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Standard Guide for Helicopter Inland Search and Rescue (SAR) Technician¹

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1. Scope

1.1 This guide establishes the minimum training standard for a helicopter inland search and rescue technician (hereafter known as Helicopter SAR Technician) with focus on the general, field, and search and rescue specific knowledge, skills, and abilities needed to function as a member of the crew with a helicopter 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 crewmember with helicopters only; no fixed-winged operations are included.

1.4 General, field, and search and rescue specific knowledge and skills related to inland search and rescue are found in the following referenced ASTM documents: **F1591**, **F1633**, **F1739**, **F1846**, **F2209**, **F2685**, and **F2751**. The training identified in this guide supplements and enhances the search and rescue technician's existing training, knowledge, and skills.

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

¹ This test method 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.

- [F1591 Practice for Visual Signals Between Persons on the Ground and in Aircraft During Ground Emergencies](#)
- [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](#)
- [F2685 Guide for Training of a Land Search Team Leader \(STL\)](#)
- [F2751 Guide for Training of a Land Search and Rescue 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 *CRM*—Crew Resource Management
- 3.1.5 *FLIR*—Forward Looking Infra-Red
- 3.1.6 *HEED*—Helicopter Emergency Egress Device
- 3.1.7 *HELP*—Heat Escape Lessening Posture
- 3.1.8 *HS*—HeliSpot
- 3.1.9 *HUET*—Helicopter Underwater Egress
- 3.1.10 *LZ*—Landing Zone
- 3.1.11 *PCDS*—Personnel Carrying Device System
- 3.1.12 *PFD*—Personal Flotation Device
- 3.1.13 *PPE*—Personal Protective Equipment
- 3.1.14 *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 in a helicopter during flight time.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 *flightcrew member, n*—means a pilot, flight engineer, or flight navigator assigned to duty in an aircraft during flight time.⁶

3.2.8 *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

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

3.2.10 *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.

3.2.11 *helicopter SAR technician, n*—a member of the flight crew that conducts tasks as planned and assigned by the helicopter SAR crew chief.

3.2.12 *HELP position, n*—heat escape lessening posture (HELP) is a single subject 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.

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

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

3.2.15 *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.

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.

3.2.16 *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 Technician, who is a crewmember with focus on the general, field, and search and rescue specific knowledge, skills, and abilities needed to function within a helicopter in support of an inland search and rescue operation. A person trained to this guide shall be recognized as a Helicopter SAR Technician crewmember.

4.2 Every person who is identified as a Helicopter SAR Technician shall meet the requirements of this guide.

4.3 This guide is to be used by individuals and authorities having jurisdiction (AHJs) that wish to identify the minimum training standards for Helicopter SAR Technician.

4.4 This guide is the first level of training for Helicopter SAR Technician and as such, only establishes the minimum knowledge and skills required to perform during helicopter operations.

4.5 This guide by itself is not a training document. It is an outline of the topics required for training or evaluating a Helicopter SAR Technician, and it can be used to develop a training document or program.

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

4.7 Though this guide establishes the minimum standards, it does not imply that a Helicopter SAR Technician 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.

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

4.9 A Helicopter SAR Technician shall meet the ASTM standards for the environments for which the technician will be working and shall be able to interface with ground SAR resources.

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

5. General Knowledge, Skills, and Abilities

5.1 The Helicopter SAR Technician 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 with regard to helicopter technician training.

5.2 The Helicopter SAR Technician shall have the ability to be deployed and retrieved 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 Technician shall explain the purpose of and demonstrate the function of the following rescue equipment:

5.3.1 Helicopter SAR Technician 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 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 Technician shall explain the need for and demonstrate the use of Personal Protective Equipment (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 Technician 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 Assist flight crew with aircraft configuration.

5.5.3 Identify and mitigate flight and mission hazards.

5.5.4 Explain fuel consumption with regards to aircraft endurance and limits for safe landing.

5.6 A Helicopter SAR Technician shall assist crew chief/pilot in preparing cargo load and have knowledge of:

5.6.1 Emergency procedures.

5.6.2 Special mission requirements.

5.6.3 Hazardous materials.

5.7 A Helicopter SAR Technician shall participate in and explain the purpose of the initial operational briefing and demonstrate the ability to provide a safety briefing for passengers.

5.8 A Helicopter SAR Technician shall understand 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 at the awareness level, including physiological effects on the human body, and the normal area of operation.

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 Technician shall be able to demonstrate the following subject management procedures and skills:

5.9.1 Direct a ground rescue crew to the 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 A Helicopter SAR Technician shall be able to explain and demonstrate 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 assist 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 on deck.

5.11 A Helicopter SAR Technician 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 Technician 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 Assist with crash rescue procedures.

5.13 A Helicopter SAR Technician shall have the following inland over water operations knowledge, skills, and abilities:

5.13.1 If tasked with conducting over water rescue operations the Helicopter SAR Technician 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 demonstrate the use of crew survival equipment.

5.14 A Helicopter SAR Technician shall be able to demonstrate general SAR training topics (refer to Guides **F1633** and **F2209**), including:

5.14.1 Properly inspect/use all applicable rescue and field equipment.

5.14.2 Assist in search for subject on land during day and night operations.

6. Keywords

6.1 helicopter; inland; personnel; rescue; SAR; search; technician; training

APPENDIX

(Nonmandatory Information)

X1. OPERATIONAL SUGGESTIONS AND CONSIDERATIONS—PERSONAL PROTECTIVE EQUIPMENT

X1.1 Personal Gear Suggestions

X1.1.1 Fire Resistant/Nomex Clothing (long-sleeved shirt and pants, or flight suit) should provide the wearer with maximum protection from flash burns. The ensemble should fit loosely to provide trapped airspace that acts as insulation to provide protection. The proper size ensemble covers the maximum area of skin. This includes sleeves long enough to reach the first knuckle on the thumb before securing snugly over the flight gloves at the wrist. The pant legs should be long enough to completely cover the boot tops while in a seated position. The slide fastener front closure should provide coverage high on the neck.

X1.1.2 Fire resistant and/or Leather Gloves.

X1.1.3 Fire-resistant Boots.

X1.1.4 Hearing Protection (refer to **X1.3**).

X1.1.5 Approved Helicopter Flight Helmet (refer to **X1.2**).

X1.1.6 Survival Equipment as applicable (PFD, Life Rafts).

X1.2 Helicopter Flight Helmets

X1.2.1 The approved helicopter flight helmet, consists of a one-piece hard shell made of polycarbonate, Kevlar, carbon fiber or fiberglass, should cover the top, sides (including the temple area and to below the ears) and the rear of the head. The

helmet should be equipped with a chin strap and should be appropriately adjusted for proper fit; helmets should be individually fitted for maximum protection.

X1.3 Hearing Protection

X1.3.1 Hearing protection is required when inside or around operating helicopters. The helicopter flight helmet provides the requisite protection, the addition of earplugs for frequent users of helicopters is recommended.

X1.4 Eye Protection

X1.4.1 Goggles, or other approved safety eyewear, should be worn while performing ground duties around operating helicopters. A helicopter flight helmet with visor down may be utilized in lieu of goggles.

X1.5 Material

X1.5.1 The approved material for flight suits, gloves, and recommended for outer garments, garments worn under the flight suit, and undergarments is generically known as “fire resistant clothing.” The actual material may be fire resistant clothing, polyamide, aramide, polybenzimidazole, Kevlar, or blends thereof.⁷ **Fig. X1.1**

⁷ *Interagency Helicopter Operations Guide (IHOG)*, NFES 1885, June 2009.