

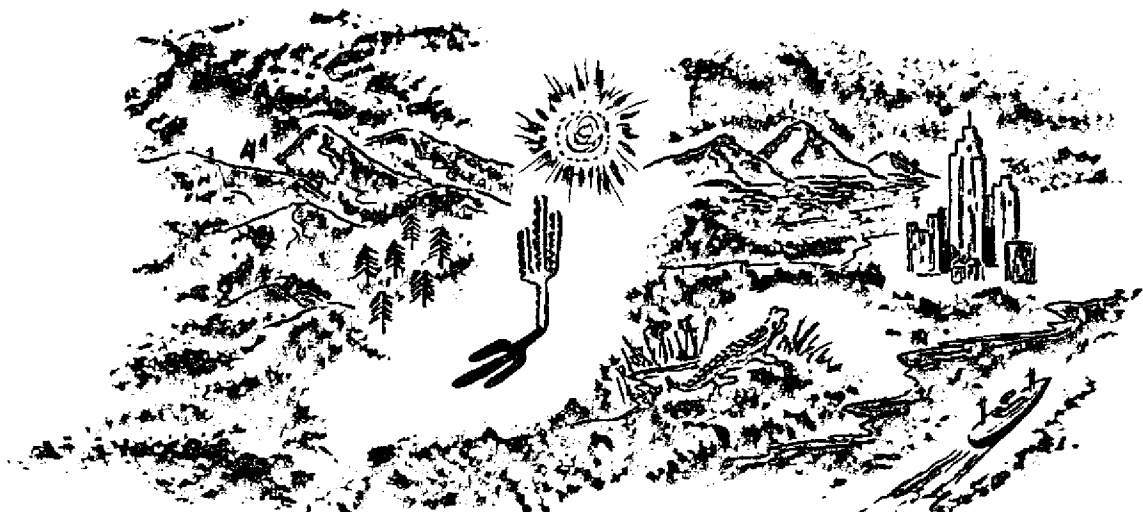
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TERRAIN FLYING

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TERRAIN FLYING

REVISED
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DEPARTMENT OF TRANSPORTATION
FEDERAL AVIATION ADMINISTRATION

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INTRODUCTION

This pocket-size booklet is designed by FAA as a flying "tool" for the average private pilot. It contains a composite picture of the observations, opinions, warnings and advice from veteran pilots. Their experience and knowledge, if heeded, can make flying more pleasant and, above all, safer.

The list of contributors to this booklet is long. It is certain that one pilot could not have gathered all of this knowledge through personal experience. It is of equal certainty that each pilot, who reads this booklet, owes these men who gave generously of their experience his thanks—and, perhaps someday, his life or the lives of others.

The FAA is happy to present this booklet in the name of all the people who have contributed to its writing.

TERRAIN FLYING

Is the phrase "terrain flying" familiar to you?

The Federal Aviation Administration hopes it will be because it is important to you as a pilot.

The dictionary defines "terrain" as:

" . . . a tract or region of ground immediately under observation"—so terrain flying refers to the problem of flying over various kinds of landscape.

We have gathered here some thoughts, advice, warnings, and "hangar flying" which we think you ought to read and study.

There was a time—and not so long ago—when all pilots talked "terrain" before every flight over a new route. That is still a good idea. But with the advent of more and better instruments, radios, air markers, charts, etc., as well as more dependable engines, and planes with longer range, the practice is less prevalent.

The idea still is so good that we are going to do a lot of "terrain talking" with you, and present in this booklet the best thoughts of those who have "been there" before you.¹

Those who have contributed ideas for this booklet have learned what they know in two ways; by personal and often rugged experience, and by talking to knowledgeable and experienced pilots before starting off over terrain new to them.

The knowledgeable and experienced pilot is not always available. You can't depend on his being at the airport before you take off on a new flight. So here are his ideas, his warnings, his do's and don'ts. And this composite pilot presented to you by the FAA is a cosmopolitan sort of man; he's been everywhere,

¹ This is not all the advice you need. Certainly there are many other helpful ideas not included here. We hope other experienced pilots will share their knowledge and send in ideas for a later revision of this booklet.



from freezing Point Barrow to torrid Central America, from the swamps to the badlands, over stump lands, over mountains and deserts, over the flat square miles of Minnesota and Manitoba, and the soggy delta of the Mississippi.

Note well that we are not talking about weather as such in this booklet; nor engines, nor instruments, nor techniques of navigation. All of these are important and at times are mentioned in this booklet, however, they are covered fully elsewhere; for example, in the FAA publications *Path of Flight*, *Realm of Flight*, *Facts of Flight*, *Private Pilot's Handbook of Aeronautical Knowledge*, and *Aviation Weather*. We'll stick primarily to terrain flying.

Neither is this written for the airline pilot, nor the pilot of a plane in industrial use—well equipped with navigating instruments, radios, and perhaps with two or more engines. This is essentially for the beginner pilot, the man or woman who flies a small airplane with radio and a minimum of instruments, who wants to use his or her plane for pleasure, vacation flying, or maybe personal business.

When this booklet was originally published, most of the material was contributed by experienced pilots from various places.

In this revision the contributors are not referred to by name since they may no longer be in the same area or doing the same thing. However, the most important consideration to them, and also to you, is the fact that their excellent advice is being passed on to you—and the advice given in this booklet *is* theirs.

You can learn a lot from experienced pilots so just drop your flaps and keep tuned in. Note well that there is no advice in this booklet against flying in any particular section of the United States. If you can fly, you can go almost anywhere. It's wonderful



to be able to fly over mountains, swamps, deserts, and to see and to behold. Moreover, it is safe, if you do it right. What this booklet wants to say is that you are welcome anywhere in your airplane when you have the appropriate "know how" and equipment; and you are safe, if you take the good advice of those who have flown before where you are flying now.

In the United States we have a wide variety of terrain. In the "first 48" the "problem" terrain divides itself into five major groups: Appalachian Mountains, The Great Mountain Areas of the West and Northwest (the Rockies, Sierras, Cascades, etc.), Flatlands of the Midwest and High Plains, Swamps, and Deserts. Perhaps we should include three other classifications, although they are not of the size or nature of the first five. These are cities and industrial areas; badlands, cut-over lands, and frozen wastes; ocean, bay, and lake shores.

In a class by itself is Alaska. We have included our 49th and largest State and the routes leading to it in a separate chapter. So also with our neighbor to the south, Mexico.



Let's look at some reasons for a serious study of terrain flying. Say you have learned to fly around Muncie, Indiana. The countryside consists of fairly large and very flat fields. The weather and the winds and the towns are very well known to you, part of your daily life.

While you are still a new pilot you take a flight to the West Coast, encountering high mountains and uninhabited deserts. Your familiar friends, the section lines, that appear to be designed just for your convenience, disappear. The winds are "all mixed up" in the mountains, compared to what they were in Indiana. Even the clouds are different. "This," you say, fighting a downdraft in a narrow valley, "is different!" And over the desert: Well, you just never see anything or anybody.

Or maybe you take a trip to Florida, cutting corners and flying straight courses, even if they take you over somber-looking swamps. If your engine sputtered over Ohio, you would generally have a choice of any one of several fields in which you could make a forced landing. Over the Everglades, you would almost twist your neck off trying to find a likely dry spot, and you would send up a little prayer of thanks if the engine purred again.

Flying is flying, but the terrain below you isn't always good old flat Indiana.

Forewarned of special conditions by knowledgeable pilots, you can adapt your flying accordingly.

The FAA urges you to read this booklet before you take off into strange country. For your convenience, it is divided according to eight classes of terrain; and while there may be repetition in some of the advice given, read it, remember it, and live to fly.

THE APPALACHIANS

"Graveyard of pilots," they used to call that part of the Appalachian chain of mountains known as the Alleghenies. That still goes today, not only for the Alleghenies, but for the entire chain as far as the unwary pilot is concerned. This includes those mountains from the Blue Ridge and Smokies down South, to the White Mountains in New Hampshire. These are mountains of general similarity, different from the Rockies, and oh, how different from the flatlands in Indiana. Naturally, there are fewer airports. Also, it is generally much easier to become lost over mountainous terrain.

The Alleghenies extend from Pennsylvania to North Carolina. Because of their geographic location, there is more air traffic passing over this range than any other mountains in the world. No small part of this traffic is made up of VFR light-plane flights. Many of the pilots of these flights depend greatly upon pilotage as an aid to navigation.

That part of a heavily traveled east-west airway which crosses the Pennsylvania Alleghenies was known to the early-day mail pilots as "Hell's Stretch." It was so named because of the difficult situations which often arose due to a combination of adverse weather conditions and mountainous terrain. Fragmentary en route reports and forecasts that were telephoned or telegraphed "along the line" made up the only available weather information.

Occasionally an airmail pilot would crash into a mountain ridge that he never saw because it was obscured by snow, rain, or clouds. This would sometimes occur even within a very few miles of Bellefonte, Pennsylvania, the refueling stop between Newark and Cleveland.

Today's vastly improved weather information and communications have contributed greatly to a decrease in such tragic incidents. The pilot, however, who does not avail himself of this weather information and attempts to fly over mountainous terrain, or any other terrain for that matter, may find himself in a predicament quite similar to that experienced by many of the pioneer airmail pilots.

Although well-briefed with the latest weather information, a pilot should keep in mind that conditions sometimes develop quite rapidly in the mountains that have not been forecasted nor reported. Blinding snowstorms in the winter and violent thunderstorms in the summer are not unusual.



It has been said by experienced pilots of southwestern Pennsylvania that an independent "weather factory" occasionally goes into operation in the vicinity of Blairsville, Pa., at the foot of the west slope of the Alleghenies. Weather conditions sometime exist there that one would never suspect after checking Pittsburgh's Allegheny County weather, 35 miles to the west, or Altoona's weather, 50 miles to the east.

It is also well to remember that a reported ceiling of 2,000 feet at Altoona, Pennsylvania, means that the next ridge west (approximately 10 miles) is quite possibly obscured. Another "valley" airport in the Alleghenies reporting the weather on the teletype circuit of aviation weather reports is in Elkins, West



Virginia, at an elevation of 1,987 feet. About 22 miles southeast of Elkins is Spruce Knob which has an elevation of 4,860 feet.

A route followed by many pilots who prefer to navigate by pilotage while crossing the southern Pennsylvania Alleghenies is the Pennsylvania Turnpike. If weather conditions are forcing a pilot to a low altitude, a landing is recommended at the earliest opportunity. The highway is tunneled through mountain ridges at eight different locations and it will be noted from the table which follows that the terrain extends as much as 900 feet above the tunnel.

Through the Pennsylvania Aeronautics Commission we learn that the pavement elevation at either end of each Pennsylvania Turnpike tunnel and the elevation of the terrain directly above each tunnel is as follows:

Name of Tunnel	Pavement Elevation Either End of Tunnel		Elevation of Terrain Directly Above Tunnel
	<i>East</i>	<i>West</i>	
Blue Mountain	1027'	1062'	1770'
Kittatinny	1064'	1061'	1780'
Tuscarora	998'	997'	1900'
Sideling Hill	1264'	1286'	1925'
Rays Hill	1428'	1435'	1980'
Allegheny	2297'	2328'	2735'
Laurel Hill	2485'	2425'	2790'
	<i>North</i>	<i>South</i>	
Lehigh Mountain	644'	753'	Unknown

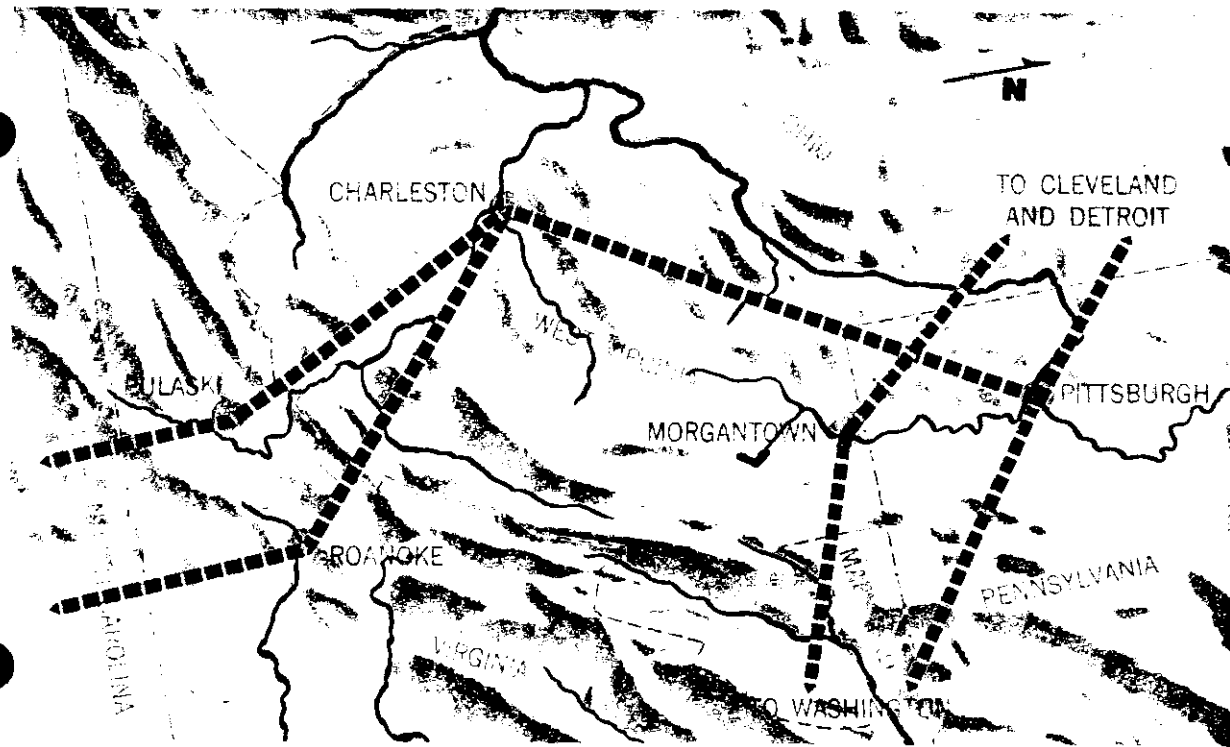
The length and curvature of some of the tunnels might present a real problem with limited visibility. The turnpike may not come out on the other side of the mountain at the location where you think that it should. Thus you might lose it on the other side. With sufficient altitude and visibility, however, there should be "no sweat."

Many pilots, when flying over the Alleghenies from the Pittsburgh, Cleveland, or Detroit areas to the Southeastern States, prefer to "dog-leg it" rather than fly direct. Properly planned, the comparatively few additional miles of "dog-legging" shortens the distance of mountain flying considerably and skirts the higher terrain. Such "dog-legs" are: Follow a course or pick up an airway out of Pittsburgh or Morgantown, W. Va., toward Washington, D.C., until across the mountains; or fly a course to Charleston, W. Va., and pick up an airway or course via Roanoke or Pulaski, Va. Of these "dog-legs" the latter requires flying over more mountainous terrain.

Although not considered as mountainous terrain, the western foothills of the Alleghenies in West Virginia all the way to the Ohio River are even more rugged than the mountains themselves. This most irregular relief affords very few natural landing areas. Some West Virginians claim that their State would be the largest of our fifty—flattened out. Any argument to the contrary from the pilot ranks is quite unlikely.

It is a wise practice to seek advice from local operators before taking off on a mountainous cross-country flight, and it is further advisable to file a flight plan. Another point to bear in mind is the rapidity with which dusk closes in at the end of the day in the mountains. Allow yourself an extra half hour if your destination is in mountainous territory.

Do not fly below 2,000 feet above the terrain, and be sure to fly higher if a strong wind is blowing. Turbulence, with severe updrafts and downdrafts, may be present. Allow yourself ample airspeed for combating these conditions especially when landing at places of higher elevation.



Pilots should insist on visibility as much as ceiling when flying in mountainous terrain. Rainfall can reduce forward visibility to zero within a very short period of time. Natural darkness, accompanied by summer thunderstorms, blends in perfectly with the color of mountains, and it is difficult under such conditions to determine any horizon. It is very easy to fly into the side of a hill when that hill appears to be only another dark spot. Many pilots believe that the most important thing for any pilot flying over the mountains is to file a flight plan, even in good weather. One pilot cracked up on the side of Grandfather Mountain and died of exposure and not of injuries. He had been out 5 days before anyone thought about looking for him.

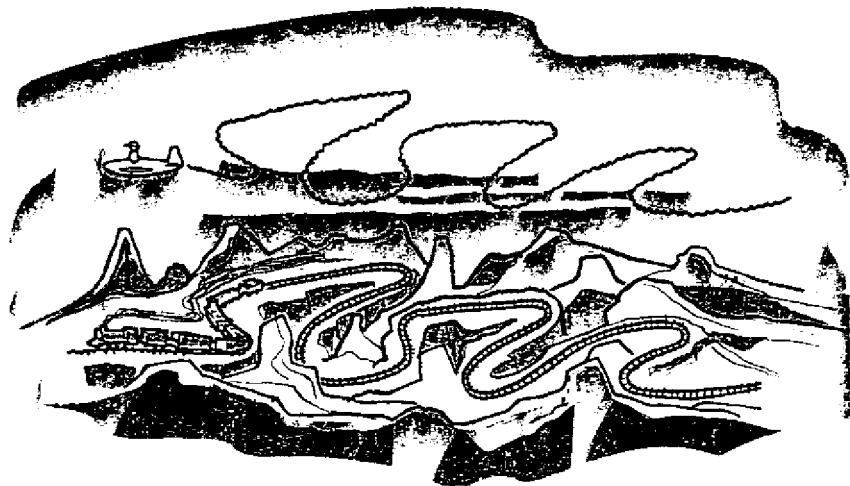
In the southern portion of the Appalachian chain, the Smoky Mountains, cloud formations are often encountered even when the skies are clear a short distance away. At the edge of the mountains there may be scattered cumulus, which increase in size and height as one gets farther into the mountainous area. Although the weather may be perfect on each side of the range, poor visibility can and often does prevail over it.

For the pilot inexperienced in mountain flying, the safest plan is to land at an airport near the Smokies and get some advice from pilots experienced in this area. Mountain wind conditions are sometimes peculiar. At Morristown, Tenn., just north of the Great Smoky Range, the prevailing winds are southwest to northwest 60 percent of the time. Just south of the range, some 60 airline miles away, the winds at Asheville, N.C., are southeast to south 26 percent of the time and are calm 45 percent of the time. This variation in wind behavior suggests special caution in Appalachian Mountain flying.

One of the most hazardous portions of this mountain system is the area known as the Great Smoky Mountains National Park which extends for several miles up and down the range. It is said that many planes have been lost in this section and have never been found so experienced pilots usually elect to go around rather than cross over the area. There is a pass running from Asheville, N.C., northwestward up

the French Broad River toward Newport, Tenn., where the crossing can be made at 2,500 to 3,000 feet if the visibility is good.

A good general suggestion as to the best routes to follow through this region is to choose from a sectional chart a main highway or railroad that runs along the desired course and stay with it even though it meanders somewhat. This is sound advice for almost any kind of difficult or isolated terrain. Following are some comments relative to VFR flights eastward from Memphis and Nashville and southward from the "Tri-Cities," Tenn., area, since you will often enter the Smoky Mountain area from these cities.



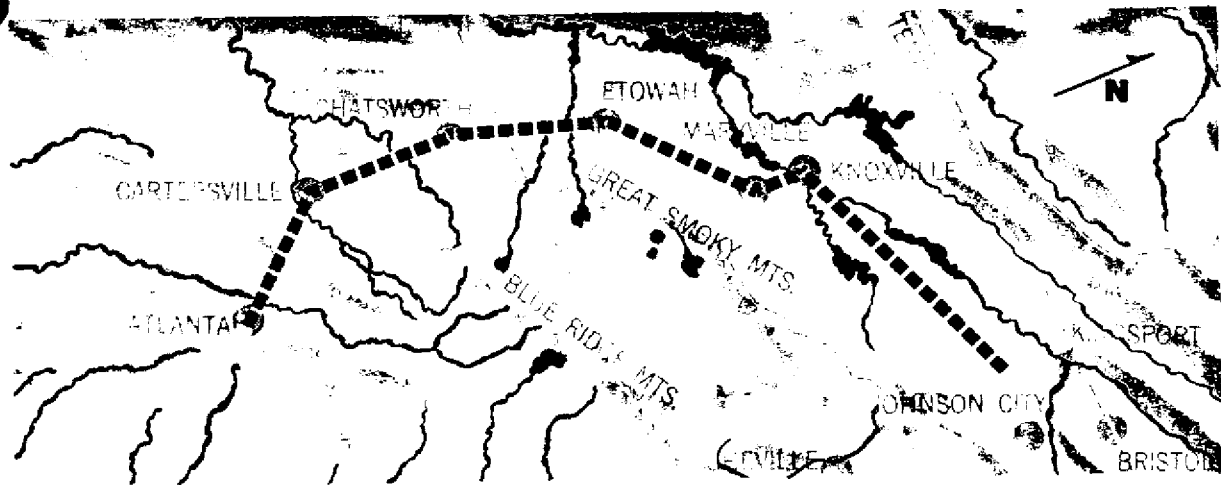
FROM MEMPHIS, TENN.: The terrain becomes gradually more rugged eastward toward Nashville, Chattanooga, or Birmingham. In such areas it is difficult to follow highways and railroads, and compass courses will have to be used for considerable distances after the general heading and drift have been established.

FROM NASHVILLE, TENN.: The terrain is hilly but not mountainous. You won't find good straight section lines to follow, but there are no especially hazardous sections to be avoided. Use your compass, ground check points, and radio.

FROM TRI-CITIES (Bristol, Kingsport, Johnson City, Tenn.): If you enter the region from this area, you already have some mountain-flying experience, useful in flights toward Knoxville and Chattanooga or across the gap to Asheville, N.C. From Knoxville toward Chattanooga there are two main highway-railroad systems, both of which follow the valley routes. From Knoxville toward Atlanta, the preferred course is the highway-railroad system running through Maryville, Etowah, Chatsworth, and Cartersville. It would be unwise for novices to plan flights south or southeast from Knoxville.

There are many other routes, of course, but the experienced pilot is your best bet. For example, he would not recommend any courses that would cross the mountains north to northeast of Atlanta.

Other small ranges of mountains are similar in conformation to those of the Appalachian Chain, notably the Bostons and Ozarks in northern Arkansas and southern Missouri and the Ouachitas of eastern Oklahoma. No peaks in this area exceed 3,000 feet elevation, and all the advice already given concerning Appalachian flying should be applied when flying in this area. From the Memphis area to Kansas City the novice is advised to go via Walnut Ridge, Ark., and Springfield, Mo., thus following a valley route with a railroad.



THE GREAT MOUNTAIN AREAS OF THE WEST AND NORTHWEST

(The Rockies, Sierras, Cascades, etc.)

The Rockies are not like the Appalachians. In many respects they are far more strange and awe-inspiring to the average flatland pilot. They cover more area, they extend higher into the clouds and they present a greater variety of terrain than their eastern counterparts. Before you tackle any part of the Rockies, read about them here and get advice from the most knowledgeable pilot at your point of takeoff.

Here is some general advice which will fit most of the mountain areas.

The visual aspects of the mountainous and desert country can be very deceptive. Pilots should maintain a 2,000 foot clearance over both mountains and deserts at all times. Often, when a pilot is trying to find an 8,000 or 9,000 foot mountain as a landmark, he will miss it because he will be looking for a large mountain when, in reality, it will be little more than a knoll, as the foot of the terrain is 4,000 or 5,000 feet. Rely upon the compass at all times.

The extremes of heat and cold must be considered on all flights.

In the event of an emergency landing during extreme heat, it is wise to carry an effective sunburn preventive to rub on face and hands exposed to the sun and have some sort of treatment for chapped lips. Dark glasses and a cap with a generous sun visor would also be very helpful in this situation.

In the event of an emergency landing during winter, the possibility of freezing temperatures and heavy snows would dictate a need for warm clothing as well as some means for starting a fire.

Pilots should carry canteens of water on every flight in many of the Rocky Mountain areas where water would not be available in the event of an emergency landing.

In the summer, flights in this whole area should be started as early in the morning as practicable. This makes each trip more enjoyable because it avoids the terrific updrafts and downdrafts, turbulence, and westerly winds that usually increase in speed as the day progresses.

Wherever possible, all trips through Rocky Mountain areas should be near a highway, airway, railroad or through a valley; there are more check points; it is easier to navigate; and, if trouble develops, you are closer to help. Sometimes the airways will lead a pilot over impossible terrain in regard to his chance of making a successful forced landing, or survival in the event of a reasonably good landing. We cannot overemphasize the importance of filing a flight plan and remaining with the plane in the event of a forced landing.

Most fields you will use are at higher altitudes than those you have been using back home. This means a longer landing run and longer takeoff run. Because of the mountains, there is generally greater air turbulence. Wind velocity and turbulence usually increase during the day. Thunderheads build up over mountains during summer afternoons.

The last two items mentioned, high-altitude air fields and turbulence, are invariably stressed by all pilots with local experience. The factor of thin air at high elevations (high-density altitudes) cannot be emphasized too much for newcomers to mountain flying.

However, the term "high elevation" can be misleading. Temperature is also a very important factor. Keep in mind, for example, that Denver on a hot summer day could have a density altitude of better than 10,000 feet, while on a very cold winter day, density altitude could drop to sea level.

When it is necessary to take off from a short airport, or one at high elevation, with a load that worries you, it would be wise to take off first without the load to learn the actual performance characteristics of the airplane. Then add partial loads, making this same check, until you have all that can be handled safely. Sometimes it may be wise to ferry partial loads to a larger airport before taking off with the complete load.

Use all the runway for takeoff. Do not unconsciously try to pull the aircraft off the ground after you have run a certain distance or time which you may have been in the habit of doing. Put the aircraft in a shallow climbing attitude and let it fly off. It will then either stay on the ground or, when it does get in the air, it most likely will stay there. Check the Airplane Flight Manual or Owner's Handbook for explicit instructions for the particular airplane and situation.

There are some one-way, high-altitude fields in the Sierras that are being frequented by untrained pilots. When we say "one-way," that's it. The landing must be made the first trip—only disaster awaits an attempted go around. Although the fields can easily be used safely with planning and skill, *never* go into them without a dual trip first with a knowledgeable instructor with experience at operating in and out of this type of field.

On the back of an aeronautical chart printed and distributed by the Idaho State Department of Aeronautics, you will find comments along this same line. Know the field you are going into. Check with experienced mountain pilots if possible—*know the altitude, the length, and whether it is a one-way field.* (If it is a one-way field, follow the advice in the preceding paragraph.) Most of these fields are one-way and on many it is impossible to go around if you overshoot. Before you fly into this territory practice short field landings with power, upwind, downwind, and crosswind. Be sure you can set your plane down on a fifty-foot spot, not once in a while but EVERY TIME. You cannot make mistakes in this territory.

Take advantage of any opportunity to learn to make approaches and landings on an airstrip with an upgrade—the steeper the better. This technique is unique and it will be an interesting experience. *Do not try to teach this to yourself.*

The importance of updrafts, downdrafts, turbulence and high winds must be recognized by those flying in mountainous terrain. Not only can it make flying unpleasant at times but it can become dangerous to the point of disaster.

One of the best bets, as a check on turbulence, is a look at the winds aloft reports. In the Rocky Mountain area, if the winds aloft in the 10,000-foot to 12,000-foot level are running above 50 knots, light plane pilots should beware. Whenever elliptical or lens-shaped (*lenticular*) clouds are seen on the leeward side of a mountain, heavy turbulence can be expected—*avoid these areas*.

Never fly up a canyon in order to clear a mountain. Low ceilings, updrafts and downdrafts, turbulence, and decreased performance are your enemies here, and they are bad. Canyons "dead end," leaving you no space within which to turn. Give peaks lots of clearance horizontally, especially with high winds, as vertical currents and turbulence usually exist in this area. Clouds over peaks usually indicate high winds. Do not fly through a pass at low altitude as extreme turbulence and wind currents may be present.

Updrafts and downdrafts may exist on both windward and leeward sides of mountain ridges. Never plan on an updraft until it is encountered. Always plan on a downdraft anywhere and at any time in mountainous terrain. Winds aloft velocities, reported from stations away from the mountain areas, may be less than half the actual velocities in the mountains, with direction as much as 30 degrees in error. With good visibility and calm winds aloft, flying will be very much like anywhere else. With visibility under 20 miles, or winds reported over 15 knots above 10,000 feet at non-mountain stations (such as Denver, Grand Junction, or Pueblo), mountain flying for the inexperienced pilot will be difficult, turbulent, unpleasant, and dangerous.

It is not unusual to encounter severe turbulence when least expected. When this happens, slow the airspeed immediately by raising the nose as quickly as possible without excessive stress on the airplane. Maintain the reduced airspeed with attitude control, and control the altitude with power. If unexpected turbulence is encountered when flying toward, or into mountain terrain, it is almost sure to get worse farther along. However, this can usually be avoided by obtaining all available weather information and carefully planning the flight.

In mountain and desert areas it is a well known fact that strong, gusty winds may arise without warning or apparent cause. Many small airstrips do not have adequate tiedown facilities. Here is a suggested emergency procedure which will enable the airplane to withstand, as one experienced pilot puts it, an "unbelievable" amount of wind. Holes may be dug in front of the wheels and the airplane rolled into them. However, don't make them deep enough to damage the gear or fairing structure. In addition to this, if it is to be left untied for any length of time, excellent "spoilers" may be made from strips of wood of any length and one to two inches square or similar size. These may be tied parallel to, and on top of, the front spar of the wing with light rope or string. At least 50 percent of the wing span should be covered. The surface of the wing should be padded to prevent damage. Articles of clothing will do if nothing else is available. Precautions such as these may prevent much damage to the airplane and a long walk out.

Another good suggestion is to carry a heliograph (mirror) on all flights as an emergency signaling device. Fifteen minutes of instruction and practice should be sufficient to learn how to use one.

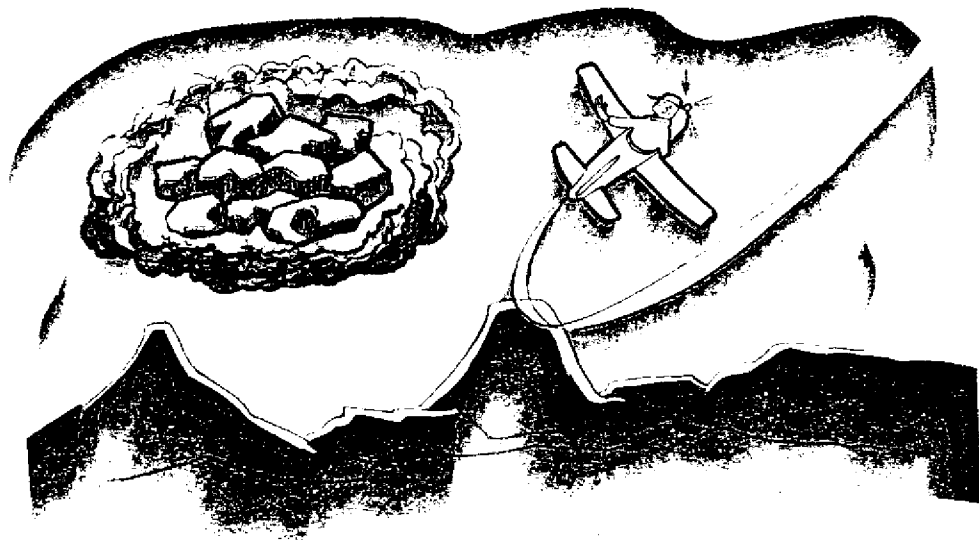
Many other interesting comments and worthwhile observations have been gleaned from the experiences of knowledgeable pilots. Read them and heed them.

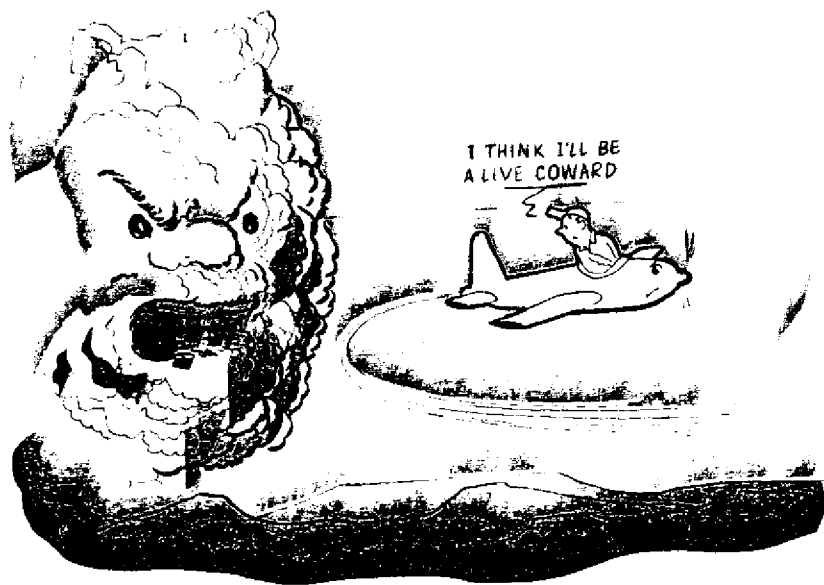
One of the most common ways for a pilot to get into trouble is to base a decision to fly VFR on the lowest reported ceiling en route. Weather reporting stations are often far apart in this area. Because of this, the conditions between stations may be entirely different than predicted and are nearly always worse. With no weather available, or doubtful weather reported at destination, a phone call to the best qualified observer (sheriff, forest ranger, fish and game warden) for existing local weather and trends may be priceless.

Beware of a weather report in this area giving the ceiling at 1,500-2,000 feet. These figures don't really "lie" but they can certainly obscure the real facts sometimes. Such a report is misleading when the reporting station is surrounded by mountains that are 2,000 to 5,000 feet higher than the station. There may be no way into, or through, such an area because of the barrier formed by the union of the clouds and the

mountains. Did you ever take a bite of cherry pie where someone forgot to pit one of the cherries? You can only lose a tooth here whereas, if you try to fly through an area where the "clouds are stuffed with rocks," you can lose your life.

Many pilots appear unaware of interior valley fogs. They are often surprised after leaving a clear coastal area to find large interior areas covered over completely. Valley fogs are usually most prevalent during the





late fall months. Check the weather when planning a cross-country flight no matter how nice it appears at your point of departure.

It is an excellent practice to plan at least two possible routes. This may help to eliminate the practice of "going a little bit farther in the hope that conditions will get better." If conditions begin to deteriorate,

make a 180-degree turn (often said to be aviation's most dependable safety maneuver) and either try an alternate route or wait until another day. Don't be afraid to retreat in the face of danger. "He who fights and runs away lives to fight another day" may be a good adage to follow in a situation like this.

Learn to use the mixture control, especially on late model, high-performance airplanes. Know the effect of carburetor heat usage on mixture control settings when flying at high altitudes. This should be learned through actual demonstration by a flight instructor.

Where high altitudes are encountered, light aircraft should not be loaded to their allowable gross weight. Perhaps your plane will not clear a ridge with enough margin for safety. If your plane will not clear a range with sufficient altitude for safety, go back to the nearest airport and start your trip early the next morning when cool air will improve your plane's performance.

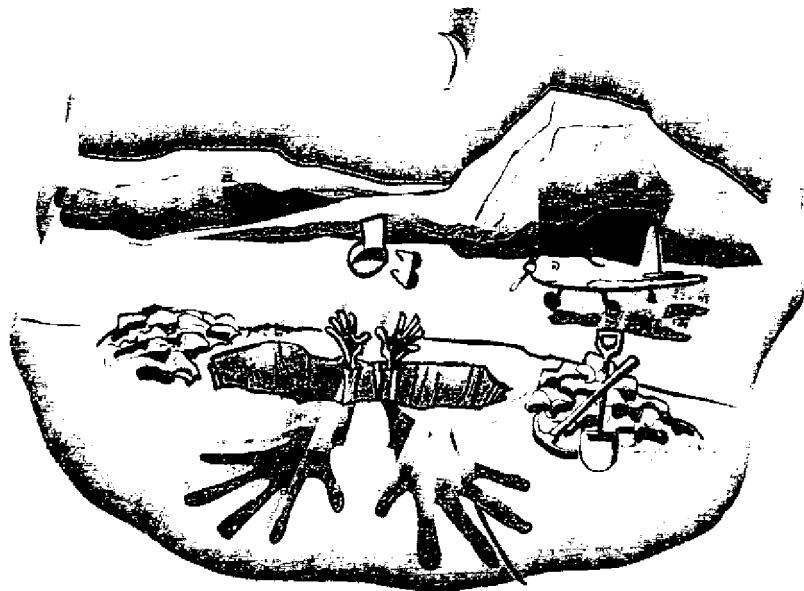
When flying in this part of the country, you should have a good airplane and sufficient fuel. It has been suggested that the pilot with little experience in mountain flying have an airplane that will climb at least 200 feet per minute at 15,000 feet. If he doesn't have such a plane, he should go around the high terrain. In any case, this is the best course; file a flight plan, stay on course, and stay with the plane so that search for you is made easier in the event of trouble. In an emergency, land in an uphill direction in the mountains whenever possible.

Don't walk around in the mountains at night. Miners have a habit of digging deep holes and leaving them unguarded.

So much for general advice on mountain flying. There are many specific do's and don'ts as well.

Some excellent points of advice have been covered previously and we now list others that should be helpful to you.

1. The flight should be arranged to avoid topography which would prevent a safe forced landing.



2. Sufficient altitude should be maintained at all times to permit gliding to a reasonably safe landing area.
3. The flight should be made along routes that include populated areas and well-known mountain passes.

4. Sectional charts are much better than World Aeronautical Charts (WAC) for details of air pilotage. Study them thoroughly for altitude over the route and for obvious check points. Prominent peaks often make good check points.
5. Believe your compass. Your compass, with proper variation, deviation and wind correction, is the only device you can rely upon to get you out of trouble, but watch for compass irregularities in areas of local magnetic disturbance, usually marked on maps.
6. Don't fly in light aircraft when the winds aloft, at your proposed altitude, are above 35 miles per hour. Expect winds to be of much greater velocity over mountain passes than reported a few miles away from them. This is very important.
7. Know your wind direction at all times; compare it to water as it flows up, over, and down the mountain ranges. Watch for abrupt changes of wind direction and velocity in the mountains.
8. Don't fly near or above abrupt changes of terrain such as cliffs or rugged areas. Very dangerous turbulence may be expected, especially with high winds.
9. Don't fly up the middle of a canyon at any time. It is better to fly along one side or the other so that you will be in a better position to execute a 180-degree turn. Also never fly so far up the canyon that a downdraft might trap you.
10. Don't get excited if you get in a downdraft. It will usually cease, leaving enough altitude above the ground to maneuver a plane safely away. Do not count on this in extremely turbulent air or in canyon areas, however.
11. When encountering a downdraft, keep the nose down. Maintain sufficient airspeed. Guard against stalling the plane and fly out of the downdraft immediately with full throttle to an area of updraft or smoother air.

12. Realize that the actual horizon is near the base of the mountain. The mistake of using the summit of the peaks as the horizon will result in the aircraft being placed in an attitude of constant climb. This could inadvertently lead to a stall with dire results.
13. Approach mountain passes with all the excess altitude possible. Downdrafts of as much as 1,500 to 2,000 feet per minute may be encountered on the leeward side. Approaching the passes over a ridge will reduce this effect considerably. A clearance of 1,500 to 2,000 feet is preferred on windy days.
14. Expect winds above 10,000 feet to be prevailing westerlies in Colorado.
15. Approach passes and ridges at a 45-degree angle so that you will be able to turn 90 degrees to the low country, instead of 180 degrees, if you encounter too great a downdraft.
16. Many experienced pilots advise that an inexperienced pilot who plans to land at a high-altitude field should make a power approach and a power wheel landing. This procedure is definitely advisable in gusty air.

Have experienced pilots pick out a few routes for you and give you good advice which they have gathered through experience and from other pilots. This advice applies to the flying of any route:

1. Check weather and forecasts;
2. Check winds aloft; and
3. File a flight plan.

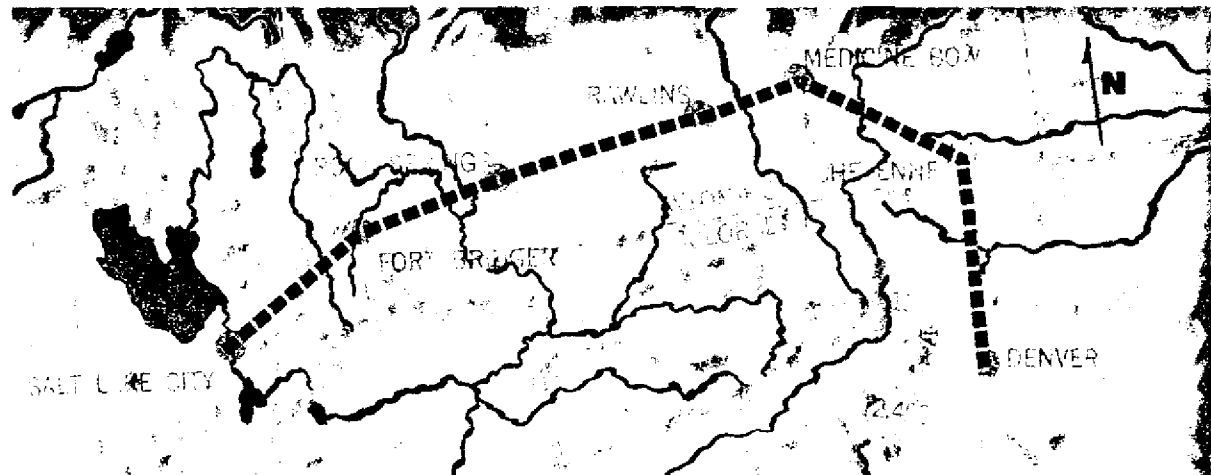
Never fail to do all three!

DENVER TO SALT LAKE CITY: The direct route is over high terrain with very few service points. Better go by way of Cheyenne. Remember that the high turbulence and high wind velocity effects

increase during the day throughout this region. Plan this flight, as well as most others described hereafter, for early morning.

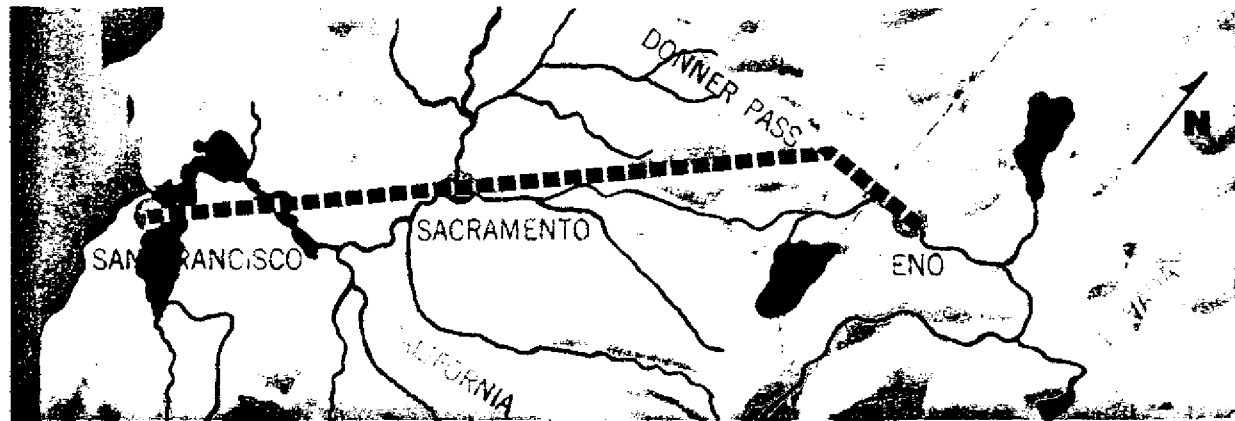
Avoid all summer thunderheads in and around Salt Lake valley. Sometimes these produce hailstorms which can cause serious damage to all-metal airplanes and which could be fatal to fabric-covered airplanes.

During the winter months, smoke from factories in the Salt Lake valley area reduces visibility considerably, especially in the early morning hours.

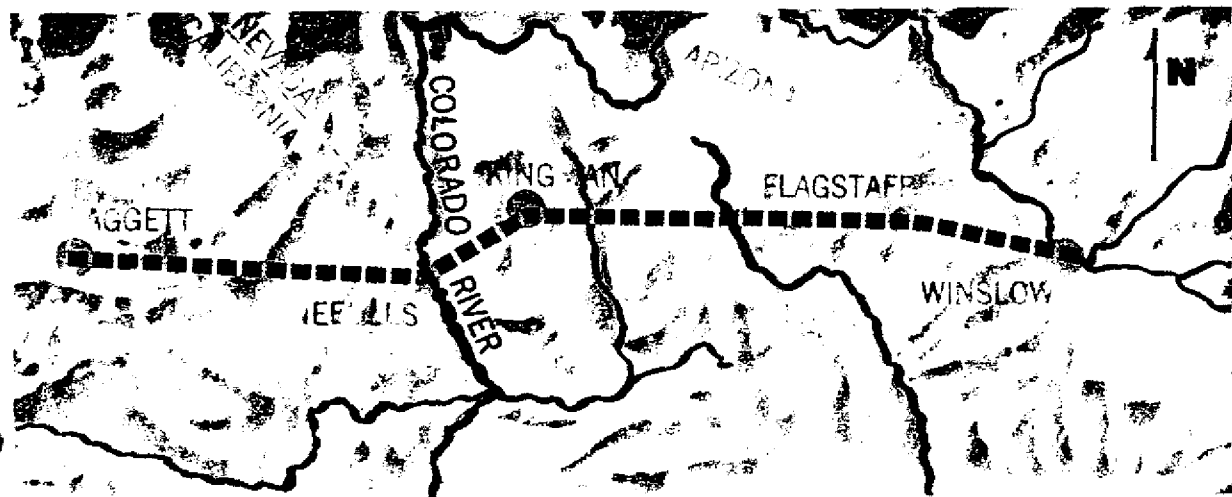


RENO TO SAN FRANCISCO: Follow the airway. It takes 8,000 to 9,000 feet to get over Donner Pass. In summer months thunderheads will build up over this area during the day, dissipating in the late afternoon. Terrific snowstorms, freezing temperatures, and high winds are encountered in winter months.

SALT LAKE CITY TO LOS ANGELES, VIA LAS VEGAS: More about this later under "Deserts" and "Cities and Industrial Areas," but there are some mountains along the route which call for the usual care in mountain terrain flying. Stick to the airway between Salt Lake City and Las Vegas. Follow the highway west of Las Vegas. If Mint Canyon is closed in, take an alternate route from Victorville through Cajon Pass via San Bernardino.



WINSLOW, ARIZ., TO DAGGETT, CALIF., VIA NEEDLES, CALIF.: This route is suggested only for planes with higher horsepower and long range, because of the distances involved, high altitude, winds, thunderstorms, and snow. There is much snow between Winslow and Kingman during winter months. Gusty and high surface wind conditions usually prevail during afternoon hours. There are usually strong westerly headwinds. Pilots should follow Highway 66 and take all the precautions advised for both mountain and desert flying.

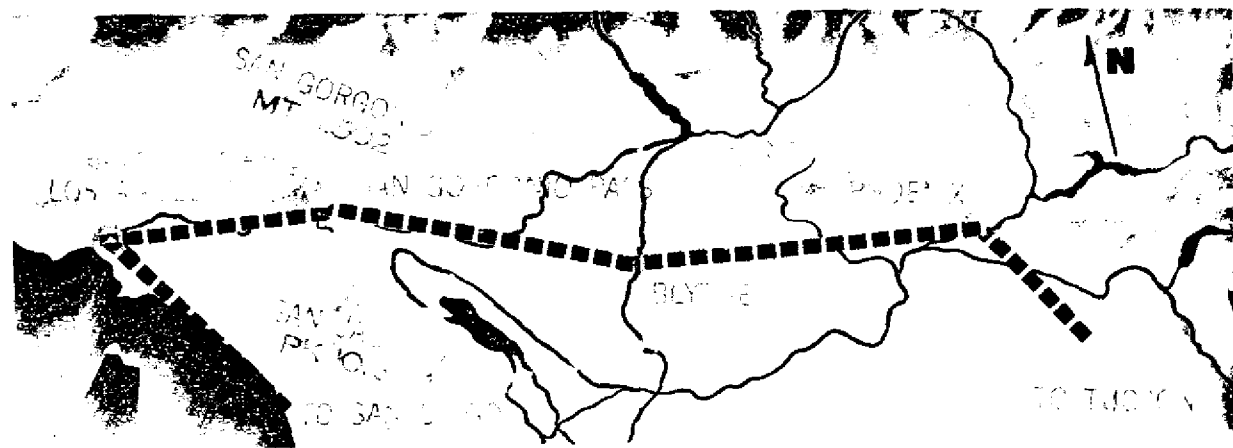


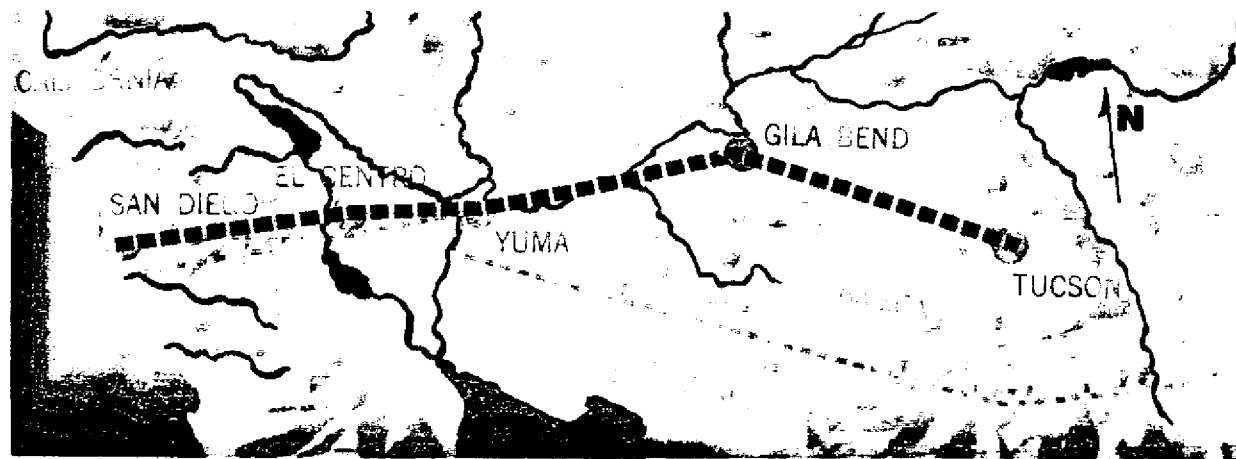
EL PASO TO PHOENIX, VIA TUCSON: This route is suggested for the itinerant pilot whose trip would terminate in southern Arizona or California. The ranges are lower, weather conditions better, service points more numerous, and generally good flying conditions prevail during early morning and late afternoon. Take mountain and desert precautions.

PHOENIX TO LOS ANGELES, VIA BLYTHE, CALIF: Here the flight had best be made in the early morning. In San Geronio Pass, flanked by San Jacinto Peak (10,804 feet) and San Geronio Mountain (11,502 feet), high winds and turbulence can become violent in the afternoon. The peaks make excellent landmarks, however. The same conditions prevail as on the Salt Lake-Las Vegas-Los Angeles flight.



TUCSON TO SAN DIEGO: One suggested route is via Blythe and Los Angeles. A careful check of the coastal weather between Los Angeles and San Diego should be made before continuing on the last leg. Another suggested route is via Gila Bend, Yuma, and El Centro since there are good airports along this route; it is shorter; and, according to some experienced pilots, it offers no more hazards than the Blythe-Los Angeles route. However, one word of caution on this latter route. Pilots are warned that it is a good practice to stop at El Centro, refuel, and make a thorough check of the weather ahead before going over the mountains to San Diego. The Navy at one time required all transient aircraft from the east to do this because so many pilots, overflying El Centro, were getting lost or running out of fuel in the coastal fog or stratus clouds.





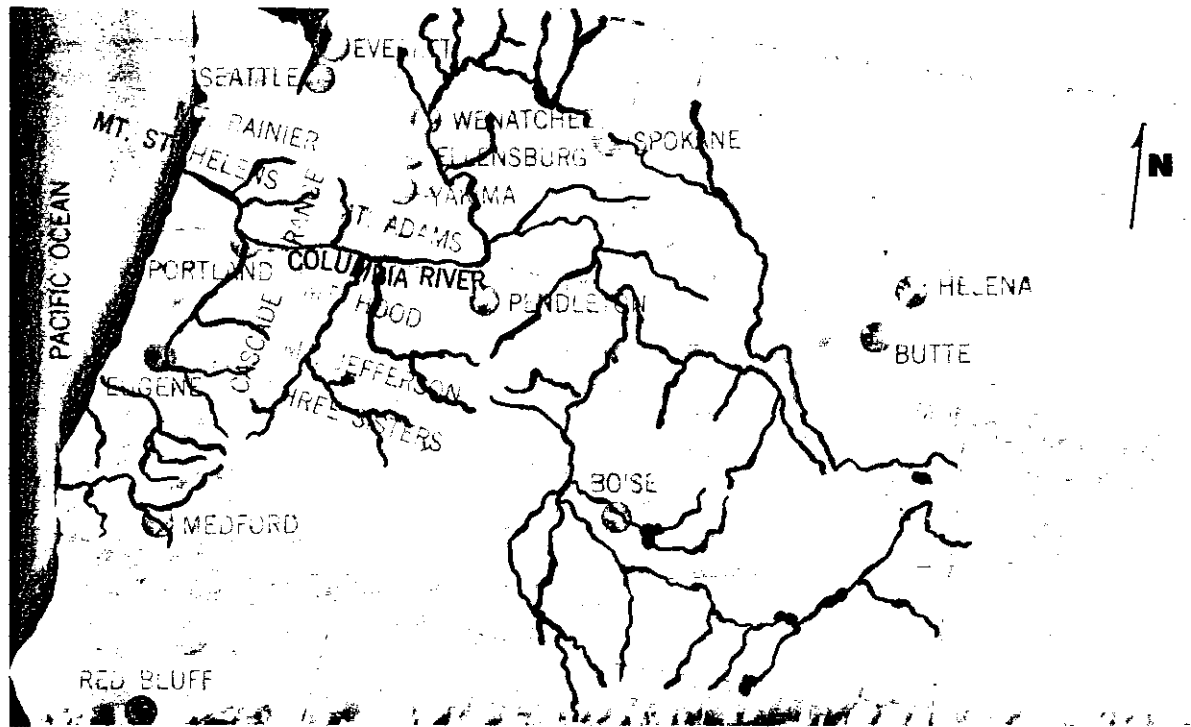
SAN DIEGO TO OREGON STATE LINE, VIA LOS ANGELES: Pilots will normally experience good flying conditions along the coastal area in both summer and winter. Coastal fogs, prevailing between March and July, usually burn off by 10 a. m. or noon, and there are occasional high fogs during winter months, suggesting a careful weather check. Smog may be encountered in the Los Angeles area (discussed in the Chapter "Cities and Industrial Areas"). Crossing the Tehachapi Mountains can be accomplished most any time during the day and most any time in the year. However, there are occasional thunderheads over these mountains in the summer and fairly heavy snow in the winter. Ideal flying conditions usually prevail in the San Joaquin-Sacramento Valley during summer and winter, with a few low fogs in winter.

Experienced pilots who know the northern Rockies, the valleys and passes of the Cascades, the Siskiyou, and the Bitter Roots give a general description of the outstanding topographic features of the Northwest States and explain the bearing this has on flying in general.

On the western edge of Oregon and Washington there is an irregular, not too high, range of mountains known as the Coastal Range, topped to the north on the Olympic Peninsula by the very rugged and sparsely settled Olympic Mountains. These are between Puget Sound and the Pacific Ocean just south of the Strait of Juan de Fuca. Through this Coastal Range between Oregon and Washington flows the mighty Columbia River. In southern Oregon this Coastal Range is fused with the Cascade Mountains by the Siskiyou Mountains.

East of the Coastal Range from Vancouver, B.C., south along the edge of Puget Sound to Tacoma, Centralia, and Portland is a fairly wide valley known as Western Washington Valley, through which arterial highways and railroads run. South of Portland to a little below Eugene is the Willamette Valley. These two valleys vary in elevation from practically sea level to approximately 400 feet, except where the fringes of the Cascade Mountains project toward the west near Kelso and Castle Rock, Washington, and just northwest of Portland where the Coastal Range projects towards the Columbia River. South of Eugene to Medford and the east-west Siskiyou Mountains, the foothills of the Coastal Range and Cascades intermingle, which in some instances makes for hazardous contact flying in bad weather.

East of the valleys mentioned above is the north and south range of mountains, rugged and sparsely settled for most of its distance, known as the Cascade Mountains. This range of mountains has many prominent high peaks. Just south of the Canadian border is Mt. Baker, 10,778 feet, and east and southeast of Mt. Baker are many mountain peaks that rise up to an elevation of more than 8,000 feet. One of these, Glacier Peak, has an elevation of 10,568 feet. South of Mt. Baker and Glacier Peak near Seattle is Mt. Rainier, 14,410 feet, and south of Mt. Rainier are Mt. St. Helens, 9,677 feet, and Mt. Adams, 12,307 feet.



In Oregon south of the Columbia River, are Mt. Hood, Mt. Jefferson, and Three Sisters, all of which extend above 10,000 feet, and Mt. Thielsen and Mt. McLoughlin, both of which are above 9,000 feet in elevation. Through the Cascade Range of mountains are several passes that are used by railroad, highway, and flyways: Stevens Pass, between Wenatchee and Everett; Snoqualmie Pass, east of Seattle to Yakima and Wenatchee; the gorge following the Columbia River; and the McKenzie River Pass, east of Eugene. Some of these visual flight routes through mountain passes are depicted on Sectional Aeronautical Charts by a series of blue elongated diamonds. The Sectional Charts for the Northwest use to be unique in that they were the only ones having this depiction. However, other western charts now depict them and the charts for Alaska which will soon be published will also depict them.

East of the Cascades in Washington the Columbia River Basin extends eastward almost to the Washington-Idaho line. To a larger degree this area is agricultural and flat open country. East of the Cascades in Oregon the land is much higher, with some mountainous areas extending northeast to the Wallowa and the Blue Mountains of eastern Oregon. In southeastern Oregon there is *much* sparsely settled, high, arid, desert-type land.

In northern Idaho and western Montana there are many mountain ranges running generally northwest-southeast that make up the great Rocky Mountain chain, and consist of some rugged terrain and sparsely settled areas. Through these chains of mountains there are few passes. The main pass follows the Coeur d'Alene, St. Regis, and Clark Fork River Valleys and takes you over Mullan Pass, Superior, and Missoula Valleys. In south central Idaho there are some very rugged mountains that branch off from the Bitter Root Range and cover a vast area. Included in the general "primitive" area are some desert and lava-bed areas. In the Bitter Roots near Butte, Montana, and to the north is the Continental Divide. From the Divide eastward, the territory generally sweeps out into high plateaus except for scattered high mountains

such as those north of Yellowstone Park, southeast of Great Falls, and south of Billings where the Big Horn Mountains extend from Montana into Wyoming.

In southeastern Idaho the mountains are offshoots of more extensive mountains of western Wyoming, which include the Tetons and Wind River Range in Wyoming, and the Wasatch Mountains of northeastern Utah.

These mountains make for rather easy navigation. But the weather is strange there and the rugged and sparsely settled areas make it necessary that the pilot be versed in more than just piloting ability. Knowledge of topography is very important.

The pilot flying in either summer or winter in this area must know the fundamentals of meteorology. The topography has a lot to do with the variable weather conditions.

There can be several types of weather prevalent in these regions at the same time say the experienced pilots. There can be valley or coastal fog west of the Cascades, even rain, and clear weather east of the Cascades, with a still different kind of weather in the mountains of Idaho and Montana. Many times during the summer in the mountainous regions, particularly those of Montana and Idaho, there can be severe turbulence from thunderstorms often accompanied by hail; and it is not always possible to accurately forecast hail. Icing conditions can be found either in summer or winter, and this is of special importance to any pilot.

The greatest problems for the inexperienced pilot in this Northwest Country are those associated with the weather, and the pilot must finally make his own decision. He should be willing to wait for improvement in conditions where he feels unsure, and must learn to turn back *a little sooner than necessary* if he encounters worse weather than anticipated en route.

Experienced pilots warn against what they call a fairly prevalent practice in this area of flying "on top." This leads to numerous incidents and a few accidents each year when pilots either become lost or are

unable to get down VFR. Conditions should be carefully evaluated before venturing on top in this mountainous area for extended flight. Don't permit yourself to get into a situation where you run "fresh out of experience." Weather at destination can change quite rapidly or the tops can easily build to heights beyond the altitude performance of the aircraft or the pilot. Extended flights above 10,000 feet without the use of oxygen should be avoided. With the loss of an engine while flying on top, even a light twin-engine aircraft may be unable to maintain an altitude above the clouds and thus force the pilot into IFR conditions.

If an "on top" flight results in IFR flight, the regulations require that the pilot hold an instrument rating, meets the recent instrument flight experience requirements of FAR, Part 61, files an IFR flight plan prior to instrument flight in controlled airspace, and that the aircraft meets the equipment requirements of FAR, Part 91.

It may be well here to cover emergency procedures that can be used if you become lost. If you have a radio, don't be bashful. Confess your predicament and call for help to anyone that will listen. Don't wait too long. Your FAA Flight Service Stations are waiting to help you. Search and Rescue facilities, including radar, radio, and DF (direction finding) stations are ready and willing to help. There is no penalty in asking for help. Stations with DF equipment may be able to receive you and give you a heading to follow to safety. Remember, the higher your altitude above the terrain the farther the operating range of your VHF radio.

If you have no radio, you may be able to alert civil or military radar systems by flying the following pattern: Fly a triangular pattern to the left. Hold each heading for two minutes. Make 120-degree turns at a rate of approximately one and one-half degrees per second. Complete at least two such patterns before resuming original course and then repeat at 20-minute intervals. If observed by radar, a rescue aircraft will be sent to your aid. Follow him and he will lead you to safety.

If you have an operating receiver but no transmitter, fly the same pattern to the right and listen for instructions on the appropriate emergency frequency (121.5 MHz. for VHF radios).

The Idaho State Department of Aeronautics prints and distributes an aeronautical chart on the back of which is a list of "Do's and Don'ts" on mountain flying. Some have already been covered but we will list others to emphasize important points.

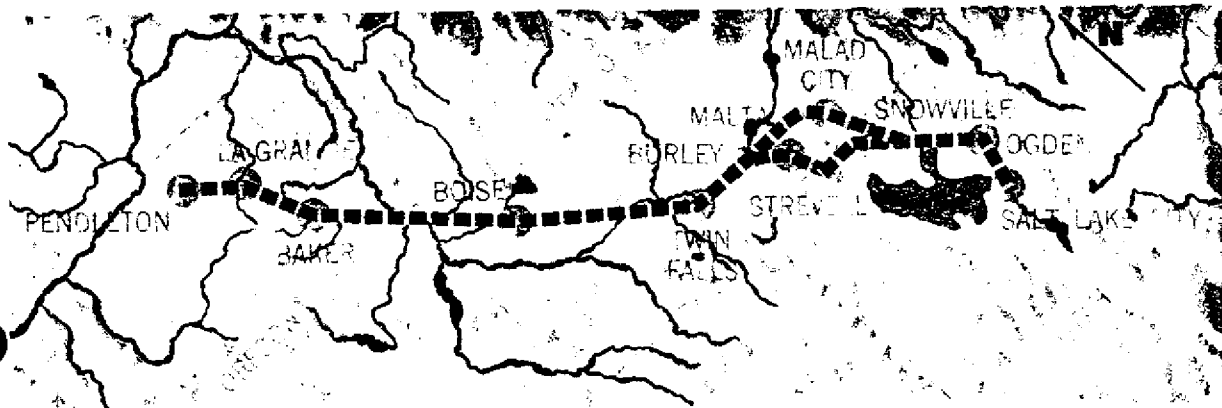
1. First and foremost do not consider flying the back country unless you have at least one hundred and fifty hours and are proficient in slow flight.
2. Know your airplane. Do not take an airplane into this territory that will not take off and land in a minimum distance. It takes a lot of experience to handle a hot airplane in this region.
3. *Remember* that for each thousand feet you are above sea level, it will increase your take off run approximately twenty-five percent, and your landing speed two percent with a longer landing roll due to your increase in landing speed.
4. Make your trips in the early morning hours. The air, as a rule, begins to get bad around ten a.m., grows steadily worse until about four p.m., then gradually improves until dark.
5. Stay out of the mountains if the wind is over twenty-five miles per hour.
6. Keep your airplane as light as possible. *Do not* carry one pound of needless weight.
7. Expect the wind to be changing constantly in the mountains. Don't rely on cloud shadows for wind direction. If you can't gain altitude on one side of a canyon, try the other—if there is no improvement there, ride the center but under no circumstances head up any canyon or valley without sufficient altitude and room to turn around—the grade of the canyon may climb faster than your airplane.
8. Remember you will not have a horizon to check the attitude of your plane once you begin to level down in the mountains. Check your airspeed and your altimeter.
9. Use common sense on takeoffs. Remember none of these fields are long enough to land again once

you have left the ground—let the airplane use all the runway it needs as long as runway is available. Do not pull it off until you are sure of flying speed.

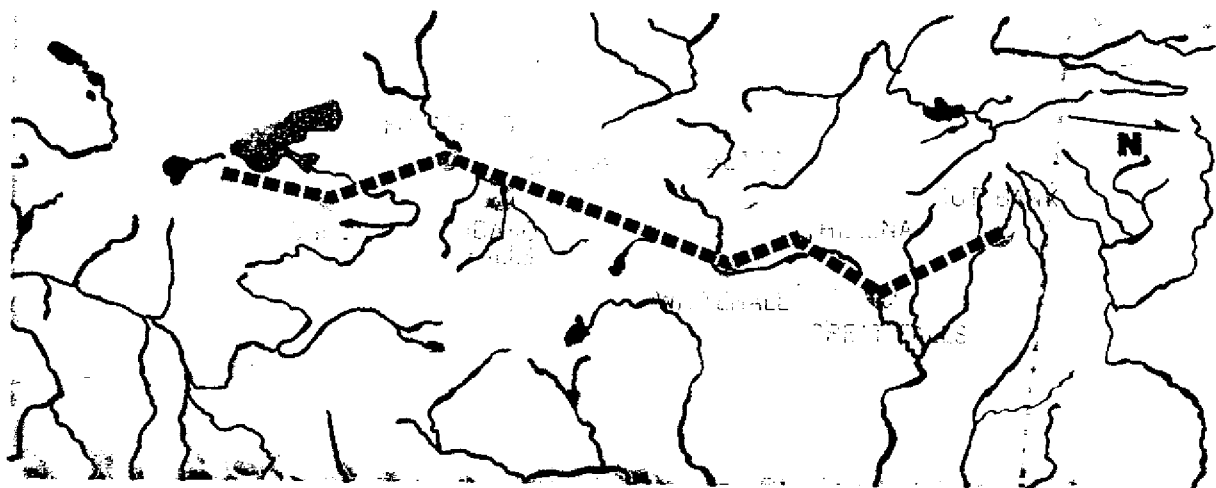
Experienced pilots believe strongly in advance study of your charts; in taking along sufficient gas to reach your destination or an acceptable and safe alternate; and in getting last-minute advice.

Here is a list of eight flyways that are usually followed in this area:

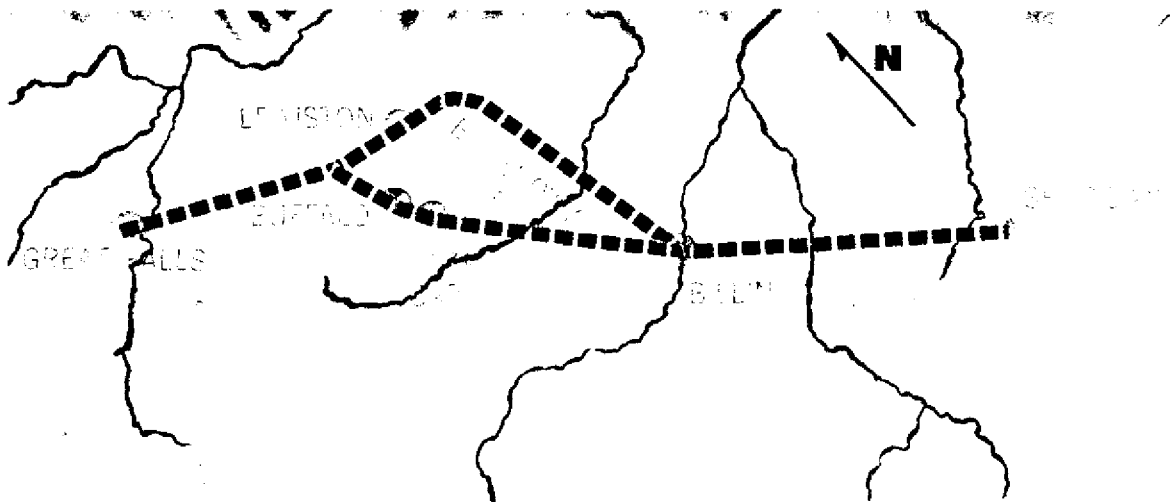
1. Salt Lake City to Pendleton, via Ogden, Malad City, Burley, Twin Falls, Boise, Baker, and LaGrande is ordinarily a good flying route. You may want to take a lower altitude route; in this case, fly north from Ogden via Snowville, Strevell, and Malta. The area in southern Idaho can be very hot in summer, very cold in winter, and high winds often prevail. Check carefully on the weather over the Blue Mountains.



2. From Ogden through Great Falls to Cut Bank, Montana, is one of the most difficult airways in the United States in the winter. There is more snow at Idaho Falls than at any other airport in this area. High elevations mark this route from Ogden, Pocatello, Idaho Falls, Dubois, Whitehall, Butte, Helena, Great Falls, to Cut Bank. The airport at Butte is at 5,554 feet elevation, and Monida Pass is almost 7,000 feet. In hot weather it is possible for winds from 8 to 12 miles an hour to have peak gusts up to 40 or 50 miles.



3. From Sheridan to Great Falls, via Billings and Lewiston is a route with conditions similar to those already described. From Billings to Lewiston the airways go to the east of the Big Snowy Mountain. However, the easiest and lowest elevation is along a route west of the Big Snowy through Judith Gap and Buffalo. From Lewiston to Great Falls, generally follow the course of the railroad over not too rugged terrain, but at an altitude of about 4,200 feet.

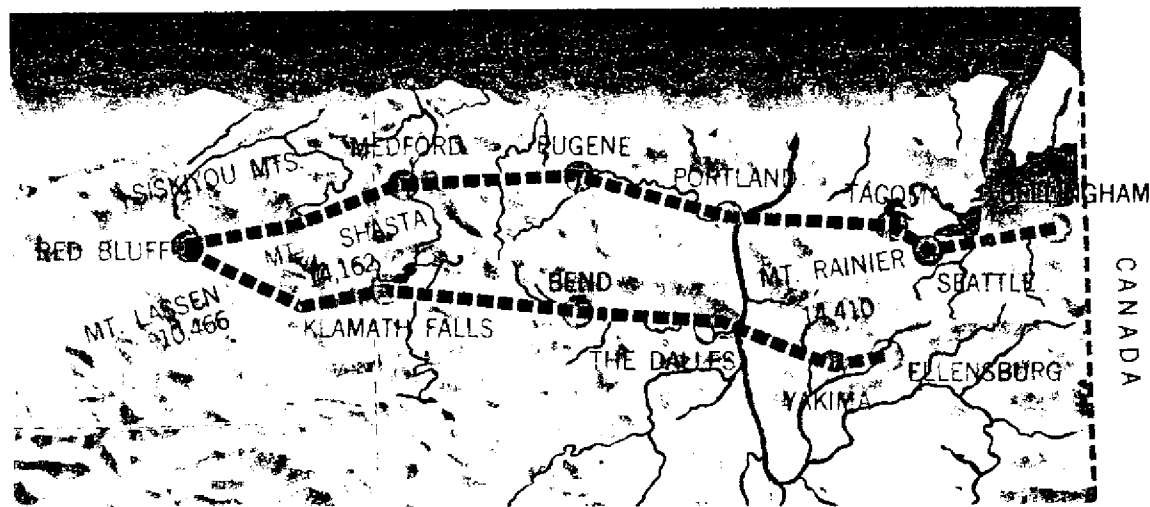


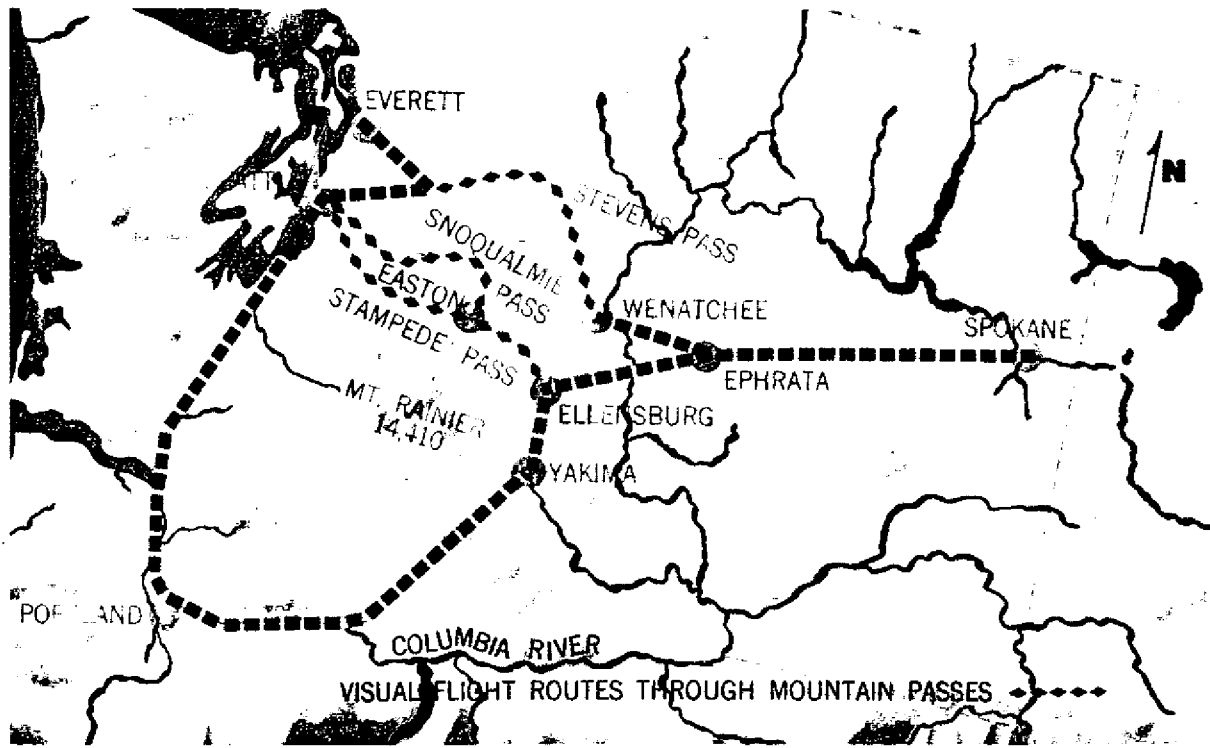
4. From Butte and Helena to the west, go via Deer Lodge, Garrison, Drummond, Superior, St. Regis, Mullan Pass, Kellogg, Coeur d'Alene, and Spokane.
5. California to Oregon or Washington, via Red Bluff, California, into Klamath Falls or Medford, Oregon, depending on whether the destination is to be east or west of the Cascades. The most general route is Medford, Eugene, Portland, Tacoma, Seattle, and Bellingham. In winter, bad weather



often exists just south of the Oregon line over the Siskiyou Mountains and in the Willamette and West Washington Valleys. In most cases, the weather is better east of the Cascades.

6. The route from Klamath Falls to Bend, Redmond, the Dalles, Yakima, and Ellensburg is generally open and flyable. In the summer the temperatures on this route can get quite high. It is generally advisable to go north between Mt. Lassen and Mt. Shasta, with Shasta and the Cascades on the left. Always check the winds at these high altitudes, especially in the summer.





7. Spokane, Ephrata, Ellensburg, Easton, and Seattle is a route over fairly flat country and generally flyable. The mountain pass routes are depicted on this map as you will find them on a sectional chart.
8. Between Ellensburg and Seattle there are many occasions when the weather east of the Cascades will be CAVU, with fog boiling over the Cascades and dissipating on their eastern slopes. Snoqualmie Pass on this route is at an altitude of about 3,500 feet, and on many occasions fog from the west makes VFR flight impossible. You can get into trouble trying to fly over or under this fog. Many pilots turn south from Ellensburg to Yakima and follow the Columbia River Gorge into Portland and thence to Seattle. Or, when Snoqualmie is closed, Stevens or Stampede Passes might be used. In Oregon, pilots flying between Eugene and Redmond or Bend use the McKenzie River Pass. These last three named passes are not on the airways, and pilots should approach and fly through them with care and with sure knowledge of the weather.

Experienced pilots have a few words of caution for those who plan to fly the Columbia River Gorge route.

They tell us that the Columbia River Gorge route is only safe when the right weather conditions exist. Many pilots have become involved in accidents while attempting flights through the gorge when ceiling and visibility were too low.

Numerous power lines cross the Columbia River. Some of them are quite high above the water. During low visibility conditions, particularly when there is precipitation, it is almost impossible to see these lines. Before a pilot attempts a flight through the gorge, he should know the location of these lines and how high they are above the river.

A large amount of traffic uses this flyway when other routes are closed. The gorge is very narrow in some areas which makes it difficult to reverse course. Because of these narrow areas, it also becomes increasingly important for the pilot to remain alert for airplanes coming from the other direction.

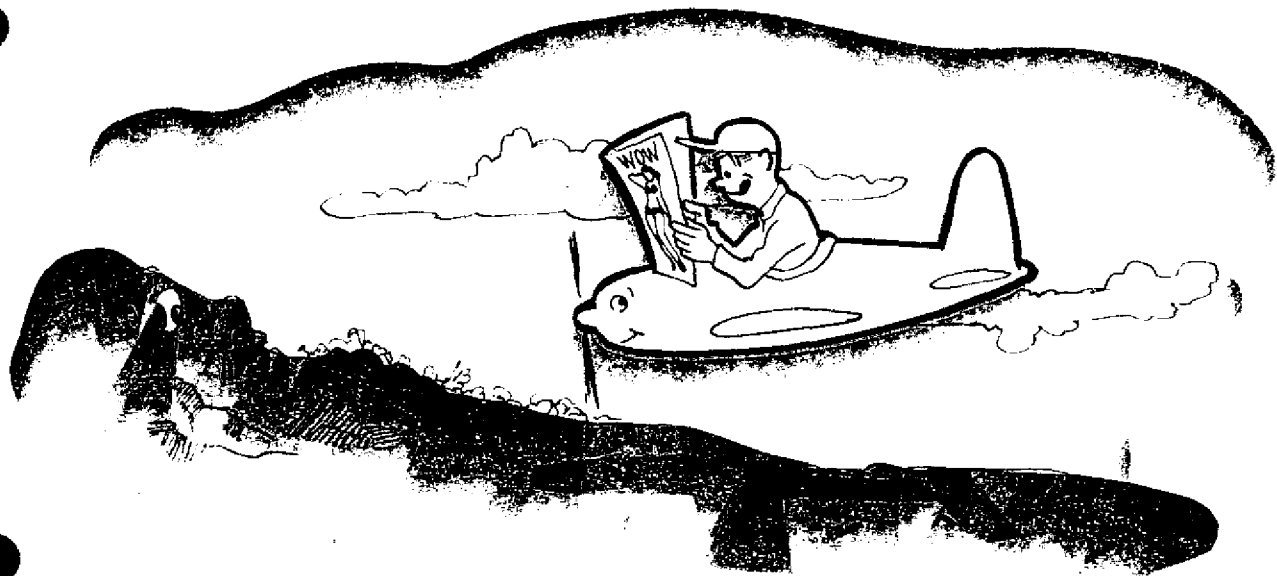
FLATLANDS OF THE MIDWEST AND THE HIGH PLAINS AREAS

Between the Appalachians on the east and the Rockies on the west lies approximately one half the area of the United States. Most of this section east of the Mississippi River consists of rolling country with much of the area west of the Mississippi consisting of wide expanses of flat, level country with an occasional outcropping of rough terrain such as the Boston Mountains in Arkansas, the Ozark Plateau in Arkansas and southern Missouri and other similar areas. From Kansas City westward through the eastern third of Colorado the terrain gradually slopes upward on an average of about seven feet per mile—from approximately 700 feet to 5,000 feet. In order to maintain the same altitude above the terrain over this route it would be necessary to gradually increase your altitude. This is rather deceptive because the terrain is so flat and the increase is so gradual.

Because much of this area does consist of flat country, many pilots may take flying here too much "for granted." However, you must remember that it is often the "unloaded gun" that does the most damage. You may have a tendency to be less alert and this should *never* happen regardless of the type of terrain over which you fly. A pilot who does not remain alert at all times while in an airplane (on the ground or in the air) is nothing but "an accident waiting to happen."

Experienced pilots tell us that terrain flying is at its best throughout the Midwest. Cultural features on the surface are numerous without being too congested and confusing to the VFR pilot. Terrain is mostly flat and, above all, the TRUE north-south, east-west lines of the earth are plainly visible to the pilot in the form of "section lines," fence lines, and secondary roads in most areas. If the pilot will remember this and compare the TRUE COURSE he wishes to make good with these lines, a simple check is offered to make certain his track over the ground is correct.

A pilot can check the accuracy of his magnetic compass while in flight. When the airplane is aligned parallel to one of the section lines, the compass should read the true direction of the section line minus easterly variation. In this case we are assuming no deviation.



If the pilot will turn the chart so that the north-south lines on the chart are parallel to the north-south section lines, he will have an accurate picture of the direction his desired track should be. He will be looking along, and in the direction of, his course line and the details below him will then fit the chart more clearly.

However, there is always an exception that spoils the rule or else serves to emphasize it. There are a few small areas in the Midwest and West where, for some unknown reason, these section lines do not correspond with true north. Caution should be exercised so that the accuracy of your compass is known and these section lines disregarded when noted.

In general, the visibility in the Midwest is good (except around the large cities) and a pilot using terrain flying can observe sufficient detail around him to locate his position accurately. However, the flat appearance of the terrain can lead the pilot into trouble when ceiling and visibility are at minimums. Gradual increases in ground elevations when flying westward can force a pilot, who tries to continue on, to fly at lower and lower altitudes (above the terrain). There are many high radio and television towers that become hazards to flight under these conditions.

The Midwest is also a large area where the warm, moist air from the gulf and the cooler air from the north collide, making it an area where the weather can change in a short distance and violent thunderstorms form quickly. **CHECK YOUR WEATHER CAREFULLY AND HAVE AN ALTERNATE AIRPORT IN MIND.**

Flight planning is just as important to the VFR pilot in this section of the country as in other sections.

High winds are very common during the months of March and April often causing restricted visibilities from blowing sand and dust.

In many areas the pastures, or grazing lands, are usually the roughest and most rocky portions of the farm land. Holes caused by wild life are often present and often not visible because of the grass that covers

them. So in the event of an emergency landing it is better to land on the tillable soil if it is dry. Corn and bean fields should be avoided because of the high ridges formed by the rows.

The Midwest has many small sod fields from which operations can be conducted safely under normal conditions. However, at times of unusually high temperatures, aircraft performance problems associated with high density altitudes are present (previously discussed under the Rocky Mountain Region) which most pilots do not take into consideration at these low elevations.

In the spring of the year (the last part of February to May), the temperature of the earth melts the snow from the bottom up, and what would appear to be a smooth snow surface may be a hard crust with very soft sod underneath. This hard crust has caused an unusual number of accidents, especially in nose-wheel-type airplanes.

Be very cautious on all sod fields in the spring. Thawing makes the ground very soft beneath the surface causing "nose-overs." Deep rutting makes takeoffs difficult.

Never take off with frost, snow, or ice on the wings, tail surfaces or control surfaces. You may never get the airplane off the runway because of the loss of lift. When a takeoff is made through water or slush, at or near freezing temperatures, in an airplane with retractable landing gear, it is possible for the gear to freeze in the up position. Precautions should be taken to prevent this by lowering and raising the gear several times after the initial retraction and a safe altitude and airspeed have been reached. However, take-off under such conditions should be considered only as an emergency measure.

Miniature tornadoes are discussed in the Desert Region chapter under the heading of "whirlwinds" or "twisters." This same phenomenon occurs quite frequently in the Midwest during the spring and summer months. They are often called "dust devils" in this area but, whatever the alias they go by, they are still to be avoided and the advice given for the Desert Region "twisters" is still apropos.

SWAMP AREAS

Swamps are pretty dismal places to land airplanes. They are inhabited by nasty little insects, bugs, snakes, and assorted venomous reptiles; and besides, there is usually somebody wandering around shouting "Chloe." It's hard to find airplanes that have gone down in swamps—still harder to find the people who were in them. A little care in flying over swamps will pay big dividends—so will a little carelessness. In one case you get comfort—in the other misery.

Our biggest swamps are in Florida and Louisiana, but there are swampy areas in other places which you can profitably avoid: along the eastern seaboard, in Georgia, Virginia, North Carolina, Mississippi, and eastern Arkansas.



There is no safe way to fly over swamps—at least over swamps of such size that the pilot must be, at any time, many miles from its edge. Forced landings can be made, but the real hazard is survival and rescue thereafter. By far the best practice is to skirt swamps and stay in the close vicinity of a highway or railroad, even if this involves adding miles to the flight.

This advice comes from experienced pilots for a swamp landing, if one should become necessary:

In searching for a safe landing spot while flying most anywhere in Florida, Georgia, or other areas where cypress swamps and pine lands exist, consider carefully the area between the cypress and the pine. You will generally find any cypress swamp surrounded by an area where neither cypress nor pine trees grow. The area will vary in width from 30 to 100 feet or more, depending upon the slope of the ground and other features.

This area is grass-covered and usually very smooth as it is the overflow area for the swamp. When the water is high in the swamp, a few inches of water floods this area and discourages the growth of pine trees. Most of the year it is dry and firm so that cypress will not root in it. This is the best—perhaps the only—place for an emergency landing in a swamp.

Experienced pilots warn that the Florida Everglades, the Okefenokee Swamp in southern Georgia, and the coastal swamps along the Atlantic and Gulf Coasts and the swamp area just north and east of Mobile are to be avoided. They point out that ocean coastlines make for easy piloting, but they advise keeping close to highways along the coastline near Charleston, Savannah, and Brunswick. Down the east coast of Florida, navigating is absurdly simple, but the novice pilot, when flying any other direction from Jacksonville except along the coast, should follow closely a highway or railroad and thus avoid the worst swamp area.

Experienced pilots suggest that any pilot who becomes lost in Florida should fly due east or west; by so doing he will arrive at the coastline within an hour, even in a slow airplane.

From Miami, there are only three routes that should be taken by the novice: straight north along the shoreline; straight west following the Tamiami Trail to Ft. Myers, Tampa, and St. Petersburg; and southwest to Homestead and Matecumbe Key; thence west-southwest to Key West, following the Key West highway.

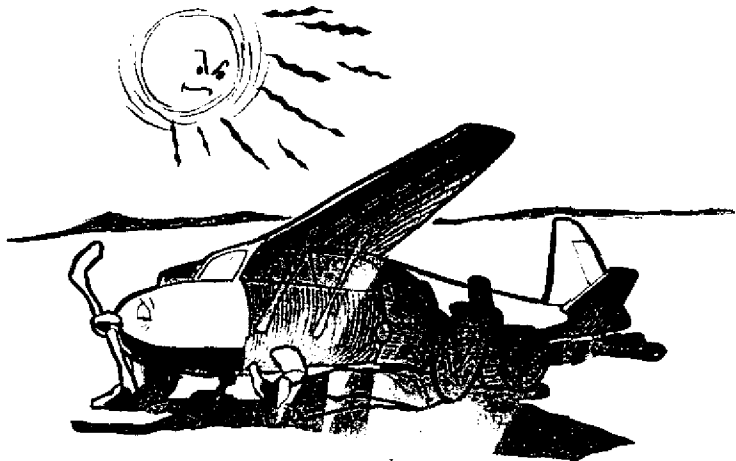
From Ft. Myers, St. Petersburg, Tampa, Lakeland, Orlando, and central Florida towns, no mountains will be encountered in any direction, but sizable swamp areas abound. The novice will be wise to find a highway or railroad leading in the desired direction and to stay close to it.

Nobody in the experienced-pilot category loves swamps. They are not even pretty or interesting to fly over, it seems. Timbered and swamp areas are encountered in Louisiana and Arkansas. Novices should fly the established airways where intermediate fields are available or follow very closely the main highways.

DESERT REGIONS

Desert flying has its beauties and its dangers, too. Wind and sun and lack of water are the natural enemies. Take care of the dangers they present and curb the human impulse to do wrong things; then you will enjoy desert flying.

Every experienced pilot stressed the very great importance of pilot behavior in the event of a forced landing in the desert. They all pointed out what an insignificant appearance a lone man makes on a vast desert when someone in an airplane is searching for him.



Their unanimous advice is that pilots, whether veterans or novices, stick to the traveled routes (airways, highways, or railroads) when flying over deserts. That advice involves filing a flight plan, of course; and this you will always do, if you're smart.

Then, if you're forced down, **STAY NEAR YOUR AIRPLANE.**

They could not emphasize too much the necessity of carrying water, chap lipstick, zinc ointment, cap with sun visor, and dark glasses during the summer months. Always fly close to the highways. Always file a flight plan, and always stay with the airplane in the event of a forced landing. You cannot survive the desert heat for long in the direct rays of the sun, and you should stay in the shade of the airplane until help arrives.

Likewise, in flying in mountainous and desert regions in the winter, adequate clothing is vital because of the freezing temperatures encountered at high altitudes. Even in summer, desert temperatures at night can be uncomfortably low.

Experienced pilots advise a solid respect for the desert. It's much better to stay close to a highway or railroad so that, in case of a forced landing, you will be near civilization and not liable to perish for lack of water. Sometimes you can even see houses in the distance, but in case of a forced landing, it's very doubtful if you would live to trek across the desert in midday without water. A few people, who don't know the desert and how they can be fooled by distances, may think they can walk 15 or 20 miles across the desert without water; but few will survive the experience. Many operators keep a gallon of water in their airplanes when they leave for XC, regardless of where they are going.

Experienced pilots in the desert region have some specific advice on the subject of desert wind conditions.

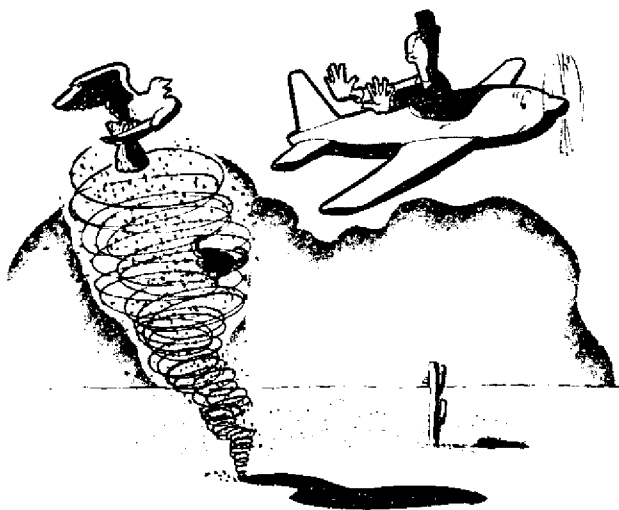
There is an old axiom that says "What you don't know won't hurt you," but desert-flying pilots should revise this to read: "What you don't see may hurt you." They refer specifically to the thousands of

small "whirlwinds" or "twisters" encountered over southwestern U.S. deserts.

In flight, you can spot these "twisters" miles away, as they spiral upward with a characteristic column of sand, dust, and even small twigs and grass. The birds also can spot them, and you will see hawks and buzzards nonchalantly riding these rising and twisting currents of air to great heights. These birds are merely riding the thermals for enjoyment.

However, even if you do have wings, don't emulate these birds. After all, if one of these birds fails to get home on time no one will worry; if you fail to arrive on time, it will give local pilots a lot of trouble buzzing around barren wastes looking for you. So when you see these "twisters," admire them all you want, but alter your course to miss them.

Pilots say there are "twisters" which you cannot see. It's very embarrassing to have one flip your plane over and pile it up on the ground while you are taxiing or if you encounter one near the ground. At least you can salvage your pride somewhat by avoiding all those you *can* see.



When landing, they advise you to watch for these little disturbances on desert airports. If any are in evidence, land on the dirt surfaces because there they are visible and can be avoided. You cannot see them on a concrete runway. Keep plenty of control and speed. Both will help in case a "twister" jumps you.

It is further emphasized by one experienced pilot that no pilot, while landing a light plane, should continue on such a landing after noticing a "whirlwind" on the airport moving in a direction which might contact the airplane during landing or landing roll. These winds are very turbulent and have put airplanes out of control on final approaches and landing rolls.

An airplane would have a better chance against these troublemakers if, when evasion is impossible, the airplane were facing them as they approached. In other words, never turn your back on a "whirlwind," especially while taxiing airplanes of the tricycle-gear type. Pilots should be on the watch for dust and sand storm areas and avoid them when possible. These conditions can suddenly place a VFR pilot on instruments and have caused numerous accidents.

You are advised not to use full throttle while taxiing or warming up when operating in a sandy or dusty area of an airport. The impact of the sand and dirt on the propeller can ruin the blades very quickly. An excessive amount of sand and dirt may be taken into the engine which could eventually result in serious internal damage and possibly lead to an emergency landing.

As with mountain flying, desert flying has its enthusiastic boosters. One experienced pilot points out some of the pleasures of desert flying. In his opinion, one of the nicest features about flying in the desert regions is the fine weather that prevails almost the entire year. By fine weather he means absence of haze, smoke and precipitation. Visibility is generally so good that distances are deceiving. A landmark or range of mountains, while appearing close, actually may be twice the estimated distance from the observer.

One experienced pilot, in describing the country between Ogden and Elko, says this is mostly typical Nevada desert, except for the 50 miles between Elko and Wells, Nevada. He assumes the pilot is following

the Southern Pacific Railroad and points out that about 10 miles west of Ogden, on the shore of the Great Salt Lake, this railroad "goes to sea." It crosses the lake on a combination of earth fills and trestle bridges. The first part of the lake between Ogden and Promontory Point, where there is an emergency field, is generally shallow and safe to cross at lower altitudes. The major portion of the lake between Promontory Point and Lakeside reaches a depth of 40 feet, and it is advisable to fly at an altitude which would enable the pilot to glide in for a shore landing in case of total power failure. The safe altitude is generally considered to be at least 8,000 feet, which will give a 4,000 foot clearance between the airplane and the water. At this altitude, the time over the middle of the lake at which it would be impossible to glide to shore can be measured in seconds.

In the event of a forced landing in the lake it might be possible to land on the railroad trestle, as it is wide enough to support double tracks at several points. The water in the lake is 26 percent salt, and an attempt to swim rapidly, dive, or splash would result in strangling. By merely drawing the lower part of the legs upward it is possible to sit in the water and float like a cork with the head and shoulders protruding. In warm weather a person might float indefinitely.

The advice already given on planning mountain and desert trips in the early morning holds very strongly for most flights in desert areas; from Salt Lake to Elko to Reno, Salt Lake to Las Vegas to Los Angeles, El Paso to Tucson to Phoenix, etc.

Flying across southern Texas offers no particular hazard since the terrain is low and smooth. In the western section, however, the State has lots of hill country, covered with timber, mesquite, sagebrush, and sand dunes. Human habitations are few and far between. This is a good argument for sticking to the highways where rescue will be easier in an emergency.

Novices in desert flying should count on much longer runs for takeoff and longer rolls in landing as a general practice. Many of our deserts are at fairly high elevations and all of them, of course, run high

temperatures. Both conditions seriously affect the performance of any airplane (since they both contribute to a high-density altitude condition), and there are many opportunities for pilot error.

No formula has been worked out in simple enough detail for use in this kind of flying. The novice may be pretty much on his own in his first landing on a high-altitude field, or a hot desert field. However, he should check the landing performance chart in his Airplane Flight Manual or Owners Handbook to determine the predicted landing distance under the *expected* or *forecast* conditions at destination. If at all possible, he should discuss the change in flying conditions with an experienced pilot familiar with these conditions. Having learned from him the *fundamental differences*, the novice should familiarize himself with the behavior of his own plane under the new conditions. Heated and rarefied air is no friend of a pilot. Prior to taking off under these conditions, takeoff and climb performance charts in the Airplane Flight Manual or Owners Handbook or the DENALT computer should be checked for predicted takeoff distance and rate of climb under the *existing* conditions.

Generalities about desert flying are not enough. There are routes over deserts which may be poison to the light plane with short range. This terse description by one experienced pilot describes the straight-line route between Tucson and San Diego.

This route is not suggested for light aircraft in summer months due to high winds, terrific turbulence, up-and-down drafts, and the distance between service facilities as well as coastal fogs. It is suggested that the route be planned instead via Phoenix, Blythe, Los Angeles, and San Diego. If the trip is necessary it should be planned for early morning hours, taking into consideration winds aloft and fuel supply aboard, after complete check of coastal weather information.

This ought to be enough to warn the novice to check in advance with an experienced pilot before every flight attempted over desert country.

BADLANDS, CUT-OVER LANDS, FORESTS, AND FROZEN WASTES

These conditions are spotty. In general, only forests occupy very large areas and they present their particular hazards to the novice pilot. Perhaps you have flown along and contemplated the fluffy green carpet of a forest beneath you, thinking it ought to be a soft and safe place to land. If it were all leaves, it would be; but there are limbs and tree trunks in that mattress, and tree landings must be listed as dangerous and expensive. In all but a few such areas there are small open fields in which an emergency landing can be made. Before flying over all the others, the novice pilot should seek the advice of an experienced pilot and listen to him very attentively.



Badlands, excepting perhaps those of South Dakota, are rather limited in area and can be avoided. There is no reason, in fact, for flying directly over the middle of any very bad stretch of country. You can always go around—it may stretch your flight, but it also will stretch your span of life.

Cut-over ground is bad for airplanes. It's as easy to run between the rain drops as it is to land between stumps. You might walk away from a stump-field landing, but your airplane will probably be a washout. There seems to be a lot of this kind of terrain, but actually there are few spots where the area is very great—certainly not too great to fly around when safety dictates the course.

"Frozen wastes" sounds bad, doesn't it? But we have them in varying sizes in this big United States. Only very hardy and experienced pilots who cannot postpone their flights should attempt to fly such areas. You can be just as much alone and lost in the county-sized wheat fields of North Dakota and Minnesota as an Alaskan "bush" pilot forced down between Galena and Nome. A forced landing is not too difficult, even in deep snow; but freezing to death at the same spot is still easier.

OCEAN, BAY, AND LAKE SHORES

There's no prettier flying than along the shore of a rolling ocean or a beautiful lake. Such flying, however, has some hazards the experienced pilots say. Certainly it should be done only under ideal conditions.

An off-shore wind along with poor visibility can, in no time, place the unsuspecting pilot in a precarious position where he might be unable to make his way back to the shore, if flying a landplane, or be unable to reach a sheltered spot for a landing, if flying a seaplane. Extra care should be exercised in crossing Chesapeake Bay, Delaware Bay, or Long Island Sound when visibility is poor. In poor visibility, the unskilled pilot can easily become confused for lack of a horizon. Better not cross unless the other side is clearly visible and then, if possible, it is better to cross so as to intercept the paths of boats. It's better to land near a boat than all by yourself.

Almost any of the Great Lakes might also have been included in these warnings. There's an awful lot of water, even in little Lake Huron, to fly across in a landplane. Because some of these lakes are comparatively shallow, they produce high waves under windy conditions.

Those who know, firmly advise against crossing any of the Great Lakes in a single-engine airplane. The risk is all out of proportion to the reward. The problem is not so much one of landing in rough water as it is one of staying alive in cold water and being picked up after the landing. Even with life preservers, the water is usually too cold for any prolonged exposure. With the exception of railroad car ferries and a few tankers, shipping traffic on the lakes is at a standstill from about November to April. The upper lakes are desolate at any season. Getting picked up after an emergency landing might be a matter of considerable luck, and will almost always be a race between exposure and the rescuer. What is said about fog in the next paragraph also applies to the Great Lakes.

Watch for fog along the ocean coasts. It will sometimes lie for hours in a straight line just offshore

and then, within a few minutes, move inland covering a wide area. It can easily and quickly cover that sea-shore airport where you had planned to land. In questionable weather, always have an alternate destination airport in mind. Fog around Long Island is doubly dangerous because of the large bodies of water on each side, and it takes only a short time, in extreme cases, for fog to blanket the whole island.

Experienced pilots in the western states recommend that you plan your arrival on the west coast shortly after noon if possible and you should be able to make it VFR most of the time. Coastal fog usually burns off by ten o'clock and does not move in again until late afternoon. However, check the remark section of the sequence report carefully. If it shows fog bank or stratus west, the field could "sock in" quickly. You must then have an alternate further inland out of the fog.

Experienced pilots point out that when making an emergency landing over water with landplanes, you should land parallel and close to the shore line when possible—never towards or away from the shore line.



However, unless absolutely necessary, never let yourself get to an altitude or position where such a landing would have to be made. Play it safe. Take the long way around. There is much truth in the old adage that "an ounce of prevention is worth a pound of cure."

CITIES AND INDUSTRIAL AREAS

There are two extra good reasons for not flying foolishly in these areas. One is that you can break your neck easily and sensationally if you are too low over such an area, and are forced to land; the other is that you do flying in general a great disservice by making a nuisance of yourself by low or unnecessary flying over populated areas. Low flying over a town is not only impolite but it is actually dangerous. In addition, you can be arrested by the local police for such flying and can be cited by the FAA for a violation. Fines, revocation of certificate, and even imprisonment can be the penalty.

If you obey the Federal Aviation Regulations and State laws and maintain an altitude that will enable you to glide to the outskirts of town in the event of a forced landing, you will be high enough not to disturb the people on the ground with the noise of your plane.

"Smog" is prevalent around most big cities, and around smaller towns with many factories. This mixture of fog and smoke is one of your worst enemies. It easily obscures an airport. It destroys your horizon, limiting both vertical and forward visibility. Stay out of it whenever you can. Where possible, land at an airport outside the limits of the smog, talk to an experienced pilot and get his advice before flying to any airport closer in which may be covered with smog.

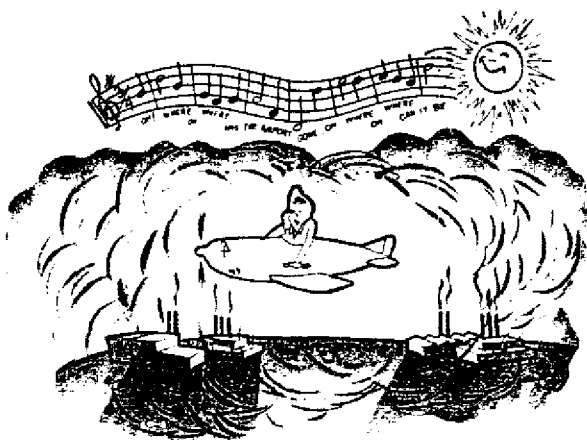
Eighteen years ago, when this booklet was first published, experienced pilots in the Los Angeles area had some sound and simple advice for pilots on the subject of smog which is still applicable. They summed it up with the statement that a pilot must pick his way carefully through heavy smog.

This hazy, light fog which is a mixture of ocean moisture, exhaust gases from automobiles, and manufacturing smoke, is proving an increasing pain-in-the-neck to local pilots. Depending on wind conditions, the visiting pilot may either fly "on top" at about 4,000 feet and still see hazy landmarks on the ground, or he may drop to 1,000 feet and fly through the haze. Smog conditions usually are most severe early in

the morning and burn off partially during the day. On fields near the coast, late afternoon ground fog often obscures the ground during the winter months.

There are more light airplanes per square mile in southern California than anywhere else in the United States. Airports are crowded, and traffic is a problem. A visiting pilot should use extreme care in entering a strange, crowded field. Usually there are planes circling any southland field at any hour when flying is permissible, and a visitor should plan to follow a local plane into the traffic pattern.

Experienced pilots say that the smog situation in the Los Angeles City Area (the area within the coastal plain from San Bernardino, westward) is far worse than it was eighteen years ago. A pilot entering this area in the late afternoon with the sun across the smog will often find the summertime flight visibility reduced to "zero" and the only terrain visible to him will be that directly below. Radio navigation, or an intimate knowledge of the terrain, is necessary under these conditions. It is advisable for the pilot to land at an airport east of the mountains and ask an experienced pilot the best method to proceed.



Don't forget flight and ground visibility requirements of Federal Aviation Regulations for VFR flight in control zones and other controlled airspace.

What experienced pilots say about smog in California also applies to such places as Buffalo, St. Louis, Pittsburgh, Wilmington, or Nashville. City haze or smog is a hazard which all pilots should respect. It causes trouble on the scheduled airlines, and many a trip which was in bright sunshine a few miles out of town finishes virtually on instruments.

The private pilot often has the option of several airports at large cities, and flights should be planned with such alternates in mind. It is not possible here to say which airports at major cities profit by prevailing winds and have their smog blown away, but the pilot himself ought to learn these facts about cities into which he flies regularly.

Another "man-made" hazard in the vicinity of cities and towns which has grown by "leaps and bounds" is that of the tall television transmitting tower. The trend is ever upward toward outer space. Many of them extend over a thousand feet above the terrain on which they are located, with some up to approximately 2,000 feet, and they are often built on some of the highest knolls in the area. Although the large cities will have more towers, you will find the tallest ones near towns centrally located in a large rural area.

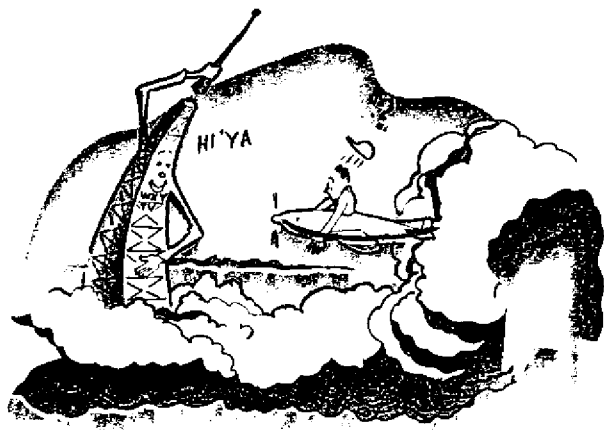
Part of your flight planning on every flight should include the use of the latest aeronautical charts to check the altitude of the highest objects on either side of the proposed course. Choose an altitude that will clear the highest one with plenty to spare. On a flight involving minimum ceiling or during letdown for a landing approach, this may not be possible. It then becomes absolutely necessary that you know where each one is and your position relative to it. If not alert in restricted visibility, you may find a tower staring you in the face before you know it. Keep in mind that recently constructed towers may not appear on your chart.

Perhaps more insidious than the towers themselves are the cables that support them. These cables

may be two or three inches in diameter—formidable opponents for any airplane, especially since they may be invisible until too late to avoid them. They may extend out at a 45-degree angle from their point of attachment to the tower. This means that collision with a cable attached at a height of 1,500 feet above the base of the tower would be made at a distance of 500 feet from the tower when flying 1,000 feet above the terrain, and at a distance of almost a quarter of a mile when flying 500 feet above the terrain. So don't see how close you can miss these towers. Remember those invisible tentacles reaching out for you. Once they make contact, you have already lost.

Remember that regulations in FAR Part 91 require visual flight over congested areas to be 1,000 feet above the highest obstacle within 2,000 feet of the aircraft.

This will affect the ticklish problems of getting into a city where industrial smoke and fog combine to restrict visibility. This rule, and known difficulties of visual flying under smog conditions, make it doubly wise for the pilot to land outside the affected area and talk it over with a knowledgeable pilot.



Check points in the outskirts of any large city are plentiful, but they must be known by the pilot, because no aeronautical chart is in sufficient detail to show them. However, the local aeronautical chart for that city (if there is one) would be helpful. Without radio, the pilot must make pinpoint observations in approaching the airport. Only two real aids are available: his own memory of landmarks gathered on previous flights, or the advice of a knowledgeable pilot.

Small cities on coasts and rivers are not so difficult to enter under hazy conditions as big, sprawling places like Chicago, Kansas City, Boston, and Detroit. Cities like Cincinnati and Pittsburgh, on rivers, give check points which are obscured only by the thickest smog. But where subdivisions, looking much alike, cover many square miles and the airport is surrounded by built-up areas, the job of finding the airport is one for an expert.

FLYING IN ALASKA

Here you have something entirely different. Here you also have a large number of pilots with long experience, all willing and eager to advise you. The reasons are easy to find. They want to be helpful, and they've lost all interest in the hardships encountered in hunting for lost pilots in the wilds of the bush country. So, they'll do anything they can to keep you from getting lost.

Alaska is about one-fifth the size of the original 48 States. Most of Alaska is primitive, uninhabited wilderness with mountains, swamps, and forests predominating. Northern Canada is similar. As you progress northward, the timberline elevation decreases. There are few forests north of the Arctic Circle; and there are no trees in the extreme northern coastal areas.

Alaska's economy, like that of northern Canada, is based primarily on air transportation due to the relatively few roads or other means of surface transportation. Aviation fuel, generally 80/87 octane only, is available in most communities served by an airstrip, although the airstrip may be of limited size.

Innumerable water areas popularize float flying in summer. The greatest part of northern North America's remote areas is accessible by ski plane in winter.

Both Canadian and Alaskan laws require—and wisely so—that emergency rations and survival equipment be carried during cross-country flying. Alaskan law requires the following (minimum) items during summer months:

Food for each occupant sufficient to sustain life for 2 weeks.

One axe or hatchet.

One first aid kit.

One pistol, revolver, shotgun or rifle, and ammunition for same.

One small gill net, and an assortment of tackle, such as hooks, flies, lines, sinkers, etc.

One knife.

Two small boxes of matches.

One mosquito headnet for each occupant.

Two small signaling devices such as colored smoke bombs, railroad fuses, or Very pistol shells, in sealed metal containers.

The following additional (minimum) items are required from October 15 to April 1:

One pair of snowshoes.

One sleeping bag.

One wool blanket for each occupant over four.

Canadian requirements are similar except that no pistols are permitted in Canada. Popular credit cards such as Standard Oil, Texaco, and Shell are honored in Canada. Standard Oil, Texaco, and Union Oil aviation products serve Alaska.

Flight through Canada presents no particular problems. The coastal route from Seattle to Alaska is *not* recommended for single-engine, wheel-equipped airplanes due to lack of suitable emergency landing areas, weather, and limited enroute servicing facilities.

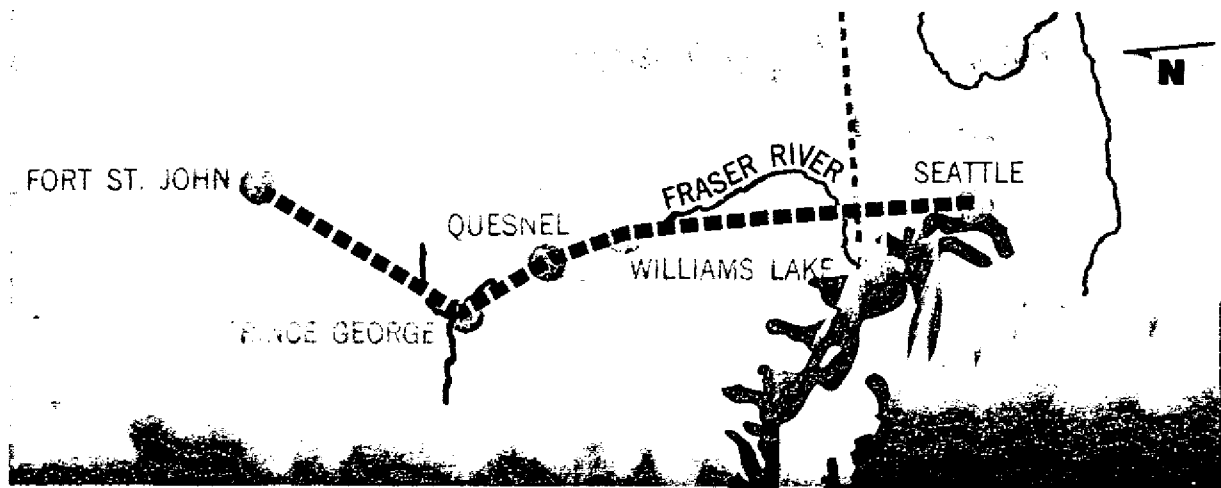
The Alaskan highway route is recommended from Ft. St. John, British Columbia, to and beyond Northway, Alaska. This route is over timbered mountainous terrain, mostly uninhabited. Single-engine aircraft, and twin-engine aircraft operating above their single-engine service ceilings, should follow the highway. All enroute service airports and a number of emergency airstrips are along the highway route. Fuel and overnight accommodations are less than 300 statute miles apart all along this route. In an actual emergency, the highway itself is likely to provide the only practical landing area. *WAC charts 116, 117, 138, and 139* cover this route.

Flight plans are required over Canadian routes and urgently recommended for all flights away from an airport in Alaska. Stay on your flight-plan route and stay with your aircraft. Canadian officials state that they will now search *only* the flight-plan route.

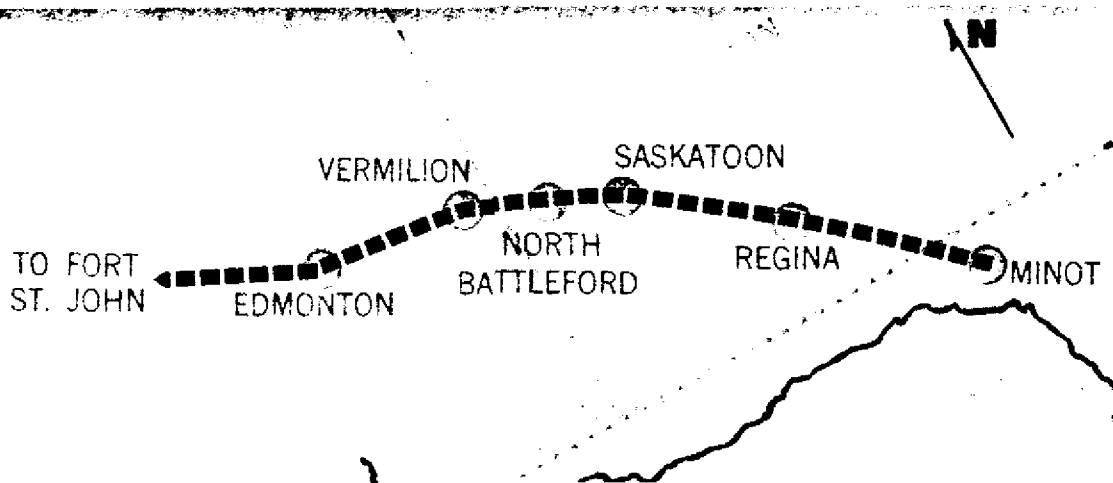
Low-frequency ranges provide nav aids in the same 200-400 kc. band as U.S. stations. Tower and station frequencies are similar to U.S. coverage in both the LF and VHF bands. The Canadian publication entitled *Air Navigation Aids* lists radio aids and frequencies. It is issued every three months and is available from: Queens Printer, Department of Public Printing and Stationery, Ottawa, Canada, price 40 cents. Also available, without charge, from Queens Printer is a booklet entitled *Canadian Border Crossing Information*. It contains much more useful information than the title indicates.

Three commonly used routes from the southern Canadian border to Fort St. John, British Columbia, where you pick up the Alaskan Highway, are:

1. Western Route: From Seattle area via the Fraser River and Hart Highway to Williams Lake, Quesnel, Prince George and Fort St. John. Customs clearance is required. *WAC Charts 185 and 216* cover this route.

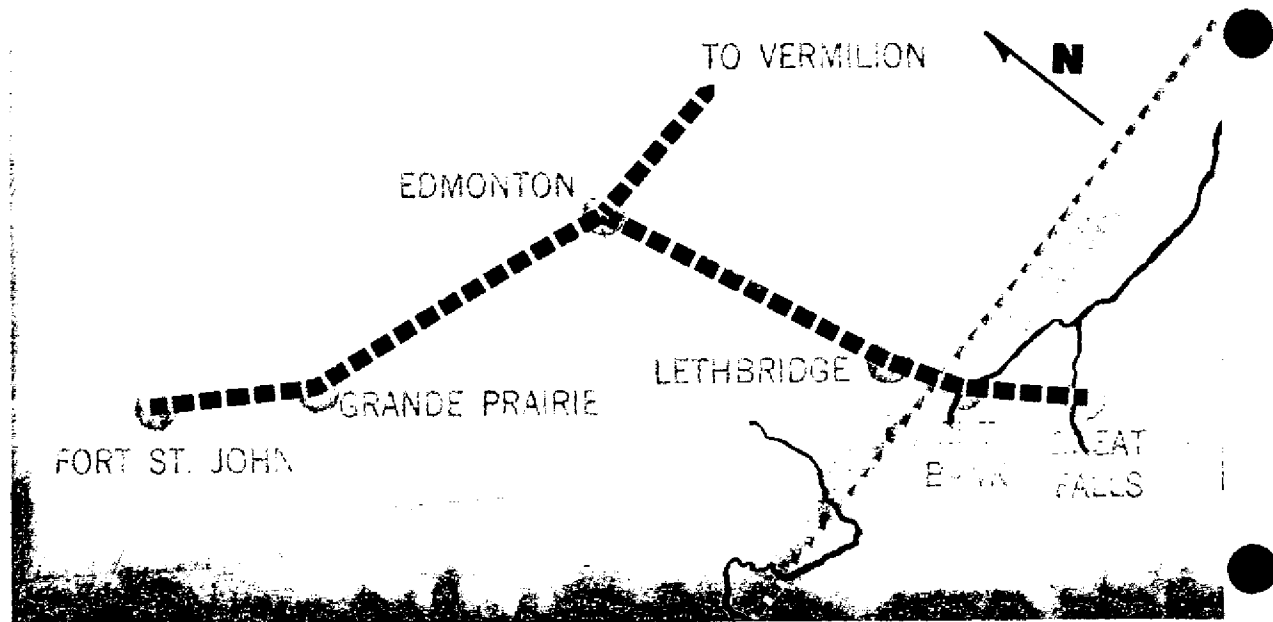


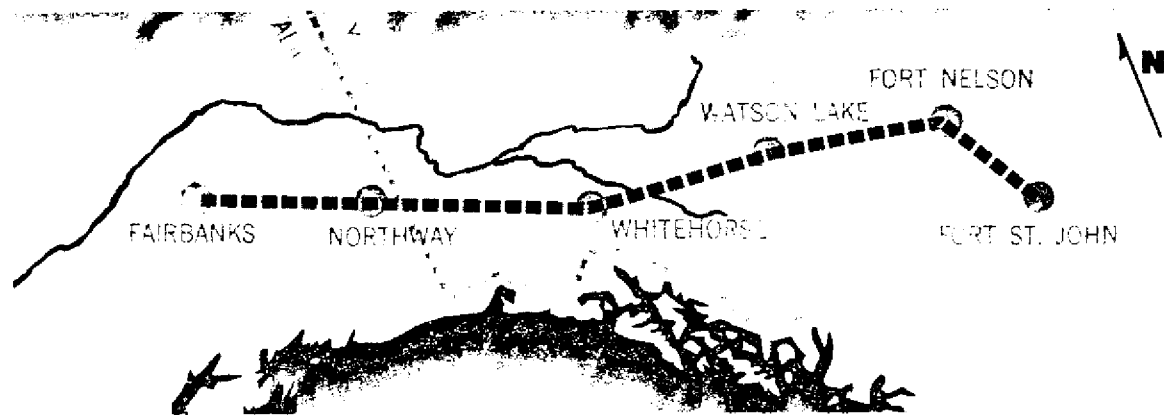
2. Eastern Route: Beginning at Minot, North Dakota, this is a low-elevation route over favorable, relatively flat terrain with paralleling highways and railroads most of the way. At Minot contact



U.S. Customs and file a flight plan to Regina, Canada, 215 (statute) miles. Notify Canadian Customs of your estimated time of arrival at Regina. Clear Canadian Customs at Regina. Additional en route service stops are Saskatoon, 150 miles; North Battleford, 79 miles; Vermilion, 96 miles; Edmonton, 148 miles; Grand Prairie, 240 miles; and Fort St. John, 100 miles. *WAC Charts 183, 184, 185, 217, and 218* cover this route.

3. Central Route: At Great Falls, Montana, clear your flight with U.S. Customs. Then file your flight plan to Lethbridge, Canada, 165 miles. Check with Canadian Customs at Lethbridge. The next flight plan should be made to Edmonton, another 270 miles.





The next fuel stop is Grande Prairie, 240 miles. Then Grande Prairie to Ft. St. John, 100 miles; Ft. St. John to Ft. Nelson, 190 miles; Ft. Nelson to Watson Lake, 235 miles; Watson Lake to Whitehorse, 215 miles; Whitehorse to Northway, Alaska, 270 miles; and Northway to Fairbanks, 225 miles.

World Aeronautical Charts 139, 183, 184, 185, 216, 217, and 268 will guide you from Great Falls, Montana, to Ft. St. John and 77, 116, 117, 118, 138 and 139 from Ft. St. John to Fairbanks and Anchorage, Alaska. When *Sectional Aeronautical Charts* are published for Alaska (scheduled to start February 1967 and to be completed by February 1968), it would be advisable to use them because of the greater detail and the identification of mountain-pass routes.

File a flight plan from your last U.S. stop to a Canadian point offering Customs service. The FAA

station from which you file can advise you. Canadian airports where this service is available include Winnipeg, Regina, Saskatoon, Edmonton, Lethbridge, Calgary, and Vancouver. Your flight plan must include the request that Canadian Customs be advised of your ETA.

Failure to give advance notice of arrival to the Immigration and Naturalization Service renders the violator subject to a "fine" which may be levied against the pilot or the owner of the plane. Under ordinary circumstances the pilot should request FAA, at the expected port of arrival, to notify both Customs and Immigration to prevent any undue delay. By notifying each, the regulations will be complied with and less inconvenience caused the pilot. At some places one officer handles inspection for both Customs and Immigration.

At your Canadian Customs entry point you will likely be given a clearance slip to be turned in to U.S. Customs in Alaska, thus making it unnecessary to contact Canadian Customs for departure clearance from Canada into Alaska.

Plan to arrive at Customs points during regular working hours (8 a.m. to 5 p.m. Monday through Friday) to avoid overtime charges.

Carry your own tiedown kit. Hangar storage is not available in the north country, in Alaska or Canada. Accommodations for large groups also may not be available outside of the main population centers. So, your emergency rations, sleeping bags, and equipment may be needed in remote spots.

Alaskan airports of entry, as of June 20, 1966, included Northway, Fairbanks, Anchorage, Haines, Juneau, Annette, Sitka, and Skagway.

The FAA *Alaska Airman's Guide and Chart Supplement*, published every four weeks, provides much valuable information, including navaid listings. It is available at 50 cents per copy or \$13 per year from the U.S. Coast and Geodetic Survey, Washington Science Center, Rockville, Md. 20852.

Seek information and advice from experienced Alaskan operators and pilots. You will find them friendly

and helpful. They would much rather help you plan your flight than to spend time searching when you become lost and overdue.

In Alaska, as elsewhere, it is not enough to know how to fly. Flying in the remote areas of the north country is a serious thing. One must know when, where, and what to fly; still more important is to know when, where, and what not to fly.

Most every year aircraft disappear. Three single-engine civil aircraft and their occupants disappeared in 1965 and remain unlocated. Weather (VFR into IFR) is often a factor.

Every word that follows is worth-while information. So listen and learn and live to fly.

The pilot new to Alaska should be properly equipped with the *Alaskan Airman's Guide* and WAC charts (Sectional Charts when they are published) showing airports, range courses, and VOR stations. In many cases charts are not entirely accurate as to bends in rivers and altitudes of the mountains. It is advisable to stay on regularly traversed routes or airways unless special arrangements are made to take some other route. The popular routes are as follows:

1. Anchorage to Cold Bay via Iliamna, Naknek, and Port Heiden.
2. Fairbanks to Kodiak Island via Summit, Talkeetna, Anchorage, Kenai, and Homer.
3. Anchorage to Nome via Skwentna, Farewell, McGrath, and Unalakleet. (From Unalakleet to Nome is practically all over water, via direct air line; therefore, the small plane should follow the coast past Moses Point and thence to destination.)
4. Fairbanks to Nome via Tanana, Galena, and Moses Point.
5. Bethel to Fairbanks via Aniak, McGrath, Minchumina, and Nenana.
6. Northway to Fairbanks via Tanacross and Big Delta. (This is the Alaska portion of the Watson Lake-to-Fairbanks chart.)
7. Northway to Anchorage via Gulkana.

8. Anchorage to Fairbanks via Rainy Pass and Windy Pass.

In addition to these listed routes, there are other perhaps less frequently traveled airways, including those from Fairbanks to Barrow via Bettles and from Nome to Barrow via Kotzebue.

Most of these routes entail the crossing of mountainous terrain, and some the crossing of mountain ranges. The charts the pilot should have with him on all flights will, of course, show where these ranges are located and the general height of the peaks. Relatively low passes are to be found through most of these ranges. However, the pilot who is new to Alaska is cautioned not to fly low over the mountains or through the passes because of the severe downdrafts and turbulence which he may encounter.

There are only a few highways to serve as check points for the pilot and section lines are completely lacking here. The Alaska Railroad is the only railroad of any appreciable length; 460 miles long, running from Seward (and Whittier) on the Gulf of Alaska coastal area, northward through Anchorage, Wasilla, Willow, Talkeetna, Curry, Summit, McKinley Park, and Nenana to Fairbanks near the central part of the State.

Hundreds of glaciers cover the slopes of Alaska's three mountain ranges. The valleys are generally broad and relatively flat and contain many rivers and smaller streams and innumerable lakes. The country, largely a glacial moraine, is covered with a mossy tundra or muskeg, varying in depth from a few inches to many feet. In the swampy areas where the muskeg is found, travel in the summertime is next to impossible on foot.

Alaska abounds with wildlife. Black and brown bear, moose, deer, caribou, and reindeer are plentiful in certain sections. In addition, fur-bearing animals, including the predatory wolfpack, are found in practically every section. Migratory birds as well as local wild fowl are abundant. This information is injected into the general description of the country because it has considerable bearing on the equipment that the pilot should take with him on his flight into, and over, the wilderness areas.



Exclusive of the airports constructed in the Aleutian chain there are a number of other airports in the State that civilian pilots may use which have been constructed, or improved, during the past few years by the FAA, Army, Navy and the State of Alaska.

While Alaska has an area one-fifth that of the continental United States, these airports are quite well spaced and can be visited by the ordinary small plane if good judgment is exercised in checking mileage, weather, and fuel supplies before departure. With few exceptions, these fields all lie south of the Arctic Circle (Barrow, Kotzebue, Fort Yukon, and Bettles being exceptions). There are, however, over 500 cleared landing

strips, constructed by the Alaska Road Commission or by private interests at other points over the country. Many of these receive little or no maintenance and airplane maintenance and servicing facilities are either nonexistent or definitely limited.

Normal fuel dispensers are available at most of the main fields, and no extra precautions are necessary at those points to avoid fuel contamination. At most other locations it is necessary for the pilot to have his own approved filter and funnel in order to assure cleanliness of the fuel. A chamois and funnel can be used in an emergency; however, it is not recommended by FAA. Chamois is frowned upon as a fire hazard because of the possibility of a static discharge exploding the fuel vapors; yet it may remain the only effective means for assuring clean fuel in remote areas. Imitation chamois cannot be used.

Some caution is in order for those not accustomed to using chamois filters. A water-wet or water-damp filter will not keep water from flowing through. A static discharge is more likely to occur from a person wearing nylon or dacron fabrics, or wool. Cotton clothing is the best protection. The greater danger is from a static discharge from the person to the funnel rather than from the funnel to the gas tank or to an uncharged person. "Wringing out" the chamois or "swishing the funnel" to dry the chamois skin may generate a static spark. This should be done well away from the airplane and fuel sources.

Except for the coastal areas and the arctic slopes, weather conditions in Alaska are pretty good. The interior is not as subject to the continuing passage of turbulent surface fronts which plague the VFR westward flyer in the "south 48." The few that do pass by are "corkers."

Since occluded fronts are the rule, the usual weather associated with occluded fronts will be met during their passage; low clouds, light precipitation, poor visibility, and sudden fog formations as precipitation saturates the air. These conditions are usually spread over a wide area.

Thunderstorms are rather frequent in the interior, particularly on the route from Whitehorse to Fairbanks. They occur from May through August. The temperate zone pilot may be startled to find that these

storms frequently move from Northeast to Southwest, and thus he may wind up in front of a storm instead of behind it if he tries to go around it in the usual way.

Most of the routes through the mountains are through relatively low passes. The passes are subject to strong and turbulent local wind conditions. Weather conditions are usually lower in the mountain passes than at reporting stations along the route on either side of the passes. The vacation pilot, or any person not familiar with a particular pass, should avoid going through the pass when his altitude is limited by a ceiling which obscures the mountain tops or sides. There may be unexpected turbulence; there may be strong updrafts which will draw him up into the clouds; there may be strong downdrafts that will force him down into the mountain side; or it might turn out to be a blind pass, narrowing around the bend, with no place to go except up. Contact the nearest Flight Service Station to obtain the latest pilot weather reports for the route you plan to fly. Perhaps someone just came from that direction and reported the existing weather to the FSS.

Because of the prevalence of "false passes" which "deadend" but which may look better than the actual pass through the mountains, vacation pilots should always allow for better than normal weather conditions so they can fly higher and with better than "legal minimum" visibility. False passes are sometimes so long before they deadend that pilots may run short of gas before they can retrace their courses.

A number of single-frequency simplex stations, remotely controlled, transmitting and receiving on 122.1 MHz., are planned for installation in remote passes and areas where VHF communication coverage at low altitude is presently not available. The *Alaska Airman's Guide and Chart Supplement* will list these stations as they are commissioned.

In winter when the ground is snow covered, it is difficult to distinguish between ground and sky. This is called a "whiteout" condition and has caused many bad accidents when pilots are not prepared

to fly IFR. This condition can be particularly bad with an overcast sky. During such conditions, VFR flights across mountain ranges should be planned for times when ceilings and visibilities are such that aircraft can be kept well clear of the terrain at all times. This is particularly true of those passes where the mountains are treeless and rounded instead of jagged.

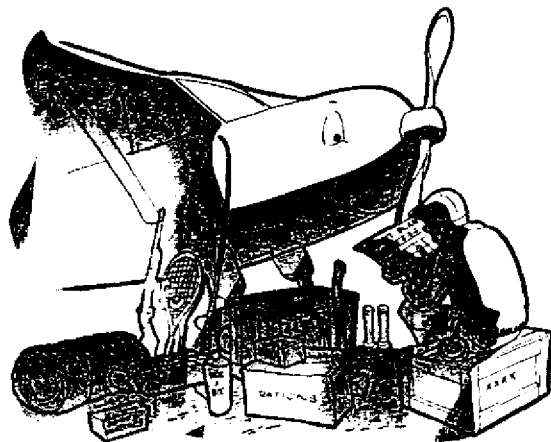
The winter tourist must gear his plan to the short winter days, ending about 2:30 p.m. in midwinter on the Fairbanks route. Flying East to West isn't so bad, but the rapidly converging longitude lines cause a great time loss, with the result that darkness sets in much earlier when flying from West to East. The time loss for a 400-mile trip would be approximately one hour. In the central United States a one-hour time loss would cover approximately 800 miles, or the distance from St. Louis to Philadelphia.

The long summer days make flight planning easy for daylight arrivals particularly during May, June, and July.

The coastal route from Seattle to Ketchikan and Juneau should not be flown VFR or in single-engine airplanes. Much rain and fog are prevalent. Rainfall as heavy as 140 to 160 inches a year is not infrequent along the Gulf of Alaska. Fog banks are an everyday affair along this coast. Landing facilities are few and far between, so that the pilot can easily get botrled up between airports with no way out.

In the winter the plane equipped with skis has a considerable advantage over the wheel-equipped plane, in the event of a forced landing away from an airport, because the many frozen lakes and other open areas offer the pilot an opportunity to get down safely, or at least with less possibility of a serious crack-up.

Before starting on a flight away from his home airport there are a few items that the private pilot should *always* carry in addition to those previously listed as required by Alaskan law: good charts of the terrain to be covered; a two-way radio in good operating condition; flashlight, complete with fresh batteries; and a pocket compass. Flashlight batteries should be of the alkaline type since they have a longer



life expectancy, maintain a more constant voltage throughout their life span, and are more resistant to freezing.

It is advisable to carry these regardless of the season. In winter, the following additional equipment should be carried: engine and airplane covers; fire pot with fuel; oil can and funnel; and snowshoes, preferably a pair for each person aboard.

In summer, the following additional equipment should be aboard: gloves for each person; bottles of insect repellent; fishing rod and tackle, complete; and a pair of rubber hip boots (recommended but not absolutely essential).

THINGS TO DO:

1. Always file a flight plan before you start.
2. Stay on the regularly traversed routes or airways.
3. Report your progress along the way in accordance with established procedure.
4. Be sure you close the flight plan on arrival at destination, or report any interruption or change in original plan. That is where your two-way radio comes in, especially if you land at a point where there are no radio facilities.
5. Be sure you have your emergency supplies aboard. Think twice before you "pooh-pooh" emergency supplies. They were developed by the "bush" pilots who have flown this country for years and they know what is needed and the true value of them in case they are forced down.
6. In the event you are forced down for any reason, it is normally advisable to **STAY WITH YOUR AIRPLANE**. Search and rescue parties can locate a plane much easier than they can a man. If searching planes, or for that matter, **ANY PLANE** is seen overhead, use your smoke bomb or rocket signal to attract attention. If possible to do so, direct them to a landing area, if there is one close at hand. Partake of your reserve or emergency rations sparingly and in accordance with instructions contained in the package. This is particularly important if you have not been located or if there is going to be some delay in reaching you due to the remoteness of the section, or for any other reason. Try to replenish your food supply by game or fish, if you are near a source of supply, and the chances are you will be. But in so doing, **KNOW WHERE YOUR PLANE IS AT ALL TIMES**. This is where your pocket compass will come in handy. **BE RESOURCEFUL**.

THINGS NOT TO DO:

1. Do not allow yourself to become confused regarding the large easterly magnetic variations in Alaska. (The radio ranges on your flight charts show the *magnetic* courses for the range legs.) Correct only for crosswinds or local magnetic attractions, usually only a few degrees if any. If your compass reads 270° , do not get the idea that you are headed directly West, for you are not. Your true heading will be approximately 30° greater, in most of Alaska, than your magnetic heading, or your compass heading if your compass has no locally induced errors.

When you plot true courses on your chart not associated with radio range legs, do not forget to subtract the 25° to 30° easterly variation to establish your magnetic heading. If an "East Coaster" adds the correction by mistake, he will have a total error of about 60° . This definitely will not get him where he wants to go.

2. In case of a forced landing do not wander away from the airplane. If you are absolutely sure you know where you are and know the location of a nearby shelter, it may be advisable to go to it. However, first try your radio and attempt to contact the nearest communications station if you did not succeed in doing this before the landing. Remember that high-frequency radio (not VHF) transmissions are usually best at night.

Then before you leave your airplane, if you have decided that is the thing to do, and you are sure of yourself and your position, plot your course over the ground, check your pocket compass, time of travel, etc., before starting out. For, after all, you might be wrong in your calculations. Whether right or wrong, you may very well want to return to your airplane. If your trail is well made, marked, and calculated, you should find the airplane in the same place you left it. *But think twice before leaving the airplane.* In about 80 percent of the cases where the pilot leaves the airplane, the rescuers find the

airplane before they find the pilot. There is every advantage in remaining with the airplane from a survival point of view, and especially from a rescue point of view.

3. No matter how inviting the "grassy plains" appear to the pilot from the air, the chances are that the surface is tundra or muskeg. A landing on this surface with wheels will usually cause the airplane to go over on its back. At any rate, it can't be taken off again until the next snow season and the installation of skis. So, unless forced to do so, do not land on the inviting brushless level lands. The only practical way out is by helicopter, which may be either expensive, or not available. If you are fortunate, there may be a lake or river within a few miles (which may take several days to reach, walking conditions being such as they are), from which rescue by seaplane may be possible.

Terrain flying in Alaska means, for the most part, "drainage flying." Very few routes cross mountain ranges. They go through the mountains by way of passes. Most routes follow river or creek drainage patterns. Therefore, chart studies of the route to be followed should include recognition of the direction of flow of streams or rivers so that flight comparisons may be made and cross checked. Many rivers twist and turn through flatlands with so little gradient that it is difficult to tell which way the water is running. Most of the floating trees which snag on bars will have the roots pointed upstream. River routes, except during periods of high water, also offer the best forced landing possibilities on gravel bars which are frequently available. It so happens, by virtue of physical geography, choice, development of settlements, and occasional wisdom that most airports are located on, or within sight of, rivers, or large streams.

In the interior, all creeks, streams, or drainages by any other name, flow into rivers which go near an airport within a reasonable distance. It follows that the best way to find an airport if you are lost is to head downstream and down river. The airport you find may not be anywhere near your destination, but you will be on an airport and not on the muskeg out of gas and perhaps upside down. Check your WAC charts (or Sectional Charts once they are published) and notice, for example, that Northway, Tanacross,

Big Delta, Fairbanks, Nenana, and Tanana are all on the Tanana River or very close to it. Even if you should be 20 or 30 miles off course flying from Northway to Fairbanks, flying "down-drainage" will bring you back to the river and on to an airport.

If you should happen to wind up 50 miles north of this route somehow or other, and follow the drainage, you wouldn't get anywhere near Fairbanks, because you would then be on the north slope, with drainage into the Yukon River instead of the Tanana. However, you would find airports at Chicken, Eagle, Circle, Fort Yukon, Beaver, Stevens Village, Rampart and again, Tanana, where the Tanana River joins the Yukon.

It is hardly possible to follow a drainage cut, down to visible water flow, without running into an airport within a hundred miles on the drainage route, following downhill cuts, then streams, then the river. In most cases there will be an airport in less distance than that.

Look at your WAC charts (or Sectional Charts when published) and see how many airports you can find which are not on rivers or drainage systems. The study will be meaningful and helpful to the concept of "drainage flying."

Even in clear weather in Alaska, radio transmission and reception is often erratic due, in many instances, to the Aurora Borealis or electrical discharges in the upper air, often referred to as "Northern Lights." Therefore, the importance of keeping the ground advised of your whereabouts cannot be overstressed, even though it may be necessary to make an extra landing to do so. Bear in mind that Alaska is a large territory to cover; in case a search is necessary, and if you have given the FAA radio network the proper information with respect to your location, it may mean the difference between life and death.

Finally, we dip into the history of flight training in wartime for some good advice for new pilots who become lost. In the Civilian Pilot Training Program cross-country course, the knowledge of experienced pilots on how to "find yourself when you're lost" was boiled down and taught to fledglings. It's still

good, bearing in mind also the advantages of "drainage flying" to the usual techniques of terrain flying and navigation by "pilotage."

Even the best pilots become lost, occasionally, usually when the visibility is restricted such as in heavy rain, smoke, dust storms, and the like. Therefore, every good pilot guards against this contingency by selecting easily identifiable "brackets" as a means of reorienting himself. A bracket should always be a line, such as a river, power line, range of hills, or the like; never a point such as a lake or city. Instead of attempting to find his position by "flying around" or zigzagging, the pilot who has set up his major bracket flies a straight course to what he believes is the nearest one, reorients himself, and sets up a new course to his destination or an alternate.

Ideal bracketing bounds both sides of the course and the destination. If identifiable boundaries are not available on all sides, one or two will serve. For example: If there is a large river parallel to your course, but some miles to the left, and no other feature which you are sure you can identify, if lost, fly to the river and follow it until you pick up a recognizable point.

List only the brackets you feel sure you *cannot miss* in the proper space of the flight plan; one bracket you are sure of is better than three which may be missed. Your proposed flight is now plotted and the plan has been prepared with the exception of the allowances for wind, weather, and elapsed time. Data applying to these items cannot be prepared in advance, since the prevailing conditions at the time of flight will determine your ground speed and the heading necessary to make good your course.

This vast expanse of land will attract more and more pilots flying their own planes. If you are one of the pilots planning to fly to, or in, the land of the Aurora Borealis, we beg you to read the words of wisdom given here by those who know. Fly by them; learn by them; and, thus, *live* by them.

FLYING IN MEXICO

Pilots should be cautioned that the physical aspects of some of the terrain in Mexico may be entirely different from those encountered in any portion of the United States. The lowlands, while level, have not been cultivated and are covered in most instances with brush, cacti, swamps, gullies, or rocks. There are many places where only a crash landing could be effected in the event of an emergency; and in many instances were such a crash landing successful, the occupants of the aircraft would be days getting to communities or transportation. It would have to be accomplished by foot, or by ox team or horseback, if either of the latter two could be obtained.

Some "highways" cutting through such areas are suitable for light aircraft emergency landings, but pilots should be cautioned that remote roads shown on maps as joining small communities usually prove to be foot trails or nonexistent.

In some areas along the eastern coast of Mexico, the beach offers safety in the event of forced landings. However, from Matamoros to approximately 25 miles north of Tampico, beach landings can be very hazardous because of boulders, driftwood, and rocky stretches along the beaches. These areas should be used only in emergencies.

The mountains are extremely steep and reach to very high altitudes. They have the characteristic violent mountain air currents, small mountain squalls, and frontal danger phenomena in passes inherent in terrain of this nature. Many of the highland plateaus are arid and uncultivated and develop violent convectional disturbances. This is particularly true in late afternoon and their danger is increased by the extreme altitude.

Landing fields in highland areas are at high altitudes (Mexico City International Airport is 7,340 feet above sea level). Normal approach airspeed should be maintained during landing but the pilot should be warned that his groundspeed will be faster on the approach and at touchdown than it would be at the

same airspeed at a lower altitude with comparable temperature and wind speed. This, of course, will increase the length of the landing roll. He should be further warned not to become panicky and attempt to pull the airplane off the runway too soon during takeoff from such fields.

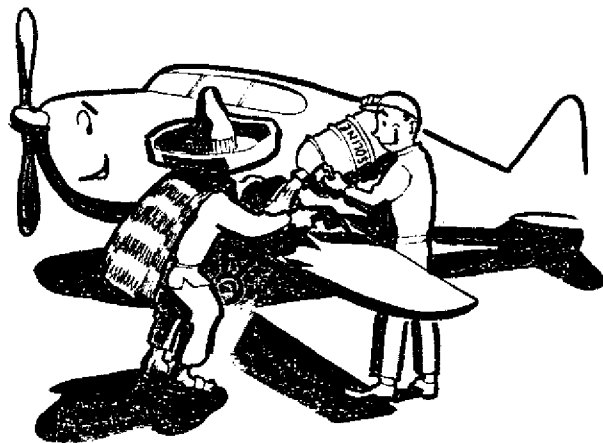
Large birds, most particularly buzzards, are a real source of constant danger in practically all portions of Mexico just as they are in some sections of the United States and should be just as scrupulously avoided in flight. Instances have been reported of such birds diving at aircraft, apparently believing the craft to be another bird.

From early fall until the spring rains, visibility may be greatly reduced by smoke in some areas because of farmers burning off their fields.

Haziness, particularly in mountainous areas, often distorts distances. Pilots will approach what appears to be the most distant range visible, only to find immediately behind it a much higher series of peaks which they had not expected. Flight in the immediate vicinity of such ranges and on the downwind side has sometimes ended disastrously for light aircraft as they failed to clear and could not turn back. Careful planning and the selection of well-traveled routes with established airports or emergency fields is advised. Along these the pilot will not encounter many of the described dangers.

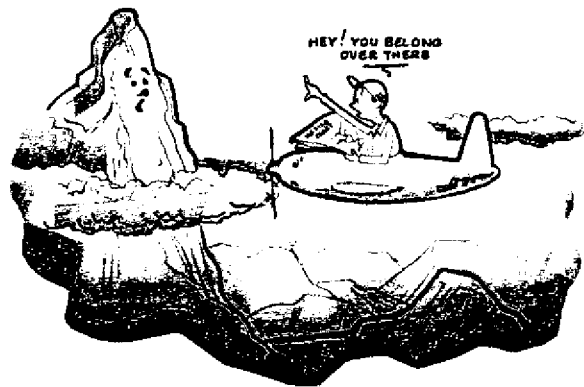
Virtually no mechanical repairs are obtainable, except at the largest of airports. Supply materials are often not available even at these; the method of repair in some instances is not that of the customary standards of the FAA licensed A & P Mechanics (although in others it is). It is not advisable for pilots to rely on repair stations in the Republic of Mexico for maintenance or periodic checks since such services are practically unobtainable on short notice.

The "availability of gasoline" situation in Mexico has improved greatly during the past few years however, some intermediate fields still do not have gas available. At company fields owned by airlines, gas will not be sold unless the purchaser has a company letter. Pilots of light aircraft should take a funnel



and approved filter since the handling of fuel at many airports is such that it is often contaminated with water or dirt. Although not recommended by FAA, a chamois can be used in an emergency (caution in the use of a chamois will be found in the chapter on Alaska). One experienced pilot says that in the absence of an approved filter or chamois, a felt hat can be used as a substitute in an emergency. Tie-down ropes and equipment are very important. A small shovel and a few empty sacks may be the means of saving an aircraft under many circumstances.

Published charts have been found incorrect as to elevations (some peaks have been determined to be as much as 2,000 feet higher than indicated). Many good position checks, such as small communities, an



occasional railroad, or other visible objects will either appear on the map and prove nonexistent or stand out from the terrain and never be indicated on the map. Mountains have been found inaccurately placed by as much as 30 miles on the maps, and completely disregarded in some instances. Very few communities or cities have any visible identification marking readable from the air.

All travelers (except tourists) are required to have passports, including those in transit to another country.

U.S. citizens, traveling as tourists, may obtain tourist cards in lieu of visas (good for 6 months) from the nearest Mexican Consulate or Mexican Tourism Office. Proof of U.S. citizenship is required, and birth certificate or similar documentary proof will suffice. Persons who wish to enter Mexico to conduct business on behalf of a U.S. company must obtain visas.

A smallpox vaccination is required and a typhus vaccination is recommended by the U.S. Public Health Service.

All persons bringing privately owned aircraft into Mexico must obtain a general declaration document at the airport of entry.

Any aircraft departing from the United States carrying passengers or cargo for hire, or which will take on board or discharge passengers anywhere outside the United States is required to obtain clearance from Customs at the customs port of entry at or nearest the last place of takeoff from the United States.

When departing from the United States for Mexico, if not carrying passengers or cargo for hire, a private aircraft on purely a business or pleasure flight does not require a U.S. Customs clearance of any type; however, modified military-type, privately owned aircraft may be subject to certain restrictions under the regulation of the Office of Munitions Control of the Department of State even on business or pleasure flights. Flights may depart from any airport in the United States unless customs clearance is required by the Office of Munitions Control regulations for military-type aircraft, in which case clearance must be obtained at a customs-staffed airport. Departing from an airport served by an FAA Flight Service Station will facilitate the filing of a flight plan. Notice of arrival may be included in the flight plan if the airport of first intended landing in Mexico is one of the airports of entry.

The first landing in Mexico must be made at one of the Mexican airports of entry. If landing at any other airport, prior written authorization is required from the Director General of Civil Aviation, Ministry of Communications and Transport, Mexico City. Prior notification of arrival is required. An arrival notice included in the flight plan is acceptable if the first landing is to be made at one of the following Airports of Entry. However, if the flying time from the airport of departure to one of the airports listed is less than one hour, the pilot should notify Mexican officials direct.

These are the Mexican Airports of Entry: Acapulco, Guerrero; Guadalajara, Jalisco; Hermosillo,

Sonora; Juárez, Chihuahua; La Paz, Baha California; Matamoros, Tamaulipas; Mazatlán, Sinaloa; Mérida, Yucatan; Mexicali, Baha California; Mexico City, D. F.; Monterrey, Nuevo Leon; Nogales, Sonora; Nuevo Laredo, Tamaulipas; Piedras Negras, Coahuila; Reynosa, Tamaulipas; Tapachula, Chiapas; Tijuana, Baha California, and Veracruz, Vera Cruz.

Air navigation services in Mexico are not free. A pilot may obtain a RAMSA card, good for 1 year, for \$24.00 (P300) at a Mexican aerodrome of entry. This card entitles the pilot to unrestricted use of RAMSA's air navigation system. A pilot who does not desire to purchase a RAMSA card must pay for each individual service as he uses it. At the time of this writing, the following schedule of fees is charged by RAMSA by type of service for aircraft weighing less than 15,000 pounds.

RADIO AERONAUTICAL MEXICANA, S.A. de C.V. (RAMSA)

Fees for private pilots not registered with RAMSA

Type of Service

Air Traffic Control (by station, per landing).....	P26. 25 (\$2. 10)
Navaid Stations, Localizers, Markers (by station, per flight).....	P26. 25 (\$2. 10)
Weather Reports (by station, per flight)...	P5. 25 (\$0. 42)
Route Forecasts (per flight).....	P52. 50 (\$4. 20)

Type of Service

Terminal Forecasts (by terminal, per flight).....	P15. 75 (\$1. 26)
Communications (air-to-ground, by station)	P21. 75 (\$1. 74)
Point-to-point transmission (weather reports, route and terminal forecasts, for each 10 words or fraction thereof).....	P2. 50 (\$0. 20)

When returning to the United States from Mexico, the point of departure must be one of the Mexican Airports of Entry. A Flight Plan must be filed since Mexican law requires flight plans for all flights in Mexico. Advance notice of arrival at the U.S. airport of first intended landing may be included in the flight plan.

The airport of first intended landing in the United States may be either an international airport (airport of entry) or a landing rights airport. In case of landing at an international airport, permission to land is not required from U.S. Customs, although advance notice of arrival must be given. For landing at a landing rights airport, both an application for permission to land and advance notice of arrival are required and should be submitted in advance to the U.S. Customs officer in charge of that airport. Advance notice of arrival is required for flights landing at either an international airport or a landing rights airport. At a landing rights airport where the flight notification service is rendered, a request to transmit arrival notice to U.S. Customs may be included in the flight plan, and such notice will be treated as application for permission to land. At international airports or landing rights airports where flight notification service is not available, U.S. Customs officials must be notified direct. Additionally, if the flying time from the airport of departure to either an international airport or landing rights airport is less than 1 hour, the pilot should notify the U.S. Customs officer direct.

These are the U.S. international airports (airports of entry) in the general area: Douglas, Ariz.; Nogales, Ariz.; Tucson, Ariz.; Yuma, Ariz.; Calexico, Calif.; San Diego, Calif.; Brownsville, Tex.; Del Rio, Tex.; Eagle Pass, Tex.; El Paso, Tex.; Laredo, Tex.; McAllen, Tex.

These are the U.S. landing rights airports in the general area: Columbus, N. Mex.; Corpus Christi, Tex.; Dallas (Love Field), Tex.; Houston, Tex.; and San Antonio, Tex.

Check the latest information in the *International Flight Information Manual* for changes in departure and arrival requirements and airports of entry.

Pilots are urged to be very cautious concerning acrobatics or infraction of minimum altitudes over communities in Mexico, since both are punishable by confiscation of the aircraft.

While in Mexico, pilots of the United States are not authorized (except by special written permission) to fly aircraft of Mexican registry. Breaking of this rule will result in a heavy fine.

For their own protection, pilots and occupants of aircraft are advised to have a series of protective inoculations prior to travel in tropical countries.

Smallpox, typhoid, cholera, diphtheria, undulant fever, tetanus, yellow fever, and amoebic dysentery are common diseases. If travel to the more remote sections is contemplated, some understanding of the causes and preventive measures relative to these diseases is essential. Small cuts should be treated promptly to prevent infection. Drink carbonated bottled drinks in isolated communities if in doubt about the purity of the local water supply.

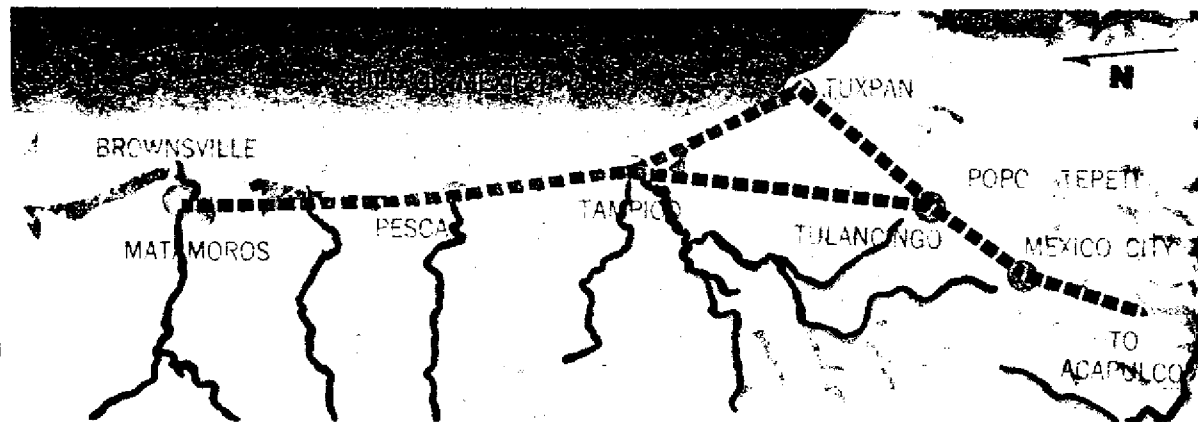
Try to arrive at a Mexican airport when officials are on duty clearing international air-carrier planes. At other times, these officials may not be available, or it may be necessary to make special arrangements at added cost.

Overtime charges are made after 12 noon for immigration inspection, and a fee is charged for customs inspection, based on a full day's wages for each inspector involved for each 3-hour period or fraction thereof after 2 p.m. Charges also may be made for a customs guard to watch the plane, and for taxi fare to bring the inspectors to the field after 12 noon. In United States money, total fees may run as high as \$15 to \$20 or higher depending on whether inspection occurs on a weekday, Sunday, or holiday.

United States requirements for flying U.S. registered aircraft abroad may be found in Federal Aviation Regulations, Parts 61 and 91—more specifically in sections 61.3 and 91.1. Note that section 91.1 identifies additional sections of Part 91 with which compliance is required.

Since most of the flights into Mexico are to Mexico City, attention is given to describing the best routes and terrain to be flown over when planning this trip south of the border. With the exception of the trip from Mexico City to Acapulco, no information is included on flying south of Mexico City or into the Yucatan Peninsula since these flights are not often made by tourist pilots. During the rainy season it is advisable to arrive in Mexico City no later than noon because of the mountain-type weather in the afternoon.

BROWNSVILLE, TEXAS, TO MEXICO CITY VIA TAMPICO: Departure will be from the Matamoros Airport which is just across the Rio Grande River from Brownsville. The Matamoros Airport is



surfaced and the one long runway is suitable for all light aircraft and many of the larger ones weighing over 12,500 lbs. About 25 miles south of Matamoros you will encounter the Laguna Madre which is separated from the Gulf of Mexico by the coastal bar. The coastal bar is straight and narrow and makes contact flying to Tampico easy since it does not depart significantly from the straight course to Tampico.

At Pesca, a little more than half way down to Tampico, there is an emergency strip. In addition, an occasional fishing camp or small settlement along the coast will have a strip that can be used in an emergency. Roughly 100 miles due west of you is the Pan American Highway.

This leg of the flight is over the coastal plain which is wide, low, and generally flat, broken occasionally by low sandhills. It is covered with brush and low growth and becomes saturated easily during the rainy season or after thunderstorms. The coast itself is fringed by numerous marshlands, lagoons, sand dunes, fairly narrow beaches, long sandbars, and small islands. Near Tampico, the country becomes more hilly with hills rising to 4,000 feet about 30 miles west of the coast.

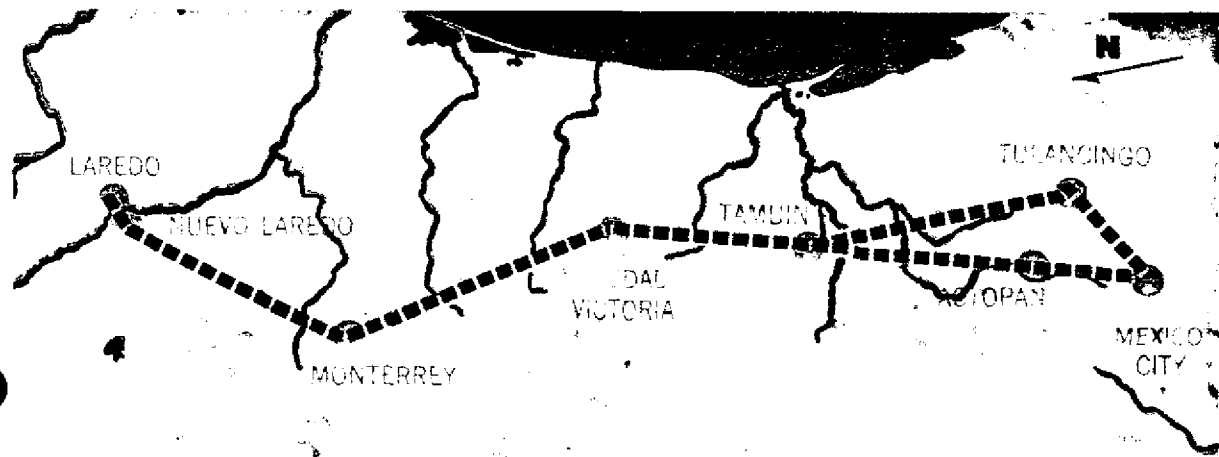
There are two ways to go to Mexico City from Tampico: Direct to Tulancingo, then to Mexico City; or down the coast to Tuxpan, then to Tulancingo and into Mexico City. If you go directly to Tulancingo, then to Mexico City, the course takes you inland over the coastal plain which soon rises into the high plateaus of Central Mexico. After takeoff at Tampico it will be necessary to start climbing to at least 12,000 feet. Before reaching Tulancingo, you could possibly go at a slightly lower altitude but you would not be as safe. From Tulancingo it is only a short flight into Mexico City.

If you elect to go by Tuxpan, you will continue down the coast over the same type of terrain as seen between Brownsville and Tampico until reaching Tuxpan. From there it is a rather steep climb to Tulancingo, 12,000 feet again, before being high enough to get into the Mexico City Valley.

Mexico City is situated in a very large depression on the central plateau and is surrounded by mountains reaching to 15,000 feet. The mountains are lower to the north near Tulancingo. Southeast of the

Mexico City International Airport is Popocatepetl which is 17,883 feet high. It is always snow covered and makes a good landmark. The elevation of Mexico City International Airport is 7,340 feet.

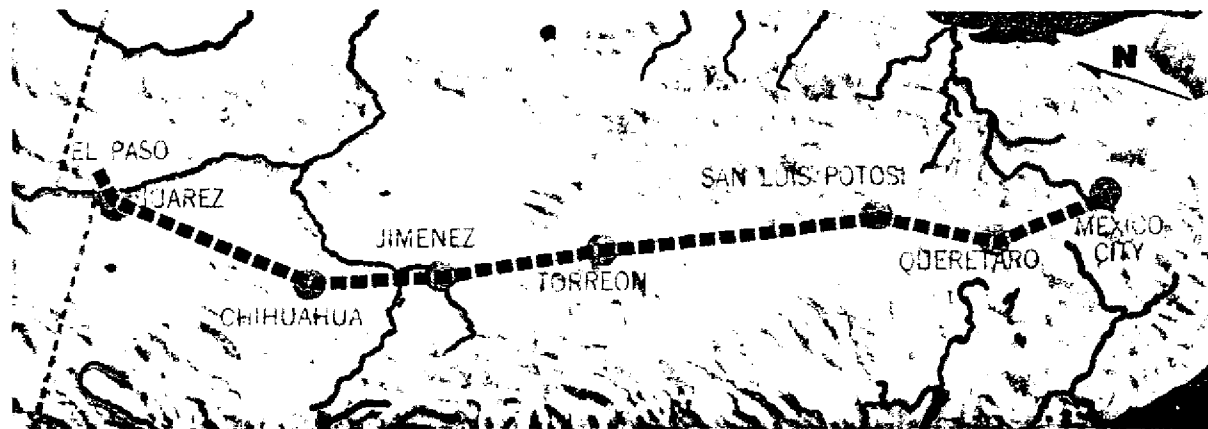
LAREDO, TEXAS, TO MEXICO CITY: To the south of Laredo the gently rolling coastal plain gradually rises and merges into the foothills of the mountains of Central Mexico. The plain is characterized by steeply-cut stream beds, small mesas, boulders, and scrub brush. At Monterrey, the Sierra Madre Escarpment dominates the horizon to the south and west. Follow along the ridge in a southerly direction to Ciudad Victoria. From Victoria the flight is over the coastal plains to Tamuin, located just west of Tampico.



From Tamiin, to get into Mexico City, one can go slightly south by east to Tulancingo, or slightly south by west across Actopan into Mexico City. An altitude of 12,000 feet is needed again by way of Tulancingo; by way of Actopan, 13,000 feet is better.

It is good to remember that the Pan American Highway closely follows this route as does the National Railroad. Both are good landmarks.

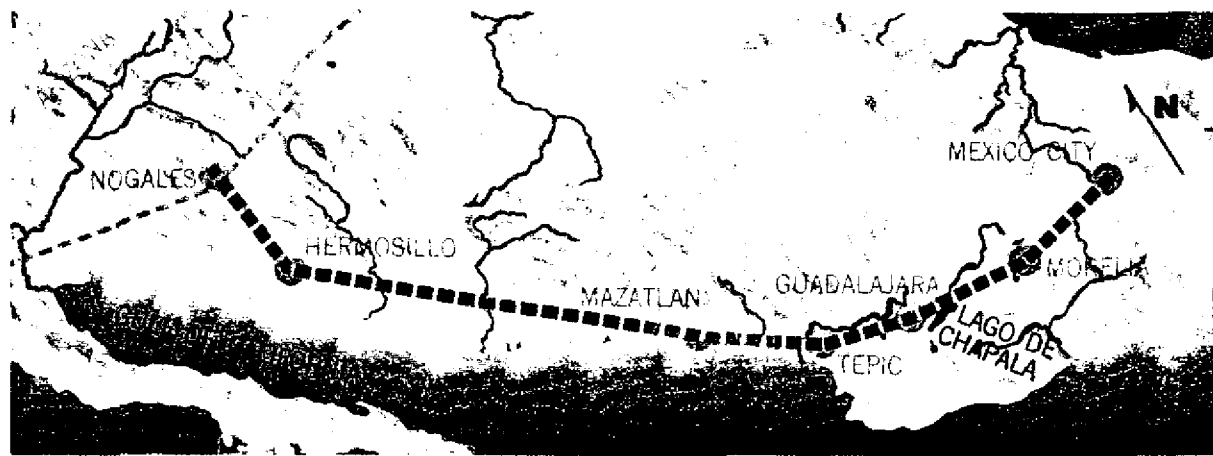
EL PASO, TEXAS, TO MEXICO CITY: From El Paso the flight to Mexico City is over the central plateau area of Mexico which, along your flight route, will average roughly 5,000 feet above sea level.



Ciudad Juárez, across the Rio Grande from El Paso, is the northern terminal of the Mexican National Railroad as well as a prominent highway. Follow the highway and railroad into Chihuahua. From Chihuahua the airway heads southeasterly and closely follows a prominent highway and railroad into Jiménez. Still paralleling your course is the same railroad and also a power line, both of which lead you into Torreón. From Torreón to San Luis Potosí you cross a plateau which averages about 7,000 feet MSL. This will be a flight by the compass across many small villages connected by secondary roads and trails with few prominent landmarks. Remember that to the east of you will be the railroad running down from the north into San Luis Potosí. From San Luis Potosí your flight is down the Airway to Querétaro. The railroad from San Luis Potosí to Querétaro bends away to the west along this route but not too far away to pick up if needed. The altitudes here get higher rapidly. You will need at least 8,000 or 9,000 feet to be safe. From Querétaro you go directly across the mountains into Mexico City, and again you are going to need 12,000 feet of altitude.

Of all the routes into Mexico City, this one from El Paso will probably require the greatest skill and alertness. The entire route is over higher terrain and all landings and takeoffs will require greater attention because of higher elevations (discussed under Rocky Mountain Flying). Better check on the performance of your plane before loading yourself too heavily for takeoff.

NOGALES, ARIZONA, TO MEXICO CITY: This is a very beautiful flight. There is a highway and a railroad south into Hermosillo. This same highway and railroad closely follow the airway and coast-line down to Mazatlán and into Tepic. From Tepic the route heads inland to Guadalajara still closely paralleling a main highway and railroad. From Guadalajara your flight will be by Lago De Chapala, a very large lake, south and east of that city. Past the lake it is a short flight, over terrain averaging between 7,000 and 9,000 feet above sea level, into Morelia. From Morelia the same type of terrain, but higher, dominates your route into Mexico City. Here you should be safe at 10,000 or 11,000 feet.



The flight down from Nogales is along the narrow coastal plain lying east of the Gulf of California. Flying conditions are good, navigation is easy, and this flight should present no difficulty to the alert pilot.

MEXICO CITY TO ACAPULCO: This is a short flight south of Mexico City closely following a very prominent, well traveled highway. The terrain begins to drop off after leaving Mexico City and should present no difficulties. The Municipal Airport is at sea level.

Weather in Mexico is variable. You can expect low ceilings, rain, and fog along the east coast in about the same manner that you will find along the coast of Texas. Low ceilings will exist in the Tulancingo-

Tuxpan-Tampico area when a north or northeast wind predominates in this area. An easterly wind usually brings low ceilings to the Veracruz area. On the West coast, along the Gulf of California, the weather picture is usually good. The high central plateau is arid, but you can expect many mountain and convectional thunderstorms in season in the late afternoon. These storms can become very violent. By noon the visibility in the Mexico City area is often restricted to three or four miles due to haze, dust, and smoke.

Weather information is available for a nominal fee at all local and international airline offices and at most airports that have radio facilities. Check the *International Flight Information Manual* (available through the Superintendent of Documents, U.S. Government Printing Office, Washington, D.C. 20402) to find if an airport has a radio facility. Take advantage of all weather information in planning your flight.

Most of the larger airports and all the points mentioned in this chapter have some radio navigational facilities, usually low-frequency aids. These can be picked up with your ADF. In addition, there is a VOR station at Mexico City and one at Pachuca. Plans are being made for others along the more traveled routes.

The larger airports in Mexico are usually surfaced, well maintained, and have attractive administration buildings. Gas facilities are satisfactory. However, it is a good idea to drain at least a quart from your sediment bowl after each filling.

There are several good repair and service facilities at the Mexico City International Airport, where you will find a factory authorized service station for your plane.

Here are some tips offered by experienced pilots to make your flights into Mexico safer and more pleasant.

1. Try to finish your cross-country flight by 2:00 p.m. Do most of your flying in the morning.
2. Avoid instrument flying. Avoid night flying.
3. Remember the high elevations. Land and take off with caution. Do not overload.
4. Cooperate with the Mexican officials. They require flight plans; file them! Remember you are a guest in their country. They are most cooperative when you ask for assistance.

5. See the *Airman's Information Manual* and *International Flight Information Manual* concerning exit and entry requirements for the United States, and airport facilities.
6. To save overtime payment to both United States and Mexican officials, plan to enter or leave during the week. Avoid weekends or holidays.
7. Obtain *World Aeronautical Charts* for Mexico from the U.S. Coast & Geodetic Survey, Environmental Science Services Administration, U.S. Department of Commerce, Washington, D.C. 20235. Information on Mexican Airports and radio frequencies may be obtained by writing to the Secretary of Communications, Department of Civil Aeronautics, Mexico City, D.F., Mexico.
8. Have your plane in good mechanical condition before entering Mexico. A 100-hour inspection is advisable before your departure.
9. Remember, you will have to clear Mexican Customs and Immigrations upon entering Mexico and before departure. Their requirements are frequently changed, so double check the latest procedures.