SHELTER AND PERSONAL PROTECTION GROUP

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More than any other, this category is dependent upon where and when you will be flying. You should always start out by dressing appropriately for the terrain and climates you will be passing over, not what it will be like at the conclusion of the flight. The basic kit should also contain some additional means of maintaining warmth and sheltering survivors from the elements.

Ponchos, blankets, individual survival shelters or large heavy duty garbage bags (if you are on a severe price or weight budget) can really make a difference in poor weather. The biggest aid all these items offer is to cut down heat loss by blocking the wind and enclosing the person in an impermeable vapor barrier, slowing loss of heat into the surrounding environment.

> **TIP:** A large garbage bag or two (a bright color is best, but any will do) will provide very effective, inexpensive and compact personal emergency shelter or serve as a poncho that will fit in your pocket. Many people have survived using them. To use, hold the bag upside down and go to one of the corners (a bottom corner, but now on top as you hold it), drop down about eight inches along the crease, and cut or tear a slit or hole only big enough for your face. Pull the bag over your body so that the corner rests on top of your head and your face sticks through the hole. Be sure to keep your head out where you can breath, you can suffocate inside the plastic if it covers your mouth and nose. Use another bag to pull up from your feet. You can stuff the bags and your clothing with dry leaves for added insulation, but be careful not to introduce any unwelcome pests into your improvised shelter. To use as a ponch0 and rain pants, just add holes for arms and legs, use some line to tie tight around you body for easier movement.

One of the most common survival and first aid shelter products is the metallized Mylar emergency "Space" blanket. This concept of a reflective surface to provide insulation was developed originally for use on spacecraft. The light weight and reflection of body heat are promoted heavily, but research indicates that, in fact, this reflective capability has negligible or no insulative or heat gain effects compared to plain plastic. The benefits come entirely from the shielding and enclosing effect they have.

Still, the space blanket is a readily available and reasonable compromise of weight, space and cost. It makes sense to include at least one metallized Mylar emergency "Space" blanket and either additional blankets or similar metallized Mylar emergency sleeping bags for each person. The bags are far better that the blankets. Drawbacks to these metallized Mylar blankets and bags is that they tear and rip easily, they are noisy enough as you shift position that they can drive you nuts and they are not fire resistant.

These super light mylar based products are not nearly as good as those which have a ripstop backing (XTG laminate), though XTG based products are necessarily a lot more bulky because they include this extra material and must be laminated to another layer of material, usually some sort of plastic. These can be found as "Sportsman Blankets" and as various "Thermal Protective Aids" or "TPAs" which fully enclose the individual, some as a "suit" (FitzWright Company Ltd.), others as more of a "bag with arms" (Stearns Mfg.). The problem with arms and legs in these procyts is they are not as efficient at retaining heat, the advange is that you can still perform many tasks from inside the TPA. In my opinion, the toughest and therefore most reliable, as well as most versitile of these is the "LAND/Shark," from Corporate Air Parts, which is designed for use both on land and in the water (as illustrated here). It can also be turned into a tarp by slitting the seams (see below). It is vacuum packed inside a very tough bag for protection from abuse in storage.

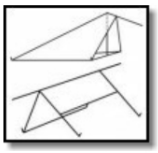
A Haven From The Elements

A lightweight tarp, plastic sheeting or tube tent is important for shelter from the sun, wind, rain, snow and whatever else Mother Nature throws at you. Depending on the size of your kit, more than one may be required to shelter your party. These can be made of virtually any waterproof material, though for desert use it must be opaque to provide good shade. Generally, the cost rises as the weight comes down, as is so often the case. Bright colors are recommended to aid rescuers, light reflective colors for deserts, darker colors for Arctic environments.

Experienced outdoorsmen will probably prefer working with a versatile and reasonably sized (8 x 8 ft. or 10 x 10 ft for two people) tarp while the less experienced may prefer the simple tube tent which is more easily erected, if somewhat less versatile and a lot less satisfactory in many circumstances. Note that a tube tent becomes a plastic tarp with a little assistance from a knife, so you aren't absolutely restricted to what you do with it, if you know how to do better. Grommets in a tarp are handy, but not vital.

For my personal survival kit, I have selected an ultralight (1.1 oz. 30 denier) sil-nylon (silicone impregnated ripstop nylon) tarp by Oware, custom made for me by David Olsen in bright orange. His quality is impeccable and I like the extra reinforced tie-outs he includes for the added versatility they offer in set-up. This is the lightest material available at this time and saved me considerable weight. I have vacuum packed it in my kit for minimum volume.

Tarp-Shelters - An Introduction - In this document David B. Macpherson provides an excellent introduction to the subject of tarp shelters. There's a wealth of information on their use and construction, covering everything from the most basic immediate action shelter to sophisticated multifaceted structures. Review the multitudes of shelters that can be created from a simple tarp.



While tube tents are so popular because they are cheap and, ostensibly, easy and quick to set up, even for the novice, they do have some significant deficiencies, in my opinion, compared to other choices which, admittedly, require a bit more experience to use to best advantage. One of the most problematic things is that it is a tube and is generally just left as one. As such, it can easily become a very drafty and cold tube, no matter how it is placed with respect to the prevailing wind. In the rain, any water that blows in will collect on the impenetrable floor, making a nice wading pool.

True, they go up quickly, but they aren't very sturdy at all. A good tarp will go up nearly as quickly and can be easily secured. Unless you secure the ground points somehow and put in a ridge pole, it will tend to sag badly, especially in winter or heavy rain, when you need it the most. It can be a PITA to secure the ground points or to come up with a real framework. Sure you can carry quick clamps, Visklamps and such, but for those kind of set-ups you are better starting with another shelter to begin with. Tube tents are generally too small and tight to properly insulate underneath yourself with local materials, and a PITA if you do try, since the floor is so slippery.

They are difficult to heat, nearly impossible. They are either pretty heavy or made of flimsy cheap plastic that won't stand up to abuse. The better quality tube tents are much heavier than a good lightweight ripstop nylon tarp or fly which is still much stronger. The plastic can get terribly stiff in the cold and can even become brittle at seriously cold temperatures. They have been known to shred in a bad wind or hail. If torn, which is easy to do, they are nearly impossible to mend in the field. Even duct tape often won't stick. Next time, I'll tell you what I really think.

Home In A Package

If you are looking for a real tent to include, whether for ease of set up or for extreme cold climate protection, be sure to purchase a good quality tent. You won't find a quality tent at a discount sporting goods store, no matter what sales pitch they give you. A quality tent costs more. Companies like North Face, Kelty and others make reasonably priced, though not cheap, three and four season tents which offer good performance, though they aren't the lightest. These will all include a separate "rain fly" to keep out any precipitation. The fly adds to the weight.

It is somewhat axiomatic that the person who needs the tent the worst, the inexperienced pilot or passenger, is least likely to be able to sort out the instructions for erecting some tents, especially in the dark on a cold and windy night. Ease of setup should be a primary consideration. One of my experts suggests that when shopping for a tent, it might not be a bad idea to bring along someone totally inexperienced in setting up tents and use them to test any potential candidates. Always pitch the tent before packing it up to ensure everything required is there and works as it is supposed to.

If weight is a big concern and money less of a concern, you have two excellent choices. Both offer only single wall designs, which saves weight, as well as utilizing other techniques to reduce overall poundage. Bilber Tents make very lightweight, expedition quality, single wall tents with a reputation for taking anything mother nature delivers. Expensive, but worth it if weight is a concern.

Stephenson Warmlite Equipment produce incredibly lightweight and somewhat radical high-tech single wall tents (as well as sleeping bags and clothing) which they will customize to your requirements. These represent the ultimate in light weight and high performance, so be prepared to dig deep into your wallet. They are very expensive, but worth every penny if weight is a serious concern. Note that there is generally a considerable backlog of orders and you should allow for weeks, sometimes even months, of delay in receiving your order. It is worth the wait. A warning: prudes may not appreciate the "natural beauty" of their catalog and video.

Sun Shines Hot

In a desert environment, on the water and especially in snow country, dark glasses are indispensable. I chose a style of very dark polycarbonate sun glasses, with sideshields for increased protection, that can be worn over most normal eye glasses. Anywhere the sun is going be a problem, such as the desert or on the water, a good shade hat will be very welcome. You can fashion head protection from salvaged material, but a hat will be very much appreciated. Choose one with a big brim or a design that also provides protection for the neck and ears. For hot weather use, be sure the crown is well ventilated to allow heat to escape, otherwise you can create more problems than you solve.

Whether you find yourself in the desert, on the water or surrounded by snow, the sun can create problems. Not withstanding hats, proper clothing and shelter, sun screen can help protect tender skin from sunburn when you have no alternatives. High SPF ratings are important under survival circumstances, SPF 25 or better is recommended. Waterproof sunscreen will stay on longer and protect better under all conditions. Sweating heavily in the desert can wash away non-waterproof sun screens as quickly as can swimming in water.

Zinc oxide is virtually sun and water proof and can be especially useful for particularly sensitive areas like the nose and lips or for people with very sensitive skin. It can be used all over, although most will find it isn't as comfortable when used over larger areas. Two products I can recommend are Sawyer "Ultra One" (SPF 30 and 45) sunblock and "Bullfrog" SPF-36 sunblock. Both come in small and easily packable containers, starting at 1 oz. The Sawyer products also have a unique 2 oz. flat plastic bottle that packs very well and is a perfect size for a two to four person kit. I use the Sawyer products exclusively with excellent results on the water and in the desert. The Bullfrog is very concentrated and is the smallest package for the coverage provided. The Sawyer is much more comfortable to wear, especially in very cold weather. Another product I recommend is Blistex "Ultra Protection" SPF-30 sunblock lip balm. This is more comfortable to wear than zinc oxide and seems to work well for most people.

If you are seriously sun sensitive, pack some lightweight sun-blocking clothing such as Solumbra brand made by Sun Precautions. The Solumbra cloth itself imparts an SPF 30 protection, even when wet. Most lighter weight clothing, even many dark fabrics, doen't actually do much to block the sun's rays. The typical white t-shirt is pretty much useless, even more so when wet.

Hand Protection

A pair of leather or leather palmed work gloves can provide welcome protection for tender hands and prevent painful blisters and injuries. Small hands will fit in large gloves, but not the other way around. A cinch strap on the wrist helps keep them from slipping off, especially if the user has smaller hands. Pigskin or deerskin are my first choice since they are more durable and more supple than cowhide. Most smooth leathers will shed water a bit, but all could stand being treated with waterproofing treatments. Breaking in the gloves by using them a while before sticking them in your kit improves the comfort level if you ever need them and reduces the chance they will cause blisters.

Don't Be Bugged

In a tropical environment, or anywhere else that biting bugs present a serious problem, plenty of bug netting and mosquito net head covers will be much appreciated

(required in Alaska). The best headnets have two hoops, top and bottom, to keep the netting away from your face. This arrangement is a lot more comfortable, and effective, than the unstructured kind or the ones with just a single hoop.

There are few places in the wilds where you won't have to deal with bugs to some degree or another, but this is especially true in tropical, swampy or forested areas. Every kit should include insect repellent. For years, repellents that contain high concentrations (95 to 100%) of DEET (N,N-diethyl-m-toluamide) have been considered the most effective against mosquitos, ticks and chiggers. However, it has been found that some people do not do well with the concentrated DEET repellents and no one should use such products for extended periods of time. DEET is absorbed through the skin with the potential for serious adverse effects. There are concerns, based on a few isolated incidents, that for a very small segment of the population DEET can even be toxic, with no clues as to why or how to identify these persons.

More and more, experts are recommending that repellents should contain no more than 30% to 35% DEET. The American Pediatric Association recommends that children and infants should not be exposed to more than 10% DEET. Some doctors believe that infants and pregnant women should not use DEET repellents at all. There are even some don't think anyone should put it on their skin, just use it on clothing, though the effectiveness is significantly reduced. An added concern about DEET, particularly in its high strength formulation, is that it can harm many plastics and synthetic fabrics, up to and including melting them. So, keep any high percentage DEET product tightly closed, protected and segregated from any other plastic items in your survival kit or gear or face damaging them. In other words, be very careful.

The U.S. military tested many products and settled on a repellent with approximately 32% DEET concentration with results reported to be comparable to repellents with high DEET levels. 3M's "Ultrathon" is the commercial version of this formulation. It can also be found in many military surplus stores in its original military olive drab tube.

DEET isn't effective for gnats, no-see-ums, biting flies, fleas and the like. Various compounds, including citronella, are included with some repellents which are supposed to repel these annoying pests. You can either get a multi-repellent product or ones which contain a single repellent.

Some people swear by the various natural repellents on the market. Most of these contain citronella or similar compounds which bugs find offensive. Natrapel, Green Ban and Muskol are examples of this type of product. Or, you can just buy citronella at a health store. One disadvantage to these natural repellents is that they need to be reapplied more often than the better DEET or composite repellents.

These may be worth packing, if DEET is an issue for you or because they seem to work better for some people than does DEET. And, that's an important point. It seems that no matter what product you ask people about, they will endorse one and belittle all others, based on their personal experience. That suggests that the effectiveness of any particular repellent is at least somewhat dependent upon its interaction with a person's body chemistry. The manufacturers say no, but anecdotal evidence suggests otherwise. Obviously, if you've found a repellent that works well for you, pack it. How well it may work for others in your party is another matter. You could make a good argument for packing both types in your kit, to cover all the bases.

After sending off samples of many products to friends in buggy places and talking with numerous others, I've settled on Sawyer "DEET Plus," a multi-repellent product (also marketed as Sawyer "Body Gard). This composite multi-repellent product has a low level of DEET (17.5%) but seems to work satisfactorily. Sawyer claims this is the result of inclusion of a "synergist" which increases the effectiveness of the DEET, eliminating the need for higher DEET levels. Another ingredient (Di-n-propyl Isocinchomeronate) is included for the other nasties on which DEET has no effect.

Another option, if you have the room, is to include a spray can or pump spray of Permethrin, available under many brand names. This chemical is really an insecticide, killing both mosquitos and ticks. It is very effective, but a bit slow acting, taking about an hour to kill the pest. This works fine for ticks which take hours to attach themselves, but not nearly so well with mosquitos, who can still bite before they pass away. It is not for use on your skin, which deactivates the active ingredients, rather it is sprayed on clothes, tents, etc. One application lasts for about two weeks, even if wetted. The best solution for dealing with these critters is to use a good repellent and Permethrin, attacking them with a one - two punch.

Finally, you can get suits of netted and absorbent material which will serve to protect you and can be soaked in repellent as well. These would be especially appropriate for anyone with a known problem with DEET.

Brrrrrrrrr!

As you move into more frigid environments, the requirements for protecting the fragile human body increase significantly. Remember, we gave up our own fur coats eons ago. Without appropriate protection from cold, chances of survival are reduced significantly. It is worth noting that desert areas can get quite cold at times. Even when warm during the day, they can drop below freezing at night. Deserts are defined by lack of water, not the heat we so often associate with them.

Bear in mind that the wind chill can dramatically lower the effective temperature, so that even a light to moderate wind in cool temperatures can result in an effective temperature below freezing. In other words, don't take the predicted lows along your route as the conditions you need to be prepared for. You will likely have to deal with much lower effective temperatures, if you have to move about or construct your own shelter. If it is wet and you are soaked, it will be even worse.

Many commercial kits now include chemical reaction heat packs to provide warmth. Depending upon size, they can be used inside mittens or in pockets to warm hands, inside clothing or sleeping bags, inside boots or shoes, even to provide some warmth inside a *well insulated* shelter. They can also be very effective for extending the life of battery powered devices, such as an ELT, in cold weather. Frigid temperatures normally significantly reduce their functional life since batteries are adversely affected by cold. These hot packs come in a variety of styles and sizes. Most generate somewhere around 130 degrees F of heat on average, starting out a bit higher and ending up a bit lower. At the upper end they can get hot enough to burn, so they must be used with care.

The most popular, and best choice in my opinion for survival purposes, are single use, air activated, dry ingredient "Warm Packs." I recommend those marketed by Grabber. The chemical reaction starts when you open the individual package. These are the lightest, longest acting (12 and 20 hours) and least expensive. There is always a risk the outer packaging could be breached while in storage, though it's reasonably tough, and the chemical reaction thereby expended. I'd recommend that these air activated packs be themselves vacuum packed for additional security. Expiration dates (three years) are stamped on the package.

Other designs contain liquid ingredients and are activated by bursting an internal package of catalyst, allowing the two compounds to mix, generating the heat. These are also single use, weigh quite a bit more, generally don't have as long life and care must be taken in packing that the internal catalyst isn't crushed and activated.

Lastly, there are liquid packs which are renewable by *boiling.* They are activated by manipulating an internal metal disc which acts as a catalyst, changing the liquid into a solid and thereby generating heat. These tend to be a bit heavier, more expensive and generally have the shortest working life, but for some, the renewable feature make them a good choice.

Colder Still

If it is likely to get colder than freezing and especially as you approach zero (F) or below, you really should have a proper sleeping bag for each person, appropriately rated for the temperatures expected. An insulated parka combined with a half sleeping bag or convertible bib (available from Exploration Products, (see 16.7) is an

rated for the temperatures expected. An insulated parka combined with a half sleeping bag or convertible bib (available from Exploration Products, (see 10.7) is an excellent compromise between utility and weight. Additional cold weather clothing (thermal underwear, insulated and waterproof jackets/coats, pants and boots) and protection for extremities (gloves or mittens, thermal socks and insulated head/face covering) should also be carried.

In extreme cold weather a good tent or survival shelter is invaluable. The importance of this equipment cannot be overemphasized. Exposure to extreme cold is an incontrovertible threat to survival and even moderately cold weather can be deadly.

The extremities are most readily affected by cold weather and the easiest to provide for since the equipment is relatively small and light. Remember that you lose the most heat from your head and keeping it warm is a priority. The best all around protection for the head is a knit watch cap or pile hat with ear flaps. Spare socks are very important; the feet are at greatest risk in a cold weather survival situation and dry socks are vital for maintaining warmth. Your perspiration alone will soak your socks in short order and even those designed to wick the water have their limits. Mittens are warmer than gloves and the only way to go in extremely cold areas.

Think layers in selecting your cold weather equipment. Not only does layered clothing retain heat more effectively, it allows you to shed layers when working, cutting down on excess sweating which can soak your clothing, reducing its insulating ability. Even the best vapor transmission fabrics can't keep up with the moisture resulting from heavy sweating. If you wear good boots and a good parka, then the addition of midweight or heavyweight thermal underwear and a pair of weather resistant overpants will increase your protection against the cold significantly.

Never wear cotton clothes in cold weather, especially not for underwear. Remember the "c" in cotton stands for "cool." Great in hot weather, but exactly what you don't want in the cold. Wool is the natural material of choice for cold weather wear. The "w" in wool stands for "warm." Wool will also retain much of its insulating properties when wet. The disadvantage of wool is that it doesn't wick moisture, it retains it, but it also retains its insulating properties when wet, an important advantage. Unfortunately, it can also be uncomfortable against the skin. The one exception we've found is SmartWool underwear, which is extremely comfortable and an even better insulator than conventional wool (and it doesn't shrink!). We've become big fans of SmartWool, both for comfort and as an excellent insulator.

In order for the modern high tech weatherproof fabrics such as Gore-Tex, to do their job and vent excess moisture, (and some question whether they really do work) the moisture must be moved to this outer layer. If you wear anything at all that retains moisture, cotton underwear or a flannel shirt, the layering system will not work properly. So, while the outside moisture may not penetrate the outer layer, you can still end up with soaking wet under layers which can create a hypothermic situation. Fishnet underwear is another option for a first layer, one that many find words well for them.

A word of warning, however, for those who would wear plastic based materials during flight. For pilots there is a potential dark side to these fabrics, and most other similar common synthetic clothing materials. Most of these man made textiles have a very low melting point, 250 to 400 degrees Fahrenheit is typical. This means they could melt, if you are caught in a fire after the crash. That can cause serious, life threatening problems, assuming you survive the fire and get out. Fire resistant materials such as Nomex and PBI don't wick moisture all that well, and have little inate insulative capabilties, but they won't melt and obviously offer the best protection against fire. You must balance the risk in a fire against their cold weather performance and come to your own conclusion.

Natural fibers have a much higher resistance to heat and flame than the synthetics typically used for insulating garments and will char before melting. Wool is an excellent insulator and is naturally flame resistant. Silk also has excellent natural flame resistant capabilities. Silk is also very warm and has been used as a lightweight insulating material for centuries. Neither is as good as Nomex or other man-made fabrics, but still far superior to typical synthetic insulating materials as far as fire-resitance goes.

For cold weather areas, the U.S. Air Force issues Nomex outerwear and underwear for use with Nomex flightsuits. These can sometimes be found as surplus in good to excellent condition. You can also get used, good to excellent condition Nomex flight suits and winter weight jackets on the surplus market at reasonable prices. Another source for fire resistant thermal underwear is the auto racing industry. They offer Nomex and other similar fabrics as thermal underwear for use as part of driver's fire protection. For those desiring fire protection without use of "flightsuits," Bulwark Protective Clothing make a complete line of conventional clothing made of Nomex and other fire-resistant materials. There are also a few Nomex fleece products out there that do offer insulative properties.

While goose down is the traditional insulator of choice for outerwear and sleeping bags and the most effective for weight, it requires care in use and doesn't do well in wet conditions. Wet down has virtually no insulating qualities and doesn't dry out easily. For survival use, where abuse and lack of proper facilities and knowledge may be more likely, the newest high tech synthetic insulation may be a better choice. The latest materials are only slightly less efficient than down and still retain considerable insulating qualities when wet while standing up better to abuse. They do weigh slightly more for comparable insulation ratings and don't compress as well as down, making for a larger pack. Many types also don't loft as well as down after being compressed or vacuum packed, a serious drawback if that is part of your plans. On the other hand, some of the synthetics pack well and regain loft even better than down, so you have to shop around. You must balance these attributes with your experience and likely conditions to arrive at the best choice for you.

Wiggy's makes a line of sleeping bags, insulated clothing and the like that use his proprietary Lamilite synthetic insulation. These products are very highly regarded and worth a look if your cosndiering dealing with seriously cold weather.

Much of this equipment can be compressed into relatively small packages for easier carriage using compression sacks. If this isn't enough, clothing, sleeping bags and tents can be vacuum packed for minimum size and long term storage. Exploration Products specializes in this sort of packaging and the results are impressive, but it doesn't come cheap. Putting this cold weather gear in a separate kit will allow you to carry it only when needed.

Finally on the subject of cold weather gear, if snow is in the forecast, particularly deep snow, snow shoes would be an extremely good idea. Alaskan and Canadian regulations require them for a reason. I can't make any recommendations myself at this time, though testing some snow shoes is on my list. There are reportedly good, lightweight emergency snow shoes available.

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