

United States
Department of the Interior

ALSE
Aviation Life Support Equipment
(351 DM 1)



FOREWORD

This Departmental Manual Handbook establishes standards for approval and use of aviation life support equipment when conducting Department of the Interior (DOI) aviation activities.

Questions regarding the content or guidance referenced in this Handbook may be directed to the Aviation Safety Office, Office of Aircraft Services (OAS), P.O. Box 15428, Boise, ID 83715-5428. The Handbook is available on the OAS web site at: www.oas.gov.

Director, OAS

Date: June 1, 1998

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Chapter 1 General Information

1.1

1.1 Purpose. This Handbook outlines policies, procedures, and responsibilities for using aviation life support equipment (ALSE) during Department of the Interior (DOI) aviation activities. It is designed to supplement the Departmental Manual, providing detailed information as well as specific requirements.

1.2 Policy.

A. DOI Policy. It is Interior policy to provide employees with a safe and healthful work environment free from recognized safety and health hazards.

B. Responsibilities. Bureaus are responsible for implementing their Personal Protective Equipment (PPE) Program. Supervisors are responsible for evaluating aviation activities and providing employees with appropriate ALSE equipment. Supervisors are also required to provide employee training on the proper use of ALSE equipment. When minimum requirements are listed, bureaus and individuals are encouraged to supplement these requirements to meet the needs of the mission and environment.

1.3 Scope. ALSE covers a broad spectrum of equipment and procedures for protecting aircrews, passengers, and support personnel engaged in aviation activities, including mishap or survival situations. While the emphasis is on special use activities, other mission-specific equipment such as fire extinguishers, first aid kits, restraint systems, and overwater equipment are also included.

Note: ALSE listed in this Handbook may require fitting, periodic inspections, testing, and scheduled replacement. Users must ensure the equipment is maintained in serviceable condition and in accordance with the manufacturer's guidance.

1.4 Exceptions and Waivers.

A. Exceptions.

1. Fire resistant clothing, gloves, and leather boots are not required for overwater flights beyond gliding distance to shore, or for offshore vessel and platform landings.
2. Fire resistant clothing is not required for aerial agricultural and chemical application operations.
3. Wildland firefighters assigned to wildland fire incidents may wear approved hardhats in lieu of flight helmets. Hardhats must be worn with the chinstrap properly fastened.
4. Personal protective equipment (PPE) is not required for precision reconnaissance (including fire recon) flights conducted above 500' AGL.
5. Flight helmets are not required in multiengine fixed wing airplanes.

Note: These exceptions do not authorize the wearing of outerwear or undergarments made of materials with low temperature melting characteristics, such as synthetics (nylon, dacron, polyester, and so on) and synthetic blends, as provided by paragraphs 2.2C and D of this Handbook.

B. Waivers. If the bureau identifies an ALSE requirement that presents a concern affecting employee safety or security, then bureau directors have discretionary authorization to grant a waiver. This authority may be exercised by the bureau director or by written delegation at a lower authority. Exercising this authority requires

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that the Director-OAS be provided a copy of the waiver and any written delegation.

- C. Other. All other waivers must be approved by the Director-OAS in accordance with 350 DM 1.9.

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Chapter 2 Personal Protective Equipment (PPE)

2.1

2.1 General. Personal protective equipment (PPE) includes head protection, flash fire protection, and the Occupational Safety and Health Administration (OSHA) requirements for hearing conservation and eye protection. Flight crews and passengers engaged in special use activities are required to wear the following ALSE unless exempted by paragraph 1.4A:

- A. Fire resistant clothing.
- B. All-leather, or leather and Nomex gloves.
- C. Leather boots.
- D. Flight helmets.

Note: Extreme environmental work conditions may dictate that a waiver be obtained, as provided by paragraph 1.4B, to negate or substitute an ALSE requirement.

2.2 Fire Resistant Clothing. Fire resistant clothing protects the wearer from flash fire burns. The preferred material is commonly known as "Nomex." The actual material may be Nomex, polyamide, aramide, polybenzimidazole, Kevlar, or blends thereof. These materials, while not fireproof, will char rather than burn at about 700 to 800 degrees Fahrenheit. Cotton materials, chemically altered and marketed as fire resistant, are acceptable. Materials treated with fire resistant chemicals which launder out and materials with low temperature melting characteristics, such as synthetics (nylon, dacron, polyester, and so on) and synthetic blends, are not approved.

Nomex shirts and trousers used by wildland firefighters are approved for DOI aviation operations. Shirt sleeves should be long enough to overlap the glove with the cuffs fastened. The shirttail should be tucked into the trouser and the trouser should cover the boot tops.

Note: Clothing must be kept clean of fuels, grease, oils, and other combustible materials. Combustibles embedded in fabric will decrease the garment's fire protection. Nomex material may be dry cleaned or laundered and tumble dried at temperatures up to 180 degrees Fahrenheit without shrinkage or damage.

Caution: Do not use starch. A garment's fire protection is reduced when starched.

A. Flight Suits. For optimum protection, Nomex coveralls should fit loosely, providing trapped air for insulation. Sleeves should be long enough to reach the first knuckle on the thumb before securing snugly over the flight gloves at the wrist. Pant legs should reach the floor while standing and secure snugly over the leather boots at the ankle while seated. Fabrics are available in 4.5- and 6.0-ounce material.

B. Flight Gloves. Gloves (Type GS/FRP-2) constructed of a soft leather palm and stretchable Nomex fabric for the back is preferred. The glove has a long cuff extending several inches above the wrist providing total coverage when the flight suit sleeve is properly worn. The gloves should fit snugly to provide maximum finger dexterity for the wearer. All-leather gloves (without the synthetic liners) are acceptable if they provide the wearer with wrist coverage and finger dexterity.

C. Outerwear Garments. Garments worn over the Nomex flight suit, such as coats, bib pants, and coveralls, should also be made of Nomex. Outerwear garments made from natural fibers, such as leather, cotton, wool, or wool/cotton blends, as well as from fire resistant cotton and cotton blends, are acceptable substitutes. Materials with low temperature melting characteristics, such as synthetics (nylon, Dacron, polyester, and so on) and synthetic blends, are not approved.

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Note: When adequate clothing for hypothermia protection is not feasible, additional survival equipment should be considered.

Chapter 2 Personal Protective Equipment

2.2D

D. Undergarments. Underwear, socks, and clothing worn under the flight suit and next to the skin will provide the best protection if made of Nomex. Natural fibers, such as cotton, wool, or wool/cotton blend, as well as fire resistant cotton and cotton blends, are acceptable substitutes. Materials with low temperature melting characteristics, such as synthetics (nylon, dacron, polyester, and so on) and synthetic blends, are not approved.

Caution: In cold climates, cotton undergarments and socks will absorb perspiration and water, subjecting the wearer to chill, hypothermia, and frostbite.

E. Boots. Boots must be made of all-leather uppers that come above the ankles (the higher the better) and must be constructed so that metal parts, such as shoestrings or zippers, do not contact the wearer's skin. Boots made of fire-resistant rubber are an acceptable substitute. Materials with low temperature melting characteristics, such as synthetics (nylon, dacron, polyester, and so on) and synthetic blends, are not approved.

2.3 Head, Hearing, and Eye Protection. Flight helmets provide head, hearing, and eye protection in most environments.

A. Flight Helmets. Flight helmets, consisting of a one-piece hard shell made of polycarbonate, Kevlar, carbon fiber, or fiberglass, must cover the top, sides (including the temple area and to below the ears), and the rear of the head. Flight helmets must conform to a national certifying agency standard, such as DOT, Snell-95, SFI, or an appropriate military standard, and be compatible with required avionics. "Shorty" helmets are not approved.

Helmets designed for use in fixed wing aircraft and HGU (helmet general use) do not provide adequate protection for helicopter occupants and are not approved for helicopter use.

Flight helmets most often used by DOI personnel are the SPH-5 and HGU-55. Other flight helmets that meet the requirements are: SPH-3, SPH-4, SPH-4B, HGU-33, HGU-34, HGU-39, HGU-53, HGU-54, and Alpha (British).

B. Hearing Protection. A hearing protection program is required whenever employees are exposed to noise equal to, or exceeding, an 8-hour time-weighted average of 85 decibels (dBA). Most operating aircraft generate noise levels above 85 dBA.

When not conducting special use activities, ear muffs and earplugs may be substituted for the flight helmet. Earplugs generally provide the best noise reduction. Earmuffs provide warmth, relieve pressure in ear canals, and reduce noise. Earplugs can be worn with ear muffs or flight helmets for added protection.

C. Eye Protection. DOI requires eye protection in work environments where air particle contaminants are present.

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Chapter 3 Survival Equipment

3.1

3.1 General. This chapter describes the minimum survival equipment and first aid kit requirements for overwater flights, special use activities, and flights conducted overland. This does not exempt mission planners from ensuring that occupants have in their possession, when boarding the aircraft, adequate clothing for the mission environment in the event of a mishap or survival situation. Additional requirements for flights conducted in Canada and Alaska are listed in Appendix 2.

Appendix 3 provides rescue and survival planning considerations.

3.2 Over Water. The appropriate overwater ALSE is based on many factors, including mission, search and rescue time, weather, and water conditions.

For extended overwater operations, DOI aircraft must comply with 14 CFR 135.167.

A. Personal Flotation Devices (PFDs). In addition to complying with applicable Federal Aviation Regulations, occupants must wear PFDs aboard DOI flights when performing takeoffs or landings to water (including float and boat-hulled aircraft) and when performing water bucket dipping or snorkeling operations.

1. Single-Engine Aircraft. PFDs must be worn by occupants aboard DOI flights operating beyond gliding distance to shore.

2. Multiengine Aircraft. PFDs need not be worn but must be immediately available to occupants aboard DOI flights operating beyond gliding distance to shore.

Note: Inflatable PFDs are preferred because they do not restrict the occupant's movement or egress.

Caution: PFDs should not be inflated in the aircraft. An occupant wearing an inflated PFD (or non-inflatable PFD) may experience difficulty egressing from an overturned or submerged aircraft. PFDs equipped with automatic (water activated) inflation devices should not be worn in aircraft.

B. Anti-Exposure Garments. Anti-exposure garments must be worn in single-engine aircraft and readily available to occupants of multiengine aircraft when conducting extended overwater flights (as defined in 14 CFR 1.1) where water temperature is colder than 50 degrees Fahrenheit. Table 3-1 estimates the effectiveness of several survival garments at various water temperatures.

1. The anti-exposure flight suit approved for DOI use is a one-piece coverall insulated to provide some hypothermia protection and buoyancy. Hood and hand protection must be carried in a specific pocket provided for that purpose.

2. Survival suits must be a dry immersion type, constructed from a closed-cell material, and insulated. Quick-donning anti-exposure suits are acceptable in multiengine aircraft.

Caution: Aircraft occupants wearing anti-exposure garments may experience difficulty egressing from an overturned or submerged aircraft.

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Probable Survival Time With Inflatable Life Vest

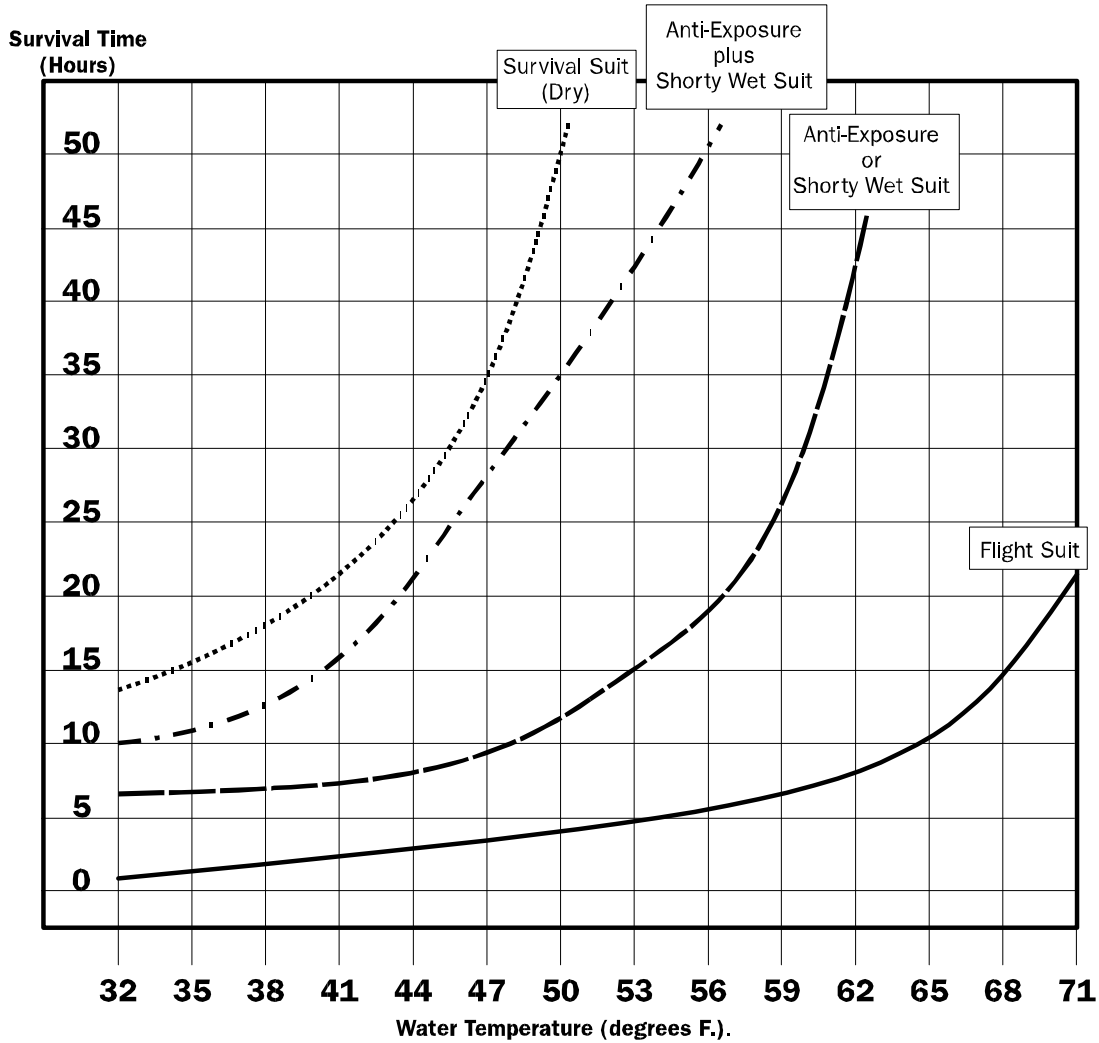


Table 3-1

This table is based on U.S. Coast Guard data for the following conditions:

- Rough Seas (4' to 6' Swells)
- Approx. 18% Body Fat
- Inflatable Life Vest with Self-Righting Characteristics

NOTE: Survival time in a covered life raft will be significantly longer in all water temperatures.

C. Life Rafts. Life rafts are required for extended overwater operations, in accordance with 14 CFR 135.167, and recommended when operating beyond gliding distance to shore.

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Chapter 3 Survival Equipment

3.3

3.3 Over Land. The appropriate overland ALSE is based on many factors, including mission, search and rescue time, weather, and terrain.

A. Survival Kits. Survival kits are required for special use activities and are recommended for all missions. Kits will include the items listed in Appendix 1, plus additional equipment appropriate to the route, environmental conditions, and number of occupants aboard the aircraft.

Caution: Avoid storing survival kits in seaplane float compartments. Kits stored in these compartments are often damaged or inaccessible after an aircraft mishap.

B. Personal Survival Vests or Hand-Carried Survival Kits. Personal survival vests or hand-carried kits, in addition to the required survival kits, are recommended for all DOI flights. Aircraft accident experience has shown that survival equipment not attached to the occupants at time of egress is often not recovered by the survivors. Suggested items include:

- | | |
|---------------------------|---|
| •Waterproof matches | •Pocketknife |
| •Magnesium fire starter | •Personal emergency locator transmitter (ELT) |
| •Two space blankets | •Water purification tablets |
| •Large plastic bag | •Signal mirror |
| •Water bag (collapsible) | •Six aerial signal flares |
| •Individual first aid kit | •Strobe light or flashlight |
| •Insect repellent | •Whistle |

Caution: Most signal flares and inflatable vests cannot be carried aboard commercial airlines as checked or carry-on baggage.

Appendix 2 provides requirements for flights in Canada and Alaska.

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Chapter 3 Survival Equipment

3.4

3.4 First Aid Kits. Aircraft owned or operated by DOI are required to carry a first aid kit. The kit items must be stored in a dust-proof and moisture-proof container. It must be readily accessible to the aircraft occupants. Kits are available through commercial sources. The kit's contents will include the items listed below plus additional equipment appropriate to the route and number of occupants aboard the aircraft.

Item	Passenger Seats 0-9	Passenger Seats 10-50
Adhesive bandage strips, (3" long)	8	16
Antiseptic or alcohol wipes (pkts)	10	20
Bandage compresses, 4"	2	4
Triangular bandage, 40" (sling)	2	4
Roller bandage, 4"x 5 yds (gauze)	2	4
Adhesive tape, 1"x 5 yds (std roll)	1	2
Bandage scissors	1	1
Body Fluids Barrier Kit: 2 - pair latex gloves 1 - face shield 1 - mouth-to-mouth barrier 1 - protective gown 2 - antiseptic towelettes 1 - biohazard disposable bag	1	1
NOTE: Splints are recommended if space permits.		

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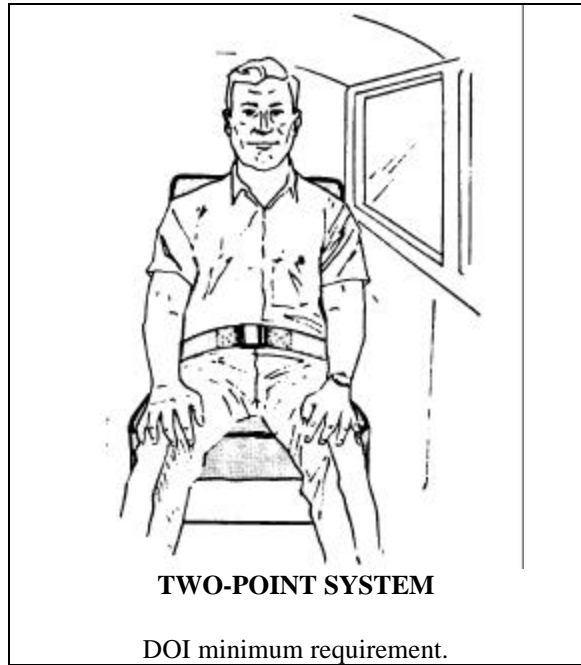
Chapter 4 Aircraft Installed ALSE

4.1

4.1 General. This chapter covers the ALSE required to be installed in aircraft owned or operated by DOI. It is the responsibility of the operator to ensure the appropriate equipment is provided. The pilot in command must ensure the correct installation, quantity, and serviceability of the equipment. The pilot in command is also responsible for briefing occupants on ALSE location and use.

4.2 Restraint Systems. Aircraft must be equipped, as a minimum, to the FAA certification standards for the specific aircraft. Restraint systems must be FAA approved and meet the installation guidance referenced in FAA Advisory Circular (AC 21-34), or its current revision. All installations must secure the occupant with a metal-to-metal buckle or latching mechanism. Occupants shall wear lap belts and installed shoulder harnesses during all phases of flight unless there is a valid operational or safety requirement, which would cause the pilot in command to direct otherwise. Additional requirements are as follows:

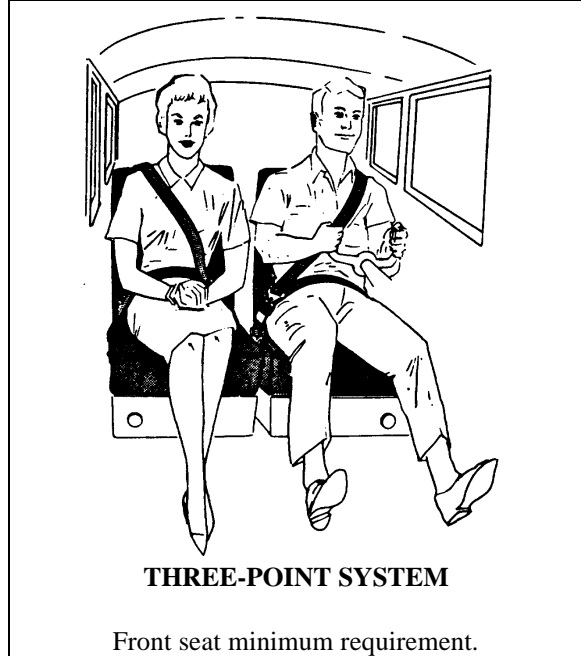
All occupied seats must have a lap belt as a minimum (two-point system). Front seat occupants must have a lap belt and shoulder harness as a minimum (three-point system). FAR 91.205 defines a front seat as a seat located at a flight crewmember's station or any seat located alongside such a seat. The single-strap shoulder harness is acceptable provided it crosses the chest diagonally when fastened. Lap belt and shoulder harness installations must not restrict crewmembers from performing their duties.



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Single- and double-strap shoulder harnesses utilizing a sewn loop allowing the seat belt to slide through, as a means of attachment, are not approved for DOI use.

Lap belts should fit low and snug across the lap. If the belt is loose, or high around the waist, it can cause injury. Shoulder harnesses should be snug, but not tight, across the chest.



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Chapter 4 Aircraft Installed ALSE

4.1

A. Helicopter. Front seat occupants must have a double-strap shoulder harness and lap belt (four-point system). It must secure the occupant using a single, quick release buckle (flight crewmembers at their duty station must also have an inertia reel). Heavy duty (military style) harnesses with a fabric loop connecting the shoulder harness to the male portion of the lap belt buckle, similar to those installed in transport category helicopters, are acceptable.

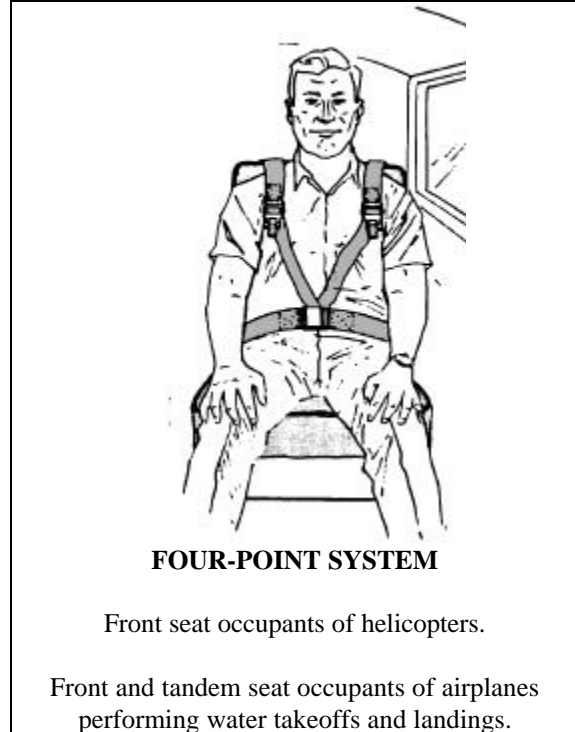
B. Airplane. Airplanes performing water takeoffs and landings must have a double-strap shoulder harness and lap belt (four-point system) for front seat occupants and both tandem seat occupants. The system must secure the occupant using a single, quick release buckle. Four-point systems with shoulder harnesses permanently attached to the lap belt are prohibited when performing water takeoffs and landings in airplanes.

4.3 Fire Extinguishers. See 351 DM 2.1A.

4.4 Emergency Locator Transmitter (ELT). An emergency locator transmitter automatic portable (ELT/AP) or automatic fixed (ELT/AF), meeting the requirements of 14 CFR 91.207, must be installed in all nonturbojet aircraft owned or operated by DOI. If the ELT location is not visible from the cockpit or passenger cabin, a conspicuous placard indicating ELT location must be installed.

A. Helicopter. The ELT must be installed in accordance with the applicable technical standard order (TSO) and the manufacturer's instructions. Install unidirectional ELTs with the directional arrow pointed 45 degrees downward from the forward direction of flight.

B. Airplane. The ELT must be installed in accordance with 14 CFR 91.207, applicable TSOs, and the manufacturer's instructions. An external antenna will be used in all airplane applications and mounted on top of the airplane.



Caution: Personal ELTs should not be operated if the aircraft-installed ELT is transmitting. Two signals, originating from the same location, may prevent the satellite or search aircraft from accurately pinpointing the mishap site.

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Appendix

1

Minimum Aircraft Survival Kit Items

These are minimum required items for special use activities in the United States and U.S. possessions. Additional requirements for flight activities conducted in Canada and Alaska are listed in Appendix 2.

- Knife
- Signal mirror
- Signal flares (six each)
- Matches (two small boxes in waterproof containers)
- Space blanket (one per occupant)
- Water (one quart per occupant [not required when operating over areas with adequate drinking water])
- Food (two days emergency rations per occupant)
- Candles
- Water purification tablets
- Collapsible water bag
- Whistle
- Magnesium fire starter
- Nylon rope or parachute cord (50 feet)

Suggested Survival Kit Items Dependent Upon Terrain and Climate

- | | |
|--|---------------------------------------|
| •Container w/carrying handle or straps | •Individual first aid kit |
| •Large plastic bags | •Signal panels |
| •Flashlight with spare batteries | •Hand saw or wire saw |
| •Collapsible shovel | •Sleeping bag (one per two occupants) |
| •Survival manual (Arctic/Desert) | •Snowshoes |
| •Insect repellent | •Axe or hatchet |
| •Insect headnet (one per occupant) | •Gill net/assorted fishing tackle |
| •Personal ELT | •Sunscreen |

Note: The hand-held 360- or 720-channel VHF transceiver radio is recommended. It should be attached, or immediately accessible, to a crewmember rather than placed in the aircraft survival kit.
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**Special Emergency (Survival) Equipment Required for Flights
in Canada and Alaska**

Remote regions such as Canada and Alaska have survival equipment requirements in addition to DOI survival kit requirements for special use activities listed in Appendix 1. Unlike DOI requirements, Canada and Alaska requirements apply to all flights. Check current flight regulations for your area of operation.

- A. Canada. Canadian law requires the following survival equipment when operating in sparsely populated areas:
1. Food having a caloric value of at least 10,000 calories per person carried, not subject to deterioration by heat or cold, and stored in a sealed waterproof container bearing a tag or label on which the operator of the aircraft or his representative has certified the amount and satisfactory condition of the food in the container following an inspection made no more than six months prior to the flight
 2. Cooking utensils
 3. Matches in a waterproof container
 4. A stove and a supply of fuel or a self-contained means of providing heat for cooking when operating north of the tree line
 5. Portable compass
 6. An axe of at least 2 1/2 pounds or 1 kilogram weight with a handle of not less than 28 inches or 70 centimeters in length
 7. Flexible saw blade or equivalent cutting tool
 8. Snare wire of at least 30 feet or 9 meters and instructions for its use
 9. Fishing equipment including still fishing bait and a gill net of not more than a 2 inch or 5 centimeter mesh
 10. Mosquito nets or netting and insect repellent sufficient to meet the needs of all persons carried when operating in an area where insects are likely to be hazardous
 11. Tents or engine and wing covers of suitable design and color or having panels colored in international orange or other high visibility color, sufficient to accommodate all persons carried when operating north of the tree line
 12. Winter sleeping bags sufficient in quantity to accommodate all persons carried when operating in an area where the mean daily temperature is like to be 7° C or less

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13. Two pairs of now shoes when operating in areas where the ground snow cover is likely to be 12 inches or 30 centimeters or more
14. Signaling mirror
15. At least 3 pyrotechnical distress signals
16. A sharp jackknife or hunting knife of good quality
17. Suitable survival instruction manual
18. Conspicuity panel
19. The following additional items are suggested:
 - Spare axe handle
 - Honing stone or file
 - Ice chisel
 - Snow knife or snow saw-knife
 - Snow shovel
 - Flashlight with spare bulbs and batteries
 - Pack sack

Note: Unless specifically prohibited by bureau regulation, firearms are carried at operator's discretion. Small arms such as hand-held pistols and revolvers, and fully automatic weapons are not authorized to be carried or worn in Canada. It is imperative that firearms be declared to Canadian Customs. Failure to do so may result in seizure of the firearm and aircraft and prosecution of the pilot.

B. Alaska. Alaska law requires the following survival equipment:

1. The minimum equipment to be carried year around, is as follows:
 - Food for each occupant sufficient to sustain life for two weeks
 - Axe or hatchet
 - First aid kit
 - A pistol, revolver, shotgun, or rifle, and ammunition
 - Small gill net and an assortment of tackle
 - Knife
 - Two small boxes of matches
 - Mosquito headnet for each occupant
 - Two small signaling devices such as colored smoke bombs, railroad fusees, or very pistol shells, in sealed metal containers

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2. In addition to the above, the following must be carried as minimum equipment from October 15 to April 1 of each year:

- Pair of snowshoes
- Sleeping bag
- Wool blanket for each occupant over four

Note: Operators of multiengine aircraft licensed to carry more than 15 passengers need carry only the food, mosquito nets, and signaling equipment at all times other than the period from October 15 to April 1 of each year, when two sleeping bags and one blanket for every two passengers shall also be carried. All of the above emergency rations and equipment requirements are the minimum requirements under current law.

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Appendix 3

Rescue and Survival Planning Considerations

When planning a mission, it is important to consider the time and effort that may be required to locate and recover victims should a mishap or survival situation occur. While prompt and safe rescue is by no means ensured, knowledge and preparation often make the difference between success and failure. Mission planning should include a review of the following areas:

Flight Plans The most important protection you can give yourself is to file a flight plan. An Air Force study of 325 search and rescues revealed that "time works against people who experience a distress but are not on a flight plan, since 36 hours normally pass before family concern initiates an (alert)."

Flight Following The time required to rescue a survivor is directly related to how accurately your position can be determined. If you have filed a flight plan, stayed on course, and updated your progress with frequent position reports, your chance of rescue is greatly enhanced.

Search and Rescue The availability of search and rescue agencies and their response time is also an important consideration for timely recovery. Personnel should be familiar with procedures used by search and rescue organizations in order to help recovery efforts.

Other Variables Knowledge of the environment, weather, physical condition, proficiency in signaling, and effectiveness of survival equipment all affect your ability to survive until help arrives. After considering the amount of time it may take for help to arrive, you should prepare accordingly.