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Standard Guide for Helicopter Inland Search and Rescue (SAR) Crew Chief¹

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1. Scope

1.1 This guide establishes the minimum training standard for a Helicopter Inland Search and Rescue (SAR) Crew Chief (hereafter known as Helicopter SAR Crew Chief) with focus on the general and crew chief specific knowledge, skills, and abilities needed to function as a member of the helicopter crew in support of an inland search and rescue operation.

1.2 This guide is focused on inland, non-oceanic areas of operation, including flood and swiftwater rescue operations.

1.3 This guide is focused on persons functioning as a Helicopter SAR Crew Chief with helicopters only; no fixed-winged operations are included.

1.4 The training discussed in this guide will supplement and enhance the Helicopter SAR Crew Chief's existing training, knowledge, skills, and abilities.

1.5 *This standard does not purport to address all of the safety concerns, if any, associated with its use. It is the responsibility of the user of this standard to establish appropriate safety, health, and environmental practices and determine the applicability of regulatory limitations prior to use.*

1.6 *This international standard was developed in accordance with internationally recognized principles on standardization established in the Decision on Principles for the Development of International Standards, Guides and Recommendations issued by the World Trade Organization Technical Barriers to Trade (TBT) Committee.*

2. Referenced Documents

2.1 ASTM Standards:²

F1591 Practice for Visual Signals Between Persons on the Ground and in Aircraft During Ground Emergencies

¹ This guide is under the jurisdiction of ASTM Committee F32 on Search and Rescue and is the direct responsibility of Subcommittee F32.03 on Personnel, Training and Education.

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² For referenced ASTM standards, visit the ASTM website, www.astm.org, or contact ASTM Customer Service at service@astm.org. For *Annual Book of ASTM Standards* volume information, refer to the standard's Document Summary page on the ASTM website.

F1633 Guide for Techniques in Land Search (Withdrawn 2017)³

F1739 Guide for Performance of a Water Rescuer—Level I
F1846 Practice for Symbols and Markings for Use With Land Search Maps

F2209 Guide for Training of Land Search Team Member

3. Terminology

3.1 Acronyms:

3.1.1 AGL—Above Ground Level

3.1.2 AHJ—Authority Having Jurisdiction

3.1.3 ANVIS—Aviator's Night Vision Imaging System

3.1.4 ASTM—American Society for Testing and Materials

3.1.5 CRM—Crew Resource Management

3.1.6 FLIR—Forward Looking Infra-Red

3.1.7 HEC—Human External Cargo

3.1.8 HEED—Helicopter Emergency Egress Device

3.1.9 HELP—Heat Escape Lessening Posture

3.1.10 HS—HeliSpot

3.1.11 HUET—Helicopter Underwater Egress

3.1.12 LZ—Landing Zone

3.1.13 PCDS—Personnel Carrying Device System

3.1.14 PFD—Personal Flotation Device

3.1.15 PPE—Personal Protective Equipment

3.1.16 SAR—Search and Rescue

3.2 Definitions of Terms Specific to This Standard:

3.2.1 *altitude, n*—the height expressed in units of distance above a reference plane, usually above mean sea level or above ground level.

3.2.2 *authority having jurisdiction (AHJ), n*—an organization, office, or individual responsible for enforcing the requirements of a code or standard, or for approving equipment, materials, and installation or procedure.

³ The last approved version of this historical standard is referenced on www.astm.org.

3.2.3 *crewmember, n*—an individual assigned a duty during flight other than the pilot, engineer, and flight navigator.⁴

3.2.4 *crew resource management (CRM), n*—a method for addressing the challenge of optimizing the human/machine interface and accompanying interpersonal activities to include activities which may include team building, information sharing, problem solving, decision making, and maintaining situational awareness. CRM is the use of all available resources, information, equipment, and people to achieve safe and efficient flight operations.⁵

3.2.5 *emergency, n*—(a) *life-threatening*—a situation or occurrence of a serious nature, developing suddenly and unexpectedly and demanding immediate action to prevent loss of life. (b) *operational*—an unforeseen combination of circumstances that calls for immediate action, but not life-threatening.

3.2.6 *external load, n*—a load that is carried, or extends, outside of the aircraft fuselage.⁴

3.2.7 *external-load attaching means, n*—the structural components used to attach an external load to an aircraft, including external-load containers, the backup structure at the attachment points, and any quick-release device used to jettison the external load.⁴

3.2.8 *flightcrew member, n*—a pilot, flight engineer, or flight navigator assigned to duty in an aircraft during flight time.⁶

3.2.9 *ground visibility, n*—prevailing horizontal visibility near the earth’s surface as reported by the United States National Weather Service or an accredited observer.⁴

3.2.10 *helicopter, n*—a rotorcraft that, for its horizontal motion, depends principally on its engine-driven rotors.⁴

3.2.11 *helicopter SAR crew chief, n*—an individual responsible for all operations and equipment starting from behind the flight deck within the helicopter and under the supervision of the pilot or co-pilot.

3.2.12 *helicopter SAR technician, n*—a member of the flight crew that conducts tasks as planned and assigned by the Helicopter SAR Crew Chief.

3.2.13 *HELP position, n*—heat escape lessening posture is a single person water rescue technique for heat conservation when immersed in cold water. This technique conserves heat by using personal flotation devices, clothing, and body posture to limit exposure of the body’s major heat loss areas to the cold water.

3.2.14 *marshal, helicopter, n*—a person on the ground responsible for communicating with and guiding the helicopter to a landing zone or HeliSpot.

3.2.15 *personal flotation device (PFD), n*—a buoyant device suitable for use by one person in water emergencies. These devices may be vests, ring buoys, life preservers, cushions, and other special purpose buoyant devices.

3.2.16 *rescue basket, also litter or stretcher, n*—a secured and protected conveyance for the sick or injured that is capable of lifting individuals from the ground in a safe and secure manner.

3.2.17 *rescue hoist, n*—a mechanical winching device mounted to the helicopter that is capable of lowering/raising personnel attached to a cable.⁷

3.2.18 *rescue strop, n*—an item of equipment that is fitted around the patient, under the arms and across the back and secured in front of the chest to secure the patient to a rescue line or helicopter hoist cable.

3.2.19 *short haul, n*—to transport one or more persons suspended on a fixed line beneath a helicopter. The intent is to transport persons a short distance (short-haul), normally from a limited or inaccessible location to a safe landing area.⁷

3.2.20 *trail line/tag line, n*—cord or line manipulated from the ground used to control and guide rescue equipment to the helicopter during hoisting operations.

4. Significance and Use

4.1 This guide establishes the minimum standard for training a Helicopter SAR Crew Chief with focus on the general knowledge and skills needed to function within a helicopter in support of an inland search and rescue operation. A person trained to this guide is a Helicopter SAR Crew Chief.

4.1.1 Every person who is identified as a Helicopter SAR Crew Chief shall have met the requirements of this guide.

4.1.2 This guide is to be used by individuals and authorities having jurisdiction (AHJ) that wish to identify the minimum training standards for a Helicopter SAR Crew Chief.

4.1.3 This guide is only the first level of training for a Helicopter SAR Crew Chief and as such, only establishes the minimum knowledge and skills required for a person to perform during helicopter operations.

4.1.4 This guide by itself is not a training document. It is only an outline of the topics required for training or evaluating a Helicopter SAR Crew Chief, but it can be used to develop a training document or program.

4.1.5 This guide does not stand alone and must be used with the referenced documents to provide the specific information needed by a Helicopter SAR Crew Chief.

4.1.6 Though this guide establishes the minimum standards, it does not imply that a Helicopter SAR Crew Chief is “in training,” “on probation,” or in any other similar AHJ member status. It is up to the AHJ to determine the requirements and qualifications for member ratings.

4.1.7 A Helicopter SAR Crew Chief shall be trained in the normal operational response areas. Examples include but are not limited to the following regions: mountainous, desert, wilderness and over inland bodies of water.

4.1.8 The knowledge, skills, and abilities presented in the following sections are not presented in any particular order and do not represent any specific training sequence.

4.1.9 A Helicopter SAR Crew Chief shall meet the minimum SAR requirements for their environments while working

⁴ Aviation Training Glossary, <https://www.iat.gov/Training/pages/online.asp>; 14CFR1.1: FAA Definitions.

⁵ Federal Aviation Administration, <https://www.faa.gov>; Section II.8.5 Crew Resource Management.

⁶ Federal Aviation Administration, DOT, 14CFR1.1 – Definitions and Abbreviations.

⁷ Emergency Helicopter Extraction Source List – 2012, [http://www.fs.fed.us/fire/aviation/av_library/Revision%205-EHE%20Source%20List%20\(01-12\).pdf](http://www.fs.fed.us/fire/aviation/av_library/Revision%205-EHE%20Source%20List%20(01-12).pdf).

as a crewmember with a helicopter and shall be able to interface with ground SAR resources.

4.1.9.1 In order to operate safely around or in a given sub-environment within this area of specialization (Helicopter SAR Crew Chief), the AHJ shall consider the applicability of requiring additional knowledge, skills, and abilities specific to a specific problem, hazard, technical challenge or environment.

4.1.10 Not all aircraft are capable of rappelling, short haul, and/or hoist operations. It is important to know an aircraft's capabilities as applicable and per AHJ requirements.

5. General Knowledge, Skills, and Abilities

5.1 A Helicopter SAR Crew Chief shall be able to explain:

5.1.1 The organization's operational structure.

5.1.2 The overview and philosophy of a helicopter SAR mission.

5.1.3 The general tactics related to aerial search and rescue operations.

5.1.4 The environmental knowledge commensurate with the operating area.

5.1.5 The regulations, policies, procedures, and guidelines relevant to Helicopter Crew Chief training.

5.2 The Helicopter SAR Crew Chief shall have the ability to deploy and retrieve the Helicopter SAR Technician by helicopter based on type of aircraft used, equipment and agency policies, procedures, and guidelines. These tactics may include external load operations.

5.2.1 Demonstrates proper use of hand signals (see X1.7 for example).

5.2.2 Demonstrates appropriate movements in aircraft cabin while in flight.

5.3 A Helicopter SAR Crew Chief shall explain the purpose of and demonstrate the function of the following rescue equipment:

5.3.1 Helicopter SAR Crew Chief Harness (personnel carrying device system (PCDS)).

5.3.2 Subject rescue adjuncts (subject harnesses, strops, litters, baskets).

5.3.3 Tether straps (travel restraint).

5.3.4 Carabiners, snap hooks, and other applicable hardware.

5.3.5 Operation of doors, seat belts, and hatches.

5.3.6 Direct and/or assist the Helicopter SAR Technician with inspection of all applicable search and rescue helicopter equipment.

5.3.7 Explain the use of vision enhancing equipment including but not limited to Electro Optical, Forward Looking Infra-Red (FLIR) and Aviator's Night Vision Imaging System (ANVIS).

5.4 The Helicopter SAR Crew Chief shall explain the need for and demonstrate the inspection and use of PPE for flight operations to include at a minimum:

5.4.1 Fire resistant clothing (flight suit).

5.4.2 Fire resistant gloves.

5.4.3 Fire resistant boots.

5.4.4 Active/passive hearing protection.

5.4.5 Approved helicopter flight helmet.

5.4.6 Personal equipment (survival). See X1.8 for a list of suggested survival equipment for individuals.

5.4.7 Clothing appropriate for anticipated weather conditions.

5.5 A Helicopter SAR Crew Chief shall demonstrate the ability to coordinate a mission with the flight crew based on the specific incident and the related needs, including:

5.5.1 Participate in developing a plan for accomplishing the mission in the most efficient and safe manner.

5.5.2 Configure aircraft to mission needs.

5.5.3 Secure and brief passengers.

5.5.4 Provide a mission briefing.

5.5.5 Identify and mitigate flight and mission hazards.

5.5.6 Explain fuel consumption as it relates to aircraft endurance and limits for safe landing.

5.5.7 Develop and implement in flight emergency procedures, as necessary.

5.6 A Helicopter SAR Crew Chief shall prepare cargo load and explain and/or demonstrate:

5.6.1 Emergency procedures.

5.6.2 Special mission requirements.

5.6.3 Performance of aircraft load calculations.

5.6.4 Center of gravity (cg) limitations.

5.6.5 Gross weight limitations.

5.6.6 Hazardous material considerations.

5.7 The Helicopter SAR Crew Chief shall be able to explain and demonstrate external load operational tactics and equipment (if so equipped), including:

5.7.1 Use of aircraft anchor points.

5.7.2 Setup and management of rappel lines.

5.7.3 Importance of having connectors that are compatible with one another and with aircraft fixtures.

5.7.4 Uses of a rescue hoist.

5.7.5 Appropriate maintenance procedures and safety checks for rescue hoist, hoist cable, and hoist hook.

5.7.6 Ability to communicate with the pilot during external load operations.

5.7.7 Emergency procedures during external load operations.

5.7.8 Ability to facilitate passenger (non crewmember) management inside the aircraft cabin during external load operations as well as during other types of retrieval.

5.7.9 Trail line/tag line procedures.

5.7.10 How various environmental factors can influence external load operations (examples: wind direction and speed, altitude, and air temperature).

5.8 A Helicopter SAR Crew Chief shall be able to explain the general concepts related to risk assessment and management of a helicopter operation, including:

5.8.1 The general concepts of CRM.

5.8.2 The general concepts of flight physiology.

5.8.3 The general concepts of aerospace physiology, including physiological effects on the human body and the normal area of operations.

5.8.4 The general concepts related to high altitude operations and physiology.

5.8.5 The concepts related to fatigue management.

- 5.8.6 The general concepts related to night adaptation.
- 5.8.7 The general concepts related to spatial disorientation.
- 5.8.8 The general concepts related to aircraft performance during extreme hot/cold temperatures.
- 5.8.9 The general concepts of how weather impacts a helicopter operation such as storms, fog, rain, clouds, and wind.
- 5.8.10 The general knowledge, skills, and abilities necessary to survive in the operational environment before, during or after an event that requires an individual to perform survival skills to preserve personal life and limb.
- 5.9 A Helicopter SAR Crew Chief shall be able to explain and demonstrate the following subject management procedures and skills:
 - 5.9.1 Direct a ground rescue crew to a subject's location.
 - 5.9.2 Prioritize subjects in the event of a multi-casualty event.
 - 5.9.3 Proper subject extraction.
 - 5.9.4 Single/multiple subject recovery into cabin area during operations.
 - 5.9.5 Proper securing of subject inside aircraft during transport.
 - 5.9.6 Facilitate subject management during external load operations as well as during other types of retrieval.
 - 5.9.7 Proper subject management in extraction procedures including subject's located on cliffs, on slopes or in trees.
 - 5.9.8 Use of a trail line/tag line.
 - 5.10 The Helicopter SAR Crew Chief shall explain the general concepts related to communications, including:
 - 5.10.1 Radio procedures, protocols, and systems.
 - 5.10.2 Operate the radio equipment.
 - 5.10.3 Relay position coordinates by radio using the appropriate datum/format.
 - 5.10.4 Receive position coordinates by radio.
 - 5.10.5 Plot coordinates and assisting pilot in navigating and locating destination.
 - 5.10.6 Ensure assigned aircraft and personal radios are functional prior to commencing daily operations.
 - 5.10.7 Check/change batteries.
 - 5.10.8 Perform radio check with personnel or aircraft.
 - 5.11 A Helicopter SAR Crew Chief shall be able to construct and prepare landing areas, Landing Zone (LZ) or HeliSpot (HS):

- 5.11.1 Determine predominant wind direction and provide indicator (for example, wind sock, flagging tape).
- 5.11.2 Demonstrate how to set up clear approach and departure paths.
- 5.11.3 Identify and advise pilot of any hazard on the ground or in the air (for example, wires, towers, fences).
- 5.11.4 Determine if the terrain is sloping and whether or not the angle is within acceptable limits. Advise accordingly.
- 5.11.5 Explain the inherent risks associated with a LZ situated in snow.
- 5.12 A Helicopter SAR Crew Chief shall be able to act as a Helicopter Marshal in a LZ or HS and demonstrate and/or explain the following:
 - 5.12.1 Use appropriate hand signals.
 - 5.12.2 Wear appropriate PPE (goggles, hearing protection, and high visibility vest).
 - 5.12.3 Ensure and maintain visual reference with pilot.
 - 5.12.4 Check for obstacles and obstructions before signaling pilot to take off or land.
 - 5.12.5 Ability to vector (guide) aircraft to SAR location at night or in low visibility conditions.
 - 5.12.6 Ability to establish crash rescue procedures.
- 5.13 The Helicopter SAR Crew Chief shall have the following inland over water knowledge, skills, and abilities:
 - 5.13.1 If tasked with conducting over water rescue operations, a Helicopter SAR Crew Chief shall have water rescue training (refer to Guide **F1739**) in addition to other specialized water training.
 - 5.13.2 Be trained in Helicopter Underwater Egress (HUET).
 - 5.13.3 Demonstrate the use of a PFD.
 - 5.13.4 Have training in the use of Helicopter Emergency Egress Device (HEED) breathing systems.
 - 5.13.5 Show the location and explain the use of crew survival equipment.
- 5.14 A Helicopter SAR Crew Chief shall be familiar with general search and rescue training topics (refer to Guides **F1633** and **F2209**).

6. Keywords

- 6.1 crew chief; helicopter; inland; personnel; rescue; SAR; search; training