ALEUTIAN SENSE

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TRAINING DIVISION ★ BUREAU OF AERONAUTICS ★ U. S. NAVY

ALEUTIAN SENSE

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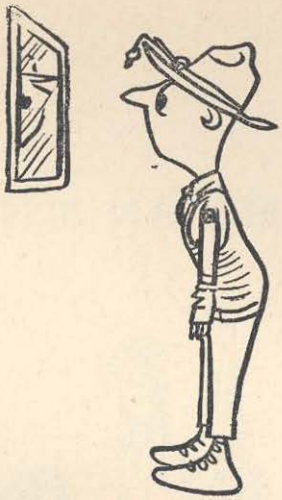
If you are assigned to duty in the Aleutians, the first thing you ought to do is to overcome your desire to outfit yourself like an Arctic explorer. You won't need a reindeer-hide parka, snowshoes, or a team of malamutes. As a matter of fact, there isn't anything that you need to go out and buy. The islands have become a chain of stations stretching west for a thousand miles across the North Pacific and the Bering Sea. They all have supply depots and ships service stores, and you'll find that experience has made the officers in charge very familiar with clothing and equipment needs.

They will issue you some articles that you may not expect. You'll get special flight gear, of course, but don't be surprised if you also get some Army equipment—trousers, shirts, and boots, for instance. The reason for this is that life on a base in the Aleutians is more like that of the Army than the Navy, and you dress accordingly. Strangely enough, some of your gear is designed for service in the temperate zone, because you'll encounter warm weather in the Aleutians. And sometimes you'll be

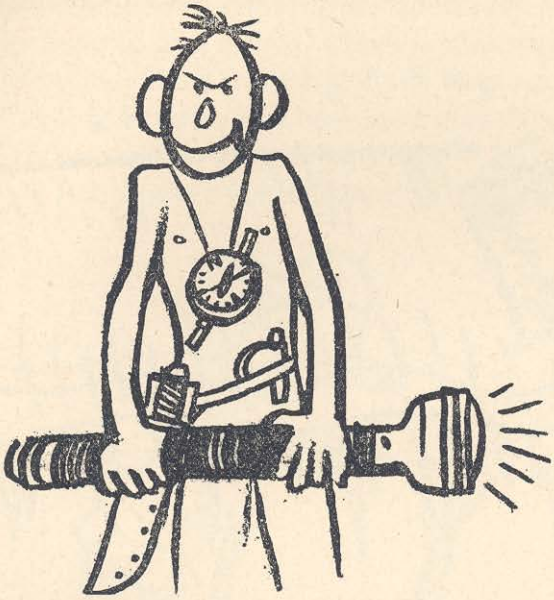


in blizzards with winds as high as 100 knots raging along the island chain. It won't be like anything you've ever seen before, because Aleutian weather is unlike that of any other place in the world. So don't try to anticipate it by taking your own

special clothing with you. Let the Supply Officer handle it for you. He will give you what you need, including woolen underwear and socks.

Unless you are a Wing officer, you will need service blues at Kodiak and Dutch

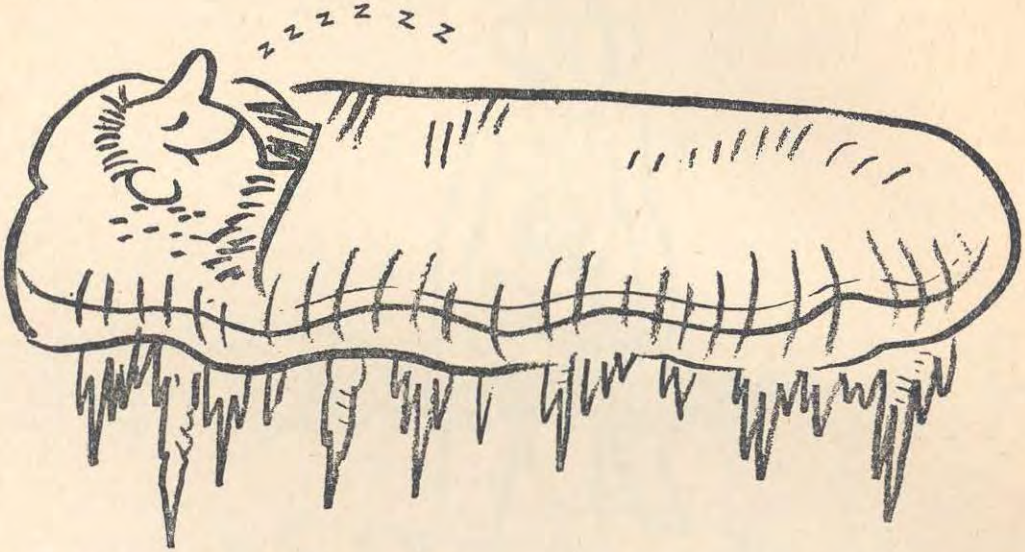
Harbor, but as you go west along the chain, the uniform of the day is whatever is most practical, and you won't find it set forth in the Uniform regulations. About the only standard equipment is a flashlight, a sheath knife, and a pocket compass.



Bring all of these along, if you can get hold of them. It's also a good idea to own a whistle, so that if necessary you can attract attention without yelling your lungs out.

Your clothing will be designed to protect you from rain, mud, snow, ice, wind, and subzero cold, all of which you will encounter in the course of your duty. Your

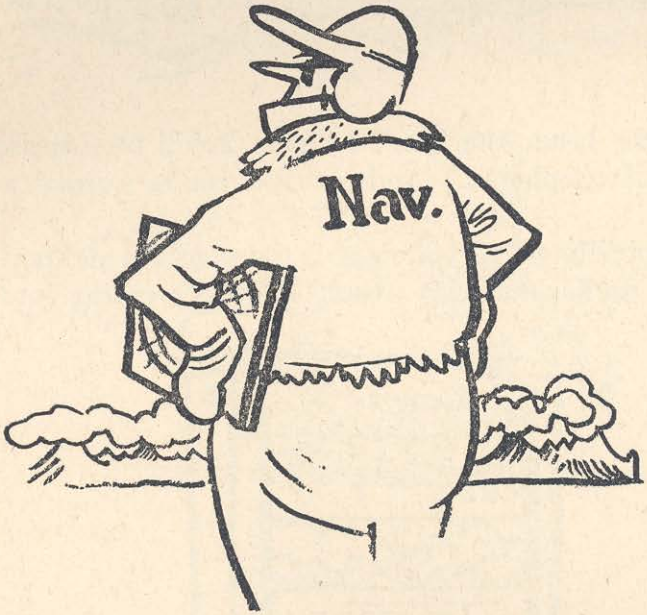
sleeping bag, and it should be eiderdown and the first item you draw from the Supply Officer, serves the dual purpose of taking care of you when you are at home, on the base, or if you should have to spend the night in the open. It will give you all the warmth you need—in fact, many well-indoctrinated sleeping-bag habitués prefer to sleep raw.



The terrain of the Aleutians is about as rough as you can imagine, a series of rocky promontories that stick out of the sea with saw-toothed edges whitened by ice and snow, so that often they seem to merge with the cloud cover and are very hard to see and a whole lot harder if you hit them. The valleys and lowlands are covered

with tundra, a thick matting of low growth that looks something like wildcats. It is a soft, tangled surface and is not suitable for landings. In the summer the lowlands are marshy and also deceptive in appearance. We got our first intact Zero because a Jap lieutenant commander thought he had found a place to set down, and two things happened immediately, (1) his plane nosed over when the wheels touched, and (2) his neck was broken.

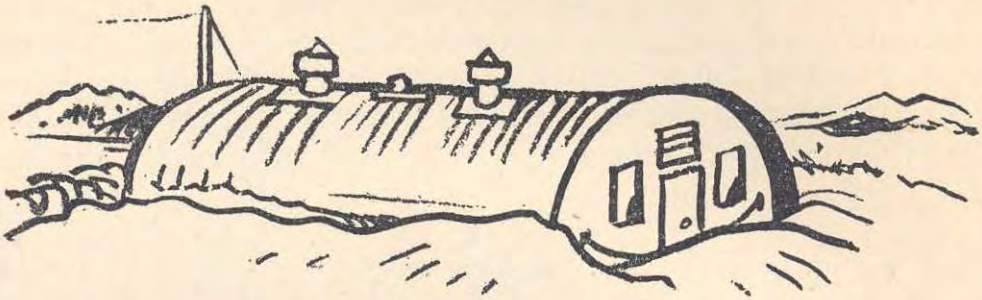
A naval aviator flying in the Aleutians may be flying seaplanes or landplanes—ranging in type from scout observations to patrol planes and medium or heavy bombers. If you are flying big boats, you have the choice of finding your base or making a water landing. Some of the OS2U's are on wheels, and so if you are flying inshore patrol, you may have to find a field, which is also true of the PV's. If you have to make a forced landing, the hard sand of the island coasts at low tide may permit you to make a landing but you had best have alternate airports well in mind whenever you take off on a search or a bombing mission. The terrain of the islands is distinctly unfriendly. It behooves you to know all you possibly can learn about



the islands, and to *"know your navigation"* better than you know your own name. Your value to the service depends upon these things.

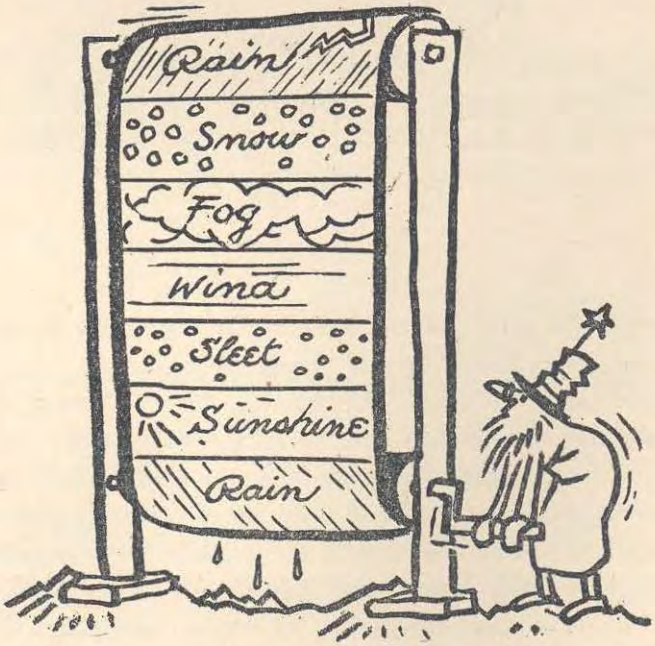
You don't have to give much thought to health precautions or to diet in Aleutian duty, because these are taken care of for you. Dispensaries have been established at every base along the chain, and living conditions, while a little different from a penthouse on Park Avenue, are nothing to add to the horrors of war. You live in a Quonset hut, which is a cabin with a rounded, metal roof, insulated inner walls, a wooden floor, and usually sunk below the ground level to repel the wind and/or Japanese shrapnel. At some bases, flight personnel is based

in Yakutat huts, which are wooden frame buildings that look like the bunk houses in a western meolodrama. They aren't exactly the love nests that would charm a young bride, but they keep off the weather, and their stoves are warm. The bunks have springs, and while you may have to carry your own water and walk a few



hundred feet to the head, you won't suffer. You'll be surprised to find showers, electric lights, and telephones. And, in case you're worried about it, you won't have to cook.

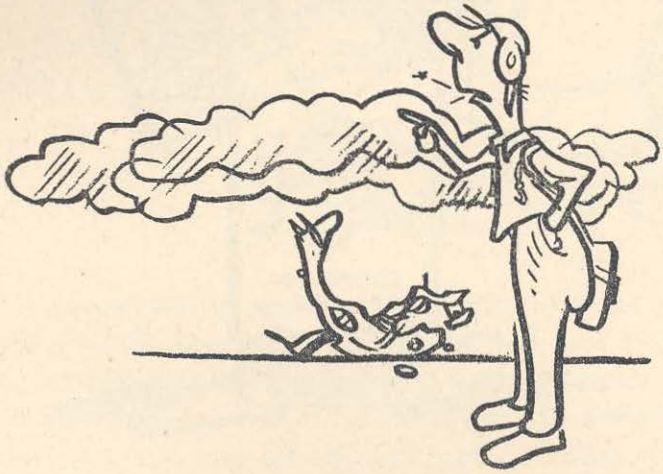
What will probably worry you most is the weather, and perhaps you have been induced by some undue publicity about Aleutian weather into thinking about it



unduly. There is a saying in the Aleutians, "If you don't like our weather, wait 10 minutes!" There is a basis for this crack, because the weather does change momentarily, and there are fogs, ice, and storms to contend with.

But the fogs are no different from those of Pensacola and Alameda. The ice that forms on your plane comes from the combination of moisture and low temperature, just as it would anywhere else, and the storms are like storms in the States, or over the Atlantic, or near Cape Horn. The only reason the weather is worse in the Aleutians than in any territory you are familiar with is that there is more of it. The rules of safety for flying Aleutian weather are the same rules that apply anywhere else.

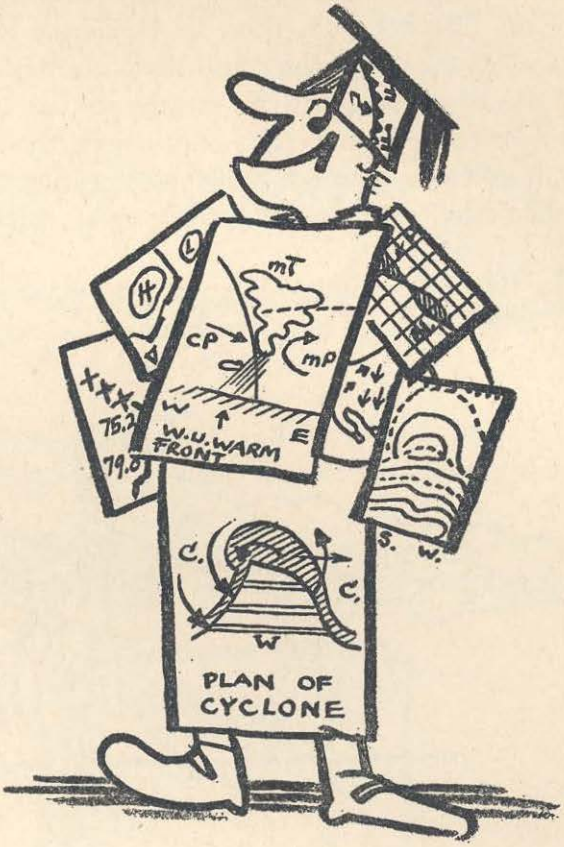
As a matter of fact, Aleutian weather has received more blame than it deserves for crack-ups. Most of the time, it isn't the fault of the weather, but the fault of



the pilot for not providing adequate navigation. Too many pilots depend upon radio aids to get them home. They rely upon it to tell them their position, when all it is calculated to do is locate land for them. Planes could not fly in the Aleutians area without radio aids when visibility is lacking; but, on the other hand, radio aids are not, and never will be, used to replace navigation. They are only a supplement.

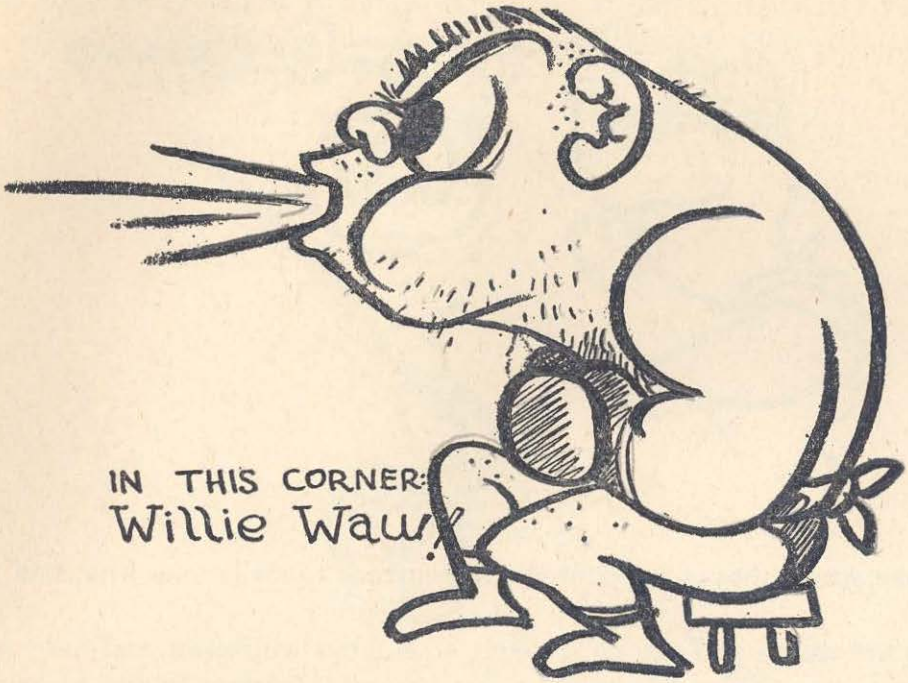
In flying Aleutian weather there is no substitute for using your head and for conforming with the rules. There is no counsel that can be put on paper that will

take care of all contingencies for you, but you can't do better than to follow this general piece of advice:



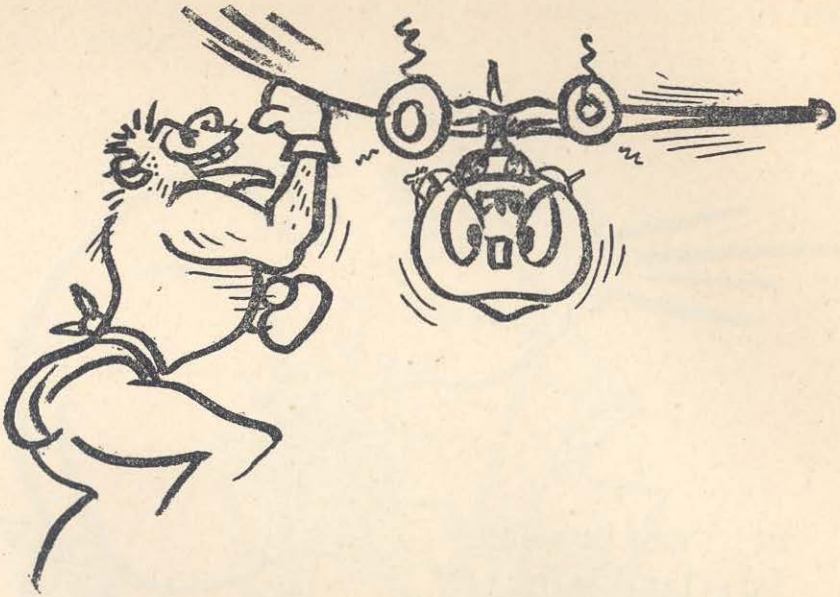
REVIEW EVERYTHING YOU EVER KNEW ABOUT AEROLOGY, AND *THEN LEARN MORE!*

The most important document you will ever see during service in the Aleutians is a weather map. Be sure you know all that it can tell you. And listen carefully to what the aerologist has to say to you. As a matter of fact, there is no better time to start paying attention to him than the present. Here is some advice from men who have been studying Aleutian weather since long before our campaign there began:



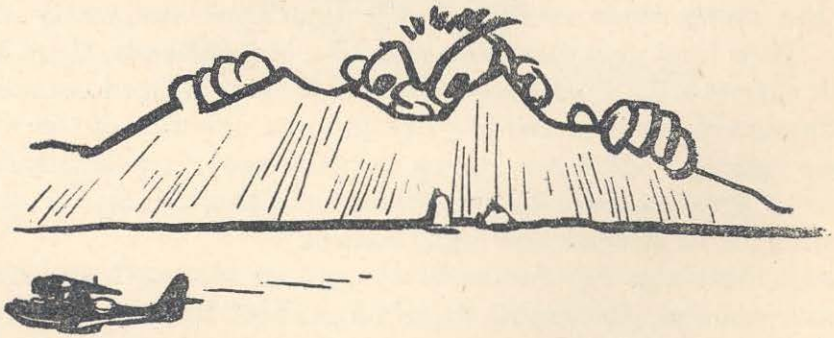
There is a constant succession of low-pressure areas across the Aleutian chain, and the strong winds associated with these areas are greatly influenced by the islands. Near land masses, especially in the lee of islands, there is an area of disturbed air currents, the exact position of which can't be fixed because it depends upon the contours of the land and the strength and direction of the wind. These disturbed air currents, which are known as "williwaws," are so strong that they are a matter of great concern to aeronautical engineers, from the standpoint of structural strength of aircraft and flight control.

Williwaws must also be of concern to you, as a pilot, for reasons that are anything but academic. Remember these things about them specifically: They are sharp-edged gusts of wind with velocities which may reach 100 knots or more. Their vertical currents may throw your plane around so roughly that crew members are knocked unconscious (this has happened) and gear may be thrown about in the plane. These vertical currents also cause a change in the flight attitude of the plane, which may result in its approaching the stall. So sharp are the discontinu-



ities of these winds that it is possible for a current to strike one wing and not the other.

There are things you can do, though, to combat williwaws, and here are some of them: You can choose tracks most likely to avoid current eddies, staying away from sharp cliffs, bluffs, peaks, and valleys. If visibility is sufficient on the wind-

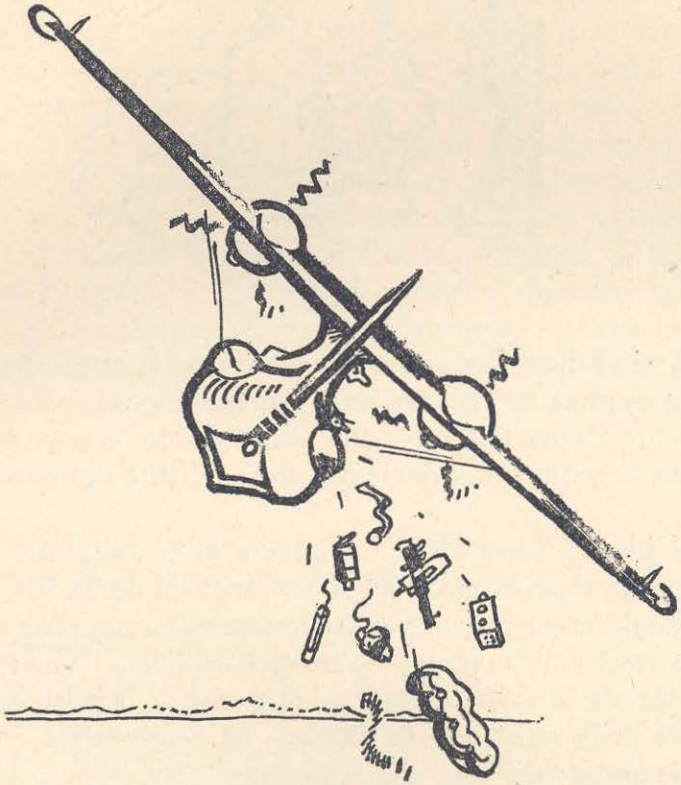


ward side of land, it's sometimes a good idea to fly on that side, because the turbulence is less there. If you fly to leeward, remember that the greater the distance from land, the gentler the gusts of wind.

Watch the water for indications of cross winds and the whitecap areas that reveal downdrafts.

Insist upon proper stowage of equipment in your plane.

Use your safety belt at all times, and make sure that all of your flight crew to whom belts are available use them when winds are strong and when the plane is near land. It may prevent a broken head.

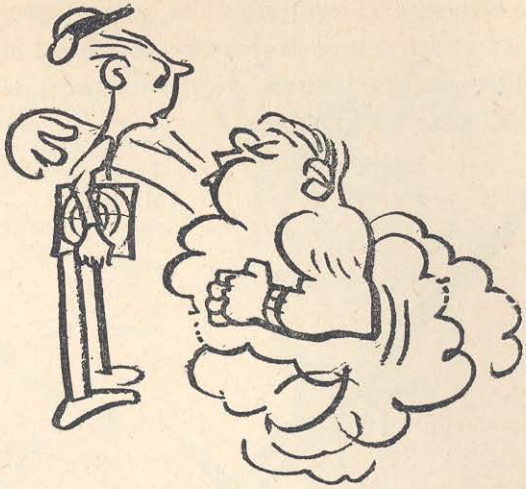


Don't bank sharply in changing course near land, if you can help it. An unforeseen williwaw may spill you.

Keep enough altitude so that you can recover before you are forced to the surface, if a strong downdraft catches your plane.

WIND CAN FOOL A NAVIGATOR

The strong winds of the Aleutians have a tendency to introduce large errors in navigation, particularly in the fall, winter, and spring, when they are heaviest. Wind velocities change radically with changes in altitude, and so do wind directions. What is more, whitecaps and swells are not always



representative of wind direction. There is danger that your navigator, busy with other duties, may neglect to keep up with changing wind factors.

Again, there are things that you, the pilot, can do to cope with the situation. It is good practice to require the navigator to take drift sights whenever he gets a spare moment.

Many pilots like to have their navigators give them the magnetic course; that is, the magnetic course uncorrected for drift or deviation. If you do this, your navigator should give you your drift as soon as he can after getting on course, so that you can correct your magnetic course accordingly. This gives you a chance to apply your estimate of drift and get as near to the correct heading as possible before the correct drift sight can be taken. (A really good navigator will pre-compute the approximate drift for the new course before you get on it.)

On the other hand, it is always a good plan to check on the navigator, because nobody is infallible, and you won't get into trouble, nor insult the navigator, if you require him to show you his complete navigator's log, so that you can review his computations. The information he passes up forward to you should look something like this:

Time	*True course*	*Variation*	*Magnetic course*	*Wind direction and velocity*	*Drift*	*Indicated air speed*	*Calibrated air speed*
1300	270°	10° E.	260°	320° 20kts.	7° L.	105 kts.	111 kts.

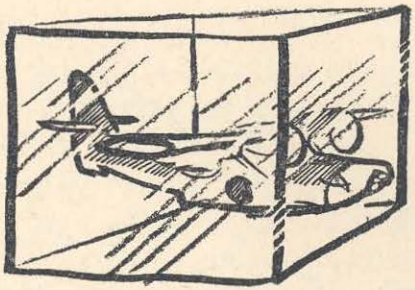
True air speed	*Alt.*	*Temp.*	*Ground speed*	*Distance*	*Time on leg*	*Estimated time arrival*
114 kts.	1,000′	5° C.	99 kts.	50 mi.	30 min.	1330

You should also have the navigator keep a time check of the run between exactly known positions in order to determine the actual speed of the plane over the surface of the water to compare or check your computed speed. A third duty of the navigator should be to keep a true track line on the chart and mark 10-minute intervals thereon, also informing you of the magnetic course to steer to reach the track line, in case you have departed from it. Inasmuch as this course includes drift as well as variation, changes in course to stay on the track line are frequent and should be made even if the change is only a degree or two. With each report on magnetic course to steer, insist that the navigator include the number of degrees of drift, so that you can appraise his estimate by your own personal observation. Always watch the sea conditions yourself, and notify the navigator immediately when you detect any changes in velocity, drift, or direction of the wind.

Next to actual navigation, the navigator must understand the complete communications plan and procedure, because your primary purpose is discovering and reporting accurate information. You, too, as a pilot, must be thoroughly familiar with all phases of communication. Some day you may get a green navigator as a crew member.

"MEAN" ICE

Icing conditions in the Aleutians are "mean," and one of the *musts* before going to the Aleutians should be to see the training film on ICE FORMATION ON



AIRCRAFT and to study the supplemental booklet. Even in summer the temperature may fall below freezing, although not far below. The warmer the temperature, the more moisture the air can hold, and consequently, at around freezing temperature, the air has about the maximum moisture it can hold and still cause icing. At above-freezing temperatures, you don't get wing ice. At very low temperatures there is little moisture, so you don't get much ice, but at 32 ° F., in the Aleutians, you get plenty of ice, and there is no greater hazard.

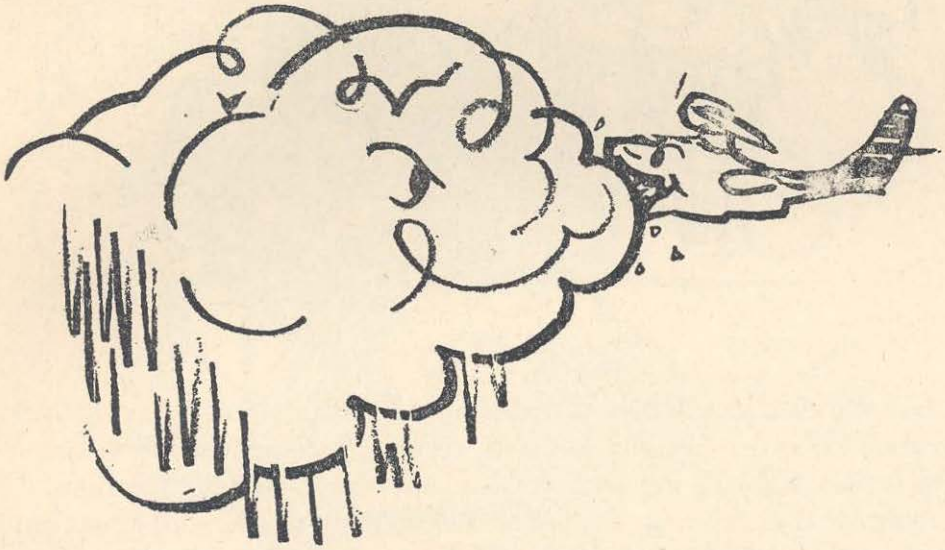
You can't tell that your plane has a load of ice, most times, until it's in the air. Then it has a tendency to settle back on the ground, and it may be too late to do anything about it. Before you take off, make sure that your plane hasn't a load of wing ice or frost.

During autumn the freezing level lowers steadily, and the closer it comes to the surface of the water, the better chance it has of being in saturated air, which makes the danger of icing over the sea greater than over the land. Also, the temperature within a cloud may be lower than in the clear, so it is often wiser to fly over, under, or around clouds than through them.

You also find, on the mainland of Alaska, a manifestation called "Arctic steam fog," which occurs in the form of light haze over landing fields near river bottoms when the temperature is −20° or −30° F. and there is little or no wind velocity. It is to be found in such localities as Whitehorse, Fairbanks, the Yukon River, Ruby Kaltag, Unalakeet, and the Kuskokwim River. It results in a hoar frost that attaches to the wings and covers the windows.

A similar condition occurs at sea and is called "Arctic Sea smoke." It is caused by any liquid that tries to build up a saturation vapor pressure in the air above it. The ocean temperature in the North Pacific and the Bering Sea is between 20° and 40° F. The water tries to create a vapor, but when the air above the water is very cold, the vapor condenses and becomes visible in the form of sea smoke.

Under some conditions this formation can be a cumulus cloud on the surface of the water, with columns surrounding it. The cloud is rightly called fog, because it actually touches the surface, but it may contain strong convective currents, and it has the disagreeable faculty of containing water droplets which cool below freezing and will freeze to your plane upon impact. Ice results, and in as short a time as 5 minutes, it can get you in plenty of trouble.



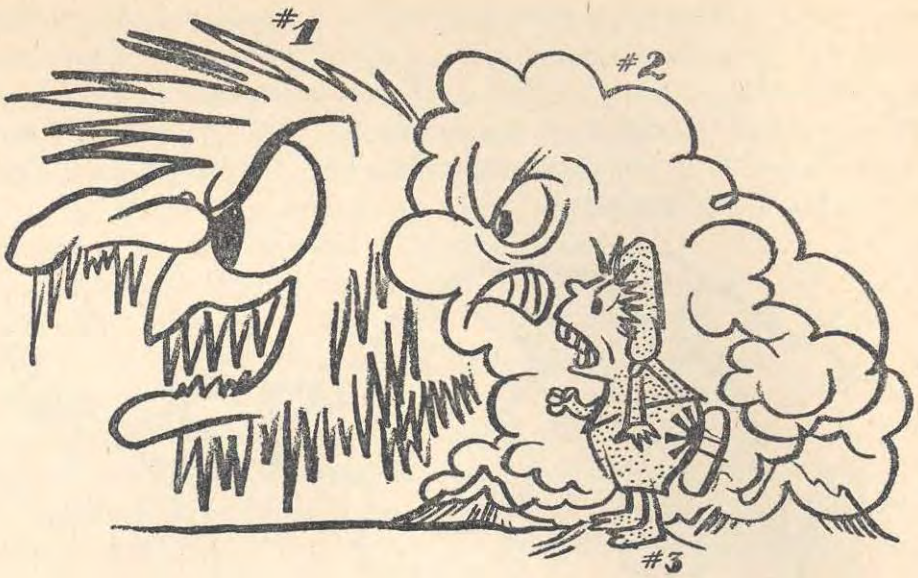
It is a sound safety precaution, if you have to fly through a formation of this kind, first to test your de-icers and then to nibble at the edges before you go into it. Make sure you know what's going to happen if you *do* enter the cloud, because once you are in you may not be able to get out.

One more word of caution. When the temperature of the air is below zero and the surface of your seaplane is below freezing, spray will ice it up. Don't taxi on the water any more than you have to, under these conditions. If you can, take off from the strip.

OH, SAY, CAN YOU SEE?

Next to icing, visibility is the principal problem of flying in the Aleutians. This statement is made with the full knowledge of the Japanese menace, which has taken nowhere near the toll of planes that have been lost on account of weather.

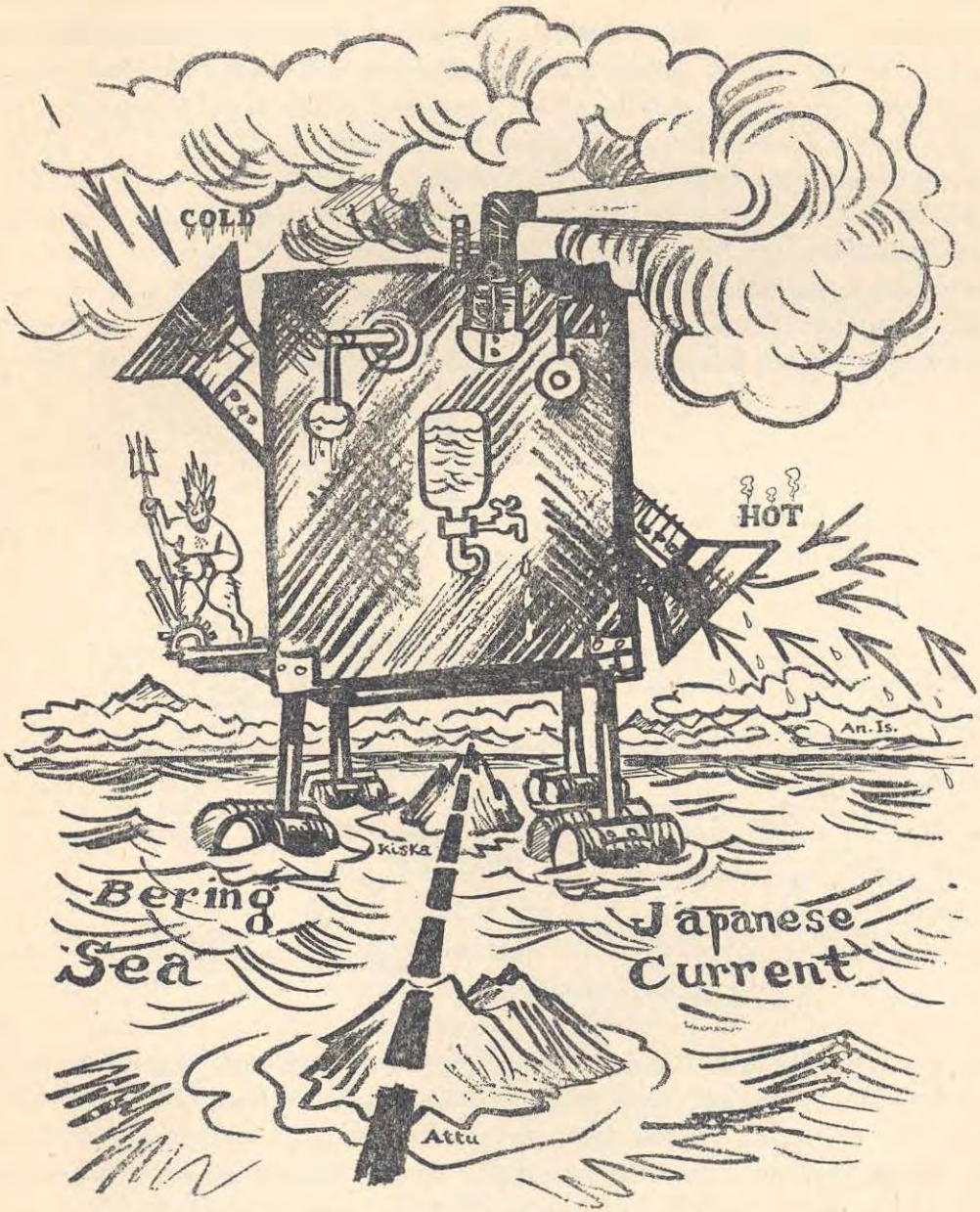
Rain, hail, snow, and sleet are conditions that are confronted in the fall and



winter, but the distinguishing feature of the Aleutians is its fog, which is like the gray curtains for which London and San Francisco are so justly famous. The only difference is that Aleutian fog doesn't have that wispy, ghostlike quality. It moves in solid chunks that may be as much as 4,000 feet thick, and the average wind won't dissipate it. The fact is that there are often fogs around the islands that remain in spite of 60-knot winds.

Now, it is obvious that you can't play around rocky islands in fog like that without radio aids, but you cannot depend on these alone, because if you depend entirely on radio aids there are three possibilities, of which only one is that everything will come out all right. The other two are that you may have your radio aids go out of order and that you may pick up the wrong landfall. Of this, more later.

There is one good rule to follow in flying fog—that is, to fly on the leeward side of land masses. When fog is blown against the windward side of mountains, it has a tendency to lift, and the result is that there is occasionally a clear area to leeward. If the fog is really thick, the advantage of visibility to leeward usually overweighs the advantage of a lower turbulence to windward. There is this possible catch, though: If the fog becomes thick enough to turn into drizzle, possibly it won't clear on the leeward side of anything, so make sure you are dealing with fog and not


COLD
HOT
An. Is.
Kiska
Bering
Sea
Japanese
Current
Attu

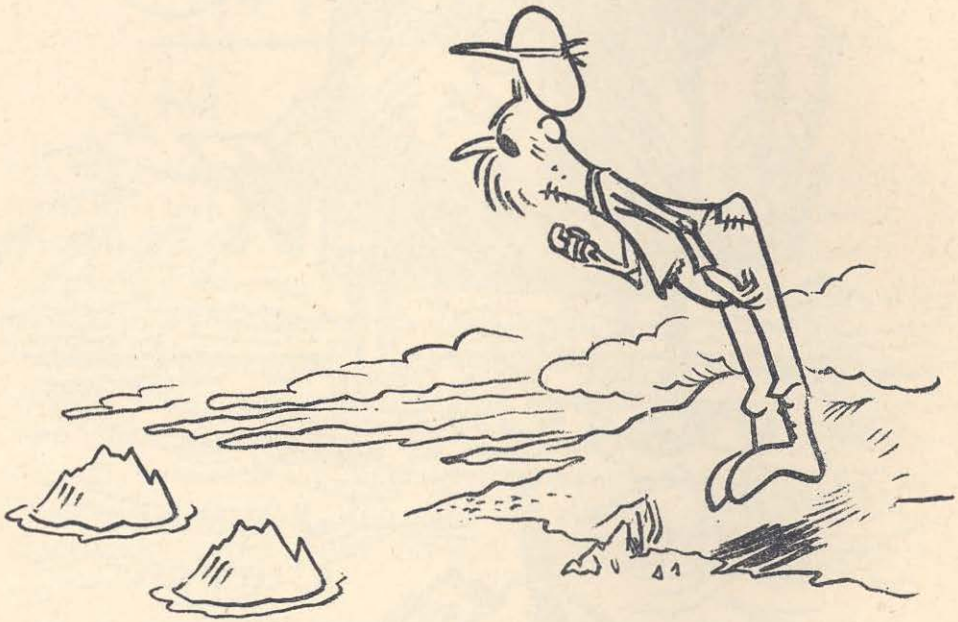
drizzle if you are depending on visibility to keep you from flying against the lee side of a hill.

Regardless of the side of the island you choose, the advantage of contact flying may be lost if your course is too far offshore. A track 10 miles offshore may never let you see your landfalls, while a course 3 miles from the coast lines may allow you to fly contact from one island to the next.

In flying close to shore in reduced visibility, however, it is always wise to choose a course which *does not approach land any closer than the tangent bearing to the point of land ahead.*

A word on the subject of landfalls:

By all means, familiarize yourself with the islands and their landmarks, but just because you *are* familiar with them, don't set yourself up as an Old Timer.



Plenty of rocks look alike, and you could be wrong in identifying one. It's never safe to spot one landmark, say joyously, "*There's* my old friend," and turn into the next bay for a landing. It may not be your old friend at all, because from some angles different landmarks look identical. Better orient yourself by *at least two landmarks* before you act on your supposition that you know where you are.

This is cold common sense, but don't forget it: In approaching the bay of an

island when there is low visibility, never go one foot beyond the point where you can actually see your way out. Even when you have what looks to you like a perfect plan, always ask yourself, "What am I going to do if this doesn't work?" And unless you can answer the question, *get out of there.*

CONTACT OR ON TOP

There is some debate among experienced pilots as to whether it is advantageous to go on top when surface visibility is sour. The difficulty is, of course, that once you break out above the overcast, you may have difficulty in getting back underneath, particularly if the overcast is thick, and variable winds

above the overcast help you to lose yourself. You have the additional difficulty that in a region of variable pressures, your altimeter may mislead you.

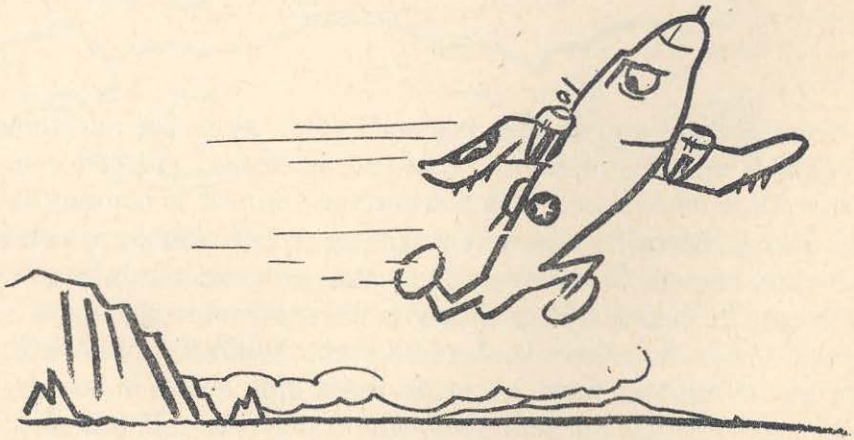
So, many pilots recommend that you confine yourself to contact flying, staying high enough above the surface so that you keep out of trouble, which is the water or land, and close enough to the overcast so that you can climb into it for concealment, yet far enough beneath it so that you get maximum visibility.

There are times when there is absolutely no visibility underneath, and unless you elect to go on top you must count on radio aids. But if you do, it's a very sound, sane practice to *get all your landfalls on one side.* If you don't, you may

mistake two headlands of a bay for two islands. That is how to make widows and orphans.

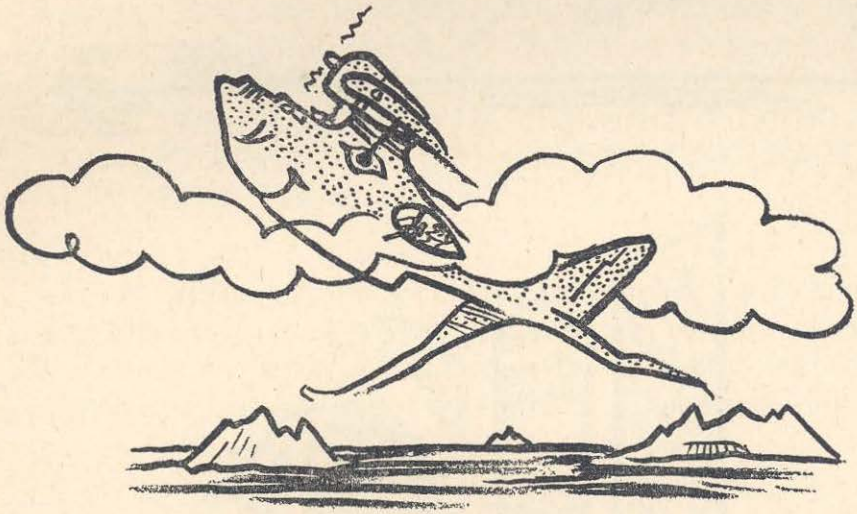
Now, let's consider the possibility that you have to go up on top. There is this advantage, if the formation isn't too thick: You can orient yourself by the

Aleutian peaks, and often you can find clear spots to leeward of them. Of course, if the cloud formation is too thick to see the peaks you have to rely upon radio aids. If you are about to go on top, look for holes, so that if things don't look so good you can turn back and go down through them. Never let down toward land. Reverse course and let down to seaward if you're about to descend through the overcast.



When you encounter high velocity winds, you are likely to find plenty of spray turbulence, which obscures your vision through the windshield which apparently gives zero visibility and zero ceiling. You frequently find this condition in passes and straits between islands, and the only solution is to get out of there. Incidentally, it's a good idea never to attempt a strange pass in bad weather and to make it a rule to explore new passes when the weather is clear, to add to your knowledge of the islands.

The Aleutians have one advantage over other islands, the Hawaiian group, for instance. They are so close together in the chain that you aren't going to lose



them by flying on instruments. You might fly between two of the Hawaiian Islands without your radio aids indicating their presence. It will always spot the Aleutians for you if your course is correct.

DON'T ALWAYS RUSH HOME

In extremely cold weather and after frontal passages at any time of the year, there are frequent instability showers. Instability showers travel as the wind moves the clouds that are their source—quickly if the wind is fresh and more slowly if winds are light. Pilots know this, and yet many have made the error of trying to come home through the soup on instruments when a few minutes' wait would clear the field for them. Don't make this mistake. Let the field clear for you.

STRIKE
STOVE
JERRY
PTN
1815E
E15Φ
2S
14/32/
18-
.02
1.2
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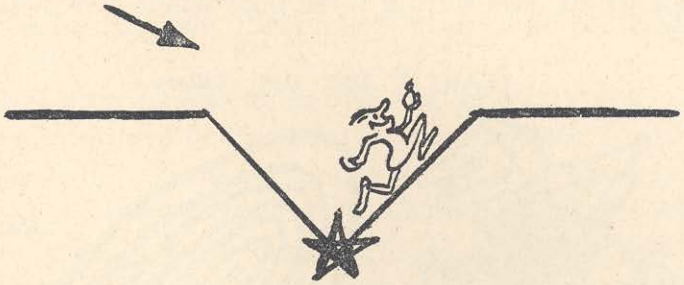
IN FRONTS, YOU'RE ON YOUR OWN

During the Aleutian winter, fronts are often violent. Usually you know about the existence of these fronts in advance, and ordinarily you will never be required to fly them. (The enemy isn't going to fly them, either.) But sometimes a front sneaks up on the aerologists, and then you are on your own. You should be able to recognize a front before you get into it, and once you recognize it, whether you decide to fly it or not is a matter for your own judgment. However, during June, July, and August, most fronts are usually weak, and by flying parallel to a cold front you usually can find a soft spot where you can go through. But don't let this mislead you. Summer is the toughest time to fly in the Aleutians, because even the hazards of winter are exceeded by the fogs, and when a frontal condition adds the possibility of icing to this, you've really got something. THE PILOTS WHO HAVE MADE THE MOST FLIGHTS OVER THE LONGEST PERIODS ARE THOSE WHO PLAN EACH FLIGHT AS IF IT WERE THEIR FIRST FLIGHT.

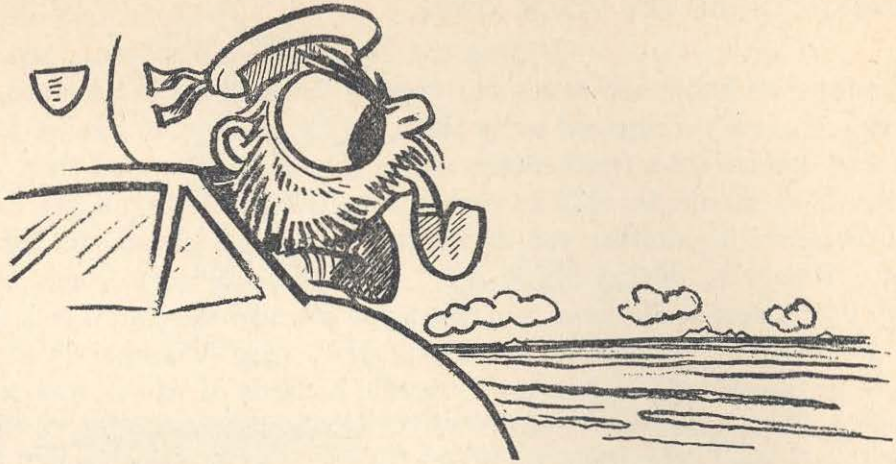
NAVIGATION

During the summer a large percentage of flying has to be at low altitudes, and during the winter there is often turbulent air. Both make drift sights unreliable. It's absolutely essential to have your navigator take drift sights frequently—every 5 or 10 minutes is not too frequent—and to run wind stars when



you can spare the time, but there is no substitute for "seaman's eye," and you had better cultivate it. You must make yourself proficient in estimating the strength and direction of the wind by the appearance of the surface of the water. If you get a line on the wind by running a wind star, make every effort to remember the state of the sea that went with it, so you can recognize any variation immediately.

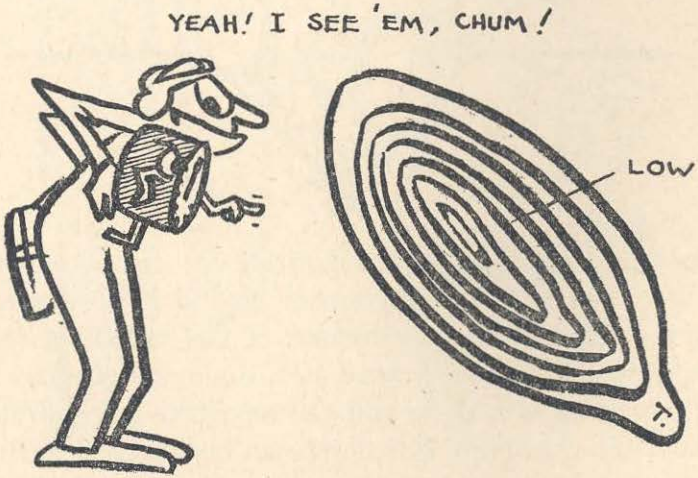
No course that the navigator lays down can be assumed to be the final course. Changes in the wind velocity and direction may vary the drift several times in a



very short distance, and therefore you should always insist on a correct course from the navigator, and a knowledge of where it is taking you, as well. When you are following a shore line, a slight variation in drift may head you inshore, and this costs Navy Relief money.

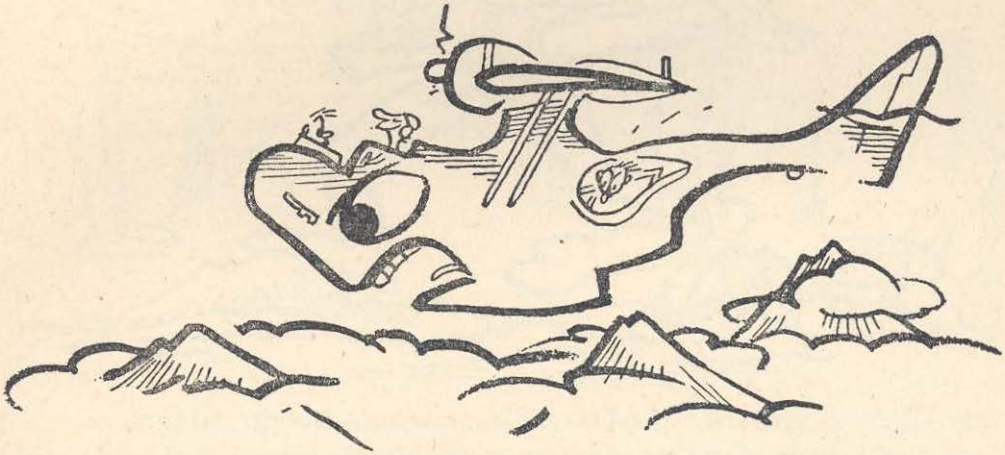
PLAY BALL WITH YOUR ALTIMETER

A word about altimeter settings: The Aleutians are noted for high winds, and during these high winds the isobars are very close



together. As each isobar represents approximately 100 feet in altimeter setting, failure to get correct settings of the instrument during high winds will result in very large errors in altimeter readings. An altimeter setting correct for one field may be more than a thousand feet off for points only 300 miles away.

If you haven't reset your altimeter and are going toward a low, you haven't so much altitude as you think. That's a good thing to remember, but it won't solve your problem if you can't see the surface and are letting down, or are skimming

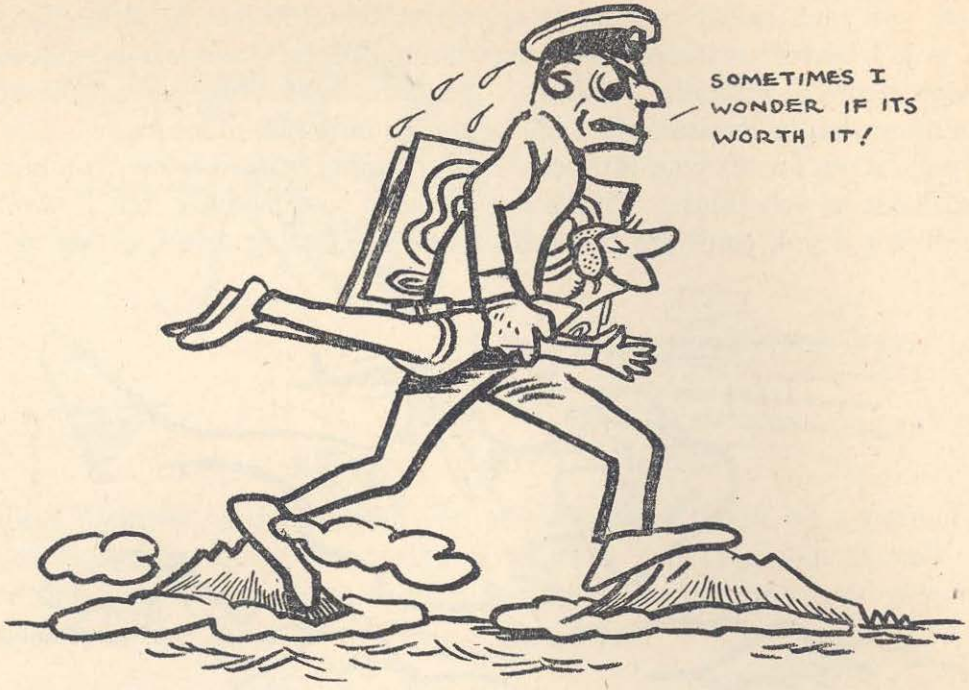


the island peaks on instruments. Therefore, every time you plan to go up on top, *first reset the altimeter*.

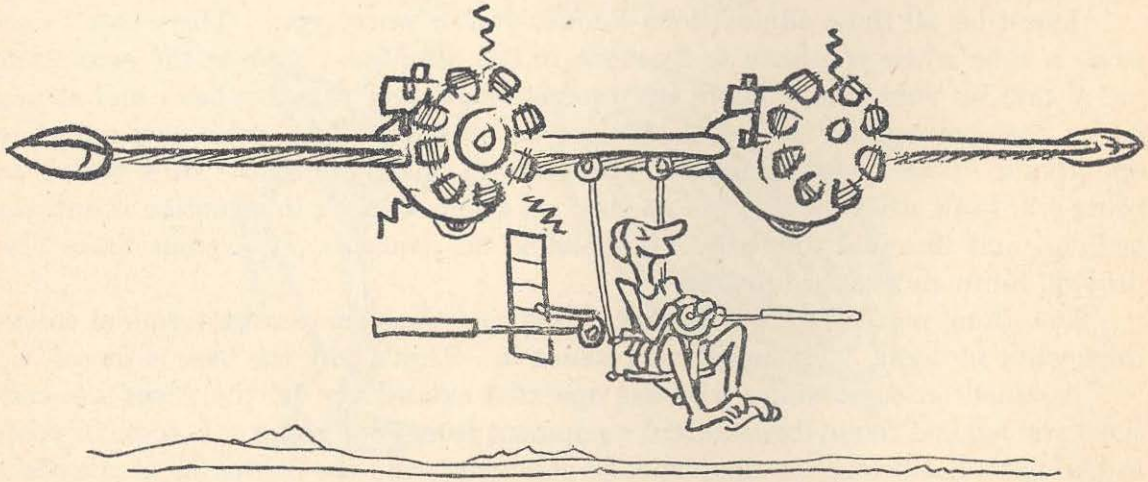
Don't let all these admonitions confuse you or worry you. There won't ever come a time when you have to fly alone in the Aleutians, because the aerologists are always on your side. There are forecasters on duty at every base, and at any major base you will be briefed on weather before every flight, when you report to operations. Give your undivided attention to the aerologist! He's trying to bring you back alive. There are no stations where weather information is entirely lacking, and terminal forecasts are available on request. The major bases also provide route and sector forecasts.

One thing more: Don't be afraid to ask questions concerning terminal conditions while in flight. The base won't resent it. That's why the base is there!

A squadron commander who has operated extensively in the Aleutians cautions you against removing standard equipment from your plane. It took 10 years to find out what belongs in the plane, he points out, and the lightening of the plane

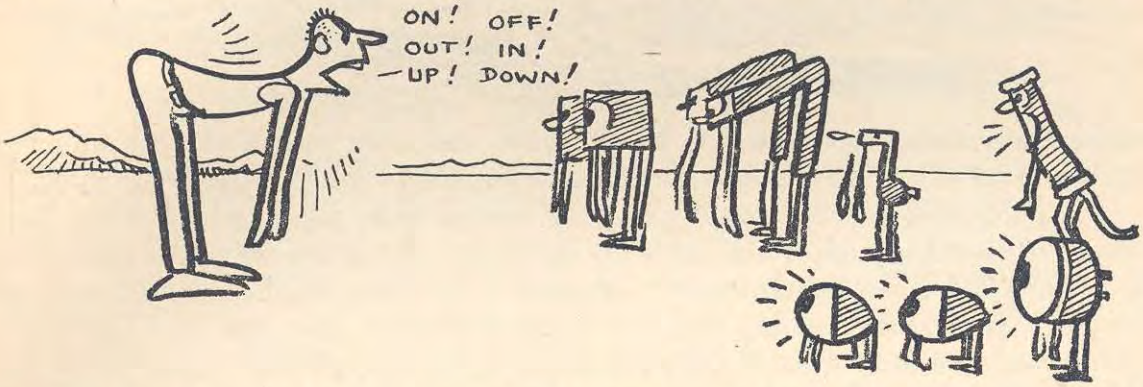


and very slight increase in speed won't compensate for the lack of essential gear. Two patrol plane commanders were converted to this school of thought when they were forced to stay out overnight. They found that removal of equipment had put them in shape so that they couldn't cook, couldn't get to the beach, and couldn't



get the snow off the wings of the plane for a take-off the next morning. Fortunately, the sun melted the snow, but if that hadn't happened they might have had to stay down for days. And how would you like to be down in the ocean without a sea anchor?

He further advises that equipment is put into the plane for use, and that it can only be used if it is in operating order. Automatic flight control, heaters, all mechanical equipment, the float control motors of PBY 5–A's ordinarily based on



land, de-icer boots, anti-icer equipment, preheaters, landing and formation lights, and fluorescent lighting in the cockpits—all should be "exercised" to make sure they work. Standard equipment should be inspected weekly to make sure that it is aboard, properly stowed, and in working order. Similarly it should always be checked before proceeding from one base to another.

In loading a plane, make sure that equipment is stowed so that the center of gravity isn't shifted, so that gear is clear of guns and does not exceed the designed gross weight of the aircraft, because the turbulence you are always likely to encounter in the Aleutians may increase the load stress beyond the safety limits.

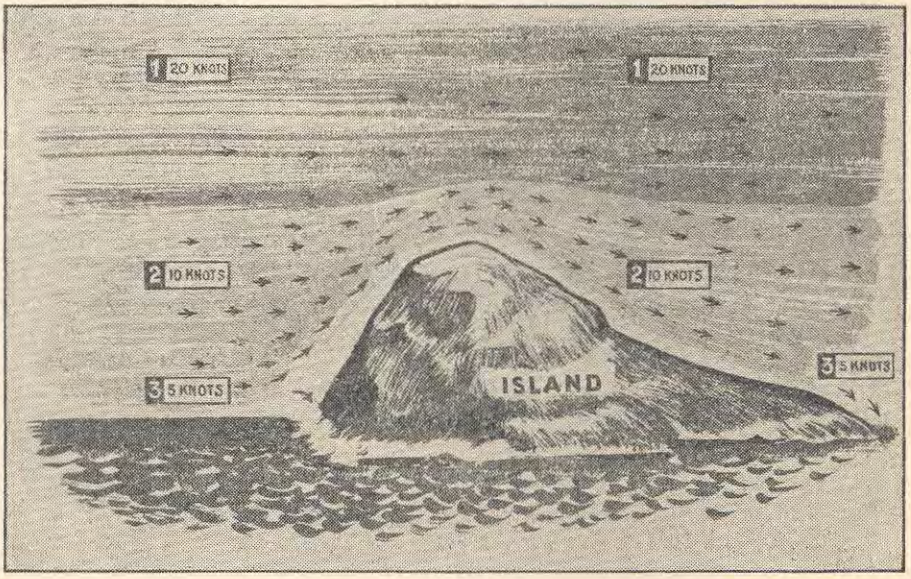
Another point in operations: If you are flying a high-speed aircraft and run into turbulence, slow down. Failure to do this has pushed bombs up into the wings of a bomber and broken the hydraulic lines to the landing gear, necessitating a crash landing. Don't let it happen to you.

Chart for Estimating the Wind

Doubtless most pilots of scouting and patrol squadrons are familiar with the problem of estimating the force and direction of wind, by observing sea conditions. It takes considerable training to become expert at this, but with sufficient practice

remarkably accurate results can be obtained, and, once mastered, this ability is very helpful in navigation on antisubmarine patrols, or other low-altitude flying.

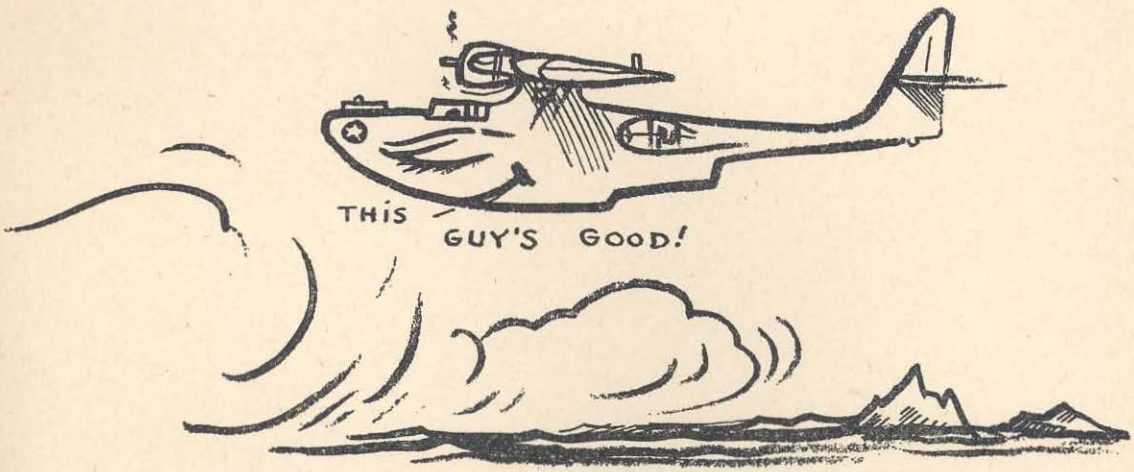
A table was issued a number of years ago to assist pilots in estimating wind force. This table is reprinted below, in case some squadrons are not familiar with it. This table is not guaranteed for accuracy in all areas, particularly in restricted waters. It is recommended that it be checked before use, also that individual pilots run a series of tests on their estimates against actual wind sights before depending on such estimates for navigation. It must also be remembered that winds aloft usually vary from surface winds, not being considered accurate for navigation above 1,000 feet.



Wind force prediction table

Velocity in knots	Surface condition	Velocity in knots	Surface condition
0	Smooth, slick sea.	20–22	Streaks are long and straight; whitecaps on every crest; wind picks up and carries mist along; large waves.
2	Small, occasional ripples.	23–26	Large seas with waves forming on them; wind picks up and carries occasional wave crest.
3–4	Small ripples all over—no calm areas.	27–30	Heavy seas; pronounced white streaks; wind picks up frequent wave crests and carry along; breaking, rolling waves are forming.
5–6	Well defined waves—smooth with no breaking.	31–37	Continual rolling waves; wind carried along all wave crests for a distance equal to one-half wave length; scud or foam streaks.
7–9	Occasional whitecaps.	38–43	Well-defined waves form on the heavy seas; scud or foam streaks; waves and seas breaking and rolling.
10–11	Pronounced waves, frequent whitecaps which carry a short distance.		
12–13	Whitecaps close together, carrying over a distance equal to the wave height. Slight traces of wind streaks.		
14–16	Clearly defined wind streaks whose lengths are equal to about 10 wave lengths. Light flurry patches.		
17–19	Long, well-defined streaks; waves and streaks coming from same direction.		

Incidental intelligence: If you fill a bucket with tundra, pour gasoline into it and let the tundra freeze, you get an inflammable fuel that will burn quite awhile. Should you find yourself without matches, you can start a fire by putting a gasoline-soaked rag in the exhaust, which will ignite it.



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Willie Waw