FAA GENERAL AVIATION NEWS

MAY 1976

A FLIGHT STANDARDS SAFETY PUBLICATION FOR AIRMEN

HOLIDAY VICTIMS...

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COVER:
Summer flying season in full swing

FAA GENERAL AVIATION NEWS

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William T. Coleman, Jr., *Secretary of Transportation*
Dr. John L. McLucas, *Administrator, FAA*
R. P. Skully, *Director, Flight Standards Service*
Bernard A. Geier, *Chief, General Aviation Division*

David Gelfan, *Editor*
Gernot Rasmussen, *Art Director* Ruth Taksel Benedict, *Assistant Editor,*
Louise Oertly, *Editorial Assistant*

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Manhood versus the Happy Landing

Memorial Day, first observed on May 30, 1868, to honor the Civil War dead, has in recent years become the anniversary of too many innocent victims of general aviation holiday accidents. Last year there were 65 accidents over the Memorial Day weekend, including 7 fatal accidents in which 15 persons lost their lives. The holiday death toll for general aviation has remained fairly constant over the past half dozen years. The probable cause of these accidents, as reported by the National Transportation Safety Board, varies; but there is one underlying factor which every concerned pilot should be aware of: the conflict of what may be termed, "Manhood versus the Happy Landing."

It is true that the accident rate is somewhat proportional to flying activity, and the latter goes up on summer weekends, beginning for most of us around Memorial Day. Over the past three years, according to NTSB figures there were an average of 57 total accidents per weekend in general aviation during the period from the end of April through the end of September. Over the remainder of the year, the average is less than half that figure—in fact the week*end* figure, on a daily basis, is little different from the week*day* figure. The accident rate per hour of usage is fairly constant. Nevertheless, holiday accidents invariably include a larger proportion of a type of accident which seems almost premeditated.

A careful study of holiday accidents shows that mechanical failure is rather infrequent. Of the 28 Memorial Day fatal accidents of 1973 through 1975, only one involved a mechanical failure. Other possible causes that are suggested by the increased activity, such as "crowded skies," or congestion at airports, are not major contributors to the accident toll. Students and other low-time pilots are involved in some of these accidents, but not to a predominant degree—especially with regard to serious or fatal accidents. In 1975 nearly half of the Memorial Day weekend accidents involved pilots with commercial or ATP certificates, many of them with thousands of hours on the logbook. *Six out of the seven fatal accidents in 1975 involved pilots with commercial certificates.* Obviously lack of experience is not the prevailing cause.

A survey of selected holiday weekend

accidents has shown that in a surprising number of instances a veteran, skillful, widely respected pilot has engaged inexplicably in a maneuver that was as unnecessary as it was unlikely to succeed—and totally out of character. A 10,000 hour transport pilot flies a *Tripacer* inverted under a bridge—a wingtip strikes the water, two on board drown. A veteran of hundreds of hazardous missions in Vietnam descends below his minimum descent altitude, searching for a resort airport, and crashes into trees, wiping out an entire family. A professional jet pilot borrows a homebuilt plane and separates the wing in a snap roll it was not designed to perform. *What is the motivation for this kind of senseless behavior?* If you asked the pilots themselves, they probably could not tell you.

But psychologists have suggested that there are various unconscious motivations, including the use of an airplane in an effort to overcome something that appears to the pilot as a threat or challenge to his essential manhood. The threat could appear in the form of a lost contract or job, a marriage breakup, physical impairment, a legal dispute, a financial crisis, loss of a close friend—whatever; *the loss of something to which the pilot is so closely bound emotionally that he believes he cannot sustain it without losing his concept of himself as a man.*

In other words, for some pilots the weekend—and especially the holiday weekend because of the additional time it affords for brooding over an impending loss—will be more than the occasion for a pleasure flight, a family reunion, etc. It may become the opportunity to prove, by means of some extraordinary maneuver or difficult bit of flying right up there in the sky where everyone can see it, that this pilot still has some special powers, some unusual skill or cunning that is essential to his sense of self-respect. The attraction of this fantasy is so strong that a pilot may pursue it at the cost of his life—and perhaps also the lives of others who fly with him, unaware of his inner turmoil.

An ex-warbird like the T-34 has been known to bring out the Walter Mitty in a pilot. Beware of that "T-for trainer" prefix. Compared to civilian trainers this is a high performance airplane.

Flying under bridges is an age-old holiday stunt, not always successful. Leave it to the professionals. Below—Lincoln Beachey flies underneath Niagara Falls in 1911.

The concept of manhood plays a strange and varying role in human history. No doubt it began in primitive tribes, when youths had to prove themselves worthy of taking their place among men by a feat of courage—and older men had to retain their authority by periodic demonstrations of heroism. In one form or another, vestiges of this primitive behavior have remained in society to our day, although often we are not aware of them, or regard them simply as traditions. For example, we are all pretty much conscious today of the value of protective equipment, both in sports and in work, for staving off serious injuries. But for many years there was a great resistance in public acceptance of this kind of behavior because, unconsciously, it was associated with the *non-heroic.* Consider that in the first 50 years of the game, baseball players were unable to wear gloves (for catching—not for batting) because of vociferous disdain expressed by fans toward this demonstration of vulnerability on the part of their afternoon heroes. (Charles Waite, first baseman of the New York Nine, was said to have been the first player to appear on the field, in 1875, with a glove to protect his thrice-broken hand. He was hooted off the turf, never to return.)

As late as World War I, the wearing of metal headgear by soldiers in battle was considered by many to be a suggestion of cowardice—irrational as that may seem. One British general actually issued an order threatening any man in his command who wore a steel helmet with courtmartial ". . . for showing cowardice in the face of the enemy." Closer to home, General Douglas MacArthur not only disdained the steel helmet in World War I (he was then a Colonel) but was never seen in anything but his famous mashed cap all through World War II and Korea—"I will not appear as a coward to my men by wearing a steel helmet."

Some of the behavior associated with manhood and courage is handed down from generation to generation, but a good deal of it is also fabricated out of pure fiction, which in time may come to be accepted as fact. An example is said to be the heroic gesture displayed by the actor James Cagney in the film of the early 40's, "The Fighting Sixty-Ninth." Cagney played a battle-shy soldier of this famous World War I unit who proved himself one of the boys in the end by jumping onto a grenade that had rolled into the trench, and so expiring heroically while saving his buddies. Although there is apparently no record of such an event ever taking place in the "Sixty-Ninth" or any other regiment, the fiction-writer's popularized example was followed by hundreds of young soldiers in three succeeding wars as an acceptable means of asserting their manhood—even when it was apparently possible to pick up the grenade and throw it out of harm's way. It seems as though the desire to find a means of asserting one's manhood is so strong that in the absence of traditional avenues we will accept patently fictitious ones.

Aerobatics can sharpen pilot skills and also be fun—*if* safety rules are followed. Requirements include an appropriate environment (never on airways); proper equipment (note parachutes); and properly qualified aircraft. Bonanza four-seater is certificated two-place-only for aerobatics.

Low-level aerobatics, without a specific waiver, are illegal. FAR 91.71 prohibits acrobatic flight (which includes abnormal attitude not necessary for normal flight) below 1,500 feet AGL.

This desire is so universal that none of us is immune to it. But it has no proper place in the cockpit. Every pilot should condition himself to be aware that if ever he considers carrying out a flight in a manner that is clearly hazardous, without genuine urgency, he may be driven by motives of which he is not conscious, and which could be tragically destructive to persons he loves, as well as to himself. This is the time to turn back or abort the flight, and work the problem out on the ground.

Nothing of a personal nature can be gained by carrying out an unnecessarily dangerous maneuver in an aircraft. Even if you manage to get away with it, for now, a bad habit will have begun that can make you an unsafe person to fly with. Courting disaster with an airplane, like playing "Chicken" with a car, is a totally meaningless gesture—an illusion of courage.

Following are three examples of accidents that happened on a Memorial Day weekend, as a result of deliberate risks taken by experienced pilots for reasons that could not be justified by the immediate circumstances of the flight. Although some of the facts have been altered to preserve anonymity, the cases are based on actual accidents from NTSB files.

The Last Loop

Memorial Day in Fargo, N.D., began as a warm, clear, unbelievably fine day for flying, perfect for the fly-in breakfast scheduled at a farm nearby, where a farmer/cropduster was celebrating the completion of the new hangar on his property. By 8:30 some two dozen aircraft had landed on the half-mile turf strip and were parked on the grass near the hangar, where a lavish country breakfast was laid out.

The group was esentially made up of ex-military pilots, most of whom had acquired former military trainers that were fully aerobatic, and as usual they prefaced their arrival at the farm with a personal display of aerial stunts before landing. And as usual there was a good deal of good-humored joshing over the relative merits of each pilot and his aircraft, and how they were holding out against the depredations of time and use.

The only pilot without military experience was a Canadian visitor, a veteran airman, who had a fixed base operation and flying school just over the border. He had an excellent reputation as a precision flyer and instructor, although when he had applied to the Canadian Air Force, many years earlier, he had been turned down, for medical reasons. An easy-going, even tempered individual, this was one subject he did not like to discuss. He had flown down with his son, a high school senior.

Reconstructing the situation: VFR on top in bright sunshine—but the vacation resort lies underneath the overcast, and the family is eager to begin its holiday. Making a wrong decision at a time like this can wipe out not only the vacation, but the entire family as well.

Conversation around the big breakfast table turned largely to the upcoming summer airshows, in which many of the pilots present would be participating. Inevitably, the subject came up as to when would the Canadians rescind their rule about not letting their pilots start a loop lower than 300 feet above ground at an airshow. The Canadian had replied, with a smile, that they would rescind the rule whenever someone built an airplane guaranteed not to lose altitude in a loop.

One of the pilots suggested that the air in Canada was so thin that it was difficult to complete a perfect loop in that environment.

The Canadian smiled again, and said nothing.

Another pilot suggested that the Canadian take his plane up and try a few loops at 100 feet or so near the farm, just to get the feel of it. The Canadian shook his head, although his son had already sprung to his feet and was looking at him eagerly.

He explained that he was used to making his loops at 300 feet, taking all his visual clues for that altitude, and he did not want to alter his habits. He had two airshows to do in the following month.

After some more banter the subject was dropped, and the visitors began to leave. It was rather noticeable, however, that as each plane departed the pilot started aerobatic maneuvers at low altitude, and two of them performed a loop at less than 100 feet.

The Canadian and his son went out to ready their plane, a Beech T-34, ex-military single-engine trainer. "What are we going to do?" the boy was heard to ask, and his father answered:

"I suppose you'd like to try a loop straight off the ground?"

"Not if you don't feel like it."

They took off to the west, circled the field and came over the hangar at 100 feet. About 500 feet past the building they started up in a loop, keeping it fairly tight. Just before inverting, the T-34 seemed to shudder slightly, but the pilot pulled it on over and continued around. As recovery began the plane seemed to shudder again, and instead of completing the loop it hurtled into the ground near a silo, bursting into flames. There was no chance to reach the occupants in time.

What had he proved?

Late for the Picnic

The pilot was a 45 year-old southern California building contractor, very successful and happy in his work, who built housing projects throughout the state and used a Cessna 210 to make on-site visits. He held a commercial certificate with instrument rating. His log showed 2,100 hours, 110 in type. Despite his busy work schedule, he was known as an active participant in pilot seminars and safety clinics and well regarded as a pilot. He had bought a six place retractable because it shaved hours or minutes from his working day, and allowed him to make quick little holiday hops, as he was doing on this Memorial Day, with his family.

He departed Hollywood/Burbank Airport with his wife and two children at 8:30 in the morning, bound for a family reunion at his brother's home in the Napa Valley. Arrangements had been made by telephone the previous night for them to be picked up at the airport, a half hour's drive from the house, with an ETA of 12:30 p.m. The annual outdoor barbecue picnic, a family tradition, was slated to begin sharply at 1:00 p.m. His brother said he had offered to move the opening festivities back to give them more time for their arrival, but the offer had been declined. The pilot is quoted as saying:

"We'll be there with bells on. Remember, I'm the one who always broaches the keg."

The weather was good, just a little smoggy, en route, but he filed IFR anyway because he preferred it. The flight was largely uneventful until he reached the vicinity of Oakland, when as a result of an altitude change they encountered strong headwinds. It began to look as though they would be 10 to 15 minutes late in landing. As soon as possible the contractor's wife contacted UNICOM at the airport and was able to speak directly to the brother who had come to pick them up. He told them not to worry, "they wouldn't miss much."

At this point the pilot came on the radio and said there was no question, but that they would arrive on time. His brother said later that being on time had become a sore point with the pilot/contractor lately. He had been late in completing his last two projects, which resulted in penalty clauses being invoked, and some tarnishing of his luster as a "master builder" who could build anything, anywhere, in less time than anyone else. In his business it was not easy to stay on top, and he was not a man who could be comfortable anywhere else.

Subsequently the pilot canceled his IFR flight plan and set a direct course for the airport, taking advantage of prevailing VFR conditions. It was now 12:10 p.m. With a little luck and light traffic at the airport, he could make it in 20 minutes.

Some 15 minutes later he had the airport in sight and called UNICOM again.

"Your brother wants to know whether he should call home and hold up the opening ceremonies," he was told.

"Negative. Tell him to pull the van around to the ramp. We'll be on the ground in five. Okay for a straight-in approach on 33?"

UNICOM advised him that 33 was the active, but there was traffic in the pattern, suggested he make a standard entry.

"Will do."

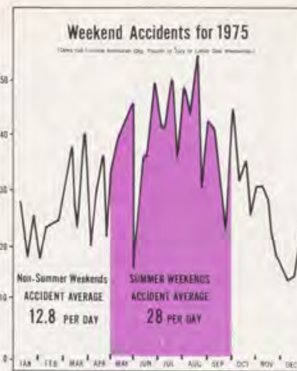
The 210 was seen entering the pattern at a 45 degree angle, but appeared rather low and close in on the downwind leg—less than 250 feet from the ground on turning base. The pilot cut the leg short for his turn on final at approximately 100 feet, but even at that the airplane was obviously too low to make the threshold. He opened the throttle and tried to pull up for a go-around, but too late. The aircraft crashed in an open field short of the runway and flipped over. None of them made it to the picnic.

Nowhere to go

The pilot had apparently been seen around the airport all that morning, trying to find someone to act as flagman so he could finish spraying the cotton and head back to his home near Austin. But on Memorial Day at this northwest Texas country town no one was in a workaday mood, so he had been obliged to lay over another day in his motel. The cleaning woman said later that she found an empty pint bottle of whiskey in the room.

Witnesses, who saw him washing down his *Pawnee* and working over the engine had noticed nothing unusual about his behavior. Everyone who knew him said he treated the agcraft more like a pet than an airplane, especially since the death of his wife. At noon he had gone into the airport cafe, ate a hamburger and watched television for a while. The airport manager found him staring out the window, bored and restless. There was a phone message from his son who lived 25 miles from the airport, urging him to change his mind about working today and join them at the house for dinner.

The manager said that over a cup of coffee the pilot had explained why he would not go. He said that his son was trying to get him to give up flying and take a job helping him sell real estate. The boy and his wife were worried about him living alone now, not eating well, flying long hours at his age, when he did not really need the money anymore. They wanted him to move in with them, spend his days fishing with his grandson.



They did not understand why he could not give up flying. He had been in and around airplanes for more than 40 years, since he was 17, messing around airport ramps and cadging rides, getting his wings in World War II as a fighter pilot, breaking into ag work afterwards—the hard way in worn-out Stearmans and J-3 *Cubs*. His skill with the airplane and his willingness to work long and hard through the growing season had kept his family well-provided for in years that had been pretty lean for his friends and neighbors, and he had built a reputation as the best ag pilot in Texas. At age 57 he could still outfly any of the new breed of dusters, with or without the spectacles his certificate now required. Why should he quit? There was really nothing else he could do.

The airport manager had symphathized with the pilot, declined his offer of a drink, and urged him to go up and see his son. Half an hour later from his office window the manager saw the bright yellow PA-25 go streaking down the runway. He assumed the pilot was going home, or else up to visit his relatives.

Two picnickers in a boat on the Colorado River branch that skirts the airport saw the *Pawnee* leave the runway and bank toward the river. The airplane rolled over smoothly into an inverted position and waggled the wings as it passed over them. A moment later they heard a sharp bang! and they saw the plane flip over and drop into the water. They did not actually see it strike the power line but they were sure that is what happened because they knew about the wire crossing at that point. They rowed ashore and ran up to the crash site, but the emergency rescue squad had already arrived. It took them about ten minutes to bring up the body.

The toxicological report indicated 112 mgs % of ethyl alcohol in the blood. All other findings were negative.

A pair of reading glasses were found intact in their case, in his shirt pocket.

* * *

(Editor's note: Material in the theoretical discussion in this article is based in part on the investigations of Robert E. Yanowitch, of FAA's Aviation Medicine, and on a paper presented by Chaytor D. Mason, Associate Professor of Aerospace Safety at the University of Southern California.)

* * *

MEMORIAL DAY ACCIDENTS

Table provides statistical evidence for the conclusion that human error is the overwhelming cause of Memorial Day holiday weekend accidents in general aviation, and that the error in a great many cases cannot be traced to lack of experience or proficiency in the cockpit. Table does not include commercial accidents, such as agricultural operations.

YEAR	TOTAL MEM. DAY ACCIDENTS	TOTAL MEM. DAY FATAL ACCIDENTS	TOTAL MEM. DAY ACCIDENTS	ALL MEM. DAY ACCIDENTS DUE TO MECH. FAILURE	FATAL ACCIDENTS MEM. DAY WITH MECH. FAILURES	ALL MEM. DAY ACCIDENTS BY CERFIFICATE	FATAL MEM. DAY ACCIDENTS BY CERTIFICATE
1975	60	7	14	12	1	STD. .... 9 P.P. .... 26 COM. .... 24 Unknown 1 60	STD. .... 0 P.P. .... 1 COM. .... 6 ATP. 0 7
1974	46	10	15	5	0	STD. .... 4 P.P. ...... 28 COM. .... 13 No Lic. 1 46	STD. .... 1 P.P. .... 7 COM. ...... 2 ATP. 0 10
1973	65	11	20	7	0	STD. .... 10 P.P. .... 31 COM. .... 23 ATP. 1 65	STD. .... 1 P.P. .... 5 COM. .... 4 ATP. 1 11

(Does not include Memorial Day, Fourth of July or Labor Day Weekends.)

Top team at Ag Rotors: President Carrol Voss and George Kramer, V.P. and Chief of Maintenance

The Flying Bug Doctor

A staunch advocate of the helicopter's role in aerial application

Is there a future for helicopter pilots in aerial application?

A strong affirmative reply to this question is registered by Carrol M. Voss, Ph.D., one of the foremost experts on this subject in the world. Dr. Voss, who operates one of the few approved helicopter schools with agricultural application certification, is an ex-Nebraska farm boy, ex-Naval aviator, and economic entomologist and one of the pioneers of rotorcraft aerial application. With nearly 9,000 hours in helicopters in his log, he knows his subject inside out.

Dr. Voss is the president and owner of Ag Rotors, Inc., a combined helicopter flight school/repair station/aerial application/charter service located in the shadow of the historic Gettysburg (Pa.) battlefield. For nearly 20 years he has been teaching pilots the art and science of aerial application from a helicopter, while at the same time helping farmers in the nearby Allegheny uplands protect their crops against insects and the weather, touring the historic sites of Gettysburg by air and generally exploiting the usefulness of the small helicopter.

In his view, the helicopter has a specialized place in agricultural and other types of aerial application in our time. For example, the many apple and peach orchards in the vicinity of Ag Rotors are frequently threatened with major crop loss when a late Spring freeze sets in at a date when the trees have already budded. When such a calamity threatens, usually in the evening, Ag Rotors can have a helicopter over the threatened orchard within the hour. Hovering continuously at low level through the night, the 'copter is capable of keeping the temperature above the freezing point by moving the air around sufficiently. This modern technique is more effective than the old-fashioned smudge pots, more quickly activated, and produces none of the air pollution associated with the pots.

The ability to maneuver safely and effectively near the ground, in the dark, is one of the important advantages of the helicopter in agricultural work. It means, among other things, that should it become expedient to spray a crop at night, in order to avoid contaminating bees that pollinize during the day, it can be done.

The area will be carefully scrutinized the day before for wires or other obstructions, and the operation will probably be carried out at a minimum speed—perhaps about 30 mph—but it will not be difficult.

Dr. Voss does not see the ag helicopter as a competitor to the fixed-wing airplane in the ag business, but as a specialized component of the industry. The future of helicopters in agriculture, as he sees it, lies in providing dissemination of needed materials by air to areas which are difficult for airplanes to handle for all kinds of reasons—nearby obstruction, contour strips, restricted visibility, special problems of application, etc. Because of lower operating speeds and greater maneuverability, the 'copter can serve small acreages tucked within tall woodlands or mountain ridges which are all but inaccessible to airplanes. Where drift of pesticides over adjoining crops, or bodies of water, is a factor, ag 'copters can minimize the danger by spraying at low speeds with pinpoint accuracy. Particular farmers like having the spray 'copter work directly from the farm site, where they can exercise more control over the operation. They also like the downwash effect that the rotor gives to the spray for better penetration.

Ag Rotors believes in fully exploiting the usefulness of the helicopter to the community, in a manner that provides a pilot employment during the off season for agricultural work. As an aerial touring bus, the helicopter has virtually no rivals. It also can become important to the community for search and rescue, police operations, air ambulance work, emergency evacuation, advertising, etc.

The key to a safe and economic helicopter

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service, in their view, is a properly trained pilot and a good maintenance program—and Ag Rotors has both. Helicopters are known to require a relatively greater ratio of shop time to air time, but this can be minimized, according to Ag Rotors Maintenance Chief George P. Kramer, when the pilot is thoroughly familiar with his aircraft, understands its sensitivities, avoids flying in a manner that creates excessive loads, and keeps a close eye on the entire mechanism.

Students at Ag Rotors are taught that every aspect of helicopter maintenance is "critical"—including a thorough preflight on the part of the pilot. Most of the essential moving parts of the rotor mechanism are accessible for inspection, and they should be *handled* as well as observed. A typical ag helicopter will have quite a few more items than an airplane to be checked before the pilot enters the cockpit, including some vital components in the tail boom and tail rotor.

Among other items, the security of locking nuts is essential. Pilots are taught to observe the alignment of safety wires, to observe that bolts around a given part show equal threading, to look for cracks in the paint or welds that might indicate metal fatigue, to look for "sloppiness" of fittings or connections, and for oil leaks or signs of insufficient lubrication. Crop spraying or any low-level work is apt to expose the machine to excessive dust that can dry up the lubrication in universal and other joints.

Inadvertent tail rotor damage, Dr. Voss believes, is one of the major causes of ag helicopter failures, and he sees to it that his students are aware of the sensitivity of this finely balanced component. 'Copter students are taught to avoid making contact with the tail boom or rotor guard against any object, even tall grass, and to report any unavoidable strike immediately to the repair shop, regardless of whether any damage is apparent or not

Ag Rotor students are also taught to identify any vibrations experienced in flight, as to low, medium or high frequency, and to report them promptly. Uneven build-up of any materials on the rotors, including such fine particles as dried chemical spray, may be enough to cause severe vibrations.

Pilot familiarity with the maintenance requirements of the 'copter is a key factor in keeping repairs to a minimum, in Dr. Voss's view. These demands are not complicated but they do call for a professional attitude on the part of the pilot, plus a close familiarity with the aircraft. His own acquaintenance with helicopters began in 1949, after he had completed a wartime stint as a Naval aviator (mostly instructing in PBY Catalinas), returned to college and earned his Ph.D. in entomology. Originally brought up on a Nebraska farm, his interest in "bugs" and their depredations on farmland led him to investigate the possibilities of some of the new light post-war helicopters for specialized aerial application. He trained at a helicopter school in Rhode Island and went to work as an itinerant ag applicator from New England to the west coast. He finally set up his own business, Ag Rotors, Inc., in Gettysburg in 1958.

Over the past 20 years Ag Rotors has earned an international reputation for first class helicopter and aerial application training. Currently Dr. Voss has a staff of 20 persons, including 7 mechanics, and a fleet of 14 helicopters. He trains about 100 students a year, with emphasis on thoroughness, not quantity. Although it is possible to be certificated for aerial ag work with 15 hours of flight time, Ag Rotors requires 25 flight hours, plus 60 hours of ground school. Flight training includes several hours of "related commercial activities," such as external load and sling operations, powerline patrol and survey work, rescue operations, etc. Placement of his students in aerial application has been gratifyingly successful.

Another source of satisfaction is the District Flight Instructor of the Year Award given his chief of flight instruction, Ken Wymer, presented on March 26 of this year at a ceremony attended by the Federal Aviation Administrator, Dr. John L. McLucas. Wymer, who flew helicopters for the Army in Vietnam, has over 7,000 hours of flight time, about half of it as instruction and most of it in helicopters. He was nominated for the award on the basis of the high standards of performance and safety he has maintained for himself and his students. Neither Wymer nor any of his students at Ag Rotors have ever had a violation, accident or incident.

ticide on a small field surrounded by tall trees.

The rotor mast is "nerve center" of the helicopter's flight mechanism. The security of every bolt is vital to safety. Here mechanic Kevin Martin inspects the swash plate.

Before completing a course, each student is checked out personally by Wymer or by Dr. Voss. The curricula offers virtually every kind of helicopter training, from the Private Pilot certificate to the Airline Transport Pilot Test Course, (IFR) Rotorcraft. Most of the students at Ag Rotors are full time students who study or fly between 8:00 a.m. and 5:00 p.m., complete their course within the minimum hours required by FAA, and go on to find jobs within the industry.

In fact, the current demand for trained ag-helicopter pilots, especially for work overseas, is greater than Ag Rotors can keep up with. Ex-military helicopter pilots training on the G. I. Bill are a prime source of new ag pilots. Increased food needs all over the world has stimulated local efforts to build up an agricultural aviation industry for which, in many instances, the helicopter is an ideal tool. In this connection Dr. Voss has served as an agricultural consultant for the World Bank in India, for the World Health Organization in Africa, and recently as a representative of the Helicopter Association of America on the Federally sponsored general aviation exchange group sent to Russia.

The many requests Dr. Voss receives for the services of his graduates reinforces his confidence in the future of ag rotorcraft as an invaluable adjunct to farmers everywhere. At 57 he still flies helicopters whenever the opportunity occurs, and delights in the freedom it gives him to roam the skies in a glass bubble with an engine "strapped on his back."

It beats peering at bugs in a test tube. ■

THE ENGINE DOCTOR

Secrets of the Sump

Q. *In your last article you talked a lot about using oil analysis to help keep track of the condition of the engine. Isn't that something for commercial aircraft? Compression checks are run on my engine every year and what I don't need is one more big maintenance expense. What can oil analysis do for me that the compression check doesn't already do?*

A. It can save you a bundle. Oil analysis and the compression check serve two entirely different purposes and are in no way interchangeable. The engine compression check (required for annual or 100-hour inspections) indicates the condition of each of your cylinders *right now.* Compression loss in the cylinders, for all practical purposes, translates to loss of engine power. So the compression checks tell you about wear—or damage—that has *already taken place* in the engine.

Oil analysis, on the other hand, serves as more of a forecaster of *potential engine problems*—things that may happen in the future if precautionary action is not taken. This allows you to have minor repairs made before things get out of hand and the whole engine has to be rebuilt—which can run into thousands of dollars. Think of it as health insurance. You may not like paying the premiums, but how well would you sleep without it—knowing what hospitals cost these days?

Actually spectrometric oil analysis programs or emission spectrometry, is a comparatively inexpensive process, usually costing under $15 per analysis.

Q. *A friend of mine who has her plane's oil analyzed regularly says that she has to put the sample in what looks like a sterilized container. Isn't this some kind of a put-on? Just to impress her?*

A. I don't think so. I've mentioned before that one of the "foreign elements" they are looking for in your oil is silicon, or just plain dirt, which can abrade the engine down in short order. If you allow any dirt at all to get into your sample of what might be good clean, healthy oil, and send that out for analysis to a conscientious lab, you are liable to get a telephone call in the middle of the night. I know of one case where an abrupt rise in the silicon content of the oil sample (the quantities of other foreign matter remained more or less constant) led to the discovery of a faulty air filter. Without the warning, operating this particular engine in any kind of dusty conditions would have ruined it in no time. If you contaminate your sample, you can expect all kinds of false indications and warnings.

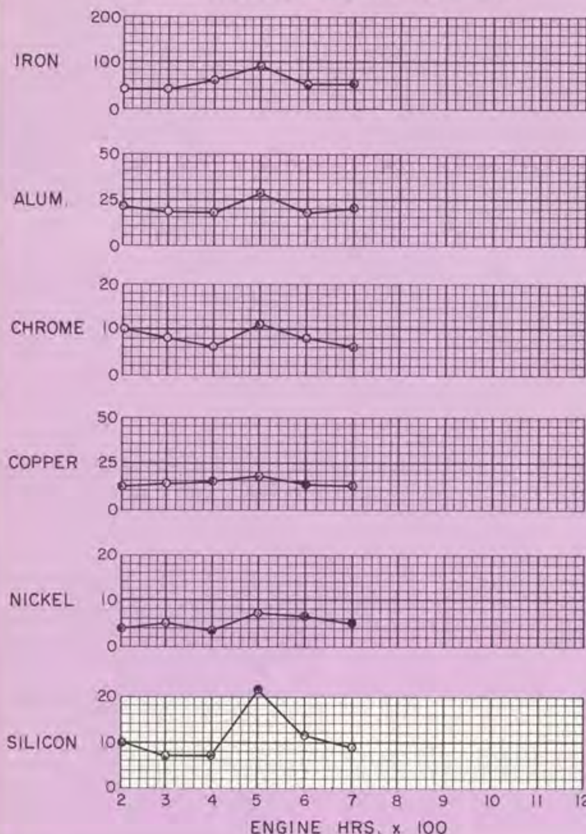
Q. *I've heard about people sending two samples—just to check on the system—from the same engine to the lab, and getting very different readings. What does that tell you? Confusion in the computer?*

A. That suggests to me that someone was not very careful about his sampling. Maybe his sample bottle got dusty, or maybe he drained the oil through or into unclean containers that were lying about the hangar. For an accurate sampling, you want to drain out about half the oil while it is still warm, take out the required sample (usually about two ounces) and seal it up. If you have a problem engine that requires sampling between oil changes, the lab will usually send you (or ask you to get) a special kit for this purpose, with instructions you will want to follow to the letter.

Computers do get confused occasionally, when someone pumps in the wrong data, but you can help avoid that by making sure that your sample has all the necessary information and identification. Include the engine manufacturer and full model number with all letter and number prefixes and suffixes (like IO 540 B4B5): each symbol has a meaning. State the brand and kind of oil you have been using, how many hours on the engine, and how many hours since that last oil change. Also how many weeks of calendar time. Give your phone number as well as address, because they might actually have a reason to call you at once.

Q. *Aren't the findings in a sample applicable to any engine? I mean, if you find scrap iron in your oil, that spells trouble for everyone, doesn't it?*

In the oil laboratory at the University of Illinois, analysis is done by atomic absorption: oil is drawn through a small capillary tube, atomized and burned (separately for each element) and read by a monochromator.



Plotted on a graph, a series of oil analysis reports tells an important story: silicon levels in the engine showed a sudden, sharp rise, accompanied by smaller increases in all metal levels. When the owner found and corrected a loose air filter, all wear rates returned to normal. Left uncorrected, silicon circulating in the oil could cause permanent engine damage.

A. Engines are not all built of the same materials. I remember a case of a *Cherokee* whose engine, in several consecutive analyses, showed increasing amounts of iron in the oil. At the suggestion of the oil analysis laboratory the owner had a boroscope examination (internal inspection) performed, which disclosed a broken piston ring and a severely worn ridge in one cylinder wall. The broken ring, which was made of chrome (a very hard metal) had been gouging the cylinder wall, which was constructed of nitrided iron—it was particles of the latter substance that had been showing up in the oil.

Now if this had been some other kind of plane with a different make of engine, the ring could have been made of iron and the cylinder wall chromed instead of nitrided—which would have given you a very different reading from the oil analysis. But in any case, the early warning could keep the inevitable repair bill from escalating out of sight—and possibly prevent an inflight failure.

Q. *Supposing a lab report says that I have a bad piston, say, and I have it replaced, but it turns out to be in perfectly good shape. What would the lab say to that?*

A. Most probably they would say that someone pulled the wrong piston. These laboratories are not infallible, but they would certainly retest for a suspected wear condition before recommending an expensive fix. Looking at it another way, it makes good sense to have an oil analysis made after any sizable repair, to make sure that the problem has actually been corrected. This would be shown by a significant reduction in the quantity of wear metal particles present. Lots of mechanics recommend it.

Incidentally, a good oil analysis can turn up some facts which have nothing to do with maintenance or repairs as such, but concern the usage of the airplane. Too little usage, for example, can result in the accumulation of excess moisture inside the engine—and in the oil. If the water content in your oil sample goes up, you know you have to start flying the airplane more, or rent it, or sell it, before corrosion grounds it.

Q. *Isn't there a better, cheaper way of analyzing the oil than emission spectometry—something called atomic absorption?*

A. Atomic absorption is an alternate method that requires less expensive equipment, and may be performed by other than skilled technicians—which is not the case with emission spectometry. Both procedures involve measuring materials in terms of light wave lengths, and each has certain advantages and disadvantages. Either procedure is considered reliable, so you should select whichever is convenient and stick with it—don't skip back and forth from one to the other.

Q. *Suppose I wanted to buy a used airplane I knew nothing about. Would I learn anything useful from this kind of a test?*

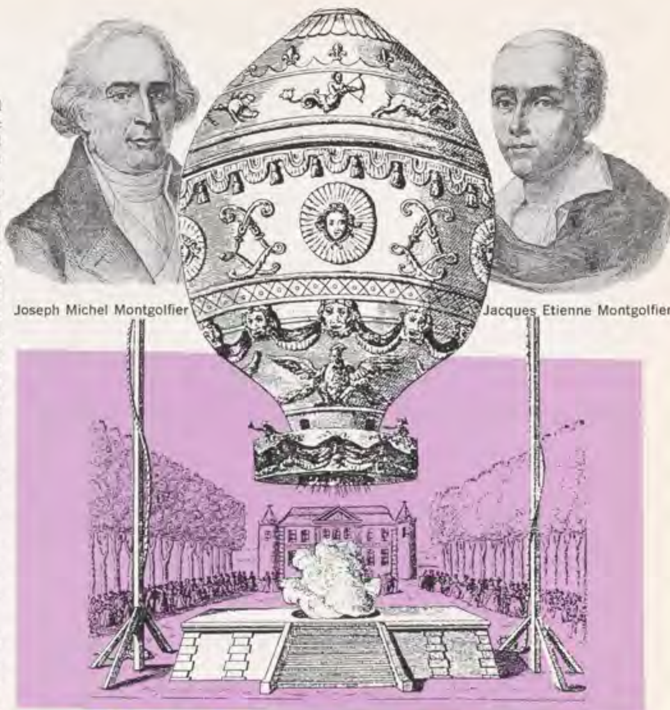
A. You would—if there were any serious problems. I personally would never buy a used airplane from anyone without seeing at least one analysis. When you consider the cost of the plane against the cost of the sampling, it's too cheap an insurance to pass up. The same thing applies to selling your airplane. If you can show the buyer a clean bill of health, in the form of a running log of oil sample tests, you can expect to get a better price. It really does pay to play it safe.

Q. *Oh, you struck a nerve. Where can I find a good laboratory?*

A. Your fixed base operator can direct you.

Famous

Flights



Up in Smoke

Montgolfier Brothers and the First Ascent Ever

Man's fascination for balloons has existed for many centuries. He has had fantastic schemes and dreams of how they could take him aloft. He has filled them with smoke, steam, hot air, hydrogen and helium, and has soared more than 113,000 feet over the earth, using sophisticated life support equipment and scientific data-gathering devices. He has also perfected simplified designs for recreation and advertising. Remarkably, the basic design of balloons has changed little over the years, and is still very similar to the first practical one developed almost 200 years ago by the brothers Montgolfier, who are credited with the first actual human ascent. The name of Montgolfier is to ballooning what Wright is to flying. Oddly enough, each breakthrough into the realm of flight was accomplished by a pair of brothers working in close harmoney to a single purpose.

Sons of a successful paper manufacturer, Joseph-Michel and Jacques-Etienne Montgolfier were born in the village of Annonay, a few miles from Lyons in central France: Joseph on August 26, 1740, and Etienne January 6, 1745. Both boys were exceptionally bright, with great enthusiasm for new ideas, and eventually took over a branch of the family firm in Rives.

The brothers' interest in aeronautics began with a curiosity about the fact that smoke always floated upward; a tendency which they termed "levity." They explored the possibility of containing "levity material" in a toy silk bag and letting it rise. Larger bags were used and various textures tested, but the heat source was always a fire of materials (such as damp straw and wool) that gave off much smoke—which they believed essential to "levity." After much testing and many failures, a Montgolfier balloon containing over 700 cu. ft. of hot, smoky air climbed to 985 feet in December 1782.

The following year 1783, was to become a major milestone in the history of conquering the air. On June 4th, at the request of the French Academy of Science, a Montgolfier balloon was constructed with a volume of 28,282 cu. ft. and tested in the presence of leading scientists of the day. It went up 460 feet and was barely held down by eight strong men. Thus was established the lifting power of this new aerial device. The Montgolfier brothers were officially credited with the invention of the hot-air balloon and made members of the prestigious Academy.

The next project was a new silken balloon, to be free-flown before the royal family of King Louis XVI and his Queen, Marie Antoinette, at the Palace of Versailles, near Paris. The arrival of the Montgolfiers at Versailles was a scene of mob curiosity and wild excitement, as thousands of interested spectators, the high and the mighty (including one Ben Franklin) a well as the low and impoverished rabble, filled the area outside the Palace set aside for the flight. While the King was being shaved, dressed and wigged, the details of the proposed ascent were read to him. He was greatly interested in the flight details, but opposed to the balloon carrying "any of his subjects." As a compromise, a cock, a duck and a sheep, all taken from the royal barnyard, were placed in the balloon's wicker basket.

After King Louis had inspected the inflated bag and given the royal signal, the balloon slowly rose, a thing of beauty, the silk cloth standing out in full shape with the royal colors, the fleur-de-lis and great LS, the royal cypher, interlocked around its surface. With the royal cannons firing a three-gun salute, the balloon sailed up and away to the north.

Because of a rip in its side which occurred in take-off, the balloon leaked air and came down somewhat precipitously only six miles away. First arrivals on the scene found the cock attacking the nearest bugs, the duck waddling in a puddle and the sheep calmly nibbling the grass—all apparently none the worse for their exposure to the air above. They soon found their way to the King's dinner table, but not as guests.

A few days later royal permission was granted for taking aloft a human cargo. On November 21, 1783, two gentlemen of the court, the Marquis d'Arlandes and M. Pilatre de Rozier, lifted off in the latest Montgolfier balloon—the Revillon III, a pear-shaped silken bag 70 feet high and 46 feet in diameter—and quietly soared over Paris: the first time in all of history that man had risen above the earth. They traveled for 25 miles before touching down.

The King honored the Montgolfiers with a coat-of-arms, and their paper mill became the Royal Paper Manufactory.

Oddly enough, only one of the two brothers, Joseph, ever went up and that was when he, Pilatre and five others made a trip in January 1784. Etienne was content to bask in the glow of popular acclaim. (Pilatre was later to become the first airman fatality, when his hydrogen-inflated balloon caught fire.)

Less than ten years later, their benefactor, King Louis XVI, was found guilty of treason against the new French Republic and was beheaded with his queen in January of 1793. Joseph and Etienne Montgolfier were regarded as heroes of the common people and given administrative jobs with the new regime.

With the advent of the Revolution in France and the dawn of a new and scientifically minded century, ballooning became less of a fanciful amusement and more of an introduction to serious aeronautics. Soon keen intellects in Europe and elsewhere were applying themselves to the problem of human flight. The age-old fears of hidden terrors lurking in the sky had been dispelled for once and for all by the two papermakers—as a result of a bag of silk, a fire of damp straw and wool, and a curious imagination.

In 1783, with the King and Queen of France watching, a sheep, cock, and duck became the first air passengers ever, riding in a wicker basket beneath a bag filled with hot air.

BRIEFS

THE LONG WAY. Two sailplane pilots are jointly claiming a world soaring record for out-and-return distances of 807 miles for flights they made separately on March 17, 1976 from Lock Haven, Pa. to Mendota, Va. and back, along the Allegheny ridges. The pilots are Karl Striedieck, an air national guard pilot from Port Matilda, Pa. who flew a Schleicher AS-W 17 sailplane, and L. Roy McMaster, an accountant from Elmira Heights, N. Y. in a Schempp-Hirth Standard Cirrus. Striedieck, who has held the out-and-return record four times before this flight, was in the air about 11 hours, averaging 73 mph. McMaster flew an hour longer, but if the claim is approved he will be given the U. S. National Standard Class record since Striedieck's aircraft does not qualify under standard class rules.

■ ALL ABOUT OPS REVIEW. A summary of the First Biennial Operations Review Conference has been published by FAA. The 525-page book includes summaries of conference proceedings and copies of important speeches. A list of conference registrants also is included. The December conference attracted some 700 aviation representatives (more than 50 from 21 foreign nations) to consider proposals for updating FAA regulations covering aircraft maintenance, airman certification and air traffic and general operations. Also covered were the certification and operation rules of air carriers, air travel clubs, commercial operators and pilot and mechanic schools. Free copies of the summary (while supplies last) may be obtained by writing FAA, AFS-920, Washington, D. C. 20591.

■ UNINTENTIONAL SOLO. A woman who knew nothing about flying an airplane was inadvertently carried aloft solo when a hand-propped plane took off without a pilot. When the Cessna 210 failed to start, the pilot got out to prop it, leaving his passenger inside. The engine roared to life and the plane began to roll, with the pilot hanging on to a strut. He was forced to drop off when the plane rose into the air. The Cessna climbed to about 5,000 feet,and flew around for 18 minutes before the key was (presumably) turned to the off position and a landing attempted. A fatal crash occurred on the airport. Pilots are cautioned never to prop an airplane unless there is a qualified person at the controls, or the aircraft is securely fastened down.

SWITCH. Recent incidents noted by FAA field personnel have spotlighted the danger of improperly grounded ignition switches that can result in a "hot prop" even though the switch is in the off position. To be sure the switch is working properly pilots should make regular checks, as follows: With engine at idle speed, turn the switch to "off" just long enough to note a change in engine sound that confirms proper shutoff action by the switch. If no change occurs, consult a mechanic. (Engine will not die during brief switch to "off".) Mechanics are reminded that this type of ignition test is required during 100-hour and annual inspections.

LET US SPRAY. Masked propeller tip is about to receive a coat of paint to increase conspicuity under "Operation Prop Tip Marking" program which was initiated by FAA Rocky Mountain Region after several accidents where persons were killed walking into spinning props. Aircraft owners are encouraged to have propeller tips painted one or more bright colors. (Navy suggests white with red stripe) Do-it-yourselfers note: Finish must be non-glare on the side that faces the pilot and must also be compatible with existing finish.

Surplus Military Aircraft Inspected Prior to Sale

Military aircraft that have been declared surplus are being inspected by FAA field personnel before being offered for sale for civilian use. Of the 1650 aircraft inspected since 1973, about two-thirds have been judged to have "reasonable potential for certification."

There have been cases in the past where purchasers of apparently attractive bargains in military surplus aircraft have faced exhaustive investigation in tracing down the aircraft's history and spent many thousands of dollars to put the craft in condition to qualify for a Standard Airworthiness Certificate (required for use in civilian aviation). In some cases it proved impossible —or impractical—to certificate the aircraft.

An aircraft is considered to be potentially certifiable if there is a civil counterpart for which a type certificate has been issued, and if the records are complete enough to determine the aircraft's configuration to enable certification in accordance with Federal requirements.

FAA Slide Show Advises Owners on Alternate Fuels

"High Lead, Low Lead" is the name of a new FAA slide presentation. The program is designed to bring the flying public up to date on the present status of the aviation gasoline situation and to offer guidance to the general aviation community for coping with changing fuel conditions.

Availability of the various grades of aviation gasoline varies greatly from one part of the country to another. In some areas grade 80 (formerly called 80-octane) gasoline is no longer being sold. In many places grade 80 and high-lead grade 100 fuel are being replaced by a single type, grade 100 LL (low-lead). Some companies, however, continue to distribute high-lead 100, either instead of, or in addition to, grade 100 LL.

The slide presentation advises owners and pilots who must substitute an alternate grade of fuel for grade 80 to use low-lead 100 rather than high-lead 100 whenever possible. (Low-lead 100 contains four times as much lead as grade 80 while high-lead 100 has six times as much.) Pilots are urged to obtain—and follow—manufacturer's operating recommendations, particularly with regard to leaning procedures, to cut down excessive lead deposits in the engine. It is also suggested that owners arrange frequent maintenance checks, particularly of spark plugs (cleaning and rotating as indicated), oil and oil filters.

To arrange showings of "High Lead, Low Lead" contact the Accident Prevention Specialist in your FAA District Office.

Wisconsin Man is Top Instructor

A flight instructor who made a film presentation on pre-flighting a Cessna 150 for his Master's Degree thesis has been named as the 1975 "Flight Instructor of the Year" by FAA. Gregory G. Gorak, a full time instructor at Gateway Technical Institute at Kenosha, Wis. traveled to Washington, D.C. May 20 to be honored by FAA and industry.

Among the testimonials to Gorak's effectiveness as an instructor was that of his wife, Diane, who said, "Greg taught me to be a safe, proficient pilot—and I'm his wife! That has to be eloquent evidence of his ability to adapt to the most stressful of student-instructor relationships."

Although most of his working hours are devoted to the students of the Institute, his teaching efforts range from conducting a "pinch-hitter" course for husbands and wives of pilots to training mechanics in the fine points of safely taxiing aircraft. He also enjoys a reputation as a "salesman", selling safety to pilots and selling aviation to the non-flying public.

Tighter Leasing Rules Proposed

The "truth in leasing" rules would be tightened under an FAA proposal that would require all large aircraft under a lease or conditional sales contract to be inspected by FAA before the first flight.

Under the proposal the lessee or conditional buyer of a large aircraft (over 12,500 pounds) would be required to notify FAA at least 48 hours prior to the scheduled first flight, to allow for a safety check by FAA inspectors.

This would be in addition to the present rules which require the lessee or conditional buyer to mail a copy of the lease or conditional sales contract within 24 hours of its execution to the FAA Aircraft Registry, Oklahoma City, Ok. Present regulations were adopted in October 1972 to eliminate confusion about who has operational control of the aircraft. The action followed a fatal crash of a chartered flight carrying the Wichita State University football team.

Comments on the new proposal (#76-10) should be submitted by June 6, 1976 to FAA, AGC-24, Washington, D.C. 20491.

FAA GENERAL AVIATION NEWS welcomes comments from our readers. No anonymous letters will be used, but names will be withheld on request. Address: FAA GENERAL AVIATION NEWS, AFS-807, Washington, D.C. 20591.

• Ground Effect

Your March article "Spring Thaws and April Showers" defines ground effect as "a temporary gain in lift due to compression of the air between the wing and the ground at very low altitudes." This is what I was told as a beginning pilot some years ago, but later I was taught that ground effect really resulted from the decrease in wingtip vortex turbulence when the wing is low enough so the vortices break up against the ground, thus reducing drag and increasing wing efficiency. Which is right?

M.H. Piper
Beltsville, Md.

The definition in the March article is from the FAA "Flight Training Handbook" (AC 61-21). An elaboration is contained in the current "Aerodynamics for Naval Aviators" (NAC-WEPS 00-80T-80), stating in part: "As the wing encounters ground effect and is maintained at a constant lift coefficient, there is a reduction in the upwash, downwash and the tip vortices. As a result of the reduced tip vortices, the wing in the presence of ground effect will behave as if it were of a greater aspect ratio. . . ." Increased aspect ratio means greater length of wing in proportion to chord.

From the pilot's point of view, it is not necessary to have a full understanding of the aerodynamics of the situation. What he (or she) experiences is an apparent increase in lift over drag. But it may help you understand why gliders, with their long, narrow wings, get off the ground so quickly.

• Metric Language

Several of the aviation magazines that I read (including yours) have recently printed articles discussing aviation fuel. Everyone seems to use a different method of indicating lead content in gasoline. In the past few months I have seen the following: m.l.; ml.; ML; ml and cc. To avoid confusion would it not be a good idea for everyone to use the metric symbol for milliliter—ml in lower case letters and without period(s)? At least until we go entirely metric, when 2.0 ml per gallon will become 0.05% (which would be correct even today).

Alan R. Mossberg
Greenwich, Conn.

Very likely a simplified standardization such as you suggest will take place in the process of conversion.

• More on Stinson

I have read your response to Mr. Jacobsen's letter on the Stinson models in your February issue, and I have to get in my two cents worth: The *Model R* came out in 1932 and had fixed gear and a Lycoming 215 hp engine; R-1 was the same, but had retractable landing gear; R-2 was the same as Model R but with 240 hp; Model R-3 had the Lycoming 240 hp engine and retractable gear.

The retracting gear pulled upward and inward into wells in the bottom of the fuselage. Mechanism was a worm gear with a 20-1 reduction, operating a drum carrying cables which lifted the gear. Lowering was done with a "dog clutch" (a clutch with teeth) between the worm gear and the drum. When the pilot pulled a lever to disengage the gear from the drum, the gear dropped free to a self-locking position. A hydraulic cylinder was used to lessen the shock on parts.

I rode in the *Model R* with Bob Kerlinger, late test pilot for Ryan, in 1932. For those days the *R* was an exceptionally quiet aircraft.

Your "Famous Flight" section is very interesting to me and I hope you continue the series. After all, the pioneering spirit is what put aircraft where they are today.

Miles F. Blaine
San Diego, Calif.

• Luggage Screening

I have heard that the rules requiring screening of checked baggage as well as carry-on bags now pertain to charter flights. As a commercial pilot I am on call as a charter pilot in a light twin. Does this rule apply to me?

Name withheld
Harrisburg, Pa.

FAA recently published recommendations that air taxi/commercial operations and also charter operations conducted by supplemental air carriers (under Part 121) follow procedures similar to those of air carrier in inspecting checked baggage, as well as carry-on luggage. Although this particular recommendation does not cover the type of charter flight you describe, in the interest of safety and in view of some recent hijackings of small aircraft, it makes sense to maintain security in the ramp areas of any aircraft that are available for hire, and to set up a system of "screening" passengers and their luggage.

Two new Advisory Circulars have recently been published by FAA on this subject. They are AC 121-20, "Aviation Security: Supplemental Air Carriers" and AC 135-4A, "Aviation Security: Scheduled Air Taxi/Commercial Operators". For free copies write DOT/FAA Distribution Unit, TAD 443.1, Washington, D. C. 20590.

• Horrible Flight Planning

"Survival in the Snow" in February was a very interesting and informative article, as far as it went. But it was another bad General Aviation accident, by a miracle(s) not fatal, and one that should not have happened! The crux of the matter is that his flight planning was horrible. His direct course (over Mt. Hood) involved 134 NMs and required a VFR minimum of 12,500 feet with forecasted weather, whereas V-500, IBM-Squaw Mt. Int., direct KPDX, is 139 NMs with MOCA of 7600 feet! In addition, this would have given him Aurora State Airport, as an alternate, at 135 NM's. Why, oh why, do pilots think "VFR direct" is always the "shortest way home?" And, I'll bet the pilot didn't even carry a Sectional Map!

Incidentally, all of the Visual Emergency Signals are in the AIM—but what pilot bothers to carry that, other than an old fuddy-duddy like me who has been flying for 50 years?

Howard T. Headley
N. Valley Stream, N.Y.

• Hugging the Line

We enjoy FAA AVIATION NEWS very much. We fly out of Danbury, Conn., airport and when driving home after flying we notice that some pilots have a bad tendency to hug the white line on the highway—probably because of the habit of straddling the line while taxiing or rolling on the runway. We have made up a little jingle which perhaps you would like to use:

"The center white line is for landing your plane—when driving your car, stay in your lane."

Martin E. Sivacek
Danbury, Conn.

More truth than poetry, friend.

INSTRUMENT CORNER

• "Alternate" Questions

I am an instrument ground school instructor with some questions regarding the naming of "alternates." When filing an instrument flight plan you are required to list an alternate airport unless your destination weather is forecast to be above certain minimums. When the terminal weather is forecast to be above those minimums but the forecast contains phrases such as "occasionally" or variable" or "chance of" lower ceilings or visibilities (which would be below the minimum), on what do I base my decision to name an alternate—the body of the forecast, or the lowest value mentioned in the added phrases? Also, are there defined values for those words? For instance, does "variable" mean 50/50, and "occasional" mean 75/25?

Please respond in your "Instrument Corner." I have been unable to find this information in my books and it really bugs me when I can't find answers to questions! FAA GENERAL AVIATION NEWS is an excellent publication—keep up the good work!

Phil Branagan
South Bend, Ind.

The main body of the forecast is used in deciding whether or not an alternate must be listed in an instrument flight plan, and also whether a given location qualifies as an alternate (for which there must also be specified minimums). Incidentally, the conditions listed in the main body of the forecast are expected to prevail more than half the time.

In weather language, "occasionally" mean "frequent changes for short periods of time." When the term "variable" is used (mostly in observations) it will usually be explained in the remarks.

Many of these terms are defined in a new book "Aviation Weather Services" published by National Weather Service and FAA as a companion book to the newly revised "Aviation Weather." Both are available from Government Bookstores or by mail from GPO, Washington, D.C. 20402. Prices are $1.95 and $4.55 respectively.

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Checking the tanks a tiresome chore?

Walking home is also a bore

Suggested by V.E. Jones, ATC
Kahului, Maui, Hawaii