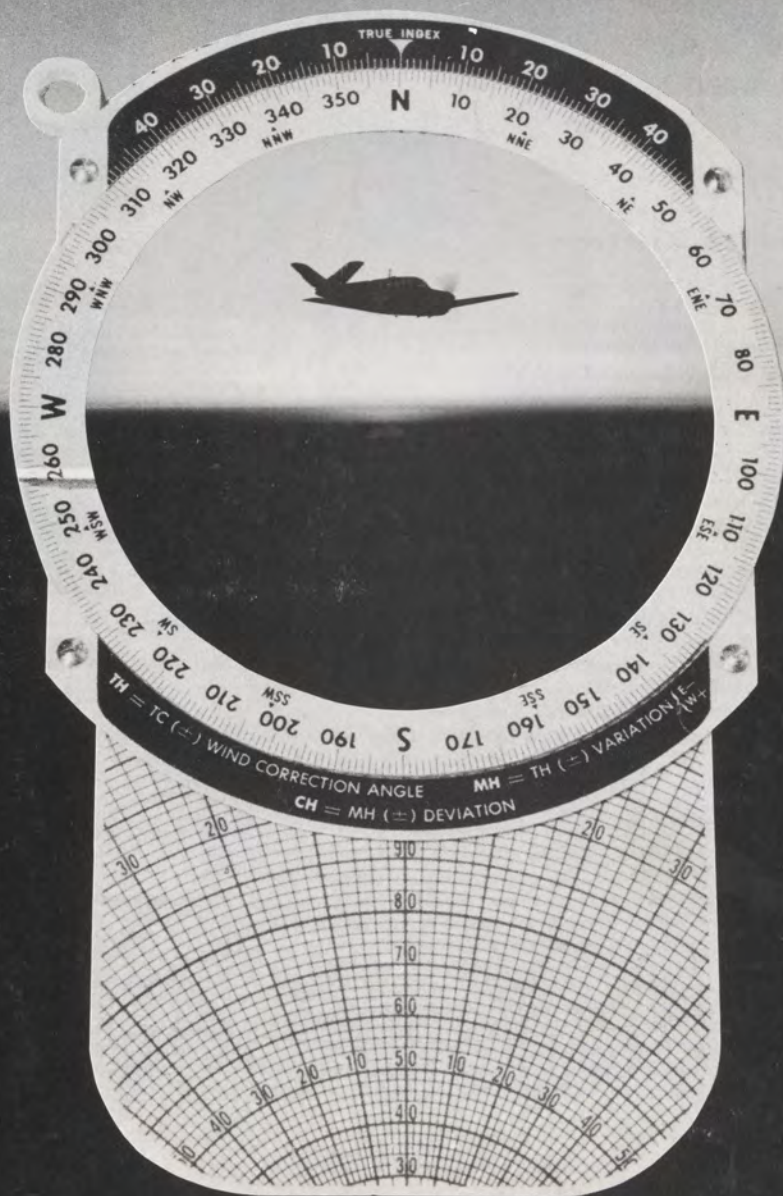


FAA GENERAL AVIATION NEWS

MARCH 1977

A FLIGHT STANDARDS SAFETY PUBLICATION FOR AIRMEN

Reckoning the Wind





FAA GENERAL AVIATION NEWS

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Voice box, circa 1917 p. 12

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Winds Aloft Can Spell Trouble Below



Failing to reckon with the wind component can lead to unexpected fuel exhaustion

The blustery winds of spring are one of nature's signs that warmer weather is approaching; but they are also a potential source of danger to the unwary pilot who neglects their effect on his aircraft's range.

If the winds aloft enroute are following winds, there is obviously no problem. Your ground speed during flight is faster than your indicated airspeed, which only means that you arrive at your destination sooner than expected, and you save some fuel in the bargain. But if there are strong contrary winds, your ground speed is lower than your airspeed, and if you pay insufficient attention to your progress over the earth you may suddenly find your fuel supply exhausted—and no airport in sight.

What causes the traditionally strong winds of March?

Basically the same elements which cause wind at any time of the year: changes in temperature and atmospheric pressure. The earth's atmosphere tends to maintain an equal pressure over the entire earth, in much the same manner that the ocean tends to maintain a constant level. Whenever that equilibrium is disturbed, air begins to flow from areas of higher pressure to areas of lower pressure. The chief factor which upsets the normal equilibrium of atmospheric pressure is uneven heating of the earth, such as frequently occurs in early spring, a period of transition.

While much of the land is springing into bloom, warming the air, other large areas are still in the grip of frost or snow. The

resulting contrasts in air temperature accelerate the horizontal flow of air.

The term, "winds aloft," may sound a bit peculiar, since all winds exist at some height above the surface of the earth. But for purposes of air navigation the Weather Service issues forecasts and observations of winds aloft for nine different altitudes, in the range between 3,000 feet and 39,000 feet. Information about winds aloft is normally provided to pilots by flight service stations when a full weather briefing is requested, but there are occasions when for reasons of exigency or apparent appropriateness (the pilot may be planning at this point to fly below 3,000 feet) this data is not given. The responsibility for obtaining it is clearly the pilot's; he should never assume that turbulent winds will not be a factor in his flight. An assumption of this kind, compounded by subsequent inlight problems, led to a sadly premature ending of a flight from Virginia to South Carolina on the western slope of the Appalachians.

The flight took place in a Cessna 172 Skyhawk and originated at Charlottesville,

Va., in March of last year. The pilot-in-command was Arvin Springer, a 43 year old construction firm executive. He held a single-engine land private pilot certificate, with 1,850 hours logged. He was required to wear corrective lenses while flying.

The passenger was William A. Willets, 56, of Charlottesville, an accountant who worked for Springer. He was not a rated pilot.

The aircraft was owned by the Jefferson Flying Club of Charlottesville. The last annual inspection was performed on January 11, 1976. During the accident investigation the aircraft was found to be free of any mechanical defects which might have caused in-flight malfunction. The fuel tanks were dry, except for a small quantity estimated to comprise the non-usable residue.

According to the statement of Mr. Springer, the pilot, he had agreed on Thursday afternoon to fly down to Greenville, S.C., in order to go over a business contract on Friday. He was to participate in a golf tourney on Saturday, and fly back to Charlottesville on Sunday. He invited his accountant, Mr. Willets, to accompany him in order to work out final contractual details.

Mr. Springer, the pilot, stated that he had flown to Greenville several times previously without incident, and had even flown non-stop once to Atlanta. His business contact in Greenville had informed him that "... the sun is shining brightly down here." After ascertaining that the club Skyhawk was available, he telephoned the Weather Service and asked for the current en route and ter-

minimal weather. Clear skies with visibilities of 20 miles or better were reported, with little change expected during the night except for occasional patches of ground fog along the mountain slopes and vicinity. It was ascertained that the pilot did not request, nor did he receive, a complete weather briefing. Information not sought or given included the winds and temperature aloft forecast.

The pilot and his passenger arrived at the airport at Charlottesville at approximately 4:45 p.m. and signed the aircraft out for the flight. The air distance direct to Greenville was approximately 300 statute miles. The pilot recalled that his initial cruise altitude was 6,500 feet, that he leaned the mixture according to recommendations of the Owner's Manual and maintained rpm of 2,600 with an indicated airspeed of about 130 mph. He figured his true airspeed was "about 135 mph." The performance chart for this aircraft shows an endurance of 4.7 hours at 75 percent of power when flown at 5,000 feet, properly leaned, with an indicated airspeed of 128 mph. The pilot did not file a flight plan, but informed his host at Greenville that he expected to be "on the ground by seven-thirty or eight (p.m.)." He told investigators

later that he did not make out a flight log because he "knew the country well."

The aircraft departed Charlottesville-Abermarle Airport at 5:13 p.m.

At 7:15 p.m. the pilot contacted Roanoke FSS, and gave his position as "over the VOR at 4,500." He said he was headed south to Greenville, S.C., and asked for an update on the weather at Greenville, which was essentially unchanged.

At this point the aircraft had flown 85 miles in one hour and 17 minutes, for an average ground speed of just over 68 mph. Mr. Springer, the pilot, said later that he did not recall checking the time or calculating the ground speed, when he called the Roanoke VOR. He said he was "not particularly aware" of headwinds on that first leg of his trip.

The National Weather Service winds aloft forecast—which the pilot did not have—had been issued at 1:00 p.m., valid until 10:00 p.m. Forecast winds for the station at Raleigh-Durham, N.C., were:

Altitude, 6,000 feet. Direction, 230.

Speed, 58. Temperature, 14.

Forecast winds at Columbia, S.C.:

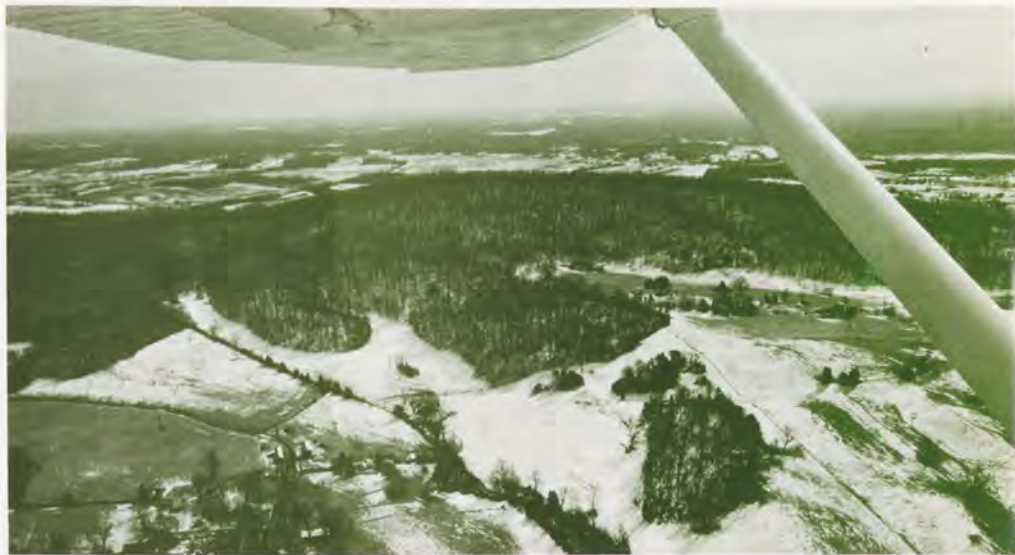
Altitude, 6,000 feet. Direction, 220.

Speed, 56. Temperature, 13.

The pilot informed the FSS that he was continuing his flight south to Greenville,

via the Pulaski, Va., and Hickory, S.C., VORs. (It was now pitch dark.) The pilot later remembered passing over the Pulaski VOR, 40 miles south of Roanoke "... about a quarter to eight." He said that he and his accountant, the passenger, had been talking shop and he had not paid much attention to his watch. He flew "by the needle," although the night was clear and he could identify landmarks below.

Proceeding toward the Hickory VOR, the pilot became aware of strong opposing winds that required a sharp crab angle to his right in order for him to stay on the 20° radial inbound to Hickory. At the same time he was encountering increasing obscuration of the ground. He descended to 4,500 feet, where the visibility was better, but he could not descend further because he was not certain of his position, although he felt sure he had passed over the Blue Ridge Mountains into North Carolina. When he thought he was approaching Hickory he attempted to contact the control tower, but did not succeed. In his statement later he reported that his radio reception was "weak," and that he had trouble staying on the needle." He also stated that the light level in the cockpit was low, and that he had difficulty reading the numbers on the radio dial.



Knowing where you are is important on any flight even when you are navigating on the VOR. Problems caused by deteriorating weather or diminishing fuel are exaggerated by uncertainty about landmarks below.



At 9:03 p.m. the pilot radioed for assistance on the emergency frequency, 121.5. He advised the Air Route Traffic Control Center, who responded, that he had been aloft for almost four hours and he "... should have been at Hickory a long time ago." He was not sure of his position. He thought he had 30 minutes of fuel remaining.

The Center requested the pilot to make two 90 degree turns, and to change his transponder code.

"... Cessna 57 Papa, radar contact, 33 miles north and east of Hickory VOR. What

are your intentions?"

"We'd like to get down on the ground, sir. What's the weather like at Hickory?"

"Can we get in VFR?"

"57 Papa, standby."

The Center checked the weather and informed the pilot that Hickory Municipal was marginally VFR, with fog and increasing obscuration.

"Cessna 57 Papa, are you instrument qualified?"

"That's affirmative."

"And you would like vectors to Hickory Municipal?"

Radiosondes, carried aloft by gas balloons, send back data on temperature, wind speed and direction, etc., at various altitudes; are launched from 85 U. S. stations two to four times daily. Dish-shaped antenna tracks device, which parachutes back to earth.

"Affirmative again."

The pilot was given and maintained a heading for Hickory Municipal Airport. At 9:16 he asked the Center again for his position, and was told he was 21 miles northwest of the airport. The pilot said that he was flying in and out of an overcast, and concerned about the weather ahead and his remaining fuel. At this time he stated that he was "instrument qualified but not current."

The Center acknowledged his transmission and asked him to standby. The pilot was then informed that Hillsboro Airport, 10 miles west of his present position, was reporting 4,500 scattered, with five miles visibility. Would he prefer to divert to Hillsboro?"

"That's affirmative, sir. That sounds good."

The Center gave the pilot his heading to Hillsboro and advised him not to descend below 4,000 feet until he had the runway in sight. The pilot was given the runway heading and asked to advise when he could see the runway lights.

At 9:32 p.m. the pilot was informed that he was two miles south of the airport, and that the runway lights had been turned on.

"Ah, this is 57 Papa, we can see the field now. Sure appreciate the help, sir. Goodnight."

The pilot told investigators that he was making a low, straight-in approach to the runway when his engine sputtered and stopped. They had been aloft four hours and 20 minutes.

The pilot made a shallow left turn in order to put the plane down in a narrow field he saw next to a woods. After rolling for about fifty feet on the ground, the plane struck a pile of stones and flipped over. There was no fire, but the passenger, Willets, was killed on impact, the pilot was severely injured. The aircraft was demolished.

Accidents of this type should be a serious reminder to the pilot that winds aloft are a factor to be reckoned with. The winds/temperature aloft forecasts are given every 12 hours for specific locations across the country, as prepared by the National Meteorological Center.

The wind direction is given in increments of tens of degrees from true north. The velocity is given in knots—one knot equals 1.15 statute miles per hour. The temperature is given in centigrade.

Given this information, the pilot can readily compute his estimated ground speed and compass heading with the use of a flight

computer, the small, hand-operated slide/revolving disk device with which most airmen are familiar. By setting up regular checkpoints and keeping a flight log, the pilot can check on the accuracy of his calculations. If he arrives late over his checkpoints, he knows that at least one of several things has happened:

1. He has miscalculated something.
2. A significant change in the weather conditions has taken place, affecting the speed and direction of winds aloft.
3. The performance of his aircraft is mechanically below par.
4. He has failed to hold his compass heading.

The first of these possibilities—simple miscalculation—can easily happen to a pilot who is in the habit of depending on his OMNI needle for cross country flying, VFR or IFR, and seldom uses a flight computer. Figures do not lie, but human computers get rusty from disuse. It helps to work out practice problems occasionally, such as those given, with answers, in the *Pilot's Handbook of Aeronautical Knowledge* (FAA Advisory Circular 61-23A, available for \$5.30 from the Superintendent of Documents, U.S. Government Printing Office, Washington, D.C. 20402). It also helps to keep the basic elements in mind—i.e., which quarter the wind will be blowing from, according to the winds aloft forecast, and the velocity. If the forecast calls for a following wind and by the time you reach your first checkpoint your ground speed is considerably less than your airspeed, you know right away something is wrong. Common errors include forgetting to convert from knots to statute miles, or indicated airspeed to true airspeed.

The forecast itself is always subject to abrupt change. Forecasts are made on the basis of a whole complexity of meteorological conditions, plus observations made with balloons and theodolites, and are reasonably accurate in the main for the location where they are made; but unforeseen factors can always bring about a shift in wind direction or velocity. When appropriate, AIRMETS or SIGMETS are issued to update weather changes that include winds aloft, so monitoring these broadcasts on the VOR receiver helps keep you in touch with current conditions.

In working out flight computations many experienced pilots like to shave 10 to 15 mph off the airspeed listed in the handbook or owner's manual for a given flight condition. They know that their airplane undoubtedly was capable of that performance when it came from the factory and was test flown by an extremely competent test pilot, but all that is many flight hours ago, and airplanes tend to lose some power as they age and come into the possession of non-professional pilots, or possibly suffer from inadequate maintenance. They also know that no two airplanes of the same make and



model will true out at exactly the same airspeed, even if the pilots are equally skillful. They determine through their own experience with the airplane what it will do, and they give themselves a little cushion, when flight planning, just in case their airplane's performance falls below the norm.

The fourth possibility—failing to hold a compass heading—is much more common than imagined. If the pilot is flying on a VOR radial, he is likely to visualize his course as virtually straight as an arrow; this is seldom true in fact. Even if he is able to keep the OMNI needle centered most of the time, his actual track will zig and zag more than he likes to believe. The OMNI signal itself is not 100% accurate (a 2.5 degree error is considered tolerable), and there are certain atmospheric or terrain conditions which decrease accuracy if you are not following a Federal Airway at the prescribed altitudes. Another factor is the length of time since you last checked the accuracy of your receiver. (A six degree error is considered tolerable for an inflight check.) Under normal circumstances these tolerances involve no hazard to navigation, but a maximum error could compound a fuel problem brought about by poor piloting. Turbulence can make it virtually impossible for a light plane to avoid wandering five or ten degrees off the intended heading frequently. Sometimes a pilot may question the heading required by the OMNI signal, especially if he has not worked out

his flight computation carefully, or if he is not conversant with the area he is flying over. He may mis-identify towns or other landmarks, or choose to follow a river or highway even though it does not provide him with the most direct course. He may also, without realizing it, be feeling fatigued or unwell and simply not attend to his flight duties as well as usual.

Any of these possibilities can increase the actual mileage flown, and may eventually lead to the same serious condition: *fuel exhaustion*. The pilot who finds himself as much as a quarter hour late over a checkpoint en route is in need of a thorough re-assessment of his flight plan. If he lands at the nearest convenient airport and checks out his calculations, the current weather, the airplane, his own physical state, fuel consumed thus far, the currency of his charts and other information, he can make an intelligent decision about whether to proceed or not, and how far. If he tries to make that decision in the air, while busy carrying out his pilot duties and without having access to all the available facts, he may fall into the trap called "Guess and Go."

That, as the unfortunate accident related above bears out, is how you head straight into trouble.

(NOTE: The accident narrated above is based on a report of the National Transportation Safety Board. Some of the details have been altered in the interest of anonymity.)

PUMPIN' THE SUMPS

TRUE OR FALSE?

Q. If you drain the main fuel strainer it is not necessary to drain the wing tank sump drains.

Q. If you drain all the wing tank sumps it is not necessary to drain the main fuel strainer.

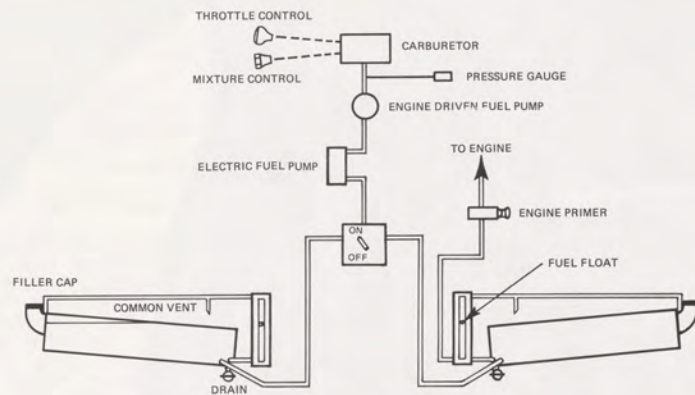
Q. If you drain a glass full of fuel from each tank you can be sure there is no water in your fuel.

Q. Positioning the fuel selector to "both" (on airplanes so equipped) while you drain the main fuel strainer assures that the entire system is adequately drained.

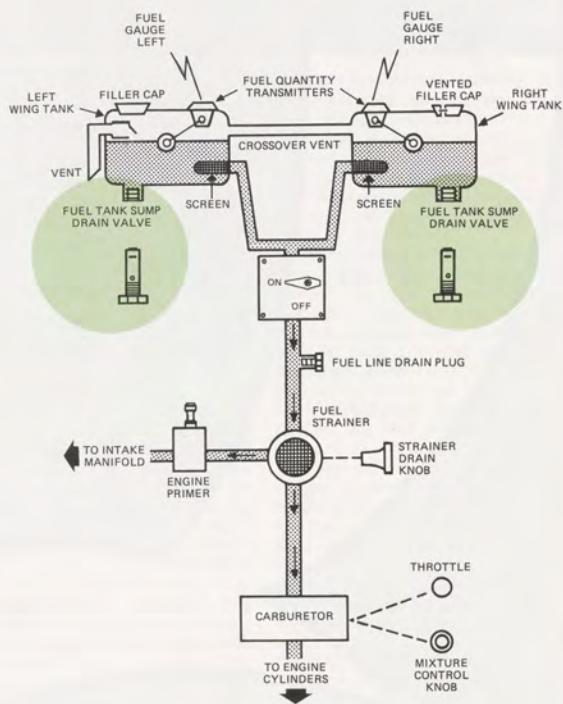
Q. If you drain the sumps immediately after refueling you can be sure there is no water in the tank.

If you answered "TRUE" to all the above questions you were exactly 100 percent wrong—but not alone. It is not the airman's

GRUMMAN AMERICAN, AA-5



CESSNA 150



Fuel systems of two different airplanes. One has quick drains at the wing tanks only, the other has a quick drain for the central strainer only.

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favorite subject. There are few chores demanded of the pilot that are as dull, repetitive, uninteresting and unappealing as checking for water or other contaminants in the fuel. At the same time, there are few quicker ways of terminating a flight, or an airplane, or a pilot, prematurely than failing to drain the sumps effectively.

Effectively is the key word. It is not necessarily the quantity you drain, nor the number of sumps, that assures complete elimination of water. You could, under some circumstances, draw off a quart of fuel from the lowest sump without getting all of the water out of the system. In a documented field test, three gallons of water were added to the half-full fuel tank of a high-wing tailwheel airplane. After several minutes the fuel strainer (gascolator) was checked for water. It was necessary to drain ten liquid ounces of fuel before any water appeared.

In another test, on a tricycle geared model, after one gallon of water was added to the half-full tank it was necessary to drain more than a quart before any water was evident. In both of these tests, about nine ounces of water remained in the fuel tanks after the belly drain and the fuel strainer had ceased to show any trace of water. This residual water could only be removed by draining the tank sumps.

The question of fuel draining to check for contamination is a confusing one to some pilots because of the variety of drainage systems devised by the various manufacturers. Every fuel container has a sump, (low point) where water and sediment will accumulate, and every sump has a drain of some kind, but it may not necessarily be a "finger drain" or "quick drain" and the sump may or may not require individual draining during the preflight.

All fuel systems have a central low point through which all fuel will flow, and a drain valve is provided at this point. For many relatively simple small aircraft the manufacturer recommends that before the first flight of each day and after each refueling, the fuel strainer be drained for a given number of seconds. On other models, recommendations call for draining through a valve in the fuel selector. A central system drain is located in the engine compartment in some aircraft; in others, it is below the fuselage, or inside the cockpit. Some manufacturers recommend draining all of the fuel lines individually through the central strainer and draining each of the wing sumps (including auxiliary tanks sumps).

What it all comes down to is that the method by which you habitually inspect the fuel for contamination during the preflight check cannot be carried over from one aircraft to another. *Fuel system designs differ significantly.* The only safe practice is to follow the recommendations given by the manufacturer for each particular make and model. There are pilots



Your chances of getting all the water out of the tank will be better if you rock the wings gently before draining the sumps.

whose experience is such that they have never had occasion, over many years of flying, to handle a wing tank sump drain. Even if they never fly any other kind of airplane, it is a good idea to know that such sumps exist and that circumstances may arise that would make it advisable to drain them.

An aircraft which has stood idle over the winter, for example, is bound to collect moisture inside the tanks, and possibly other contamination which could plug up the lines in flight. Draining the tank sumps is one good means of assuring that you start out the season with clean fuel. Incidentally, not all aircraft have quick opening drains; some merely have a sump plug that is screwed into place with a wrench and safetied with wire. These plugs can be replaced by a mechanic with a more convenient approved quick draining device. Checking the security of these plugs during the preflight examinations is a good safety measure; the plugs are removed during regular inspections, and it is possible, if unlikely, to forget to secure them.

The possibility of leakage also exists for quick drains, especially where the mechanism is released from within the cockpit, and no one observes the flow of fuel. If the valve does not automatically reset itself properly, you could take off and find yourself with a fuel consumption rate beyond belief—and a very short flight.

There are other important reasons why the pilot *should not simply spill the fuel, sight unseen or otherwise, on the surface.* Grass is killed by gasoline; asphalt is deteriorated by it, and ignition of the vapor is always a potential hazard. Furthermore, the only sure means of knowing when you have drained enough fuel is to examine it, in a clean (preferably clear) container, so that you can check on the color, or lack

of it (water or jet fuel). The presence of water in jet fuel, incidentally, usually cannot be determined without introducing a coloring agent that will stain the water but not the fuel. Such dyes are available from fixed base operators.

Small amounts of water do no harm to jet engines but may cause problems by freezing and blocking up the flow of fuel. Most turbine powered aircraft employ a fuel heater that prevents freezing anywhere in the system. Those aircraft without fuel heaters should be serviced with approved anti-freeze additives in the fuel. Contamination from micro-organisms growing in water in the fuel tanks is another threat to jet aircraft; approved fuel additives are also available to stop the bugs.

What to do with the drained fuel you have collected is sometimes a problem. (DO NOT PUT IT BACK INTO THE AIRPLANE HOWEVER PURE IT APPEARS.) Concerned airport managers will see that safe and suitable disposal containers are available.

The answer to the frequent question, "Is it better to drain the sumps *before* or *after* refueling?" leads to several other questions. Do you suspect moisture in your tanks, or in the fuel supply? How long is it to your next takeoff? etc. In any case, allow a little time to pass after refueling before you go to the drains, because it takes some time for the water in the fuel to settle down after it has been agitated by pouring. A quarter of an hour should suffice for most small planes, just time to relax at the coffee counter or get your flight planning done.

But don't forget to (wo)man the sumps!

An advisory circular on this subject, "Aircraft Fuel Control," (FAA AC 20-43C) is available free from the DOT/FAA Distribution Unit, TAD-443.1, Washington, D.C. 20591.

Respecting Military Airspace

Identifying military use areas on charts is an important part of flight planning

The aircraft had departed Wilmington, Del., on an early Spring day when the upper Delaware Bay was still frozen solid and the shoreline piled with fantastic shapes of ice debris. The pilot, thoroughly experienced, had a professional photographer on board who wanted to take pictures of the unusual ice forms and occasional stranded vessels. They were flying south along the coastline at an altitude of about 1,000 feet, fascinated by the sights below, when abruptly their windshield was filled with a sight that was as unwelcome as it was unexpected: a CSA, flaps down and landing gear extended. The giant military troop carrier passed within a hundred feet of them—close enough to see the expressions on the faces of the crew.

It was not a picture that appeared on the photographer's film—he was virtually paralyzed with fright—but the image remained in the minds of both occupants of the light plane for many weeks to come. The pilot realized almost at once what had happened: in his preoccupation with the shoreline, he had unwittingly (and quite illegally) penetrated the traffic area of Dover Air Force Base and flown across the approach path; one of the runways. He had also come within a few seconds of obliteration.

There are, on an average, six or seven reported near-midair collisions between general aviation and military aircraft every month in the United States (no one knows

how many go unreported). The first part of this article ("Green Demons and Grey Phantoms," February 1977) dealt with low altitude military training routes, which are not shown on civilian aeronautical charts, and suggested that pilots familiarize themselves with such military operations as may be taking place in the airspace where they fly. However, a surprising number of near misses occur in—or near—areas that are clearly shown on VFR and IFR aeronautical charts.

In fact, of the 311 near-midair collisions reported between general aviation and military aircraft during the four-year period, 1973-1976, about half took place in the vicinity of a military airport.

In most cases it appears that the small plane pilot either was unaware of the military operations being conducted in that segment of the airspace, or felt it was not a serious factor for him to be concerned with.

In addition to military airport traffic areas and the low altitude training routes described last month, general aviation pilots should make themselves familiar with the special meaning of "Military Operations Areas" (MOA's) and "Restricted Areas," which are shown on civilian charts.

Many general aviation pilots are familiar to some degree with the location of military operations areas, since they are marked on VFR and IFR civilian aviation charts. How-

ever, the term "MOA" may not itself be familiar, since it has come into use only during the past couple of years. MOA's are specific areas, delineated on sectionals by magenta slash lines, where considerable military flying, including intensive student jet training takes place. IFR traffic is provided appropriate separation from such activities; VFR aircraft can fly in a MOA, without special permission, but the pilot is advised to exercise caution when military operations are being conducted. (This information is available from any FSS within 200 miles of the area.) MOA's are also shown on VFR terminal and low altitude en route charts. MOA's now cover airspace formally designated as "Alert" or "Caution" areas.

Delineated by blue slash marks on sectionals, "Restricted Areas" denote airspace within which various activities may be carried out that are potentially dangerous to aircraft. This includes bombing ranges, guided missiles, weapons firing, flight testing, etc. The altitudes and times of usage vary considerably, and must be determined individually. Military airports are sometimes, but not always, located within Restricted Areas—caution must always be exercised in the vicinity of such airports. Permission to penetrate a Restricted Area must be obtained from the controlling authority as indicated on the chart.



Regulations for penetrating military airport traffic areas are the same as for civilian airports, but special care in watching out for highspeed aircraft is advised. Eastern Georgia has considerable military activity, as evident from the sectional chart. Can you find ten military airfields on the chart area shown?

Pilots should not regard the charted boundary line of a Restricted Area, MOA or control zone of a military airport as a precise line of protection beyond which they will never meet a military aircraft. Some of the near-miss reports filed with FAA describe incidents where small aircraft encountered military jets several miles outside of the zone. One such incident involved a flight instructor and a beginning student pilot in a Cessna 150.

After shooting a few touch and go landings at Oceanside, Calif., they left the pattern briefly for some air work, then headed back for additional landing practice. Oceanside has a single, 3,000 foot hard-surface runway (6/24) with traffic always to the north of the airport (right pattern for runway 24). Camp Pendleton's (Marine Corp) runway is about eight miles to the north.

The flight path of the Cessna paralleled runway 24, south of Oceanside Airport, then turned right on a crosswind leg to enter downwind. The instructor later recalled that their altitude was about 600 feet, they were in a bank of about 25 degrees, heading approximately 300, with the student handling the controls, when they both saw the military jet at about the same time. It appeared first as a small silhouette in the lower left corner of the windshield but grew larger at an alarmingly rapid rate that left no doubt: They were on a collision course! It was like something out of a horror movie.

"I've got it!" shouted the instructor, shoving the yoke forward to put the aircraft into a dive, still banking right. The jet in a tight climbing turn, passed just over the Cessna.

Unhurt but shaken the instructor leveled at 800 feet and turned downwind. From

this point he could observe the jet trail still hanging in the air in an unbroken arc that extended from over Oceanside Airport and back toward Camp Pendleton, according to the account he filed with his "near-miss" report.

The military aircraft and pilot were never identified or located, although other pilots also reported the flight over the Oceanside

Airport. Only one F4 was flying from Camp Pendleton that day, a photo reconnaissance flight, and that pilot insisted he had never strayed outside the Restricted Area. Whether he did or not matters little: the point is, when looking out for other traffic, especially military jets, never take anything for granted—including boundary lines in the sky.

AREAS THAT REQUIRE SPECIAL CAUTION BY GENERAL AVIATION PILOTS

Restricted Areas:

Flight is prohibited between specified altitudes and times, except by permission (generally obtainable by radio) of the using agency and/or controlling agency. (See FAR 73.13.) Activities include artillery firing, aerial gunnery and guided missiles. Shown on sectionals and other charts (blue slash-marks).

Warning Areas:

Similar to Restricted Areas except that they are over international waters (beyond the three-mile limit).

Military Operations Areas (MOA's):

Civilian VFR aircraft can transit MOA's on their own responsibility but should use caution. MOA's (individually code-named) are shown on sectionals and other charts (magenta slash-lines). FSSs nearby will know schedules of military operations, which include intensive student jet training.

All Weather Low Altitude Training Routes (Olive Branch):

High-speed, low-altitude IFR and VFR navigation/bombing training is conducted on Olive Branch routes,

which do not appear on civilian charts but are diagrammed in detail in AIM Part 4. Nearby FSSs have data on routes and times of activity, but precise scheduling is impossible, so routes should be avoided when "hot".

VFR Low Altitude Training Routes:

High-speed (near mach), low-altitude (below 1,500 feet AGL) VFR navigation and tactical training. Shown only on military FLIP ("Green Demon") charts. Nearby FSSs will know of routes and activity but notification time of individual flights may be short (10-30 minutes). Safest course is to cross these routes well above 1,500 feet AGL or go around.

Prohibited Areas:

Unlike above areas and routes, which generally involve military flight operations. Prohibited Areas (also shown by blue slash-marks) are established for the security of a specific place of importance, (such as the Capitol/White House area of Washington, D.C.) Flight is prohibited except by advance authorization by the using agency (FAR 73.63).

First Voice

"Six seven Tango, say your position."

A ground-to-air transmission of this nature is made thousands of times each day from air traffic control facilities across the nation. Pilots rightly regard these voice contacts as an invaluable and necessary part of aviation. Without it the orderly flow of air traffic would be diminished radically—as would the assistance available to pilots in difficulty. The development of air-ground voice radio came rather early in the history of aviation, thanks to the work of a singularly gifted individual who might be called the "Father of Avionics."

George Owen Squier was born in Dryden, Mich., in 1865, to a traditionally military family whose forbears had fought in the Revolutionary War. As expected, he went to West Point, graduated near the top of his class, and was assigned to artillery. At the outbreak of the Spanish-American War (in 1898) he transferred to the Signal Corps because of what was to become a lifelong preoccupation with communications. His genius in this field was so exceptional that if he had chosen to work on his own, he clearly would have stood on a par with such contemporaries as Edison, Bell, and Marconi. His work on electromagnetic waves eventually affected such diverse fields as ballistics, internal medicine, telephony, telegraphy, radio, television, and numerous others. As a military officer he was unable to benefit monetarily from his many patents, but he did utilize the vast resources of government in wartime to bring about the early solution of airborne communications which otherwise might have languished unsolved for decades.

Squier's research on multiplex telegraphy, which led to the sending of numerous messages simultaneously over the same wire, brought him a rapid rise to chief of staff of the Signal Corps in 1907, and the rank of major. Since aviation, then of course in its infancy, came under the command of the Signal Corps, Squier was directed to advise the Wright brothers in the design of the first U.S. military airplane. To gain the necessary background, he became (in 1908) the first military passenger ever taken



Brig. General George Owen Squier.

aloft by the Wrights. Aeronautics was not his field and he never took up flying; but the problem of communicating between the pilot and the ground fascinated him at once.

In 1912 Squier went to London to attend an international conference on electricity, and stayed on in that city for four years as a military attache, researching and ex-



Early aviation communications—even between crew members—was difficult because of engine and airframe noise. "Wired" helmet was a necessity.

in the Sky

perimenting, and later observing the progress of World War I. From his knowledge of electromagnetic waves he was able to show Allied ground troops how to tap in on enemy radio and telegraph communications by simply driving a nail into a tree and attaching an Audion (amplifier). As a Signal Corps officer he paid special attention to the increasingly important role of air combat. Pilots on both sides were already using battery powered spark transmitters to send dot-dash messages by keying the transmitter, but this was an agonizingly slow process. Squier was convinced that airborne voice radio was plausible and would be of enormous benefits to the Allies.

His opportunity to embark on a crash program to achieve this capability opened up in 1917 when the U.S. Army, which was beginning to gear up for entry into World War I, brought him home as a Brigadier General in charge of the entire Signal Corps, and Congress appropriated the largest single sum of money in American history to that date—\$640 million—for aviation. Over the

next two years, while overseeing the production of some 40,000 military aircraft, Squier found time to carry out his pet project.

Gathering together in Washington some of the best radio engineering talent in the country, under the leadership of Major C. A. Culver, he outlined the major obstacles which he saw had to be overcome:

1. **Noise suppression.** A radio was needed that would be responsive to voice but not to propeller, engine, machinegun or wind noise—and not require tuning adjustments during maneuvers.

2. **Voltage regulation.** Slipstream driven generators were being used, with rapidly varying rpm speeds requiring a special type of regulator.

3. **Omni directional transmission and reception.** Fighter pilots were too busy to rotate antennas.

4. **Weight reduction.** Contemporary radios capable of long distance operation were bulky and heavy, usurping too much of the available payload of the aircraft.

Inspired and imaginative research led Squier's team to the solution of these and other problems. Virtually all of the existing radio components were redesigned, piece by piece, to be lighter, smaller, more compact. Batteries were replaced with effective slipstream generators. Receiver headsets were built into helmets. Problem by problem was attacked and solved. The key problem of all was in the vacuum tube, the virtual heart of early radios which provided amplification, modulation, changed alternating current into direct current and performed a host of other essential functions. Still in the infancy of their development, radio tubes lacked standardization—no two were alike—and if subjected to any vibration whatever produced a deluge of microphonics (interference). But Squier's team included the most knowledgeable men in the world on this subject—largely recruited from Western Electric, General Electric and De Forest Radio. By 1918 they were mass-producing standard tubes for aircraft.

On May 17, 1918, Major Culver led a "voice commanded" flight of *Jennys* through an entire spectrum of air combat maneuvers over Lake Charles, La. Following this successful demonstration, General Squier ordered 5,000 of these relatively lightweight radio sets installed in fighter aircraft and sent to the front in Europe. They arrived on the eve of Armistice Day.

As military interest in airborne communications diminished after the war, civilian flying had to wait out another decade of slow progress before it could enjoy the fruits of General Squier's project.

Decorated by all the Allied Forces and honored by scientific societies all over the world, George Squier died in Washington, D.C., on March 24, 1934. He never married, reserving all the passions of his mind for his creative genius. (From material prepared by Robert M. Richardson.)

■ **TELL US YOUR AIRPORT PLANS.** Anyone proposing to construct, alter, activate or deactivate a civil or joint-use civil/military airport is required to notify FAA of their plans. The requirement applies to both private use or public use airports. A recently revised FAA advisory circular explains when and how this notification should be made, and notes that failure to comply could result in a civil penalty of up to a \$1,000 fine for each violation. Information and forms for making such notification can be obtained from an FAA Airports District Office or FAA Regional Office. The advisory circular is free. Request AC 70-2A "Airspace Utilization Considerations In the Proposed Construction, Alteration, Activation and Deactivation of Airports."

■ **HOW MUCH TO CHARGE?** Most pilots know about the woes of an undercharged battery. Not so well known is that overcharging too can cause problems through excessive gassing and internal heat. Gas bubbles tend to wash active material from the plates, and moisture and acid escaping from the cells in a fine mist may corrode surrounding metal parts. Overcharging results when the charging system is faulty, or is improperly used. Whenever possible, slow charging is recommended. In any case, batteries are fully charged when the electrolyte temperature is 80 degrees F. (27 C) and the specific gravity is 1.240. Incidentally, when a battery must be charged or replaced, be sure to have the generator, alternator, regulator, etc. checked; if one of these has caused the problem it must obviously be repaired or replaced.

■ **CHECK THAT LOCK.** Pilots are reminded that the preflight checklist should include removal of control locks, if such devices are used on the aircraft as well as a check that all controls move freely. A surprising number of accidents have occurred when pilots attempted to take off with the control locks in place. Many of these locks were of the internally applied type, such as pins installed in the control wheel column. In some cases the locks had been altered eliminating the required visual warning for pilots. Such accidents are preventable if the pilot remembers to perform the customary "controls-free" check list before takeoff.



■ **TSO GUIDE.** The list of aircraft components conforming to Technical Standards Orders (TSO's) under Part 37 of the Federal Aviation Regulations has been updated. The handbook lists those manufacturers (along with the name, type or model designation of the article) who have been authorized to manufacture articles conforming to the individual TSO under which they are listed. FAR Part 37 should be consulted to prevent misunderstandings about an article's use in a particular type design. Request AC 20-36F, "Index of Materials, Parts and Appliances Certified Under the Technical Standard Order System."

Advisory Circulars mentioned in this column, unless otherwise noted, are available free from DOT/FAA Publications Section, TAD-443.1, Washington, D.C. 20590.



PINNED TO THE CEILING BY WEIGHTLESSNESS is an embarrassing position to be in, especially if you are the only person in the aircraft and it is diving toward the ground. Pilot of this aircraft had unbuckled his seatbelt to reach for some equipment in the back of the plane. The next thing he knew he had "floated" up from his seat. He barely managed to regain control of the airplane in time (at 200 to 300 feet above the ground) to avert a crash. Bent metal on the wing testifies to strain. (Photo by FAA Central Region)

General Flight Rules to be Reviewed in August

A four-day public meeting has been scheduled for August 1-4 in Washington, D.C., by FAA to review the general flight rules governing all aircraft in the U.S. The meeting is one of a series of regulatory review conferences being conducted by FAA in a comprehensive program to revise and update the Federal Aviation Regulations in a systematic and timely manner.

A conference on air taxi rules (Part 135) was held in November and another on structural fatigue requirements for transport air-

planes is being held in March.

Discussions at the August meeting will focus on Subpart B of Part 91. This section includes rules covering right-of-way, aerobatic flight, minimum safe altitudes, compliances with air traffic control clearances and instructions, operations at airports with and without control towers, terminal control areas and special-use airspace.

Exact times and location of the August sessions will be announced later. Meetings are open to the public without charge.

New Publications

The Directory of FAA certificated mechanics who hold an inspection authorization has been updated to include all those holding such authorizations as of July 31, 1976. Names in the 125-page book are listed alphabetically within states. There is also a section on foreign countries.

Ask for AC 65-13B, "FAA Inspection Authorization Directory". It is free from DOT/FAA Publications Section, TAD 443.1, Washington, D.C. 20590.

The Flight Test Guide for Instrument Rating—Airplane is now available in a revised form. The pocket-sized booklet concerns information and guidance on operations, procedures and maneuvers that may be required on the instrument flight check.

"Flight Test Guide, Instrument Pilot, Airplane" (AC 61-56A) is for sale by the Superintendent of Documents, U.S. Government Printing Office, Washington, D.C. 20402. Price is 55 cents (but there is a minimum charge of \$1.00 for each mail order from GPO).

Latest Aviation Statistics

Three recently issued FAA publications contain a variety of data on the civil aircraft fleet and air traffic activity.

"FAA Air Traffic Activity Report, Fiscal Year 1976" (ADA-032260, \$8.00) contains activity data and rankings for all FAA-operated towers, flight service stations and air route traffic control centers. It shows that the en route centers handled 24 million instrument movements during 1976, while control towers logged 62 million takeoffs and landings during the same twelve month period.

Current figures on the civil air fleet are contained in the "1975 Census of U.S. Civil Aircraft" (ADA-034823, \$10.75). In addition to totals of registered aircraft the book includes data on aircraft production, aircraft registration by state, geographic region, type and year of manufacture. The book shows that California has the most general aviation aircraft, followed by Texas and Florida.

The "FAA Statistical Handbook of Aviation, Calendar Year 1975" (ADA-033210, \$6.75) offers current and historical information on FAA appropriations and personnel; air traffic operations statistics; data on air carrier operations; airman and aircraft license information and accident data.

The reports may be ordered from the National Technical Information Service, Springfield, Va. 22161. Requests should include the "ADA" order number and a check or money order for the correct amount.

U.S. GENERAL AVIATION ACCIDENTS, FATALITIES, RATES

YEAR	ACCIDENTS			AIRCRAFT-HOURS FLOWN (000)	AIRCRAFT-MILES FLOWN (000)	ACCIDENT RATES		PER MILLION MILES FLOWN	
	TOTAL	FATAL	FATALITIES			TOTAL	FATAL	TOTAL	FATAL
1966	5,712	573	1,149	21,023	3,336,138	27.2	2.73	1.71	0.172
1967	5,115	603	1,229	22,153	3,439,964	27.6	2.72	1.78	0.175
1968	4,968	692	1,399	24,053	3,700,864	20.6	2.86	1.34	0.186
1969	4,767	647	1,413	25,351	3,926,461	18.8	2.55	1.21	0.164
1970	4,712	641	1,310	26,030	3,207,127	18.1	2.46	1.47	0.200
1971	4,648	661	1,355	25,512	3,143,181	18.2	2.59	1.48	0.211
1972	4,256	695	1,421	26,974	3,317,100	15.8	2.57	1.28	0.209
1973	4,255	723	1,412	30,048	3,728,500	14.2	2.40	1.14	0.193
1974	4,425	729	1,438	32,475	4,042,700	13.6	2.24	1.04	0.180
1975	4,237	675	1,345	34,165	4,238,400	12.4	1.97	1.00	0.159
1976	4,567	636	1,188	36,500	4,296,400	12.5	1.74	1.06	0.148
	(Prel.)								

A slight increase in general aviation accidents, both in terms of hours logged and miles flown, was recorded in 1976, according to figures published by the National Transportation Safety Board. However the Board noted a continued decline in fatal accidents and fatalities. The one segment of general aviation which did not improve in this respect was air taxi operations. Air carriers, which flew nearly 2.5 billion miles last year, had a record low accident rate of 0.010 accidents per million miles.

• What Price Salvation?

I recently found myself in a position where for the first time I felt it was necessary to declare an emergency. Although I had taken all pre-flight planning precautions I thought necessary, I failed to compensate for a strong headwind as it relates to ground-speed and fuel consumption. Those factors, coupled with inaccurate forecast and enroute weather advisories, resulted in my flying into ceilings which dropped from 8,500 to 800 feet in thirty minutes, and led me to the edge of dangerous flight conditions. I lost VOR navigation for some undetermined reason, and found myself running very low on fuel, some 20 miles from the nearest airport.

I remembered having read in a recent issue of your magazine that when an emergency appears imminent, declare it. I did, and as a result got help and got down safely. I consider FAA GENERAL AVIATION NEWS a part of my continuing flight instruction and flight education. The subscription cost is indeed a small tuition to pay for admission to a good flight school.

Joe B. Chandler, Jr.
Fayetteville, N.C.

We are glad to have you with us.

• Wrong Appendix

In your recent article, "Returned to Service," reference was made to the Altimeter Test as required by FAR 91.170 and FAR 43, Appendix "B". Please advise your readers that should be FAR 43, Appendix "E", not Appendix "B". Could be a typographical error?

T. M. Whittingham
Norwood, Mass.



It was, Appendix "E" is right. Thank you very much for calling attention to it.

• Acro vs. Aero

Noticed your item on aerobatic flight in the September Forum. Can you tell me if "aerobatic," and "acrobatic" are interchangeable terms? A while back I was called to talk for speaking of "acrobatic maneuvers". My critic informed me that the correct term was "aerobatic," since such maneuvers were not part of a circus. Please comment.

Name withheld
Los Angeles

The FARs speak only of "aerobatic flight" which is defined in FAR 91.71 as "an intentional maneuver involving an abrupt change in an aircraft's attitude, an abnormal attitude or abnormal acceleration, not necessary for flight." As to "acrobatics", these are defined in Webster's College Dictionary as "stunts performed in an airplane or glider."

• Rental Aircraft

Can aircraft be rented by an FBO if they are not 100-hour inspected? I don't mean flying club aircraft, but those that are rented to pilots or solo students for pleasure or solo practice (not dual). Also, can an FAA flight check be taken in such an aircraft?

William N. Wagner
Des Moines, Iowa

The 100-hour inspection is not required for rental aircraft, and the FAA flight check can be taken in such an aircraft. However, if paid instruction is given, or supervised solo work as a part of an overall instruction curriculum is flown, or if passengers are carried for hire, then the aircraft is required to have 100-hour inspections (FAR 91.169).

• Engine Failure Odds

My aircraft engine, which is rated for 2,000 hours TBO now has almost 1,400 hours on it. I am interested in the potential hazards associated with flying in aircraft with well worn engines, although mine does not use excessive oil and still has plenty of power. What are the odds of an inflight engine failure when an engine is nearing its TBO?

Leonard Silvergate
Riverside, Calif.

As a general rule engines do not suddenly fail in flight with no advance warning, and many airplanes go the full TBO, or even beyond, in good health, depending on the way they are flown and maintained. However, as time builds on an engine, more frequent inspections are in order, during which your mechanic will be watching for early signs of powerplant problems, paying special attention to such items as compression tests, plug, screen and filter examinations, etc. according to the manufacturer's recommendations. See "The Engine Doctor," in our June 1976 issue.

• ELTs and Private Jets

In the recent crash of a private Learjet which took four lives including the mother of Frank Sinatra near Palm Springs, Calif. the press indicated that the plane did not carry an ELT on board. Isn't it an FAA requirement for all civil aircraft to be equipped with the ELT, or are private jets excluded from that rule, as are commercial aircraft, on the assumption that they operate strictly in IFR conditions? It is somewhat ironic that a sophisticated aircraft such as Learjet, which carries thousands of dollars worth of fancy navigational equipment, should not include an ELT—a less than \$200 item! If nothing else, hundreds of manpower hours and serious personal danger to the rescue teams on San Geronimo Mountain could have been spared if an ELT was operative in that ill-fated aircraft.

Karol Fishler, Ph.D.
Los Angeles

The requirement for ELTs is contained in a 1970 Federal Law (P.L. 91-596 Section 31) that was enacted by Congress. This law specifically exempted jet powered aircraft and air carriers. These aircraft normally operate on instrument flight plans under air traffic control surveillance. Congressional action is necessary to change a Federal Law.

FAA GENERAL AVIATION NEWS comments from our readers. No anonymous comments will be used, but names will be withheld on request. Address: FAA GENERAL AVIATION NEWS, AFS-807, Washington, D.C. 20531.

• UNICOM Rules

A local airport is mainly used by a flight school. The airport has a UNICOM but 122.8 is crowded by many other airports in the vicinity. The flight school uses the frequency 123.3 (assigned to flight schools). Non-flight school aircraft at this airport have also taken to using 123.3, so that all aircraft are communicating on the same frequency. However the procedure is of dubious legality. What do the rules say?

Jack Wilson
Rochester, N.Y.

Radio frequency assignments are the responsibility of the Federal Communications Commission (FCC), not FAA. FCC Rules and Regulations, Part 87, Aviation Services, specifies that "The frequency 123.3 MHz is available exclusively for assignment to ground and aircraft instructional stations." There is, however, currently a proposal that additional UNICOM frequencies be assigned, which should reduce the frequency congestion found in some areas. For further information you can contact Federal Communications Commission, Washington, D.C. 20554.

INSTRUMENT CORNER

• Appropriately Rated

Your publication is very informative and helpful. Would you clarify the following for me?

For simulated instrument flight FAR 91.21(b)(1) requires an "appropriately rated" safety pilot. Please explain the term "appropriately". Does it mean any pilot with an airplane rating, or does he have to be qualified in the particular airplane used? Must he be instrument rated? Can a student pilot act as a safety pilot?

R. A. Hanes, D.D.S.
Naples, Fla.

The safety pilot is there with his dual controls so he can take over control of the aircraft if necessary to avoid other traffic, or recover from hazardous attitudes. Thus he must be qualified to operate the aircraft under conditions as they exist during the flight. If the flight is conducted in a light twin-engine land airplane the safety pilot need not be at least a private pilot certificate with airplane multi-engine land ratings. A single-engine pilot would not qualify. When simulated instrument flight is conducted under VFR, neither the pilot under the hood nor the safety pilot is required to have an instrument rating. A student pilot is not acceptable as a safety pilot; for purposes of this rule the student is not considered "rated". Furthermore a student pilot may not have the judgment, experience and skill needed to be a safety pilot.

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How the heart quickens



In poor braking conditions