than 100 feet AGL.

c. Fly the pattern at 200 feet AGL and 80–100 KIAS.

d. Any crewmember may call out, "*Contact LZ, _____o'clock, _____ meters*."

e. The PAC will alert the crew of landing intentions and coordinate a specific touchdown point.

i. PAC: *"Left 360, no hover landing, on the discolored spot in the grass."*

ii. Aircrewman: *"Roger left 360."*

f. From the up wind, initiate the maneuver with a decelerating turn before or directly over the intended point of landing.

– The PAC will state, *"Coming left."*

g. The aircrewman will provide callouts for the LZ until the PAC has the LZ in sight.

i. Aircrewman: *"LZ 8 o'clock. LZ 9 o'clock."*

ii. PAC: *"Contact LZ."*

h. Maintain 200 feet AGL and decelerate to no slower than 80 KIAS until abeam the intended point of landing.

i. Abeam the intended point of landing, begin a descending, decelerating turn to intercept final at 100 feet AGL and 60 KIAS.

j. The aircrewman will give closure rate calls to the spot.

CAUTION

As G-loading increases in the turn, NR will increase. Increase collective as required to maintain NR in limits.

k. On short final, the aircrewman will continue with closure altitude calls and a final clearance call on the right side of the helicopter. The left seat pilot (or aircrewman) will clear the left side to signal final clearance to touchdown.

i. Aircrewman: *"Forward and down 50, 40, 30, 20, 10, 5, 3, 2, 1."*

ii. Aircrewman: *"Clear right and below."*

iii. Left seat pilot: *"Clear left and below."*

l. Terminate the approach in a hover or no hover landing.

CAUTION

Avoid excessive nose-up attitude when executing a no hover landing to preclude contacting the tail skid on the ground.

205. 180-DEGREE OFFSET APPROACH

Application: This approach is used when the intended point of landing is abeam and 180 degrees from the helicopter's current heading. Refer to Figure 2-2 for the approach.

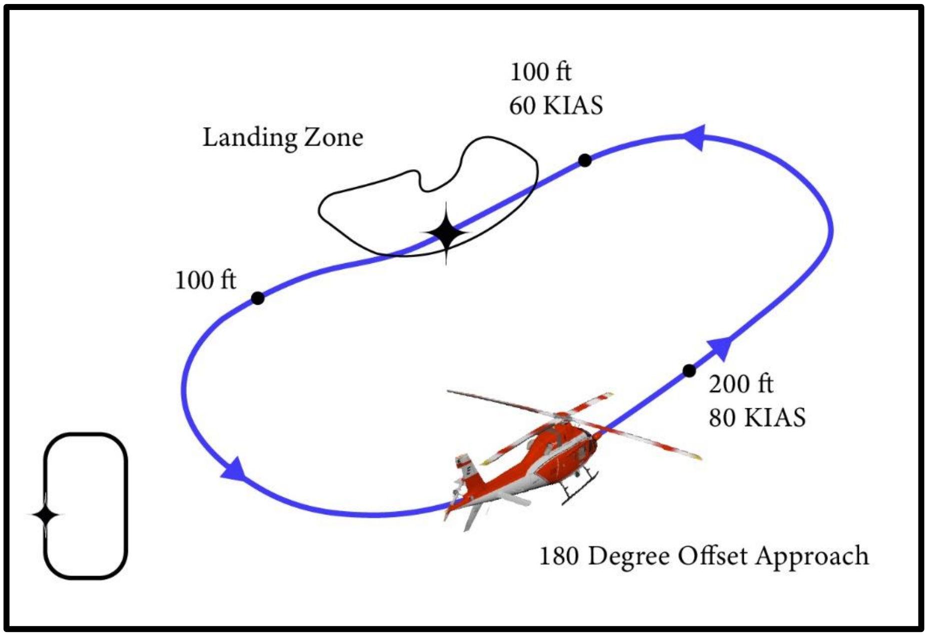

Figure 2-2 180-Degree Offset Approach

1. Procedures

a. Complete an LZ evaluation.

b. From a takeoff, execute the downwind turn no lower than 100 feet AGL.

c. Set up by flying a downwind at 200 feet AGL and 80 to 100 KIAS.

d. Any crewmember may call out, "*Contact LZ, _____ o'clock, _____miles/yards/meters*."

e. The PAC will alert the crew of landing intentions and coordinate a specific touchdown point. The aircrewman will then acknowledge.

i. PAC: *"Left 180, no hover landing, on the gravel spot."*

ii. Aircrewman: *"Roger, left 180."*

f. Initiate the maneuver directly abeam or slightly past the intended point of landing with a descending, decelerating turn.

g. The PAC will state, "*Coming down and left*."

CAUTION

As G-loading increases in the turn, NR will increase. Increase collective as required to maintain N2/NR in limits.

h. On short final, the aircrewman will continue with closure rate and altitude calls as well as a final clearance call on the right side of the helicopter. The left seat pilot (or aircrewman) will clear the left side to signal final clearance to touchdown.

i. Aircrewman: *"Forward and down 50, 40, 30, 20, 10, 5, 3, 2, 1."*

ii. Aircrewman: *"Clear right and below."*

iii. Left seat pilot: *"Clear left and below."*

i. Terminate the approach to a hover or no hover landing.

CAUTION

Avoid excessive nose-up attitude when executing a no hover landing to preclude contacting the tail skid on the ground.

2. Amplification and Technique

a. DLAs are meant to be executed starting from an airspeed of 100 KIAS. At IP discretion, the Student Naval Aviator (SNA) may execute these at 80 or 90 KIAS as a build up to 100 KIAS. An effective DLA requires deliberate energy management to handle the excess power on the helicopter in order to transition from the high-speed, low-level environment to landing. Initiate the DLA by reducing power and introducing a turn. Using approximately 10 degrees nose up during the first part of the turn will easily dissipate energy and allow the helicopter to arrive on proper parameters on final.

b. Constantly reevaluate your position relative to the LZ and ensure you are dissipating the kinetic and potential energy on the helicopter at a rate that will allow a safe landing on your intended profile.

c. Using the mnemonic "Trim, Power, Pedal, Pause, Turn, Trim" may remind the PAC of what to do to dissipate the energy necessary when starting the descending, decelerating turn to final.

d. Energy management principles are applied to dissipate excess energy and land the helicopter safely and quickly. Additionally, this maneuver allows the helicopter to rapidly transition through the avoid area of the H-V diagram.

e. Every dynamic landing should be flown with the possibility of reduced visibility (i.e., brownout or whiteout) in mind. Although brownout landings are not practiced in the TH-73A training environment, consistently flying a profile that efficiently manages energy and maximizes the trim and stability of the helicopter allows the pilot to react to wave-off conditions safely and effectively. It also prepares you to handle reduced visibility conditions during the landing profile.

f. In the turn to final, increase Angle of Bank (AOB) sufficiently to induce a descent. As the helicopter settles into the turning descent, increase nose attitude to approximately 10 degrees to reduce speed.

g. Plan to execute a profile slightly steeper than a normal approach to allow for a higher airspeed but not so steep that a large power increase is needed to arrest the rate of descent and land.

h. Once airspeed is below minimum power required airspeed (approximately 60 KIAS), increasing collective is more effective at slowing the helicopter than reducing the collective. This technique effectively keeps thrust on the helicopter in preparation for landing.

3. Common Errors and Safety Notes

a. Ensure 100 feet AGL is reached prior to turning downwind.

b. Anticipate leveling off at 200 feet by beginning to reduce collective after passing 100 feet AGL to avoid ballooning past the DLA pattern altitude.

c. Adhere to NATOPS AOB limitations.

d. Anticipate an increase in collective when increasing AOB to maintain NR within operating limits.

e. Maintain a vigilant scan to avoid all obstacles by a minimum of 10 feet.

f. If the closure rate becomes excessive or the glideslope exceeds 45 degrees, execute a wave-off.

g. Avoid excessive nose high attitudes when close to the ground, especially when executing a no hover landing. Ensure nose attitude is below eight degrees as the helicopter descends below 10 feet AGL.

206. CONFINED AREA OPERATIONS

Maneuver Description: A confined area is an LZ in which the helicopter's maneuverability is limited in some direction by terrain or other obstructions. The Confined Area Approach is a steeper than normal, power-controlled approach used when obstacles prevent a normal approach glideslope to the intended point of landing. During these approaches and landings, pilots will smoothly control descent and closure rates to achieve a precision descent.

Application: CAL procedures, as shown in Figure 2-3, may be necessary for a wide variety of missions flown by naval helicopters, including disaster relief, SAR, and Assault Support when higher terrain and/or obstacles surround the optimum-landing site.

207. CAL

1. **Procedures**

    a. Ensure power checks are completed and the power margin is satisfied.

    b. Take off and establish a pattern at 300 feet AGL and 70 KIAS.

    c. Make a reconnaissance pass of the CAL.

        i. Descend to no lower than 150 feet AGL and go no slower than 50 KIAS on the reconnaissance pass.

        ii. Aircrewman will describe the LZ over the Intercommunication System (ICS) using the SWEEP acronym.

        iii. The PAC will describe the intended approach: *"We'll approach the CAL from South-to-North, steep approach to a hover, and touch down on the gravel. Wave off will be straight ahead."*

    d. Aircrewman will announce "Abeam" when abeam the intended point of landing at 300 feet AGL and 70 KIAS. Commence a descending, decelerating turn to final for the CAL.

    e. Intercept course line at 150 feet AGL and 60 KIAS.

        i. PAC announces, *"On final left/right seat for CAL zone _____"* when established on final.

        ii. Aircrewman acknowledges with, *"Roger, on final left/right seat for CAL zone _____."*

        iii. Aircrewman begins advisory ICS calls.

    f. Continue descending and decelerating to a position 30–50 feet above the highest obstacle with the CAL in sight. Decelerate so that as the nose of the aircraft approaches the edge of the CAL, groundspeed is not faster than 20 KGS.

g. Adjust closure rate and glideslope as necessary to ensure a minimum of 10 feet of obstacle clearance.

   i. Aircrewman reports the distance to the landing point and makes advisory calls concerning rotor clearance and drift.

   ii. Aircrewman announces *"tail clear"* when the tail rotor is clear of all obstacles.

h. Adjust collective as necessary to continue descent into the CAL. Maintain a comfortable closure rate.

   i. Aircrewman continually clears around the aircraft once in the CAL and provides directions to the PAC as necessary.

   ii. Any crewmember may announce *"committed"* when a wave off is no longer possible.

i. Continue forward as necessary and down until established in a steady 3-foot hover in the upwind half of the CAL.

   i. Aircrewman announces *"clear right and below."*

   ii. Left seat pilot announces *"clear left."*

   iii. Aircrewman clears under the aircraft and announces *"clear to land."*

j. Smoothly execute a vertical or no hover landing, anticipate sloping or rough terrain in the LZ.

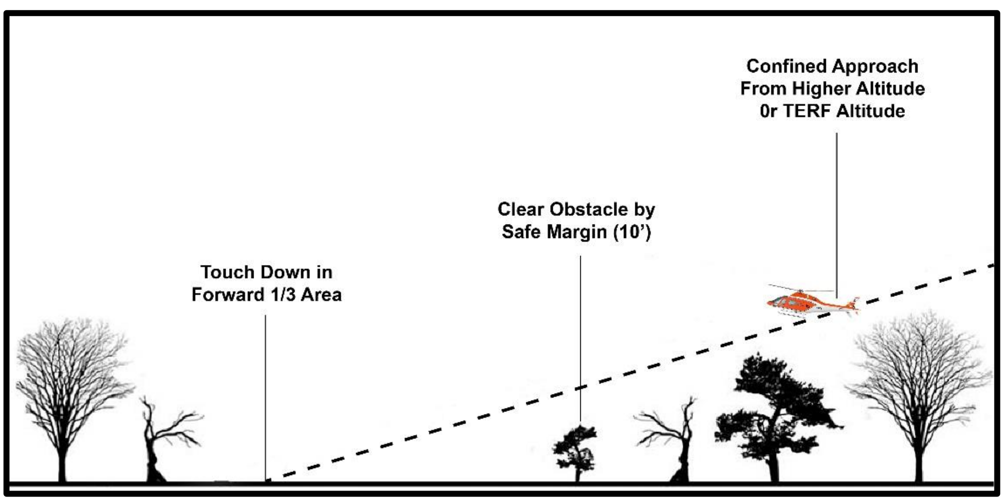

Figure 2-3 CAL Approach

2. Amplification and Technique

a. Power checks shall be completed prior to performing CAL operations. CAL approaches build on the SNA's ability to fly an approach precisely to a spot along a consistent approach path. During CAL approach, the spot is surrounded by obstructions, requiring increased understanding and anticipation of power requirements.

b. Planning the approach requires consideration of several factors, which will be assessed during the reconnaissance pass (SWEEP check).

   i. **Size, Surface, Slope, and Suitability:** Note the size of the CAL and plan the intended point of landing accordingly. If possible, determine the surface type and slope of the zone. Avoid landing on soft or loose surfaces or areas with high slopes.

   ii. **Wind:** Take note of where the loss of wind effect may occur. Choose the approach direction, which allows for the advantage of wind effects and provides the lowest obstacles and best entry into the zone.

   iii. **Elevation:** During the reconnaissance pass, note the radar and barometric altimeter elevations to determine the zone's approximate Mean Sea Level (MSL) elevation.

   iv. **Egress Route:** Determine the direction of wave-off should one become necessary. Take note of locations along the approach where the helicopter can land safely in the event of an engine failure or other emergencies during the approach. Keep in mind that once the helicopter is committed to the CAL, the forced landing area is the zone itself.

   v. **Power Required versus Power Available:** Calculating an accurate weight and balance and conducting a power available check ensures the pilot knows how much power will be available during the approach. This also ensures the pilot will know how much power will be needed to complete the approach.

c. Landing in CAL is at the IP's discretion, depending on the terrain. The first approach by the SNA should be to a hover. All other landings may be conducted as no hover or vertical landings.

d. Smooth, coordinated cyclic and collective inputs are required to maintain the glideslope without requiring excessive power. If the glideslope or the closure rate are excessive, wave off.

e. Once on deck, the aircrew may elect to walk the outline of the rotor arc to give the SNA a better visualization of the rotor arc.

f. The mark on top feature may aid the aircrew in maintaining SA of the aircraft position in relation to the zone.

g. Be aware of your power margin (power required vs. power available) when maneuvering the helicopter. This is especially important once the helicopter is committed to the zone and no longer able to execute a wave-off.

h. If the helicopter approaches the landing point with a high descent rate, a large increase in power will be required to arrest the descent rate to land safely. Under conditions of high gross weight, high DA, or high temperatures, the engine may not be able to produce the power required to stop the ROD, resulting in a hard landing.

i. Increase power early in the descent and establish a high-powered, low descent rate approach. This will allow the pilot to fly a controlled approach to a landing point without placing the helicopter in a "power required exceeds power available" situation.

3. **Common Errors and Safety Notes**

a. Controlling rate of closure is critical. Avoid descent rates in excess of 500 Feet per Minute (fpm) when airspeed is below 30 KIAS; vortex ring state may result.

b. If the closure rate becomes excessive or the approach becomes uncomfortable, execute a wave-off.

c. As the helicopter crosses the obstacle, ensure the aircrewman has cleared the tail rotor. Do not descend into the CAL until verbally cleared to do so.

d. Anticipate a loss of wind effect or turbulence as the helicopter nears and descends below the upwind obstructions.

e. Ensure power required does not exceed the required margin.

208. CONFINED AREA TAKEOFF

See the Day Familiarization Flight Training Instruction (FTI) Procedures for Obstacle Clearance Takeoff. Confined Area Takeoff is displayed in Figure 2-4 below.

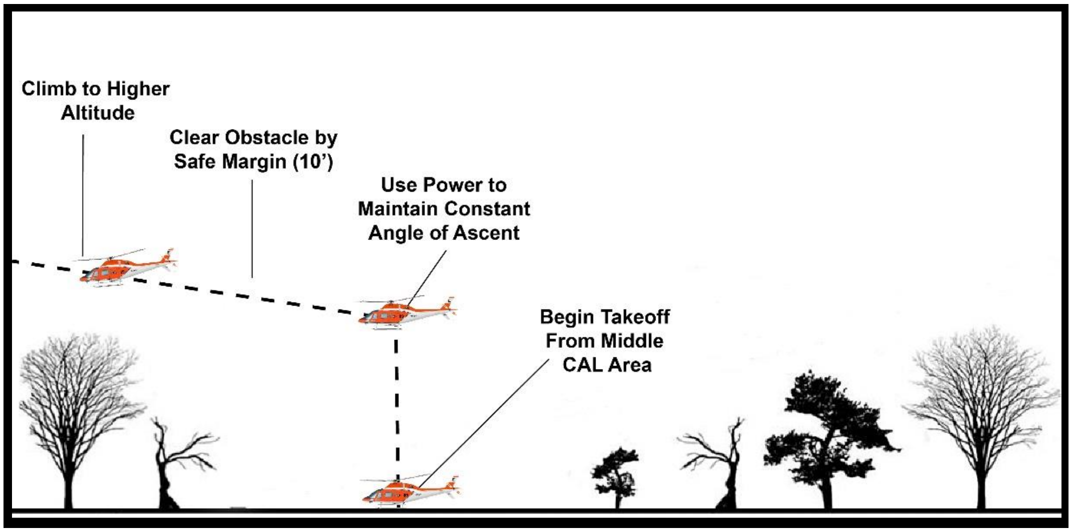

Figure 2-4 Confined Area Takeoff

1. **Procedures**

   a. Lift into a three-foot hover. The PAC will make a radio call, *"(NOLF) traffic, (Aircraft callsign) lifting CAL zone _____."*

   b. The aircrewman will make one last look for traffic and call *"clear."*

   c. Proceed with Obstacle Clearance Takeoff Procedures.

2. **Amplification and Technique**

   a. Execute two 90-degree turns to the left so the aircrew may ensure adequate tail clearance prior to taxiing to the center of the CAL. These turns may be continuous at the IP's discretion if cleared by the aircrew to do so. Once in the center, conduct a 180 degree left turn back to desired egress heading.

   b. Select the best takeoff route that optimizes wind and the lowest obstacle clearance. Include a minimum of 10 feet of clearance from the highest obstacle on the intended flight path.

   c. Obstacles permitting, the PAC may elect to gain some forward airspeed. Doing so will allow the helicopter to pass through the avoid area of the H-V diagram more quickly.

   d. Take note of where the helicopter will regain wind effect.

e. Consideration may be given to using the Hover Mode on the bottom of the Primary Flight Display (PFD) or on the top of the PFD when not using the basic attitude indicator mode to aid the PAC in recognizing any drift. However, the PAC should primarily be scanning outside.

3. **Common Errors and Safety Notes**

a. While in the confined area LZ, any helicopter movement shall be cleared by all crewmembers prior to commencement and shall be executed to the left. Always ensure main and tail rotor clearance prior to maneuvering in the zone. Without clearance, a tail rotor strike may occur, potentially resulting in a complete loss of tail rotor thrust.

b. Rushing the maneuver may cause settling, poor yaw control, and loss of obstacle clearance. Confined Area Takeoffs are precision maneuvers and require more time and concentration than normal takeoffs. Smooth control coordination is required throughout the landing and takeoff.

c. The Hover Mode on the PFD is an aid for the PAC and does not supersede an outside scan or positional calls from the aircrewman.

209. PINNACLE OPERATIONS

Maneuver Description: A pinnacle is an area from which the surface drops away steeply on all sides. The absence of obstacles does not necessarily decrease the difficulty of Pinnacle Operations. The Pinnacle approach and landing, as shown in Figure 2-5, is a precision, power-controlled approach used when the intended point of landing is elevated above the surrounding terrain. The Pinnacle takeoff is shown in Figure 2-6.

Application: Pinnacle Operations are used when landing on an elevated LZ, such as a ship's flight deck or an LZ in mountainous terrain.

210. PINNACLE LANDING

1. **Procedures**

a. Ensure power checks are completed and a sufficient power margin is satisfied.

b. Take off and establish a pattern at 300 feet above the elevation of the intended point of landing and 70 KIAS.

c. Make a reconnaissance pass of the pinnacle.

i. Descend to no lower than 150 feet AGL and go no slower than 50 KIAS on the reconnaissance pass.

ii. The aircrewman will describe the LZ over the ICS using the SWEEP acronym.

iii. The PAC will describe the intended approach: *"We'll approach the pinnacle from South to North, steeper than normal approach to a hover, and touch down on the gravel. Wave-off will be straight ahead."*

d. Aircrewman will announce *"Abeam"* when abeam the intended point of landing at 300 feet AGL and 70 KIAS. Commence a descending, decelerating turn to final. Intercept final at 150 feet AGL and 60 KIAs with glideslope appropriate to clear any obstacles for the forward part of the LZ.

i. Announce, "*On final left/right seat for the pinnac*le."

ii. Aircrewman acknowledges with "*Roger, on final left/right seat for the pinnacle*."

iii. Aircrewman begins advisory ICS calls.

e. Continue until established in a steady 3-foot hover or continue to a no hover landing.

i. Aircrewman announces, "*Clear right and below*."

ii. The left seat pilot announces, "*Clear left*."

iii. Aircrewman clears under the helicopter and announces, "*Clear to land*."

f. Smoothly execute a vertical or no hover landing, anticipate sloping or rough terrain on the pinnacle.

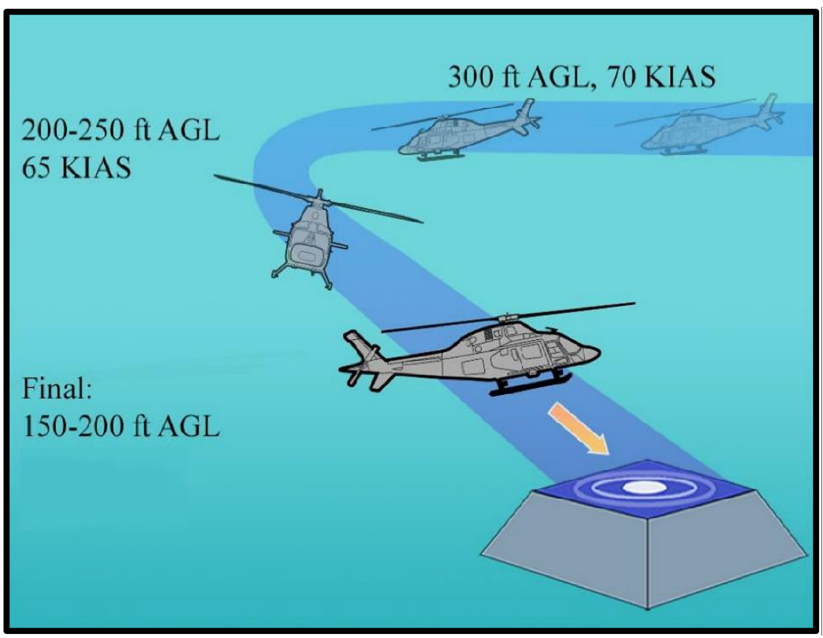

Figure 2-5 Pinnacle Landing

2. **Amplification and Technique**

a. Power checks shall be completed prior to performing Pinnacle Operations. Pinnacle approaches build on the SNA's ability to fly an approach precisely to a spot along a consistent approach path.

b. Planning the approach requires considering several factors, which will be assessed during the LZ evaluation (SWEEP Check).

i. **Size, Slope, Surface, and Suitability:** If possible, plan an approach to the forward half of the pinnacle to take advantage of the ground effect sooner. Take note of where the surface of the LZ slopes down or lends itself to loss of visibility (i.e., loose dirt, sand, etc.).

ii. **Wind:** Plan the approach to be into the wind to the greatest extent possible.

iii. **Elevation:** During the reconnaissance pass, note the radar and barometric altimeter elevations to determine the pinnacle's approximate MSL elevation.

iv. **Egress Route:** Determine the direction of wave-off, should one become necessary. Note the position of obstacles that will affect the approach or departure.

v. **Power Required versus Power Available:** Using data from the weight and balance and power checks, determine the power required to accomplish the approach. Consider determining if the helicopter will have the ability to HOGE in the event the helicopter slows to a hover before reaching ground effect over the Pinnacle.

c. Be aware of your power margin (power required vs. power available) when maneuvering the helicopter.

d. The first approach by the SNA shall be to a hover. All other landings may be conducted as no hover or vertical landings.

e. When it is not possible to keep the LZ in sight, the PAC should choose specific reference points along the flight path to stay oriented on the glideslope.

f. The mark on top feature may aid the aircrew in maintaining SA on the aircraft's position in relation to the pinnacle.

g. A steep approach glideslope is preferred. Increase power early in the descent and establish a high-powered, low descent rate approach. This will allow the pilot to fly a controlled approach to a precise landing point while checking the helicopter's performance. If power required exceeds power available early on glideslope, a steep approach glideslope allows time to exchange altitude for airspeed and waveoff above the pinnacle/deck edge. Moreover, a steep approach glideslope precludes the normal tendency to fly shallow, fast glideslopes (searching for visual cues) with the potential for pinnacle/deck edge contact. Finally, a steep approach will prevent flying into potential downdrafts or burbles at the downwind (aft) pinnacle/deck edge, resulting in power required exceeding power available or exceeding aircraft limitations.

h. Smooth, coordinated cyclic and collective inputs are required to maintain the glideslope without requiring excessive power. If the glideslope or the closure rate becomes excessive, wave off.

3. Common Errors and Safety Notes

a. The rate of closure is critical. As the rate of closure increases, the ROD also increases. Avoid descent rates in excess of 500 fpm when airspeed is below 30 KIAS; vortex ring state may result.

b. Ensure the aircrewman clears the landing area prior to landing. Failure to wait for the aircrewman's "Clear to land" may result in a dynamic rollover caused by excessive lateral drift or improper skid placement on the pinnacle.

211. PINNACLE TAKEOFF

1. **Procedures**

a. Establish a steady 3-foot hover and complete a clearing turn. Transition to a forward flight may be accomplished from a hover or no hover takeoff.

i. The aircrewman will make one last check for traffic and call *"Clear right and forward."*

ii. Begin a smooth acceleration and transition to forward flight. Keep the scan moving and continually clear all parts of the helicopter.

b. Select the best takeoff route optimizing wind effects and lowest obstacle clearance.

c. Include a minimum clearance of ten feet from the highest obstacle on the intended flight path.

d. When clear of any immediate obstacles, maneuver as necessary while gaining airspeed as soon as possible.

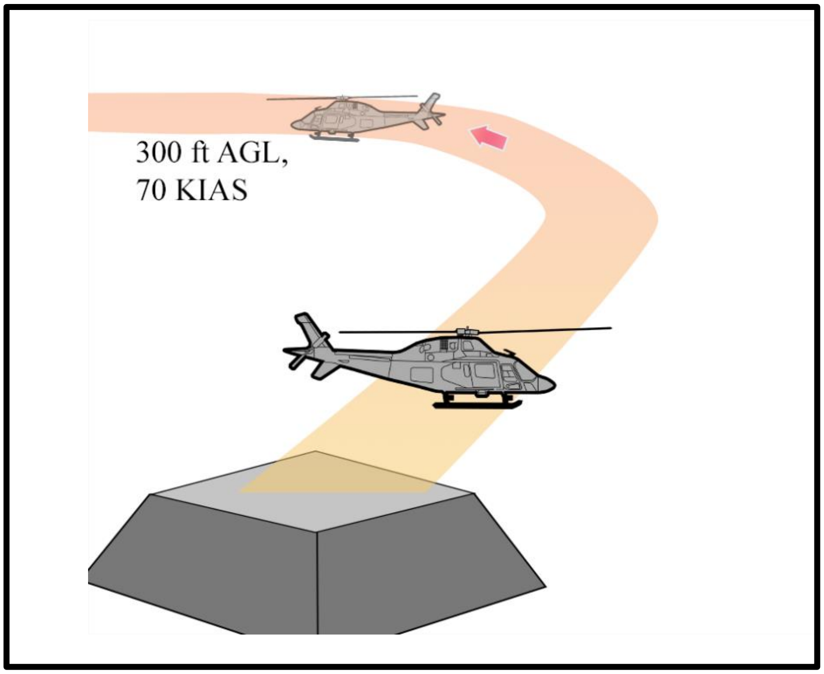

Figure 2-6 Pinnacle Takeoff

2. **Amplification and Technique**

a. The takeoff from a pinnacle is an altitude over airspeed maneuver. This is done to check and confirm aircraft performance and power margins before crossing the forward edge of the pinnacle (HIGE to HOGE). Moreover, crossing the forward edge at a higher altitude (greater than 10 feet of clearance is recommended) precludes tail contact with the pinnacle if/when the helicopter settles during the transition to forward flight.

b. Once the helicopter has transitioned to forward flight past the forward edge of the pinnacle, it is no longer in ground effect. Anticipate the increase in power required by slightly increasing collective as needed to maintain takeoff profile.

3. **Common Errors and Safety Notes**

a. Take note of forced landing areas for your approach and take off.

b. Smooth control coordination is required throughout the takeoff. Rushing the maneuver may cause settling and poor yaw control resulting in loss of obstacle clearance.

c. Anticipate loss of ground effect on takeoff by adding power to prevent settling. Failure to do so may result in the tail striking the pinnacle.

d. Do not delay accelerating to a normal takeoff airspeed once clear of the pinnacle/deck edge and any other obstacles. A higher airspeed will assist the PAC in reaching a safe area in the event of a forced landing. It also permits a more effective flare prior to making an autorotative landing if a suitable forced landing area is not available.

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CHAPTER THREE
EXTERNAL LOAD AND HOISTING OPERATIONS

300. INTRODUCTION

External load and hoisting operations require extensive CRM. Aircrewmen can monitor underneath and around the helicopter and build the pilots' SA at critical phases during external load and hoisting operations. This is especially important when operating with personnel underneath the helicopter or on the hoist.

301. EXTERNAL LOAD OPERATIONS

The two basic modes of helicopter cargo transport are internal and external loading. This section discusses only external loads. Each Type, Model, and/or Series (T/M/S) will have specific procedures for external load operations in the NATOPS manual.

Preflight briefings, weight and balance computations, and cargo hook systems preflight are essential steps to complete prior to commencing external load operations. Do not attempt external load operations with an uncorrected discrepancy of the cargo release system.

The TH-73A has a detachable external cargo hook located underneath the cabin directly under the main rotor mast. It is capable of lifting up to a 3,086-lb load and has an electrical release on the cyclic. There are two manual releases, one between the pilots and one on the cargo hook itself. The hook load indicator located in the center of the glareshield provides a readout of the weight of the external load for the pilots' reference. For more information on the cargo hook, see the TH-73A NATOPS Flight Manual.

The TH-73A uses a DSG-12-4K pendant, Figure 3-1, to attach an external load to the cargo hook, Figure 3-2. This pendant is 12 feet long and includes a six-foot plastic reach tube to ease external hook up. The DSG-12-4K is capable of holding a working load of up to 4,000 lbs.

Figure 3-1 DSG 12-4K Pendant

Figure 3-2 DSG 12-4K Pendant Attached to TH-73A Cargo Hook

Depending on the type of external load, some T/M/S may land next to the external load and hook it up while on deck. Other types of external load operations, such as Vertical Replenishment (VERTREP), call for the external load to be attached to the helicopter in a hover. For external operations in the TH-73A, an aircrewman assigned to the Outlying Field (OLF) site will attach the load to the cargo hook while the helicopter is in a hover.

Safe and efficient external load operations necessitate a significant amount of CRM. The aircrewman will be able to see the external load and pick up/drop off zone while the pilots lose sight of each of these elements. The aircrewman shall give verbal directions to the pilot concerning the pick-up, drop, and status of the load during flight. Helicopter movement, wind speed, and azimuth during external load operations shall be conducted in accordance with the Low Speed Controllability Chart (Figure 3-3).

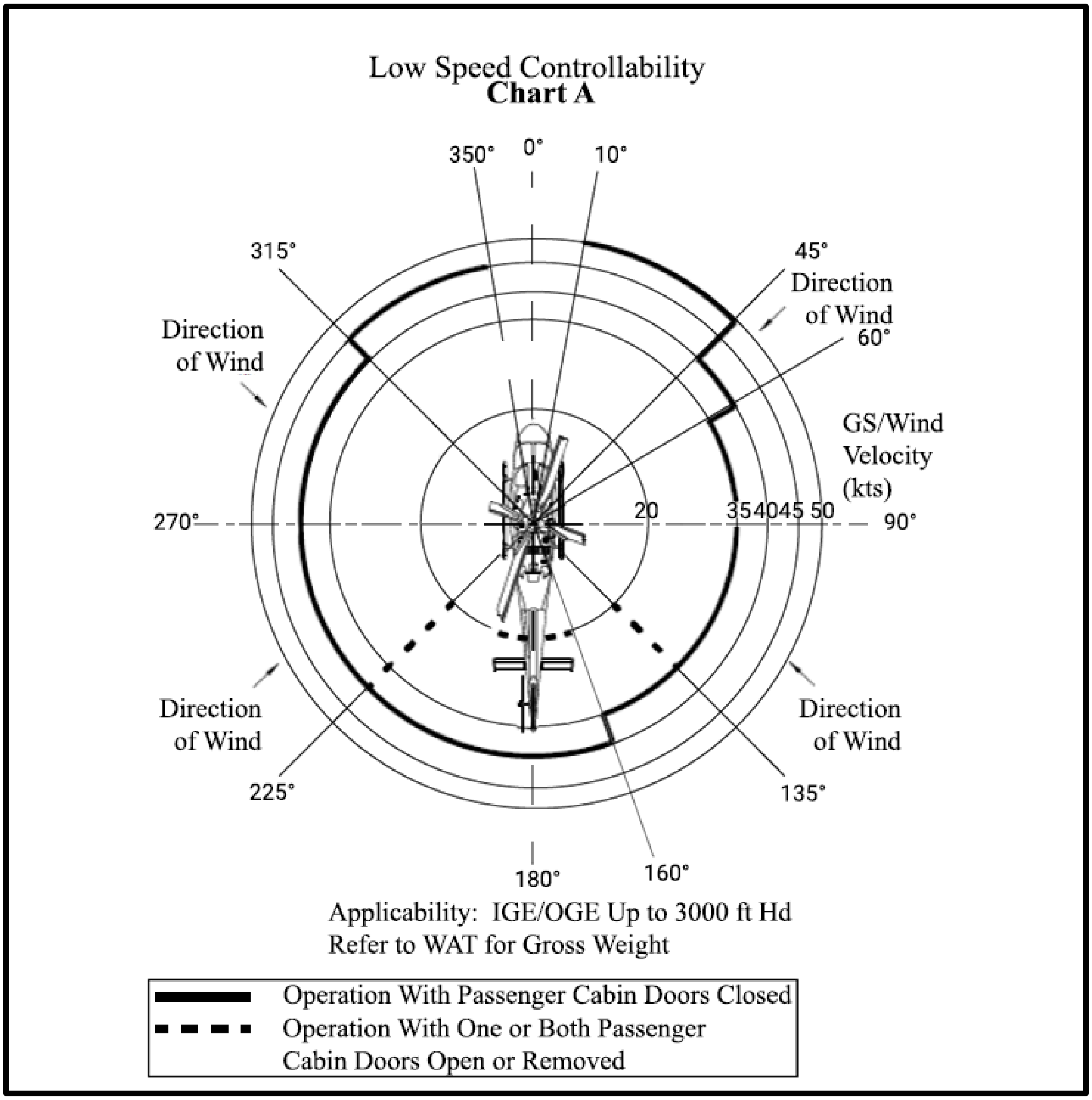

Figure 3-3 Low Speed Controllability Chart

302. EXTERNAL LOAD

Maneuver Description: This maneuver enables the crew to move external cargo from a pick-up zone to a drop-off zone. For training, crews will use the same zone for pick-up and drop-off after flying the pattern shown in Figure 3-5.

Application: External load operations facilitate the rapid transfer of cargo between two points, both at sea and ashore. External load operations are used to move cargo expeditiously or cargo that otherwise cannot fit in the helicopter.

1. **Procedures**

a. Ensure power checks are completed and a sufficient power margin exist.

b. Complete the Pre-External Load/Hoist Checklist (Figure 3-4).

TH-73 Pre-External Load/Hoist Checks	
1 Cabin	Secure
2 Harness	Cross Check
3 Instruments	Check
4 CAS Messages	Check
5 Cargo Hook	Armed, as required
6 Hoist Power Switch	On, as required
7 Airspeed	Check (70 KIAS max door opening)
8 Cabin Door	Open/Locked (85 KIAS max door open)
9 Load Briefing	Complete
TH-73 Post External Load/Hoist Checks	
After the last hook/hoist op:	
1 Hoist Cable	Secure
2 Hoist Power	Off
3 Cargo Hook	Safe
4 Cabin Door	Close/Locked
5 Cabin	Secure
6 Instruments	Check
7 CAS Messages	Check

Figure 3-4 Pre-External Load/Hoist Checklist

c. Complete a transition to forward flight arriving at 300 feet AGL and 70 KIAS on downwind. Once abeam the pickup zone, the aircrewman will call, "Abeam."

d. Begin a decelerating descent to intercept final at 150 feet AGL, 60 KIAS, and on the course line to the zone using a normal glideslope.

i. PAC reports, *"On final, right/left seat, pick."*

ii. Aircrewman will respond, *"Roger, right/left seat, pick."*

NOTE

Wave off and hold are mandatory voice and hand signals.

Example hand signals are shown below (Figure 3-5).

Signal	Day	Night	Remark
 WAVE OFF	Waving of Arms Over the Head.	Same as Day Signal With Addition of Wands.	Signal is Mandatory.
 HOLD	Both Hands Held Straight Up in Fists.	Same Day Signal With Addition of Wands.	Signal is Mandatory.

Figure 3-5..Hand Signals Example

e. Terminate the approach to a 10–12-foot AGL hover over the external load.

f. Any required refining of the helicopter position over the load will be done using verbal commands from the aircrewman indicating direction and distance (i.e., "*Left and up 3, 2, 1, steady*").

g. Maintain a steady hover while the hook-up man attaches the external load and the hook-up man leaves the rotor arc. The following aircrew calls can be expected:

i. *"Steady, over the load."*

ii. *"Load hooked up."*

iii. *"Hook up man clear."*

h. When cleared to do so by aircrewman, smoothly apply collective and climb vertically to arrive in a 25-foot hover.

– The aircrewman will notify the pilot *"Tension is coming on"* when the slack is removed from the pendant.

i. Any hover adjustments will be directed by the aircrewman. The following calls can be expected:

   i. *"Easy up."*

   ii. *"Weight coming on."*

   iii. *"Load is clear."*

j. When in a stable 25-foot hover, the Pilot not at Controls (PNAC) will call out TQ and clear the left and right side of the helicopter, *"Torque checks_____%.* When cleared by aircrew *("Cleared for forward flight"),* smoothly transition to forward flight to enter a 300-foot AGL and 70 KIAS downwind.

k. The aircrewman will monitor the load and advise the pilots of any issues e.g. longitudinal or lateral load movement (swinging), unstable load, unsecured load, etc.

l. When abeam of the intended point of landing, begin the approach to intercept final at 150 feet AGL, 60 KIAS, on the course line to the zone using a normal or shallow glideslope.

   i. PAC reports, *"On final, right/left seat, drop."*

   ii. Aircrew responds, *"Roger, right/left seat, drop."*

m. Terminate the approach in a 25-foot AGL hover over the drop zone.

n. Any required refining of the helicopter position over the drop zone will be done using verbal commands from the aircrewman.

o. At the aircrewman's command, begin a vertical descent until the load is on the deck. The aircrewman will give advisory calls throughout the descent and clear the PAC or PNAC to release the load.

   i. *"Easy down 15 feet."*

   ii. *"Load on deck."*

   iii. *"Easy down two feet."*

   iv. *"Steady."*

   v. *"Clear to release the load."*

WARNING: Keep hands clear of the CARGO REL pushbutton until cleared to release the load. Failure to do so may result in inadvertent jettison of the load.

vi. *"Hook clear."*

vii. *"Clear for forward flight on the right."*

2. **Amplification and Technique**

a. Power checks shall be completed prior to performing external load operations.

b. The aircrewman begins giving verbal commands at approximately 100 feet from the load.

c. Prior to the PAC and aircrewman losing sight of the pickup zone, the PAC may elect to yaw the nose 45 (preferred) or 90 degrees to the left. This will increase the visibility of the pickup zone and external load for the PAC, and most importantly, for the aircrewman. The crew shall adhere to NATOPS limitations.

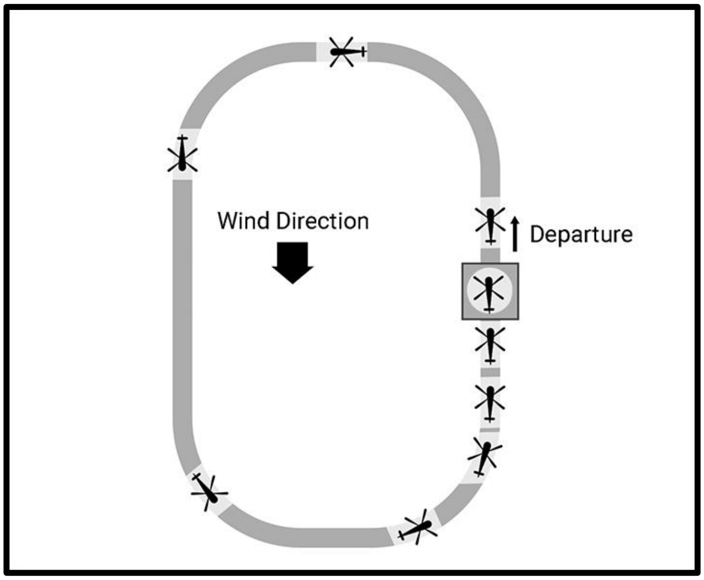

Figure 3-6 External Load Pattern

d. A shallow to normal approach glideslope with a well-controlled closure rate will allow for a smooth transition to a hover over the load for hook-up.

e. The PAC must adjust their sight picture to fly the cargo hook over the eye of the pendant. The cargo hook is located underneath the main rotor mast, which is approximately one foot laterally and five feet aft of the pilots' seats. For SNA flights, the IP will release the load when the SNA is flying. Instructors Under Training (IUT) and IPs may release the load while at the controls. At the very least, the IP SHALL have their cyclic guard covering the CARGO REL pushbutton open to arm the hook when a load is attached.

f. The pilot usually will feel the slack come out of the pendant when picking up the load. This occurs at approximately 15 feet (12-foot pendant plus three feet of load/sling assembly). An aircrewman will also call *"Tension coming on"* as they observe the tension coming on the pendant. At this point, a slight increase in collective may be necessary for the helicopter to continue to climb to a stable 25-foot hover.

g. As power is applied to lift the load off the deck, the PNAC will verify all performance instruments remain within limits.

h. The PAC must make smooth, slow, and deliberate inputs with an external load.

i. Transition to forward flight and initial climb with an external load must be commensurate with helicopter operating limitations. Sufficient power must be applied on the initial takeoff transition to ensure that the load clears all obstacles by a safe altitude (50 to 100 feet above the tallest immediate obstruction).

j. Ensure closure rate is under control early on final for the drop.

k. Consideration may be given to displaying the hover cue on the PFD to aid the PAC in identifying any unwanted drift. However, the PAC's scan should still be primarily outside.

3. **Common Errors and Safety Notes**

a. Ensure power required does not exceed the required margin.

b. A wave-off or hold call/hand signal from any member of the aircrew or the hook-up man is mandatory.

c. The PNAC shall alert the rest of the crew any time a performance instrument is approaching operating limits.

d. Execute a wave-off if the closure rate or glideslope becomes excessive to avoid large control inputs over the hook-up man. It is imperative to have a steady, stable platform when approaching or hovering over the hook-up man.

e. Once the load is clear of the ground, ensure a smooth, judicious rate of climb to a 25-foot hover, then a steady climb out to keep the helicopter from settling. Failure to do so may cause the load to drag on the ground. Do not snatch the load off the ground.

f. Do not overfly any personnel, livestock, buildings, or aircraft, and remain within the field boundaries of the OLF with a load on the helicopter in case of the unlikely event of any inadvertent load release. Failure to do so may result in ground beef.

g. Should a partial or complete power loss occur, jettison the load before making a forced landing. If in a hover, move forward and left when executing the taxi autorotation to avoid striking the jettisoned load. Additionally, any ground personnel will move right to get clear the helicopter.

h. Ensure closure rates are under control early when executing an external load drop. Excessive rates of descent at high gross weights can lead to the power required exceeding the power available.

i. Do not descend below 25 feet until cleared by the aircrewman to do so with an external load attached to the cargo hook. A 25-foot hover provides approximately 10 feet of clearance between the load and the ground.

j. The Hover Mode on the PFD is an aid for the PAC and does not supersede an outside scan or positional calls from the aircrewman.

k. Avoid hovering out of the wind line to avoid unnecessarily high power settings.

l. Because of electrical shock hazards, ground hook-up crews should not grab the helicopter or hook with their hands. The pendant is rubber coated and will sufficiently protect against electrical shock when the hook-up man holds it by the reach tube.

m. Should the load begin to swing excessively, the aircrewman may call for the PAC to slow down or give a slight and momentary increase with the collective to reduce oscillations. In all cases, the PAC must avoid quick, aggressive maneuvers.

n. Keep hands clear of the CARGO REL pushbutton until cleared to release the load. Failure to do so may result in inadvertent jettison of the load.

o. At the very least, the IP SHALL have their cyclic guard covering the CARGO REL pushbutton open to arm the hook with a load is attached. This allows for quick jettison in case of an emergency. The EMER CARGO RELEASE handle may also be used to jettison the load in an emergency.

p. If both of the CARGO REL pushbutton fails, the PNAC will attempt to release the external load by pulling the EMER CARGO RELEASE handle per NATOPS Cargo Hook Emergency Release procedure. If this also fails, the aircrewman will direct the PAC back and down incrementally to land with the load outside the rotor arc at the 12 o'clock position. Once on deck, the aircrewman can release the load using the manual release on the cargo hook.

303. HOISTING OPERATIONS

Hoisting operations are used during rescue operations when landing is not an option to affect the recovery. The hoist may also be lowered to pick up or drop off needed personnel or equipment when landing is not possible in a MEDEVAC, CASEVAC, SAR, or Combat Search and Rescue (CSAR) scenario. Each T/M/S, if equipped with a hoist, will have specific procedures contained in the NATOPS manual or Dash 1 for the U.S. Coast Guard.

Preflight briefings, weight and balance computations, and hoist systems preflight are essential steps to complete prior to commencing hoisting operations. Weight and balance calculations are particularly important because the location of the hoist shifts the helicopter's CG up and right with a load attached to the hoist hook and in transit between the helicopter and the water/ground.

The TH-73A has a detachable Breeze-Eastern hoist located above the forward part of the right cabin door and is capable of hoisting a load up to 450 lbs. as shown in Figure 3-7. The 164-foot hoist cable can be raised or lowered electrically via two different controls. First, the pendant control thumbwheel, as shown in Figure 3-8, is the primary means of control used by the aircrewman in the cabin. Second, the pilot's side (right seat) cyclic can raise and lower the hoist using the hoist control switch on either cyclic, as shown in Figure 3-9. Raising and lowering the hoist is only accomplished when the helicopter is in a hover. Helicopter movement, wind speed, and azimuth with a load on the hoist are limited to 45 Knots (kts) within 10 degrees of the nose and 20 kts from any other direction (Figure 3-10). For more information on the hoist, see the TH-73A NATOPS Flight Manual.

Figure 3-7 TH-73A with Hoist Installed

Figure 3-8 TH-73A Pendant Control Thumbwheel

Figure 3-9 Hoist Control Switch on Cyclic

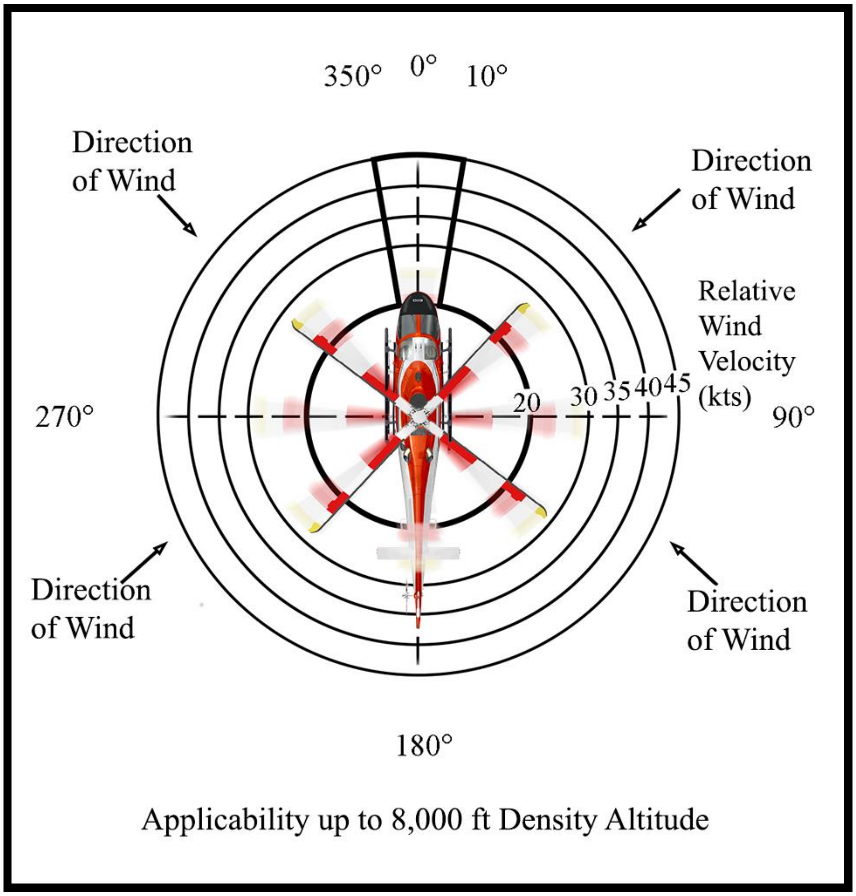

Figure 3-10 Wind Envelope for Hoist Employment

Safe and efficient hoisting operations necessitate a significant amount of CRM. The aircrewman will see the hoist load and pick-up/drop-off zone and normally raise and lower the hoist. The aircrewman shall give verbal directions to the pilot concerning the status of the hoist.

Maneuver Description: This maneuver enables the crew to raise or lower personnel and cargo in a hover using an external hoist.

Application: Hoisting operations facilitate moving personnel and cargo out of and into the cabin both at sea and ashore when landing is not possible. It is applicable in life-saving tactical and non-tactical missions.

1. **Procedures**

   a. Ensure power checks are complete and a sufficient power margin is available.

   b. Complete the Pre-External Load/Hoisting procedures checklist.

   c. Fly a pattern to arrive at 300 feet AGL and 70 KIAS abeam the hoisting zone. The aircrewman will call the abeam position.

d. Abeam the zone, begin a decelerating descent to intercept final at 150 feet AGL, 60 KIAS, on the course line to the zone using a normal glideslope if obstacles permit.

   i. PAC reports, *"On final, right/left seat, _____foot hoist."*

   ii. Aircrewman will respond, *"Roger, right/left seat, _____foot hoist."*

e. Terminate the approach to a 20–50-foot AGL hover into the wind with the zone at the 1 to 2 o'clock position just outside the rotor arc.

   – PAC reports, *"Steady at ___feet. You have verbal control in the back."*

f. The aircrewman will then direct the PAC to bring the helicopter forward and right to put the zone just below the hoist (right cabin door). This will be done using verbal commands from the aircrewman indicating direction and distance (i.e., "*forward and right 3, 2, 1, steady*").

g. The aircrewman will request *"Permission to lower hoist."* The PAC will respond *"Lower the hoist."*

h. Maintain a steady hover while the hoist is raised or lowered. The following aircrew calls are an example of what can be expected while lowering the hoist load, simulating a rescue aircrewman being lowered:

   i. *"Rescuer outside the cabin."*

   ii. *"Rescuer going down."*

   iii. *"Rescuer on deck."*

i. When ready to raise the hoist, the aircrewman will call, *"I have a pickup signal,"* then use verbal commands to position the helicopter over the zone as necessary.

j. The aircrewman will notify the pilot *"Standby for weight on helicopter"* as the slack is removed from the hoist.

k. The following calls can be expected:

   i. *"Survivor clear of the deck."*

   ii. *"Halfway up."*

   iii. *"At the cabin door."*

   iv. *"Aboard."*

l. The aircrewman will secure the hoist station and alert the PAC when they may transition to forward flight, *"Rescue station secure, clear for forward flight."*

m. Smoothly transition to forward flight and complete the Post-External Load/Hoisting Checklist.

2. **Amplification and Technique**

a. There is no requirement to complete a full pattern between hoisting evolutions; the IP may elect to reset in a hover with the zone at the 1 to 2 o'clock position.

b. Power checks shall be completed prior to performing external load operations.

c. Planning the approach to hoist requires consideration of several factors, which will be assessed during the hoisting location evaluation.

i. Choose the approach direction, which allows for taking advantage of wind effects (headwind component or updraft) and provides the lowest obstacle.

ii. Note the position of obstacles that will affect the approach or departure.

iii. The altitude for the hover height shall be at least 10 feet above the highest obstacle near the zone. Normally, the lowest altitude allowable for the hover is most suitable for hoisting. For training purposes, the IP may choose to hover at an altitude between 20 and 50 feet AGL.

d. The helicopter should maneuver to hover with the nose into the wind line.

e. The aircrewman begins giving verbal commands at approximately 100 feet from the zone.

f. A normal approach glideslope with well-controlled closure will allow for a smooth transition to a hover with the zone at the 1 to 2 o'clock position.

g. A lower hover will provide better visual cues for the PAC to hold a steady hover. Displaying the Hover Mode at the bottom of the PFD will aid the PAC in identifying any unwanted drift. However, the PAC's scan should still be primarily outside.

h. The mark on top feature may aid the aircrew in maintaining SA of the aircraft's position in relation to the zone.

i. As the helicopter approaches the hover to hoist, the PNAC will verify all performance instruments remain within limits.

j. The PNAC will verify the helicopter is within flight limits for the hoist operations prior to the hoist being raised or lowered.

k. The PAC will feel the helicopter roll right when the load on the hoist is moved outside the cabin door before lowering, and when the slack comes out of the hoist cable while picking up the load. Anticipate a slight left cyclic input to maintain a steady hover.

l. While the above communications provide a scenario for lowering a rescue aircrewman and raising a survivor only, the IP and aircrewman may elect to simulate the rescue aircrewman being hoisted back into the helicopter as well. It is poor form to leave your rescue aircrewman on the ground in real-life situations. Other scenarios are permitted.

3. **Common Errors and Safety Notes**

a. Ensure a sufficient power margin.

b. Ensure the aircrew operating the hoist has their tether secured to their vest as well as the helicopter.

c. Ensure a steady hover height, especially once the hoist is on or near the ground. Failure to do so may cause the load to drag on the ground.

d. Do not transition to forward flight until the aircrewman is ready and the hoist station has been secured.

e. The hover mode on the PFD is an aid for the PAC and does not supersede an outside scan or positional calls from the aircrewman.

f. Avoid hovering out of the wind line to minimize the power required and ensure hoisting limitations are not exceeded.

g. Because of electrical shock hazards, ground crews, if used, should not grab the hoist cable or hook with their hands until it is on the ground.

h. If a hoist malfunction occurs, consult the appropriate NATOPS procedure in Chapter 12. The aircrewman will alert the crew of the malfunction and direct the PAC to position the helicopter as necessary.

i. Lateral CG limits must be calculated during preflight planning and must be recalculated if crews or weights change.

j. In an emergency, the hoist may be sheared from the pilot’s cyclic or in the back via shears. Leave the hoist cut guard down unless directed by the IP to raise it and depress the button.

k. If the hoist becomes fouled and the crew is unable to raise it, the aircrew will direct the PAC down and left in a stairstep method to land with the hoist cable laid out to the 3 o’clock.

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