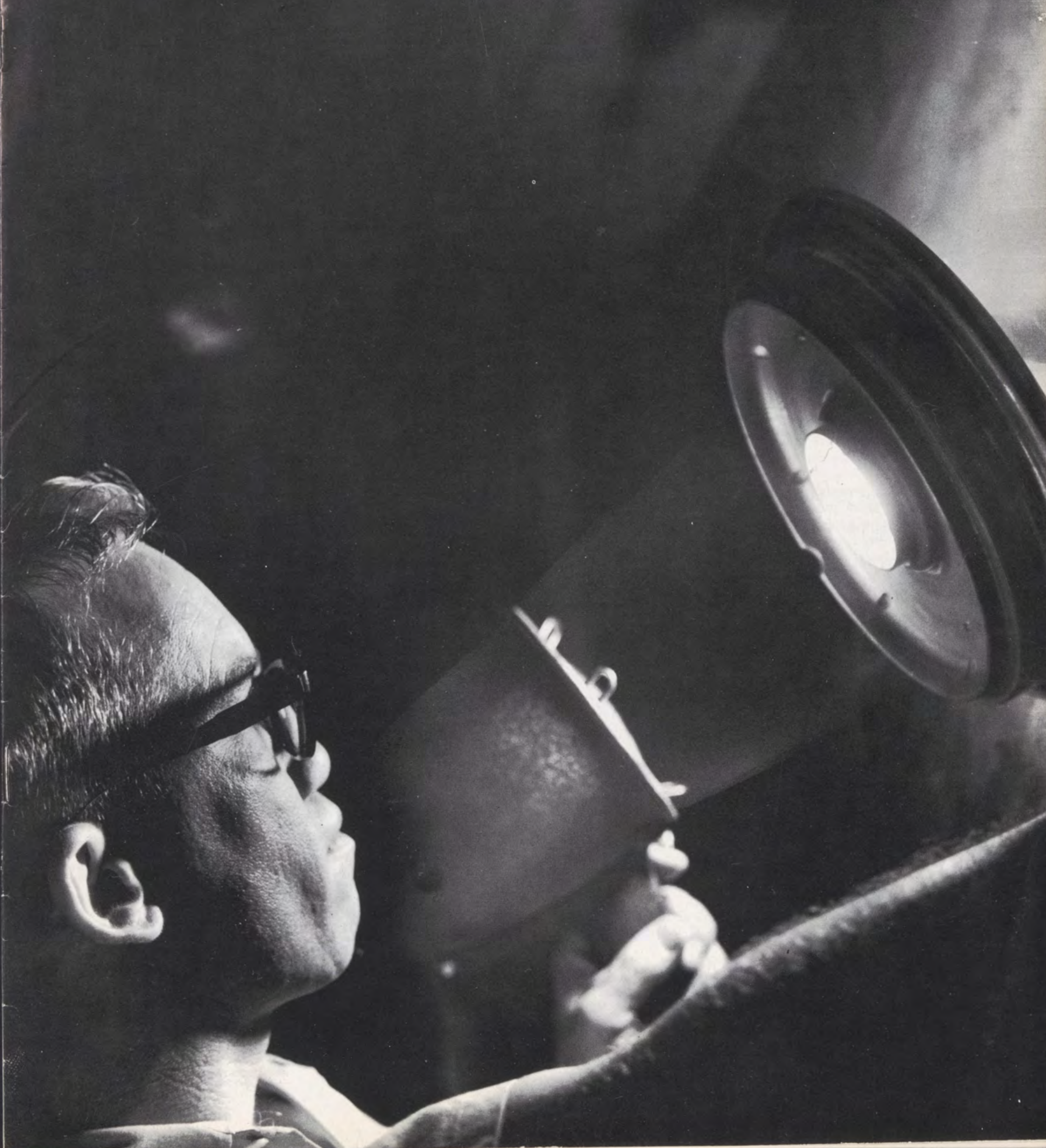
FAA AVIATION NEWS

OCTOBER 1967



COVER

An eerie glow lights the face of a mechanic as he checks wheel for cracks using NDT fluorescent dye . . . See page 4.

FAA AVIATION NEWS

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Somebody Down There Likes Me

"I'm lost . . . I think I'm due north of you . . . I'm out of fuel . . . Can you help me?"

Ten times a day on the average a radio message telling of a pilot in trouble echoes through the nation's airways. In 1966, 3,351 distress calls were picked up at Federal Aviation Administration facilities across the land and responded to with life-saving speed . . . "May Day pilot, this is Oakland Center. We believe we have you on radar. Turn left heading zero six zero. . . ."

FAA's 663 air traffic control facilities, including airport towers, en route centers and flight service stations, have a complement of over 16,000 air traffic control specialists. Their duties vary, from guiding huge 150 passenger airliners along 40,000-foot jet routes to bringing single place light planes onto the runway. They are given highly specialized training in the use of radar, radio, weather charts instrument landing and navigation equipment, traffic flow and automated systems. But each one of them is prepared at any moment to interrupt his work pattern to give assistance to an aircraft in trouble.

Response to an emergency signal calls for a cool head, quick thinking and a pinpoint familiarity with the local terrain. Foolish pride often causes the pilot in trouble to delay seeking help until only minutes—or seconds—stand between him and a crash. A pilot without instrument qualifications may try to feel his way down through an overcast, and then suddenly lose his bearings and his nerve, as his horizon disappears. Or he may coast on top of a cloud layer seeking an opening until his tanks run dry and the engine starts to cough, and a problem has been converted into an emergency.

Unavoidable emergencies due to engine or mechanical failure do occur occasionally, but more than half of the 3,351 "saves" logged by FAA air traffic facilities last year were simple cases of inexperienced pilots getting lost or disoriented. Often they waited so long to call for help that only extreme ingenuity on the part of the responding air traffic specialist prevented a tragedy.

The Oregon pilot of a single-engine aircraft who suddenly reported, "Heavy snow, unable to proceed in any direction," is a case in point. Luckily for him, a flight service specialist was able to contact the state police in time to halt traffic on the highway immediately beneath him, where he made an emergency landing.

A non-instrument-rated pilot with three passengers on board, reported . . . "Low on fuel . . . unsure of my position." At 3,500 feet he was over a solid cloud deck with only an 800 foot ceiling at the Indianapolis Airport below. An FAA tower controller obtained an offer of help from a twin-engine aircraft on instrument approach. Vectored by the controller into visual contact with the aircraft in distress, the more experienced pilot was able to lead the other safely down through the clouds. A check of the fuel supply, after landing, showed only two or three minutes remaining.

But FAA's flight assistance cannot always work miracles, and some pilots who call for help at the last second are less fortunate, as the annual accident toll indicates. Many accidents could be averted if pilots would bear in mind a few cardinal rules about what to do when trouble strikes:

1. At the first sign of mechanical trouble, contact the nearest FAA facility and tell them the problem and what you are doing to correct it. They may be able to contact an expert pilot or mechanic on your model of plane. In any case, if you have to land quickly they will have spotted the nearest air field and alerted police and rescue equipment if necessary. If the trouble clears up, it probably won't even go down in the books as an assist.

2. Remember that mountains may block out radar and radio coverage. Before you assume your radio is faulty, gain as much altitude as you can safely.

3. As soon as your call has been answered, give your altitude, heading, and last known position or visual reference. These three pieces of information will start an immediate radar search, while you are filling in other details of your problem. Try to hold your altitude and heading until you are advised otherwise. If you are really lost and in clouds, guessing which way to turn could be a kind of Russian roulette.

Every year dozens of letters are received by FAA Administrator William F. McKee expressing gratitude for flight assistance. "Your people sure helped me out of a a mess. I don't know how I can thank you enough . . ." is the usual sentiment, as the letters tell of tense moments in the air with one sweating hand on the microphone calling for aid.

Sometimes the letters tell how the anxiety that flooded the cockpit when a pilot began to sense trouble was dissipated simply by the reassuring voice of an air traffic specialist on the radio. Knowing that a pilot is not alone with the problem can be all it takes to clear the mind of worry and allow him to take proper corrective action. "Somebody down there likes me," was the comment of a clergyman-pilot, after a flight service station near Huntsville, Texas, helped him restart his engine in flight and guided him to a safe landing.

Gathering lost, strayed or crippled planes into the fold is all a part of a day's work for FAA's air traffic service. ■

NDT Down with DOWN TIME!

Radiological eyes that see through oil, grease and layers of metal, sonic probes that no one can hear, magnetic flaw charting, electric currents and phosphorescent liquids that search for hidden damage—these are some of a new array of tools that are adding a fifth dimension to aviation safety and at the same time knifing into maintenance costs.

These are the tools that make nondestructive testing (NDT) one of the most attractive developments in aircraft preventive and routine maintenance. Through their use, virtually every component in an aircraft can be inspected "in place," thereby eliminating removal, disassembly and reinstallation costs. Discernible in the not too distant future are devices which will measure the rate of fatigue in an aircraft and relay the information to engineers on the ground hundreds of miles away.

The tools of NDT are expensive to develop, to be sure, but in the aviation business time is the arch villain, and this is where NDT more than makes up for its price.

In the first place, nondestructive testing—as the name implies—spares the airplane. With conventional maintenance, some areas of an engine or airframe cannot be reached without some incidental (and expensive) destruction, such as removal of cabin upholstery, bulkheads, etc. NDT is expected to provide a reliable inspection of parts without necessarily requiring physical contact.

NDT makes use of X-ray and other forms of penetrating radiation, ultrasonics, dye penetrants, eddy currents, magnetic particles and microwaves. Formidable as the terms sound, with unmistakable overtones of *very, very expensive*, NDT is nevertheless also a part of the general aviation maintenance scene—whatever applies to a "big" airplane, more often than not, applies to all airplanes.

In a recent forum on nondestructive testing in Washington, an airline maintenance expert calculated that a Boeing 707, sidelined for maintenance during the "golden hours" (from 7 a.m. to 10 p.m., the hours the traveling public prefers to fly) cost an airline $1,500 for each hour of "down time." An hour's down time cost for a Boeing 720 is estimated at $1,374. Even the much smaller Lockheed *Electra* gives the auditor's a $716-per-hour headache.

Cost of Down Time Goes Up

With the civil air carrier fleet growing bigger, not only in terms of aircraft, but especially in capacity, the role of NDT will grow larger. FAA forecasts that U. S. domestic and international air lines will carry some 352 million passengers, flying an estimated 266 *billion* revenue passenger miles in 1977. This is three times what was carried in fiscal year 1967. In ten years, the FAA study reports, the air carrier fleet will have 3,500 planes, most of them expensive jets. As the ratio of passengers to aircraft increases, the lost revenue during maintenance will rise significantly. At some point in the near future, the cost of NDT is expected to be far overbalanced by the savings in operational hours. In theory the cost of NDT diminishes as the size, complexity and number of air carrier and executive type planes increases. One item, tires, will give an idea of the savings in aircraft utilization almost guaranteed by nondestructive test procedures. One major airline mounts some 5,000 tires a month, or about 60,000 a year. Each wheel is given either an ultrasonic or eddy current test to make sure there is no crack that will cause an in-service failure. If the wheel had to be dissembled in order to inspect it completely, or replaced after a conservatively calculated life span, maintenance costs would skyrocket.

The Civil Aeronautics Board recently reported that material failures were a primary factor in about six per cent of the accidents it had investigated, the vast majority occurred in pleasure and small aircraft. Material failure during 1964 and 1965 was involved in 538 small, fixed wing aircraft accidents, compared to only 13 during the same period for large piston aircraft and only three each for turboprop and turbo jet aircraft.

Although the scientific gadgetry is brand new, the principle

Portable X-ray, mobile as a tool box, being sited for DC-3 stabilizer check.

Eight inspectors swarm over **Electra** turboprop wing with ultrasonic "black boxes" searching for internal structural flaws.

Above: Technician uses eddy current to inspect cylinder. Irregularities would oscillate needle. Left: Dye penetrant highlights crack in wheel.

of nondestructive testing is not—nor has the technique been restricted to aircraft applications. Back in the 1800's railroad car wheels were tested by striking them with a sledge hammer. The trueness of the tone would tell the inspector if the casting had any cracks. Inevitably, one foundry, so the story goes, ran into a 100 per cent rejection rate and the place was turned upside down searching for bad casting procedures. Things returned to normal when it was discovered that it was the inspector's hammer that had the crack, not the wheels.

To avoid "cracked hammer" incidents, all devices used in NDT are calibrated against rigid controls.

Dye penetrants were among the earliest tools of NDT—it is probable that the aluminum propeller of the *Spirit of St. Louis* was checked for cracks by an early NDT method: the application of a thin oil solution, followed by a whiting overlay. A new generation of dye penetrants are phosphorescent liquids which disclose imperfections when they lodge in minute cracks and porous areas. This technique is a tremendous boon in the maintenance of modern engines where parts are exposed to critical temperatures. For example, using dye penetrants, airline mechanics are able to uncover cracks in the hard to get at "blucket" (so called in maintenance jargon because it is half bucket and half blade) which operates partly in the hot, partly in the cold area of a jet engine.

This unhappy hot and cold marriage results in hair line cracks where the temperatures come into conflict. Potential engine failure due to a cracked blucket breaking off has a stiff price tag—about $20,000. Using the dye penetrant technique, engines are inspected on the wing in about four man-hours. Doing the same job on the bench would consume about 160 man-hours.

A specialized dye penetrant procedure is the "wink-zyglo," used to detect cracks deep in the hub that retains first stage jet fan blades. A compressive stress, which twists and pulls, is put on the hub; if any cracks in the rim slot open to admit the penetrant—a black light shows up in a wink. Other coloration agents of NDT include special paints which change color according to the heat range experienced—in some installations the coloration is visible to the in-flight engineer.

An old standby in NDT is magnetic testing, long known as Magnafluxing, first used in World War I. It has since been refined by the incorporation of fluorescent-coated particles which can be viewed under black, fluorescent or ultraviolet lights. Its chief drawback is its limitation to ferrous metals—it cannot be used for inspecting aluminum, titanium, magnesium etc.

The Magnaflux principle is familiar to every schoolboy who has ever observed the pattern of iron filings on a sheet of paper covering a bar magnet. A magnetized piece of metal has a north and a south pole. Where a crack occurs, a new pattern of north-south polarization takes place. When ferrous metal filings are exposed to the material, they form a pattern that defines the lines of force of the new polarization, effectively pinpointing the crack. Magnaflux (a trade name for one of several magnetic particle techniques) can detect cracks in ferrous metals even under a coating of cadmium or chrome plating.

X-Ray Photography

Nondestructive test practitioners make extensive use of X-rays, not exclusively for *diagnosis*, as do their medical colleagues, but also for *prevention* before an "illness" occurs in an airframe or powerplant. The use of X-rays as an inspection tool in aircraft maintenance and overhaul became general in the early 1950's. Its hard dollars and sense value was soon apparent.

For example, in 1955, an FAA Airworthiness Directive prescribed a mandatory inspection of the wing tanks of a certain type aircraft every 800 hours. To physically examine the area would require stripping away the wing tank sealant, a 32-man-hour job. X-rays did the job in two hours, and proved so successful that the interval between physical inspections was lengthened from 800 to 2,400 hours.

The introduction of honeycomb construction saw a new application of X-ray NDT—detection of separation of the honeycomb from the skin structure. Water entering the separation unseen could freeze at altitude and result in further separation leading to progressive destruction which could not be observed. The "half-dollar" test (tapping the suspected surface with a fifty-cent piece) was not only time consuming but unreliable. A simple X-ray exposure accurately located the point of water entry.

X-raying is now a "big thing" in aircraft NDT. Using a special X-ray emission device, inspectors can cover an area of 200 square feet—*in one shot*. A nose-to-tail X-ray examination of a modern jet will call for about 2,800 14" by 17" pictures. And X-rays are versatile: a 360 degree emission tube can inspect fuselage frames for structural integrity without removing interior upholstery and panels from passenger or cargo compartments.

Radioactive isotopes have opened a new dimension in X-ray NDT. Iridium 192, a long-life energy source, provides the radioactivity necessary to penetrate and produce a photo from the *inside* out. The isotope capsule, no bigger than a pencil in diameter and shaped in various forms from spherical to the familiar medical capsule, is inserted into the heart of the engine. Preliminary to this, the engine is wrapped in X-ray film, using appropriate holders to suit engine configuration.

A life-saver in medical science, X-ray photography may broaden the safety margin as well as improve the economy of all forms of aviation. ■

(Next month: more of the NDT wonder tools . . . the cost of a NDT shop . . . future implications.)

Born to Fly

If you are a small boy with big dreams of becoming an astronaut, and you start out with a physical handicap, what happens to those dreams? Do you give them up? Do you turn your face away from the stars and let your thoughts drift elsewhere?

Not if you are plucky little Sonny Hall, eight years old, with a stout heart that hasn't any room for doubt or discouragement. You keep watching the skies, following the airplanes with your eyes and the rockets with your imagination, devouring books on airmen and flight and wondering all the time what it feels like to be up there in the clouds.

Last month Sonny Hall found out.

A friend of the family arranged for him to fly up to New York from Washington, D. C.'s Dulles International Airport. And the friendly FAA airport manager arranged for his visit to be a VIP affair of the highest order.

An airport police car brought Sonny Hall to Dulles Airport. The first thing he saw was a beautiful lake, with an island floating in the middle. Nearby was a building that looked like a gigantic hammock spread out over the earth and held up by huge pillars of concrete, as though ready to catch the airplanes as they swooped down from the sky. This, he was told, was the terminal where people came to board airplanes. Next to it was a strange tower, almost 200 feet high, with a glass eye that looked in all directions.

The famous Dulles Tower, Sonny discovered, when he was whisked up an elevator inside it, had a dark, mysterious room where men sat watching what looked like television sets, only instead of pictures they saw small blobs of light moving about. He learned that these were radar scopes, that the little blobs were actually airplanes, and that the men were FAA controllers, who directed the traffic in the sky many miles away by talking to the pilots over the radio.

The "eye" at the top of the tower, he found, was a glass-enclosed room where other controllers sat watching the airplanes moving near the airport and directing air traffic by radio. The watch supervisor let him listen in on the radio communications. A voice said: "Dulles Tower this is Piedmont flight 302, inbound." It was his flight!

Back inside the terminal, Sonny, his mother and his friends sat in a comfortable lounge while the airport manager, Dan Mahaney, explained that the airplanes did not actually come down on the roof, but out on the airfield. While they were talking, the "room" began to move, and when Sonny looked out the window he saw that they were actually traveling on some kind of huge, wheeled vehicle as big as *eight* city buses.

This "mobile lounge," he was told, carried passengers to the jet ramp, where the big airplanes parked. A special stairway unfolded from the lounge to the jet, for the passengers to step aboard. When Sonny boarded his Piedmont airliner for New York, a friendly captain took him forward to the cockpit and showed him how the aircraft operated.

When the plane took off, Sonny was filled with excitement and wonder; now he could actually look down on the earth! Flying over his home near Baltimore, he could almost part the clouds with his hands and peek down on his home, as small as a toy block, with toy-like cars crawling slowly around it. The world below seemed to him like a make-believe world; the real world was up above the clouds.

"Now I know what it's like in Heaven," he said. And he wasn't at all afraid. He sat up straight in his seat like the boy-hero of a modern fairy tale, who knew that you had to believe in a miracle in order to make it come true.

Sonny Hall's whole life has been a miracle. From the day he was born, with an incompletely developed arm, he has been surprising doctors, teachers, friends and relatives (he refers to his four younger brothers and sisters as "the kids") with his will to live, his ability to hold his own, to learn and to dream.

His ambition is to take part in the heroic quest of flight to the stars. Last month, on that memorable day at Dulles International Airport, he came a little closer to his dream.

—Lewis Gelfan

Left: Piedmont Captain Edward Thurber pins wings on Sonny Hall after checking him out on F-27. Above: Sonny and his mother ride the mobile lounge at Dulles International Airport. Right: Sonny and his mother are served by stewardess Trula Kirkpatrick prior to departure.

Left, Ansel H. McAllaster, FAA general aviation operations inspector, chats with Tony Vangrieken at Antwerp Airport.

A Shortcut for European Pilots

ANTWERP—An FAA-approved Belgian flying school, which conducts classes in English along American lines for its polyglot student body, boasts a better exam record than many of its counterparts in the U.S.

SOTRAMAT flying school, located at Antwerp Airport, only three years old, also is extremely proud of its safety record. Last year, the school logged some 7,000 flight training hours without an accident. Thus far in 1967, with a goal of 10,000 hours on the horizon, their record is unmarred.

Students from Western European countries flock to the school to earn coveted FAA certificates as private and commercial pilots and to acquire instrument ratings. Because FAA licenses are readily accepted by West European governments, they have become a convenient way of overflying the disinterest which many Europeans feel that their governments evince in encouraging civil aviation. This disinterest is evidenced by the cumbersome examination machinery which deters many a fledgling.

In Belgium, for example, it can take up to six months to schedule a flight exam for a Belgian license. Moreover, it can take up to two months to get the results of a written exam, as compared to the 10 days it takes for the FAA computer in Oklahoma City to grade the tests.

Managing SOTRAMAT's flying school operation and its chief instructor is Tony Vangrieken, an amiable, soft-spoken Belgian who has an FAA ATR license and instructor's rating. He was recently designated an FAA pilot examiner to give oral and practical tests, the third such designee in Europe.

McAllaster flies to Antwerp regularly to give written tests to budding pilots.

"The whole attitude of FAA," says Vangrieken, "is to get people airborne. Some European governments seem to want to do just the opposite."

Vangrieken's students can get their FAA written exam any week day in Frankfurt, Germany, where an FAA general aviation operations inspector, Ansel H. McAllaster, has his headquarters. Or the students can wait for McAllaster to make his monthly visit to Antwerp on one of his circuit-riding flights which he conducts throughout Western Europe.

McAllaster pays tribute to SOTRAMAT's school by pointing out its very low failure rate on the written exam, one lower than in the U.S. Says McAllaster: "There's only about a 10 per cent failure rate the first time a student takes a written. That's well above the 20 per cent failure allowed in FAA-approved schools in the U.S."

A British aviation expert who visited SOTRAMAT flying school summed up his impressions this way:

"Coming from Antwerp, one feels that FAA's refreshing philosophy—which incidentally helps to sell more airplanes—has found a firm European foothold in Belgium, from which it could have an important effect in brightening up the whole pilot training situation in the area." ■

Above: Preheating the engine and cabin is a prime safety precaution that makes for easier engine starting and more comfortable flight. Below: Air Force mechanics apply de-icing fluid from safe vantage point on "cherry picker" lift.

An "ice vise" accumulated on this engine after brief exposure during sleet storm.

Above: Before hangaring plane after winter flight, top the fuel tanks to prevent condensation. Below: When plane remains idle between flights, condensation can quickly accumulate dangerous amounts of water. Drain your sumps.

COLD WEATHER PREPARATION:

The Time is Now

As a matter of cold fact, airplanes generally get less use in the winter, but they need more care and attention at this time than at any other season. Cold weather is a silent assailant that can cripple an aircraft in many unseen ways — congealing oil, blocking up vents and static ports, and even shrinking the structure so as to interfere with control response.

Qualified mechanics know how to prepare an airplane for winter in each locality, but the responsibility lies with the pilot to understand the basic preparations needed insure him of smooth flying when he does fly in cold weather. The basic needs are shelter, winterization, and heating.

Ideally, aircraft in cold regions should be hangared. Even an unheated hangar is a tremendous advantage in protecting the airplane from external icing, snow accumulation and corrosion. It also affords the pilot a welcome shelter in which to work on his plane, or make a careful pre-flight examination. Where a heated hangar is used, care should be taken to avoid condensation —top tanks before bringing the aircraft in from a flight. On departure, fuel sumps can be drained inside the hangar, but they should be drained a second time if the plane stands outside in cold weather for a half hour or more.

Where a hangar is not available, a hard-surfaced airfield is preferable. Mud and slush spun off the wheels during taxiing and takeoff from dirt runways can be thrown into wheel wells and may freeze hard at altitude. Jammed wheel well doors or other landing gear problems are likely to follow. If wet muck has been accumulated on takeoff, the gear should be retracted and extended several times to help clear the moving parts. If operating in sloshy conditions cannot be avoided, fixed gear wheel pants should be removed for the winter. Mud and slosh packed into them while rolling on the ground may freeze in flight and lock the wheels.

Batteries must be protected from extreme cold weather. Wet cell batteries can freeze and rupture at 32° Fahrenheit. Applying a high charge to a frozen battery may explode it, spraying sulphuric acid.

The freezing point of a wet cell battery is determined by the charge, and the resultant specific gravity:

	Specific Gravity		
(No charge)	1.000	freezes at	32 F
(Partial charge)	1.050	" "	26 F
" "	1.100	" "	18 F
" "	1.150	" "	5 F
" "	1.200	" "	—17 F
(Fully charged)	1.250	" "	—61 F

FAA certificated winterization kits are available from the manufacturer for many aircraft types and models. These are preferred over homemade kits, which would require individual FAA approval and which might nevertheless invalidate the manufacturer's warranty. Kits are designed to restrict the cooling effect of airflow over the engine. A cylinder head temperature gauge should be installed, to make certain engine temperatures do not run dangerously high.

Where extreme cold is the rule rather than the exception, along some of the Canadian border states, for example, *lagging* oil lines and tanks is also a recommended form of winterization. Severe subzero temperatures are capable of congealing oil flow to the point where engine failure occurs. Lagging, or wrapping lines and tanks with non-inflammable tape (commercially available), protects vital oil flow. Selection of proper seasonal lubricant depends on engine type, and can only be determined reliably by the manufacturer.

Another problem brought about by exposure to the elements is uneven airframe shrinkage. In cold weather, aluminum alloys, the basic structural material in most aircraft, contract at a different rate than the steel control cables. Cable tension could become too loose, or too tight, seriously affecting the control response of the airplane. A mechanic can adjust the cable tensions safely for winter with a tensiometer.

The mechanic will also use a torque wrench to see that flexible tubing and seals, hose clamps and other fittings in the hydraulic system are up to the recommended torquing specifications for winter. Hoses and seals need a thorough going over at this point, and if showing signs of deterioration — cracking, checking, drying out — should be replaced before the weather makes repair work unpleasant.

Ice sometimes forms in breather lines and the resultant pressure buildup can blow the oil filter cap off or rupture a seal—allowing oil to be pumped over the side. One method of forestalling an oil pressure blow-out is to drill a small hole in the line, or cut a slit in the hose, patching the opening over with tape. If pressure builds up to a dangerous point, the tape will be blown off and the pressure relieved through the small opening without a heavy loss of oil.

Caution: do not drill the hole or cut the slit where escaping oil and vapor could strike against the exhaust pipe.

Cabin heaters are important in winter. Since cabin heat is usually drawn from the area surrounding the muffler or exhaust system, the muffler, joints and welds in this area must be inspected carefully with flashlight and wirebrush. The slightest crack could allow deadly carbon monoxide to be drawn into the cabin—and this odorless, colorless gas gives no warning. FAA studies have shown that a concentration of 0.06 per cent can cause unconsciousness; 0.1 per cent can bring death within an hour.

Use of cabin heat before takeoff is sometimes desirable to insure instrument reliability. Instrument switches have been known to stick in low temperatures.

Aircraft that have to be started after standing outdoors in subzero weather may require some form of external heat—usually from a preflight heater that throws a stream of hot air. Preheating requires constant supervision, with a fire extinguisher at hand. The hot air stream should never be directed at fuel, oil or hydraulic lines, upholstery, canvas engine shrouds or other naturally inflammable materials. That old reliable but not notoriously safe preheating standby, the plumber's fire pot, should have a wire mesh grate between the pot and the engine to screen out flaming bits of carbon.

If preheating is not convenient, pull the engine through by hand a few times before trying the starter, and don't overprime—a great temptation in cold weather, but no help in starting up an airplane. Carbon tetrachloride and carbon dioxide fire extinguishers can freeze if the mercury dips low enough. Make sure yours has been winterized, or you may feel very foolish with a dud cannister in your hands watching a $20,000 airplane go up in smoke in front of your eyes.

In addition to providing shelter, warmth and winterization care for his airplanes, the winter pilot has a cardinal rule to remember: don't hurry the preflight! In bitter weather everyone is tempted to walk quickly around the airplane, hands in pockets and shoulders hunched against the wind, and then hop aboard. *Resist that temptation in the full knowledge that your life may depend upon it.* A lot can go wrong with a plane just standing on the ground in the winter.

Condensation of moisture on the sparkplugs, for example, after prolonged idling, can freeze and bridge over the electrodes, shorting them out. (Damp plugs should be removed and baked in moderate heat until dry.) Pitot tubes and other openings, which are usually closed off when the aircraft is parked outdoors in bad weather, must be examined individually to make sure that all covers have been removed, as well as control locks. Ice must be carefully removed no matter how small the buildup. Iced-over fuel vents, incidentally, are a notorious cause of fuel stoppage.

No cold weather preflight is complete without draining all of the fuel filters and sumps. Use a transparent container—a fruit jar is fine—and draw enough of a sample to give a true picture of the contents of the tank. Be especially suspicious of gas bought in drum containers.

Probably the main danger in cold weather flying is that numbed fingers will lead to an abbreviated checklist. But there is no better insurance you can get than a careful, methodical checkoff of each preflight item before you climb into the cockpit. Then those grim, forbidding wintry skies will look a lot more friendly.

Stunting for the Hollywood Camera

Precision Flying is Needed in a Profession Where the Price is High and Mistakes Costly.

Climbing down a rope latter on to a moving train—favorite stunt in early day Hollywood serials—provided plenty of thrills.

Hangar fly-throughs were all the rage in 1928 movie dramas.

Lindbergh over Dublin, Hollywood style.

Stunt pilot Dick Grace in "Dawn Patrol".

Realistic "Dogfights" of World War I.

Paul Mantz (arrow) tearing off the wings.

Hank Coffin clips steeple in "Lilac Time."

Hollywood's stunt flyers once received a paltry $100 for crashing an aircraft into splinters. Today a stunt like that brings in several thousand dollars per sequence, but there is still a question whether the compensation is equal to the hazard involved.

Frank Tallman, uncrowned king of Hollywood's stunt flyers, is doing no griping on this score. In his view, deliberately flying a plane in a manner that appears highly dangerous is a skill born of many thousands of hours of flying experience and a keen awareness of the capabilities of many types of aircraft.

Tallman, whose log book shows more than 12,000 hours—the equivalent of a year and a half aloft—is the most sought after of the handful of movie stunt pilots now in the business.

Within the past year Tallman has done stunt work for such television series as "F-Troop," "Combat," "Green Acres," "Wackiest Ship in the Army," and "Hogan's Heroes." He also worked in a feature length film called "Wings of Fire."

In his spare time, he supervised construction of a replica of the "Spirit of St. Louis," and flew it into Le Bourget Field as a highlight of the Paris Air Show. He also operates an air museum containing historic aircraft in the Los Angeles area.

In the course of a day's work, Tallman may put a 1918 German Fokker D-7 through its paces, loop a frail Bleriot monoplane, or race a hot air balloon across Catalina channel.

For the picture "Mad, Mad, Mad, Mad World," Tallman buzzed a control tower, taxied a plane into the glass wall of a restaurant, and flew a twin-engine Beech at 160 mph through an open hangar. But his most dangerous stunt, he will tell you, was flying a twin-engine plane through a billboard:

"I practiced by setting up a simulated signboard rimmed with rope. The leading edges of the wings were sharpened to cut on impact, should the plane strike the rope framework. Then came the moment of truth. The actual signboard was rimmed in steel and latticed with wooden 2 x 4s. When I crashed through the board, debris clogged the air intake and the engines immediately began heating up—at 12 feet off the ground! Luckily it cleared up right away."

Because Tallman is a perfectionist, the stunt left him unscratched. After planning each stunt carefully with the director and producer of the film, he outlines it in detail to his FAA General Aviation District Office supervisor, who decides whether or not to grant a waiver. Part 91 of the Federal Air Regulations prohibits stunt flying unless a specific waiver has been sought and granted for the specific performance planned in a specific airplane. When an aircraft is especially built or modified for a film sequence, an FAA limited "experimental" certificate is required as well.

Hollywood stunt flying has a colorful history. In the Twenties and early Thirties, a band of about a dozen stunt men organized in a club known as "The Black Cats," did most of the stunt work in the early Ruth Roland serial films and other aviation thrillers such as Clark Gable's "Hell's Angels."

Among the best known of the early stunt pilots were Dick Grace, Art Goebel, Frank Clarke, and Frank Tomick. A typical stunt for Grace was to change planes in mid-air, actually dropping from one ship to the other. And he didn't believe in wearing a parachute.

Another famous stunt pilot, Joe Johnson, flew under a Pasadena bridge with two girls standing on the top wing of the bi-plane. For another film shot, a card table was wired to the wing of the bi-plane and two stunt men dressed as cowboys simulated a card game as the craft skimmed 3,000 feet above Los Angeles.

Stunting is not always an occasion for humor. Recently a well-known stunt man, Paul Mantz (Tallman's business partner) lost his life during the filming of "Flight of the Phoenix" for Twentieth Century-Fox. The specially built airplane he was flying across the sand dunes near Yuma, Ariz., cartwheeled on a sand hummock, killing Mantz instantly.

Although Hollywood is the land par excellence of make-believe, Tallman does not believe in faking aircraft. He insists that the planes he flies be completely authentic. He believes that when you call a Spad a Spad, you should actually see one.

Tallman has the world's largest stock of photographic planes and he rents these out for movie and television work. One of his planes, a Stinson L-1, can stay aloft at speeds as low as 25 mph. Others will bring back memories of bygone wars, celebrated "aces" and aviation pioneers. Probably no other man in America—or the world—is current in such an amazing variety of airplanes. But that's what it takes to be Hollywood's kind of stunt man.

—*Clifford Cernick*

Giants of the Industry/ Last of a series

IGOR SIKORSKY:

Virtuoso of Vertical Flight

Incongruous is probably the best word to describe the goings on just outside Stratford, Conn., on Sept. 14, 1939.

Here was this distinguished, mustachioed gentleman of 50, clad in a dark business suit with a black fedora rakishly turned up fore and aft, sitting in a jungle gym of metal tubing suspended beneath a noisy whirling rotor 100 feet in the air. Thirty years after his first experiment in vertical lift, he was about to test the first true helicopter developed in the Western Hemisphere.

He was born in 1889 into a well-to-do, scientifically inclined family of Kiev, Russia. At age 20, having just earned his engineering degree at Kiev Polytechnical Institute, Igor I. Sikorsky designed and flew and crashed his first "rotary wing" airplane. After repeated crashes he was practical enough to recognize that the engineering complexities of vertical lift aircraft were, for the moment, beyond his ken, and he turned to "conventional aircraft."

By the time he was 23 his sixth aircraft, the S-6-A, took first prize at the 1912 Moscow Aviation Exhibition and moved him in as head of the aviation subsidiary of the Russian Baltic Railroad Car Works.

Within a year his four-engine "The Grand" flew into the sub-Arctic night—and into history. It was the world's first successful multi-engine airplane.

Befitting its name, the craft was "grand" in every respect. It had an enclosed cabin, lavatory, upholstered chairs and an exterior catwalk for passengers inclined to take a stroll in flight. In World War I, improved and bigger versions of "The Grand" proved to be extremely successful bombers.

In 1917 the Russian revolution drove Sikorsky into exile in France. He designed bombers for the Allies until the war ended, and emigrated to the U. S. in 1919.

After four years of lecturing and teaching to make ends meet, his friends and students set him up as head of the Sikorsky Aero Engineering Corp. He wasted no time in getting into production—on May 4, 1924 he test-flew the S-29-A, a two-engine, all-metal biplane transport which proved a forerunner of the modern air liner.

Like the rest of America's aviation pioneers, Sikorsky was no stranger to a chronic shortage at the bank. At one point, Serge Rachmaninoff, the famed composer and pianist, saved the company with a $5,000 check. Sikorsky himself scavenged far and wide for precious metal parts. More than one junked bedframe contributed angle iron to the airframe.

The S-29-A led to a distinguished line of large aircraft, including the twin-engine S-38 amphibian which opened up Central and South America air routes and did much to make Pan American Airways a household word. The S-38 led to Sikorsky's company coming under the banner of United Aircraft, where it remains today.

The golden age of aviation was dawning. The Sikorsky S-42 "flying boat" blazed the path to Hawaii and the Orient; the S-44 was unquestioned champion of the Atlantic run.

With his reputation firmly established as an aircraft designer, Igor Sikorsky dusted off his folio of helicopter plans, and returned to his first love—vertical flight. He brought himself up to date on the state of the art and in 1938 got the go-ahead from United Aircraft to develop a direct lift aircraft.

This was the VS-300, a simple helicopter with one main rotor for lift and one much smaller rotor, at the tail of the spidery, welded-steel tubing fuselage, to counteract torque.

When the horizontal thrust of the tail rotor just balanced the torquing or twisting effect of the main rotor, the helicopter was able to maintain a straight heading. Increasing the thrust pushed the tail to the right, producing a left turn; reducing it similarly produced a right turn. Thrust output was controlled by varying the pitch of the rotor blades, while the rpms remained constant.

The main rotor worked on the same principle, increasing the pitch of the blades for vertical lift, and decreasing them for descent—the so-called collective pitch control that is standard in helicopters today.

Another form of pitch control—the cyclic pitch—enabled the pilot to increase the main rotor pitch at any particular point in the rotating circle. If he wanted to point the nose up, for example, he could increase the "bite" of each blade momentarily just as it passed in front of him. This gave the aircraft greater lift over the nose, and produced a climb. Increasing the pitch behind him put the nose down. Similarly he could "bank" the helicopter in any direction simply by pointing his "cyclic" control stick in that direction. By coordinating the two pitch controls, the direction and the speed could be controlled within the limitations of the power thrust.

The theory itself was as simple as it was ingenious, but the engineering process was a difficult, complicated and painstaking one.

Above: Igor Sikorsky flies original VS-300 in maiden flight. Right: S-64 **Skycrane** can hoist variety of external loads. Below: Sikorsky in refined version of VS-300.

Alarming vibration, caused by insecure mounting of the main rotor, marred the first flights and sent the inventor back to the drafting table. More experimental "hops" were made, with the aircraft tethered to the ground as Sikorsky cautiously tried out the controls. Soon the VS-300 was making short flights of one and two minutes, hovering in one spot and slowly moving forward and backward and from side to side.

By mid-summer of 1940, Sikorsky had perfected the VS-300 and introduced the first really maneuverable helicopter to the public. His first customer was the U. S. Army, which placed an immediate order for a modified VS-300 with a 165-hp engine and an enclosed cabin, designated the XR-4.

The completed XR-4 was delivered from Stratford, Conn., to the Army's Wright Field at Dayton, Ohio, in May, 1942, part of the 760 mile ferry trip being flown by the inventor himself. En route, Sikorsky and his chief test pilot, C. L. "Les" Morris, amused themselves by dropping down to check route signs or to ask directions from astounded motorists while hovering in the air.

At one airport they deliberately overshot the runway and, as spectators braced themselves for a crash, casually backed up, hovered, and gently settled to the ground. People could not believe their eyes.

Although helicopter production and use came along too late to play a major part in World War II, the value of vertical lift aircraft was clearly established in emergency rescue work. In January, 1944, a steamship explosion off Sandy Hook, N. J., caused massive injuries to crewmen and a desperate immediate need for blood plasma. Coast Guard Comdr. Frank A. Erickson airlifted the plasma to the stricken crewmen by flying an R-4 through a blinding snowstorm. From that date to the present, the annals of mercy rescue missions are liberally dotted with miraculous "saves" that could only have been accomplished by helicopter.

Today Sikorsky's helicopters are clattering through the air in more than 30 countries. They are flown by all the U. S. military services, by half of the world's scheduled airlines and by many independent operators. The dependability of the helicopter is shown clearly in its role as the doorstep "taxi" of three American presidents.

Igor Sikorsky, at age 75, is still enthusiastically active in aircraft design, and it would not be surprising to see him achieve the first dramatic breakthrough in the field of practical VSTOL (Very Short Take-Off and Landing) aircraft. A man whose genius is versatile enough to encompass vertical flight as well as transoceanic air passage has virtually no limits.

—Frank J. Clifford

news

BRIEFS

• D.C. PILOTS GET HOME DELIVERY of aviation weather via commercial TV stations, thanks to an arrangement made by the FAA's Office of General Aviation Affairs and Washington, D.C.broadcasters. TV-viewing pilots are now able to "see" the weather as well as hear about it, a safety extra that FAA officials hope will be picked up by TV stations nation-wide, as a life-saving public service at no expense to either the agency or the public.

• VORLOC? That's right, and it stands for VOR-localizer. It is a low-cost item similar to a regular localizer but operates on VOR frequencies and can be received with conventional VOR receivers. Previously tested with satisfactory results at the FAA's National Aviation Facilities Experimental Center (NAFEC), the equipment also performed well at Jamestown, N.Y., where difficult terrain features provide a tougher-than-average proving ground. A complete report on the tests can be obtained from the Clearinghouse for Scientific Information, Springfield, Va. 22151 for $3. Ask for "Interim Report: Jamestown VOR Localizer (VORLOC)" AD 653-719.

• Fairchild Hiller's FH-1100 picked up a new operational dimension when it was recently certificated by FAA to operate on floats. The floats, which are inflatable and have five separate compartments, are fitted with skids to enable the helicopter to operate from land as well as water. Because of clean aerodynamic design, the floats permit higher touchdown speeds than was previously possible. A pair of floats weigh only 62 pounds, may be attached in half an hour once the aircraft is rigged for them.

• ONE OF THE LAST of the FAA type "O" towers, a 49-foot tall, five-sided panel structure, went into commission at Fanning Airport, Panama City, Fla., on Aug. 1. This brings to 310 the number of FAA operated towers. The Fanning installation is a VFR tower and is in operation from 7 a.m. to 11 p.m. In calendar year 1966, some 52,260 operations were logged at Fanning Airport.

• A SYSTEMATIC, CENTRALLY EVALUATED program for collecting reports on aircraft maintenance troubles got under way July 1 when FAA's 195 general aviation maintenance inspectors began filing the newly introduced Maintenance Irregularity Report (MIR). The MIR's go to FAA's Maintenance Analysis Center (MAC) at Oklahoma City where they are processed and analyzed by computer. The readouts will be studied by maintenance experts in an attempt to detect potential accident trends and indicators.

RUBBER SEALS REPLACE WHEEL-WELL "DOORS" IN 737

When Boeing's new 737 short-to-medium range jet transport goes into operation sometime next year, it will be without conventional main wheel-well doors if a new development by the B. F. Goodrich Co. works out. Goodrich has introduced inflatable rubber "seals" which fill the gaps around the main retractable gear, doing away with the heavy metal doors and, in the case of the 737, saving about 150 pounds.

The seals are arranged in a circle, with 17 segments to each wheel-well. When the wheels are fully retracted, the seals are inflated against the edges of the outer two main tires, forming a reasonably flush door for the landing gear well.

A manifold chamber inside the 737 feeds regulated low pressure air from the jet engine compressor to each seal unit. When the wheels are to be extended, an ejector draws the seals back flat against the side of the wheel-well. Even if deflation does not take place, the gear will extend normally.

Rubber wheel-well "doors" eliminate heavy metal doors and hydraulic actuating gear.

Air Taxi Operators Asked to Stand Up and Be Counted

The 3,600 U. S. air taxi operators on record with the FAA have been sent a one-page questionnaire designed to give an accurate picture of this growing industry as it was at the close of 1966.

The FAA air taxi census, first of its kind, is intended to fill serious gaps in factual knowledge about the size, equipment and extent of operations of the majority of operators. The Civil Aeronautics Board, aircraft associations, and aircraft and aircraft component makers are expected to benefit from the availability of detailed data on air taxi operations.

The census form is a simplified tally sheet which lists the operating characteristics of the air taxis, including IFR approval, interline connections, through ticketing agreements, scheduled flights and authorization to carry mail.

For the first time, an accurate headcount of aircraft types is expected to emerge, with data broken down to equipment type: single-engine piston; multi-engine piston; turboprop; turbojet and rotorcraft.

A section on manpower asks for employee types—pilots with ATR rating; other pilots; certificated mechanics; other mechanics and other employees.

Response to the survey has been better than expected. More than 1,000 replies were received within 10 days of the initial mailing in July. A follow-up mailing was made early in August, in order to obtain the most accurate survey possible.

The FAA expects to have a full report on the census available for interested persons before the end of the year. Announcement will be made in this magazine.

Stiffer Operating Rules Asked For Air Travel Clubs

With an eye to keeping aviation safety levels high, the FAA has proposed steps to tighten the rules governing the operation of travel club aircraft.

Affected are some 40 air travel clubs, some of which have as many as 2,000 dues-paying members. Club aircraft are generally large passenger planes in the DC-7 and Lockheed *Constellation* category which were sold as surplus by airlines when they converted to jet-powered fleets.

Under the proposal, clubs operating aircraft weighing more than 12,500 pounds would be bound by the same rules governing commercial operators of large planes and would be subject to the same Federal Aviation Regulations that apply to public air carriers.

Travel clubs are now operating under the liberal rules governing such general aviation as personal and business flying.

The proposal would require the flying clubs to conform to more strict and comprehensive qualifications for flight crews, training and proficiency of flight crews, passenger protection, airborne navigational and communication equipment, and aircraft operational control and maintenance.

Local Airports Give Communities Edge in Attracting New Industry

Proof that a community airport is a magnet for industry and a stimulant to business in general has been demonstrated in five communities in Texas, South Carolina, California, Maryland and Minnesota.

A recently published FAA study, "The Airport and Its Influence on the Community Economy," traces the economic growth of the five communities to the development of a local general aviation airport.

Singled out were public airports in Hereford, Texas; Sumpter, S. C.; Hayward, Calif.; Frederick, Md.; and Fairmont, Minn., all developed or improved with Federal assistance under the Federal-aid Airport Program administered by the FAA.

The presence of the airport was linked directly with increased retail and wholesale trade and the creation of new service businesses. In addition to attracting new industries, the airport was credited with influencing established companies to remain in the community. New industries brought with them increased job opportunities—not only in number, but in diversity—and provided openings for displaced farm labor.

The report provides case histories on how airport development was responsible for a healthy business climate:

- The $1.2 million annual payroll of the Holly Sugar Corporation's new Shoup, Tex., plant landed in that community because of a new municipal airport.
- Twenty new factories, out of the 80 industrial firms currently in Sumter, came to the city after the new municipal airport opened in 1956.
- Hayward, a city of 60,000, 15 miles southeast of Oakland, has a growing industrial air park already employing about 500.

A "suburb" of Baltimore and Washington, D. C. (each only about 40 miles distance), Frederick, Md., has attracted such diverse industries as Aerojet-General Corp., the American Optical Co. and the J. M. Bucheimer Co., thanks to the Frederick airport, which the city developed after World War II.

- Minnesota Mining and Manufacturing Co., which operates six business aircraft, put its new plant in rural Fairmont, Minn., because of its modern airport. M. M. & M. uses its planes for fast delivery of air freight and movement of executives and sales personnel.

Copies of "The Airport and Its Influence on the Community Economy" are available in limited supply on a first-come, first-served basis, free of charge. Written requests should be addressed to the Federal Aviation Administration, HQ-438, 800 Independence Ave., S.W., Washington, D. C. 20590. Requests should be accompanied by a self-addressed mailing label.

FAA Aviation News welcomes comments from the aviation community. We will reserve this page for an exchange of views. No anonymous letters will be used, but names will be withheld on request.

• Aerial Smokeaters Like Us

We recently received our first copy of *Aviation News* and were very pleased with the contents.

The Boise National Forest is involved in extensive air operations during the summer months. Much of our activity is associated with fire control work including use of aerial tankers, smoke jumpers, paracargo and helicopter operations. Some of your articles are of particular interest to us, such as "To See or Not to See" in the May issue.

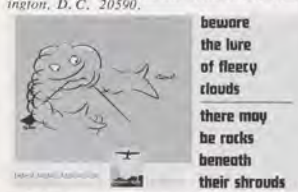
Are reprints or individual articles available for purchase? Also, how do we obtain poster-size copies of the Osborn safety cartoon which appears regularly on the back cover of *Aviation News*?

Howard E. Ahlskog
Forest Supervisor
Boise National Forest
Boise, Idaho

Reprints of "To See or Not to See" are not available, but we are sending you a half-dozen copies of that issue, along with the March 1966 Aviation News *which carried an article on smoke-jumping.*

We've added your name to the distribution list for poster-size Osborn cartoons, which are distributed to airports, flight service stations and other facilities on a monthly schedule soon after they appear in the magazine.

Also eligible to receive the posters are airport managers and flying club safety officers. These can be obtained by writing to: Federal Aviation Administration, Distribution Unit, HQ-438, 800 Independence Ave., S.W., Washington, D. C. 20590.



• Auto Versus Aircraft Seat Belts

We are interested in replacing the seat belts in our airplane, preferably metal-to-metal closure. Not having an aircraft supplier locally it is not easy to obtain aircraft seat belts. Are standard automobile seat belts (meeting SAE standards) adequate for use in airplanes? If not, please list the standards required. Thank you.

T. W. Jensen, M.D.
Safford, Arizona

Replacement seat belts must meet the original aircraft airworthiness requirements. The SAE standards that are commonly used in the automotive industry may not meet all of these requirements. Approved aircraft seat belts are easily recognized by one of the following markings: (1) a permanently attached label bearing TSO C-22, the manufacturer's name, address and date of manufacture; (2) the aircraft manufacturer's part number; or (c) a military designation.

There are several approved belts manufactured with the metal-to-metal type buckle. Any aircraft parts supply house should be able to furnish you with proper replacement belts of the type you prefer. Our General Aviation District Office, 2800 Sky Harbor Blvd., Phoenix Arizona 85034, will be able to assist you in locating the supplier nearest you.

• Doctor's Prescription

As an FAA Aviation Medical Examiner and regular reader of *Aviation News*, I'll take you up on your invitation to submit a safety slogan in Morse Code. As a doctor, I've found that:

"·— ·—· —·—· ——— ···· ——— ·—·· / ·· ··· /
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J. L. S.
Wichita, Kan.

A sound prescription, and one that we are happy to pass along.

• Manual Search

We have been searching for a copy of Civil Aeronautics Manual No. 1. We have tried several possible sources, but our efforts have been fruitless. Could you help us? We are willing to purchase a copy if they are for sale.

San Diego, Calif.

Civil Aeronautics Manual No. 1 has been obsolete for some time, and extant copies are very scarce.

However, Rules Service Company, 1001 15th Street, N.W., Washington, D. C. 20005, has a copy and will duplicate this 92-page manual for 25 cents per page or $23 total. If you are interested, contact them at the above address.

• Accident Reports

We receive many letters from your readers asking for the "Summary Reports of Accidents—U.S. Civil Aviation" formerly published by CAB. Would you be kind enough to announce in your column that this publication has been discontinued as of January 1, 1967?

Monthly reports on aircraft accidents, called "Briefs of Accidents—U. S. Civil Aviation," are now issued by the National Transportation Safety Board, Bureau of Safety, Accident Inquiry Section, Washington, D. C. 20591. An annual subscription costs $15.

Edward E. Slattery, Jr.
Director, Office of Public Affairs
National Transportation Safety Board

• Zero? Zulu? There's a Difference!

On a recent pleasure flight I radioed the tower after runup, "Five-Three-Zulu, ready for takeoff." I understood the tower to clear me, acknowledged, and started my roll. As we neared takeoff speed, I heard, "Five-Three-Zulu, hold short. Hold short of the next intersection, Five-Three-Zulu, aircraft taking off."

I chopped the power and hit the brakes. The explanation? A Cessna 140 had been cleared for takeoff on an intersecting runway. The tower actually had said, "Five-Three-*Zero*, cleared for takeoff." Not, "Five-Three-*Zulu*."

In further communications, I prefaced my number with my aircraft type. Perhaps the lesson here is an old one that cannot be overstressed—in aviation, we must keep our eyes and ears wide open at all times.

Peoria, Ill.

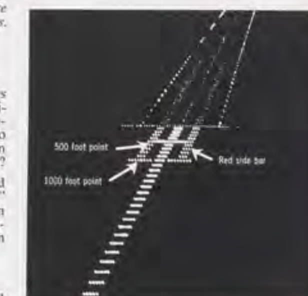
• Cat II For Light Planes?

"Category II: Halfway to All-weather Landings" in the July *Aviation News* is informative and accurate but did not tell the whole story.

It might be appropriate to point out that the FAA is conducting several evaluations of light aircraft Category II operations, using existing equipment normal to such planes, to determine whether such procedures can be safely implemented without the exotic equipment requirements in the current rule.

I believe that single pilot Category II approaches will eventually be authorized in light twin and single-engine aircraft equipped with standard IFR instrumentation, provided the pilot has the ability to fly within tolerance.

Michael V. Huck
Aircraft Owners and Pilot Association



Quite right. Now that the Category II rule intended for heavier aircraft is enacted, the FAA believes the time is at hand to consider possible special Category II rules for lighter single and multiengine aircraft. Appropriate studies are under way.

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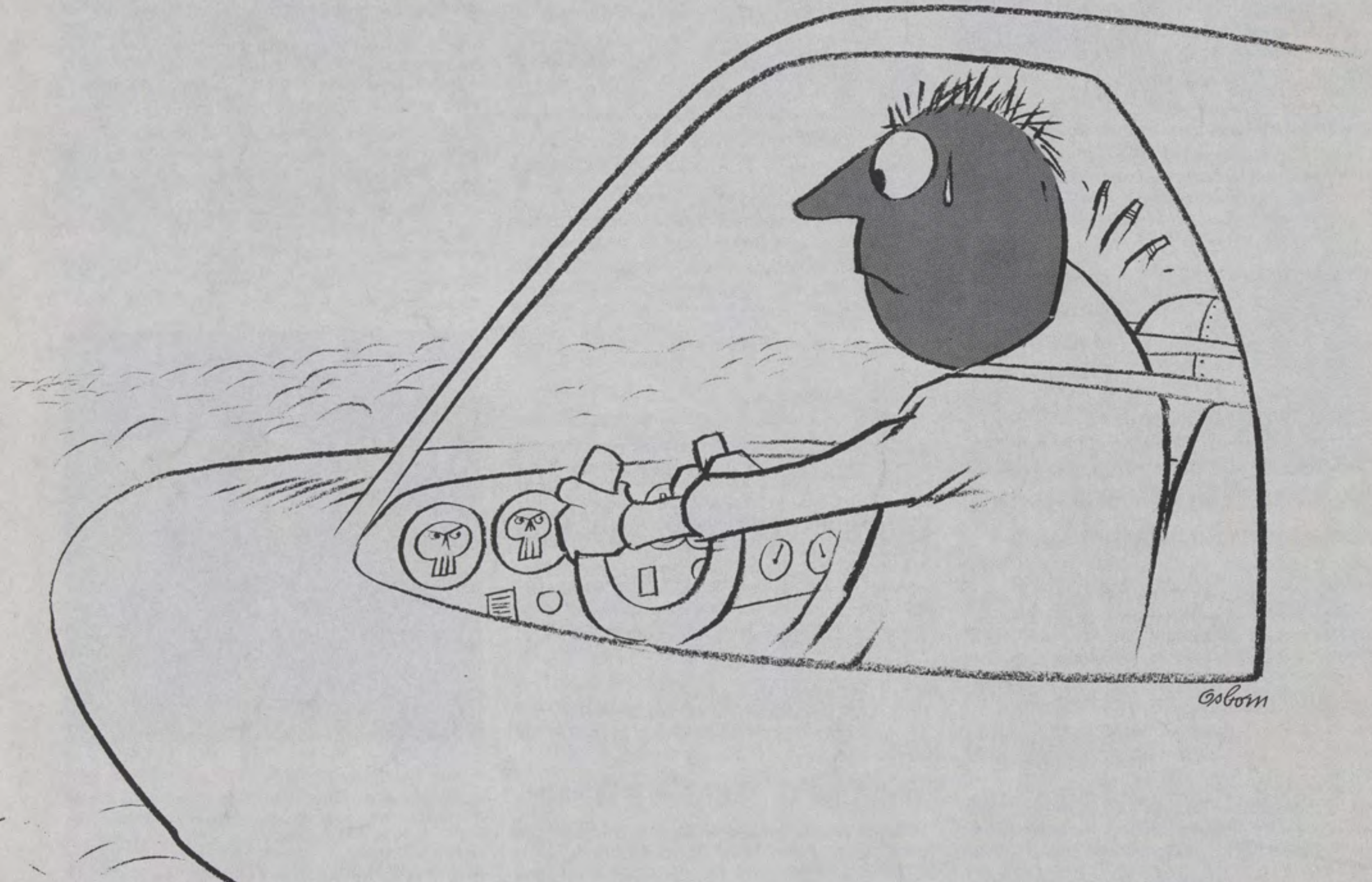
Lost on top . . . fuel running low?



Confess your plight to the man below.