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| UNIT OVERVIEW |
| **Course** Helicopter Crewmember, S-271 |
| **Unit** 7 – Operational Safety |
| **Lesson** C – Cargo |
| **Time** XX Hour |
| **Objectives**1. Describe proper procedures for handling hazardous materials.2. Describe the entire internal cargo transportation process.3. Describe the process to follow for safe external loads operations. |
| **Strategy**Through lecture, class discussion and hands on exposure this unit helps students obtain an overall knowledge of handling hazardous material for aviation transport, understand how to safely perform internal loads, and how to safely perform external loads utilizing the proper equipment to do so. |
| **Instructional Methods*** Facilitation /informal lecture supported with slides
* Class discussion
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| **Instructional Aids*** Computer with presentation software with LCD projector
* Incident Reponses Pocket Guide (IRPG)
* Interagency Aviation Transport of Hazardous Materials Guide
* Interagency Basic Aviation Safety Publication
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| **Exercise*** Hazardous Material Transport
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| **Evaluation Methods*** Unit review
* Unit Quiz
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| **Outline**I. Hazardous MaterialsA. What Is Hazardous Material?B. Transporting Hazardous MaterialsII. Internal CargoA. Internal Cargo Transport ProceduresB. InspectionC. Weighing CargoD. Loading CargoIII. External LoadsA. Why External LoadsB. Height Velocity DiagramC. Prior to External Load MissionD. Preparing Sling LoadsE. Assessing Sling SitesF. EquipmentG. External Load Operations |
| **Aids and Cues Codes**The codes in the Aids and Cues column are defined as follows:IG – Instructor Guide IR – Instructor ReferenceSW – Student Workbook SR – Student ReferenceHO – Handout Slide – PowerPoint |

# UNIT PRESENTATION

COURSE: Helicopter Crewmember, S-271

UNIT: 7 – Operational Safety

LESSON: C – Cargo

| OUTLINE | AIDS & CUES |
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| Unit Title Slide.Present Unit Objectives.i. hazardous materialsA. What Is Hazardous Material?A hazardous material is a substance or material which has been determined by the Department of Transportation to be capable of posing an unreasonable risk to health, safety, and property when transported in commerce and which has been so designated. Types of hazardous materials and proper transportation procedures can be found in the Interagency Aviation Transport of Hazardous Materials Guide.Some of the common hazardous materials are:* Gasoline
* Diesel Fuel
* Fusees
* Batteries
* Explosives
* Propane (compressed gas)

B. Transporting Hazardous MaterialsHazardous Materials can only be transported in accordance with the Interagency Aviation Transport of Hazardous Materials Handbook/ Guide, NFES 1068. We must transport hazardous materials according to the Guide. Additionally, an exemption is issued by the Department of Transportation in accordance Both the Guide and the exemption should be onboard the aircraft when transporting hazardous materials.* Hazardous materials need to be identified.
* Have pilot brief crewmembers on acceptable locations for loading hazardous materials.
* On first flight, the pilot shall be notified in writing of HazMat being transported. Can be oral if subsequent flights are transporting same type of HazMat.
* Do not transport food items with liquid hazardous materials if at all possible.

**EXERCISE: Hazardous Material Transport**Purpose: For students to become familiar with the use of the Interagency Aviation Transport of Hazardous Materials Guide (IATHMG).Format: Students groups or classroomTime: 10-15 minutesMaterials: * Interagency Aviation Transport of Hazardous Materials Guide (one per group).

Instructions: 1. Assign each student group one or more of the following hazardous materials: chainsaws, fusees, pepper spray, guns, ammunition, batteries, gasoline, and compressed gases. 2. Utilizing the IATHMG each group will look up the correct way to transport their assigned hazardous material(s) in an aircraft. 3. Select a spokesperson to inform the class of the proper way to transport the assigned hazardous material(s).4. When finished, review group answers and discuss why it is important to follow this guide.**End of Exercise.**Ii. INTERNAL CARGOA. Internal Cargo Transport Procedures* Inspection of cargo
* Identifying hazardous materials
* Packaging, weighing, securing, and rigging
* Manifesting
* Obtain pilot approval
* Loading and unloading

B. Inspection* Some items may need to be double bagged or boxed to prevent leakage into the helicopter. Wrap the neck of plastic bags with tape.
* Boxes need to be taped and all loose items secured. Smaller items can be taped or tied to larger items to avoid being lost.
* If straps or nets are present in the helicopter to secure items, they must be used. Inspect prior to use.
* Sharp edges need to be protected to prevent damage to the helicopter or other cargo.
* All liquid containers need to be boxed or secured to remain upright.

C. Weighing Cargo* Weigh cargo. Never estimate the weights.
* Organize and tag multiple loads with destination and weight.
* Do not exceed weight limits of internal cargo compartments or baskets. Cargo baskets require a detailed briefing on loading and securing gear.

D. Loading Cargo* Pilot must be briefed on destination, weight of cargo, and if there are hazardous materials being transported.
* Ensure all weight and balance concerns are addressed.
* Follow the pilot’s direction for loading and securing all cargo, especially in external baskets.

iII. external loadsA. Why External Loads* No suitable landing area for internal cargo.
* No ground vehicle access.
* Reduces rotor wash
* Reduces number of people involved in operation.
* Able to deliver loads without personnel on the ground.
* Bulky or large cargo to be delivered.
* Loads can be pre-packaged to reduce loading and unloading time.

The safe and efficient transport of external loads relies on standard procedures being followed correctly.Rigging and external load improperly can be disastrous to the pilot, the aircraft, and personnel on the ground.* Only persons essential to the operation should be positioned beneath a hovering helicopter; i.e., external loads, slinging, bucket work.
* Flying aboard the helicopter with an external load shall comply with agency policy.

**Remember – Check, and then double check!** If it’s wrong on the ground, it will only get worse in the air.Refer students to the Height Velocity Diagram in the Basic Aviation Safety Guide.B. Height Velocity DiagramStart some interaction by asking students the following:Where on the diagram would they find a helicopter with a sling load connected to a cargo hook, 150-foot AGL and with 20 knots of airspeed as it’s approaching a sling site?They are in the shaded area in the dead man’s curve.Have students consider the following:* This is a typical environment that pilots and aircraft are asked to work in for natural resource missions.
* The height velocity diagram does not factor in the time it takes for the pilot to release the load and initiate an autorotation maneuver.
* Time spent in the shaded area reduces the safety margin and limits the pilot’s options.
* The risks of low-level maneuvers and extended hovers.

C. Prior to External Load MissionBefore any external load mission ensure:* A risk management process has been completed at the appropriate level.
* The pilot is qualified and the aircraft is equipped for the mission.
* A load calculation is completed for current conditions.
* All cargo has been weighed and manifested.
* Ensure total weight on manifest is less than allowable payload for specific aircraft.
* Submit manifest to helicopter or helibase manager at the end of shift.
* Hazardous materials have been identified and packaged properly.
* Pilot must be briefed on destination, weight of cargo, and if there are hazardous materials being transported.
* Pilot has approved of cargo to be transported.
* Cargo has been inspected, secured, and packaged properly.
* Multiple loads have been identified and tagged according to destination.
* Length of longline required for mission.
* Personnel are qualified and minimum staffing requirements are met.

D. Preparing Sling LoadsPreparing slings to be flown* Inspection

Bag and/or box items to prevent leaking.Tape boxes and secure loose items.Protect sharp edges.Place liquid containers in upright position.Cushion fragile items.* Hazardous Materials

HazMat identified, packaged and transported in accordance with Interagency Transport of Hazardous Materials Guide, NFES 1068.Pilot must be notified verbally of the type and quantity of hazardous materials. * Weighing Cargo

Cargo must be weighed and manifested.Tag loads with weight and destination.Do not exceed helicopter’s allowable payload.* Loading Nets

Place heavy/bulky items in center of net.Build loads in pyramid shape.Do not over-bulk net.Pull metal rings on perimeter rope to equal lengths. Do not “stitch” or “weave.”Add ballast (rocks, tools, etc) to light loads.Every load gets a swivel.E. Assessing Sling Sites1. Assessment Process* Identify trees or snags that would pose a threat to the mission.
* Gauge height of surrounding obstacles to determine length of longline needed.

2. The Compass Processa. To use a compass, back up from the tree or hazard along level ground or along a line of elevation so that the top is roughly at a 45 degree angle above you.b. Set the compass bezel to 315 degrees. \*(360-45=315)c. The north-south axis of the compass becomes your horizon line.d. Eye the top of the tree or hazard along the edge of the compass.e. Adjust your position to get an exact 45 degree angle.f. Have a partner help in adjusting the compass and your position to get the angle right.g. Once you have a 45 degree angle and the top of the hazard lines up with the edge of the compass, pace the distance from that point back to the base of the tree or hazard.h. It is important to walk a direct line with no ups and downs.i. Don’t gauge the height from higher to lower ground. Need to be level with the base of the tree or hazard.j. Know the length of your pace.k. Add your height to the paced distance, which will equal tree height. 3. The Stick or Pencil Processa. Back up from the tree or hazardb. Bracket the tree or hazard with the stick or pencilc. The top and bottom of the tree or hazard needs to match up with the top and bottom of a stick or pencil held out at arm’s length.d. Lay the stick or pencil on its side, (horizontal) with one end matched up to the bottom of the tree or hazard.e. The point where the other end falls on the horizon, along level ground, is equal to the height of the hazard.f. Pace from that point on the ground back to the base of the tree or hazard to get the height. 4. The Fall a Tree Process**This process is not favorable**a. If all else fails, consider felling the tallest tree or snag around.b. May need approval from a Resource Advisor if in the wilderness.c. Once you have it on the ground, measure it by using the pacing method.d. From that measurement, should be able to determine the general heights of surrounding trees.F. EquipmentAt instructors discretion, may want to have examples of following items:1. The Cargo Hook* The cargo hook is attached to the belly of the helicopter, and can be manually or electrically released by the pilot from the cockpit.
* It is self-cocking and has an automatic locking function.
* Check pilot’s manual cable, electrical and manual release before each use to ensure serviceability.
* Inspect for damage and wear before use.

2. The Swivel* Consists of a ring or link on the upper end, a hook on the lower end, and a swivel section in between.
* Allows the load to rotate in flight to reduce twisting of the leads, preventing damage to the cargo hook or an inadvertent release.
* Always the link between a cargo remote hook and a load.
* Must have a rated capacity stamped on the swivel.
* The swivel action must be verified before use.
* The keeper-gate must be checked before use for serviceability.

3. The Leadline* Connects the load to the helicopter or multiple loads together.
* Consists of a flexible cable with a swaged hook and keeper-gate on one end, and a swaged ring or link on the other.
* Must be inspected before use, and retired if unserviceable.

4. The Cargo Net* Comes in round and square configurations.
* The perimeter ropes cinch up in a purse string arrangement to hold the cargo.
* The rope ends have steel rings, which are the attachment points for a swivel.
* Require inspection for wear or damage.

5. The Longline and Remote Hook* Consist of sections of steel cable or Kevlar rope with an electrical cable to provide power to a remote hook.
* Constructed of anti-twist cable, generally in 50-foot sections, which can be added together to meet mission requirement.
* Remote hook has manual and electrical releases.
* Attaches to the cargo hook and uses an electrical pigtail to connect to the helicopter.
* Must be inspected for kinks and damage.
* Releases checked before each use.
* Do not use swivel for link to cargo hook!

 6. Grappling HookG. External Load Operations1. Mission Preparation* It is imperative a good briefing be provided to all personnel involved.
* Pilot/aircraft approved for mission.
* Load calculation completed.
* Cargo weighed and manifested.
* Hazardous materials packaged and labeled.
* Personnel qualified, minimum staffing.
* Cargo packaged, inspected and secured.
* Pilot has approved cargo.
* Loads identified and tagged for destination.
* Sling/rigging equipment designed for load.
* Flight following and crash/rescue procedures established.
* Radios operational with correct frequencies.
* Ground and flight hazards identified.

Identify Hazards* Wires
* Obstructions in the Approach and Departure paths
* Tall trees and snags
* Weather
* Other aircraft in area
* Wrong helicopter for mission

Are identified hazards known to all?2. Ground Personnel Long Line Procedure* Parking tender and hook-up person are in front and off to the side of the helicopter where the pilot is seated.
* This clears the departure lane for the pilot, and reduces the exposure to ground personnel.
* All other personnel should be in a safety area.
* Try to keep the hover time to a minimum.
* Allow remote hook to rest on the ground before hook-up person enters safety circle and attaches load.
* Hook-up person attaches swivel to remote hook, walks back to parking tender.
* Parking tender notifies pilot, hook-up person is clear, lifts at their discretion.

Procedure will be demonstrated during field exercises.3. Hover Hook-Up* Preparation
* Proper PPE
* Two people recommended one with radio.
* Emergency procedures established.
* Crash/rescues procedures identified.
* Site preparation completed.
* Keep area clear of unauthorized personnel.
* Procedure
* The hook-up person should stand facing the helicopter with the swivel extended overhead.
* The parking tender should direct the pilot with hand signals and radio communication. A radio/flight helmet interface is recommended for positive two-way communication.
* The pilot should approach the hook-up person and come to a hover over them.
* The hook-up person will attach the load, turn and walk towards the parking tender, and then turn to face the helicopter and kneel down.

**Never cross underneath skid of helicopter.** * The parking tender will signal to begin movement of the load.
* When the load has cleared any obstacles, give the pilot the “clear to depart” signal.
* Parking tender should continue to check the load visually, and inform the pilot of any problems.
* Loads can also be attached to the cargo hook, when the helicopter is on the ground.

Review the Standard Helicopter Hand Signals out of the IRPG.**Remember – Check and then double check!****If it’s wrong on the ground, it will only get worse in the air.**Any Questions?Review Unit Objectives. | Slide 7C-1Slide 7C-2Slide 7C-3Slide 7C-4Slide 7C-5Slide 7C-6Slide 7C-7Slide 7C-8Slide 7C-9Slide 7C-10Slide 7C-11Slide 7C-12Slide 7C-13Slide 7C-14Slide 7C-15Slide 7C-16Slide 7C-17Slide 7C-18Slide 7C-19Slide 7C-20Slide 7C-21Slide 7C-22Slide 7C-23Slide 7C-24Slide 7C-25Slide 7C-26Slide 7C-27Slide 7C-28Slide 7C-29Slide 7C-30Slide 7C-31Slide 7C-32Slide 7C-33Slide 7C-34Slide 7C-35Slide 7C-36Slide 7C-37Slide 7C-38Slide 7C-39Slide 7C-40Slide 7C-41Slide 7C-42Slide 7C-43Slide 7C-44Slide 7C-45Slide 7C-46Slide 7C-47Slide 7C-48Slide 7C-49Slide 7C-50Slide 7C-51Slide 7C-52Slide 7C-53Slide 7C-54Slide 7C-55Slide 7C-56Slide 7C-57Slide 7C-58Slide 7C-59Slide 7C-60Slide 7C-61Slide 7C-62Slide 7C-63 |