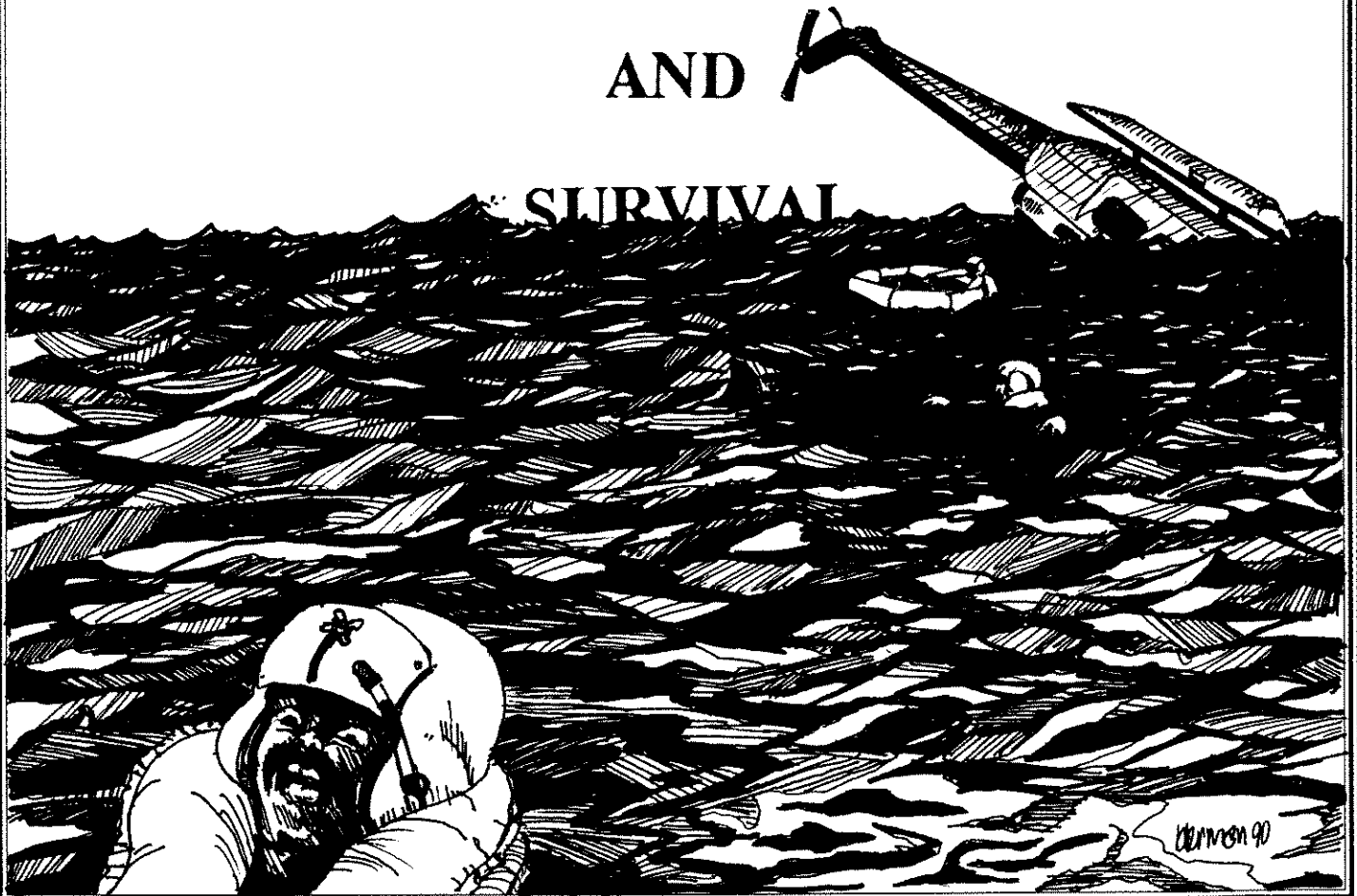




Department of the Interior



AIRCRAFT WATER DITCHING AND SURVIVAL



WELLS 90



U.S. DEPARTMENT OF THE INTERIOR

OFFICE OF AIRCRAFT SERVICES

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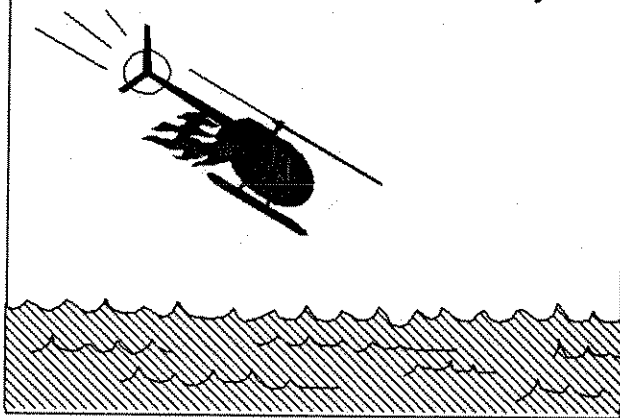
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AIRCRAFT WATER DITCHING & SURVIVAL

INTRODUCTION

How far is "overwater"? When it comes to swimming, not very far if you had to make it back to shore. Policy requires that all occupants wear an FAA or Coast Gaurd approved personal floatation device (PFD) when flying beyond autorotative or gliding distance from shore, except in multiengine airplanes. (ref. 351 DM 1.7 E [6]).

If you fly over water, the possibility of ditching the aircraft is a distinct reality.



Your survival will depend on:

- Protecting** yourself from an incapacitating injury.
- Knowing** how to successfully locate and operate the emergency exits.
- Reaching** the water's surface with all the needed survival equipment, within the limited time span of a breath of air.

Most fatalities are offically listed as drownings. Disorientation, unfamiliarity with underwater escape procedures, and the non-availability of personal flotation devices contribute to this statistic.

EMERGENCY EQUIPMENT

Should the pilot inform you of an imminent water ditching, it is very important that you know the location of the following items:

- First Aid Kit
- Survival Kit
- Fire Extinguisher
- Emergency Locator Transmitter
- Life Raft
- Emergency Exits
- Personal Flotation Device

NOTE: During an inflight emergency there will not be time to become familiar with this equipment's location and use.

FLIGHT HELMETS

Drowning victims frequently receive blows to the head which either daze or render them unconscious, and thus prevents their escape. By absorbing impacts, flight helmets have prevented head injuries to many ditching survivors.

SEAT BELTS

Improper use of seat belts and shoulder harnesses can also cause injuries. A properly adjusted safety belt offers far more protection than does a prematurely released belt and just "holding on for dear life" during a crash.

LOOSE CARGO

Pilots and passengers can be fatally injured by flying cargo and improperly stowed equipment. They can be hampered in their egress or pinned inside the aircraft by shifting cargo. It is essential that all tool boxes, cargo and equipment be **secured** before each flight. Only those items needed inside the aircraft should be placed in the passenger compartment. All other equipment should be **secured** in the cargo compartment.

SUBMERSION AND PANIC

Aircraft have been known to roll-over and sink immediately after impact. Many aircraft will float upside down with the cabin submerged for short periods of time due to buoyancy provided by the internal fuel cells. With the cabin inverted and underwater, problems of escaping become compounded, and **panic** is more likely to occur.

Not only must pilots and passengers be protected physically from impact forces, but they must also be mentally prepared to cope with the events that rapidly occur in a water ditching situation. To be simultaneously shaken up, turned end-for-end, possibly rolled upside down, and submerged beneath cold on-rushing water can be a great shock for even the most prepared person. The initial reactions of most ditching survivors have been **disorientation, confusion and panic.**

Survivors experience not only these factors, but they must overcome other problems which may hamper their escape from the aircraft.

The most common are as follows:

- On-rushing water.** The most frequently reported single problem, it is the greatest deterrent to escape. It forces cabin occupants into the rear corners of the cabin, sometimes disorienting them so that emergency exits cannot be located in the underwater darkness.
- Difficulty, to locate and utilize personal flotation devices.**
- Difficulty reaching an exit.** Hampered by obstructions, injury, aircraft attitude, entangled clothing, survival gear, interphone cords or seat belts.
- Inability to see.** Because of darkness or murky water.
- Inability to open emergency exits.**
- Pinned in the aircraft.**
- Smoke, fire or spilled fuel.**
- Difficulty releasing seat belts.**
- State of consciousness.**
- Unable to hold breath long enough.**

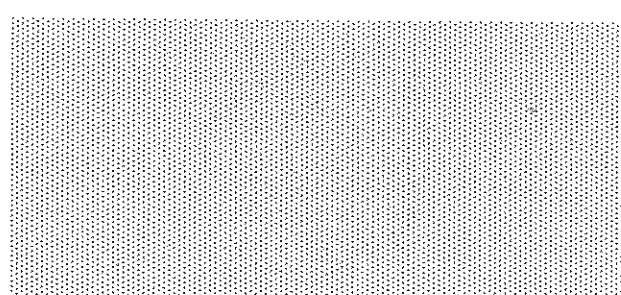


SURVIVAL OF A WATER DITCHING

Your mind is your best survival tool. *Fear and Panic must not be the predominate driving force behind your actions.* Panic is the natural tendency in a situation such as this. *You must make every effort to remain calm and think clearly.*

You must convince yourself that by using your knowledge, common sense, and a logical thought process you can survive the water ditching. Eliminate negative thoughts and images that may detract from this goal.

A thorough understanding of emergency procedures and aircraft familiarity are essential tools. You must have this knowledge to aid in your exit and survival of a ditching aircraft.



WATER DITCHING PROCEDURES

In the event of a water ditching, follow these procedures in "order."


1. Remove any loose items, glasses ,etc.
2. Unplug flight helmet mike jack from coil cord, this prevents getting "hung-up" when exiting the aircraft.
3. Upon contact with the water, open aircraft door if you are seated next to one.

Maintain control of the door by holding on to it, having it slightly ajar. External water pressure is reduced, making the door easier to open as the aircraft settles or submerges. This procedure also accomplishes the next step.

4. Establish reference point with your hand.

If you were seated by a door and opened it, as stated above, the hand holding the door would be your reference hand. Your reference point would be either the door handle or the door window, depending on which you are holding. Once you have established your reference point, **DO NOT REMOVE YOUR HAND** until it is safe to leave the aircraft.

This will keep you from becoming disoriented. If you are in another seat, not located by a door or emergency exit, establish a fixed reference point such as a seat back, or console. Do not let go until your departure path is clear.



NOTE: The best way to reduce disorientation, confusion, the effects of inward rushing water, incapacitating injuries, and the accompanying panic is to remain securely strapped in your seat and to establish a reference point. Remain in your seat and maintain your reference point until all violent aircraft movement ceases, the rotor has stopped turning, and you are reoriented. Only at this time should you unstrap and exit, following the hand used to maintain a reference point.

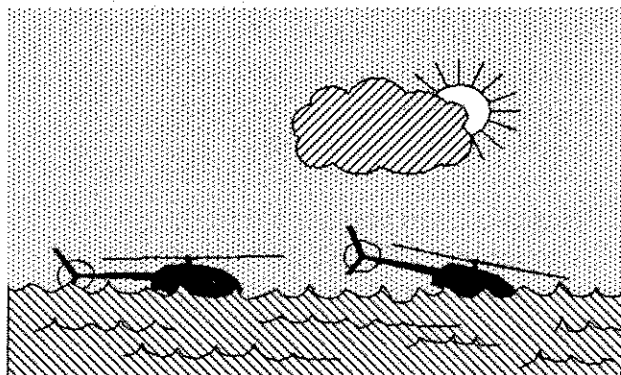
5. As the aircraft settles into the water, it is important that you count slowly to five.

This allows time for all movement of the aircraft to come to a stop, and reduces the risk of you exiting into a potentially dangerous situation.

6. Use your free hand, the one not on the reference point to release your seat belt.

7. Exit the aircraft following your reference hand, by moving hand over hand.

Do not climb over other occupants in the aircraft. Wait until they are out. This will lessen confusion and actually speed-up the process.



The best situation is that your aircraft remains upright and afloat even if for a brief period of time. This allows you time to better plan your next steps.

REACHING THE SURFACE

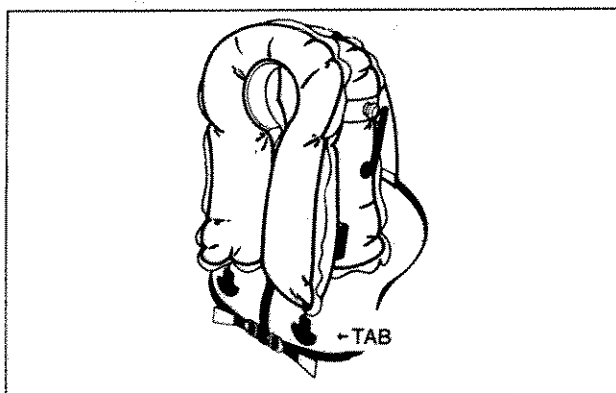
It is very easy to become disoriented during the rolling and sinking of the aircraft. Personnel have frequently escaped from the aircraft and swam downward rather than upward--this has proven fatal.

Following the air bubbles to the surface will help in maintaining your surface orientation, or inflating your PFD at this point will assist you in reaching the surface.

Beware of the potential of a water surface fire due to a fuel spill. If you find yourself in this situation try to stay beneath the water surface and swim to a point beyond the fire. If you surface into fire attempt to grasp a breath of air using your (PFD) as a shield, and submerge yourself again and swim to a point of safety.

PERSONAL FLOTATION DEVICE

Do not deploy your PFD inside the aircraft. It will restrict your mobility when moving through aircraft doors or windows. It would also be susceptible to puncture by broken plexiglass and ripped airframe metal. Once clear of the aircraft activate your PFD by pulling down on the tabs, this will cause the CO2 cartridges to puncture and fill the air cells. If needed, your PFD also has a manual inflation tube, which when blown into will also fill the air cells.



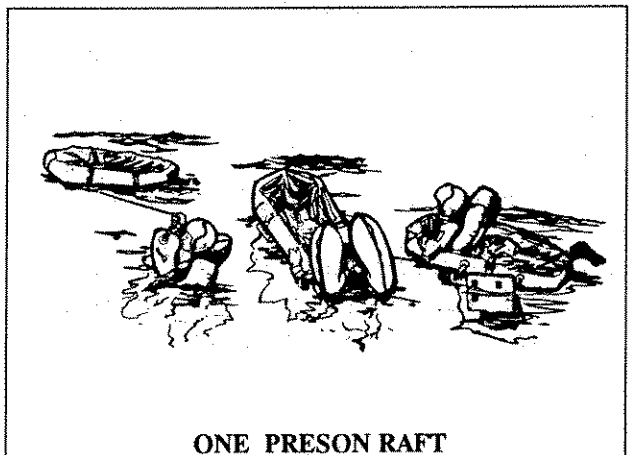
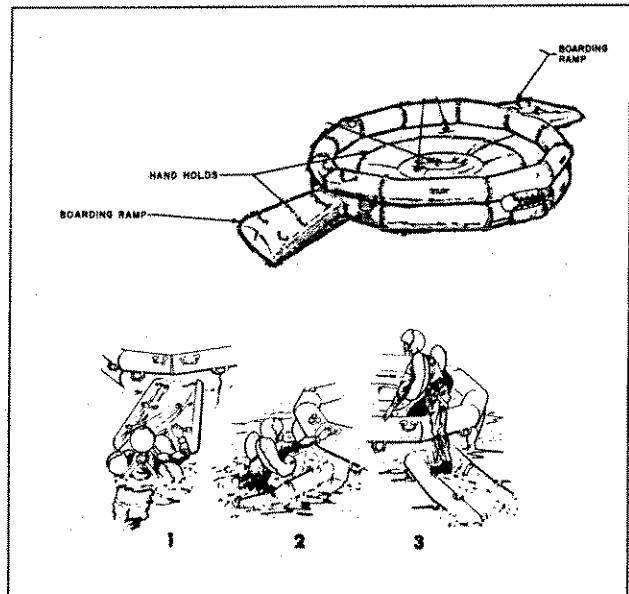
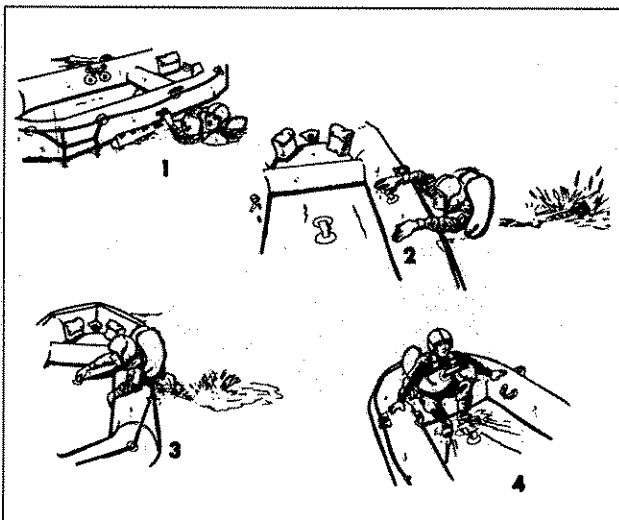
RAFT DEPLOYMENT AND USE

Do not assume the aircraft is going to stay afloat. Start exiting as soon as the rotors or props have come to a full stop. Deploy the life raft, making sure you maintain control of the lanyard, do not secure the lanyard permanently to the aircraft. Deploy the raft into the wind. This will cause the raft to stay in proximity of the aircraft, making entry much easier. *Your PFD'S should be inflated during the transition* between the aircraft and the raft.

In calm seas entry into the raft can be done directly from the aircraft. In rougher seas this is more difficult to accomplish, and entry into the water first is usually necessary. Entry into the life raft needs to be expeditious as it will reduce your risk of hypothermia.

The manner in which you enter the life raft from the water will depend on what type of raft you have. Pictured are different types, with unique ways to access them.

Make sure you are familiar with the raft onboard your aircraft.



ONE PERSON RAFT

EXPOSURE OR HYPOTHERMIA

If you are not able to get to the raft, the key to survival is to remain calm. From the standpoint of conserving body heat this is the best possible behavior. *Struggling or swimming will cause maximum heat loss due to the flushing action of cold water against the body's critical heat-loss areas.* Also the expenditure of calories produced by strenuous exercise will lessen your endurance.

KEY SURVIVAL POINTS

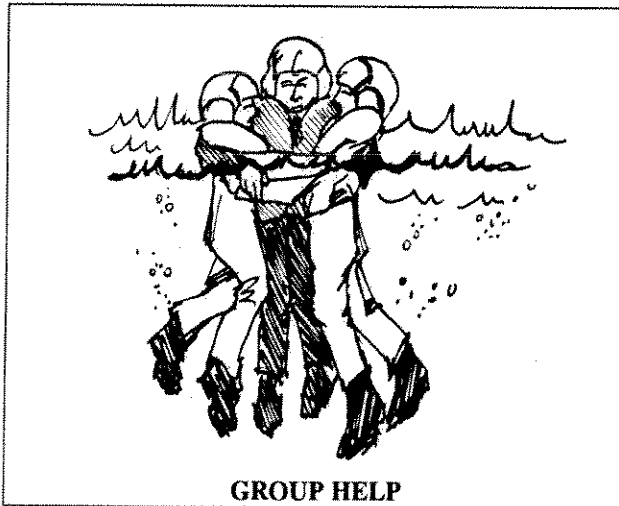
- A calm body floats better than a tense one.
- Of your total body temperature, **50%-70%** of the heat loss will take place through your head.
- Keeping your head out of the water and the flight helmet on will help minimize this heat loss, and provide additional buoyancy.
- The colder the water temperature the more harsh this environment becomes.

WATER TEMPERATURE--SURVIVAL TIME

| F. Water Temp. | No Protection Exhaustion Unconsciousness Occurs within | Expected Time of Survival with Floatation Device | Expected Time of Survival with Survival Suit |
|----------------|--|--|--|
| 32.5 | under 15 min. | 15 to 45 min. | 18 hours + |
| 32.5 - 40 | 15 to 30 min. | 30 to 90 min. | 22 hours + |
| 40 - 50 | 30 to 60 min. | 1 to 3 hours | Indefinite |
| 50 - 60 | 1 to 2 hours | 1 to 6 hours | Indefinite |
| 60 - 70 | 2 to 7 hours | 2 to 40 hours | Indefinite |

The cold facts on time and temperature.

Survivors should huddle together while afloat in the water. This aids in preventing heat loss and presents a larger target for rescuers to locate.

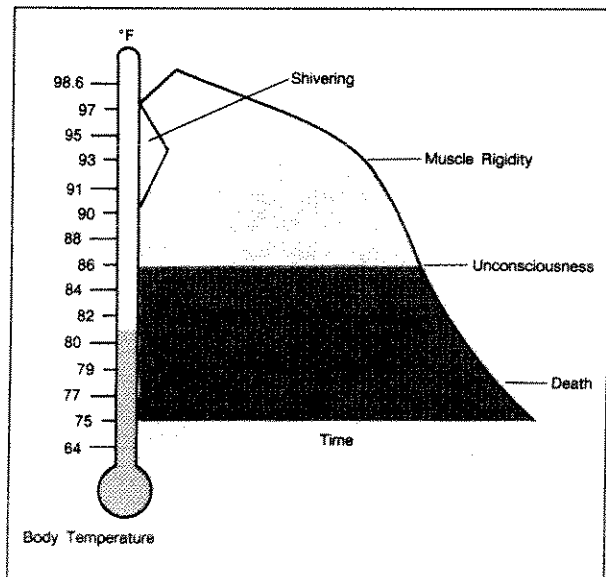


If you are alone in the water assume the **H.E.L.P. (Heat Escape Lessening Posture)** position. Draw the knees to the chest, lock hands over knees. This will also help retain critical body heat.



H.E.L.P. POSITION

The following chart shows how heat loss through hypothermia affects the body's core and the symptoms that accompany this drop in temperature.



SIGNALING FOR RESCUE

There are many signaling devices to help survivors increase their chances of being rescued. Each type of signaling device has a specific design and purpose, as well as definite operating limitations. The wider range of devices you have, the greater your chance of rescue.

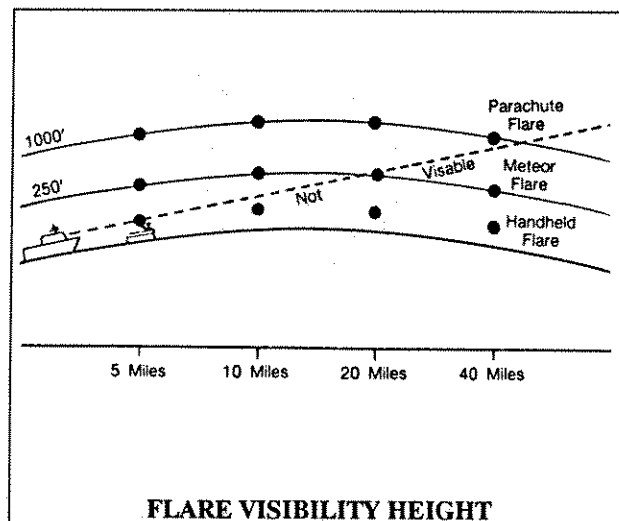
Being able to alert the rescue party of your situation or whereabouts is essential. The chance of being spotted accidentally does not generally occur. The negative effect of heavy swells on the visibility of any floating object in the ocean is well understood by sailors. The chance of an alerted ship or aircraft pinpointing and reaching the position of the raft is slim, unless the survivor can provide a constant signal.

AERIAL FLARES

Hand-Held Rocket Flares: These are generally of two types, low altitude with a short burn span and high altitude with a long burn span.

Pen Gun Flares: A 45-caliber cartridge is screwed into the end of the pen gun and fired by a spring-loaded pin. The flare generates a candle power of 4,000 and attains altitudes of 450 to 500 feet and has a burning time of between 5 and 10 seconds.

Pistol Launched Flares: These are generally available in 12 gauge, 25mm, and 37mm. They produce a candle power of 10,000 and have a burning time of between 10 and 30 seconds. They are also referred to as meteor flares, and are capable of alerting ships from as far away as 20 miles and aircraft at around 10 miles, depending on atmospheric conditions.



FLARE VISIBILITY HEIGHT

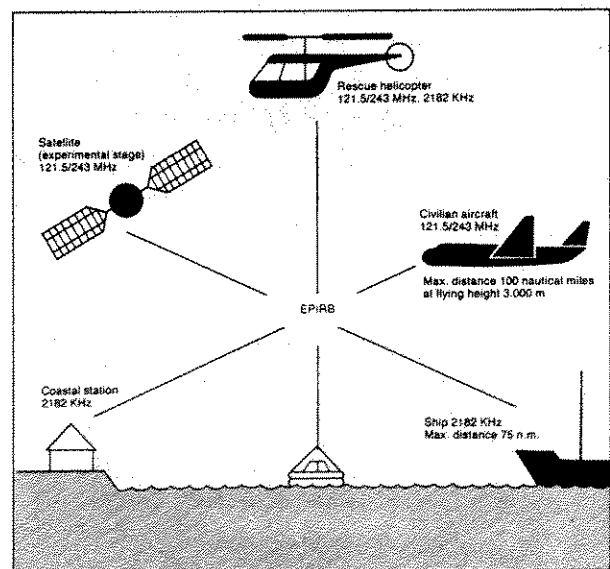
EPIRB (Emergency Position Indicating Radio Beacon) is a modified version of the aviation ELT (Emergency Locator Transmitter). It is usually equipped with both a manual and a salt water activating system. This self-contained, battery-operated unit transmits an inaudible, electric oscillating or "swept" tone.

The EPIRB transmits on the civil VHF frequency of 121.5 MHz and on the military UHF distress frequency of 243.0. The effective range can vary with atmospheric conditions and battery charge. Aircraft can pick up the signal from 200 to 300 miles away, but the range at sea level is considerably less.



The beacon is capable of transmitting a continuous distress signal 24 hours a day for the life of the batteries. The important benefit of an EPIRB is that the survivor need not be awake or be able to see the rescue vessel in order to alert it.

Search and Rescue Satellites: The latest in search and rescue technology is a satellite system called SARSAT (Search and Rescue Satellite). These satellites are equipped with special receivers that are tuned to standard international distress frequencies. Orbiting, these satellites are capable of receiving and pinpointing transmissions almost anywhere on earth. Once activated EPIRB's or ELT's should be left on continuously.



SIGNAL DEVICE CAPABILITIES & LIMITATIONS

Daytime Smoke Flares: Use only if you know aircraft or ships are in the area. These flares are adversely affected by poor visibility. They are difficult for rescue personnel to see if they must look into the sun. They are also limited by relatively short burn times.

Lights (strobe, flash): These are effective only at night and have a limited battery life; carry extra batteries.

Whistle or Horn: Your position relative to the wind direction and the rescue vessel will influence their effectiveness. The most obvious limitation of a whistle or horn is distance.

Signal Mirror: There must be a workable angle between the sun and your mirror, and the sun and the rescue craft. Mirrors have proven effective at 10 miles plus. (Limited to daytime and sunny skies.)

Dyes: Are visible in the water at relatively close range only, one mile or less. They can best be seen by aircraft flying at higher altitudes. They have limited visibility at sea level from boats. It also dissipates quickly in rough seas.

Aerial Flares: Very effective at night or close range in daylight. These can be difficult to see against bright sunlight.



By illustrating the multiple capabilities of signaling devices, and more importantly their individual limitations, the necessity of having a variety of devices should be apparent.

IN CONCLUSION: "BE PREPARED"

Being thrown into a survival situation is a traumatic and potentially fatal experience. Positive control over your emotional and mental state are key factors to survival. Accidents can and do happen. Your chance of surviving a water ditching emergency can be maximized by being prepared with the knowledge and equipment it takes to stay alive.

