



## SURVIVAL MANUAL

### SAN FRANCISCO SHERIFF'S DEPARTMENT AIR SQUADRON

**SURVIVAL STRATEGY:** In general aviation, there is a very good prognosis for survival during the immediate off-field landing if the aircraft is controllable in flight and the pilot is adequately trained in forced landing techniques. Salient points include: immediately

establishing a safe glide, rapidly selecting a landing site, rapidly initiating restart procedures if there is engine failure, sending distress signals while still airborne (squawk and mayday call, activate ELT), tighten safety belts, shutdown of fuel and master switch, doors free,. After landing, the most urgent move is to get all occupants out of the aircraft quickly because of danger of fire. Some may be injured. The injury that will require special technique for evacuation is head and neck trauma. In extracting such a victim from the aircraft, the neck should be held so as not to flex, particularly not forward on the chest, because of danger of spinal cord injury. After it is clear that the danger of fire has passed you may return to the aircraft to secure your survival materials. Here is where the task of long term survival begins. This manual will treat each aspect separately describing strategies and materials that are recommended. Any aircraft that is operated over inhospitable terrain should be equipped with a set of materials and equipment that increase the odds of survival. Given a landing in the Siskiyous or Sierras, it could take several days to be found or to trek out to a roadhead. In any off-airport landing you should be prepared to deal with communication, food and water, warmth, and medical problems in the interim. Water landings require flotation equipment. This is available from aviation supply companies, so is left to the pilot's discretion. In principle, if you fly farther over water than you can glide to shore, you need flotation equipment.

**COMMUNICATION and SIGNALLING:** If they don't know where you are, they will have difficulty finding you! The statistics show that the survival rate for individuals involved in remote off-airfield landings decreases from over 60% to about 10% as the length of time to rescue extends to two days! If you can fix your locale before landing, it will be very helpful. If you have a GPS you can read off the exact coordinates, otherwise relate your position to landmarks, etc.. Time permitting, you can put this in your Mayday message. You should put that message out on any frequency you are connected to, rather than trying to switch to the emergency frequencies. Actually ATC or tower frequencies are probably better. Many pilots have hand-held GPS units. This is probably a good investment, because you can continuously read your coordinates if you are walking out to safety. How else can you communicate? Clearly a portable ham radio is useful here, though a transceiver may get you a contact also. Cell phones can often connect from fairly remote areas as well. If you have a cell phone you may consider carrying the small, extended battery pack that will give you an extra day or more of activity. The



newly developed 406Mhz ELT has the ability to transmit actual coordinates, so is expected to greatly improve the rapid location of a downed aircraft. Installation is mandated by 2009 by the FAA, but this appears to be an important enough improvement to warrant early installation.

Lights are important as well, at night. The shake-charge flashlights will not fail you. If you have regular flashlights, you should carry at least one fresh set of batteries for each unit. The lifetime of LED lights is many times that of incandescent bulbs and the power requirement much smaller, so this is a reasonable shift to make. Flashlights are essential for activity after dark as well as for signaling. However it is generally unwise to try to hike out in the dark because of the danger of injury and disorientation. A mirror can be very effective in using the sun's rays to attract attention. A good substitute is a CD. Fires are useful for signaling as well as for warmth. A woods knife, at least, is needed to cut small limbs, etc for fuel. Dry leaves from under logs make good tinder as do approach charts. A surefire tinder that will light even in a rainstorm is pitch gathered from many species of trees. It is important to have a waterproof container for matches. Be sure to dig to mineral soil beneath and around your site before starting your fire to keep it under control!

**WATER:** This can easily be a life-and-death issue. Every aircraft should carry water to last for at least three days. This is very convenient in the form of bottled water. Adults require two quarts daily under normal weather conditions, (and children almost as much due to higher metabolic requirements), and twice that in desert heat. Save your water bottles for getting water from streams, if needed. Water, even from rapidly flowing mountain streams, presents a danger to health, and thus must be disinfected. The best disinfectants are the iodine compounds such as tetraglycine hydroperiodide. Chlorine disinfectants such as the widely used Halazone tablets are less effective. It is very important that water be clear before disinfecting it because organic matter uses up the disinfectant quickly. If necessary, you can filter natural water through a piece of cloth or a scarf, etc to remove particulate material before disinfecting it. In cold weather you must wait up to thirty minutes for disinfection to be effective. Though the chemical disinfectants kill most microbes, the cysts of Giardia ( Giardia is a diarrheal disease caused by a protozoan that is common in Western mountain waters) are relatively resistant. It is best to boil water if you can. Light weight plastic water filtration kits for hikers are available from outdoor stores. These can remove Giardia cysts effectively. Snow is usually relatively clean and when melted can be drunk. If you have to find water, you often can at the base of cliffs. Also if you are in arid country, look for green plants and try the bends in dry river beds where water may be found near the surface.

**FOOD:** This is left to the discretion of the flyer, but the object is to have food that is stable in storage over a long time and not excessively heavy. There are a number of freeze dried, waterproof, stable foods available from stores that sell camping goods. These are highly recommended. However, even a stash of granola bars, candy bars, etc can be a real aid. Remember, if you are going to be hiking out of rough country, you are going to expend thousand of calories above your usual rate. Canned, vacuum -sealed



nuts last a long time and provide a lot of calories for their weight. Unless you are an expert, there isn't much you can get from your environment that is safe to eat. Mushrooms have no nutritional value, and can be deadly. Wild blackberries and huckleberries will give you some sustenance, however.

**CLOTHING AND SHELTER;** All occupants should have adequate clothing for the climactic conditions that will be encountered. This includes gloves, occlusive hats, dark glasses, and waterproof outer clothing, parkas, etc.. Sunscreen compounds are essential for protection against serious solar burns. An essential principle of thermal protection is to remain dry. Wet clothing loses over ninety percent of its insulating value. Thus, warm clothing must be coupled with protection against water. Waterproofing sprays are available from outdoors suppliers that greatly increase the water resistance of cotton or polyester clothing. Vinyl ponchos provide much protection with very little weight. Light weight vinyl tarpaulins are also very valuable in this respect. The value of a tarp is significantly increased by having lightweight nylon cord for hanging it. Low temperature (at least zero degree rating) sleeping bags are essential for survival. There are bags available that weigh no more than three pounds. Some very light weight mountain tents are available from outdoor suppliers, that would be a valuable addition if a lot of flying is to be done over mountainous terrain. Another essential in the survival kit is heat retaining Mylar bags. These weigh only a few ounces but can retain more than fifty percent of radiated body heat. Outer clothing should be in bright colors like red, yellow or orange, rather than olive drab, so that you can be seen readily. Wear shoes that could carry you out of the mountains if necessary.

The wings, stabilizers, etc. from your aircraft may make good improvised shelter. Snow has a great deal of insulating value, especially when there is a high wind chill factor. Body heat can be conserved rather well in a snow cave, if space is left between you and the snow as much as possible. Be sure to keep adequate access for air to breathe. Many outdoorsmen carry candles as a source of heat and light. A candle in a well constructed snow cave can raise the ambient temperature to at least 40 degrees F.

#### **MEDICATIONS and FIRST AID KIT:**

First, if any occupant of the aircraft has special requirements for medication (e.g. insulin, cardiac medications, etc.) it is wise to ensure that sufficient stock is on board for at least several days. It is essential to have a first aid kit that provides minimal needs for bandaging etc. It is recommended that this be supplemented with a small bottle of Pepto-Bismol which is actually very effective for most forms of diarrheal illness. Your physician may write a prescription for a powerful antibiotic like Ciprofloxacin, which would be useful in case of a compound fracture, or cutaneous burns, for example.

#### **PRINCIPLES OF FIRST AID:**

**AIRWAY:** The first consideration is adequate airway. Aspiration of vomitus or blood can cause death. The airway should be cleared using the fingers with the victim facing downward. Give mouth-to-mouth respiration if necessary. Do not allow the neck to flex during this maneuver or at any other time if there is neck/spinal cord injury.



**BLEEDING:** Hemorrhage must be stopped quickly. If there is obvious arterial bleeding ( spurting blood), you will have to find a pressure point on the artery and occlude it above the site of laceration. A tourniquet is valuable here, except that you must not leave it on more than two hours, and should loosen it every twenty minutes, briefly, to prevent tissue death. Keep the pressure on till the bleeding stops. Most arterial bleeding will stop after a while from arterial spasm and blood clot formation. If a large denuded area is bleeding you can keep pressure on the area with a bandage, if possible, otherwise a clean cloth. It is very important to keep dirt out of wounds, and even to wash them out if they have become contaminated, in order to prevent infection. Local antibiotic from the first aid kit may be applied to wounds to forestall infection.

**SHOCK:** Trauma and blood loss lead to shock, manifested by low blood pressure, fast pulse, fainting. Keep the victims lying down, but be sure to keep them warm with appropriate clothing, sleeping bag, etc. If cardiac arrest occurs, use cardio-respiratory resuscitation.

**FRACTURES;** Fractured limbs should be splinted to prevent movement of bone fragments, which can do much damage if allowed to move. A splint can be improvised with a thick folded newspaper, small tree limbs etc, held in place with strips of cloth, duct tape, etc.

**BURNS;** If the victim's clothing is still burning, smother the flames with garments, sleeping bag, etc. Keep burned areas from contamination. Apply local antibiotic ointment to burned areas. A bar of soap is valuable for cleaning wounds as are Betadine pads.

**ARTHROPOD-BORNE DISEASE:** The West Nile virus and other mosquito-borne encephalitis viruses are endemic in California and neighboring states, as is Lyme disease, carried by ticks. An insect repellent spray or stick ( DEET for example) is important to prevent exposure.

#### **GETTING OUT OF THERE: TO GO OR NOT TO GO?**

This depends entirely on the circumstances. Is anyone in the party injured? Do you know where you are? Have you made contact with someone? If you are in good physical shape, are in doubt as to whether anyone knows you're there, and have a good GPS or lensatic compass with some kind of map (U.S. Forest Service maps are worth carrying when flying over rough country, but sectionals contain a lot of information) then you may do well getting out on your own. Otherwise you are probably better off staying put. In that case you can improve your chances by keeping warm and dry, marking your location for better sighting from the air, signaling with lights at night, and radio/transceiver at intervals, and being very visible when you hear low flying aircraft overhead.