Helicopter Crewmember
S-271

NFES 001499

Student Workbook
DECEMBER 2010

CERTIFICATION STATEMENT

on behalf of the

NATIONAL WILDFIRE COORDINATING GROUP

The following training material attains the standards prescribed for courses developed under the interagency curriculum established and coordinated by the National Wildfire Coordinating Group. The instruction is certified for interagency use and is known as:

Helicopter Crewmember, S-271
Certified at Level I

This product is part of an established NWCG curriculum. It meets the requirements of the NWCG Curriculum Management Plan and has received a technical review and a professional edit.

Howard Hedrick
Member NWCG and Operations and Workforce Development Committee Liaison

Date Dec 14, 2010

Rosemary Thomas
Chairperson, Operations and Workforce Development Committee

Date 12-7-2010

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National Interagency Fire Center, Fire Training, 3833 South Development Avenue, Boise, Idaho 83705.
E-mail: nwcg_evaluation@nifc.blm.gov

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PREFACE

Helicopter Crewmember, S-271 is a required training course in the National Wildfire Coordinating Group (NWCG) wildland and prescribed fire curriculum. It was developed by an interagency group of experts with guidance from NWCG Training under authority of the NWCG. The primary participants in this development effort were:

U.S. FOREST SERVICE

David M. Redman, Caribou Targhee National Forest

Eastern Idaho Interagency Fire Center

NATIONAL INTERAGENCY FIRE CENTER, FIRE TRAINING
NWCG Development Unit, Evaluation Unit, and Instructional Media Unit

The NWCG appreciates the efforts of these personnel and all those who have contributed to the development of this training product.

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Helicopter Crewmember, S-271

Unit 0 – Introduction

OBJECTIVES:

Upon completion of this unit, students will be able to:

1. Introduce the course coordinator, instructor, and students.
2. Review and discuss course logistics.
3. Present and go over the course overview.
4. Review and discuss instructor and student course expectations.
5. Identify the course references and essential materials.
6. Review and discuss the position responsibilities.

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I. INTRODUCTIONS

- Name and job title
- Agency, home unit
- ICS qualifications

  Experience relative to the position as either a trainee or a trainer/coach; both positive and negative.

II. COURSE LOGISTICS

- Course agenda
- Sign-in sheet
- Housekeeping
  - Message and telephone location
  - Cell phone policy
  - Facility locations (restrooms, vending machines, drinking fountains, smoking areas, evacuation policy, etc.)
  - Local information (restaurants, local map, transportation)
  - Computer use (no internet surfing, log on only when instructed, etc.)
  - Punctuality, meals and breaks
- Other concerns

III. COURSE OVERVIEW

This course is designed to meet the training needs of a Helicopter Crewmember (HECM) as outlined in the Wildland Fire Qualifications System Guide (PMS 310-1) and the position task book developed for the position.

A. Course Objective

Upon completion of this course, the student will be able to demonstrate proficiency in all identified areas of helicopter use to safely achieve efficiency and standardization.

B. Instructional Methods

1. Facilitation/short lectures with PowerPoint
2. Discussion
3. Exercises
4. Hands-on

C. Student Assessment/Evaluation

To successfully complete the course, students must:

1. Participate in all classroom discussions, exercises, and scenarios.
2. Complete all quizzes.
3. Achieve 70% or higher on the final assessment/scenario.

D. Course Evaluation Form

Students are given the opportunity to comment on the course and the quality of the instruction.

IV. COURSE EXPECTATIONS

A. Student Expectations

B. Instructor Expectations

Students will:

- Have an interest in becoming a Helicopter Crewmember (HECM).
- Exhibit mutual cooperation with the group.
- Be open-minded to accomplishments during the course presentation.
- Participate actively in all of the training exercises presented in the course.
- Return to class at stated times.
- Use what is presented in the course to effectively perform the duties of a HECM.
- Not leave the course with any unanswered questions.

V. COURSE REFERENCE MATERIALS

Below is a list of materials that are referenced throughout the course:

- Incident Response Pocket Guide (IRPG), PMS 461
- Interagency Helicopter Operations Guide (IHOG), NFES 1885
- Interagency Aviation Transport of Hazardous Materials, NFES 1068

VI. HELICOPTER CREWMEMBER POSITION

A. The Helicopter Crewmember in the Incident Command System

- The HECM is a designated member of an Incident Management organization.

- The HECM is supervised by the Helicopter Manager (HMGB), Air Operations section of the Incident Management organization.

B. Position Task Book (PTB) Description

The PTB contains common tasks and additional specific tasks for the HECM.

The PTB is the primary tool for observing and evaluating performance.

In the current performance based system, trainees must complete the tasking in the PTB to become qualified as a HECM.

This PTB can only be initiated by the home unit, not at this course.

C. HECM Duties

The Helicopter Crewmember (HECM) for both Fire and Resource Exclusive-Use and Call-When-Needed (CWN) serves as a trained member of a helicopter crew, assisting the Manager in the performance and completion of helicopter missions.

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Unit 1 - Readiness

OBJECTIVES:

Upon completion of this unit, students will be able to:

1. Describe information and material needed for assignment.

2. Describe the information that is needed from dispatch when assigned to an incident.

3. Describe the check-in process upon arrival at the incident.

4. Describe the information gathered from the assigned supervisor at the incident.

I. THE HELICOPTER CREWMEMBER

Duties and responsibilities of the Helicopter Crewmember are as follows:

- Constructs helispots, prepares manifest, loads, and unloads cargo and personnel, marshals helicopters, rigs external loads, etc.
- Assist Manager in performing daily inventory check and in ensuring operational readiness of helicopter unit; performs tool, equipment, and vehicle maintenance and refurbishment; performs facility and cache maintenance.
- Participates in proficiency checks and drills.
- Participates in safety sessions and critiques; provides preflight safety briefings to passengers; ensures own and others' safety and welfare in all aspects of job.

II. AVIATION LIFE SUPPORT AND SURVIVAL

A. Aviation Life Support Equipment (ALSE)

The ALSE handbook provides policy and responsibilities requirements.

1. Policy

Policy states that, the responsibility of management is to "provide employees with a safe and healthful work environment."

2. Agency Responsibilities

Agencies are responsible for implementing their PPE program. They are also responsible for evaluating aviation activities and providing employees with the appropriate equipment and training.

3. Why Personal Protective Equipment (PPE)

This accident occurred on August 3, 2000. The helicopter was destroyed when it abruptly rolled to the right and impacted terrain during hover after takeoff at Montello, Nevada.

The helicopter was providing support of wildland firefighting activities and taking off with two passengers on board. The pilot "picked the helicopter up" to a 3 foot hover height and glanced down at the engine torque gauge. Suddenly, the helicopter did a "violent snap roll" to the right coming to rest upright. He estimated the whole event lasted about a ¼ second.

During the roll sequence, the main rotor blades entered the front cabin area and impacted the left front seat passenger on the head.

The flight helmet received substantial damage. The integrity of the outer shell was maintained, while the inner Styrofoam liner received substantial indentations absorbing most of the impact.

Although the passenger was seriously injured, the flight helmet saved his life.

An aviator's flight helmet can save your life if properly fitted. The following topics within this unit will cover proper fitting and care of the primary element of PPE that should be worn during special use activities.

B. Care and Fitting of your PPE

Prior to dispatch or flight missions all helicopter crewmembers and passengers are required to wear the following PPE:

- Nomex clothing (fire resistant clothing)
- Nomex flight gloves (fire resistant or leather gloves)
- Leather Boots (8” tops)
- Flight helmet

Be sure PPE is readily available in preparation for an assignment.

1. Fire Resistant Clothing

The purpose of wearing fire resistant clothing is to protect you from a flash fire. The preferred material is Nomex.

- Clothing must be kept clean – do not use starch.
- Clothing worn over Nomex (Coats, sweatshirts, coveralls, etc.) should be made of a fire resistant material. Natural fibers such as wool, cotton, or leather are best.
- To provide adequate protection, under garments worn next to skin should also be made of fire resistant material or natural fibers.

Chemically altered clothing is acceptable as fire resistant, and chemically treated is not. This is due to the fact that the chemical treatment will launder out and will no longer provide protection.

2. Flight Suit

- Should fit loosely to provide trapped air for insulation.
- Sleeves should be long enough to reach first knuckle of thumb.
- Pant legs should reach the floor while standing.

3. Gloves

- Gloves should have a long cuff extending above the wrist.
- Gloves should fit under a snugly secured flight suit sleeve cuff.
- Gloves should fit snugly to provide for dexterity.

4. Boots

- Boots made of all leather. (No nylon, canvas, etc.)
- Flight suit should fit snugly over the tops of the boot around the ankles.

5. Head, Hearing, and Eye Protection

- To comply with national standards flight helmets must consist of a one-piece hard shell, must cover the top, sides and rear of the head.
- Hearing protection program is required whenever employees are exposed to noise equal to, or exceeding an eight-hour time-weighted average of 85 decibels (dBA).
- Eye protection is required in work environments where air particle contaminants are present.

The three standards mentioned are met with the SPH-5 flight helmet.

The SPH-4 is no longer being manufactured and has been replaced by the SPH-5. The Gentex SPH-5 is the current upgrade from the previous version. The fiberglass outside shell has been improved by replacing it with Kevlar. The interior webbing suspension system has been replaced using a thermo plastic liner (TPL).

The current helmet exceeds the safety performance of the previous SPH-4 helmet in all areas of technical testing (crash force attenuation, helmet retention characteristics, overall weight, and hearing attenuation).

The procedure to ensure proper fit of the helmet is to demonstrate:

- Donning and removing (doffing) the helmet.
- Adjusting the nape strap.
- Fastening and unfastening the chinstrap.
- Operating the sun visor.

Don the helmet as follows:

- Grip the retention assembly below the earcups as shown.
- Grip and depress the ear pads into the ear cups to allow for more space to roll the helmet onto your head.
- Roll the helmet back and down onto the head. Press the helmet firmly downward with both hands to ensure that the helmet is properly seated on the head and the ears are surrounded by the earcups.

- Check the distance between the eyebrows and the edge of the helmet shell; it should be approximately ¾” for optimum vision.

- Tighten the rear of the retention assembly appropriately per manufacture specifications.

- Fasten the chinstrap by inserting the snap end through the D-ring on the right side of the assembly, and snapping the connectors or per manufacture specifications.

- Tighten the chinstrap to the desired tension. Once the desired tension is achieved, the chinstrap can be fastened and unfastened via the snap.

- Lower and raise the visor the test operation and clearance.

Evaluate the fit according to the following criteria:

- The earcups should surround the ears completely.

- The ear seals should be compressed to the greatest degree possible without discomfort.

- The overall fit should be comfortable; no hotspots or pressure points should exist.

Remove the helmet in reverse steps of the previous donning the helmet instructions.

6. Survival Equipment

The nature of the survival equipment each aircraft carries depends on whether the flight will be strictly over water, over land, or special use. Basically there are two categories of survival equipment:

- Over Water
- Over Land

This covers the minimum required for survival in the event of a crash.

When planning a mission, each person should ensure they have the appropriate clothing for the mission environment.

You wouldn't wear Gucci loafers and a cotton sweater when flying an Alaskan wolf survey in January.

a. Over Water

The appropriate over water ALSE consists of:

- Type of mission (extended over water or not)
- Weather
- Water conditions (water temp < 50 degrees F)

b. Personal Flotation Devices (PFD)

An inflatable personal flotation device that meets requirements of 14 CFR 91 or inflatable life preserver required by 14 CFR 135.

PFDs shall be worn by each individual on board the helicopter when conducting operations beyond gliding distance to shore, and during all hovering flights over water sources such as ponds, streams, lakes, and coastal waters. Automatic inflation (water activated) personal flotation devices shall not be allowed.

Inflatable PFDs should not be deployed until after you have exited the downed aircraft. Deploying a PFD while inside a submerged or overturned aircraft may make egress from the aircraft impossible.

c. Anti-Exposure Garments

All occupants must wear anti-exposure garments when conducting extended over-water flights where the water temperature is less than 50 degrees F.

There are two types of anti-exposure garments:

1) Anti-exposure flight suit, a one-piece insulated coverall that provides some hypothermia protection and buoyancy.

2) Survival suit, a dry immersion suit made from closed cell material.

   Caution should be taken where wearing anti-exposure garments will hinder their ability to egress from a submerged or overturned aircraft.

d. Survival Kits

Survival kits are required for all special use activities and are recommended for all missions.

At a minimum an aircraft survival kit should include:

- Knife
- Signal mirror
- Signal flares (6)
- Matches
- Space blanket
- Water (1 qt./person)
- Food (2 days/person)
- Candles
- Water purification tablets
- Collapsible water bag
- Whistle
- Magnesium fire starter
- Nylon rope (50 ft)

e. Personal Survival Equipment

Although policy does not require that agency personnel carry personal survival kits, it is recommended.

Aircraft accident experience has shown that survival equipment not attached to the occupants at the time of egress is often not recovered by the survivors.

The following are suggested items to have in a personal survival kit:

- Waterproof matches
- Magnesium fire starter
- Space blankets
- Large plastic bag
- First aid kit
- Knife
- Hand-held radio
- Water purification tablets
- Signal mirror
- Flashlight
- Whistle

III. READINESS FOR ASSIGNMENT

Assemble Information and Materials for Assignment

Suggested items to have:

- Fireline pack/flight gear
- Passenger/Cargo Manifest
- Passenger Briefing Card
- IRPG
- Radio w/flight helmet connector
- Cloning cable
- Global positioning system (GPS)
- Spare batteries
- Calculator
- Fiber tape
- Black electrical tape
- Flagging
- Knife
- Notepads
- Blue or black pens
- Crew time report (CTR)

- Fire timesheets (OF-288)
- Unit Log (ICS-214) and other ICS forms

IV. ASSIGNMENT INFORMATION

A. Dispatch Ordering Process

1. When a helicopter is needed the initial attack, dispatch submits an aircraft resource order.

   Local agencies and cooperators are checked with first.

   - If unfilled locally the order goes to a Geographical Area Coordination Center (GACC).
   - If unfilled at a GACC, it goes to the National Interagency Coordination Center (NICC).
   - NICC in Boise, Idaho has ultimate authority for managing national aircraft resources.
   - This cycle then returns to the local dispatch.

2. The requesting unit must request a module be assigned to an aircraft when ordering.

   - When a fire helicopter is ordered, a manager and module must be ordered at the same time through the dispatch system.
   - These orders for personnel are filled at the regional level first, if available. If not, the national level will attempt to fill.

B. Acceptance of Assignment

Out of unit assignment information you should obtain before leaving the home unit.

Personnel will be notified of an out of unit assignment by their respective agency (dispatch). The following minimum information should be obtained before departing.

After you accept an assignment, make sure you don't leave your home unit until you receive a copy of the resource order.

This is usually a resource order or any other written document with all the pertinent information:

- Incident name – Block 2
- Incident order number – Block 3
- Incident phone number – Block 8
- Request number – Block 12
- Reporting location – Block 12
- Reporting time – Block 12
- Transportation arrangements, travel routes
- Contact procedures (telephone/radio)
- Charge code – Finance Code Box

C. Mobilization

Obtain a copy of the resource order and request number from the dispatching office.

Determine mode of travel comply with weight limitations.

- Commercial airline
- GOV
- Rental vehicle
- Charter flight

The local unit dispatch office may be able to provide you with additional information such as:

- Briefing packets
- Maps
- Situation updates
- Additional frequencies and contacts
- Flight itineraries

D. Module Preparation (CWN)

The helicopter crewmember may or may not know the other module members or where they are from. If possible, a brief contact prior to dispatch can verify items like PPE, radio, and radio equipment compatibility, any details to "marry up."

"Marriage" of the helicopter and module should occur at a pre-designated location away from the incident. This is where the module manager completes the pre-use inspection and documentation.

The Helicopter Manager must be confirmed before NICC assigns a call-when-needed (CWN) helicopter.

For any fire assignment, with the exception of Alaska, the following modules must be assigned to each aircraft:

Category	Standard Category	Restricted Category
Type 1	Manager plus 4	Manager only
Type 2	Manager plus 3	Manager only
Type 3	Manager plus 2	Manager only

In Alaska, the minimum is a manager for all categories, although there will often be modules assigned.

NICC will not automatically assign a module to helicopter orders; the requesting unit must request a module be assigned when ordering the aircraft.

Occasionally, crewmembers are ordered to support helibase functions and are not assigned to an aircraft or helicopter manager.

V. CHECK-IN PROCESS

A. Arrive at the Incident and Check-in

Each individual should ensure that all information needed to complete the Check-in List (ICS-211) is provided.

Resource order and request numbers, manifest information, home base, departure point, method of travel and other qualifications blocks are especially important.

There may be several locations for incident check-in. Check-in officially logs you in at the incident and provides important release and demobilization information.

B. Check-in Locations (Single Resource)

You may check-in at the following locations:

- Incident Command Post (ICP)
- Base or camp
- Staging area
- Helibase (for direct assignment)

VI. INITIAL BRIEFING

After check-in, locate your incident supervisor (helibase manager or helicopter manager) and obtain your initial briefing.

The items you receive in your briefing, in addition to functional objectives.

A. Initial briefing

Obtain a copy: Incident Action Plan (IAP) or Project Aviation Safety Plan (PASP)

Upon arrival on the incident/project you need to be briefed on:

- The organization structure
- The objectives
- Status of the incident/project
- Current and predicted weather (evening thunderstorms, red flag days, etc.)
- Hazard/safety issues
- Assigned duties
- Radio frequencies
- Other resources (aircraft equipment personnel and facilities)
- Flight hazard map
- Maps of the area
- Meals
- Helibase layout

- Helispot locations
- Deck procedures
- Briefing/debriefing times
- Crash rescue procedures and plan

B. Incident action plan key information from briefing

There are a number of ICS forms that you will see and use regularly as a helicopter crewmember. Some examples are:

Forms in the Incident Action Plan (IAP)

- ICS 201, Incident Briefing
- ICS 202, Incident Objectives
- ICS 203, Organization Assignment List
- ICS 204, Assignment List
- ICS 205, Incident Radio Communication Plan
- ICS 206, Medical Plan
- ICS 220, Air Operations Summary

Ask the helicopter manager for any of the above that has been presented in this unit.

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Unit 2 – Effective Working Relationships

OBJECTIVES:

Upon completion of this unit, students will be able to:

1. Define the professional conduct the HECM should practice.

2. Define how to establish and maintain positive interagency working relationships.

I. PROFESSIONAL CONDUCT

As a helicopter crewmember you are a member of an organized group. You are expected to conduct yourself in a professional manner while on an incident assignment.

A. What is Conduct?

Conduct can be defined as the way one acts, or ones' behavior. The way you conduct yourself paints an image of you, who you are, and the agency you represent.

Remember, there is always someone, or a group who is watching how you conduct yourself.

Conduct yourself in a professional manner:

- Be respectful – To others and their property, and to public property.
- Be courteous – To other crewmembers, to the public and officials.
- Be prompt – For briefings, meetings, and completing tasks.
- Be safe – At all times
- Set an example – Be a positive role model.

B. Rest and Recuperation Conduct

During off incident Rest and Recuperation (R&R) periods you must conduct yourself in the same manner.

- Personnel are responsible for proper conduct and maintenance of fitness for duty.

- Drug or alcohol abuse resulting in being unfit for duty will normally result in disciplinary action.

- Report any observed drug or alcohol abuse to your supervisor.

It is extremely important that inappropriate behavior be recognized and dealt with promptly. Inappropriate behavior is all forms of harassment and all will not be tolerated, e.g., sexual and racial harassment.

II. POSITIVE WORKING RELATIONSHIPS

A. Establish and Maintain Positive Interpersonal Working Relationships.

- Know your crewmembers and look out for their well-being.

  – Put the safety of your co-workers above all other objectives.

  – Take care of their needs.

  – Resolve conflicts between individuals on the crew.

  – Keep supervisors/co-workers informed.

B. Establish and Maintain Positive Interagency Working Relationships.

Throughout your career you will have that opportunity to work with other agencies and their personnel.

- When working with other agencies maintain a professional conduct.
  - Put safety before and above all other objectives.
  - Be respectful – To line officers, policies, and their way of doing business.
  - Be courteous – To supervisors, crewmembers, and officials.
  - Establish and maintain good communications.
  - Remain focused on the task so they will function safely and efficiently.
  - Provide clear instructions on the tasks to be accomplished.
  - Build everyone into an interagency team.
  - Be honest, personable, professional and presentable.

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Unit 3 – ICS Concepts and Principles

OBJECTIVES:

Upon completion of this unit, students will be able to:

1. Describe the application of the Incident Command System (ICS) as it pertains to the HECM.

2. Describe the ICS types of helicopters and the minimum National Standards for each type.

I. ICS CONCEPTS AND PRINCIPLES

Incident Command System: A standardized on-scene emergency management concept specifically designed to allow its user(s) to adopt an integrated organizational structure equal to the complexity and demands of single or multiple incidents, without the hindrance of jurisdictional boundaries.

ICS was developed to manage incidents and the resources used on the incident. Incident resources are part of one of the four management sections; Planning, Operations, Logistics, and Finance/Administration.

As helicopter crewmembers you will be part of the Air Operations Branch a branch of the Operations Section within the ICS organization.

A. ICS positions related to your daily operations assignment:

- Incident Commander (IC) oversees all incident activity.
- Air Operations Branch Director (AOBD) oversees all air operations.
- Air Support Group Supervisor (ASGS) oversees air support personnel and needs.
- Helibase Manager
  - Helispot Manager
  - Deck Coordinator
  - Loadmaster – Personnel
  - Loadmaster – Cargo
  - Crash Rescue Supervisor
  - Parking Tender

- Air Tactical Group Supervisor (ATGS) is responsible for tactical coordination of all aircraft.

- Helicopter Coordinator (HLCO) coordinates helicopter operations.

- Air Tanker Coordinator (ATCO) coordinates air tanker operations.

- Division Supervisor (DIVS) coordinates aerial tactical request for their division.

The helibase or helispot manager may directly or indirectly supervise the helicopter crewmember.

B. Follow the Chain of Command

The ICS is a series of management positions in order of authority. Following the chain of command is simplified.

The **chain of command** refers to the orderly line of authority within the ranks of the incident management organization. The flow of task assignments and resource requests between positions in the ICS occurs only with the person directly above or below them on the organizational chart.

It is very important to following the established chain of command anytime you have a question or a concern to get it resolved.

C. Span of Control

Key points:

- Span of control is key to an effective and efficient incident management. Maintaining an effective span of control is important because safety and accountability are a priority.

- Within ICS, the span of control for any incident management supervisor should range from three to seven subordinates with five being the optimum.

D. ICS Terminology

ICS establishes common terminology that allows diverse incident management and support entities to work together across a wide variety of incident management functions and hazard scenarios.

This common terminology covers the following:

- **Organizational Functions** – Major functions and functional units with domestic incident management responsibilities are named and defined.

Terminology for the organizational elements involved is standard and consistent.

- **Incident Facilities –** Common terminology is used to designate the facilities in the vicinity of the incident area that will be used in the course of incident management activities.

- **Resource Descriptions –** Major resources—including personnel, facilities, and major equipment and supply items—used to support incident management activities are given common names and are "typed" with respect to their capabilities, to help avoid confusion and to enhance interoperability.

- **Position Titles –** At each level within the ICS organization, individuals with primary responsibility have distinct titles. Titles provide a common standard for all users, and also make it easier to fill ICS positions with qualified personnel.

II. ICS HELICOPTER TYPING

For the purpose of managing aerial fire resources used during fire suppression the Incident Command System developed a classification to distinguish the different types, sizes, and capabilities of helicopters.

Helicopters were classified as "Type" along with a number to distinguish what category an aircraft fits in based on capabilities. Typically, a Type 1 is the largest category.

Typing of helicopters took the guess work out of what kind of helicopter to order or what type of helicopter you're expecting.

This simplified the entire air operation organization.

A. Helicopter Typing

Type	Passenger Seats	Minimum Allowable Payload	Minimum Gallons Retardant
1	15+	5,000 lbs	700
2	9-14	2,500 lbs	300
3	4-8	1,200 lbs	100

It is important to recognize that not all makes of helicopters are equal. A helicopter may have twelve passenger seats, but that does not mean it can lift that much weight. Density altitude and other environmental factors can dramatically affect payload.

Density altitude will be covered in Unit 5.

Different models within the same series of helicopter may look the same, but newer models generally have increased performance.

An example is the Bell 206 "Long Ranger" Series (L-1, L-3, L-4). The L-1, L-3, and L-4 look the same, but the L-4 has a bigger engine and better performance.

Other examples are the AS350 “Eurocopter Astar” (BA, B-2, B-3), and Bell 205.

Even within the same make and model some helicopters may have engine and/or rotor blade modifications that dramatically increase performance. If you don’t know, ask the pilot.

1. Type 1 -- Minimum of:

   - 15 passenger seats
   - 700 gallons retardant or water
   - 5,000 lbs. allowable payload at 59 degrees Fahrenheit at sea level

   Examples include:

   - Kaman K1200 “K-MAX”
   - Kaman H-43 “Husky”
   - Bell 214 B-1
   - Bell 214 ST
   - Sikorsky S-70
   - UH-60 “Blackhawk” (Military)
   - Aerospatiale AS-332L “Super Puma”
   - Boeing Vertol 107-II
   - Boeing Vertol 234 (CH-47 Military)
   - Sikorsky S-64 “Sky Crane”
   - Sikorsky S-61

2. Type 2 -- Minimum of:

- 9-14 passenger seats
- 300 gallons retardant or water
- 2,500 lbs. allowable payload at 59 degrees Fahrenheit at sea level

Examples include:

- Bell 204B
- Bell 205
- Bell 212
- Bell 412
- Sikorsky S-58T
- Eurocopter BK-117 A-4

3. Type 3 -- Minimum of:

- 4-8 passenger seats
- 100 gallons retardant or water
- 1,200 lbs. allowable payload at 59 degrees Fahrenheit at sea level

Examples include:

- McDonnell Douglas (MD) 500D and Hughes 500D
- MD 500E
- MD 530F
- MD 900 NOTAR
- Bell 206 B-III “Jet Ranger”
- Bell 206 L-3/4 “Long Ranger”
- Bell 407
- Aerospatiale AS-350 “Astar”
- Aerospatiale AS-355 “Twin Star”
- Aerospatiale SA-315B “Lama”
- Aerospatiale SA-316B Alouette III
- Eurocopter MBB BO-105

B. Summary

ICS types of helicopters are intended to provide a general classification of their capability.

Helicopters dispatched to incidents are generally what are available. However, it is important for firefighters to know the general capabilities of the types of helicopters to effectively and efficiently use them when assigned to an incident.

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Unit 4 – Communications

OBJECTIVES:

Upon completion of this unit, students will be able to:

1. Ensure all communication is performed using clear text.

2. Describe the process of communication within the chain of command.

3. Demonstrate proper radio usage.

4. Describe helicopter marshalling procedures and techniques.

I. COMMUNICATION PROTOCOL

A. Clear Text

All communications should be in clear text. What is clear text? Clear text is the use of the English language to communicate. All radio transmissions, written messages, and verbal instructions will be in clear text. No ten codes or agency specific codes are used when using clear text.

- Use Clear Text
- Be brief, clear and to the point (short concise communication).
- Plan your transmission before you key the radio. “Don’t think out loud on the radio”.

B. Flight Plans and Flight Following

All aviation missions for USDA Forest Service and Department of the Interior agencies, regardless of how simple or complex, are required to have an approved flight plan filed.

A flight plan is a detailed outline of where, when, and how the mission will be flown. Good thorough flight planning leads to a safe mission, poor planning only increases the chances for problems or accidents.

1. Federal Aviation Administration flight plan (for point to point)

   FAA flight plans shall be filed by the pilot prior to take-off whenever possible.

2. Agency flight following (radio) providing:

   a. Flight following will be accomplished under the agency's written flight following policy.

   b. Radio contact will be made at predetermined intervals not to exceed one hour. (Most agencies use predetermined intervals of less than one hour, e.g., 15 to 30 minutes).

   c. Position reports or amendments are communicated and recorded.

   d. Personnel tasked with flight following responsibility must monitor the communications radio at all times during the flight.

   e. Agency flight following must minimally include:

      - Aircraft type and identification ("N" number)
      - Aircraft color
      - Pilot name(s)
      - Fuel on board (e.g., two hours of fuel)
      - Passenger(s) name(s)
      - Passenger/cargo weight
      - Nature of mission
      - Flight routes/point of departure/destination
      - Estimated duration of mission

- Estimated time of departure
- Estimated time of arrival
- Check-in procedures

f. Automated Flight Following (AFF):

AFF is a satellite/web-based system, which allows the dispatcher to monitor aircraft location on a computer screen.

AFF reduces the requirement to "check in" via radio every 15 minutes, and provides the dispatcher near real time information regarding the aircraft latitude and longitude, heading, airspeed, altitude, and flight history. This reduces pilot workload, clears congested radio frequencies, and provides the dispatcher with much greater detail and accuracy on aircraft location.

AFF is an approved method of agency flight following. Most agency aircraft have AFF capability.

C. Flight Planning (emergency response for overdue/missing aircraft)

An FAA study on general aviation accidents found that the response time for search and rescue (SAR) units to arrive at the accident scene was significantly decreased when a flight plan was used. Filing a written flight plan and flight following may double your odds of surviving an aircraft mishap.

1. The average time for SAR initial notification is about 30 minutes.

2. Average time for SAR units to arrive on scene is about 4 hours.

A written flight plan and flight following dramatically decreases the response time for SAR efforts. It may still require more than five hours for individuals to check and confirm there is a missing aircraft.

The search area may be massive because only written information is available to determine the flight route and destination. Deviation from a flight plan only complicates the potential of locating a downed aircraft.

By the time SAR efforts locate the aircraft and arrive on scene, an average time of 38 hours has passed. What is the potential of surviving a trauma if it takes more than a day to get to you?

Without a flight plan, in a downed aircraft, if you have even minor injuries, the chances of your survival are slim. It may take more than a day for someone to acknowledge that you're missing (FAA average of 35.5 hours).

More than three days (FAA average of 82 hours) may pass before someone arrives at the scene of the accident. What are your chances for survival?

Post-Crash Survival Time–After an accident in a remote area, an injured person may survive for one day. An uninjured person may survive for three days.

Always consider the environment that you will be flying in. Even on routine flights, remember to bring clothing and/or supplies commensurate with the conditions in the event you have a mishap. Know what your agencies policy is regarding supplemental survival equipment.

D. Communication within the Chain of Command

The chain of command refers to the orderly line of authority within the ranks of the incident management organization.

Task assignments and resource request between positions occurs only with the person directly above or below them in the organization.

The helibase usually has good radio communications once it is established. Radio is the primary communication link between other Air Operation Sections; helispots, aircraft, ASGS, etc., and other incident sections and functions; Logistics, Supply, Medical, etc.

It is important to follow the chain of command when contacting another section or function.

II. RADIO COMMUNICATIONS

A. Radio Communications

Ground Communications

- Logistics
- Line operations
- Operations Section Chief
- Helibase operations

Air to Ground Communications

- Air attack
- Flight following
- Takeoff and landing coordinator

Air to Air Communications

- Air attack to incident aircraft
- Position reporting
- Coordination between aircraft

Radio is the most common mode of communication used on incidents. It, however, is subject to limitations such as line-of-site.

B. Types of Radios

There are three types of radio communication available:

- **VHF-FM** use most frequently for on incident communications.

- **VHF-AM** is commonly known as VICTOR radio. It is an AM frequency and can be used to direct aircraft from the ground takeoff and landing coordinator (TOLC) or provide air-to air communications between aircraft. Either of the two, VHF-FM or VHF-AM, can be used for continuous flight following.

- **UHF-FM** is primarily for logistical helibase and Incident Base Camp.

Repeaters are used to link all elements of the communications operation together.

C. Daily Radio Preparations

Part of your daily routine is to make sure that all assigned radios are functional prior to commencing daily operations by:

- Checking batteries - replace and change daily (good practice).
- Spare batteries with each radio.
- Check antenna for damage (replace as needed).
- Check key button to make sure it works.
- Radio check – With personnel or aircraft on deck.
- Verify frequencies with Incident Action Plan (IAP).

D. Target Description (TD)

TD is a systematic technique for a ground contact to communicate target identification and location by radio, enabling the pilot to locate, identify and take action on the target in the shortest possible time reducing risk for the pilot.

The purpose of TD is to have aircraft in the “low and slow” zone the shortest amount of time possible.

1. The ground contact may need to communicate with:

    - Air Tactical Group Supervisor (ATGS)
    - Aerial Supervision Module (ATGS and Lead Pilot are in same aircraft)
    - Air Tanker/Fixed Wing coordinator (ATCO)
    - Helicopter Coordinator (HLCO)
    - Air Tanker Pilot
    - Helicopter Pilot

2. Before talking to aircraft the ground contact needs to know:

    - Hazards to aircraft
    - Where you are
    - Your call sign
    - Your tactical objective (plan)
    - Aircraft call sign
    - Aircraft frequencies
    - Primary and secondary targets
    - Wind speed and direction

3. Where do you get this information?

- Helibase
- Incident Action Plan (IAP)
- Division/Group supervisor
- Personal observations
- Radio traffic
- Briefings

4. Operating procedures

   a. Use the ICS position resources (ATGS, HLCO, ATCO) to coordinate drops.

   b. Have and know the tactical plan.

      - Anchor and flank
      - Hot spot
      - Buy time
      - Secure the edge

   c. Use standard fire terminology.

      - Head
      - Heel
      - Right flank
      - Left flank
      - Spot fire

d. Use target description

- Parts of the fire
- Clock orientation (from the aircraft's position)
- Right, left, nose, tail
- High, even, low
- Cardinal points (north, south, east, and west). Only use compass directions if you and the pilot both agree on which way is north. This is the least desirable method.

e. Use easily identifiable target references.

- To previous drop
- From your position
- To topographic or terrain features
- To human made features (cut areas, trails, roads, dozer line, vehicles, structures)
- Part of fire (heel, head, flanks) or fire activity, e.g., spot fire on right flank
- To cardinal points (agree with pilot which way is north)

f. Describe target when pilot is in position to see target.

- Be brief, clear and to the point (short concise communication).
- Plan your transmission before you key the radio.
- Don't "think out loud" on the radio.

5. Stages of pilot orientation

a. Long distance (Radio contact but no visual contact with aircraft)

- Geographical and topographical reference points must be large and obvious.
- GPS coordinates are useful if the air crew has time to enter the information.
- Relay lat/longs to helibase when initial order is made for aircraft allowing pilots to enter coordinates into GPS unit while still on ground.
- Keep positive communication with aircraft until visual contact is established (both the ground contact and pilot).

b. Medium distance (may or may not have visual contact with aircraft)

- Reference points must be obvious.
- If aircraft is in sight use the clock orientation technique.
- Signaling devices are effective (mirrors, strobes, flares).
- Keep positive communication with aircraft until visual contact is established (both the ground contact and pilot).
- Relay aerial hazards to pilot including other aircraft expected or on the incident.
- If appropriate, relay overall tactical plan to pilot.

c. Short distance (visual contact with aircraft)

- Reference points must be unique to your target area.
- Clock orientation technique is effective.
- Signaling devices are effective (mirrors, strobes, flares, space blankets, flagging).
- Describe targets and give tactical plan to pilot (including location of ground forces).
- Reemphasize aerial hazards including other aircraft expected or on the incident.
- If the aircraft is getting close and the pilot doesn't have the target location, communicate any aerial hazards.

6. Feedback

- Give honest, constructive evaluation regarding the drop accuracy.
- Early, late, uphill, downhill, on target, etc.
- If conditions allow, pilot will adjust based on your feedback.

E. Marshalling Helicopters

Safety precautions to follow while marshalling:

- Receive a briefing from supervisor.
- Obtain a radio for communication.
- Clear the landing area of all obstacles and obstructions before signaling the pilot to take off or land.
- Ensure you remain at the front and visual to the pilot at all times.
- Direct the pilot by radio or standard hand signals.
- Have an adequate fire extinguisher(s) accessible.
- Approved hand signals should be used by all personnel and pilot.
- Brace yourself when large helicopters are landing or taking off due to the velocity of the rotor downwash.
- Keep landing area free of litter and trash.

F. Hand Signals

Use National Standards – Use the hand signals in Basic Aviation Safety or in the Incident Response Pocket Guide (IRPG).

Standard hand signals should be used.

- Include pilot in training so everyone has the same understanding.
- Hand signals need to be exaggerated to be effective.
- A smooth transition between one signal to the next.
- Minimize the time spent holding the helicopter in a hover.

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Unit 5 – Helicopter Performance, Limitations, and Load Calculations

OBJECTIVES:

Upon completion of this unit, students will be able to:

1. Describe general aspects of helicopter design, flight controls, and terminology.

2. Define “in-ground-effect” and “out-of-ground-effect” as they relate to helicopter performance.

3. Describe air density altitude and the effects on helicopter performance.

4. Describe the process for completing a load calculation form.

I. HELICOPTER PERFORMANCE

The helicopter has proven its value and versatility throughout the world. Its abilities to operate from restricted area and to remain above a selected spot are perhaps the helicopter's greatest attributes. Managed by trained personnel and treated with proper respect, it is as inherently safe as any equipment in use today.

To properly manage helicopters for safe and efficient use, we must know something of their basic capabilities and limitations.

A. Basic Helicopter Design

1. Rotor Systems

Single-Rotor Helicopter - The most common design uses a single main rotor which imparts lift and thrust, and a smaller tail rotor, which compensates for torque induced by the powered turning of the main rotor.

Dual-Rotor Helicopter – Some helicopters have dual main rotors, mounted in tandem or side-by-side.

Torque compensation is achieved by turning the rotors in opposite directions.

2. Helicopter Controls

There are four controls that are used in conjunction with each other when flying a helicopter.

a. Collective Control

This changes the angle of the pitch (of angle of attack) of each main rotor blade simultaneously. The collective is controlled by the left hand.

As the pitch of the blades is increased, lift is created causing the helicopter to rise from the ground, hover or climb, as long as sufficient power is available.

b. Throttle Control

As the pitch is increased, power must be added to maintain rotor RPM when the helicopter lifts off or climbs. On the turbine-powered helicopters, this power coordination is accomplished automatically through the fuel control and governor systems of the turbine engine. A manual throttle control may be located on the collective or on the control panel.

c. Anti-Torque Control

Two anti-torque pedals are provided to counteract the torque effect of the main rotor. This is done by increasing or decreasing the thrust of the tail rotor.

The anti-torque pedals accomplish this by changing the pitch (angle of attack) or the tail rotor blades.

Pedal action will provide heading and directional control in hover and at low airspeeds.

On dual rotor helicopters, the problem of torque control is solved through the counter-rotation of the main rotor system. Pedal movement induces pitch changes to the main rotor blades, thereby accomplishing heading and directional control in a hover.

As forward speed increases, the tail rotor becomes less necessary. The “slip-streaming” effect of the fuselage provides enough surface contact with the relative wind to counteract the torque of the main rotor.

d. Cyclic Control

The "cyclic" is controlled by the pilot's right hand. The purpose of the cyclic pitch control is to vary the amount of lift in the portion of the rotor disk. The aircraft moves in the direction that pressure is applied to the cyclic.

If the pilot moves the cyclic forward, the lift in the rear half of the rotor disk is increased, and the aircraft moves forward.

3. Landing Gear

- Skids – Skids are the most common type of landing gear used in light and medium-class helicopters.

- Wheels – Wheels are primarily used on medium and heavy helicopters.

- Floats – Floats can be used on land as well as water. There are two types; fixed or inflated. "Pop Outs" are inflated only as needed.

B. Helicopter Loading

1. Center of Gravity Effects

- Consideration of center of gravity (CG) limitations is important in the loading of all aircraft, but is particularly important and critical in helicopters.

  In a helicopter, it is carried under a single point, like a pendulum; therefore, very little "out of CG" loading can greatly affect the controllability of the helicopter.

- The CG point of most helicopters is an imaginary line extending from the rotor hub through to the cargo hook and extended straight below if an external load is attached.

- Always consult pilot about proper loading. Try to keep load centered.

  It is also important to properly secure all materials loaded on or in a helicopter, as a shift in cargo could affect CG.

2. Floor Loading

   Careful attention must be given to small, heavy parcels loaded into helicopters to determine that the maximum pounds-per-square-inch limitations are not exceeded. Small, object can punch holes in flooring or collapse decking and supporting stringer.

II. PRINCIPLES OF FLIGHT

Certain terms are commonly used in reference to helicopter flight characteristics. Being familiar with these terms is important to persons involved with helicopter use.

A. Ground Effect

A condition of improved rotor system performance encountered when the helicopter is hovering near the ground. The apparent result is increased lift thus decreased power requirements. This provides for a greater allowable payload.

1. Hover-In-Ground-Effect (HIGE)

   HIGE is achieved when the helicopter is hovering less than one-half the rotor diameter distance from the ground. In a hover, the rotor blades move large volumes of air from above the rotors down through the system.

   The ground interrupts the airflow under the helicopter; this reduces downward velocity of the air and produces an outward airflow pattern.

2. Hover-Out-Of-Ground-Effect (HOGE)

HOGE occurs when the helicopter exceeds about one-half the rotor diameter distance from the ground, and the cushion of air disintegrates.

To maintain a hover, the helicopter is now power dependent. This situation will occur when the terrain does not provide sufficient ground base, or when performing external load work. Maximum performance is required and payload may have to be reduced.

It is important to understand the capabilities and limitations presented by ground effect when choosing a landing site.

When planning a helicopter project, the safety and efficiency of the operation will be enhanced by selecting landing areas that allow the pilot to approach into the wind and HIGE. Normal take-off and landings are initiated by bringing the helicopter up to an in-ground-effect hover and translating the aircraft into forward flight.

Additional lift is gained as the helicopter moves from the turbulent air created from hovering, to undisturbed, “clean” air which moves through the rotor system as the helicopter increases airspeed.

3. Translational Lift

Translational lift occurs when the helicopter approaches 15 to 18 MPH indicated airspeed. Translational lift will also be produced when the helicopter is hovering with a 15 MPH steady headwind. Translational lift can be felt as an aircraft transitions from a hover to forward flight. A brief vibration can be felt as forward airspeed increases from a hover.

B. Autorotation

Autorotation is a non-powered flight condition in which the rotor system maintains flight RPM by reversed airflow. It provides the pilot a means of safely landing the helicopter after an engine failure or other mechanical emergency.

- Helicopters have a freewheeling unit in the transmission which automatically disengages the engine from the rotor system in the event of failure. This allows the main rotor to rotate freely.

- When the helicopter is powered by the engine, airflow is downward through the rotors. During an autorotation airflow is upward, "wind milling" the rotor blades as the helicopter descends.

The pilot maintains constant rotor RPM by changing the pitch to the blades as the aircraft continues descent. As the helicopter approaches a landing site, the pilot flares the aircraft by moving the cyclic back and gently lifting the nose. This slows the forward airspeed and rate of descent. Before touchdown, the helicopter is leveled and the pilot utilizes the stored-up blade inertia to cushion the helicopter to the ground. The autorotation is complete.

C. Height Velocity Diagram

In the flight manual for each helicopter type is a chart which provides necessary information to complete a safe autorotation. This is a height velocity curve, indicating the comparative combination of airspeed and altitude require accomplish a safe autorotation (for most light helicopter, 350 to 450 feet above ground level at zero airspeed). When flying low-level or performing extended hovers, it dramatically reducing the safety margin and limiting the pilot's options.

D. Maximum Performance Takeoff

On occasion, a maximum performance takeoff or landing must be accomplished. This occurs when the helicopter hovers- out-of-ground-effect before or after translational lift. In this situation, the helicopter is totally power dependent and the margin of safety is significantly reduced.

When possible, avoid confined areas, or large obstructions that require the pilot to use maximum power for extended periods.

E. Density Altitude

Density altitude refers to a theoretical air density which exists under standard conditions of a given altitude.

By definition, **density altitude is pressure altitude corrected for temperature and humidity.**

It can have a profound effect on aircraft performance. Air, like other gases and liquids, is fluid. It flows and changes shape under pressure. Air is said to be "thin" at higher elevations.

There are more air molecules per cubic foot at sea level feet than at 8,500 feet. As density altitude increases, air thins out and aircraft performance decreases. At lower elevations, the rotor blade is cutting through more dense air, which provides additional lift and increased performance.

There are three factors that affect density altitude in varying degrees; **atmospheric pressure, temperature**, and to some degree, humidity.

- If we change the pressure .10 inches, from 29.92 to 30.92 inches Hg (inches of mercury), we will have a density altitude change of 100 feet.

  Or if the change was an inch in Hg (29.92 to 30.92) that would equal approximately 1,000 feet.

F. Density Altitude Chart

Density Altitude Affects Performance

High elevation, high temperature, and high moisture content all contribute to high density altitude conditions and lessen performance.

Performance is reduced because the thinner air at high density altitudes reduces blade efficiency.

This in turn requires additional pitch to maintain the same lift capability. The greater pitch angle results in increased drag that requires additional power. Unsupercharged piston engines and turbines also operate less efficiently in this less dense air.

Density altitude is the biggest factor when you are hot, high and heavy, be alert!

III. HELICOPTER LOAD CALCULATIONS

A. Load Calculation Form

One of the most important documents you will become familiar with is the Load Calculation Form.

For a helicopter to fly safely it is critical that you obtain an allowable payload from the Load Calculation form.

The AMD-67 and FS-5700-17 load calculation is required for all helicopter flights conducted on interagency fires and project work.

For any 5 degree C change in outside air temperature or any 1,000 pressure altitude feet change, a new load calculation will need to be completed to ensure safe operations.

Many accidents have happened that involved aircraft that were operating in conditions that were too high or too hot for the weight of the aircraft.

B. Reading the Form

1. Header Information

- Aircraft model

  Make and model

- N Number

  Actual aircraft tail number

- Mission

  General mission description

- Date/Time

  When will the mission take place?

- Departure

  Departure location, altitude and temperature

- Destination

  Destination location, altitude and temperature

2. Helicopter equipped weight

   Found in the weight and balance data in the flight manual.

3. Operating weight

   Add lines 3, 4, and 5 together to obtain the "operating weight" of the helicopter. Use 7 lbs per gallon for fuel weight.

4. Computed gross weight

The pilot must go to the performance charts to obtain the "computed gross weight."

This reduces the maximum weight allowed, down to the weight that the aircraft can be at the altitude and temperature it is taking off or landing, or conducting high power demand operations, like sling work.

5. Weight reduction (download)

This set amount of weight is taken off the computed weight.

In this way, whenever performance capability has dropped below the limitations of the aircraft, an extra "margin of safety" will be provided.

The amount of reduction for each model of aircraft is found in the contract.

After the weight reduction is subtracted from the computed gross weight, the "adjusted weight" is recorded in line 9.

6. Gross weight limit

A limitation to the operation of that aircraft, found in the flight manual, and never to be exceeded.

Here is an example of a maximum weight limitation for a "non-jettisonable load" for an A-Star B3.

For this model of helicopter, the non-jettisonable gross weight limitation is a "structural" limitation, not a limitation to the performance capability of the engine.

The jettisonable load maximum weight limitation, however, is the maximum weight that the aircraft can sustain in the air, and is the limit of its performance capability.

These limitations are entered into line 10 of the form.

Line 9 is your adjusted weight, having been through the "computation" of the performance charts, and with the down load subtracted, if appropriate.

Line 10 is the gross (total) weight limitation of the helicopter for that situation (jettisonable or non-jettisonable).

You must choose whichever is less:

Line 9 (adjusted weight) or line 10 (the limitation).

- Allowable Payload – This is the weight of passengers and cargo that can be carried for any mission. The allowable payload is the computed gross weight minus the weight reduction minus the operating weight.

- Hover-in-ground-effect. Used at in-ground effect helispots with internal cargo or passengers.

- Hover-out-of-ground-effect. Used at out-of-ground effect helispots or external loads that are not jettisonable.

  Hover-out-of-ground-effect jettisonable. For external jettisonable loads only.

7. Final Blocks of Load Calculation Form

- Passengers and cargo

  Only applicable if load calculation specific to mission

- Actual payload

  Total weight of passengers and cargo

- Pilot signature

  Pilot must sign for load calculation to be valid.

- Manager signature

  Manager must sign for load calculation to be valid.

- HazMat

  Must be identified on the load calculation if on aircraft.

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Unit 6 –Risk Management and Safety Management System

OBJECTIVES:

Upon completion of this unit, students will be able to:

1. Describe the Risk Management process as applied to helicopter operations.

2. Explain the purpose of the Safety Management System (SMS).

I. RISK ASSESSMENT AND MANAGEMENT

A. What is Risk Assessment?

Risk assessment is the process which associates “hazards” with “risks.”

Risk assessment is the initial part of the risk management process which includes:

- Identifying know hazards and
- Analyzing the degree of risk associated with each hazard

B. Risk Management Process

Risk management is a continuous systematic process of identifying and controlling risk in all activities according to established parameters.

This process includes detecting hazards, assessing the risk, and implementing and monitoring risk controls to support effective, risk based decision making.

Risk management is a 5-step cyclical process individuals can use to determine if a mission should be performed and to identify hazards that need to be mitigated.

1. Step 1 – Identify Hazards - Situation Awareness

What is a hazard?

Any real or potential condition that can cause:

- Mission degradation
- Injury
- Illness, or death to personnel
- Damage/loss of equipment or property

Here are some factors that determine hazards:

- Weather
- Time of flight
- Terrain – landing areas
- Equipment
- Wires
- Military training area
- Take-off and landing weights
- Training and proficiency level

Risk Factor that determine hazards are generally divided into four categories, the 4Ms:

- Man
- Machine
- Medium
- Method

2. Step 2 – Assess the Hazards - Hazard Assessment

How should hazards be assessed?

Each hazard should be identified and analyzed by examining:

1. The effect on personnel/equipment should a hazard be encountered.
2. The probability that a hazard will be encountered.

Effect – If a hazard is encountered during a mission, the effect may be:

- **Catastrophic** – Death or serious injury
- **Critical** – Serious injury, damaged equipment
- **Moderate** – Mission accomplished, adverse effects
- **Negligible** – No effect, mission accomplished

Probability – The probability of encountering a hazard during a mission may be:

- **Frequent** – Continuously or often
- **Likely** – May encounter several times
- **Occasional** – May encounter sporadically
- **Seldom** – Encountered infrequently, remote
- **Unlikely** – Rarely, possible, but improbable

How to determine the risk?

- Determine the severity, probability and exposure with each hazard.
- Determine the risk associated with the combined hazards.

Initial assessment may indicate risk level(s) unacceptable. Once controls are implemented, risk level(s) may be at an acceptable level.

3. Step 3 – Develop Controls Make Decisions - Hazard Control

What is a risk decision?

- Weigh the risk against the benefits of performing a mission.
- Be aware that the mentality, even during non-emergency missions may be mission-oriented (get the job done).

Risk Decision Tips:

- Involve operational personnel, especially those impacted by the risk decision.

- Apply redundant risk controls when practical and cost effective.

- Make risk decisions when benefit out ways the cost.

Who should make a risk decision?

Decision should be made at the level that corresponds to the degree of risk associated with that mission.

Majority of the decisions that you will be associated with will be made by the Helicopter Manager

- Extreme High/High Risk Decision (In red and orange)– An extremely high or high-risk decision, which potentially involves the safety of the aircraft and pilot, should be evaluated through the chain of command to the highest level of responsibility for the operation (i.e., the Incident Commander on a fire or the Line Manager for a project mission).

- Medium Risk Decision (in green) – A medium-risk decision, which potentially involves extra cost or delays, should be evaluated at a somewhat lower level of command such as the Air Operations Branch Director or the Project Aviation Manager.

- Low Risk Decision (in blue) – A low-risk decision, which potentially involves little or no effect on the personnel or equipment should be evaluated and determined at the Helibase Manager or Helicopter Manager level.

4. Step 4 – Implement Controls/Decision point

What are controls?

Included in this step is supervisory action to reduce or eliminate hazards.

- A control is any kind of action that is taken to mitigate the risks that have been identified.

- These controls can range from writing a special-use action plan to simply conducting a short safety briefing.

Once controls are implemented, reassess hazards to ensure that risk(s) have been mitigated to an acceptable level of safety.

Incorporate selected controls into:

- Brief the pilot

- Brief personnel

- Weigh and prioritize loads

- Evaluate helispot

5. Step 5 – Supervise

How do you supervise control actions?

- **Brief** – to ensure that all personnel know what they are supposed to do.
- **Follow-up** – on instruction to see that people are doing what is expected.
- **Update** – and evaluate the plan continually.
- **Adjust** – or make changes as unforeseen issues arise.
- **Debrief** – after mission is completed.
- **Incorporate** – lesson learned for future use.

II. SAFETY MANAGEMENT SYSTEM (SMS)

The ultimate goal of SMS is to provide an organizational framework or roadmap for developing and promoting a true safety culture, ultimately reducing our accident rate.

A. Examples of integrated elements or components of an aviation safety system

- Aircraft and Technology
- Training programs
- Supervision (span of control)
- Aviation Policy
- Safety Plans
- Communication procedures

- Vendor Pilot/Aircraft carding
- Line Officers' oversight
- Dedicated Aviation Managers
- PPE requirements
- SAFECOM (hazard reporting)
- ICS and organizational structure
- Interagency agreements
- Financial Systems
- FAA Part 135, 137 standards, etc.
- Contract requirements
- Pilot and aircraft inspectors
- Frequency management

B. What does SMS do for us?

- Takes a proactive, "systemic" (big-picture) approach to managing Aviation safety from all-angles within an organization. In other words it helps you to seek and identify "latent defects".
- Helps identify hazards and control measures to reduce risks (Risk Management Worksheet (RMW), Job Hazard Analysis (JHA), etc.).
- Provides for ongoing "quality assurance" to ensure that risk controls are effective.

C. SMS is based on the following premises:

Every person in the organization accepts that safety is a conscious and ongoing mindset as opposed to simply a box to be checked.

If we continuously and proactively seek out and eliminate latent defects within our systems and culture, we eliminate potential causal factors that could lead to future accidents.

D. Four "Pillars" or Components of SMS

1. Safety Policy

- Agency handbooks, manuals and guides
- Organization and position requirements
- NWCG position standards, task books
- Contract requirements, national/regional/zone aviation plans

2. Safety Risk Management

- RMW and JHAs
- Go-No Go checklists
- SMS risk assessments
- Crew resource management "team decision-making,"
- Assignment "turn-down" policy, etc.

3. Safety Assurance

- Briefings
- Training
- Fire and Aviation Safety Team (FAST)
- Phase Limitations
- Check rides/carding requirements
- Accident investigations
- Program reviews

4. Safety Promotion

- Lessons Learned bulletins
- Safety Alerts
- Training
- Briefings
- SAFECOM reporting system
- Airwards
- Effective Leadership
- Safety Communication

E. Negative Organizational and Cultural Influences

1. Improper use of SAFECOMs include:

   - Failure or delaying to report unsafe acts
   - Information cannot be used to support claims for or against the government.
   - To evaluate contractor performance or award contracts
   - As a venue for complaints or personal agendas.
   - Not a substitute for "on-the-spot" correction(s) to a safety concern

2. Failure to understand or follow policy

   - Policy overload
   - Conflicting or confusing policy
   - Lack of accountability and discipline.

3. Fiscal/staffing constraints

   - Outdated equipment
   - Lack of proper equipment
   - Lack of qualified personnel (multi-task)

4. Overemphasis on mission accomplishment vs. safety

   - Management pressure
   - Critical incident needs
   - Urban interface

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Unit 7 – Operational Safety

Lesson A – General Aviation Safety

OBJECTIVES:

Upon completion of this unit, students will be able to:

1. List safety precautions to be observed when working around or flying in a helicopter.

2. Define the requirements and procedures to safely perform special missions.

The purpose of this unit is to provide you with information and skills to perform your job safely in and around helicopters.

Many accidents and incidents could have been prevented if the established policies and procedures were followed.

Helicopters are potentially dangerous to all personnel. Through application of the following safety practices, the helicopter operations environment can be safe.

I. GENERAL AVIATION SAFETY

A. Safety Precautions

- Helicopter operations will be limited to missions approved on the Aircraft Data Card and the Pilot Qualifications Card. If you have not flown in the aircraft or with the pilot recently you should ask to see both cards. The pilot is required to carry the pilot qualifications card, and the aircraft data card is required to be in the aircraft.

- Helicopter operations will comply with the user agency manual, Helicopter Contract and Federal and State Occupational Safety and Health Act. Standards applicable to the general safety rules for operations and practices.

- Flight following and flight planning will be in place and conducted based on agency policy.

- Operation of the helicopter will be during daylight hours only. (Defined as one-half hour before sunrise to one-half hour after sunset.)

- Helicopter pilot duty and flight limitations have been established by the agencies in an effort to reduce pilot fatigue.
  - 8 hours flight time/day
  - 14 consecutive duty hours/day
  - 10 hours rest between days
  - 36 hours in 6 days (not to exceed 42)
  - 2 days off in any 14-day period
- No unnecessary passengers will be aboard the helicopters.
- Do not allow unnecessary flights.
- Helicopters shall not be dispatched for mountainous flying when average wind velocity exceeds agency or manufacturer limitations.
- Personal protective equipment required for all missions-available and worn by all ground personnel, passengers and pilot.
- Daily or mission briefing

  Participants
  - Pilot
  - Crewmembers
  - Ground personnel
  - Helicopter manager

Briefing items

- On the ground and in the air safety precautions
- Safety plan
- Hazard map
- Mission

- Responsibilities

Pilot

- Safe use of the helicopter at all times.
- Participate in the helicopter safety program and the efficient use of the aircraft.
- Approve all missions; the pilot's word is final as to whether or not the flight can safely be made.

All personnel

- Ensure mission objectives and hazards are clear and understood.
- A passenger may refuse to fly with any pilot or in any aircraft or curtail an existing flight if, in the opinion of the passenger, conditions exist which make the flight unsafe.

B. General Helicopter Safety

- Keep clear of helicopter's rotors.
  - Unless loading or unloading, stay outside safety circle at all times.
  - Approach or depart in a slight crouch from front or side in full view of the pilot or as directed by the pilot or helitack personnel.
- Under no circumstances go near the tail rotor of the helicopter.
- Do not approach from or depart to an area where ground is higher than where the helicopter is sitting or hovering.
- Never run when approaching or leaving helicopters.
- Carry equipment parallel to the ground.
- Obtain pilot's approval for all gear stowed in or on the helicopter, especially explosives, flammable, or other hazardous materials.
- Cargo in racks or cargo compartments must be enclosed or tied down securely.
- Know location and operation of doors and emergency exits.
- Know location and operation of:
  - Fire extinguisher

    All DOI and Forest Service aircraft must have a hand held minimum 20B:C rated fire extinguisher.
  - Emergency location transmitter (ELT)

    Every aircraft must have an ELT.

– First-aid kit

Aircraft owned or operated by DOI and Forest Service are required to carry a first aid kit.

The first aid kit must be readily accessible to all occupants in the aircraft.

– Survival kit

Survival kits are required to be on every agency contracted helicopter at all times per contract.

– Restraint systems

All aircraft must be equipped with an FAA approved restraint system.

All restraint systems must have a metal-to-metal buckle or latching mechanism.

Keep belt fastened during flight.

Three types of restraint systems:

- Two-point (No longer used by USFS and DOI)
- Three-point
- Four-point

Front seat occupants of a helicopter must have a four-point harness.

Make sure lap belts are refastened before closing door.

– Fuel and battery shut off

Know location and operation, specifically which to shut-off first in the event of an emergency.

- Use a chin strap or secure hard hat when working close to the helicopter.

- No smoking within 100 feet of helicopter or fuel trucks.

- One-wheel, one-skid, hover stepping, or power-on landing will not be performed without written agency approval.

C. In-Flight Discipline

- No moving about in flight; e.g., changing seats.

- Keep arms and legs clear of controls and inside helicopter.

- Control objects, such as maps so as to not restrict visibility.

- Keep hardhat, gloves and other PPE on.

- Locate the emergency exits and know how to operate. Use only in emergency.

- No smoking at any time while in flight.

- Keep alert for aerial hazards, particularly other aircraft and power lines; inform pilot of their presence.

- Always know your location so you may assist in flight following and maintain situational awareness.

- Do not throw objects out of helicopter unless trained in procedures and pilot approval is obtained.

D. Common Questions and Concerns to Consider

1. Aviation Watch out Situations

- Is the flight necessary?
- Who is in charge?

  Are all known hazards identified and have you made them known?

- Should you stop the operation or flight due to change in conditions, communications, confusion, conflicting priorities, weather, turbulence, personnel?
- Is this the best way to accomplish the mission?
- Are you driven by an overwhelming sense of urgency?
- Can you justify your actions?
- Are there any other aircraft in the area?
- Do you have an escape route?
- Are there any rules being broken?
- Are communications getting tense?
- Are you deviating from assigned operation or flight?

2. Other Questions to Consider

- Do the risks outweigh the benefits of the operation?
- Is there an adequate safety margin?
- Has adequate planning been accomplished?
- Are the pilot and helicopter carded and equipped for the mission?
- Are there sufficient qualified personnel to accomplish the mission?
- Has there been an adequate planning and hazard analysis?
- Is there adequate equipment to accomplish the mission?
- Have all personnel been briefed on the mission and a positive communication established?
- Are contingency plans in place for changes due to bad weather or equipment failure?

II. SPECIAL MISSION SAFETY

A. What Is Special Use?

Special use is operations involving the use of helicopters in support of DOI and U.S. Forest Service programs, which require special considerations due to their functional use. Pilot and aircraft must be carded for special mission.

Example of Special Use:

- Flying low-level (below 500 ft.)
- Mountain flying
- Long-line
- Aerial ignition
- Rappel
- ACETA (Aerial Capture, Eradication, Transport of Animals)

B. Pilot and Helicopter Approved For the Mission

Before any flight, you must ensure the pilot and helicopter are approved for the planned mission.

Special use activities require that everyone aboard the helicopter wear a full complement of PPE.

Helicopter Crewmember, S-271

Unit 7 – Operational Safety

Lesson B – Briefings and Manifest

OBJECTIVES:

Upon completion of this unit, students will be able to:

1. Describe the briefing the HECM should receive from the pilot prior to internal and external cargo operations and passenger transport.

2. Brief the pilot and passengers of flight plans and potential hazards.

3. Describe safe helicopter loading and unloading procedures in a wide variety of aviation environments.

4. Describe the briefing the HECM would provide to the pilot prior to internal and external cargo operations and passenger transport.

5. Prepare a passenger/cargo manifest utilizing the helicopter load calculation form.

6. Describe procedures for in-flight and landing emergencies.

7. Describe key elements of an After Action Review (AAR).

I. BRIEFINGS

A. Pre-Flight Briefing

- Routine part of every flight.
- Pilot and aircraft carded for mission.
- Flight plan/following
- PPE required for mission
- Ensure pilot and all involved personnel understand the mission objectives, method and known flight hazards.
  - Safety plan and hazard map reviewed
  - Review a map of the area where the mission will take place prior to take-off.
  - The map should display:
    - The intended flight route.
    - Temporary flight restrictions
    - Military operation areas
    - Military training routes
    - Known aerial hazards such as power lines, communication towers.

Failure to attend briefing could lead to assumptions that may compromise safety or completion of mission.

B. Pilot Briefing to the Passengers

The pilot is required to brief passenger before the flight as a requirement of Federal Aviation Regulation 135.117. The briefing should include:

- Smoking restrictions
- Use of seatbelts
- Emergency exits
- Operation of doors
- Fire extinguisher
- Supplemental oxygen, if applicable
- Placement of seat backs, if applicable
- Location of first aid kit, survival kit and Emergency Locator Transmitter (ELT)
- Shut-off procedures for battery and fuel

C. Crewmember Briefing to Passengers

Many times passengers are thinking more about taking a flight instead of the mission at hand and ensuring their own safety. Providing an effective briefing is the first step towards having a safe flight.

It is the responsibility of the person briefing passengers to be familiar with and communicate the specific locations of safety equipment on aircraft to be used.

- ELT
- First aid kit
- Fire extinguishers
- Door operation
- Seatbelt operation
- Fuel and battery shut-off
- Emergency landing positions

It is the responsibility of the person giving the briefing to:

- Ensure that all passengers are wearing necessary personal protective equipment.
- Passenger should stay in a safe area until given direction to load.
- Ensure that packs are free of items that could come loose in flight.
- Ensure tools are properly protected and bundled.

When loading passengers and equipment:

- Wait for approval from pilot to approach aircraft.
- Escort and maintain control of personnel to be transported while approaching aircraft.
- Make sure passengers are in a crouched position while approaching the aircraft.
- Make sure all passengers walk around obstacles, and not over.
- Have passengers place gear at skid of aircraft, load passengers then cargo.
- Assist personnel to assigned seats and help fasten seatbelts if needed.
- Have items removed that could impede egress from the aircraft during an emergency.
- Have no loose items, including handheld radios.
- All other cargo will need to be secured in the cargo compartment, or in cargo baskets.
- Perform a visual inspection to ensure aircraft and passengers are ready for flight.
- Notify pilot that passengers and cargo are ready for flight.

Important aspects of in-flight procedures:

- Keep clear of controls.
- Keep control of maps, gear, especially flying with the doors off.
- Be aware of emergency exits and crash positions for make and model.
- Sit in assigned seating position. No changing seats.

Important aspects of unloading procedures:

- Wait until directed to exit by the pilot or other authorized personnel.
- Only authorized personnel should open doors.
- When seatbelts are unfastened, check to see they are refastened after passengers have exited.
- Make sure that appropriate PPE is in place by all passengers.
- Maintain control of personal gear.
- See that passengers exit slowly and in a crouched position.
- Passengers should depart by route specified by authorized personnel to the designated staging area.
- See that personnel stay away from the tail and main rotors.
- Personnel need to stay out of the departure path.

D. Important Aspects of In-Flight Emergencies

During flight it is important that we are always prepared for an emergency.

- Pilot declares an emergency
- Notify base of emergency and location
- PPE use – Collars up, sleeves down, gloves on, eye protection in use (visor down on flight helmet and hardhat and chin strap used.
- All seatbelts snug
- Keep hands and feet clear of controls
- Secure loose gear
- Locate emergency exits
- Assume crash position
- Wait for all motion to stop before exiting unless, there is a post-crash fire. The safest environment during a crash is in the aircraft.
- If there is a fire, it is important to get away as soon as practical. Time may be required to help those in need. The fire extinguisher may buy added time to help others.

II. MANIFEST

Manifest requires the following information:

- Full name of each person being transported.
- Actual weight of each person including personal gear.
- Actual weight of any additional equipment.
- Destination of personnel
- Nature of mission
- 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.

III. DEBRIEFING

A post flight evaluation and mission debriefing also referred to as a, After Action Review (AAR) are often overlooked, yet are integral to safe aviation operations.

Debriefing and After Action Review (AAR)

- A debriefing/AAR should include a constructive dialogue that identifies what went well and areas needing improvement. The debriefing should include:
  - Post flight evaluation
  - What was planned?
  - What actually happened?
  - Why did it happen?
  - What can we do next time?

A post flight debriefing should include all personnel that were pertinent to the mission. An open dialogue with all parties will ensure that **all aspects** of the mission are evaluated.

Be aware that not everyone will evaluate a mission or flight with the same viewpoint. Each individual involved with a mission has a unique perspective. In many cases a flight may seem to go well from one person's perspective while another individual may have noticed an aspect of the mission that was unsafe.

Identifying areas needing improvement is important. Following up and **correcting** those areas needing improvement is more important.

Following the debriefing, it is important to review the aircraft flight use report with the pilot and verify services provided are correct.

The last item is to sign the document to provide final verification that flight services have been received.

Remember…

The pre-flight briefing sets the stage for a safe mission the debriefing ensures continued success.

Helicopter Crewmember, S-271

Unit 7 – Operational Safety

Lesson C – Cargo

OBJECTIVES:

Upon completion of this unit, students will be able to:

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.

I. HAZARDOUS MATERIALS

A. 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 Materials

Hazardous Materials can only be transported in accordance with the Interagency Aviation Transport of Hazardous Materials 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.

II. INTERNAL CARGO

A. Internal Cargo Transport Procedures

- Inspection of cargo
- Identifying hazardous materials
- Packaging, weighing, securing, and rigging
- Manifesting
- Obtaining 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 LOADS

A. 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 an 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.

B. Height Velocity Diagram

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?

- 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 Mission

Before 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. Do weights include: Remote hook, net, swivel, and line weight?
- Ensure total weight on manifest is less than HOGE-J 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 Loads

Preparing 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.
  - Daisy chain will require a swivel for each load attached.
- 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 Sites

1. 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 Process

   a. 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 Process

a. Back up from the tree or hazard

b. Bracket the tree or hazard with the stick or pencil

c. 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. Equipment

The following is an introduction to the basics of the equipment used. Your instructor will provide more detail during the field exercises.

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 an external load, <u>always.</u>

- Must have a rated capacity stamped on the swivel.

- The swivel action must be verified and inspected 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!

G. External Load Operations

1. 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 Procedures

- 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.

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.

- Procedures

  - 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. Keep hover to a minimum.

  - 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. Checks line for entanglement.

- 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.

Remember – Check and then double check!

If it’s wrong on the ground, it will only get worse in the air.

Helicopter Crewmember, S-271

Unit 7 – Operational Safety

Lesson D - Parking Tender and Miscellaneous Roles and Responsibilities

OBJECTIVES:

Upon completion of this unit, students will be able to:

1. Describe parking tender roles and responsibilities.

2. Describe the plan for medivac procedures.

I. PARKING TENDER

The parking tender provides safety and oversight for all operations occurring within the safety circle of the helicopter.

A. Personal Protective Equipment (PPE)

It is essential that you wear all personal protective equipment including a:

- Non-flammable high visibility vest

B. Roles and responsibilities

1. Obtain briefing from appropriate supervisor; obtain radio frequencies and other information necessary to perform the job.

2. Whenever the assigned helicopter's engine is running, or whenever it is approaching or departing the parking spot, supervise activities at the assigned landing pad, including personnel, ground vehicle, and helicopter movement. Keep unauthorized people out of safety circle.

3. Know and understand crash-rescue procedures; ensure that extinguishers are placed at the landing pad; be responsible for extinguisher operation in the event of the fire either on landing, takeoff, or refueling.

4. Ensure touchdown pad is properly prepared, numbered, and maintained.

5. Ensure there is adequate communication(s).

6. Provide wind advisories and other landing, takeoff, and holding directions to the pilot.

7. Communication with the pilot may be done either through hand signals or by way of radio communication.

8. Parking tender should be positioned outside the safety circle.

9. Be alert for potential conflicts between inbound and/or outbound aircraft.

10. Coordinate with loadmasters on the loading and unloading of personnel and cargo; ensure that loading personnel check personal seatbelts, cargo restraints, and helicopter doors prior to departing the area.

11. Monitor the fueling of helicopters.

12. Immediately report any problems.

C. Safety Precautions While Refueling

- A parking tender's job is to observe and maintain safety circle.
- Keep out other vehicles and people.
- Stage at fire extinguisher in the event of a fueling fire.
- Parking tender should also know the positions and operation of emergency shut-off valve on fuel truck.
- Fueling the helicopter is primarily the contractor's responsibility.
- Helicopter and fuel containers will be bonded.
- There will be no passengers aboard.
- No smoking or unauthorized personnel will be within 50 feet.
- Rotor and engines will be stopped except for when agency approval is given for re-fueling operations.

D. Emergency Procedures – Take-off and Landing Area

- Clear landing areas, including: personnel, other aircraft, and vehicles.

- Be familiar with the use and application of:

  – Crash Rescue Kit, NFES #1040. For entry and extrication.

  – Evacuation Kit, NFES #0650. Includes stokes combined package litter and 25-person first aid kit.

  – Fire extinguisher, 40 lb 20-B-C

Emergency Plan

- Activate Local Emergency Plan, it should include the following information:

  – How to contact specialized crash/fire rescue units.

  – Specialized medical facilities available such as burn and head injury treatment facilities.

  – Transportation methods available.

  – Bureau or agency notification procedures.

  – Refer to pre-accident plan for local specific actions.

Only respond to aircraft accident if properly trained and briefed on procedures.

II. MEDICAL EVACUATION

Medical evacuation plans can be found in the incident action plan (IAP) and/or project aviation safety plan.

It is a pre-determined plan that provides procedures and protocols for crash rescue, medivac and helicopter evacuation missions.

The plan should be posted on the helibase information board and reviewed with all personnel involved.

If crash rescue personnel are performing the evacuation, it is critical that the helibase aircraft base radio operator or other individual assigned be making the contacts identified in the Medical Unit Plan and/or in Form HJA-4, Crash Rescue/Medivac/Evacuation Plan. Note that for project operations, initial contact is usually made with the local dispatch office, which will implement the unit accident preparedness plan.

Helicopter pilots, crews, and helibase personnel should all be briefed on roles, responsibilities, and procedures.

Coordinate closely with the local dispatch or other responsible office both in preparedness planning and during the actual evacuation.

III. AVIATION MISHAP TYPES

A. Aircraft Accident

An aircraft accident is an occurrence associated with the operation of an aircraft, which takes place between the time any person boards the aircraft with the intention of flight and the time all such persons have disembarked, and in which any person suffers death or serious injury or in which the aircraft receives substantial damage. (350DM 1, FSM 5700)

1. Incident with Potential

- An incident that narrowly misses being an accident and which the circumstances indicate serious potential for damage or injury.

- Classification of incidents with potential are determined by Aviation Safety Managers. (350DM 1, FSM 5700)

2. Aircraft Incident

An occurrence, other than an accident, associated with the operation of an aircraft that effects, or could affect the safety of operations or the mission.
(350 DM 1)

3. Aviation Hazard

Any condition, act or set of circumstances that exposes an individual to unnecessary risk or harm during aviation operations. (350 DM 1)

- A policy or procedure deviation.
- Unsafe actions of pilots, mechanics, fuel handlers, support personnel, aviation user or manager.
- Deviation from planned flight operations.
- Failure to use required PPE, file a flight plan, use flight following procedures, or to conduct required load calculations or downloading.

4. Maintenance Deficiency

A maintenance deficiency report is any serious defect or failure causing mechanical difficulties encountered in aircraft operations and not specifically identified as an aircraft incident or aviation hazard.

5. Communicating Mishaps

SAFECOM

- A reporting form to communicate any condition, act, maintenance problem or circumstance which has potential to cause an aviation related mishap.
- Online searchable database of past events.

Take Home Message

- If you see something, say something.
- As a new Helicopter Crewmember you may be the one to prevent a serious accident.

Helicopter Crewmember, S-271

Unit 8 – Helispot Operations

OBJECTIVES:

Upon completion of this unit, students will be able to:

1. Describe the process for staffing and preparing a landing area or helispot.

2. Define the methods for constructing landing areas or helispots.

3. Describe the duties performed in managing a helispot.

I. TAKE-OFF AND LANDING AREAS

A. Heliport

Permanent facility built to FAA standards typically found at hospitals, city, and county facilities.

Heliport Components:

- Permanent pad
- Wind indicator
- Road access
- Parking area
- Communications
- Rest area (pilot and crew)

B. Permanent Helibase

Have the same the components of a heliport.

Permanent Helibase Components:

- Permanent pad
- Wind indicator
- Road access
- Parking area
- Communications
- Rest area (pilot and crew)

C. Temporary Helibase

Are established for a short duration.

Temporary Helibase Components:

- Communications
- Road access
- Parking areas
- Landing pads
- Wind indicator
- Rest area (pilot and crew)
- Staging area (passengers/cargo)

D. Helispot

Are natural or improved take-off and landing areas for temporary use.

Helispot Components:

- Communications
- Landing pads
- Wind indicator
- Fire extinguisher
- Crash rescue kit
- Staging area (passengers/cargo)

A helispot might not have:

- Road access

E. Unimproved Landing Area

Intended for one time use only and at the discretion of the pilot.

Unimproved landing areas are not intended for multiple uses.

If it is to be used on a recurring basis, necessary improvements should be made, and it should be referred to thereafter as a helispot.

The pilot is responsible for making the decision to utilize unimproved landing sites. The government representative on board may make a recommendation, but must defer to the pilot's judgment, even if the pilot's preferred site is at a distance from that desired.

Conversely, the government representative has the option to advise the pilot that he or she does not feel comfortable landing at a site selected. Examples of this type of landing area would be sites selected by the pilot for an emergency rescue, inspection of aircraft due to mechanical problems (chip light, rotor strike, etc.). The point being that no subsequent landings will occur again in this area.

Prior to landing for the first time at an unimproved site, the pilot shall make a high-level reconnaissance of the area to determine the location of any aerial hazards in the approach or departure path and to determine wind conditions, slope, ground stability, rotor clearances, ground hazards, and size of pad.

F. Take-off and Landing Area

This a specific area in which the helicopter actually lands and takes off, including the touchdown pad and safety circle.

G. Safety Circle

A safety circle is a zone that provides an obstruction-free area on all sides of the touchdown pad. For helispots and helibases, the only items that should be within the safety circle are a fire extinguisher, a pad marker, and if applicable, external or internal loads awaiting transport. The parking tender may also be within the safety circle.

The size of the safety circle will depend on the size of the helicopter. But as a rule of thumb, it should be at least one and one-half times the diameter of the rotor.

H. Touchdown Pad

This is the specific location where the skids or wheels will come to rest. Usually has a prepared or improved surface, on a heliport, airport, takeoff/landing area, apron/ramp, or movement area used for takeoff, landing or parking of helicopters.

I. Standard Landing Area Size

Type 3 (light helicopters):

- Safety circle should be at least 75 feet in diameter.
- Touchdown pad is 15 by 15 feet.

Type 2 (medium helicopters):

- Safety circle should be at least 90 feet in diameter.
- Touchdown pad is 20 by 20 feet.

Type 1 (heavy helicopters):

- Safety circle should be at least 110 feet in diameter.
- Touchdown pad is 30 by 30 feet.

II. HELISPOT CONSTRUCTION

A. Selecting a Helispot Site

Ideal: 2-way approach/departure path

- Ridge tops or exposed knobs
- HIGE
- Level pad
- No obstructions
- Requires minimum labor
- Close to work area or incident
- Natural dust abatement
- Proximity to safety zone
- Ensure LCES can be established

Always attempt to locate the area so that takeoffs and landings may be executed into the prevailing winds. Avoid if at all possible one way helispots. This becomes more important with higher elevations.

Ridge tops and exposed knobs offer the best locations, especially if they can be approached and departed from in all or several directions.

If possible, avoid locating the landing and takeoff area on a slope.

Area that will require minimum labor to bring to proper standards.

Area must be clear of people, vehicles, and obstructions such as trees, poles, and especially overhead wires. The area must be free of stumps, brush, posts, large rocks or anything over 18 inches high.

Address LCES prior to staffing existing or proposed helicopter landing areas.

B. Helispot Site Situations to Avoid

- Helispots that require that same approach and departure paths (one-way helispots) should be avoided whenever, possible.
- Freshly cut dozer lines (dust)
- Rocky touchdown pads (tank clearance, skid damage)
- Sites that are HOGE limited (height/velocity curve)
- Dusty locations which cause visibility problems; flying debris, dust and particles get ingested into the helicopter engines. Injuries to personnel can be caused by loose objects. Always provide for dust abatement before using these types of helispots.
- Aerial hazards (cannot be seen from air)
- Tall grass (lessens ground effect, conceals hazards)
- Tundra and boggy areas (dynamic rollover)
- Sloping touchdown pads (dynamic rollover)
- Lee side turbulence (downdrafts, wind shear)
- Trash and debris (foreign object damage)
- Pinnacles requiring high power-on landings (tailbooms become inaccessible for loading and unloading cargo)
- Nearby commercial flight patterns
- Nearby populated area

C. Approach and Departure Path

- 2-way approach/departure
- Width same as safety circle
- Obstruction free (300’ approach by 300’ departure)
- Into prevailing wind

This is a clear path selected for flight extending upward and outward from the touchdown pad and safety circle. Preferably, the approach and departure paths should not be the same. Several approach and departure paths should be developed. This allows pilots to adjust to changes in wind conditions.

The minimum width of approach and departure paths should be the same as the diameter of the corresponding safety circle.

Safety may be improved if the paths could be widened 20 degrees from the safety circle.

The paths may generally be aligned with the prevailing wind, but not always. Pilots will use such variables as velocity of the wind, turbulence, updrafts and downdrafts in deciding the direction of approach and departure.

The approach and departure path should not overfly structures, inhabited areas, personnel, and vehicle parking areas.

Routes for sling operations should never fly over these areas.

Curving paths are permissible in order to avoid major obstacles.

No obstacles should penetrate that slope during the 20 degree spread for:

- Approach Path – 150 feet (48 meters)
- Departure Path –300 feet (95 meters)

The minimum clearance for the approach and departure path should be equal to the safety circle diameter.

D. Helispot Construction

Hand construction methods are best since there is less ground disturbance than that created by mechanized construction.

Be aware of construction restraints, follow local policy and get permission first from a resource advisor.

Time to construct a helispot in timber will take time to establish. May want to take the extra time to find another location.

Remove all brush and trees with the following diameter safety circle around the touchdown pad according to the size of the helicopter.

- 75 feet for type 3 helicopters.
- 90 feet for type 2 helicopters.
- 110 feet for type 1 helicopters (such as UH-60, S-61N, and Boeing-Vertol 107).
- Sufficient approach and departure
- Minimized ground disturbance

Clear brush and trees below the level required for approach and departure.

- Cut trees or snags close to the ground, leaving stump heights of 0-3 inches. (It is recognized that this may not always be possible during initial construction; follow-up flush cutting will be necessary.)

If possible, and **only** if it can be performed safely, fell trees or other vegetation so that some cut trees and snags will be in a crisscrossed or natural appearing arrangement.

- Buck up and limb only what is necessary to achieve a safe operation in and around the touchdown pad and in the approach and departure paths.

  Excessive bucked up pieces are unnatural. They also increase the workload of camouflaging cut faces during helispot rehabilitation.

- If large rocks are moved, they should be removed and placed in an area where they appear to be natural.

- Dozer-constructed landing areas generally have soil that is too disturbed, requiring dust abatement procedures.

E. Helispot Hazards

- Wires, towers, fences, snags
- Construction incomplete, not level, or not cleared; ground cover not removed to a safe distance.
- Canyon bottoms or converging canyons
- Cirque basins
- Roads
- Tundra or boggy areas
- Dusty, loose soil conditions
- Crews congregating on the helispot.
- Litter, paper and plastic bags, boxes, sleeping bags or other light items
- Personnel working around landing area should brace themselves when larger helicopters are landing or taking off due to the velocity of the rotor downwash.

III. HELISPOT MANAGER DUTIES AND RESPONSIBILITIES

A. Helispot Equipment Needs

Required supplies at helispot:

- Wind Indicator
- 20 BC Fire Extinguisher (40 lbs.)
- Evacuation/crash rescue kit
- Pad marker
- Hanging scale

Recommended supplies for personnel staffing helispot:

- Allowable payloads (HIGE and HOGE) for all helicopters using helispot
- Passenger/cargo manifest book
- Fiber tape
- Flagging
- Pocket calculator
- Line gear
- Food and drinking water
- Passenger briefing cards
- Radio
- Incident action plan (IAP)

B. Personnel Assigned to a Helispot

Helispot management assignments will normally be given out at the morning briefing at the helibase.

- Ensure that daily missions to helispot are understood.

- Flight helmets must be worn when flying to staff a helispot. When a helispot manager is on the helispot, it is then considered managed.

  Passengers flying from a managed helispot or helibase to another managed helispot or helibase may wear a hard hat with a chin strap in lieu of a flight helmet.

- The helispot should not be made operational until the helispot manager informs the helibase that they are ready to receive personnel and/or cargo.

C. Helispot Management

Helispot management is essential for safe and efficient operations.

- Obtain briefing from Helibase Manager.

- Minimum of two persons assigned.

- Should be familiar with all helicopters at helibase.

- As the helispot operation becomes more complex, additional people may be needed to provide support.

- Ensure that qualified helicopter crew members are assigned to assist in helispot management.

- Provide on-the-job training as necessary.

- Conduct regular briefings with helispot crew.

- Ensure all assigned personnel understand their responsibilities and authority.
- Manage resources/supplies dispatched to the helispot.
- Ensure that all helispot personnel are capable and prepared to perform fire suppression duties in and around the helispot.
- Ensure that helispot crew is equipped to remain overnight, even in adverse weather conditions.
- Establish radio communications with the helibase.
- Ensure the helispot and landing pad is constructed and prepared properly.
- Install wind indicators and sign the area perimeter as necessary.
- Perform any necessary aerial and ground hazard reduction and safety improvements.
- Anticipate dust abatement needs and provide or request as necessary.
- Ensure crash-rescue equipment is available.
- Ensure that flight routes and aerial hazards are made known to all pilots.
- Ensure manifests and briefings are timely and accurate.
- Return external load equipment (nets, leadlines, swivels) and excess firefighting equipment to the helibase promptly.

- Inform Helibase Manager of helispot activities.

- If returned to the helibase, attend the nightly debriefing and provide feedback on the day's operations; otherwise, provide by radio.

- Helispot crews should be continuously cleaning the helispots of garbage and loose debris.

D. Apply Risk Management

- Before any helispot staffing/development can occur, refer to the IRPG and apply the Risk Management Process.

- Do not rely on helicopters to be your escape route to a safety zone.

- Follow the process to determine if the helispot can be developed and function safely.

- Anytime the situation changes, contact the helibase manager to inform of situation change.

- Wait for further instructions to cease or continue helispot operations.

Helicopter Crewmember, S-271

Unit 9 – Demobilization

OBJECTIVE:

Upon completion of this unit, students will be able to:

Describe the demobilization process for the HECM.

DEMOBILIZATION PROCESS

Preparation for demobilization begins with mobilization. Each individual (single resource) or Chief of Party (exclusive use) mobilized to an incident has responsibilities in the demobilization process.

If you are a member of an exclusive use helicopter the helicopter manager will usually take care of the demobilization for the crew.

If you are a single resource on a CWN helicopter you will need to go through the demobilization process before getting released from an incident.

The following checklist identifies some of the key responsibilities:

- Verify demobilization schedule with supervisor.
- Ensure that your sleeping area is clean and free of debris and trash.
- Clean and ready gear for another assignment and travel.
- File required forms and report to the documentation unit.
- Make sure travel time to your final destination is posted on your Emergency Firefighter Time Report, OF-288.
- Verify that your time on your timesheet is correct before signing. By signing you are stating that your time is correct.
- Submit timesheet to the Finance/Administration Section. Be sure to get your copy to give to your home unit for processing.
- Return incident issued communications equipment to the communications unit.
- Return incident issued work materials to the supply unit.
- Follow check-out procedures, you may be asked to use Demobilization Checkout Form, ICS-221.

- Ensure you receive a performance evaluation from your incident supervisor. Keep a copy for your records.

  For a HECM this may be a:

  – Helitack Crew Performance HBM-12

  – Helibase Personnel Performance Rating HBM-13

  – Individual Performance Rating ICS-226

- Closeout with the Incident Training Specialist TNSP if you worked on a task book.

- Report to departure points ahead of schedule.

- Stay with your group until you arrive at your final destination.

- Get feedback on overhead performance suggestions for improvement.

Once you have completed the demobilization process double check to make sure you haven't left any of the ICS-221 form incomplete.

Don't leave without copies of your firefighter time report and your performance evaluation.