For a downed pilot, lost in the wilderness, having adequate shelter may be the difference between life and death.

The author, an experienced mountain outdoorsman, challenges the philosophy that pilots can get by without planning for emergencies.

■■ Many current philosophies and practices regarding downed aircraft and pilot survival in the Rocky Mountain states are sadly inadequate.

We pilots are guilty of exercising the placid attitude that "it can't happen to me" or, "if it did, I'd get by anyway!"

The assumption that, in the event of a crash, we can spend our downed time building an adequate shelter, scrounging water and food, and caring for our injuries with a haphazard array of tools, that only by chance we have with us, is a killing assumption.

The FAA supports this philosophy by offering their "27-cent do-it-yourself survival kit" as a bare minimum kit. It contains a metal can, a candle, a penny box of matches, three garbage bags, a dozen sugar cubes and a roll of plastic tape.

This may work for highly trained survival teams, but how about the average pilot? We need a more realistic and more conservative approach to winter survival in the mountains.

Survival, according to the popular aviation philosophy, is similar to Webster's definition—"the act of continuing to live after or in spite of . . ."—which implies that a downed pilot may have to make huge sacrifices, but he will sustain life. Hands and feet are sacrificed to frostbite (and amputation); simple injuries degenerate to serious ones; general health deteriorates until sickness takes command; suffering becomes so intense it breaks the will to live. That is a bleak way to define survival.

Suppose you are on your way from Kansas City to Salt Lake City, VFR. You are crossing the Rockies. The raw beauty of their 12,000-foot snow-capped granite mountains slides quietly by your wingtips. Then your airplane is swatted down into a dark canyon and smashed against the frozen slopes.

Miraculously, everyone is alive. You have a broken leg. Your wife is unconscious with a broken arm. Your two children are dazed and in shock. Your ELT is not working.

Now you must "make-do" with the tools at hand. Will the casual clothes you brought keep out the bitter 20 below zero cold? Will the crumbled cabin work as a shelter? Can you find any firewood to burn? Is it dry enough? Who will drag

The Killing Assumption

There's more to successful rough-country survival than "making do" after you get there

by GLEN TABOR

it over? You can't. Your wife can't. Your children are dying because of shock and no protection against the cold. Meanwhile, your ruptured fuel tanks are pouring away the gasoline you desperately need to get frozen firewood started.

What about the first aid for your injuries? What about personal comfort and hope to spark your will to live? How are you going to signal the search plane? You will have one minute of exposure time to get the search and rescue plane's attention. It will not come until early in the third morning. What will you eat and drink for the five days it will take to get a rescue team into your location?

Slowly you begin to understand the danger of the killing assumption.

A better definition, we believe, is—"survival is keeping body and soul intact, in their entirety and in reasonably good health under adverse conditions"—to settle for anything less is foolhardy. The small cost of preparing to survive by this definition far outweighs the ultimate penalty for lesser expectations.

What will it cost in dollars, weight, bulk, time and effort to adopt this more liberal view of survival?

With today's emphasis on search and rescue, we can adopt the basic practice of staying with our airplane and waiting to be rescued. The alternative is to walk out to safety. This alternative should be followed *only* if a town is in sight and the terrain and condition of the pilot and passengers allow it. These conditions seldom apply. So plan to stay with your aircraft.

Surviving until help arrives depends on adequately filling five basic needs: first aid; shelter/warmth; signaling; food/water; and personal comfort.

First aid skills are best learned from experts. Take a good first aid course and learn what supplies you need and how to use them. Remember, you are limited by both space and weight in what you can take along, so only pack materials that you know how to use. Even if you buy a commercial kit, go through it item by item and either learn to use each of its contents, or throw out what you don't know how to use and replace it with something which will be of use to you.

Plan on a five-day supply for the expendables and make sure that you have some pain killers along. Pain contributes to shock and demoralization. Although it is difficult to control pain, it is essential that you try to do so.

Shelter and warmth. In this area more than any other, the killing assumption takes its effect. If you had to plan on spending three days and nights in a commercial meat locker with an average temperature of −10°F, what would you take with you? A light jacket and some frozen fire wood? A lean-to?

The question of surviving cold temperatures, even above-freezing temperatures, is laughed off far too easily. The fantasy of magically building a shelter which will keep us warm is immature. Just trying to gather the material to build a lean-to in deep powder snow can lead to exhaustion.

You may want to try to live in a snow cave. But do you know the limited temperature range in which they work? Do you know how to build one? What about the snow that melts and soaks your clothing?

Even if you know, how can you possibly build a lean-to, or a snow cave with a broken arm or leg?

There is an easy and simple way to provide shelter and warmth. Take along an adequate sleeping bag and ground cloth. The airplane's cabin, if it's intact, can provide shelter and the sleeping bag, warmth. The ground cloth can be sandwiched around the sleeping bag (to look like a hot dog) if no other shelter is available.

Although the FAA insists that the cabin of an airplane is worse than being outside in a lean-to because the aluminum skin repels rather than absorbs heat, I decided to find out for myself. I would measure the rate of heat loss from a known and constant mass in each of several situations.

I enlisted the services of a "lab assistant" to help in the measurements. We began the experiment by recording time and temperature inside the cabin of my Skyhawk, outside behind a lean-to shelter, and outside with a six mph wind.

We found that heat escaped from the cabin 50% slower than from the no-shelter condition and 35% slower than behind a wind break.

We repeated the experiment for rate of heat loss in the mountains of Idaho in a survival tent (nylon with fly—three man). As it turned out, a February blizzard hit us on the first night and we were able to also try out many of the survival gadgets in my survival kit.

The heat loss for the tent was fully 100% less than remaining outside.

A snow cave was not measured because the temperature did not allow the use of one.

Our findings suggest that the intact

cabin of a Cessna 172 is, in fact, superior to a wind break or the ambient conditions outside and is significant in slowing the heat loss rate over those two choices. A nylon tent with a fly was superior to the cabin.

Considering the above, the aircraft can be used to provide an adequate shelter. A tent is much better, however. If the aircraft is lost, keep in mind that mountain rescue teams recommend using an under-the-log shelter wherein pine boughs, small logs, etc. are placed against a fallen tree and more boughs used for a floor. If you're able to use this in support of your ground cloth and sleeping bag—so much the better. If not, the ground cloth and sleeping bag alone will do nicely. Above all, keep your shelter tight and snug.

Depending upon a fire to provide enough warmth to sustain life and limbs is dangerous in cold weather, especially in the high country. Just getting a fire started can be a major task, even with the right equipment. Keeping it going can be a tremendous task and keeping it fueled can exhaust you. (It can be hundreds of yards to the nearest firewood in waist-deep, wet snow).

A pocket cigarette lighter, either the new butane or the trusty flint lighter is the easiest ignitor to have with you. But if you really want to get the job done, take along a couple of fusees. These are the flares that highway patrolmen use to alert motorists to an accident or dangerous conditions. The railroad has used them for years. They burn with an extremely high temperature and last long enough to get even the stubbornest fires started. A can of lighter fluid is icing on the cake.

Locate your fire away from snow-covered limbs (snow melts—puts out the fire) and on top of bare ground or on a log "raft" on top of the snow.

If you are going to depend upon this fire to provide the warmth to keep you alive, you become a slave to it. You must feed it and care for it until rescue is accomplished. This is a great drawback.

With respect to shelter and warmth, keep in mind that protection against the wind is the primary requirement. If you lose the aircraft or if you can't get a fire started, you can still insure shelter and warmth by utilizing the ground cloth and sleeping bag—set them up to protect yourself from the wind.

My recommendation is this, take along a Polarguard or Dacron II sleeping bag and a 9 by 12 waterproof ground cloth for every other person on board, minimum. Plan your activities so that you will always keep your sleeping bag dry.

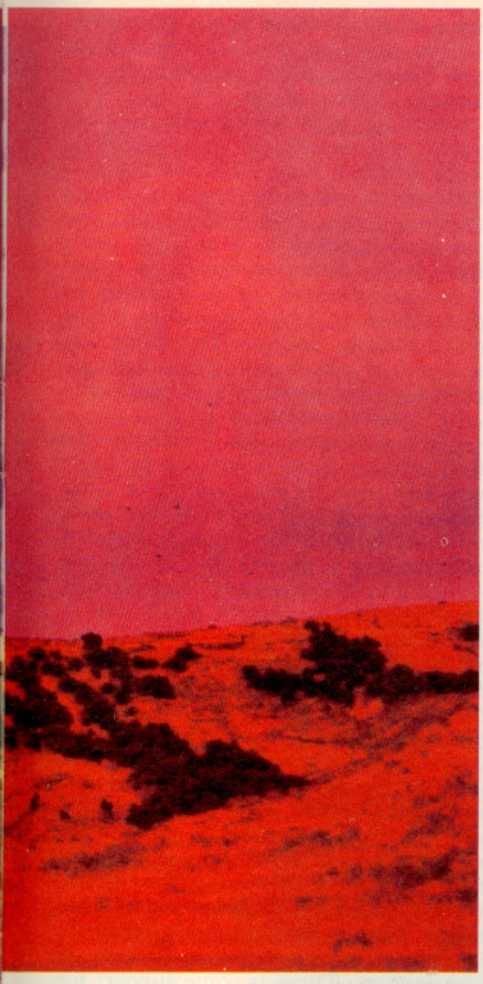
I suggest a Polarguard bag over a down bag because even though it is slightly less efficient under dry conditions, when it is wet it will offer more warmth and can be dried out more quickly over a fire.

When you are planning on traveling over extremely rugged terrain, throwing in a small tent is not a bad idea. This will give you a strong advantage over the elements.

There are other items of shelter and warmth that must also be considered. Gloves or mittens are mandatory. Waterproof boots with heavy socks are strongly recommended. Garbage bags can be substituted for waterproof boots, but are easily nipped.

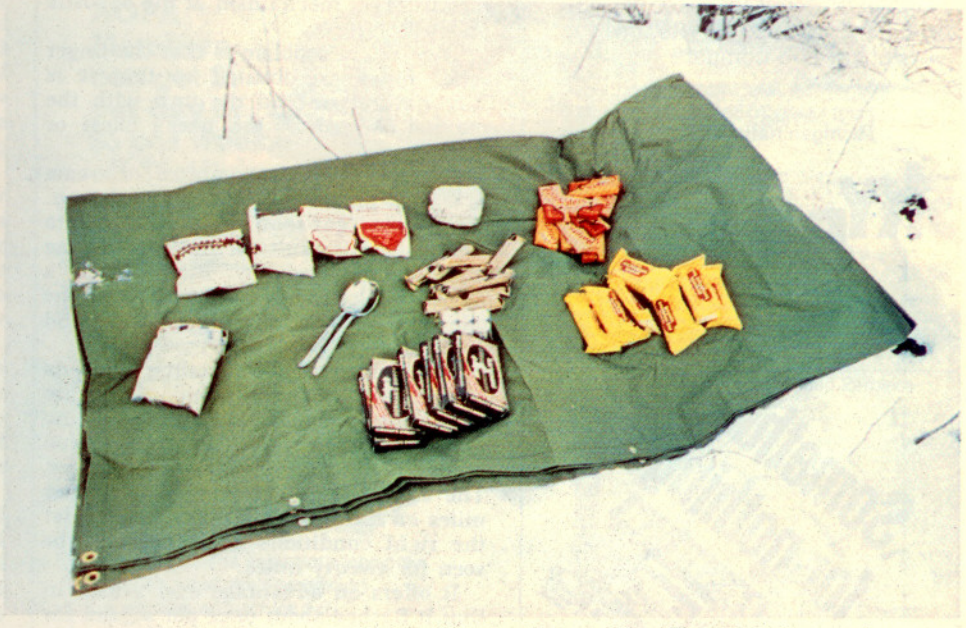
An arctic hat, balaklavia, or other cold weather hat is extremely important. Almost half of the heat loss from your body is associated with your head. This is due to the tremendous volume/flow rate of blood that goes to the head. A proper hat can conserve that precious body heat.

To aid fellow pilots in finding us in a timely manner, we can employ some signaling devices. Obviously, our ELT comes into play at this time. It probably will be credited with getting a search plane into the general area within 24 hours. But let's help the ELT out by also having a way to show the S & R pilots exactly where we are when they fly by.



After waiting from two to five days for your rescuers, you may have only one shot at being spotted. How can you best make that shot count.

Makeshift tools may not be enough in mountain wilderness. This array, compactly packed, will give the pilot a fighting chance.



Living off the land is more than difficult in high mountain country, especially in winter, so plan to have provisions along.

Keep in mind that, should the ELT fail, these items will be the primary signaling devices.

You may have only one shot at telling someone where you are. Will you be satisfied to gamble your one shot with a fire? Can you get it started in time? Will it be bright enough in time? Will it smoke enough before the search plane passes by?

Every book that I have read on survival strongly recommends a signal mirror over all other signaling items. To discover for myself why it is recommended so highly as well as what other signal devices might offer, I enlisted the aid of two companions. We would put several signaling devices to the acid test: One man on the ground would use them while the second man and myself, all armed with walkie-talkies, would fly a search pattern over him in my Cessna 172 and observe and photograph their effectiveness.

This exercise provided a good indication of what can be expected from signal devices.

continued

Your first priority will be first aid. These supplies can be easily stored and, if you know how to use them, may save your life.

For a clear day, the signal mirror is unequaled. Its drawbacks occur on cloudy days, at dusk and dawn, and when the sun's position prevents reflecting a signal to the target. Remember, the sun and the target must be approximately on the same side of the signaler.

The aerial night flares are useless in daylight conditions. Two flares were photographed in the dusk hours and proved to be brilliant and easily spotted.

The night flare's drawbacks are obvious. They're good only from dusk to dawn. They are brief, burning only about 10 seconds. And a commercial one by SSI had two design problems which caused our ground man to injure himself. All the military flares I have seen are triggered by pulling a ring fixed to the muzzle end. The SSI flare has a trigger mechanism at the opposite end.

The second problem is that the finger relief flutes are located so that it is very natural to hold the unit with the muzzle pointed at the user's chest or abdomen.

These two problems united to create a serious problem for our ground man. He almost "gut-shot" himself trying to signal us. His fault for not reading the instructions? Probably. But what if a novice is closest to the flares when the one search plane appears on the second or third night out?

An excellent night signaling device is offered by Honeywell, Inc. They are marketing a small, portable strobelite (Model 2700), which runs for seven (plus) hours on two size "C" batteries. The strobelite could be seen for many miles on the night I tested it and under the right conditions could probably be seen for twenty miles.

It offers an advantage over a flare in that it flashes about once per second for hours. A flare, however, can gain altitude which may be important in some applications.

Smoke bombs were good during the day. They were easy to spot and the gentle breeze created enough motion to further aid in detection. The wind also caused the smoke cloud to disburse in about one to two minutes. Obviously a strong wind would make their use ineffective.

The flame orange cross was extremely effective. Its fluttering motion due to the breeze caught our eye the moment we turned level about one mile away. It has the advantage over the mirror, the flares, and the smoke bombs in that it is not dependent on the plane-to-sun position, the wind, or the proper timing. If I had only one signal tool to choose, it would be the orange nylon cross.

My recommendation for signaling is this: Take one signal mirror, three flares or the strobelite, three smoke bombs, and the orange cross. They are small, inexpensive, and give you the benefit of hedging your bet. Remember, you may get only one shot at being seen. And our basic premise is to await rescue. Don't forget to try your communications radio on 121.5 MHz (if it is intact) when you spot a plane.

According to most experts, you can live three days without water and three weeks without food. This doesn't take into account what three weeks without eating or three days without drinking does to your desire to live. It can bring about deep depression which may contribute significantly to your death by other causes. It is best to plan on eating and drinking, perhaps sparingly, but regularly. For both eating and drinking purposes, a fire or stove is a luxury, but a most convenient one.

In the winter months, I seldom take along any liquid as it will freeze. I rely on melted snow. It is unwise to eat snow before melting it, I am told, because it wastes body heat and often contributes to the feeling of thirstiness. To melt the snow I purchased a small backpacker's gasoline-fueled stove. It burns like a blow torch, lasts several hours with each fueling, costs about twenty bucks and looks rugged enough to handle a crash without damage. It also has its own small pot/cup and can use remaining gas from the aircraft as its own fuel.

A few tea bags or a pouch of coffee will provide some taste to the melted snow and will do absolute wonders for your morale. It should be noted, however, that in the case of serious injury or a possible dehydration situation, pure water (melted snow) is much better.

In the summer, a gallon of water is easy to carry. There is some support for using "Gatorade" as it is supposed to contain certain electrolytes which could be helpful, although I cannot find a specific endorsement at this time.

It is a mistake to believe that you can live off the land in the winter months here in the Rockies! If you land in the high mountains all the big game will have already vacated. The remaining squirrels and rabbits may or may not exist in the particular habitat in which you have crashed. Even if they do exist there, you may be severely limited in your ability to catch them. At best, game animals will be few and far between.

There are hundreds of food items, however, that can be taken along as part of a survival kit. The trick is to correctly trade-off perishability and food value (calories), for weight, bulk, and handling ease. Backpackers have been doing this for years. Their jobs have been made easier in the last few years by new foods and food processing techniques.

In general pack some high energy food in the form of candy, chocolate (Hershey's Tropical or Baker's Chocolate) and hard candy; bulk and warmth foods such as oatmeal and freeze-dried trail foods; hot liquids such as dried soups and hot chocolate powder; and salt. Better plan on three to five days full ration supply.

Now, with the backpackers stove, a quick cup of soup or a trail dinner can be prepared without the ordeal of first building a fire.

The next question is one of personal comfort. Why worry about personal comfort in a one-in-a-million chance that you'll need it? There is a simple answer. The answer is "morale" which translates into sustaining your "will-to-live and survive".

For me, there are a couple of things that maintain or restore my spirits when in a tight spot. A cup of hot coffee and a daily brushing of my teeth. One old salt swears that he has in his survival kit a bottle of champagne. He says it's to be used in the event of a crash to help his morale and brighten his spirits. Another says he must have a pillow. The important thing is to be sure that those few items of personal comfort, which make the difference in morale for you, are on board.

The feelings of loneliness and despair are the most severe survival stresses. Plan on having something to combat them. A good book may help pass the hours of waiting. Maintaining a log book can also help. It can be very useful to others as it may contain clues as to what to do or what not to do when it is analyzed later on.

Finally, you may wish to take along a few primary tools. The author's list includes a pair of pliers (with side cutter), a wire saw, snare wire, fish hooks, line and sinkers, dental floss, small sharpening stone, survival knife, .22 caliber survival rifle (AR-7), a steel handled hatchet and aluminum foil.

Finding a container that will package your survival paraphernalia is no small task. It should be rugged enough to take some banging around and yet be light in weight. I have never found the ideal container(s) and any suggestions would be welcomed. Currently, I use army surplus ammo cans. They are strong and waterproof—but very heavy. They can double as water pans, etc. I am exploring the idea of storing items in knapsacks or possibly a custom, multiple-pouched affair which would hang from the back of the rear seat.

Pilots are taught to plan ahead. Survival is no exception. Be prepared. Before you climb into your airplane ask yourself—"Am I prepared to survive in the terrain over which I will be passing?" Accept the fact that it *can* happen to you. Know that panic and exhaustion are real dangers of cold weather survival. Have a plan to prevent both. Know that mental obstacles can be more a factor than physical ones. Prepare a "checklist for survival" which gives you a step-by-step checklist of what to do in a survival situation. The planning will be invaluable. You will have already done most of the thinking before you are placed under the stress of a crash landing. You might take a course in survival. Several groups including the AOPA and NRA offer excellent ones.

In the event of a forced landing, will you be prepared to handle first aid, shelter and warmth, signaling, food and water, personal comfort, and the will to live?

Or, will the killing assumption kill you? □