

Survivalak





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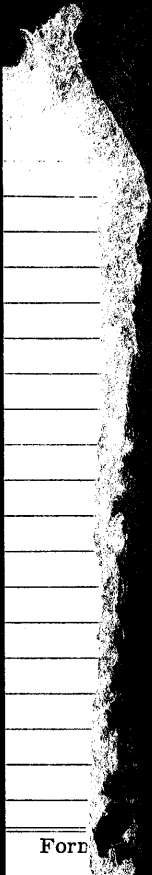
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Ford

Survival

A manual for aircraft crews forced down in all parts of the world—including hints on living off the land, building shelters, traveling, protection against disease, saving life and limb.

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FOREWORD

"A Word to the Unwise" seems a more suitable title for this book. It is written in your language and mine, and fully covers every possible angle of safety known. While other data may be prepared on this subject, nothing can surpass the splendid and comprehensive manner in which this material has been compiled.

The careful study of this thorough treatise should be compulsory for members of the Armed Forces, and a "must" for every person working in civilian capacity whose duties might, even remotely, require this life-preserving information.



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A word to the wise

THE aim of this book is to help you get out of a jam almost anywhere. But we can't help you if you don't help yourself.

Before every trip check over your emergency equipment! Make sure that nothing is lacking, no matter how small. Matches, fish hooks, pocketknife—they may mean all the difference between life and death.

Lieutenant James C. Whittaker of the Army Air Corps, who was downed with Captain Eddie Rickenbacker in the South Pacific, October, 1942, wrote bitterly of their sufferings from lack of food and water:

"All bombers in that region carry jungle packs zippered into the cushions of the parachute. Each is supposed to contain a flashlight, jungle knife, fish hooks and line, hard biscuit and chocolate . . . [Someone, however, is] always pilfering them. I remember hoping that whoever had taken our biscuit and chocolate might someday be as hungry as we were then."

► Take inventory yourself! Don't let George do it. It's you who may be cold and hungry, not he.

► Repeat the check-up each time you make a stop. At every field something may disappear.

► Often you may have to fly over several different types of country, all in the same trip—jungle, desert, and ocean, for instance. Make sure you have emergency equipment for each region.

Caution never made a sissy out of anybody. It's the experienced pilots who take most pains with their emergency equipment. They know what they're up against.

A forced landing anywhere is a challenge to survival. All over the world men and women are drifting on the ocean, stumbling through the jungle, lighting signal fires on the desert, using their wits and beating fate. . . .

If they can do it, you can too

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SURVIVAL IN THE ARCTIC

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MOST people think of the Arctic as a land of continuous blizzards and perpetual snow—so barren that like Charlie Chaplin in *The Gold Rush*, hungry men have nothing to eat but their shoes. That's nonsense. All the blizzards are local; there is less snowfall than in Iowa; the coastal temperatures are higher than those in the lowlands of Wyoming. If you are properly dressed and equipped, you will probably mind the cold less than you would on a windy winter's day on North Michigan Boulevard in Chicago. In many sections of the North there are plenty of animals: bighorned sheep, moose, caribou, bears, wolves, foxes, beaver, seal, whales and walrus—all good to eat. As for colds, pneumonia, or tuberculosis, you run practically no risk of catching them in the uninhabited parts of the Arctic; the germs which cause these diseases do not exist there.

Your chief danger is not from cold or polar bears, but from yourself. Get rid of all your old notions about the frozen North. Let your mind thaw out. Don't fight nature; play along with her. If you have the right equipment, know a few tricks, and are in good condition, there is little reason for you to freeze or starve. The winter nights are long, but they are not as dark as you suppose. The stars and moon give a clear, cold light which is magnified by the shining snow. If the gloom and loneliness get you down, remember it is only your nerves. The best cure for the blues is plenty of work, or a good long sleep.



ARCTIC EQUIPMENT

Arctic

Glut

Snowshoes

Small Primus Stove

Shovel

Eiderdown Sleeping Bag

Army galley kit, containing cooking pan, cup, fork, spoons

Small housewife's kit, containing large safety pins, needles, cotton, darning wool, buttons

Four ounces of light flexible wire for making a snare

1-gallon container for gasoline

Candle (for starting fires and heating up tent)

Carry on Your Person:

A flint lighter or waterproof matches in a waterproof box

Hunting knife

Pocket compass

Signaling Devices:

Rockets

Very pistol

Special glass signaling mirror, about 5½ inches x 7¼ inches, ½ inch thick, with a cross in the center for sighting

V-K smoke signals

Fishing Kit: (No. 5 Pinchot-Lerner lightweight fishing kit for rafts) — complete with instructions, net, knife, assorted hooks and lines, bait, etc. Be sure it contains a pair of cloth gloves, so you won't cut your hands on the line.

Winter Clothing: (also needed for summer on the coasts)

Complete Arctic Suit, including:

Inner pile parka (hair-side worn toward skin)

Outer pile parka (hair-side out)

Windproof fabric parka (to be worn over the other two)

Inner pile trousers (hair-side worn toward skin)

Outer pile trousers (hair-side out)

Windproof trousers (to be worn over the other two)

Arctic belt

1 pair wool cushion-sole socks

1 pair wool ski socks or Arctic socks

1 pair duffel socks

1 pair net socks

1 pair big-size mukluk boots with insoles

(Take two extra pair of socks)

2-piece woolen underwear and change

1 pair wristlets

2 pair woolen mittens

1 pair leather gauntlets

IMPORTANT: 2 pair of the best amber-colored sunglasses with shields at the edges. Ordinary beach glasses are no good. Do not get glasses with metal frames. For chapped lips carry a stick of pomade.

Additional Equipment (for summer in the interior):

Broad-brimmed hat

Fine mesh net to cover hat and face

Mosquito net for sleeping

If you have a favorite bug dope, take it along. If not, see page 28 for a good prescription. Have your druggist make it up before you start.

Food: Make it a rule not to carry less than five pounds of concentrated food per man. Pack it in waterproof packages or containers. If you carry food in 5-gallon cans, you can use the empty can for cooking or melting snow.

The following grub is carried by Canadian fliers: Tea, sugar, salt, flour, beans, rice, prunes, raisins, slab bacon, baking powder, oxo cubes, dried potatoes and apples, dried vegetable soup, hard tack, powdered skim milk, butter, jam, chocolate.

First-Aid Kit:

- 1 burn injury set containing sulfadiazine ointment
- 3 packages small first-aid dressings
- 1 set eye dressing
- 100 halazone tablets (for purifying water)
- 2 ampoules of morphine
- 1 pair scissors
- 1 package sulfadiazine tablets (to be taken when wounded)
- 1 package sulfanilamide powder (to be sprinkled on wounds)
- 1 tourniquet
- 1 large gauze adhesive bandage
- 1 box iodine swabs

NOTE: Check everything over yourself! Before you start out on a trip, spread all your equipment on the floor and count it over. Inspect your food to make sure it's not spoiled.

Read the following information carefully. Some of it may be contrary to what you already believe, but it has helped others and will help you.

When Forced Down Stick By Your Plane. Don't move any distance away no matter how much you may want to leave. Chances are that a searching party will be after you soon, and your job is to attract their attention. If you disappear you may prolong the search by several days. The plane is large and can be seen from the air; you are small and can't be seen.

First, take inventory of everything you have. If it's not possible to stay in the plane, remove anything which might possibly be of any help. Don't think of each tool or piece of equipment in terms of its ordinary use, for you never can tell when it may come in handy for another purpose.

For instance, don't disregard your parachute just because you won't need to jump; it may make a good tent, or warm foot-wrappings. Large-sized inspection plates may make good snowshoes; the kapok lining of the plane makes fine weatherproof bedding. If you have crashed, work fast. The plane may burst into flames long after landing.

Of course, if any of the crew members are wounded, you will stop the flow of blood, doctor them as best you can, and make them as warm and comfortable as possible. Watch out for symptoms of *Shock* in wounded men: pale face and lips, chilly sweat, nausea, weak pulse, rapid breathing, mental confusion. If not treated, shock results in quick death. Treatment:

- 1) Lay the victim down flat, with head low, feet raised.
- 2) Put blankets and wraps *over and under him*.
- 3) Keep him warm the best way you can.
- 4) Give him warm, sweet drinks, but only if he is conscious and not injured internally.
- 5) Do not give him liquor.

Signaling

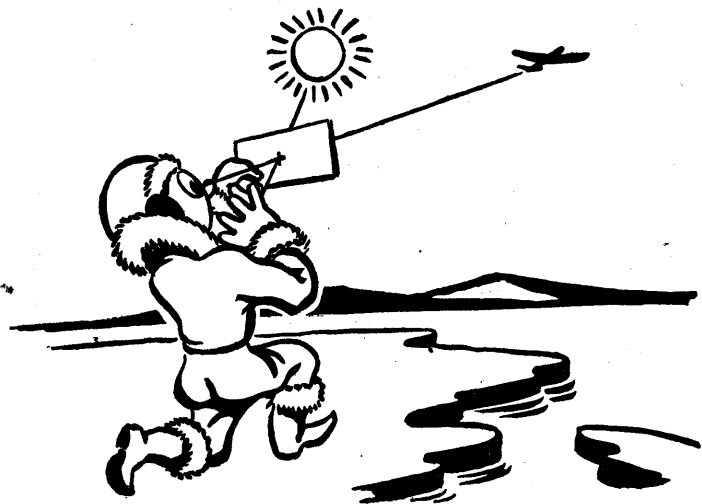
Clean snow off the plane and make it as shiny as possible. Place bright objects on the wings.

► Make a smudge fire with oil-soaked rags, green branches, damp leaves and moss, or by throwing snow on hot embers. If you are short on materials, build your smudge only when rescue planes are in the vicinity.

► Send off a rocket or shoot your Very pistol only when you hear the engine of a plane headed toward you. Don't make a Fourth of July celebration with your rockets as soon as a plane comes by. You may waste them all at a time when the pilot can't see them.



- ▶ Tramp out a huge S.O.S. in the snow, or make a large circle of spruce boughs on an open spot nearby.
- ▶ When a rescue plane comes by, use a special glass mirror with a cross, or a piece of polished metal from the plane, as a lens to focus the sun's rays and create a beam directed onto the plane. Don't touch the metal with bare hands.



To use the glass signaling mirror with a cross:

1. Face toward a point about halfway between the sun and the plane.
2. Hold the mirror in one hand about four inches from your face and sight the plane through the cross in the mirror.
3. Hold your other hand about 8 inches behind the mirror in line with the sun and the cross on the mirror, so that a small cross of light appears upon your hand. This cross of light is reflected upon the back face of the mirror (side toward you).

4. Now tilt the mirror so that the cross of light on the back face disappears through the transparent cross on the mirror. At the same time keep the plane sighted through the cross in the mirror. With the mirror in this position, the light rays from the sun will be reflected onto the plane, even though it is ten miles away.

When the angle between the sun and the plane is small, the cross of light will appear on your face, thus allowing you to use both hands in tilting the mirror.

Building a Fire

If you come down on wooded land, pick a campsite close to green timber and dry timber. Dry timber will provide fuel; green timber, boughs for bedding and material for a smudge fire. Try to stay out of the prevailing winds. If the snow is not too deep, tramp it down or cover it with boughs. Don't build a fire under a snowladen tree; it will drip and put out your fire. After the fire gets going, brew some tea and make yourself comfortable. Think things over. Take your time. Plain thinking never hurt anybody and it always puts things back in their right perspective.

Fuel. If you are near the coast, or a river, you may find willow trees, some no bigger than shrubs. They can be recognized by their long graceful branches; in summer their leaves are like draperies. Even in midwinter willows can be found in many places where snow has been swept from the tops and slopes of hills.

▶ In river valleys you may find coal lying around loose. Sometimes it looks like wood compressed into bricks. You may also find a black, tar-like or gummy substance, called pitch, which can be burned.

▶ A good fuel is white heather, an evergreen plant with bell-shaped flowers, which grows from three inches to a

foot high. It is very common in big patches even in winter. Burning heather is a special art. Make a small fire and feed in a handful at a time, keeping the blaze uniform. When wet, heather is not easy to ignite, but once you get it going it lasts a long time.

► Look under the snow for dry, spiky caribou moss. You can burn it between two flat stones set on edge to make a fireplace. It takes about a bale of moss to cook a meal.

Tinder. In wet weather you can get tinder by cutting out the middle portion of a dead standing tree, or by looking for dry moss or twigs.

► On the lower twigs of most spruce trees is a black, dry moss, very inflammable. The outer bark of birch trees is a good starter; so is pussy willow fuzz.

► If you can find nothing else, try a snip of your tie or some scraps of gauze from your first-aid kit.

Using Oil for a Fire. You may have heard that oil won't burn, but if you take pains you can always use it for a fire. Dip a few slivers of wood in oil and start them burning. They don't have to be any bigger than tooth-picks. Place them on your pile of fuel, and as your fire takes hold, slowly feed in the oil, a drop at a time.

Another method of utilizing oil: take a piece of metal about six inches square. It should be heavy enough to retain heat. Aluminum is too light; steel is best. Arrange a few stones on the ground to make a little prop for the metal. Now get your metal hot. You can do this by pouring a little gasoline on the ground under the props, igniting it, then placing the metal on the props over the flames. When the metal is good and hot, you can keep the fire going by dripping the oil onto the metal a drop at a time. The metal should be so hot that the oil smokes. If you can suspend some kind of can over the plate with a tiny hole in

the end so that the oil drips out, you'll save yourself the trouble of feeding it by hand.

If you have no matches, look for iron pyrites, or "Fool's Gold," common both on the coast and in the interior. The pyrites are hard chunks or chips of ore—shiny, pale brass-yellow with a greenish black streak (not worth a penny—don't bother to load up). Find a couple of pieces the size of lemons. Cover them up to the tip with whatever material you have so you don't have to touch them with your bare hands. Strike the tips of two pyrites together to get a shower of sparks.

You won't have much trouble striking sparks, but it takes a lot of cursing to ignite tinder and get a fire going. Don't let the fire go out! You may have trouble starting another one. To keep it burning, blow on it or fan it gently with an inspection plate or other flat ware.

► If you cannot find pyrites, you can start a fire with gunpowder and a bit of cotton rag or scrap of gauze from your first-aid kit. First prepare your tinder and your kindling. Pry a bullet out of the cartridge and sprinkle most of the powder on the tinder, leaving only a few grains in the shell. Then place the rag or gauze into the nearly emptied cartridge. Put the cartridge back into the gun and fire straight up into the air. Pick up the smoldering cloth and quickly carry it to the tinder, fanning it to a flame. If the ground is wet, make a little dry nest for the tinder from whatever material you have handy.

► You can start a fire by soaking a scrap of cloth in gasoline and using the magneto to get a spark.

Clothing Several layers of loose thin woolens are better than one layer which is heavy and tight. Reason: the border of air between skin and clothing imprisons the warmth of your body. When you wear tight





heavy clothes, you perspire, and feel clammy. Wear woolen underwear with separate shirt and drawers so you can change one without removing the other. Don't tuck your shirt in your pants, and never wear a tight belt or garters—they cut off your circulation. If you have a sweater and windbreaker, wear the sweater inside. A windproof outer garment is most important against cold.

When working around the plane be careful not to become overheated. If you start to sweat, open your shirt a little. If you get hot, take it off! But when you stop working, bundle up at once.

Keep your clothes as dry as you can, and brush off all snow immediately. Suppose you fall into water: jump into a snowbank at once and roll around. The snow acts as a blotter and sucks up moisture.

Face: Frostbite Your face is the only exposed part of your body and hence most likely to be frostbitten. Face masks are not much use in Arctic cold, and grease is worse than nothing. Do not let your beard grow, but shave as often as you can, or at least keep your beard trimmed with clippers. Otherwise your breath will form frost on your beard and your face will freeze so badly that you will feel as though you were being slashed with a knife.

Frostbite shows up first as a stiff, whitish spot which is not painful. Inspect each other's faces frequently. Get the habit of making monkey faces so you can discover a stiff spot yourself. Watch out for your nose especially.

When you find a stiff spot, take off your glove at once and press your bare hand gently to the spot. In a few seconds it will warm up. If you follow this practice, you will have no trouble even though you freeze your face many



times a day. **Never rub a frost-bitten spot; don't use snow; you will bruise your skin and open the way for infection.**

Hands Wear one or two pairs of woolen mittens and over these a pair of strong, horsehide gauntlets. When working around the engine, use just ordinary canvas gloves.

Don't touch metal with your bare hands. The skin will freeze to the metal, leaving your hands raw and bleeding. Train yourself to think before you stretch out your hand. Tape the tools on all parts likely to come in contact with your hands.

If you must work with bare hands and you have any oil or kerosene, you can warm your tools. Heat up the oil or kerosene in a can, drop the tools into it and remove them when they reach skin temperature. As soon as they cool off, put them back in the pot to get warm again.

If your clothes are loose enough, warm your hands Eskimo fashion: withdraw your arms from your sleeves and fold them across your bare chest, or tuck them under your armpits. Cold hands should be treated as gently as cold feet.

Feet Watch your feet constantly. Frozen feet usually result from carelessness. The two main causes of freezing are: (1) tight socks and shoes, which cut off the circulation; (2) wet feet.

If you wear shoes instead of mukluks, they should be large and loose—two sizes bigger than usual. Wear two pair of light wool socks, a pair of heavy ones, a burlap boot sock or an insole of felt or burlap. If you have no boot



socks, wind a strip of burlap or similar material outside the socks and over your feet and ankles, but make sure the binding is not too tight. If wearing all your socks makes your shoes uncomfortable, take off a pair.

Always keep your feet dry. Never put on damp socks or shoes, and keep them as clean as possible. If your shoes get wet, scuffle your feet in the snow to absorb the moisture.

To dry wet shoes: Heat some gravel in a can and shake the warm gravel around inside your shoes. You may have to hack the gravel from the ground with an axe.

To warm feet: Use dried grass or kapok stuffed loosely between socks and shoes for insulation against cold. If you have a comrade, take off your shoes and socks, put your feet between his coat and abdomen, or between his thighs. Remember body heat is the safest heat for thawing cold hands or feet.

Never use friction. Do not rub cold feet with snow. White, frozen flesh is like wax. It is easily broken, and once your flesh is mauled, infection, inflammation, and gangrene may set in.



Treatment for Frozen Hands and Feet

If you care for your hands and feet properly, they should not become seriously

frozen. But if they do, handle them as carefully as you would glass, and follow this treatment to the letter:

► Thaw hands and feet gradually. Do this in a place which has a warmer temperature than outside, but is still cool. Do not thaw them out before a fire and do not use hot water. Hot water can do great harm, by making the skin sodden and increasing the danger of infection. **Severe pain is a sign that warmth is being too quickly applied.**

► If feeling and warmth do not return, paint the frozen part with a mild antiseptic. In your first-aid kit, you should have one of the sulfa powders (sulfanilamide or sulfathiazole). Sprinkle a little powder over the frozen surface two or three times a day till the crystals give it a frosty look. Wrap the frozen area in sterilized bandages, and keep it clean.

► As a frozen part thaws it becomes swollen. The skin turns pink, red or purple, and blisters form, filled with clear fluid or blood. Leave the blisters alone. Unbroken skin is the best protection against infection.

► To heal frozen fingers or toes the entire body must be kept in good condition. Keep the patient warm; put him in his sleeping bag, and give him hot coffee or tea. *Liquor is dangerous!* If a person is frozen, it upsets his circulation and prevents natural healing.

► Frozen hands and arms must be carried in a sling and rested as much as possible.

► For frozen feet, the patient should be kept lying down with his feet raised. On no account should he use his feet.

The best treatment: **INACTIVITY.**

If you follow these rules, inflammation and infection should not occur. When there is no throbbing, no pain, and the swelling goes down, do not worry about the appearance of the frozen part. Even if it grows black and looks dead, don't get scared, for the decaying skin may peel off. Don't be upset if a "line of demarcation" appears between healthy and black skin. That is no sign that amputation is necessary.

Eyes: Snowblindness

If you are forced down in timberless country, put on a pair of colored goggles as soon as you land. If you don't, the dazzling light reflected from the snow will cause snowblindness. This condition is not real blindness but a burn so painful that you cannot use your eyes for several days. Snowblindness occurs not only on bright days, but also on dark, cloudy days when the light is evenly diffused. Keep your glasses on at all times. Don't let the metal of your glasses touch your skin. If you have any propeller de-icing fluid, use a couple of drops on the lenses to keep them from clouding over.

If you have no glasses:

- ▶ Make a mask of your handkerchief, cardboard, or similar material, with slits for the eyes. But don't use metal.
- ▶ Blacken your nose with carbon from the fire or exhaust manifold of the engine. Paint circles under your eyes.
- ▶ Keep your eyes half-closed. Use one at a time. Look through your lashes.
- ▶ When moving around keep your eyes on a dark object, or throw something dark on the ground ahead of you and fix your eyes on it.

Snowblindness comes on very gradually. At first you

may not be able to see uneven places on the ground, and your eyes may feel as if they had grains of sand in them. Then they become inflamed, and you may suffer from shooting pains in the head, similar to a severe toothache.

Treatment. Snowblindness is not permanent, so don't be afraid that your eyes are ruined. Stay in a dark place and do not use your eyes for several days. Place warm, moist compresses upon your eyelids. If there's no shelter from the glare, bandage your eyes with dark cloth. Take care of your eyes next time you get out. You may easily suffer a second attack.

Shelter

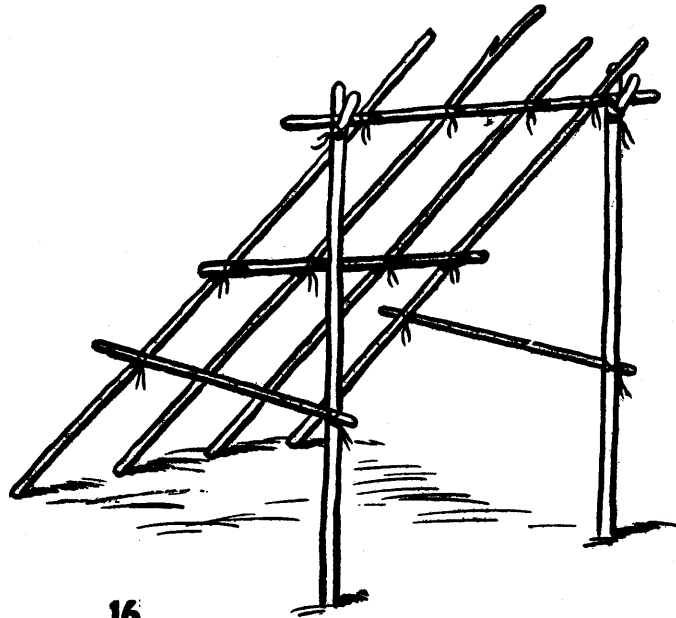
Don't sleep in the cabin of the plane; it's usually the coldest possible place. Try to pick a campsite as much out of the prevailing wind as possible. If there is a gale blowing and you are near a high cliff, get right up close to it. It will protect you from the wind sweeping down over the edge. Valleys surrounded by high mountains may be 30° colder than the slopes or ridges.

Sleeping Bags: A down-filled sleeping bag will keep you warm out in the open almost anywhere. Never spread it on the bare ground or snow, but place it on brush, grass or insulation from the plane. Since moisture condenses in the bag, it must be dried out thoroughly as often as possible. Never wear frosted clothing in a sleeping bag; you will surely get a chill. Be sure to loosen your belt, collar, underwear, etc. before you get into the bag so you won't cut off the circulation of your blood. The fewer clothes you wear in a sleeping bag, the warmer you'll be. The Eskimos sleep naked, and not for fun.

Tent. In open country, if snow is drifting, never pitch

a tent next to a large sheltering object, such as a rock, the plane, baggage, etc. The snow will bury your tent. If snow is not drifting, you can build a low, semi-circular windbreak from snowblocks, or parts of the plane, or evergreen boughs, right close up to the tent on the windward side. Make the wall two or three feet high. Cover the floor of the tent with evergreen boughs.

Lean-to. If you can find boughs, build a framework of poles in the shape of half an A-tent divided lengthwise (see sketch). Cover the three sides thickly with evergreen boughs. Keep the twigs pointing downward, and start laying them on from the bottom. Have the open side of the lean-to facing away from the wind toward the fire, and build a wall of green logs behind the fire to increase warmth.



Using The Engine Cowling. A snug shelter can be made with the two halves of the engine cowling. Place each half on the ground with the curved surface upward. Fit the outer edges end-to-end like a tunnel. Block up one end with snow, canvas, brush, or whatever you can find. Pile the same stuff over the top and sides for insulation. If you want to make your shelter higher, first build a low snow wall or foundation and set the cowling firmly on top of it. If you can't use your engine cowling, take whatever you have handy for making a large, hollow shape, and pack snow around it.

Parachute Tent. You can use a parachute for a tent in several ways: (1) by hanging the peak from a tree and tying out the skirt to stakes or rocks; (2) by raising the chute over crossed poles like an Indian tepee, and spreading the skirt out as described above. In both cases, the vent in the top of the chute will act as a chimney and let the smoke out; (3) by folding the chute double and pitch-

ing a low, A-shaped tent. The first two methods will give a fairly high peak which sheds water; the third method will produce a low tent which gives good protection against wind. You can also wrap yourself up in a parachute for protection from cold.

Warning: Carbon Monoxide Poisoning

This is a direct result of carelessness. Often you may be tempted to keep your shelter warm by shutting out all the air. But if you have a stove going through the night, it may generate carbon monoxide gas and you will be asphyxiated. Always make certain that you have proper ventilation. Keep snow brushed off the tents so air can come in through the fabric. **Carbon monoxide gas has no smell. Death comes without warning. Cutting off ventilation means suicide.**

The only advance symptoms of carbon monoxide poisoning are a slight pressure on the temples, a beating of the pulse like a slow drum.

If you are overcome by fumes and still conscious:

- (1) Turn off the stove at once
- (2) Crawl outside for air
- (3) Take even breaths to clear out your lungs
- (4) Crawl in your sleeping bag to avoid freezing
- (5) Get a good long rest.

How to Act in a Blizzard

Caught in a blizzard! This at once brings up the idea that you must punch and poke yourself to keep awake, that you must struggle ahead with your last ounce of strength, that once you fall asleep you are doomed. That's all the bunk. If you are caught in

a storm, don't fight it. Sit down before you get chilled. Conserve your energy. Ride it through. In spite of everything you have heard and read, the best thing to do is to go to sleep—if you are not numbed and thoroughly exhausted. The more energy you save, the warmer you will be. Don't run. It wears you out, makes your clothes wet, and chills you. Remember: through overheating and excessive sweating you can freeze to death.

The best policy out in the open is to dig a long, narrow trench and sit in it with your back to the wind. Take a nap. After a while you will feel chilled; this is your body's automatic safeguard against freezing. To warm up, walk up and down in the trench a little, then go back to sleep again.

Stefansson, the great Arctic explorer, once met an old Eskimo woman who slept out in the open during a bitter three-day storm. Although her home was a short distance away she did not try to reach it, for she knew it was impossible to walk ten feet without getting lost. She had no need for food during her hibernation because she was using little energy. When the storm was over, she brushed the snow off her clothes and walked home, none the worse for her experience.

Drinking Water

In Arctic seas there are two kinds of ice: sea ice and old ice. Sea ice is gray, milky, hard as rock. Do not use it for drinking water, because it is salty. Old ice is good for drinking water. It is bluish, with rounded corners, splinters easily, and has a glare.

► On the coast, where the ice to seaward is solid and salty, there may be neither fresh water nor fresh ice. In that case use granular snow—the more granular the better. Scoop



it up in buckets, cloth, or skins. New spongy snow takes more fuel to melt, gives less water.

► If you use a tin can to melt snow, feed in a little at a time, or the bottom of the pot will burn. You can also melt snow by spreading it out on a black cloth in the sun.

► Once you have melted snow, drink to the utmost to save fuel.

► When short on fuel eat snow. Never take it in large quantities but nibble small amounts almost constantly. In this way you will keep ahead of your water requirement and save yourself much trouble. Warm the snow in your hand first and compress it, otherwise you will freeze your mouth and stomach. When your hand gets cold, remember to warm it on your bare chest, under your arm, or in your crotch.

Food The Arctic abounds in various kinds of animals, all living off each other in a business-like way. The seal dwell in strong ocean currents amidst grinding ice floes. They eat fish, and in turn are eaten by polar bears. While the bears strip off the seal blubber, the foxes hang around waiting for the meat. Finally, after bears and foxes leave the carcass, the gulls come to pick the bones. Inland roam herds of caribou — cousins of reindeer — as well as rabbits, ground squirrels, and other small game.

Any animal you can get is safe to eat. If you have luck in hunting, your main trouble will be learning to like new kinds of meat, and conquering your disgust at the thought of seal or field-mice. After all there is no dirtier animal than a fat pig.

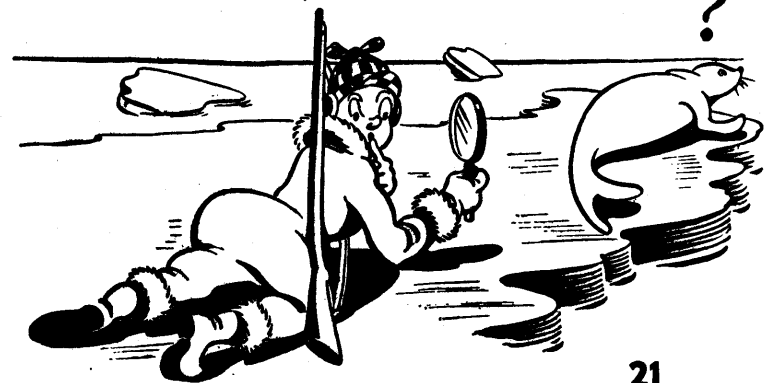
Meat is an excellent diet. If you eat both the lean and the fat — like Jack Sprat and his wife — you need neither bread nor vegetables, for you will have plenty of vitamins,

plenty of nourishment. If you eat only the lean, you will eventually get sick. Fat is very important for a balanced diet and gives excellent protection against cold. Learn to like it. Eat as much of both fat and lean as you wish.

Cook your meat in the most convenient way. Brief boiling is best; drink the cooking water for soup. But be sure not to overcook it, or you will spoil the vitamins. You can also eat meat raw — it won't hurt you.

If you are alone, don't leave the plane to look for game. If there are a number of you, let the experienced hunters scout in the region near the camp. But unless you are terribly hungry, try not to waste your ammunition on anything smaller than a wolf.

Common Arctic Animals Seal are plentiful amidst strong currents and broken ice. They may be found far from shore. In summer they live near open water; in winter they stay near breathing holes in the ice. Don't rush up to a seal — easy does it. You have to pretend you are a seal, too. To get results, the hunt should take about two hours. First study the seal's movements carefully while he is basking. Then imitate him while you crawl up close. Take aim



from 25 to 75 yards and aim for the brain. As soon as you hit him, rush up and grab him before he sinks. You will probably need a helper for this.

Seal is an all-round animal — you can eat the meat and use the skins for clothing. Be sure to eat the blubber; when there is plenty to spare you can use it with some bones to start a fire. If you boil seal, pour some blood into the boiling water and stir it up to make Eskimo soup.

Bears will probably amble in if you are camped on an ice floe. They look around lazily like window shoppers, but are often vicious, so you had better kill them before they start a fight. One bear provides more than 400 lbs. of food. Bear meat is tough and stringy. To avoid irritating your gums, don't overcook it, and cut it into small pieces before eating. Don't eat the liver — it might be poisonous.

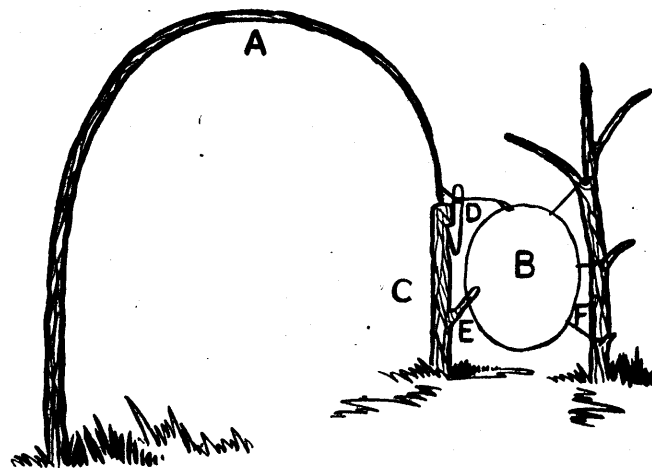
Caribou sometimes move in herds across a lake or up a river. Since they frequently travel into the wind and have a keen scent, do not approach them from the windward. Get within 200 yards before you shoot.

Wolves seldom travel in large packs. Many wolves are lone wolves. They run from man, if he stands still when they threaten attack.

Foxes may hang around when you make camp. They are not foxy and can be trapped.

Rabbit or ground-squirrel is common all year round and easy to snare. But don't waste time on a snare unless you see signs of rabbit — tracks, droppings, nibbled twigs, etc. You can attract rabbits at night by sitting perfectly still with a lighted flashlight in your lap. Since rabbit flesh has no fat, be sure to eat some from another source.

To make a snare, find a small springy sapling growing to one side of the rabbit path—if none grows there,



drive one in. (See diagram A). Whittle a little wooden trigger (D). Drive a stout stake at (C) and notch it for the trigger (D). Plant opposite it at (F), a dead branch that forks over the top of the snare so the animal will run under.

Now take a length of soft brass safety wire. Twist or tie it to the end of the spring pole and around the little wooden trigger, and form the long part into a noose (B). Bend the pole and set the trigger—see sketch. Extend the loop over the path, or runway, a couple of inches off the ground. The noose may be about six inches in diameter. To hold it in place, the wire can be drawn lightly into the cleft end of a stub, as at (E). No bait is necessary. This is also a good snare to set at the mouth of a den or burrow.

Birds, such as geese, ducks, owl and ptarmigan make good eating. Ptarmigan, called "white chicken," look like a cross between a grouse and a bantam. White in winter,

and brown flecked with white the rest of the year, they wear long white stockings, and cackle as they fly into banks of snow to sleep. Birds can be snared with very thin wire. For bait use a piece of pork rind from your fishing kit. Some birds are so tame they can be killed by throwing stones.

Lemming, a chubby, rat-like animal about five inches long, with a stumpy tail and no external ears, is very common. In summer its coat is brownish or gray; the rest of the year it usually turns white. You can catch lemmings by digging a pit the size of a gallon jar in the winding furrows they dig under the snow.

Fish are quite plentiful. If you're on the coast, you can use your handkerchief for a net to scoop up tiny shrimp. Herring are sometimes very common and can be swept up in a net. Sea trout or salmon are found in fresh water, and also in salt water near the mouths of rivers. Whitefish, cod, and pike are also abundant. In winter, catch them through the ice with hooks which are baited with something red or bright in color. Clean the fish right away.

Whale carcass might by chance be found lying on the shore. Even if the whale is old and decayed, don't be afraid to eat every part of it—the dried meat, and the dried-out blubber, which looks like felt.

Travel There are only two exceptions to the rule of sticking with your plane:

- 1) If you land in enemy country you must abandon your ship. Destroy it first.
- 2) If you have waited a long time for help and you are certain you cannot be reached, you must set forth on your own. But do not leave unless you have adequate equip-

ment, know how to travel, are positive of your position, and know that a settlement is close at hand.

If you are alone, don't take a sled but pack all your provisions onto your back. If you have no pack, make one out of the parachute; it will also double as a tent. Take with you as much food and necessary equipment as you can. *Do not forget a compass, axe, rifle, ammunition, first-aid kit and matches.*

If there are several of you, make a sled out of a part of the plane. Whatever part you use, make sure it has a curved edge and a boat-like shape so it doesn't drag flat in the snow. A nose-wheel door or cabin door is fine. Be sure to make your sled long and narrow rather than square and wide; it will be easier to pack and to pull. Use parachute lines for rope.

You may be able to make snowshoes out of a nose-wheel door or large-sized inspection plates. Use line for ties.

Once on your way:

- ▶ Never trust your own judgment. Always rely on your map and compass. Arctic air is so clear that a mountain which seems a mile away may actually be twenty miles distant. In very low temperatures on an exceedingly clear day, you can hear a man chopping wood ten miles away.
- ▶ Don't over-travel. On a good winter day 10-12 miles is far enough. Remember to nibble snow constantly so you won't have to build a fire for melting water.
- ▶ Don't get overheated. Unbutton your clothes to cool off. You may get so warm while exercising, even at temperatures of -40 or -50 degrees, that you may take off everything but your underwear. Be sure to cover up as soon as you stop, so you won't freeze. Never decrease your foot protection. Change your socks often, or change socks from one foot to another, first massaging the socks to soften them.

- ▶ Watch your step. There are deadly crevasses under innocent-looking snow. Poke for crevasses with a long stick.
- ▶ Snowshoes are good for heavy work like hauling sleds; skis are better for quick travel.
- ▶ When crossing river ice, jab a spear into the snow every three or four steps to discover cracks. The danger signs are never visible; safe-looking snow may be most treacherous.
- ▶ In climbing or descending a glacier, men should be roped together at a distance of 40 feet or more, so if one man falls in, the others have more chance to hold him.
- ▶ If there are no signs of game, ration your provisions carefully.
- ▶ If you get lost, try to find a river and follow it straight down. It may lead you to a settlement. Once you choose your general course don't be turned aside from it.

Summer in the North

The Arctic has a real, though brief, summer.

The sun does not set. As a result, the interior regions of the North retain a great deal of heat. The coasts remain rainy, windy, and cold, but in other sections the snow melts. The land takes on colors of red, gold, pink and blue from patches of flowers and berries; grass and mosses grow thick as a carpet, and there are hundreds of fresh lakes.

All this may sound like paradise, but it's damned uncomfortable for three reasons: heat — sometimes up to 90 degrees in the shade; mud — everywhere; and mosquitoes — billions of them. Some places have ten times more mosquitoes than in the tropics. They can cover your hand black, swarm on your gun, and keep you from taking



accurate sight. Sometimes they even drive the animals mad. But there is one consolation; northern mosquitoes don't carry diseases like those in the tropics. The most they can do, when biting you, is to draw a little blood. Nor are the other Arctic pests — especially sandflies (punkies) and deerflies — carriers of disease.

Protection Against Insects. Wear heavy clothes covering the entire body, no matter how hot it is. Leggings, gauntlets, and a wide-brimmed hat are necessary. Underwear with tight elastic at the ankles and wrists is a great help.

▶ Wear a very fine mosquito net on top of your hat, hanging down over your face. Make sure it has an elastic band at the top, gripping the crown of the hat. The net should hang over the brim of your hat, and be tied loosely about your shoulders. Don't leave it hanging loose unless you want to invite the mosquitoes in.

▶ Use fine mesh for a bed net. Be careful not to tear it. If the mesh is too coarse, punkies will crawl through. Clear

the bed of mosquitoes before you crawl under the net.

▶ A large handkerchief tied around your head and under your chin will keep black flies out of your hair and face.

▶ If you have a favorite bug dope with you, use it. The following recipe is for a black tar "varnish" which you smear over your face. Have your druggist mix it up for you before you leave:

Pure pine tar	1 oz.	} Mix cold in a mortar
Oil Pennyroyal	1 oz.	
Vaseline	1 oz.	

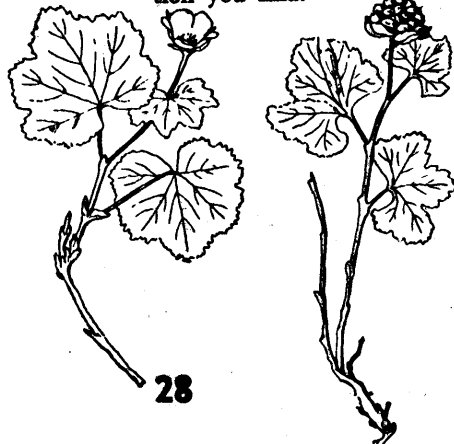
Rub the varnish all over your face and hands when you land. *Do not wash it off.* Of course, if the weather is very warm and you are sweating all the time, or if it rains, the glaze will run off. But it's worth trying.

▶ Try building a smudge fire with damp or green leaves. But on the whole, smoke is more annoying to human beings than to mosquitoes.

▶ Go easy about scratching your bites. Once you break your skin, you may get an infection.

Plants: Food

Few if any Arctic plants are poisonous. You can eat almost any vegetation you find.



28

Berries are plentiful. Practically none of them are poisonous. Salmonberries, which look like yellow

Salmonberry. About
½ natural size

raspberries, are especially good. You may also find cranberries, wild strawberries, gooseberries, red currants, and the shiny black crowberry which is sweet and juicy—in some parts of the Arctic it is gathered under the snow.

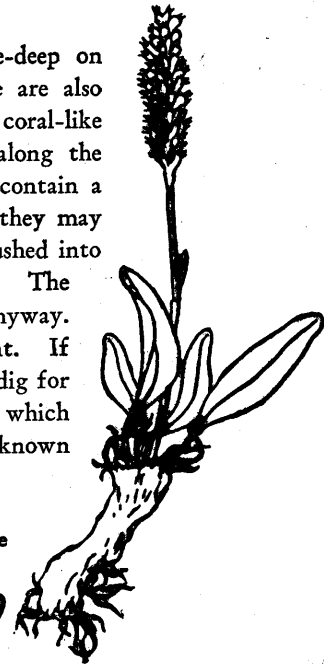


Iceland Moss
About ½ natural size

Mosses grow all through the North, ankle-deep on the ground, or clinging to tree trunks. There are also lichens—greyish or brownish plants with coral-like branches, growing on rocks, rocky ledges, or along the ground. All these plants are good to eat, and contain a large amount of nourishing starch. When raw they may be bitter. But they can be boiled, dried, and crushed into powder for cakes, or else cooked into porridge. The porridge is sometimes a slimy mess, but eat it anyway.

Arctic roots also provide good nourishment. If you are hard up and see flowers of pink or white, dig for the finger-size roots. You may find snakewood, which is about the size of a pecan, or licorice root (known

Snakewood. About ½ natural size



29

Licorice Root
About 1/2 natural size



to the Eskimos as *masu*) which tastes like carrots. Boil the roots or roast them like spuds. Also common is mountain sorrel, which has red and green flowers, and juicy, kidney-shaped leaves. Cook the leaves like spinach, or eat them raw.

If you decide to eat strange plants, first sample a little bit of leaf or bud on your tongue. Anything that tastes bitter should be soaked or boiled until it is more palatable.

Travel in the Summer Because of the mud, brush, and innumerable lakes, travel on land is tough. The best way would be by canoe from lake to lake through connecting rivers, portaging the canoe when necessary. If you do this, watch out for rapids in the rivers.

But if you are forced to push through mud, you might

try making snowshoes from parts of the plane and using them in the marshes. Some of the lakes are shallow enough to wade across. Try to follow a stream or a divide and work down country toward a settlement. To avoid mud, don't follow the bank of the stream, but try to find a ridge between two streams. The ground is relatively dry and there's less brush to hold you back.

Rest frequently but seldom for more than five minutes. Watch your feet. If you don't have clean socks, change them from one foot to the other, and massage them a bit before putting them on.

Natives When you meet natives, most of your troubles will be over, for they can lead you to a settlement. Make your wants clearly known. Don't wait for them to make the first move, but speak up in a pleasant voice, make gestures, ask for whatever you want. They will be happy to tear a herring with you. Be friendly and follow their ways; they know better than you how to live off the land.





OUT OF THE JUNGLE

THE perils of the jungle are largely the product of Hollywood imagination. Jungle beasts are not belligerent, but timid and nervous. They usually clear out of man's way long before they see him coming.

As for the natives — remember how they have helped our troops in the Solomons, New Guinea, the Philippines, and other jungle areas. Most of them will help you too if you gain their confidence with a smile, and offer them some bullets, tobacco, salt, or a couple of silver coins.

The real dangers of the jungle are not the animals or the natives, but the tiny flies, ticks, parasites, and mosquitoes which carry the germs of lingering diseases. If you take precautions and dress properly, you can ward off these diseases. By following a few simple directions you can live in the jungle for weeks and get back to civilization safe and sound. And you may even enjoy the journey.

Read the following information carefully. It comes from the experience of old-timers who know the jungle and would rather blaze a path through wild country than beat their way through Times Square.

Food and Equipment

You don't need much to get on in the jungle. Be

sure to take the following:

► Food which is compact, nourishing, and needs little or no cooking. Don't take ordinary undried foods: they consist mostly of water. Dried foods give maximum nourish-

ment for minimum weight. Examples: dried cooked meats, dried breads, powdered milk, quick-cooking oatmeal, rice, coffee essence, cocomalt, sugar, salt, dried fruits and vegetables.

► Waterproof matches in a waterproof box. Carry them on your person. Remember, even your sweat may make them moist. Take special pains to protect them.

► A machete (pronounced match-etty)—a knife like a long meat-cleaver. You can use it to chop down trees, clear a path, and kill animals; it also makes a good prop and spade. To use it properly, hold the handle against the heel of your hand. Get a firm grip, but don't clutch the machete tightly or your hand will get tired. Keep your wrist flexible and flick the machete like a tennis racket.

► Gun and ammunition.

► A compass.

► A big, five-celled waterproof flashlight.

► A pocket knife.

► First-aid kit. *Be sure it contains quinine or atabrine for malaria, chemical tablets for purifying water, sulfaguanidine tablets for dysentery, and iodine.* The iodine is invaluable, not only for cuts, but for getting rid of leeches, and in a pinch, for purifying water.

► A net hammock for use in South American jungles. It can double as a fishing net or travel pack.

► A good length of fine wire for making animal snares.

► The Pinchot-Lerner lightweight emergency fishing kit.

► Presents for natives: glass, a mirror, tobacco, salt.

A plane forced down in the jungle is completely hidden by heavy green leaves which close over it just as waves close over a sinking ship. You are downed — you step out of the plane and see the tangled leaves and vines all around you. What next?

Don't rush off into the jungle! Don't start beating frantically around the bush! Conquer your wild urge to leave the plane. You have plenty to do before you get going.

If you have wounded comrades, your first job is to doctor them, and make them comfortable. Carry them a safe distance away from the plane until the danger of fire is over. Watch out for *Shock* in wounded men. (See page 5 for treatment.)

Salvage all your water, food, emergency equipment, clothing, and anything else from the plane that will make your camp comfortable.

Signaling

It's very difficult to send signals from the floor of a tall-treed forest. Reasons: 1) smoke from a fire or signal bomb drifts up through the trees and fades out; 2) sometimes the range of radio may be greatly decreased in the jungle, making it hard for a pilot in a plane to hear any messages from the ground.

You must get to a clearing where your smoke or fire signals can be seen from aloft. You may have been lucky enough to land near one: in that case, wait till a rescue plane flies overhead, then send up your signals.

► If by chance you have landed in a bog, spread out your parachute in a large circle and stand in the center. It will not only hold you up but will be clearly visible to planes overhead.

► On open land, a smoke fire is generally the best type of signal. To get thick black smoke, start your fire with dry leaves or moss; when it gets going add damp leaves, damp moss, rotten wood, a little at a time. Don't pack the leaves tightly or you'll choke the fire. If you can't find any fuel, use rags soaked in oil from the plane. At

night use dry wood and leaves to build a fire with bright flames. (For further instructions on fire-building see page 57.)

► Send off a rocket or smoke bomb only when you hear the engine of a plane headed toward you. Don't shoot off all your rockets as soon as a plane comes by.

► If a rescue plane comes by on a sunny day, use a glass signal mirror. (For instructions see *Arctic* section, page 6.)

A Flop for the Night

If you have landed in mid-afternoon and are not near a clearing, don't set out at once to find one. It may be miles away — a long, hard journey through sucking mud and tangled vines. If you can make a mile before dark you will be lucky. The time to start out is early in the morning. So eat supper, settle down near the plane, and get some sleep. If you are near a river, don't sleep on the shore, (crocodiles) but pick a high place.

► Never sleep on bare ground. Bugs, dampness, and small animals will bother you. For a bed you can do one of several things, depending on the type of jungle you are in, and the kind of materials that are handy.

► In a wet forest you must protect yourself from dampness. *To make a lean-to:* cut down some slender boughs or trees and drive them into the ground in the shape of half an A-tent. Cover the skeleton with large leaves, starting from the bottom and working up, to provide drainage from the rain.

► You can climb up into a tree — not too high, but just off the ground. Make a small platform with boughs in a crotch of the tree; lash the platform to the tree with tough vines, and sleep there.

► To make a native-style bed, used in Malay and Borneo, cut down some palm stems and lay them side by side on the ground till you get a sort of corrugated platform. Make it comfortable by covering it with cushions, kapok lining from the plane, or leaves.

► In South America hammocks are widely used. A net one is best, for it can serve as a fishnet and a pack for your equipment. If you have no hammock along, try making one from the parachute and shroud lines, or from the engine covers. Swing your hammock rather loosely — but not too loosely — from between two trees. Sleep in it diagonally. (see sketch.)

► *Be sure to cover yourself with mosquito netting. In tropical countries the mosquitoes may carry malaria, yellow fever, and other dangerous diseases. Always make up your bed and crawl under the net before sundown. Once it gets*



"Green Eyes?" No.
They're either
luminous insects or
bits of phosphores-
cent wood.



dark the vicious mosquitoes begin to attack. You may have been vaccinated against yellow fever, but there is no vaccination against malaria — you have to watch out for yourself.

Try to get some sleep, if you can. Some jungles are very noisy. The screams of animals, the chatter of monkeys, the crash of falling timber, mysterious sounds like the clang of an iron bar against a tree — all these noises will probably give you the willies. You'll get used to them.

Plotting a Course through the Jungle

send up signals. But suppose your signals bring no results, and after a day or two you decide no rescue planes are coming. What then?

Plot a course to the nearest or most accessible river.

In the morning, get an early start on your journey. Remember, your aim is to find a clearing where you can

Plan to go downstream. Somewhere on the shore you will almost always find a native village. The natives will bring you help, lead you to a white settlement, or carry messages for you.

Before you set forth, study the map very carefully. Pick your goal, and don't let anything turn you aside from it. Use your head about the course you choose. For instance, if you happen to be on a mountain top and decide to walk downhill, make sure that you're not descending into a desert. Food and water are obtainable in a jungle, but not in the desert. So try to find a means of walking across the mountain, or circling it.

You should also have an idea of the type of jungle you're in. The word "jungle" includes many varieties of tropical forest, and each one presents different problems of travel. Some sample jungles:

► A New Guinea tropical rain forest with dripping wet trees, tall and leafy enough to shut out the sunlight. After walking 15 minutes you may feel as though you were in a Turkish bath. No need to hack your way through the underbrush, for there is none — there's not enough light for brush to grow. The ground is soft mud that sucks you in up to your ankles or knees. Generally, in this kind of forest, it's best to walk on the fallen trunks of trees, using them as a bridge or road.

► A "dry forest" of the sort which occurs around central Africa. The trees are moderately tall with whitish trunks, and the undergrowth of ferns, mosses and vines may be so dense you may have to hack your way through every foot of territory.

► The Australian bush, half-jungle, half-desert, with rocky soil, tough spiny shrubs, giant ant-hills, and many underground wells.



No matter what type of jungle you land in, patience, quick wits and proper equipment will get you out. Travel lightly. Be sure to take all the items listed on page 34.

Tramping through the Jungle

A pilot must resort to instrument navigation even on the ground, for in strange territory everyone has a natural tendency to go round in a circle. Don't rely on your instincts. Consult your compass frequently. When you take bearings with it leave your knife, gun, and machete a few steps away.

Jungle travel is hard and tedious. Be patient. Go slowly. Don't try to rip your way through the underbrush. You'll only exhaust your strength, tear your skin to pieces. At best you can make five miles a day in thick forest. A few travel tips:

- ▶ Blaze a trail from the plane as you walk along, so you will be able to find your way back, if necessary. You can mark a trail by breaking branches of trees or tying bundles of leaves or grass to branches or sticks. Look back to check them. Keep a sight line from one mark to another.
- ▶ Don't travel at night! Stop half an hour before dark, so you'll have plenty of time to make a bed.
- ▶ If you come to a bog, don't try to slosh through it. You may sink up to your hips in the mud. Stop, look, try to go around it on either side.
- ▶ In the Amazon valley there are frequent lines of drainage along the ground that lead to a river. They look like furrows. Going down a slope will sometimes lead you to water. You may find native trails, which are marked by cuts on the trees. But beware of game trails which look like a straight road, wide enough to drive a car on. In South

America droves of wild pigs with tusks (boars) may run down these trails, and if you should happen to be in their way you'd better climb a tree to avoid being gored.

▶ Whenever possible, pick a campsite on open ground where there is a breeze. The site should be at least half a mile from marshes or pools of water. Reason: malaria mosquitoes breed in stagnant pools.

▶ When you come to a river, build a raft and float downstream. Cut down palm stems or saplings to make your raft. If you have no rope to bind them together, use thick jungle vines. Some fliers who have landed near a river have used their life raft. If you can do this, be sure it doesn't get punctured by rocks.

▶ One of the main causes of death in the jungle is drowning in the rapids. When you travel on a river, keep your ears open! Listen for the sound of roaring water. You can hear it a long way off. As soon as you do, land, reconnoiter, proceed cautiously.

Game

Big game is rare in the jungles—lions and leopards prowl on the plains—and the small animals are usually hard to get because most of them live high up in trees. Be content with anything that comes along—monkey, snakes, water-rat, or lizard. **Any animal you catch is safe to eat.** Roast meat on a stick over the fire, or wrap it in wet leaves and place it on the glowing embers.

▶ In wet forests, guns will rust in a few hours, and the mechanism soon gets clogged with dirt. In fact, many old-timers never bother to carry a gun in the jungle. To catch small game make snares, and set them up where you see little animal tracks, or near water. (For instructions on snare-making see *Arctic* section, page 23.)

Monkeys are very common in some jungles. They are the tastiest of jungle animals, and if they are abundant, don't waste ammunition shooting hawks or owls.



Iguanas, found mostly in the tropical Americas, are bulky, ugly-looking lizards from about one to six feet long, with loose, sloppy-fitting skin, large swollen jowls, and generally, a high-humped back. They scurry along the ground or sprawl on branches and bushes, sometimes flopping into the water when frightened. You can catch them with a loop on the end of a long stick. They taste like chicken. Their eggs, which are oblong-shaped, about 1½ inches long, are laid in burrows dug in the banks of streams or in hollow trees. The eggs are tasty, even raw.

Turtles may be found along river banks or in bays and shallow lagoons of the forest. They make broad parallel

tracks like the furrows of a tiny plough, from the side of the water to the edge of the woods. Follow the turtle tracks and poke in the sand or mud with a big stick for turtle eggs. They are very nourishing.

Snakes are a great delicacy, especially when broiled over a fire. Skin them, cut off the fangs, and chop the snakes into chunks.

Anteater, found in South American river country, looks like a walking flag. Each side of its body has broad, oblique stripes, half-grey, half-black. Watch out for its claws, like steel hooks. Anteater tastes like goose.

Flying Squirrels or **Bats** may be found in holes at the roots of trees. Build a snare before a large tree hole; smoke the animals out with a fire of wet leaves.

Pigeons as big as peacocks are abundant in some New Guinea forests. You can kill them with a slingshot.



Fish A wet jungle may have many little streams which are full of fish, easily caught. If you have no fish hooks try making one from a thorn lashed to a long piece of wood, and use it to jig fish in the body. For bait, try the fat white grubs which swarm in rotten logs.

Other ways of catching fish:

► At night you can shine your flashlight on the water. When fish come to the surface they will be blinded and you can flick them out with your machete.

► Try a trick of the Borneo women. Make a small dike in the bend of a stream to form a pond. Then scoop out the water. Little shrimps and fish will be stranded in the mud.

Never eat fresh-water fish raw. Cook them thoroughly. They may contain harmful parasites.



Bugs-a-la-Mode

If you're not choosy you can nibble away all day long on bugs. They won't hurt you. Some of them taste very good, like nuts.

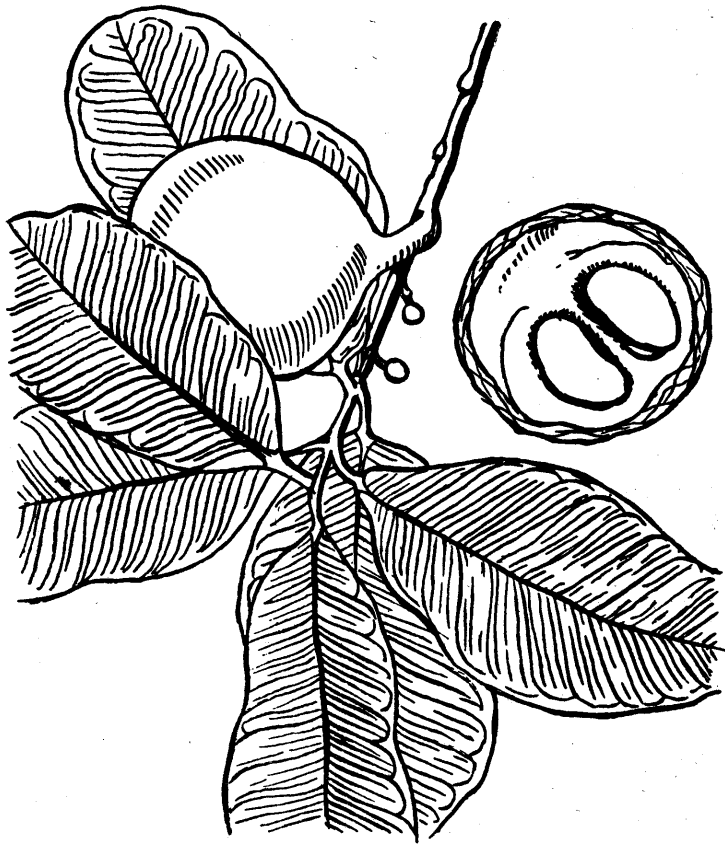
- ▶ Grasshoppers, locusts and crickets all provide nourishment.
- ▶ The white grubs that rustle around in rotten logs are considered quite a treat by old-timers. Just pop them into your mouth. One famous Borneo explorer kept munching them at the bridge table after he got back to Australia. The girls screamed, but he soon had them eating grubs out of his hand.
- ▶ Termites are also a delicacy. They live in big, cone shaped houses, sometimes hard as rock. Hack them open, eat both termites and eggs.

Fruits and Plants

Some jungles are like vast fruit orchards. They have hundreds of plants which are good to eat, like pineapples, coconuts, bananas, limes, and oranges. But you must watch out for the poisonous plants. A description of even the most common poisonous and edible jungle plants in tropical areas would fill a book as big as this one. For practical purposes remember these simple rules:

- ▶ *Before biting into a strange plant or fruit, try a speck on your tongue. If it's bitter, spit it out.*
- ▶ Fruit showing tooth-marks of animals is usually safe to eat. But test it for bitterness first. Watch the monkeys. Whatever they eat is safe for human beings.
- ▶ Avoid trees and plants with milky sap.
- ▶ Avoid seeds of fruit and plants. That's generally where the poison is concentrated. Sample the tender young twigs, buds and flowers.

Following is a short list of common plants and fruits in certain jungle regions which you can eat with safety. Some of these plants provide water as well as nourishment. Before you eat fruit, check it with the sketches and descriptions in these pages.

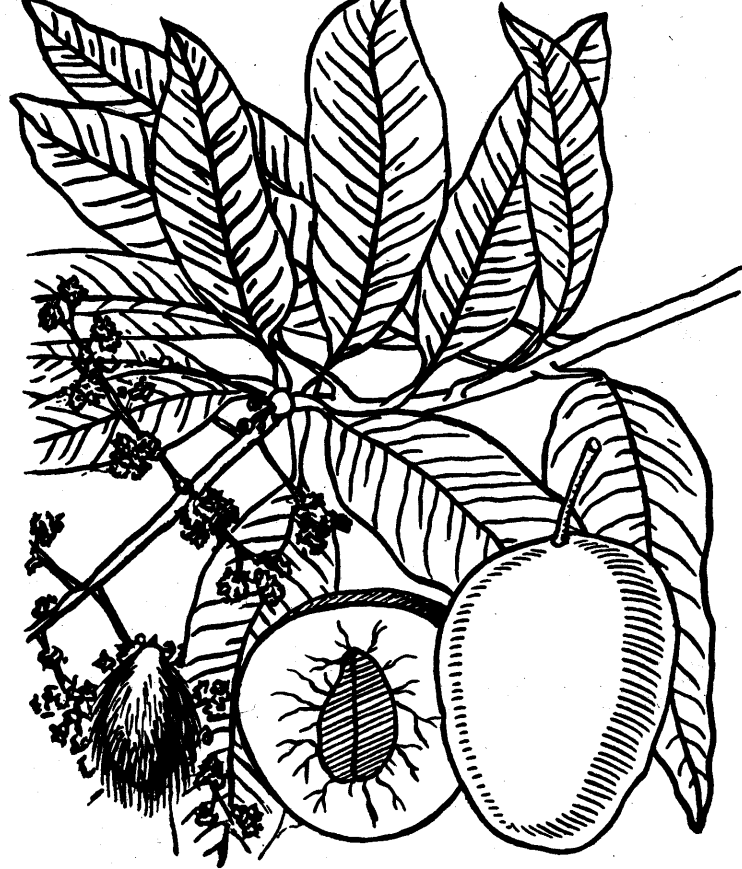
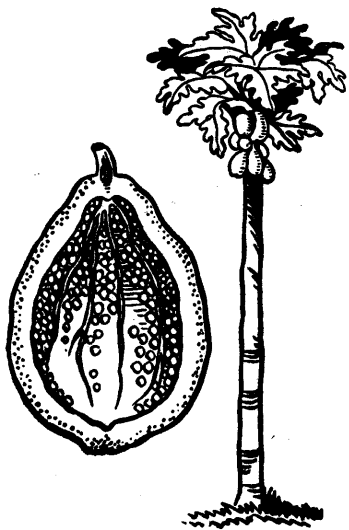


Mamey, a native of the West Indies, also grows in Central America. The trees sometimes reach 60 feet, and have a dense top of thick, glossy, oval leaves, five to eight inches long. The round fruit, as big as a small grapefruit, has a brownish leathery skin. The meat is yellow or reddish with juicy white sap, and tastes like a clingstone peach.



Sugar Cane is common throughout the tropical regions of the world. It looks like cornstalks from eight to twenty feet high, and has purplish-green stalks. The long thin leaves grow up from the stalks like plumes and are silver-striped. Strip off the outer woody layer of the cane and chew the inside part. It's very nourishing and contains vitamins.

Papaya is found all over the tropical Americas and the Indo-Pacific region. The tree looks like a palm bearing muskmelons, or cantaloupes. Ripe papaya is yellowish green, round or oval, with a pepsin taste. Green fruit will ripen very quickly if placed in the sun. Be careful not to get any milky sap from the tree or the rind of the fruit on your skin or eyes. It can cause intense pain and blindness, sometimes temporary, sometimes permanent. You can knock down a papaya tree with one blow of your machete.



Mangoes grow everywhere in tropical America, as well as in Java, Malaysia, India, the Philippines. The trees are 30-40 feet high, with a big spread like huge beach umbrellas. The reddish yellow fruit, bigger than a baseball, hangs on long stems. Wild mangoes are stringy and taste like turpentine, but are safe to eat.



Manioc (also called cassava, or yuca, or manihot) is one of the great food plants of tropical regions from the Americas to Africa and Malaysia. Big and bushy, it has long, stalk-like light-green leaves which are divided into three to seven long pointed sections. Peel and wash the roots, grate or mash them to a pulp. The juice is very poisonous. Remove all of it by squeezing or crushing the pulp with your hands. Cook into a thick soup-like farina or pat into thin cakes and bake as bread. The squeezed-out pulp must be well-cooked two to three hours. The leaves can be eaten as greens.



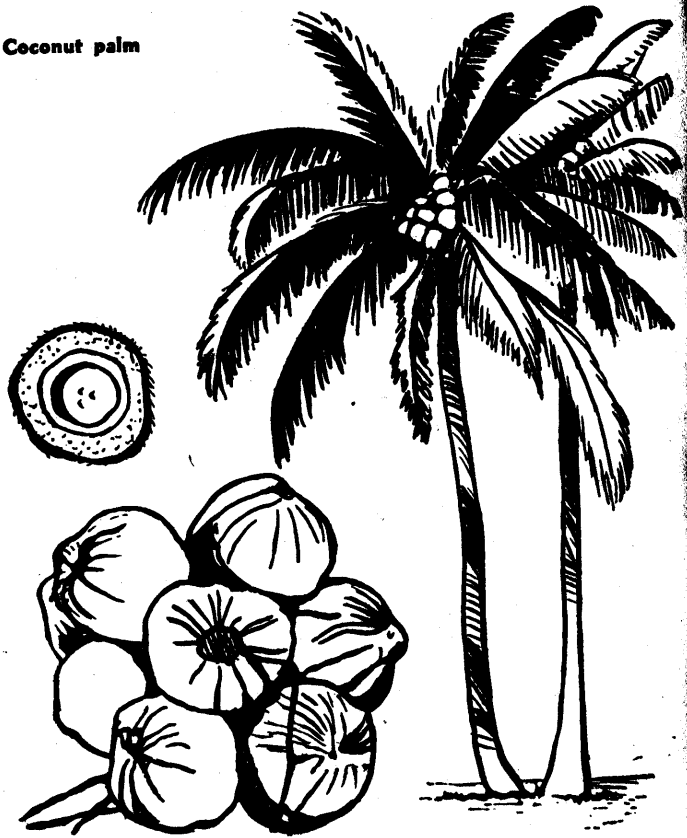
Breadfruit grows in the East Indies, the Pacific Isles, and the Canal Zone. The tree is 30-40 feet high, has large leathery leaves of dark, shiny green, which look something like the head-dresses of Indian chiefs. The fruit, thick as a club, is yellowish green and grows near the ends of the branches. It's very starchy. Cook it like potatoes.



Water Chestnuts are common in wet forests and swamps. The water chestnut is a small or medium-sized tree with only a few branches growing out from the trunk. The tree has narrow, pointed leaflets, large pinkish flowers, and reddish brown fruit, about eight-ten inches long. The fruit is very hard and heavy, and the brown seeds grow deep in solid white flesh. Eat the seeds raw, or roast them. In the Guianas the young leaves are cooked and eaten.

Yams are found in many tropical areas of Asia, Africa, South America, Australia, the Indo-Pacific. They have long, trailing reddish-green vines, and large, thick brown roots, which are eaten like sweet potatoes.





Palm trees have many shapes and sizes: some have long straight trunks with a tuft of leaves at the top; others have short stems and leaves so close to the ground they look like bushes. The leaves generally have a central stalk with narrow leaflets on either side, like a feather; some are broad and look like the palm of a hand. In all palms there is a growing point or cabbage in the center of the

crown of leaves. This can be cut out and eaten. The tender unopened flower clusters are also edible.

Suppose you see coconuts at the top of a palm. How to get them? Take a piece of rope about two feet long, or make one out of vines. Knot the ends together so you have a loop. Go close up to the trunk of the tree, take your shoes off, and slip the loop of rope around your ankles. Then encircle the trunk of the tree with your arms and pull yourself up, using the friction of the rope against the bark, as well as the power of your arms.

Bamboos are widely distributed, sometimes occurring in stands covering thousands of acres. The young sprouts grow up to a foot tall, are very nourishing, and can be eaten raw or boiled.

Blackberries and raspberries are common throughout the East Indies and Indo-China region.

Durian is one of the most popular fruits in the East Indies and southern Asia. It grows on large lofty trees resembling elms, and smells like rotting onions. The fruit looks like a coconut but has sharp stout spines. The coat is very heavy but you can remove it by cutting along the five grooves which divide the fruit. After you get to the creamy yellow pulp, you may think you're in for a treat. But, say two botanical experts, it tastes "like a rich, butter-like custard highly flavored with almonds, intermingled with suggestions of cream cheese, limburger, onions, brown sherry," etc. Eat it raw (if you can). You can find the tree by following the smell. Never lie under a durian tree; the nuts may fall on your head.

Bananas look exactly the way they did hanging from the grocer's ceiling, except that they grow "upside down." If they are green, boil them like potatoes. The tender young leaf sheaths can be eaten raw. The thick stems

contain a good deal of water; cut them and drain the water into a container.

Plantains look like great big bananas. If they are very ripe (brownish-yellow) you can eat them raw; if they are green, cook them any way you wish.

Grape (known as *Uva* or *Bejuco de Agua*) is common in Central and South America. It has long vines with gray, wooly tendrils and tiny purple grapes which are quite sour. You can get a large amount of good pure water by cutting the main stem.

Guava occurs throughout the tropics of the world. The trees are about 10-15 feet high with peculiar pale brown smooth bark that scales off in thin sheets. The fruit grows in many different shapes, sizes and colors, sometimes yellowish. It has a strong musky odor. You can eat it raw.

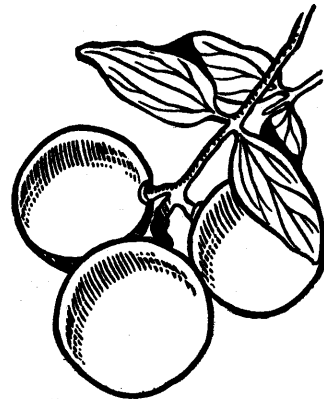
Ferns are abundant in many jungles. The tips, shoots, and stems are good to eat raw or cooked.

Taro (or *Dranu*) is a plant from one to eight feet high, a relative of the calla lily, which occurs throughout the Pacific Islands, India, Southeastern Asia, French West Africa. It has leaves like elephant ears and thick roots weighing from one to twelve pounds, that grow partly above ground and look like bluish-gray mottled soap. Boil or bake the roots like potatoes. Cook the young leaves and stalks like spinach.

Rattan Tips. In the tip of rattan vines you will find good meat. Rattans include the long, slender, bamboo-like stems of climbing palm trees, and the stiff stems of certain very straight palms—used for making malacca canes. They occur in tangled thickets and have sharp, curved thorns. You can also find pure drinking water in rattans by cutting the stems.

Beware of trees, shrubs and vines throughout southern

Asia, the Philippines, Ceylon and India, that bear luscious fruits the size and shape of small oranges. Some of the fruits are yellow, some white. They have an exceedingly bitter pulp. The fruits look edible, but actually they contain the powerful poison, strychnine.



Building a Fire

In a wet forest it's very difficult to build a fire. Try making a little basin or fireplace of stones the way the Indians do. It is important to design your fire so that air can circulate through it freely. Start the fire very economically, with scraps of dry moss, or some gauze from your first-aid kit. To this add a few splinters of dry wood, or some pieces of dry rattan. You don't need to make a bonfire; in fact,

the Indians use small fires. Have ready a reserve pile of dry kindling. Blow up through the fire to start it going. After your fire is burning well, you can add a little wet wood without ruining it. To dry wet wood, stack it around the fire.

Water All water must be boiled for five minutes, or chemically purified, before you drink it. The only exception to this rule: water which you drain from trees or vines (see next page). If you can't boil water, there are two ways to sterilize it:

► Halazone tablets can be used. They should be in your first-aid kit. Follow this procedure:

- 1) Fill your canteen about $\frac{2}{3}$ full.
- 2) Drop in two tablets of halazone and insert the bottle-stopper.
- 3) Shake the canteen.
- 4) Let it stand. After $\frac{1}{2}$ hour shake it again.
- 5) Remove the stopper and see if you can smell the chlorine. If you can't, put in one or two more tablets and start all over again.

This is guaranteed to give you water that will taste worse than any you've ever had before. But it will be pure. If you have water left over, keep the canteen tightly stopped, and the water will stay pure.

Don't try any short cuts. The hour you spend purifying water will save you months of painful, lingering illness.

► Iodine is a good substitute for halazone tablets. Use two or three drops of iodine to a quart of water. Let it stand for 30 minutes. If the water is muddy, use more iodine.

When you are traveling through the jungle, don't gulp

down your water but just rinse out your mouth and moisten your lips. Don't swallow much—it's wasteful. In a short time you'll get used to rationing your water and you won't mind it.

There are many sources of water:

► Suppose you find nothing but liquid mud. To strain the water, take a handful of grass, tie it together in the form of a cone, six to eight inches long. Dip the broad end of the cone into the puddle, then flick it upward, out of the water. Water will trickle down through the small end of the cone. Catch the water in a cup, or bamboo container. You can also filter muddy water through a handkerchief full of sand. Be sure to boil it!

► The big ropey vines or lianas that hang down from the trees are really water tubes. To get the water, make a notch in the vine as high as you can reach; then cut it off near the ground. Hold a cup to the cut end. A six-foot section of vine should yield half a cup of water. Be careful not to cut the bottom of the liana first or the sap will ascend and the vine will be dry. This water is pure and doesn't have to be sterilized.

► Don't forget that grapevines contain water (see page 56). Bamboos have watery juice. Shake the stems to see if they gurgle, then cut a notch low down on the stem and catch the water in a cup.

► In the wet forests of New Guinea all you have to do is dig a hole in the ground. In a few minutes water will fill the hole. Purify it before drinking.

► Birds or animals may lead you to water. You can also brush off the dew from large leaves.

► Water is likely to be found downhill. In dry bush country, look for water in shaded rocky pockets in valleys. Look under stones and examine carefully the beds of streams



which appear to be dry. There may still be a trickle of water near the surface. Water turns up in the most unexpected places.

Snakes Men who have traveled the Amazon claim there are fewer snakes in the wilds of South America than in Virginia. And in the Malay-Polynesia region, says another expert, "chances of being bitten by poisonous snakes are infinitely smaller than in any part of the United States where poisonous snakes abound."

But of course there is always a chance of being bitten by a snake in any forest. So take the following precautions:

- ▶ Don't travel at night. If you are forced to, then rake the ground with your flashlight constantly.
- ▶ Sleep off the ground and examine your bed or surroundings just before you turn in. If by chance a snake should crawl into your bed, lie perfectly still. The snake will glide away.
- ▶ When stepping over the trunk of a fallen tree, look out for hollows or shelves on the opposite side where a snake might be coiled. Always, when climbing up a cliff or rocky place, watch where you put your hand.

How to Treat Snake Bite

- 1) Tie a shoelace, piece of string, a bandage, belt or length of vine just above the snake bite. This will prevent the poison from circulating throughout the body. Be sure to loosen the string every fifteen minutes for about five minutes, or you will cut off the circulation from the limb and gangrene will set in.
- 2) Make the bite bleed. Sterilize your knife in a match flame, and make x-shaped cuts about $\frac{3}{8}$ of an inch deep at each fang mark. Let the cuts bleed freely.

3) Start sucking out the venom. You can do it with your mouth, but the best way is to heat a bottle or any vessel having a small mouth, and immediately press the mouth of the bottle firmly against the bite. As the bottle cools, the air inside contracts and produces a negative pressure, drawing the poison out.

Don't take whiskey! It speeds the circulation of poison throughout the body.

Insects — Pesky and Poisonous

If possible, wear a long-sleeved shirt, long pants, a mosquito net hanging over the brim of your hat, and tucked inside your collar. Never lay your clothes on the ground. Always shake them out very carefully before putting them on, unless you want ants in your pants. To relieve itching, touch bites with the stopper of your iodine bottle. If you have an antiseptic salve, use that. Scratching brings on bleeding and ulcers which may take weeks to heal.

Chiggers, small, flea-like animals, burrow into the skin and lay eggs. As the eggs develop, the body of the insect embedded under the skin swells to the size of a pea. The itching is terrible. To get rid of chiggers, sterilize a needle or the point of a knife, or a sharp stick, by holding it in a match flame. Then shell out the swollen chigger. Be sure not to break it. Apply iodine and make a bandage to keep out dirt.

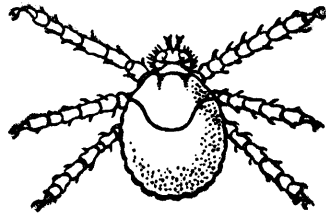
Ants in swarms are very ferocious. Flit salve will protect you against the small red fireants. In the forests of Africa and South America are great numbers of army ants which sweep forward like a rustling curtain and sometimes

drive the natives out of their homes. You can fight the ants off with fire or gasoline.

Botflies, two-winged insects with short antennae, are also common in the American and African tropics. Their larvae burrow into the skin and cause swellings like boils. Treatment: drop oil—whatever kind you have—into the punctured skin several times a day. The larvae will pop up for air, and you can squeeze them out by pressing with your thumbnails on either side of the swelling. Or you can kill them by smearing a mouthful of wet tobacco on the bite, then squeezing the larvae out.

Leeches are very common in damp forests. They're out for your blood. To get rid of them apply a drop of iodine, a pinch of salt, or touch a burning match or cigarette to the leech. Leech bites are painless but may result in ulcers.

Ticks, another kind of sandy flea, may swarm on your body by the hundreds. Pick them off carefully by grasping them between the edge of a knife and your thumb. Never squash ticks. Their blood may be full of the germs of a deadly fever.



Female tick

Keeping Well in the Tropics

Ever stayed too long in a hot bath? That's how you'll feel when you first go into the tropics. There's something about the climate that seems to drain your strength away. Even though you've had injections against typhoid, smallpox, yellow fever, and other diseases, take every precaution for your health. In the beautiful tropics, danger lurks everywhere. A glass of cold milk may harbor the germs of a recurrent fever. A dip in a cool forest pond may net you a batch of parasites in your bladder. A stroll in the moonlight may lay you low with malaria.

To stay well in the tropics you must compel yourself to become a sissy. Obey the following rules. At first they may be an awful nuisance, but soon they'll become habit.

- ▶ When you are in a settlement, or among natives, never eat uncooked food, raw fruits and vegetables, green salads, etc. They may carry the germs of several dangerous diseases. Be sure everything is thoroughly cooked, and fresh. When you're traveling through the jungle, far from the haunts of man, then it's safe to eat whatever can be eaten.
- ▶ Never drink milk or water which has not been boiled.
- ▶ Keep as clean as you can. Wash your socks and underclothes as often as possible. *But* stay out of fresh water lakes, ponds, canals, ditches, and sluggish streams. Reason: little worms called flukes may enter your body, burrow into your bladder or bowels, and make you miserably sick for months.
- ▶ Never go out after dark if you can help it. If you're in a region where malaria and yellow fever are prevalent, try to get into bed and under your mosquito net before sundown. If you are forced to go out at night, be sure to keep well covered.



► Avoid chills. If necessary, wear warm clothes at night. In the tropics you become so sensitive to temperature that a drop to 60 degree F. at night may make you shiver uncontrollably.

► Never walk barefoot. Always see that your feet are well covered. You may get hookworm or ringworm.

► Paint every little scratch and cut with whatever anti-septic you have in your first-aid kit. Don't let flies or insects settle on your broken skin. In the tropics even tiny wounds are slow to heal. A broken water-blister on your heel, for instance, may stay red and angry-looking for months, even though you may have touched it with iodine. Do not make bandages tight, but as light and porous as you can, for germs thrive in dark places where there is no air.

► When traveling in the sun, wear a helmet or damp cloth on your head. Wear sun goggles all the time, to avoid getting your eyes irritated and inflamed. Also cover up your skin as much as you can. Too much sunlight may cause serious trouble. (For treatment of heat exhaustion, see page 78 in Desert Section chapter.) Be sure to use anti-sunburn lotion if you have it.

► In the tropics you sweat all the time. As your body loses water it loses salt too. You must replace this salt or you will get painful, muscular cramps. Salt tablets are provided in your first-aid kit. Take one with some water two or three times a day.

Tropical Diseases

The following is a list of the most common tropical diseases, the ways to avoid them, and treat them.

Malaria occurs almost everywhere in the tropics. The main symptoms are chills and fever. To avoid malaria

you must protect yourself from the night-flying mosquitoes. Remember to sleep under nets, and wear full clothing at night.

There are two drugs — quinine and atabrine — which suppress the symptoms of malaria. One or the other should be in your first-aid kit. As soon as you hit the jungle, start taking your medicine religiously every day. The average doses will be printed in your kit, but here they are:

If you have *quinine*, take five or six grains every evening.

If you have *atabrine*, take it in any one of three ways — whichever agrees with you best:

Either: half of a 0.1 gram tablet every day.

Or: two tablets of 0.1 grams each on two successive days each week.

Or: one tablet of 0.1 grams three times a week.

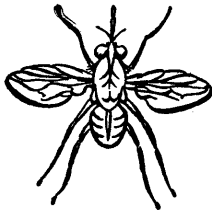
Never forget to take your medicine.

Dysentery is caused by certain bacteria or amoebae which occur in unclean water and food.

Symptoms: Stomach-ache, constant diarrhea, chills and fever.

Treatment: You should have sulfaguanidine in your first-aid kit. Take seven tablets dissolved in pure water every four hours until there are no more than five bowel movements a day. Then take the tablets every eight hours until bowels return to normal. Rest as much as possible. Take nothing but water the first 24 hours but drink a lot of it (boiled or sterilized, of course). Later on take soups or tea. Avoid sugars, starchy foods, fat foods.

African Sleeping Sickness occurs in most parts of the African tropical belt, especially in the Congo Basin, and near Lakes Victoria, Edward, Albert, Tanganyika and Nyasa. The tsetse fly, which carries the disease, bites only



Tsetse fly

in the daytime. In regions where sleeping sickness is prevalent take these precautions:

1) Wear a head-net, gloves, long pants; 2) avoid the bushes near lakes or streams where the tsetse breeds; 3) camp on open, rising ground at least 100 yards away from water, where there is a breeze.

Symptoms: fever, "swollen glands", skin rashes.

Treatment: rest as much as possible, take plenty of liquids and the best food available. Take a laxative. A doctor will give you proper medicine.

Yellow Fever is another disease carried by mosquitoes. It occurs in West Africa, South America, Central America, the Caribbean Islands, Mexico, and the southern United States. You will probably be vaccinated against the disease before you make your trip.

Symptoms: sudden sickness, fever, slow pulse, "yellow jaundice", weakness, black vomit.

Treatment: 1) Take no food at first. Later, only liquids. No milk. 2) Take *no* laxatives. 3) Rest from one to two weeks.

Dhobie Itch is a ringworm infection similar to athlete's foot. It shows up in red, itchy patches between the toes, in the crotch, or armpits. Athletes call it "red flap". To prevent dhobie itch, wash yourself as frequently as you can, and dry carefully. Keep your underwear as clean as you can. If you've got the itch, wash very thoroughly and paint the sore surfaces with iodine on three alternate days. Do not apply iodine to the scrotum.

Natives

When you're plodding through the jungle, keep your eyes peeled for the natives: they'll prove to be your friends. If you treat them right, they'll stake you to a meal, put you up for the night, and lead

you to a white settlement. They may even throw in a little dancing and entertainment, on the house.

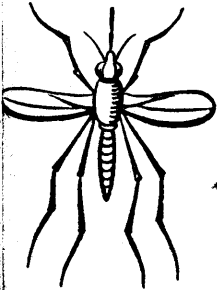
The main thing to remember when dealing with natives is this: *never look down on them*. Maybe you can fly a plane—all right. But where you stumble and flounder around in the mud, the natives can run like deer. Where you cry for food, they find all sorts of chow. When you are exhausted, the wiry black men are still full of bounce. So treat them with respect. They can do a lot of things you can't do. They can save your life.

Suppose you see a black face with a bushy head of hair peeking out from the trees. Your first thought may be: "He's after my head." Nonsense. The natives are probably hiding because they're scared of you.

You have to court them. Motion to them to come out. They're very timid and have to be coaxed. Smile at them. Offer them a little present: tobacco, a couple of matches, thread, fish hooks, a shiny quarter, or some salt. Swap things with them. Then point down your throat, make signs of eating and say "I'm hungry." If you ask them properly, they will take a message from you to the nearest white man. You don't have to get boisterous and slap them on the back. Just be friendly and dignified.

In New Guinea, for example, you may find some natives who are very greasy and smelly. Don't edge away from them, or talk to each other on the sly about them. Some natives speak pidgin English, but even if they don't understand your language, they may understand your thoughts. They're very sensitive. If their feelings are hurt they may get tough. So be careful.

Recently a crew had to bail out over New Guinea. On the shore, near the wreck of their ship, they saw some natives peeking through the bushes. One of the crew got



Yellow Fever
Mosquito





a green branch, waved it at the natives, then broke it in two and threw the pieces on the ground. The crew stood there quietly, with big smiles on their faces. The natives came out of the bushes and began to talk pidgin English. One of the men promised the natives some silver if they would lead the crew to white men.

"We were real uneasy anyhow," said the Captain, "because the natives looked so fierce, but actually they were real timid. We saved our food because the natives gave us fruit and a sort of potato to eat called Taro . . . The natives took us by boat and on foot . . . they hid us by day [from the Japanese] and traveled some at night. We washed ourselves every night because leeches and ticks are bad up there . . .

"A couple of us got sick with malaria during our trip

but we had our quinine from the parachute pack and so got along pretty well . . . As our little caravan progressed, we really began to enjoy the thing since we were so well prepared with medicine, food, guns, etc. We kept a good lookout for snakes too . . ."

These men used their heads. About the same time that they made their journey, another crew of ten men landed in a sloshy jungle in Central America. They made no plans, but went beating around the bush. When they saw a native and his wife paddling a canoe, they didn't feel "sociable," so they just let them go by. They found a native hut, carried off a couple of ducks, and left two dollars for the natives—to hang on the wall, probably. Finally, when the natives took pity on these tenderfeet, brought them food and cooked the ducks, the men ate the ducks without offering any to the natives. The journey to a settlement was needlessly prolonged, because they didn't take advantage of the natives' help from the very beginning. Don't repeat these blunders.

Whenever you have any dealings with natives, remember these rules:

▶ Never shout or laugh at them. Be quiet and friendly. Don't act frightened, even if you are.

▶ Never make promises unless you can keep them to the letter. Be absolutely fair and square in all your dealings. If you promise them two bits you must give them two bits.

▶ Never make passes at native women. Not so much because of the danger of venereal disease—but because the men will resent it and you may pay with your life. Keep your eyes and hands to yourself.

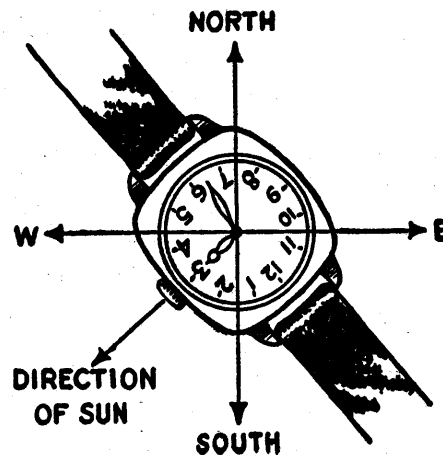
▶ Try to pick up a few words of the native language. Act interested in them. They will like you for it.



REMEMBER: EVERY NATIVE YOU ANTAGONIZE BECOMES AN ENEMY OF THE UNITED STATES. EVERY NATIVE YOU TREAT DECENTLY BECOMES AN ALLY AND MAY SAVE THE LIVES OF MANY OTHER MEN.

Keep in mind what an Australian native said about Sir Hubert Wilkins, the great explorer:

"You proper-white man. You come sit down 'longa camp; no humbug 'longa women. You eat tucker [food] allasame black people. You no more make 'em allabout work 'fore give 'em tucker, no more make 'em allabout listen when you talk; you sit down quiet and listen allatime . . . Allabout feel quiet inside when with you and allabout want to touch you."



If you have no compass:

- ▶ North of the Equator—when the sun is visible, hold your watch flat, and point the hour-hand towards the direction of the sun. Midway between the hour-hand and the 12 o'clock mark will be the direction South.
- ▶ In the Southern Hemisphere, point 12 o'clock mark to the sun. North will lie midway between the 12 o'clock mark and the hour-hand.

SURVIVAL IN THE DESERT

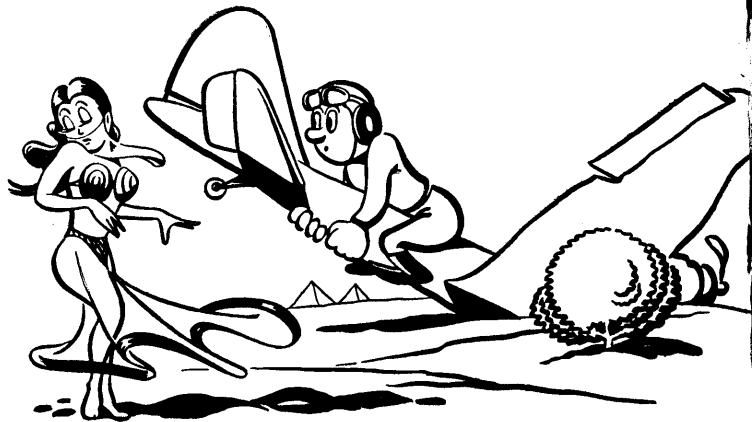
BEFORE you fly over the desert, take a tip from the camel: see that your plane carries a full quota of water. For emergency purposes you should have at least two gallons of water per man. Check on this yourself! Don't leave it to anyone else. *You can live on the desert only if you have water.*

Besides water, you need:

- ▶ Compass
- ▶ Matches
- ▶ Pocket knife
- ▶ Flashlight—5-celled
- ▶ Good, amber-colored sunglasses
- ▶ Sun helmet or hat
- ▶ Sweater, long trousers, long-sleeved shirt
- ▶ Emergency rations—dried meats, fruit or Army ration
- ▶ Signaling Equipment: smoke bombs, glass mirror
- ▶ First-Aid kit including halazone or iodine for purifying water
- ▶ A map showing the caravan routes and wells

When forced down in the desert, stick by your plane; do not budge, no matter how strong your impulse to get going. You may be ten minutes flying time from your base, but on the ground this may mean a week's walk.





If you stay with your ship you have a chance of being picked up by a rescue plane. Your plane will be clearly visible from the air. But if you leave your ship, your chances of being seen from the air are practically nil. You are just a tiny dot on the vast desert.

So sit tight and make yourself as comfortable as possible. Stay out of the sun. Park in the shadow of the fuselage or rig up an awning with a parachute. Don't stay inside the plane; the heat may cause illness. Don't work while the sun is up. Wait till the cool of dawn or evening.

Signaling — Firebuilding

If your plane has been camouflaged for the desert, you will have to take special pains to attract the attention of the pilot in a rescue plane.

You can catch his eye by focusing the sun's rays on a glass signal mirror (see page 6 Arctic Section), or by shooting off a smoke bomb when he passes over.

The best type of signal on the desert is a fire—bright flames at night, smoke in the daytime.

► Look for scrubby desert bushes to use as fuel. They'll burn very easily. Sometimes you can't find bushes, but you may see slender stems no thicker than your little finger, growing in the sand. Underneath the stems are thick masses of roots which burn well.

► Camel dung makes a good emergency fuel.

► If you can't find fuel, take the toilet or a similar container out of the plane, fill it with sand, add a little gasoline, and ignite. When you have no container, just pour a little gasoline on a small patch of ground, and ignite. When the sand is hot and the gasoline still burning, add a few drops of oil for a dense smoke.



Food and Drink

As soon as your plane has landed, take stock of your provisions and water. Ration them carefully. **If you have only a little water, don't eat. If you have plenty of water, it's safe to eat.** Reason: when you eat, your body uses up its water reserves to digest the food. Every mouthful you take helps to drain precious water from your body tissues. In the heat of the desert you won't feel like eating anyhow, so don't force food on yourself. And don't worry about starving. A man with plenty of water to drink can live without food for many weeks.

► Don't gulp down your water. You will only sweat a good deal and will have to drink soon again. Instead, follow the Arabs' practice: just moisten your lips and rinse your mouth with water. You don't need very much for this. Think of your water supply as your bank account. Put yourself on a budget; conserve your liquid assets.

► Don't wash. If you have a few drops of water to spare, rub yourself with a damp rag.



Finding Water in an Emergency

Some deserts become very humid at night. After the sun goes down you may be able to utilize the humidity to collect dew.

Scoop a shallow basin in the ground, about three feet in diameter. Cover the basin with a piece of canvas. Over this build a pyramid of stones at least three feet high. During the night dew will collect in the chinks between the stones, trickle down through the inside of the pyramid onto the canvas. The canvas will sag with water. If you have no canvas, use whatever cloth is available, but try placing a metal object like a hub-cap into the basin so the water won't seep into the ground.

► When there are leafy bushes in the vicinity you can collect dew off the leaves.

► If you find damp sand, dig a hole and wait. Water will percolate into the well.

► Look for water in hollows and chinks of rocks, under the stones of dry river beds, especially in districts of limestone and granite. Dig wells where animals have scratched, or where flies hover. Follow the tracks of animals, the flights of birds—they may be going toward water. But don't go far or lose sight of the plane, no matter how thirsty you are.

► *Remember: all water from wells must be boiled or sterilized.* It may be polluted with urine from the nomads' cattle, rotting vegetable fibers, other filth from travelers. It is especially dangerous to drink any water in Africa without purifying it. You may get typhoid, dysentery, or other diseases.

► When you find a watering hole with very muddy water, use grass for a filter. (See page 59 Jungle section for technique.)

Water-Yielding Plants

Some desert plants store up gallons of water in their trunks, branches, or roots the way camels store water in their humps. The three most

common families of water-yielding plants:

Cactus, found in the deserts of North and South America. Example: the Barrel Cactus, which looks like a squat, spiny barrel about four to five feet high and two to three feet broad. Cut off the top, scoop out the white pulp and mash it till the water oozes out.

Eucalyptus (also known as gum tree and mallee), found in the great Australian desert. Example: the Oleosa, an evergreen bush about fifteen feet high, branched from the root, with long, narrow-pointed leaves and a smooth, pale trunk. Water is stored in its root. The roots lie from two to nine inches below the ground, and may run from the trunk from forty to fifty feet. Pry up a root the size of your wrist. Break off the root near the trunk, cut it into pieces about a foot long, hold it up vertically and let the water drip into your mouth or into a container. You can make a water bottle out of a whole, small-sized root by plugging up the cut end.

The Palm, found in oases and tropical regions throughout the world. Examples: Coco Palm and Date Palm. Other palms have fruits, nuts, edible seeds and leaves, and sweet sap which is made into sugar and wine. The thick stems of many palms contain water.

Animals

Gazelles, foxes, kangaroos, jackals, rabbits, wild rats, who close the mouth of their burrows by day to keep cool, or jerboas, resembling a rat-size edition of the kangaroo, can be eaten. So can lizards, snails, beetles, grasshoppers, termites, and ants.

Heat, Sun, and Sickness

There is no mysterious power in the rays of the sun which is dangerous to human beings or affects their brain. People collapse in the sun because

their bodies absorb more heat than they can throw off. A man working in the engine-room of a ship is just as liable to collapse from heat as a man digging ditches in the sun. There are three kinds of heat collapse: each needs different treatment. Study the following information carefully so you will know what to do in an emergency.

Heat Cramps. These occur in the muscles of the legs or abdomen, and are usually a warning of heat exhaustion.

Treatment: 1) massage the sore muscles gently; 2) apply moderate heat to legs and abdomen; 3) give the victim a teaspoonful of salt in some water, to replace the salt he has lost in sweating. And see that he gets rest.

Heat Exhaustion. This may occur from direct exposure to the sun, or from staying in the hot interior of the plane too long. The face first turns red, then pale; there is a great deal of sweating; the skin is moist and cool. Body temperature sinks below normal (98.6° F.). The victim feels faint, but does not become unconscious. If he does pass out, it is only for a few seconds or minutes.

Treatment: Place the patient flat on his back, and lower his head. Since he is cool, you must apply heat. *Give him whiskey, coffee, or tea.* Remember that much of the body's salt content has been lost through excessive sweating. So give the patient some salt—about one teaspoonful in a glass of water. This should be repeated three times a day.

Sunstroke. The face becomes beet red; there is severe headache; the skin becomes hot and dry; all sweating stops. The pulse is fast, full, and strong; body temperature soars

above normal. The victim becomes unconscious or semi-conscious.

Treatment: Shelter the patient from the sun. Lay him down flat. Apply cool sponges (made of clothes or rags) to his body. *Warning: Do not give him whiskey, tea, or coffee.*

Travel in the Desert

There is only one exception to the rule of sticking by your plane. If you are forced down in enemy country, you must destroy your plane and leave. Travel lightly. Take only the equipment listed on page 73. Don't forget the map showing caravan routes and wells.

► Carry as much water as you can. One man can start out with two 2½ gallon canteens. Five gallons of water should last five days, enable you to travel 150 miles. In a pinch, a man who is used to desert life can travel on as little as a quart of water a day. He can keep up on those short rations for five days—but only if he travels at night and rests during the day. *Remember: if you are short on water, don't take any food. You won't need it.*

► If you have a good supply of water and want to take a little packet of food, *don't* take the kind that will make you thirsty—like candy, crackers, etc. Rather carry something which is cooked, light, and concentrated like dried meat, fruits, or Army ration.

Travel only at night. Usually the moon will give plenty of light. *Don't use your flashlight in hostile country—you will easily be spotted by enemy planes.* First check your course with the compass; then follow the stars. When day comes, dig a trench in the sand, get in, cover the top of the trench with the piece of parachute or your shirt.





and go to sleep. If you have nothing to cover the top of the trench, wear your helmet or hat. If a sandstorm comes up, dig a trench and stay there till the storm blows over.

In some deserts caravan routes are marked by little heaps of stone. Sometimes

these landmarks are only a few inches high, so you have to look sharp for them. If you meet Bedouins jogging along on camels, thumb a lift from them—they'll take you to an oasis, and a settlement. Be pleasant and courteous. Hospitality and generosity are the law of the desert.

Remember: travel in the daytime is suicide. The sun draws water from your body—you will suffer from heat exhaustion. And the mirages will make it very difficult for you to keep to your course. For example, a huge green tree which looms up before you may turn out to be only a scrubby little desert bush. But after the sun sets, mirages fade away, and your vision is no longer distorted.

A Successful Journey

Several years ago a large passenger plane was forced down in the South American desert, only ten minutes flying time from the field. It was necessary for the pilot, an engineer, and a passenger—a newspaperman—to go for help. The pilot and engineer knew the desert like a book, knew exactly how to travel, realized that it would take several days to reach their destination. They traveled light, taking only a compass, map, flashlight, their hats, one bottle of soda pop, three bananas, and a black umbrella. Starting at night, two men walked ahead while the pilot walked behind them with the flashlight and compass, directing their course. They did not drink the pop, but marked off portions on the bottle and passed it around once or twice during the night for each one to moisten his lips.

They traveled this way for three nights. During the day they dug holes in the sand, crawled in, and covered their heads with their shirts and the umbrella. The pilot and crew members reached their destination in good physical condition, except for the loss of weight. During the last lap of the journey, the newspaperman did not cover his head in the daytime. Result: he was laid up several weeks in the hospital with second degree burns.

Wits and water—use one, save the other, and you'll get along in the desert.



CONQUERING THE OCEAN



SURVIVAL on the ocean is like survival on the desert: you must have an ample supply of drinking water to live, and should carry as much water as possible along with you. But there is one great difference—while the arid deserts yield practically nothing, you can get food and water from the ocean, provided you have proper equipment. With a portable still or vaporizing apparatus you can make seawater drinkable; with proper lines and fishhooks you can supply yourself with nourishment.

The main problems:

- ▶ To make sure you have the newest and most modern equipment;
- ▶ To have your equipment, rations and water packed in a foolproof manner, so you can get at them easily;
- ▶ To practice the procedure of abandoning the plane so thoroughly that nothing will be lost if the zero hour should come.

When Captain Eddie Rickenbacker and eight men were adrift in the South Pacific in October 1942, they had nothing but four oranges and a few odds and ends of equipment. "If it seems odd that we should have left the [emergency] food and water after all the careful preparations," Captain Rickenbacker wrote, "I can only say that the shock and confusion, the hurt men, the rough seas, the trouble with the rafts, drove the thought of them out of mind. By the time the last man got out, the water was feet deep inside the plane; the pile of things we had collected was somewhere underneath, scattered by the crash."

Don't let this happen to you!

Sea-Gear

All emergency equipment should be securely lashed to the raft. Only exceptions: rations, radio, and water-still, which should be packed in special floating bags with mooring ropes attached. These bags should be stored in the plane next to the life-rafts and water tanks. The 20-foot mooring ropes attached to rafts and containers are fastened to the plane with a short piece of cord having a maximum 40-lb. pull resistance. If the plane sinks, this cord breaks without pulling the rafts under. Mounted nearby on the plane wall should be an ax and a flashlight.

The best type of rubber life-raft is the new seven-man model. It has wooden oars, a square-rigged sail, a fabric sea-anchor, and horizontal bulkheads to keep it afloat, even if one chamber is pierced. Some of these rafts carry a radio sending apparatus, with a kite to suspend the antennae.

Lashed to the Raft—

Raft repair equipment:

- 1 hand pump
- 1 air bottle
- 1 raft patching kit (with new screw-in patches which need no cement)

Navigating gear:

- 1 pocket compass
- 1 lightweight canvas anchor with ten feet of 1/4-inch rope attached. Cone-shape, minimum size, 24 inches diameter by 25 inches long, made of six-ounce water-proofed canvas or rejected balloon cloth.

A combination sail and awning, made of light-weight

water-repellent airplane cloth. This cloth can be used for:

1) **A life-raft cover**—to prevent waves from breaking into raft—an awning, or a wind-breaker. One side of the cover can be tied firmly to the raft; the other side can be battened down to the raft with stainless steel snap fasteners, to facilitate escape if the raft capsizes.

2) **A sail.** For this, an oar pocket should be fastened into the inside V in the bow of the raft, and two oar pockets—one horizontal, the other vertical—sewed in the raft cover. When the oars are placed in these two oar pockets they serve as mast and top cross arm for a square sail. (A square sail is the only type which can be used effectively on a craft without a keel). It is also useful to have an oar lock in the stern of the raft so that another oar can be used as a rudder.

3) **A funnel for catching rainwater.** If it rains and the cloth has been used as a raft cover, simply turn it inside out and spread it out to collect rainwater. Although the outside will be thoroughly coated with salt, the underside will be clean, and your water will stay sweet. As the water is caught, it can be funneled into a container or the rubber balloons, which hold a total of 28 gallons.

Signaling Equipment

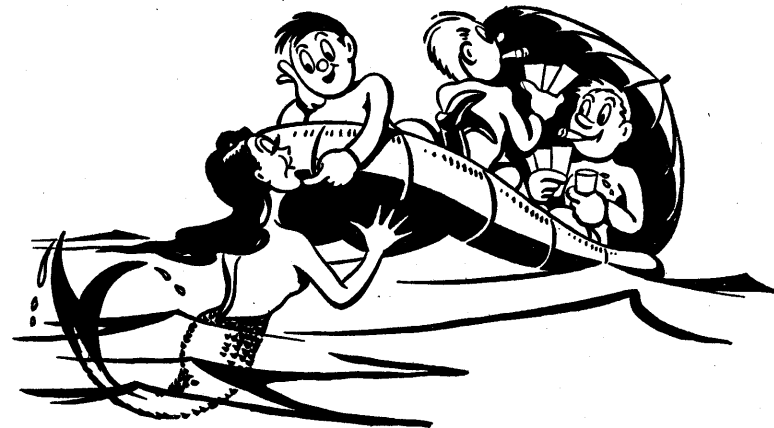
- 1-stainless steel or glass signaling mirror.
- 1 international orange flag.
- 1 can sea marker containing fluorescein soluble sodium salt. When dumped into the sea the powder produces a brilliant green spot which lasts about three hours, can be seen for eight to ten miles at about 10,000 feet altitude.

1 V-K unit for smoke signals and night flares. The basic unit consists of a slim wooden barrel about nine inches long, with a trigger arrangement. To the head of the barrel can be attached either a V-K smoke signal (thick, black, lasting 2½ minutes) or a V-K night flare. When not in use for the signals, the barrel can be used with a special cartridge as a gun for shooting albatross and seagulls. The gun will not rust or corrode.

Pinchot-Lerner No. 5 lightweight emergency Fishing Kit, complete with instructions, assorted hooks, knife, bait, etc.

- ▶ Lifejacket Light.
- ▶ First-Aid Kit
- ▶ Stainless Steel Knife
- ▶ Good amber-colored sunglasses
- ▶ Seven large balloons with screw caps for storing rain-water
- ▶ Waterproof match container
- ▶ Plastic whistle—safer, louder, and easier on the lungs than hollering, if you should fall overboard

NOTE: Why not carry a deck of plastic playing cards in your pocket? There's nothing like a quiet game of blackjack in the middle of the ocean. You won't have much else to do.



Packed in Floating Bags

Emergency radio transmitter, complete with kite for antennae

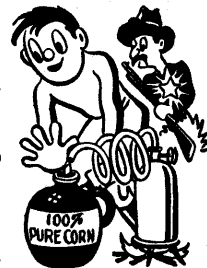
Rations

Water Still or vaporizing device

Making Saltwater Sweet A compact water still weighing six pounds and operating on canned gasoline is now available for use on planes. Instructions for running the still are printed on the outside of the can.

NOTE: Although the still is very easy to operate, it is important to practice assembling it several times before you leave the field.

Solar Still. A simple vaporizing device made of two sheets of plastic framing a piece of turkish toweling, can provide enough fresh water out of salt water to keep one man going indefinitely. No fuel, no upkeep. All you need is sea water and sunshine.



The solar still is about one foot square, weighs a few ounces. The two pieces of plastic are sealed together. Connected directly to the toweling is a rubber bulb and tube. Fill the bulb with sea water and squeeze till the towel becomes saturated with water. Then let the frame stand in the sun. Gradually large beads of moisture condense on the outside of the plastic frame—like the moisture on the glass of a hothouse window. As the water runs down, it can be collected in a cup.

Chemicals. A new chemical compound makes salt water fairly drinkable. A cake weighing less than ½ lb. makes two quarts of sweet but sulfurous water.

Drill, Drill, Drill *To avoid chaos and confusion when a plane comes down on the ocean, the whole crew must practice abandon-ship procedure before leaving the field. Every man should have an assigned position and assigned duties in case of a forced ocean landing.*

How long will a transport plane remain afloat after land-



ing on water? No one knows. Maybe one minute, maybe five or six, perhaps even longer, depending on the gross weight at time of landing, the amount of fuel remaining in the gas tanks, the amount of damage at landing. Under good conditions, everyone should be able to leave the ship without reckless haste. Once your raft is launched with all provisions and equipment aboard, half the battle is won.

Think it over: is your life worth two minutes' drill?

On page 103, at the end of this section, is printed the abandon-ship schedule now being followed by one of the airlines. Read the schedule carefully. Practice it before you leave.

Be sure to wear all the clothes you can get before you leave the plane! The more clothes, the better. Your Mae West will keep you afloat no matter how much you're wearing. Even on the equator it gets miserably cold at night. And in the daytime you need to keep your skin completely covered against the burning sun. So keep your shirt on! Bundle up! If possible take a parachute along—the silk and shroud lines are useful for an awning, sail, or sea anchor.

How to Swim Australian crawl? No! Breast-stroke? No! They use up too much energy—good only for exhibition. Don't churn up and down like an old ferryboat, but follow the ducks and dogs: take it easy.

► If you merely want to stay afloat in the water, turn over on your back. Float lazily, moving your arms very slowly, either together or alternately, like the oars of a rowboat. Kick your legs up and down very slowly.

► If you have to swim to a lifeboat or raft, use dog-paddle or modified breast-stroke. Don't use the breast-stroke kick,

but kick your legs slowly up and down while you use a breast-stroke movement of your arms.

► To swim through oil, use the modified breast-stroke. You can clear a path through oily water by pushing the oil away from and to your sides. When coming up through an oily surface, keep your eyes and mouth closed until your shoulders are above the oil. Then you can open your mouth and inhale quickly. Also open your eyes to check on your position in the water. Exhale through your nose and mouth. Swim to the windward to get away from the oil as quickly as possible. Swim underwater as much as you can.

First Duties Aboard the Raft

1) Treat wounded comrades as best you can.

2) Rig up your canvas or tarpaulin as an awning for protection against the sun.

3) Take your bearings. If you have a new raft with sail, pick an objective, chart your course, and head for it, no matter how far away it is.

4) Take stock of your provisions. You may be adrift for several days, or even a couple of weeks. So start a strict system of rationing at once. Take no food or water for the first 24 hours. If it's very hot, take a few sips of water—no more.

5) Don't gripe! Cooperate with the officer in charge. Don't shout or sing. It will only exhaust you and waste valuable water in your breath. If you're packed in the raft like sardines, make the best of it. It may not be for long. Your survival depends on good morale. Says the Coast Guard: "If you can't be cheerful, be quiet!"

Signaling

The toughest spot to be downed is the North Atlantic, during the fall and winter months. Few men have survived more than 24 hours in the freezing cold. But chances of being picked up speedily in the North Atlantic are good, if you can attract the attention of rescue planes.

Remember that you have several ways of doing this:

► The glass signaling mirror for sunny days. (See page 6 Arctic Section.)

► The sea marker and sea dye. These are the longest-lasting of all the signals, but don't waste them unless rescue planes are in the vicinity.

► The V-K smoke signal for daytime. Instructions are printed on the can. Send up this signal only when a rescue plane is overhead.

► The V-K flare for night-time. Also to be used only when a plane is overhead.

Water

The smallest amount of drinking water needed to keep a man in good physical condition is eighteen ounces a day—two ounces more than a pint.

► If you have enough water on hand and can make a conservative guess as to the time when you'll be picked up, adopt the eighteen ounce ration.

► If you are going to be afloat a long time, hoard your water. Suggested rations: two to eight ounces daily.

► Make the most of each portion of water by keeping it in your mouth for a long time. Rinse, gargle, then swallow. Keep some water to drink before going to sleep.

Seawater. The amount of salt in seawater is equal to that of a teaspoon of salt in a six-ounce cup of water. This is three times as much salt as is present in the blood-

stream. *Don't drink seawater! It's suicide!* Your precious body water will be used up to dilute the extra salt. Men who fill themselves with seawater increase their thirst, suffer from terrible retching and cramps, run a high fever, finally go out of their minds. Seawater enemas are just as dangerous. So don't try to put seawater into your rectum.

How about seawater in small doses? "The experience of survivors from shipwreck," say British medical authorities, "as well as the results of experiments, point to the value of using seawater in small quantities for moistening the lips, and for moistening the mouth as an aid to swallowing food. If the total amount of seawater consumed daily in this way is *not more than six ounces*, no harm is likely to result in the course of a lifeboat voyage of at least ten days. Taken in large quantities, however, seawater is very dangerous."

Emergency Measures. A man in good health can live from eight to twelve days without water. But he's likely to get giddy after four days.

- ▶ If you have no water, don't eat. Reason: your body will have to use up its water supplies in digesting and assimilating the food.
- ▶ Cover up as much as you can in order to lose as little water as possible in sweating.
- ▶ Don't drink liquor—it will make you sick and delirious. Save it for men who are severely wounded: it's a pain-killer and will put them to sleep.
- ▶ Don't drink urine: its poisonous waste-products will increase thirst, contribute to the drying-out process, and raise the body temperature as high as 105 degrees.
- ▶ When you do get fresh water after a long period of thirst, sip it slowly like wine. Otherwise you'll throw up.
- ▶ For relief, chew on untanned leather, cloth, or buttons.

Food

Water is more important than food. On a life-raft you have little to do and will not need much energy. A pound of your body's own fat will supply you with 3500 calories—more than enough for a day on a raft. With enough water to drink you can get along without food for several weeks.

- ▶ Eat, suck, or chew your food slowly.
- ▶ If you have crackers, break them up, put the pieces in your pockets, and nibble the crumbs throughout the day. You can soak them in your water ration if you wish.
- ▶ If you have condensed milk, spread it on your crackers, mix it with water, or best of all, take it by itself an hour before the water ration.
- ▶ Don't eat seaweed unless you have plenty of fresh water. Although full of vitamins, seaweed is too salty.

Fish

Remember these ten rules:

- 1) Never make your line fast to your finger, hand, or foot, or to your boat. A big fish might cut you, or break your line and carry off your tackle.
- 2) Let another man hold the end of your line while you are fishing. That gives you two chances to save your tackle and catch your fish.
- 3) Do not lean over the side of the raft when a fish is hooked. The raft may turn over.
- 4) Try to catch small fish rather than large ones. Big fish may snap lines, steal baits, cut your hands, even upset the raft.
- 5) Keep your bait moving to make it look alive.
- 6) Be sure to keep a part of any bird or fish you catch to use for bait. Fresh bait is better than the pork rind in your fishing kit.

7) After you use them, clean your hooks and lines, wind them up as they were in the kit. See that the hooks are not sticking into the lines. Dry them in the sun, return them to the cloth pockets and try to keep them dry.

8) When you're not fishing, lash the tackle to the raft so it won't get lost.

9) Don't let your lines get tangled or let hooked fish tangle them. Two men can fish at the same time but they must watch out.

10) Be careful not to stab your rubber raft with knife, harpoon, or fish hooks. Don't let your line wear or cut into the rubber side of the raft. Be very careful where you lay your tackle down, especially after catching a fish.

Any fish you catch in the open sea out of sight of land is good to eat raw. You can drink the blood too. *Always divide the catch equally among all crew members.*

► Turtles may swim to the raft on moonlight nights. Keep perfectly still until a turtle comes close, then grab it by the hind legs and turn it over. Kill it by knocking it on the head. Drain the blood from the breast and drink it at once before it coagulates. It's cold, refreshing, and filling. Eat the liver immediately. Throw out the stomach and kidneys, but drink up all the fluid and save the grayish fat to eat with fish. After you have removed the fat, hang the extra meat up to dry on the sail. When a turtle's head is cut off, the jaws may snap and the claws scratch. Watch out!

► All birds are good to eat. Save their feathers to stuff inside your shirt for warmth, save their guts and toes for bait.

► Phosphorescent fish and albatross are safe to eat. Don't pass up a meal just because the fish glows green at night.

The only poisonous fish occur along rocky or coral reefs, and along muddy and sandy shores of tropical seas. Examples: parrot fish (brilliant coloring, sharp beak), puffer fish (snubby nose, inflates its body like a balloon), porcupine fish, cone-shaped shellfish. Eels are good, but don't eat sea snakes. You can tell them from eels by the bony plates that cover their heads and bodies.

► If you get a good catch, you can squeeze out the juice from the flesh of extra fish, and drink it. You can also dry fish for future meals. Clean them as soon as they are caught and wash the flesh free of blood, preferably in fresh water. Then cut the fish in strips and hang them up in the sun.

► Fish liver can be eaten if it's pink. If it's dark, throw it away.

► Shark is tough to carve, and tastes awful, but men have survived on nothing but raw shark meat and water for several weeks.

If you don't have an emergency fishing kit you have to improvise.

► Clinging to masses of seaweed are shrimps and little phosphorescent fish. Lift the seaweed out of the water carefully and shake it over the bottom of the raft so the fish and crabs will fall out. You can eat them, or use them for bait. If you can't get live bait, try a piece of bright-colored cloth, a small scrap of lamp wick, or a piece of bright tin can made into the form of an oval spinner and attached to the hook, etc.

► For hook and line you have to use whatever is at hand. Nine Norwegian seamen who drifted in the Atlantic on two rafts for 48 days, used safety pins and string. They "jigged" about fifty twelve-inch baby dolphins in one

day by dangling the pins in the water and hooking the fish in the body. Sometimes they used the eyes or gills of raw fish as bait. The dolphins were "delicious."

► There are two ways to get fish at night: 1) by shining a light on the water; 2) by hanging a mirror on the edge of the raft so it catches the moonlight. The fish, attracted by the light, will rise to the surface. You can scoop them up in a dip net, or spear them with a knife lashed to your wrist. Flying fish come skipping across the water like a flat stone spun across the surface. They bang against the side of the raft or fall into the water and lie blinded on the surface. Some men have speared as many as 100 an hour, have found them good to eat.

Sharks Some men have shark trouble, some don't. Most everyone agrees that sharks are playful—up to a point. When they rub against a lifeboat, they're not trying to overturn it; they want to get rid of their sea-lice. They rarely attack, and can usually be scared off by vigorous splashing or by a crack on the snout with a paddle.

A group of torpedoed sailors and passengers from an American merchant vessel rode in a slat raft for 21 days with a school of sharks following them. They named the sharks "Big Joe," "Sophie and her Son," and "Grover." The sharks were frisky till the captain died and was thrown overboard. Then they got wild. Grover was finally machine-gunned by a British destroyer which picked the survivors up.

Don't provoke sharks! Don't trail your hands and feet in the water! If the coast is clear you may enjoy a dip in the ocean twice a day. But don't take any chances. On

rare occasions sharks have jumped into rafts, started up wrestling matches. Watch out for their tail! They can swat you in the face. Shark hide is tough, so try to stab them in the nose or gill, their most vulnerable spots.

Raft Ailments

Besides hunger and thirst, the great causes of suffering are sun and sea-water. The sun burns unprotected skin; the salt stings and scours till flesh is left raw and bleeding.

Cracked skin may be prevented by using anti-sunburn lotion, or sulfadiazine ointment, if you have it.

Cracked and parched lips: smear with vaseline.

Saltwater burns (boils):

- (1) Do not squeeze the boils.
- (2) Do not prick them to let the matter out.
- (3) If the boils burst of their own accord, do not squeeze the matter out of them.
- (4) Cover large, angry-looking boils with sulfanilimide paste. Then bandage.

Inflammation of the eyes:

- Smear the upper and lower eyelids with vaseline, and apply a small dab of vaseline to the outer corner of the eye itself.
- Wear goggles if you have them. If not, and your eyes are very painful and bloodshot, cover them lightly with cloth and bandage.

Constipation. When taking little or no food you can't expect a bowel movement. You don't need any treatment for this condition—in fact, laxatives will do harm.

Difficulty of Urination. You can't expect to pass much water when you're not drinking much. There may

be some difficulty in passing urine, and the bladder may feel uncomfortably full. Dangling the hands in the sea will help urination. The urine will most likely be dark and thick. Don't be alarmed.

Swollen Legs. This is a common occurrence on rafts and occurs to practically everyone for a few days after rescue. The swelling goes down without treatment and by itself is nothing to worry about.

"Immersion Foot." If feet or legs are soaked for many hours in cold water or mud, the tissues gradually suffer damage. At first, cold wet feet may hurt a little, but this does not last long. After a while the feet get red and numb, and the toes seem to freeze stiff. The numbness and weakness get worse; the legs swell. If the legs can be taken out of water and warmed, all these troubles disappear. But there is likely to be serious trouble with legs which have been soaking for several days. Blisters or dark patches may appear and the skin may break, leaving the way open for infection.

To prevent immersion foot:

- ▶ Keep your feet out of water as much as possible. Try to keep them raised above body level.
- ▶ If your socks are wet, wring them out and put them on again quickly. Put on dry ones if you can.
- ▶ Try wiggling your toes frequently, and moving your feet.
- ▶ If your feet become swollen, don't rub them. Handle them very gently. Rubbing bruises delicate flesh, invites infection.
- ▶ Sprinkle sulfanilamide powder on the sores.
- ▶ Keep the upper parts of your body dry and warm; this also helps to keep the limbs warm.

▶ Keep damp or wet clothes on the body under water-proof covering rather than stripping and wringing out clothes in a cold wind.

▶ Do not wear tight garters, suspenders, tight boots, or any other tight clothing on the legs.

Men vs. the Sea

The *will* to live is half the battle. Men who give up right away are sure to be licked. Time after time rescued sailors from the Merchant Marine tell of crew members and officers who gave up and died after a few days afloat, without any apparent reason. They were usually in good health, had the same rations as everybody else, but took no interest in their plight and quietly passed out. *Don't give in to the sea! Life is worth a gamble. Just when you think you can't go on a minute longer, help may be on the way.*

▶ On the 33rd day in a life raft, Navy fliers Dixon, Pastula and Aldrich lost practically everything in the sea, including all their clothes. The next day they found an island with water, food, shelter.

▶ Captain Eddie Rickenbacker and his party had no rain for eight days, no food except four oranges. They all prayed. "Within an hour after prayer meeting," said Rickenbacker, "a seagull came in and landed on my head." He divided the carcass among the crew and used the innards for bait.

Alone in the middle of the ocean, everyone thinks of suicide. But few men actually make a move to take their own lives. While you still have breath in your body, there's always hope. Men have been adrift as long as 83 days, and have lived to tell the tale. Even women and children have lived on crowded life rafts for more than three weeks.

Pipe Dreams. The broiling sun, the vast gloom of the night, the ceaseless pitching of the raft, the cramped quarters, sore bodies, terrible craving for water and food—all these hardships are enough to make the mind wander. What about the man who says in the middle of the night, "I'm going round the corner for a glass of beer," and then calmly steps overboard? Or the man who insists on shaking hands over and over again? Or the one who dumps fresh water in the ocean and cries: "I'm serving my God?"

You'll need all your strength and patience to keep these men from harming themselves and you. You may even have to knock them out. But remember, it's only temporary delirium—the result of food and water starvation—and not really "insanity." In most cases they'll come to themselves in the morning.

Grousing. Pilot Harold Dixon says that at times he suffered most from not having anything to throw at his two companions. The British seamen Tapscott and Widdicombe had always hated each other, were forced to stick together in a life-boat for seventy days.

There's nothing you can do about hot tempers. But it's surprising how much a good rainfall will pep up your spirits, how much new hope you can get from a half-cup of water or a piece of smelly fish.

Landing ► A single cumulus cloud lying low over water in a clear sky is usually sign of an island.

► In the South Pacific, lagoon islands may give off lagoon glare—a light greenish tint in the sky, sometimes visible for 75 miles.

► Coconuts, driftwood, and floating plants in the water are also a sign that land is near.

You may have great difficulty getting ashore because of the reefs. Dixon and his men paddled over a high coral reef in the interval between two waves—that is, ahead of a breaker. Even so, the breaker smacked their raft from behind, threw it up in the air and flipped it over like a pancake, so that all three men landed in the water.

Water can be found on coral reefs if you dig a hole at low tide, just below high water mark six to nine inches below the surface of the ground. The hole should be about six to eight inches in diameter. After a few minutes, surface water will collect and may be scooped out. It's brackish, but don't dig any deeper or you'll reach salt water.

Crabs and lobsters of various kinds live in crevices of the reefs, and among rocks. They come out at night and crawl around in shallow water. You can catch them by using a light or torch, and dip-net or spear.

Turtles shuffle their feet in the sand and leave little parallel tracks along the shore. Follow the tracks, and where they end, dig for the turtle eggs with a long stick.

Natives Once you meet natives, you're safe. Probably they'll treat you like a hero. When Dixon, Aldrich and Pastula reached an island, they got food from the natives, and were put to bed in the home of the commissioner of the island. That night a hurricane came up and wrecked most of the natives' homes. "Nevertheless," wrote Dixon in *The Raft*, "the natives, a brave and generous people, began pouring gifts of food upon us as soon as the hurricane had subsided. . . . The native who found us was typical. With his home gone, his gardens ruined, and

no boat coming until no one knew when, he sat down and wove for me a beautiful coconut hat, with a band of beaded shells. He gathered somewhere a basket of coconuts, another basket of taro, and two chickens . . . and presented them to us. . . . I resolved that someday I would go back to that lovely, generous place, and if God is willing I will."



APPENDIX

Ditching

A. The following notes have been prepared for the general guidance of all airplane crews in the event of a forced landing at sea:

B. If doubt exists in the captain's mind whether he can reach land, preparation for ditching must begin.

If height cannot be maintained above 1000 feet, the crew should move to their ditching stations in order that the captain may be able to readjust the trim and lower flaps without the crew moving about the ship.

The captain's order to prepare for ditching is: "*Prepare for Ditching.*" The order should be acknowledged by the whole crew. The passengers (if any), should be notified of the captain's order. The preparation for ditching is thus begun, and if the drill has been practiced, all should know exactly what they should do and execute the order without delay.

C. Navigator

(1) On the captain's order, the navigator will:

- a. Calculate position.
- b. Pass position report to radio operator with course, altitude above sea level, and speed maintained.
- c. Receive bearings from Radio Operator.
- d. Calculate estimated position of ditching and pass to R.O.
- e. Inform captain of surface W. F. and D.
- f. Make out air and raft release messages.
- g. Destroy secret papers and place charts (with latest positions marked thereon) in satchel with necessary Navigation Equipment.

D. Radio Operator

(1) On captain's orders, the radio operator will:

- a. If on a group frequency, make first signal on that frequency, and then change over to the allotted M.F.D.F. Station.

b. Turn IFF to Emergency.

c. According to the situation, use the appropriate distress signal:

1. Send automatic alarm signal if time permits.
2. SOS — (code operation) I am in distress, may be forced to land without further signal.
3. MAY DAY — (by radio telephone) — I am in distress.

d. Give time and position in the signal. It is better to make one of the distress signals as appropriate, then to remain silent. A distress signal can always be cancelled when no longer applicable; in fact, this must be done.

e. Pass bearings to navigators.

f. Receive estimated position of ditching from navigator.

g. Transmit estimated position of ditching.

h. Clamp down key on captain's order and move to ditching station.

i. Destroy secret papers.

j. Where possible, use trailing antenna as an altimeter.

E. Captain's Responsibilities in Preparation for Ditching:

- (1) To open the pilot's upper exit.
- (2) To check that the landing gear is "UP."
- (3) To lower flaps to the ditching setting.
- (4) To order the Radio Operator to his ditching station, since it is important to remain at the set as long as possible.
- (5) To warn the crew when ditching is imminent.
- (6) To switch on the landing lamp and the upper identification lamp (if this does not cause reflections which upset vision). It is important to remember that judgment of height may not be correct.

NOTE: A web strap passing over each shoulder, holding the pilot securely in his seat (Sutton harness) may soon be in general use.

F. Preparation of Aircraft to make it as Seaworthy as Possible:

- (1) Cargo which can be dumped should be; see that it does not hit tail or IFF aerials.
- (2) *The security of all lower and side hatches must be checked.* Side exits may have to be used as ditching exits but only upper exits can be regarded as ideal, since they must be opened before ditching. This is necessary because the hatches may become jammed on impact and also because it is essential for the crew to be free to leave the airplane without delay after ditching.

(3) All bulkhead doors must be closed to hinder the flow of water, from bow to stern.

G. Preparation by Crew to Insure Safety on and After Impact:

(1) All the actions to make the aircraft seaworthy also come into this category.

(2) It is vitally important that the crew should be braced against the impact. There are two ideal ditching stations:

a. In a sitting position back and head braced against a solid structure, such as the rear of a spar. If the head comes above a spar being used as a ditching station, it is very important that the head should be clasped in the hands, to avoid it being forced back and injured. In this position, the body can withstand forces which are far greater than those expected in ditching with the exception of forces expected when the aircraft dives straight in.

b. The second but less satisfactory ditching station, is to lie upon the floor with the head to the rear and the feet braced against a solid structure. It is necessary to have the knees bent to avoid injury as far as possible, but the limiting factor of this ditching station is the liability of the legs to fracture.

NOTE: Serious casualties have occurred in crews who have not taken up proper ditching stations or who have relaxed before the final impact. Also, some crews have thought that they knew better ditching stations than those laid down in the official drill; this also has resulted in casualties. It is pointed out that these drills are the results of experience of a great many previous ditchings. Such advice and instructions should not be lightly disregarded.

(3) Seat belts are not normally required at ditching stations unless there is a lack of suitable positions in the aircraft when the member of the crew may have to remain in his seat. Loss of life may occur due to failure to get clear of the aircraft so that straps must not be used unless virtually necessary.

(4) It is vitally necessary for the pilot to fasten his seat belt.

(5) All forward upper hatches should be opened before ditching to facilitate the rapid evacuation of the crew and also to make sure that the hatches do not become jammed on impact because they were left closed. It should, however, be remembered that

open hatches cause drag and, therefore, if the aircraft is being flown at reduced power those upper hatches should not be opened until at least 1000 feet is reached.

- (6) In night ditching all bright internal light should be put out and only the amber lamps used. This will accustom the eyes to the external darkness.
- (7) All light should be left on after ditching to facilitate search, in the event of the aircraft floating for a period.
- (8) Life vests must be worn at all times with the leg strips secured. Where there are small upper ditching exits, jackets should not be inflated till immediately after leaving the exit. On aircraft with large upper exits the jacket may be inflated before the ditching takes place.
- (9) Parachute harnesses should be removed before ditching in all cases where practicable, except where the single-seater raft is attached to the parachute harness.
- (10) Helmets should be retained for the sake of protection of the head against cold when in the raft. The leads should be tucked firmly within the life jacket below the V of the neck, at the top tie.
- (11) The latest airplane sea rescue equipment is usually stowed in either the raft stowage or conveniently near the ditching exits and it should not be removed from these stowages before ditching to avoid it being flung forward on impact and becoming lost in the surge of water. That equipment which is carried free must be held firmly during ditching.

H. Wind Speed and Direction and Surface Conditions in Relation to Ditching:

- (1) *Calm Sea*—With this type of sea, there may be little or no wind, so that it is essential to ditch with the lowest IAS possible. Such a sea is deceptive with regard to judgment of height, particularly if the surface is "glassy". If there are ripples upon the surface, judgment of height is improved.
- (2) *Waves* always move with the wind except when close inshore. Waves are the direct result of the wind, which creates them and maintains them.
- (3) *Swell* is an undulating movement of the surface caused by past or distant disturbance by action of the wind. It does not neces-

sarily move with the wind and it has no breaking crests. If the wind is blowing across the swell a cross-sea is created with the waves (which are moving down wind) running on the swell. In these conditions the pilot must choose that direction along the swell which will make the approach as near into the wind as possible.

I. Ditching Characteristics:

- (1) If the airplane lands tail down in a three-point attitude (as it should), there will be a primary slight impact as the rear of the aircraft strikes. This will be followed by a severe impact with violent deceleration in most cases. If the landing has been made too fast a bounce will occur, providing the underbody is sufficiently strong. As the aircraft comes to rest, the nose will bury, but if the alighting has been carried out correctly, the effect of the nose burying will be minimized and the structure may not collapse. Usually the airplane may be expected to float for a minimum period of one minute.

J. Characteristics in a Short, Moderate or Calm Sea:

- (1) If the airplane bounces, the control column should be held back. In the average short sea, the tail should touch the crest of a wave and as soon as it does the nose should be kept up as much as possible. This should cause the forebody to touch down approximately under the CG on the next wave crest.
WARNING: The open sea always appears from the air to be much more calm than is actually the case.

K. Wind Speed and Direction:

- (1) In the absence of any fixed mark (land, lightship, etc.) or floating object not under way, the pilot can only judge motion relative to the motion of the waves.
- (2) Waves, as distant from swell, move down wind and the line of the wind can be taken to be at right angles to the lines of the wave crests.
- (3) If there is sufficient wind, waves break down wind. This can readily be observed from a low height. If the aircraft is flown at right angles to the breaking waves, the direction of draft will be apparent.

- (4) If there is enough wind to blow the spray off the wave crests, the direction in which the spray moves is reliable.
- (5) Wind direction may be obtained by dropping a smoke float. The smoke from ships is also a useful guide. Smoke naturally drifts with the wind and if this draft could be observed, the direction would be indicated.
- (6) If low enough, it is possible to calculate the direction of the wind by observing the sails of surface craft. A reasonable indication of speed can also be gained by observing the set of the sails.
- (7) Where the surface is not broken up, it is possible to watch gusts of wind rippling the surface in great sweeps, which indicate the wind direction.

L. Drill During the Final Approach:

- (1) The captain should keep his radio operator at the set as long as possible and leave him a safe margin of time to take up his ditching station.
- (2) The crew on their part must see to it that the radio operator's ditching station is not occupied and is clear of obstacles.
- (3) The captain will warn the radio operator to move to his ditching station by call light and/or interphone or by shouting.
- (4) The radio operator for his part can be fairly certain that the order will come, when he feels the flaps finally being lowered.
- (5) The radio operator will immediately clamp down the key and move to his ditching station on the captain's order, fully realizing that he has been left at the radio only as long as it is safe, thus if he does not move quickly he may be caught standing up at impact. This is very dangerous.
- (6) The captain will maintain intercommunication with the crew up till the last moment and warn them of the impending impact. It is not reasonable to expect the crew to remain braced for long periods. If they are not in intercommunication with the captain, the temptation to get up and see how things are progressing may end in being caught out of a ditching station with consequent injury. A casualty in ditching is a very grave

handicap to the rest of the crew, who may scarcely be able to save themselves.

M. Drill During Ditching:

- (1) The crew must not release themselves from their ditching stations until the airplane has come to rest. The first impact of the tail can be mistaken for the shock against which they are on guard, but it will be followed by a greater shock as the nose strikes the water after a correct three-point tail-down ditching.
- (2) The airplane may slew to one side after impact, especially after a down wind or cross wind ditching. In most raft drills the ditching stations provide for this contingency in various ways.

N. Handling of Landplanes in Ditching:

- (1) *Use of Flaps**—The flaps should be lowered to reduce speed at which the airplane can approach and touch down. Full flaps should be used if CG is aft of 25% (of wing, mean chord) so that a tail down landing can be made. $\frac{1}{2}$ - $\frac{3}{4}$ flap should be used if CG is ahead of 25% as full flaps will cause a nose down and fast landing. A steep nose down descent is dangerous if the sea is met sooner than expected, and also more height is required for flattening out from such an altitude.

*NOTE: For detailed Ditching Procedures involving specific plane types, see individual T.O.'s covering each type of aircraft.

- (2) *Approach Speed*—Assuming that power is not available from all engines, the normal glide approach speed should be used. This will ensure control and some margin of speed after flattening out to allow the pilot to choose the best spot for ditching on the swell.
- (3) *Touch Down*—Apart from choosing the best point at which to ditch, the pilot should hold off till he loses all excess speed above the stall and so strikes the sea at the normal three-point landing attitude (slow landing attitude for tricycles). The best point for ditching is towards an oncoming swell top.
- (4) *Direction of Approach in a Swell*—In a steep swell the pilot should generally ditch along the top of the swell. He should

ditch up wind in a long ocean swell; however, if ditching along the swell would involve alighting with a very strong cross wind, the aircraft should be ditched into the wind. In ditching across the swell, the aircraft should be put down on an upslope towards the top.

(5) *Ditching Across Wind Along a Swell*—As the sea is approached, drift should be taken off by sideslipping and the airplane is ditched on the upslope towards the top of the swell.

(6) *Use of Engines*

a. If two engines are available on one side, the inner engine should be used.

b. If the power is, for instance, right inboard and left outboard, it will be possible to use considerable power, adjusting the throttles so that little rudder is needed; this case approximates the next case.

c. If equal power is available on all engines, it should be used—to full, if necessary, with two engines out of four—to secure the flattest possible approach and the slowest possible down. The slip-streams over wings and tail will aid considerably in reducing speed and maintaining control.

O. Retention of Fuel for Ditching

(1) *The value of power in ditching is so great that the pilot should always ditch before fuel is quite exhausted, when it is certain that land cannot be reached.*

P. Altimeter

(1) *The aneroid altimeter is quite unreliable as an indicator of close approach to sea. The trailing aerial can be used, the radio operator signaling the captain when the current drops as the weight hits the sea. An alternative method is to engage the aerial with an insulated hook in the hand, when the impact of the weight on the sea will be felt. This drill can only be carried out where a suitable ditching station is adjacent to the R.O.*

Q. Drill After the Airplane Has Come to Rest

NOTE: There are two critical periods in ditching: The actual maneuvering of the airplane into the water. This is the sole responsibility of the pilot.

The evacuation of the airplane in an orderly manner after ditching in the very shortest time possible. This can be done well in a training fuselage in a hangar without much practice. But it is very difficult in the dark after a shock in a fuselage which is filling with water. Practice makes perfect.

(1) The crew must not release themselves until the airplane has come to rest.

(2) Operate the manual release of the raft as soon as the aircraft comes to rest but not before. The manual release should not be gripped before or during the ditching to avoid inadvertent release as a result of the impact. If this mistake is made the raft will blow out while there is still way on, and it may thus break free and drift out of reach.

(3) As soon as the airplane comes to rest, rise from the ditching stations and collect the equipment detailed in the drill. Leave by the hatch detailed in the drill and in the correct order. The raft radio and the means of erecting the aerial (mast or kite), are the most vital pieces of equipment required in the raft to assist rescue.

(4) On emerging, inflate the life jacket if this has not been already done. Do not be surprised to find that waves may be breaking over the aircraft. If they are large it is possible to get swept off. If the aircraft has a life line attached to the inside of the hatch, make use of it, otherwise hold on to the outside of the hatch and await a favorable moment to board the raft. Take care not to block the escape hatch, or to hinder the speed of the drill to any great extent.

(5) In airplanes with blow-out rafts *one man is detailed to assist the raft from the stowage and it is his duty to see that the necessary cordage does not entangle during inflation.* He should also assist the raft into the water in order to hasten the boarding.

(6) If the raft should inflate inverted, an endeavor should be made to right it from the wing if the aircraft is not sinking rapidly; otherwise one (and one only) of the crew should jump into the sea and right it. There are two methods of doing this:

a. If there are handling patches on the bottom of the raft, grasp them with both hands. Then haul on these patches with the knees on the buoyancy chamber. Now, while still hauling on the handling patches, lean back and prepare to

become submerged for a moment. The raft, even the largest, will turn over.

b. In the absence of handling patches, place the toe of the foot on the bottom of the ladder, grasp the two nearest stabilizing pockets, lean back and haul on the pockets while pressing with the foot on the ladder.

- (7) Do not jump onto the inverted raft, as doing so expels air trapped beneath it and makes righting more difficult.
- (8) If there is a cord which attaches the raft to the aircraft, it is made intentionally light in order that it shall break if the aircraft sinks while the raft is still attached. There is a knife attached to the raft near the point where the cord is made fast. This knife is to be used to cut the raft free.

R. Boarding the Life Raft:

- (1) If the ditching has been made into wind, the raft should float toward the tail and the boarding should not be difficult.
- (2) If a cross wind ditching has been made, the aircraft will tend to swing into the wind. If the raft is on the up-wind side of the aircraft, there is danger of it becoming wedged beneath the wing as the aircraft rolls and swings into wind. On the other hand, if the raft is on the downwind side, there is a danger of getting beneath the fuselage or tail which may be thrashing up and down as the aircraft weathercocks into the wind. Look out for jagged edges which may puncture the dinghy.
- (3) Do not jump into the raft; by so doing, it may become damaged and the whole crew endangered.
- (4) If boarding from the sea, use the rope ladder, or the tail line, if provided. When using the ladder, grasp the ratlines (which run across the raft) with one hand and the bottom rung of the ladder with the other pushing it down into the water as far as it will go to assist in inserting the foot. Then grasp the ratlines with both hands and pull, at the same time pressing downward with the foot.
- (5) One man already in the raft can be of great assistance to those in the water who require helping aboard.
- (6) To avoid the consequences of exposure, it is important not to get more wet than absolutely necessary. But wet clothes must NOT be taken off; it is far warmer with wet clothes on than

off. In hot weather this may not apply, so far as cold is concerned, but the body should be covered against the sun.

- (7) On every main raft there is a heaving line which may be used for aiding crews to reach the raft.
- (8) All the above actions concerning boarding the raft are comparatively simple if the life jacket is fully inflated. If this jacket has been partly inflated by mouth, it is important to ensure that the mouth valve is closed before using the CO₂ bottle. A non-swimmer can feel quite confident in a fully inflated jacket providing the leg straps are secure.

S. Aboard the Life Raft:

- (1) Once aboard it is the duty of the man detailed in the drill to check whether there are any leaks and stop them up with the patches provided. Another member of the crew is also detailed to connect up the hand pump and pump until the raft is rigid. If any of the crew are in the water, the rigidity of the raft will greatly assist in boarding.
- (2) Once everyone is aboard the captain should call the roll and give the order to cast off, then the crew should paddle away from the airplane. If the airplane floats, keep nearby to increase the chance of being spotted. But do not remain made fast to the airplane where there is any chance of the raft being damaged by the rise and fall of the airplane.

The radio operator will, as soon as the ship hits the water and stops, and not before, take care of the radio transmitter. The navigator will go out of the escape hatch first. The radio operator will hand the SOS set and any other equipment out of the hatch to the navigator who in turn will deposit the articles in the raft, if possible, and on top of the wing or in water as a last resort.

If passengers are on board, it will be the duty of the first officer to go back one hour after takeoff (over water) and give passengers any necessary orders or instructions pertaining to order of evacuation, the doors that should be opened, and the items that should go out with the passengers. Loosen life-raft of any straps or cover over raft, assign a pass to each item to go out at the proper time (when pilot gives warning of the impending crash) to carry out ditching practices, as to where and how to sit and protect oneself, and also to take those precautions himself. The moment the ship hits and stops

moving, it will be his responsibility to see that everyone gets out as fast as is physically possible.

The flight mechanic will be ready to help get out any equipment plus the one gallon water jug.

The captain will land the airplane and leave as the last member of the crew. The crew leaves the plane in the following order:

1. Navigator
2. Radio Operator
3. Flight Mechanic
4. First Officer (If no passengers are in cabin)
5. Captain

All crew members and passengers will don *Mae Wests* as soon as the order of "Prepare for Ditching" is given. First officer will go back and make the necessary preparations for passengers' safety. Other members of the crew will perform duties as outlined and prepare for immediate evacuation.

T. Emergency Operation of Radio Equipment

Preparation:

- (1) To prepare for operation, proceed as follows:
- (2) Take the set out of the bag and *immediately* strap it securely to some part of the raft.
- (3) Unscrew the cap on top of the set. Take the crank out of its well, first releasing the locking key, insert in socket on top of the set, and tighten thumb nut. **DON'T DROP CRANK.** There is no spare.
- (4) Open door in front of set, first removing cotter key, and pull out a few feet of antenna wire from the reel.
- (5) Set slight tension on the brake by turning the BRAKE knob clockwise.
- (6) a. *Use Kite Whenever Possible, i.e.:* When wind is from seven to fifty miles per hour.
b. *Use Balloon If Kite Cannot Be Flown, i.e.:* If wind is less than seven miles per hour.
- (7) a. Take kite from tubular bag and spread by pushing spreaders outward from center till they lock. **DON'T ALLOW SPREADER TO SNAP OPEN.** It may tear fabric.
b. Take balloon can, gas generator, and inflation tube from

tubular bag, open balloon and attach antenna wire **AT ONCE.**

- (8) a. Attach antenna wire swivel to one of two eyelets on the kite according to wind speed indicated on kite.
b. Remove top and bottom plugs from gas generator can, screw inflation tube into top of generator. Wet blunt needle of tube and insert into balloon valve. Hold generator in water up to lower red line for ten minutes.
- (9) a. Stand up in boat, wait for a gust, toss kite in air, fly kite with slack in antenna wire till it can be flown from the reel with the brake. If kite falls in water, pull in slowly, dry kite, and try again.
b. Slowly lower generator in water to upper red line. Control rate of inflation by rate of lowering generator. When balloon is full, put rubber stopper in valve, unscrew inflation tube, and *throw generator away.*
- (10) Release antenna **SLOWLY** all the way, as far as possible, then tie loose end of cord to life raft to take the pull of the kite or balloon. Take antenna lead-in from set and clip to antenna. (See Fig. 1 on card to left of crank socket.)
- (11) Strap transmitter between legs. Unscrew cap marked **GROUND**, take out reel, unreel wire, and throw all ground wire into water. **DON'T ALLOW ANTENNA TO SAG INTO WATER.** This grounds antenna and no signals will be heard.

Operation

- (1) Turn selector switch to "Auto 1" unless in North Sea. (This sends SOS). In North Sea turn switch to "Auto 2." (This sends A.A.)
- (2) Rotate crank clockwise till "SPEED INDICATOR" light burns brightly (about 72 r.p.m.). Allow 20 seconds for tubes to warm up. Keep light burning steadily.
- (3) Turn "TUNING" control to produce maximum brilliancy of "TUNE TO BRIGHTEST" lamp.
- (4) Send in proper "Auto" position for five minutes. **REST.** Turn switch to "Manual". Use key to send call letters of plane (or identification numbers if the call letters are not known) followed by known or estimated location, using Continental Code shown on card to left of crank socket,

- (5) Try to send so as to include the three-minute International silent periods starting at 15 minutes and 45 minutes after each hour (Greenwich Time). Keep cranking. Change hands or operators frequently, if possible, to avoid tiring. Keep on the air as much as possible.
- (6) At night the signal lamp may be plugged into socket above tuning knob. Turn switch so that "LIGHT" is in "MANUAL" position and send with manual key as described above (4). This should be done only if it is thought friendly vessels are within sight. No antenna or ground is needed, with light.

CAUTIONS

- (1) **WORK CAREFULLY—TAKE IT EASY—KEEP AT IT.**
Take frequent short rests.
- (2) **DON'T USE BALLOON IN HOT SUN UNLESS ABSOLUTELY NECESSARY.**
Heat expands gas and will explode balloon if fully inflated during heat of day.
- (3) **DON'T SPILL CONTENTS OF GAS GENERATOR—IT WILL BURN.**
If spilled on skin, eyes, clothing, or raft, flush promptly with water.
- (4) **DON'T SMOKE OR USE OPEN FLAME WHILE INFLATING BALLOON.**
Hydrogen gas is explosive.
- (5) **DON'T USE SET IF SEVERE LIGHTNING IS OCCURRING.**
Antenna will attract lightning and may result in severe shock.