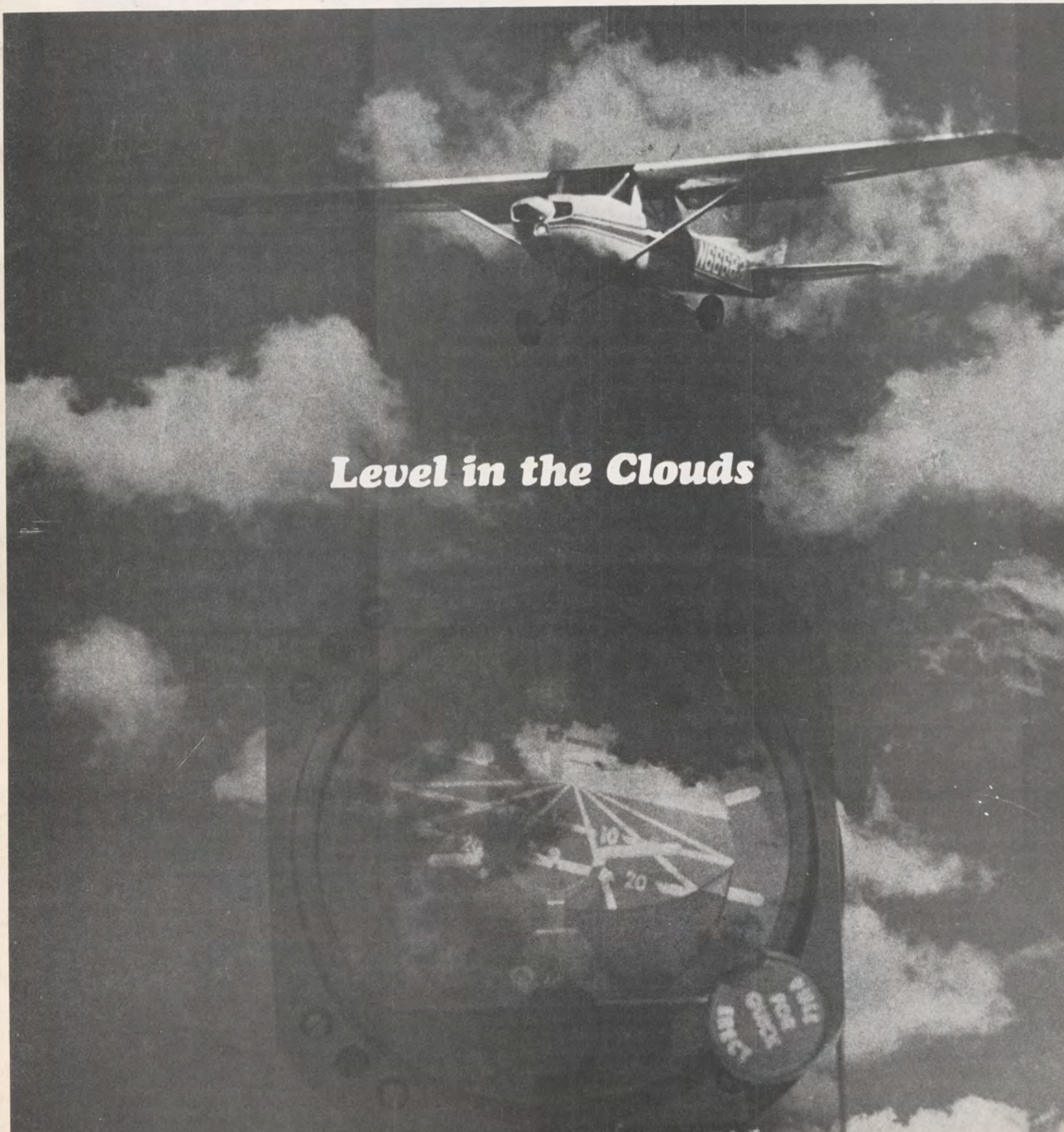
FAA GENERAL AVIATION NEWS

MAY 1977

A FLIGHT STANDARDS SAFETY PUBLICATION FOR AIRMEN



Level in the Clouds

FAA GENERAL AVIATION NEWS

DEPARTMENT OF TRANSPORTATION/FEDERAL AVIATION ADMINISTRATION VOL. 16, NO. 1

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Small general aviation airports are becoming potential havens for illegal drug traffic

Drug smuggling into the United States in private aircraft (often stolen for the purpose) has long been associated with border, or near-border airports, and in those areas pilots and airport operators alike have become accustomed to watching for suspicious actions around the aerodrome. But lately smuggling operations have moved farther and farther inland, with some "drops" being made 1,000 or more miles from the border over which the aircraft passed as it entered the nation illegally.

Old, sometimes barely airworthy, circa World War II airplanes such as the DC-4, DC-6, or the *Constellation*, with an extensive 3,000 to 5,000 mile range, are being pressed into use, sometimes to be abandoned after their task is completed. The drug runners hope to take advantage of the fact that pilots or airport operators located in the midlands or even farther north are less likely to become suspicious of strange aircraft landing at night and discharging cargo at remote corners of the field. Or, even if suspicions were aroused, no one might know what to do about it.

Not so one Julian Walker, manager of the Hanover County (Va.) Airport. When Walker took over the 105 acre field north of Richmond last September, he made a list of goals he hoped to accomplish in order to make his airport one of the best general aviation facilities in the country. At the top of the list he put "Service," and he harped on that theme every chance he got—to his employees on the line, behind the counter and on the telephone. "Service," he said, "is something the customer shouldn't have to *ask* for; you should *offer* it."

Walker was also looking for ways to give the five-year-old airport publicity—to put it on the map of transiting airmen. "You have to get people in here the first time or they'll never know about the service part."

On the night of March 22, 1977, Walker got an opportunity to practice what he preached, and the result, coincidentally, was coast-to-coast publicity for the mid-state airport, plus the satisfaction of stopping a large shipment of illegal drugs intended for local distribution.

At 8:00 p.m. on a Tuesday night in March, Hanover County Airport should have been virtually deserted, although the airport beacon and the lights on the 4,600 foot runway are left on. It so happened that a ground-school course which the airport manager teaches was being conducted at this time in the terminal building with some 20 students in attendance. Their concentration was broken unexpectedly by the sound of a heavy aircraft overhead.

Looking out the window they were all surprised to see what at first appeared to be a large twin line up with the runway and proceed to land. Walker was even more

Above—The biggest thing that ever happened to Hanover County Airport: DC-4 on the ramp towers over rows of small aircraft like a mother hen. Top right—deep rut gouged in the mud by the heavy craft while taxiing to unloading point. Right—wheels of the DC-4 sink into the asphalt ramp.

surprised when, as the aircraft turned off the runway, he observed the fiery exhaust of four engines.

The idea of an aircraft weighing at least 50,000 lbs. rolling over his runway (stressed for a mere 17,000 lbs.) was not at all to his liking, but he assumed that the landing had been dictated by an emergency of some kind. Remembering his motto of "Service!" he made his way through the empty cafe to the UNICOM radio and made a polite call: "Aircraft taxiing in at Hanover County, can we help you? Do you need any service or fuel?"

The response was a curt negative.

But the words were hardly spoken when it became apparent that the aircraft *was* in difficulty. The main wheels were nearly as far apart as the width of the taxiway (30 feet), and in making a short turn the pilot was unable to prevent one pair of his dual wheels from getting into the soft mud at the edge of the paved surface—and there the wheels stuck. All four engines, revved up to full power, shattered the tranquility of the Virginia countryside without budging the big aircraft.

At this point Walker was not sure what was going on, but he *did* know that there was an airplane in trouble on his airport. Asking his students to remain where they were, he jumped in his car and started out to see if he could help.

As he approached the mired aircraft, which he now recognized as a DC-4, his lights flashed across a big, flat-bed truck and a forklift that were parked on a patch of asphalt off the taxiway in a far corner of the airport. The private corporation airplane that normally parked on this ramp was away at the time, and Walker was positive the truck had not been there when he drove in to the airport a couple of hours previously. *Something fishy is going on here*, he decided. He wheeled the car around, went back to the office, and picked up the telephone.

Just a few days earlier Walker had received a bulletin from the State of Virginia Aeronautics Division, asking all airport operators to be on the lookout for any suspicious actions that could indicate drug smuggling, and to notify police when appropriate.

In a few minutes Sheriff's deputies were on the scene, drove up to the ancient transport aircraft and signalled to the pilot—who was still struggling to blast it out of the mud—to shut down his engines. The pilot came down from the cockpit and explained to the group of lawmen that he was only attempting to unload some "antique furniture" in two wooden crates. The skeptical officers asked to see for themselves, opened the crates and found not furniture, but marijuana—7,000 pounds of it, with an estimated "street value" of $4.4 million. The pilot and two other men on the airplane were placed under arrest; two (or possibly more) men who were standing by with the truck for unloading ran off into the night as the operation began to go awry. In a bizarre quirk, one of the pair was hit by a car and killed near the airport, as he fled across the highway a few minutes later.

Federal agents from the Drug Enforcement Administration were called in to deal with the suspects, who were already facing previous charges of drug smuggling. FAA officials from Washington Headquarters and from the Flight Standards General Aviation District Office in Richmond were also called in to check on the aircraft. The N-number of the venerable DC-4 was freshly painted over; a check was begun to see if it might be fictitious. There was evidence that the departure point of this flight had been as far away as Colombia, South America.

In this case, delivery of the illegal drugs was foiled by the actions of an alert airport manager—and a soft spot in the taxiway shoulder. The incident made headlines over much of the country, and terminated for the time being the activities of these particular smugglers. But many such flights are made every month, and some of them manage to draw very little attention. Indications are that rings of drug smugglers are using long-range airplanes to make non-stop flights from a point of origin outside of the United States to a small, quiet countryside airport, preferably unattended, at night, where their "goods" can be spirited away unobserved.

There are also increasing reports, particularly in the far southwestern portions of the country, of aircraft being stolen for the purpose of drug running. In a recent case in Arizona, a Cessna *Skymaster* was stolen from Carefree Airport, located in the mountains about 25 miles north of Phoenix. The thieves were apparently not familiar with the terrain, however, and in attempting a midnight takeoff without lights they crashed into a nearby ridge. One of the two men on board was killed on impact; the other, badly injured, managed to crawl across the cactus-covered hillside to a road where he was eventually found by a motorist and transported to the hospital.

FAA inspectors investigating the crash learned that the two thieves were notorious drug smugglers and listed among the "Ten most wanted criminals in the world" on the books of police in several countries. Not only were the pair known to be involved in drug traffic but they were also accused of murdering a mechanic accomplice a few days before the crash. The surviving criminal was sentenced to a long prison term.

The Scottsdale (Ariz.) FAA District Office, which covers all of the state of Arizona, investigates from 100 to 200 incidents annually involving aircraft that appear to have been stolen for the purpose of transporting drugs and later abandoned or wrecked. The fact that such thieves invariably select aircraft that are fully fueled has led some pilots to discontinue the generally accepted practice of topping the tanks before parking the airplane for the night. This, of course, increases the likelihood that substantial amounts of water will condense from the air in the tanks prior to the next fill-up, and requires very careful preflight drainage of the sumps to avoid an inflight engine failure.

Of the 278 thefts of American aircraft over the two year period from 1975 through 1976, more than 100 are known to be drug-related, according to criminal justice sources. During this period there were over 200 drug-related crashes of aircraft, resulting in 76 fatalities. Some 66,000 lbs. of marijuana were seized, along with lesser amounts of other illicit drugs.

Concerned airmen and airport operators can help authorities curtail airborne drug smuggling in the following ways:

1. **Support a program of adequate security at your airport.**

What constitutes adequate security at a general aviation airport will vary considerably from one community to another. No one wants to see airports turned into armed camps, but the earlier concept of the landing field as an open stretch of ground accessible to one and all is rapidly disappearing—for reasons of accident prevention, as well as a deterrent to crime. An airplane is a valuable piece of property, in most cases far more costly than your automobile; it makes sense not to expose it to any more risk than necessary.

Fencing can be used to prevent ground traffic onto an airfield except through controllable avenues. Tie-down and ramp areas can be illuminated at night. Full time airport guards are not always practical, but periodic patrolling by police vehicles can be encouraged.

2. **Be alert for suspicious operations, and report them promptly to the airport manager or to appropriate local authority.**

"Suspicious operations" are also hard to define, but airmen who pay attention to what goes on at their airport readily notice things like fuel bills being paid off with large sums of cash; airplanes with unusually large long-range tanks or numerous portable fuel containers; apparently altered registration numbers; post-midnight or pre-dawn flight activity associated with covert or furtive loading activity (some drugs are reportedly carried down by sky divers at night), etc.

If your suspicions are aroused, take no direct action yourself! Illegal drug traffic involves some extremely dangerous and murderous individuals, who may easily become alarmed and react violently to even a casual question. Report the matter to the airport manager. He may have some prior knowledge of the operation—or if not, he can call in the appropriate local authority. A special FAA form (5200.3—1969), which gives the telephone numbers of local officials to call for all types of airport emergencies, may be obtained from FAA Airport District Offices or your local Accident Prevention Specialist, or FAA Flight Standards District Office. Or you can make your own.

The District Office also usually designates an FAA inspector to be contacted on such occasions. If the Office is not open at the time of the emergency, call any FAA facility nearby, by phone or radio—FSS, control tower, etc.—and ask the respondent to contact the official "on call." His help may be needed in checking the registration and ownership of an aircraft, and in determining whether any regulations have been broken as regards the certification of the aircrew, the nature and extent of the cargo, the airworthiness of the aircraft, and other related matters.

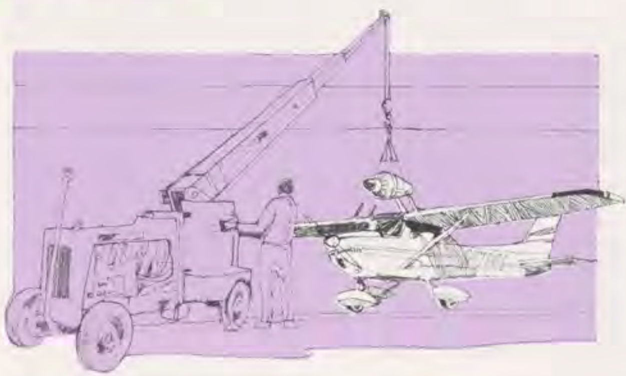
The success of Federal and local officials in curtailing aerial drug smuggling, aircraft theft and other crimes at airports will depend in part on citizen support. The "bad guys" may outnumber the "good guys" on some occasions, but numerically they are only a small segment of the airmen population. We can learn to recognize them.

And report them.

Suspicious aircraft and pilot get thoroughly searched by agents after landing at Cleveland. Inset photo shows rich haul of drugs and money recovered after crash of a smuggling aircraft.

GILDING THE LILY

Why the slightest modification of an aircraft needs official approval



The classic example of an alter-in-haste, repent-in-sorrow airplane owner concerns a pilot/owner of a newly acquired light plane which delighted him in every way—except that there was no lock on the door. Since the plane was to be tied down outside at night and he was concerned about the possibility of it being stolen, he went to a hardware store, bought a lock, drilled a hole in the door and frame, and installed it himself. Then he topped his tanks and took off for an afternoon of pleasant flying. When he came back at dusk and parked the aircraft he made a discovery: he was locked inside his own airplane. The lock he had installed snapped into place automatically when the door was shut, and he had not provided any inside release. There was no other exit, not even a baggage door. It was after 6:00 p.m., the local UNICOM was shut down, and the ramp was deserted. He considered radioing the FSS to send help, but just felt too embarrassed to describe his predicament. It was three hours later before his wife finally found him. *Supposing he had crash landed and fire broke out!*

In this case, fortunately, no harm was done except to a pilot's pride, but the story points up the danger of unapproved aircraft alterations, which in other cases have led to serious and even fatal accidents. Few conveyances designed by man are as sensitive to change as an aircraft. Even very slight—and seemingly insignificant—alterations such as the lock installation mentioned above could have serious consequences if the installer unknowingly weakened a structural member or cut into a wire or tube when he drilled into the frame.

All alterations must be performed by a certified and appropriately rated person, and entered into the maintenance log. Otherwise the aircraft is no longer legally airworthy, and is unsafe to fly.

A *major alteration* is defined as *any alteration not listed in the aircraft, engine, or propeller specifications that:*

(1) *Might appreciably affect weight, balance, structural strength, performance, powerplant operation, flight characteristics, or other qualities affecting airworthiness, or*

(2) *Is not done according to accepted practices or cannot be done by elementary operations.*

Any other type of change is a *minor alteration.*

The various systems of an aircraft, especially the more complex aircraft now common even in general aviation, are so finely balanced against one another that, like a row of dominoes, the slight displacement of one piece may affect many others at considerable distance. Not only the workmanship must be first rate, but full consideration must be given to all possible implications of the design change on performance or structural characteristics. This includes air flow over the various surfaces, vibrations, metal fatigue, internal temperatures, and a myriad of other ramifications not visible to the naked eye—which may require flight testing as well as theoretical computation.

For example, the owner of a light airplane who liked to fly aerobatics had a larger engine installed in his airplane. The battery was moved aft from near the firewall to a location near the tail, where it appeared to best satisfy the weight and balance requirements. However, one day the airplane entered a spin and could not be recovered in time to prevent a fatal crash. The subsequent investigation disclosed that while the balance had been properly computed, no consideration had been given to the inertia effect of a mass of weight in the tail area during the spin. Apparently the aircraft with this alteration did not have sufficient control response to stop the rotation of a fully developed spin. A subsequent flight test, using a drag chute to stop the spin, confirmed this assumption.

Every alteration to an aircraft has a potential effect on its performance or structural integrity. Some of the more common alterations include:

• **Additional equipment.** This may include extra seats, cabin fire extinguishers, autopilots, additional lights, heaters, etc. A major concern is the effect on weight and balance. In some small aircraft the center of gravity range is no more than six inches, and a few pounds of weight that extends the C.G. beyond that range might lead to derogation of control. Additional equipment can easily build up weight to a point where passenger load must be reduced in order to fly within the allowable maximum gross weight.

A fire extinguisher is a good safety item, certainly, but its installation is important, and not merely because of the weight factor. If it is simply fastened to an interior panel, perhaps made of plastic or thin wood, it may tear loose as a result of turbulence, a minor crash, or rough landing. An extinguisher weighing four lbs. or more hurtling through the cabin could become a deadly projectile.

Additional equipment such as autopilots, lights and heaters must be considered for their electrical power drain, as well as their weight. An alternator capable of supplying higher amperage than the original equipment may be needed. This too may mean additional weight, and could require heavier wiring, more circuit breakers, etc.

• **Avionics.** The installation of radios, including emergency locator transmitters, is an alteration affecting the exterior as well as the interior of the aircraft. The location of antennas may affect the flow of air over the fuselage or other surfaces, and if improperly positioned could cause fluttering or other adverse aerodynamic problems. The location of the ELT antenna is of key importance with regard to postcrash functioning—its primary intended function.

• **Propellers.** A different type of propeller could set up vibrations in a frequency which could adversely affect engine vibrations. The spinner of the propeller, incidentally, cannot be removed in some aircraft without leading to overheating of the engine in flight. Such spinners are designed to direct cooling air into the cowling.

• **Landing gear.** One frequent question is whether the replacement of wheels with skis may be performed by the pilot. If the replacement gear is specifically approved by the aircraft manufacturer for a given airplane, and is provided as a complete kit with clear conversion instructions involving no structural changes, it is not technically an alteration. The installation of floats, on the other hand, which have considerable effect on the aerodynamics of the airplane, may be an alteration.

Note: The installation or removal of wheel fairings on some aircraft may alter flight characteristics—particularly the nose wheel fairing. In certain aircraft the mechanism which connects the steerable nose wheel with the rudder relies upon the fairing to streamline the wheel and neutralize the rudder. If the latter is removed, the wheel could remain sidewise in flight and increase drag perceptibly. The "Required Equipment" list should be consulted before attempting to remove a wheel fairing.

Caution: Do not, in the interest of beautification, remove any parts whose function you do not understand. One example is the "stall strip," a slender, triangular, or half-round piece of metal fitted against the leading edge of the wing, usually near the root. Its purpose is to cause a stall to begin at the root of the wing, rather than outboard. The strips are occasionally removed, out of ignorance of their function.

Use of oversized "tundra tires" on PA-11 constitutes major alteration, must be approved.

• **Replacement parts.** All parts must be replaced by parts which have been tested and approved in accordance with FAA regulations. Responsibility for conformance rests with the owner/operator. For example, several recent cases have come to light wherein automobile batteries were installed as replacements on aircraft. Such an installation would constitute a major alteration, and require appropriate testing and FAA approval.

Alterations must be performed by properly rated maintenance "entities," certificated by FAA, such as repair stations or mechanics. A description of the work must be entered in the maintenance record before the aircraft is approved for return to service. Moreover, *the data upon which the alteration is based must be approved by FAA.*

In some cases, where FAA-approved data for the same alteration on the *same make and model* of aircraft already exists, conformance to requirements is simplified. A summary of previous approvals may be examined in the local Flight Standards District Office. This summary also lists the names and addresses of persons who have been granted the approvals, so that they may be contacted in the pursuance of data. The District Office will also advise whether "field approval" is possible for the proposed alteration, or whether it will require regional engineering evaluation and a supplemental type certificate.

In other cases new data must be developed, involving considerable engineering work and/or bench and flight testing. Some alterations require the issuance of a Supplemental Type Certificate. This can be a lengthy and expensive process.

A field approval is limited to "one aircraft only" or may permit multiple duplication. The deciding factor is the extent and reproducibility of the data. Approval may be granted purely on the basis of given data, or the inspector may also call for flight testing.

Similarly a Supplemental Type Certificate may be issued for one aircraft only or for any number of makes, models or serial numbers of aircraft.

The number of FAA engineering personnel available for issuing approvals for major alterations is limited. However, nongovernment agents, known as Designated Engineering Representatives, are available to assist applicants seeking approval. A list of local DERs may be consulted in the District Office.

The road to FAA approval for a major alteration may be long or short, depending largely upon how frequently it has been trodden before. Aircraft owners may become impatient at delays and over expenses incurred, but there is simply no short cut to safety in aviation.

Above all, always discuss your intended alterations with your local FAA Flight Standards District Office (GADO or FSDO) *before* you do the work.

Then do it right or not at all.

Spinning Wheels

Flight instruments that depend on gyroscopic action

The inability of non-instrument trained pilots to maintain control of the aircraft in clouds, leading to a fatal earthbound spiral, is well known to accident investigators. But a recent review of "deadly spiral" accidents in general aviation involving *fully instrument rated pilots* discloses the fact that in many cases pilot error plus malfunction of the vacuum system may have caused the crash by producing a misreading of gyro navigation instruments.

An analysis of 125 accidents covering a ten-year period (January 1964 through December 1974) in which instrument failure occurred in IFR weather and control was lost indicates three basic causal factors:

- Flying into instrument conditions with known instrument deficiencies.
- Inadequate instrument cross-checking.
- Lack of proficiency in flying with a partially operative instrument panel.

All three of these factors were evident in a recent fatal accident in the midwest involving an instrument-rated pilot, who took off in IFR conditions despite the fact that he knew his vacuum system was not functioning dependably. Erroneous reading of his directional gyro and artificial horizon apparently caused him to become confused while in the clouds, and as he attempted to turn to a correct heading he lost control and flew into the ground, striking the earth at a 45 degree angle and killing all on board.

Investigation of the accident revealed badly scored bearings in the vacuum pump—on which both the directional gyro and the artificial horizon depended. Nevertheless, control of the aircraft in clouds is possible without these two instruments, provided that the pilot understands what is happening, and knows how to fly with the aid of the remaining instruments that are not dependent on the vacuum system. All instrument rated pilots must demonstrate this capability, but evidently not all retain the currency.

Keeping an aircraft straight and level, on course, or in an appropriate turn, without reference to the ground, is made possible by the action of the gyroscope, an ancient instrument which originally came into existence several thousand years ago as a spinning top, a child's toy. No one knows exactly who first discovered that "a spinning mass tends to retain its plane of motion relative to the earth," but by the latter half of the 19th century the gyrocompass was widely used on metal ships in modern navies. Much of the pioneering work on these instruments was done by the American, Elmer Sperry, whose son Lawrence applied the basic principles to aerial navigation in the early years of the 20th century.

Today the gyro still remains the key component of three basic flight instruments: the *heading indicator* (gyro compass or directional gyro), the *turn and bank indicator* (needle and ball), and the *attitude indicator* (artificial horizon).

In aviation the gyro wheel or rotor is spun either by negative or positive air pressure or by means of a small electrical motor drawing power from the battery. Each method has its advantages and disadvantages. In the earlier aircraft vacuum pressure (actually lack of pressure) was created by means of a Venturi tube mounted outside on the fuselage, in the slipstream. Except for aircraft pretty much in the antique category, the Venturi installation has disappeared. To be effective the airplane had to be moving at about 100 mph at standard sea level conditions. Variations in the altitude and airspeed resulted in an unreliable performance. Furthermore, it was not possible to preflight test the instrument on the ground prior to takeoff, except by dismounting it and placing it in a wind tunnel.

The Venturi tube gave way to the engine driven vacuum pump, which draws filtered air from within the cabin through the instrument case. This air is directed against the gyro rotor vanes by nozzle jets, causing it to spin rapidly, not unlike the action of falling water against the buckets of a millwheel. The revolving speed of the rotor is fast, varying from 8,000 to 18,000 rpm, depending on instrument design. For proper operation, the suction gauge reading should be approximately between 3.5 and 5.0 inches of mercury—the exact limits for each aircraft are given in the Flight Manual, and in some cases, noted in the Owner's Handbook. On some aircraft the permissible range is as small as 0.1 inches.

As aircraft, including the general aviation fleet, began to fly faster and higher, the en-

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DETACH ENVELOPE HERE ⬆ ENCLOSE LETTER WITH CHECK OR MONEY ORDER (Do Not Send Cash) gine driven vacuum system began to show inadequacies. At 18,000 feet, with atmospheric pressure approximately half that of sea level, the vacuum pump is about half as efficient. At higher altitudes, also, low temperatures thicken the oil in the rotor bearings, slowing it down.

Perhaps the most serious problem is contamination from the air drawn into the instrument case. The filters become clogged at regular intervals. Even tobacco smoke in the cabin is harmful, as it deposits a tarry residue on the rotor bearings. And finally, if the engine fails in flight, the instruments dependent on the vacuum pump will no longer function correctly.

The electrically driven gyro has some obvious advantages. The instrument is hermetically sealed, which prevents outside air contamination. The rotor in an electric gyro is actually the armature of a small, electric motor, and it is not affected by such factors as temperature, altitude, engine performance, etc. *As long as power is available from the battery,* it will function properly.

For reasons of safety, in most modern general aviation aircraft a vacuum system is used for the attitude and heading indicators, and an electrically driven gyro system is used for the turn needle. With this arrangement the pilot should always have available enough navigational information from at least one of the three instruments to complete his flight safely, even in fully IFR conditions —provided that he stays alert to any mechanical error by making regular instrument crosschecks. Some systems incorporate warning devices to alert pilots to failures.

The directional gyro, the oldest of these instruments, spins on a horizontal axis, supported freely by gimbals, such as those used for magnetic compasses. A cylindrical scale, like that on the magnetic compass, is attached to the gimbals and read through a window in the instrument face. In effect, the gyro axis remains in place while the readout scale, and the airplane, change direction. A manual knob is provided for setting the directional gyro in accordance with the compass heading. Pushing the knob in ("caging the gyro") clamps the gimbals and gyro and engages a gear mesh. Turning the knob permits the pilot to rotate the entire assembly to the correct direction. The knob is then pulled out ("uncaged") for normal operation.

In flight the gyro will gradually drift from its setting, due to such factors as friction, imbalance, and earth rotation. It should be caged and reset about every 15 minutes. A gyro that develops an error of no more than three degrees in 15 minutes is considered normal. Some advanced types of directional gyros have been produced which use a magnetic sensing device to realign themselves automatically.

The gyro compass may also be set just prior to takeoff, if the pilot is able to align his aircraft with a known direction, such as the runway.

Some pilots are in the habit of caging the gyro and leaving it in this condition while taxiing or landing, in the mistaken belief that caging the instrument protects it from bumps or landing shocks. In point of fact, the opposite is true. A caged gyro is much more likely to be damaged on the ground than an uncaged one that is able to move freely in its gimbals. *Never leave the instrument caged except when shipping it or when preparing to engage in maneuvers beyond its limits.*

The operating limitations of the vacuum driven gyro compass are 55° of pitch or bank; for the electrically driven indicator, the limits are 85° of pitch or bank. Exceeding these limits causes the instrument to strike the limit stop (possibly damaging the bearings if the maneuver is sufficiently abrupt) and spin rapidly. This may be corrected by caging, resetting, and uncaging the gyro.

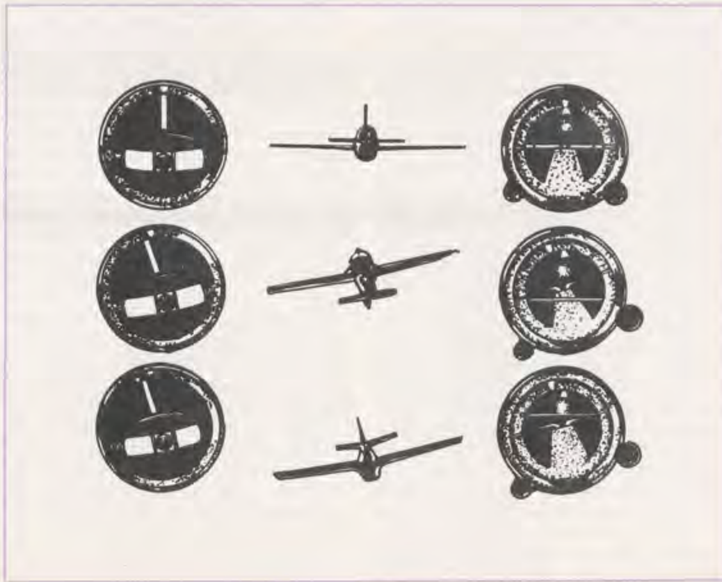
Some apparent malfunctions of the gyro may be traced to misuse of the magnetic compass when the directional gyro is set. Unless magnetic deviations are applied, the indicator may appear to drift several degrees after a turn is completed. Another common error results from failure to maintain straight-and-level flight while setting the directional gyro to the magnetic compass. Errors in the latter instrument are thus duplicated in the heading indicator.

The *attitude indicator* or *artificial horizon* provides the pilot with a simulated horizon line which corresponds to the position of the natural horizon at all times.

A display of this kind is made possible by mounting a gyro within three gimbal rings, which gives it universal movement. The simulated horizon line is synchronized to the gyro axis by appropriate linkage which allows it to spin freely in place regardless of pitch or bank movement. The display also contains an aircraft symbol which moves with the airplane to indicate the attitude of the nose and wings relative to the horizon. In a typical modern instrument, measured pitch reference points are displayed both above and below the horizon along with three specific degrees of bank.

In turbulence, or as a result of sharply executed maneuvers, the attitude indicator may develop a temporary error of up to 5° or slightly higher. Even in a normal turn, centrifugal force may induce a slight and momentary erroneous reading in pitch or bank, *after* return to straight and level flying. Also, following sudden acceleration the true pitch attitude may be lower than indicated. An opposite error may occur after sudden deceleration. The instruments will normally self-correct within a few seconds.

When the attitude indicator is to be uncaged, the aircraft attitude should be straight-and-level, so that the instrument indication and the aircraft attitude are the same. Otherwise the instrument will give an incorrect indication until the automatic correcting mechanism makes the necessary adjustment. Correction devices develop torque



around the deflected axis of the gyro, and use the torque to restore it to its normal position. During intentional aerobatics the pilot should keep the attitude indicator caged in order to avoid possible damage to the instrument.

The value of the attitude indicator depends heavily upon the readability of the instrument—the ease and speed with which you can use it to determine exact aircraft attitude. Although the older types of instruments are not difficult to interpret in normal flight attitudes, their limitations and errors may require rapid reference to other instruments for precise flying.

Improved modern attitude indicator designs now on the market remove some of the confusion and allow for swifter, surer readings. One such design eliminates the horizon bar and divides the sphere horizontally by using two distinct colors, representing earth and sky. Bank index degrees are shown by lines painted on the "ground" and shown converging dead center on the horizon. Horizontal ground lines show degree of dive, and a dot above the horizon shows a climb reference.

With this arrangement, there is no mistaking the attitude of the aircraft as shown on the display. When the aircraft goes into a left bank, the aircraft symbol clearly is seen as turning in that direction, regardless of whether the plane is climbing, descending or in level flight. Degrees of pitch can be read quickly, and excessive climb or dive attitudes are signalled by the appearance of a red warning flag.

In recent years the attitude indicator has grown much more versatile through the addition of new symbols and functions. Computed steering commands may be provided by a "flight director" system to control the aircraft along pre-selected courses and conclude with a full instrument landing.

Future aircraft may have access to an electronic presentation in which most essential flight information is given to the pilot on a cathode ray tube, much like a television screen. The picture will be a symbolic presentation of the outside world, reconstructed from the gyros and various radio signals. This type of instrumentation will have the advantages of greater versatility and instantaneous action, but it may be some time until they are considered economical by the average pilot.

The *turn and bank indicator*, also known as the "needle and ball," or "turn and slip," was the only reference for bank attitude before the perfection of the attitude indicator. The latter is a much more useful instrument as regards indication of bank angle, which it displays directly. The needle of the "needle and ball" instrument simply indicates *the rate at which the aircraft is turning around its vertical axis*. Indirect indications of bank attitude may be computed from the reading of the turn and bank indicator if you understand the relationship between airspeed, angle of bank, and rate of turn. The principal use of the needle and ball instrument in modern aircraft is to show the degree (or lack) of coordination between rudder and aileron in a turn.

The three gyro instruments (directional gyro, artificial horizon, and turn-and-bank indicator), are grouped together for easy cross reference in most aircraft panels.

The gyro of the needle and ball instrument is mounted so that it spins freely on a horizontal and lateral axis, but not on a vertical axis. When the aircraft turns about a vertical axis, this force causes the gyro rotor to *precess*, or turn about its lateral (fore and aft) axis. This is displayed as a movement of the needle to one side of center. Actually the needle and the rotor move in opposite directions; the instrument is designed in this manner in order to allow the rotor to spin continually in a more or less horizontal axis. Stops prevent the gyro from tilting more than 45 degrees to either side of the upright position, and a damping mechanism prevents excessive oscillation of the needle.

The movement of the *ball* in this instrument is not affected by gyro action. Composed either of black agate or ball-bearing steel, it moves freely in a sealed, curved glass tube containing kerosene or other light oil. (The fluid provides a damping action, so that the ball moves smoothly and evenly.) A small bubble of air at one end of the tube compensates for expansion of the fluid during changes in temperature and altitude. Two strands of wire wound around the tube fasten it to the instrument case, and also mark the center position where the ball rests in straight and level flight, and in fully coordinated turns.

In a turn the ball, acted upon by centrifugal force, shows the relationship between the angle of bank and the rate of turn. Excessive rudder produces excessive centrifugal force, which pushes the ball high in the glass—indicating a skid. Insufficient rudder allows the ball to slide down toward the bottom of the tube, indicating a slip—the rate of turn is too slow for the bank angle. The reference marks for the needle are for monitoring the *rate of turn*, which should be constant; coordination is done with the rudder, not the ailerons. For a standard four-minute turn (3° per second), the needle is held at one needle-width off center—on a two-minute instrument. On a four-minute instrument that position would indicate a half-standard turn.

Because of the greater convenience of the more sophisticated attitude indicator, familiarity with the needle and ball has fallen into disuse with many pilots. But a great many flights in difficult weather have been completed safely with no other gyro-derived information than what was provided by this time-honored instrument. The careful pilot normally uses the entire panel at his disposal, but he is quick to spot instrument malfunction and able to get by with supplementary means of navigation in a pinch.

How about you?

(The second half of this article in the June issue will cover gyro instrument monitoring, cross-checking, and flying by partial panel.)

Famous

FLYERS

Harold Pitcairn and His Tilted Windmills

First Pitcairn autogiro, in 1931, had four-bladed rotor, turned-up wings.

"Windmill aircraft" is what some journalists of the 1930's called the autogiro, that intriguing combination of rotorcraft and fixed wing airplane which Harold Pitcairn introduced to the United States as "Everyman's airplane," capable of operating out of a cabbage patch and as crash-proof as a feather.

Actually the term "windmill" was a misnomer because autorotation, the principle on which the autogiro worked, is the direct opposite of windmilling as regards relative flow of air. Nevertheless, the homely connotation helped build up its public image, and for a few years in the 1930's a humanitarian's dream of making aviation safe for everyone seemed close to reality. Thomas Edison, after witnessing a flight of the autogiro, called it "the greatest advance made since the Wrights." And in 1931 an autogiro landed on the White House lawn—the first aircraft ever to do so. Pitcairn received the Collier trophy for the greatest achievement in aviation during the preceding year.

Harold F. Pitcairn, the recipient of this honor, was a multi-millionaire's son, one of four children of John Pitcairn, a Scottish immigrant who had settled in Allegheny County in Pennsylvania in the middle of the 19th century and literally rose from rags to riches, primarily via the oil refinery business.

His son Harold was born in 1897. Groomed to succeed his father in the family business enterprise, he attended the University of Pennsylvania and the Wharton School of Finance. But the wealthy young man was also developing a passion of his own which would occupy him all his life. As a teenager he had designed and built two airplanes which he unsuccessfully tried to fly. When he was 17 he took flying lessons during the summer at the Curtiss Flight School near Syracuse, and the following summer more lessons at Newport News, where he met another enthusiastic airman, Agnew Larsen later to become his chief aircraft designing engineer. In 1918 Pitcairn enlisted in the Army Air Service and trained in Texas in *Jennies*, but the war ended before he could fly in combat.

Pitcairn's father died in 1919, and the young man of 22 became part of the family business. However, he continued to fly, and he soon found a way to combine business and pleasure by setting up an aviation manufacturing firm as a wholly owned venture. He summoned Larsen to join him and Pitcairn Aircraft was established at Bryn Athyn, Pa., in 1924. He began production with a five-place open cockpit biplane, the *Fleetwing*, followed by the *Orowing*, a stagger-wing 90 mph training plane, advertised in 1926 as the lowest priced three-place plane in America (at $2,000). In 1927 he produced the *Mailwing*, a highly stable biplane designed to carry heavy loads of mail on overnight runs. The maximum airmail load carried in the mid 1920's was about 500 pounds, but through four different designs of his *Mailwing* Pitcairn produced an airplane capable of carrying 1,000 pounds of mail. He built a total of 140 *Mailwings*, selling them to various fledgling airlines, and to the American and Canadian governments and to wealthy individuals such as Henry Dupont and J. C. Penney. Pitcairn also started up his own mailcarrying operation along the eastern seaboard from New York to Florida. He sold the venture profitably in 1929, when it became the forerunner of Eastern Airlines.

By this time another aspect of aviation had begun to intrigue him—the noncrashable airplane.

A sensitive man deeply imbued with his family's Swedenborgian principles, Pitcairn became visibly upset whenever he heard about an airplane crash. While his overnight airline was operating, he often lay awake nights worrying about the possibility of an

Above—early model PC-2's over Manhattan. Top right—first Autogiro sold in this country, in 1931, was used for aerial photography. Bottom—wingless **Roadable** could fold its rotor, and be driven down the road.

accident to one of his pilots; and every time his telephone rang after retiring he anxiously leaped out of bed to answer it.

During a vacation in Europe in 1928 he met a man who was also on a quest for the non-crashable aircraft. Juan de la Cierva, a courtly Spaniard had designed and built a huge three-engine bomber for the Spanish army, which was test flown with great success, only to crash following a stall at low altitude.

Searching for "something which would continue to give the aircraft lift even at low speeds and low altitudes," Cierva in 1923 had devised a horizontally rotating wing to be installed on top of a propeller-driven aircraft. The four blades of Cierva's "autogiro" were not connected to the engine (which was used solely to power the conventional propeller) but were turned by the air flowing by the aircraft in flight. The blades were angled to deflect the air downward, thus sustaining the craft aloft in continuous autorotation.

After seeing a demonstration by Cierva in his autogiro, in London in 1928, Pitcairn immediately felt it was the answer to his search for a stall-proof design. The autogiro was so balanced that if forward speed dropped below the necessary 15 or 20 miles an hour required to sustain altitude, it would simply go into a leisurely descent, as the airflow coming up from below the rotor would keep it spinning until it touched down as gently as a falling leaf.

Pitcairn brought one of Cierva's autogiros home with him on shipboard, acquired the United States rights to all the Cierva patents, and established a mutual patent licensing agreement with the English Cierva firm under which they would exchange all autogiro developments.

The Pitcairn Autogiro Company of Pennsylvania then produced the American version of the autogiro: a stub-winged aircraft powered by a 300 hp Wright R-975 engine. It was an open cockpit, two-seater with a rate of climb of 1,000 feet per minute and a top speed fo 123 mph. Following Cierva's suggestions, Pitcairn mounted four hinged blades on the rotor mast, and set the blades at a positive angle of incidence so that they bit into the air at the same angle as an airplane's wings during the climb. In 1930 Pitcairn's "windmill airplanes" were exhibited at air shows and county fairs across the nation, stirring up great excitement.

In 1931 Pitcairn made the first American sale of an autogiro, his PCA-2, to the *Detroit News* for use in aerial photography. During that year he sold 27 autogiros, including one to the U.S. Navy that was landed on the deck of a ship at sea. That same year Amelia Earhart took the PCA-2 up to an altitude of 18,400 feet.

In 1933 Pitcairn introduced the first cabin autogiro, capable of seating five people. He designed an improved undercarriage to cushion ground impact. In cooperation with Cierva engineers he developed numerous other improvements intended to establish the practicality of his aircraft.

The most radical of these was the use of engine power to start the rotor spinning. Up to that time autogiros required considerable taxiing on the ground before they could achieve minimum rotor speed necessary for takeoff. The new device included a clutch and driveshaft arrangement which permitted the pilot to drive the rotor under power while the aircraft was still on the ground and the rotor blades in flat pitch. After the desired rotor speed (at flat pitch) was reached, the drive system was declutched and the pitch of the blades suddenly increased; the autogiro then went straight up for some 30 or 40 feet. Once in the air, the pilot gunned the engine for forward flight. For the first time a rotating wing machine existed that could actually lift itself vertically in the air, and fly off in full control.

Eventually the "direct control" autogiro design evolved, eliminating all fixed airfoils—including wings, elevators, tail fin, even the rudder in some designs. The engine was moved aft and geared to drive the tailwheel when needed. The propeller was used only for thrust: all lift and control forces were supplied by the rotor blades, which spun freely except during the take off. The rotor was also moved aft of the cockpit or cabin, and mounted on a universal joint so that it could be tilted in any direction, under the pilot's control. This forerunner of "cyclic pitch" enabled the pilot to bank and turn the autogiro entirely by means of the tiltable rotor.

The rotor blades were double-hinged, so that in flight they were free to "flap"—i.e., to move laterally or vertically, restrained only by centrifugal force and air pressure. This arrangement neatly solved many of the problems that had previously plagued rotorcraft, especially the problem of unequal lift supplied by advancing (into wind) and retreating blades. These improvements, according to Pitcairn, made the autogiro alone of all aircraft "as free as a bird"—immune to the turbulent effect of rough air upon unyielding structures such as wings and stabilizers.

The normal incidence of the blades, about 3° positive, maintained continuous lift at all times, through "autorotation," so that if the pilot got into difficulty in flight all he had to do was release the controls and throttle and the plane would settle to the earth at a rate of about 12 feet per second—slower than the descent of a parachutist. It could not stall, and it could not spin, thanks to its Mary Poppins umbrella.

What is more, in its later designs the Pitcairn autogiro was made completely "roadable." If the plot was late returning home and had trouble seeing fences or wires at dusk, or if he became disoriented in poor weather, he could settle down on any available road, fold up his rotors, engage the rear wheel and drive directly home. He could also park the "roadable" in a one-car garage.

What more could the Common Man wish for? Here was an airplane flyable from his own backyard, as easy to control as a car, with all the freedom of the skies to travel through—and safer than a bicycle.

Strangely enough, the Common Man did not beat a path to the factory door in Bryn Athyn, Pa. It may be that at this point in history, scarcely a quarter of a century since the first toddling beginnings of flight at Kitty Hawk, the C.M. still thought of aviation as belonging only to highly adventuresome souls. It may be that the rigors of the economic depression of the 1930s riveted his mind to the earth, as the source of needed food and shelter, and left him no energy for pursuing dreams of flight. Perhaps the whole concept sounded just too good to be true. Whatever the reasons, Pitcairn found few buyers for his beloved autogiro in the civilian ranks, and a waning military interest, as Congress declined to vote funds for continued research and development. The Pitcairn Autogiro Co. closed its doors in 1937. A few homebuilt models continue to be built even today and a gyro plane pilot rating is available from FAA.

But the outbreak of World War II, saw the development of engine-driven rotorcraft—the helicopter, which offered military forces such advantages as greater speed, responsiveness, and above all the ability to hover "dead still' in the air—one accomplishment Pitcairn's autogiro never quite achieved. The safety factor which had always been at the heart of Pitcairn's designs was pushed into the background by the demands of a wartime environment, as the powered rotorcraft became a vertical lift troop transport and aerial gun carriage. What the common man had rejected as a pleasure machine had become an essential part of the modern war machine.

Near the end of his life Harold Pitcairn remarked, somewhat ruefully, that he was the only man in America who ever spent $4.5 million for developing a tilted windmill—something no one wanted. But by the time of his death in 1960, rotorcraft had begun to find their way into the multitude of civilian uses he had envisaged, such as police work, forest patrol, crop dusting, photography, etc.—and dearest to his wishes, the humanitarian function of rushing aid to the sick and needy. Few human inventions have provided the rescue capability of modern rotorcraft. The ingenious designer's tilted windmills proved, in the long run, to be something more than quixotic illusion. ■

BRIEFS

MAGNETIC INTERFERENCE. If you plan to ship or carry any magnetic materials or magnetron tubes in an aircraft, be advised that they can present a serious navigational hazard unless they are properly packaged and loaded. If improperly shielded or poorly located in aircraft, this type of material can produce a magnetic compass deviation of 125 degrees or more. The magnetic strength of cargo can be determined by using either a gauss meter or a magnetic compass with an appropriate formula; if it exceeds a given strength, shielding should be used. Whenever possible, magnetic materials being carried by air should be placed 15 feet or more from the magnetic compass. Magnetic cargo must also be properly labeled under the hazardous materials regulations. More detailed information on the subject is contained in "Preparation and Loading of Magnetron Tubes and Magnetic Materials for Air Shipments" (AC 121-23).

MUDDY PANTS. Most pilots are aware that operating from a muddy field can result in dirt being thrown up by the wheels of an airplane, but not every pilot realizes how serious the problem can become in extreme cases. Recently when the wheel fairings were removed from a piper Cherokee each fairing contained approximately 23 pounds of dirt! The aircraft had been operating from an unpaved strip.

CHANGING METHODS. A change has been published to FAA's book on aircraft inspection and repair methods, Paragraph 867 (Chapter 16), which is concerned with tests and adjustments of instruments. The change clarifies recommended adjustments and deletes two subparagraphs, and discourages indiscriminate adjustments of altimeters and vertical speed indicators without the use of appropriate test equipment or standards. Change 2 to "Acceptable Methods, Techniques and Practices—Aircraft Inspection and Repair" (AC 43.13-1A) is 35 cents from Superintendent of Documents, GPO, Washington, D.C. 20402. Stock # 050-007-00368-4. (Note that GPO has a minimum of $1.00 on mail orders).

EMDO LIST. The address list of FAA Engineering and Manufacturing District Offices (EMDO's) has been issued in an updated form. The publication includes addresses and phone numbers for EMDOs and also for FAA Regional Offices, and describes the areas served by each, making it a ready reference for the public and industry. Ask for "Address List for Engineering and Manufacturing District Offices" AC 20-90B, free from the address listed below.

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

New Frequencies Assigned for UNICOM, Begin May 20

Two new "primary frequencies" (those with one digit after the point) are being assigned for UNICOM use at non-tower airports under a recent Federal Communications Commission action designed to help reduce radio congestion.

Under the new plan UNICOM at uncontrolled airports will use the existing 122.8 MHz plus 122.7 and 123.0. Beginning May 20, 1977, these frequency changes will be phased in over the next two years as ground station licenses come up for renewal or new ones are issued.

To provide the primary frequencies where it was felt they were most needed, and to allow for the growing use of the band of frequencies from 122.7 to 123.075, a number of other UNICOM frequency changes were announced. Controlled airports will use 122.95 for UNICOM; 122.75 is assigned for UNICOM at private airports and for other special uses; for MULTICOM use (air-to-air) 122.85 has been added to the existing channel, 122.9. Heliports will continue to use 123.05.

The new schedule of UNICOM frequencies will be as follows:

Uncontrolled airports	122.7; 122.8; 123.0
Controlled airports	122.95
Air-to-air	122.9; 122.85
Private airports, special use	122.75
Heliports	123.05

NOTE: Since these frequencies are to be phased in gradually, pilots should check carefully with the ground facility for current frequencies. Also, two frequencies now used by FSSs (122.7 and 122.75) will not be completely removed from FSS use until January 1, 1978 to allow for an orderly transition.

The 25 kHz spaced channels (with three digits after the point) are for the most part being reserved for future use as needed, with the exception of a few that have been assigned for use by high altitude aircraft.

The action by FCC followed a Notice of Proposed Rulemaking in mid-1976. Of the 24 comments received on the NPRM, 19 supported it in its entirety.

FAA Administrator Named

Langhorne Bond, who has been Secretary of Transportation for the state of Illinois for the past four years, has been named by President Carter to be FAA Administrator.

Bond, who was born March 11, 1937, in Shanghai, China, has been involved with transportation matters at the state and federal level since 1965. During the middle 1960's he aided in establishing the U.S. Department of Transportation and subsequently served as Special Assistant to Alan Boyd, the first U.S. Secretary of Transportation.

Bond holds a private pilot certificate and also participates in auto racing. His wife, Queta, is Assistant Professor of Medical Science at Southern Illinois University Medical School. They have two children.

Stolen Aircraft Publicized

Aircraft that are listed with FAA as stolen within 90 days are now being carried regularly in Part 3a of the Airman's Information Manual. Latest list includes the following aircraft and locations from which they disappeared:

N2231R	Cessna 210	Odessa, Tex.
N514GS	BE-36	Wheeling, Ill.
N6086S	BE-35	Concord, Cal.
N6261Y	PA2T	Richardson, Tex.
N732AF	Cessna 210	Albuquerque, N.M.
N732EY	Cessna 210	Long Beach, Cal.
N79464	Cessna 182	Long Beach, Cal.
N9173K	Stinson	Cutter Globe, Ariz.
N9329U	Cessna 150	Phoenix, Ariz.

The above list includes only aircraft that have been reported to FAA by a law enforcement agency, and is published as a quick reference for FAA personnel, airport operators and employees, and pilots who may spot the airplanes. It does not include aircraft whose locations are known (often in Mexico) but which have not been returned to their owners.

If you see any of these aircraft, advise the nearest FAA flight service station at once, bearing in mind that any listed plane may since have been recovered by the owner. DO NOT contact the aircraft or pilot. If your aircraft is stolen, notify the local police, who may then request that a "stolen aircraft alert" be issued by the nearest FSS.

JUST LIKE THE GOOD OLD DAYS was how two veteran Texas pilots described their low-and-slow cross-country flight from Houston to Washington, D.C., in a Piper Cub recently. The 1941 yellow J-3, with 65 hp engine, is being donated to the National Air and Space Museum to be hung in the general aviation gallery when it is revamped later this year. Donor Roland ("Rocky") Howard and his friend Dave Stirton, both ex-military pilots, with some 8,000 hours between them, made the 1,200 mile flight in the no-radio, no-gyro Cub, navigating by highways, rivers and the coastline. Their average speed was a little more than 50 miles per hour.

Wind Shear Monitors Tested

The latest FAA tests of wind shear monitoring systems will be conducted this summer during thunderstorm season, at six airports. The new Surface Wind Monitoring System (dubbed SWIMS) will be tested at Tampa, Oklahoma City, Houston, Denver, Atlanta and New York (Kennedy).

The new system uses a mini-computer to compare measurements of wind speed and direction in the runway approach corridors with wind data obtained near the center of the airport. When a significant difference—approximately 15 knots—is detected, an aural and visual alarm is triggered in the control tower cab, alerting controllers to potential wind shear conditions. The wind data is also presented on a cathode ray display in the tower.

Wind readings are taken at five or six locations around the airport by means of anemometers on 20 foot poles, with a radio-link to relay the data to the computer. Tests will run up to six months, depending on the length of the summer storm season at each of the test sites.

By giving controllers early warning of wind shear conditions, the SWIMS program allows them to alert pilots and to rearrange traffic flow if necessary. Low-level wind shear is believed to have been a factor in a number of takeoff and landing accidents.

Flight FORUM

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.

• Show It As It Is

I have just read your article in the February issue, "Green Demons and Grey Phantoms," concerning low altitude military VFR routes. Why are these routes not on the sectionals?

Operating from North Philadelphia Airport as I do, necessitates having New York and Washington sectionals, and a Phila. TCA chart—what I *don't* need is another chart. In fact, if the military routes were put on the sectional and if the TCAs could be shown in insets on the sectionals, then the information would be where pilots could use it. I say if you don't want the VFR pilot to get into the low altitude military routes, then put the data where he will see it, and that place is on the sectionals.

Boyd Spencer
Philadelphia

Depiction of military training routes on aeronautical charts is in preparation, although the subject of how best to show them is not a simple one. Certain changes in the training route structure of the military services are programmed to take place this year; the revised structure should appear on sectionals and other charts, beginning possibly by the end of 1977.

As for TCA's, your wish has already been granted: All new sectional charts, starting with April 1977 issues, show the entire TCA structure, including altitudes of floors and ceilings.

• Written Exam Questions

In the November-December issue of your magazine a news item noted that FAA would release a complete list of examination questions for various ratings. I understand the first to be released will be the Airline Transport Rating, with others to follow. Can you tell me when these will be available, and will the price, GPO stock number, and date of release be announced in your magazine?

Bruce K. Harvey
Philadelphia

Information on release of the test guides will be printed in our magazine as they become available. The first two, Commercial Pilot and Flight Instructor, are expected to be out by early summer, followed by Airline Transport Pilot and Private Pilot Airplane. They will be available for sale at Government Bookstores or by mail from the Government Printing Office in the same manner as previous written test guides.

• Mechanic Schools

I am interested in becoming an aircraft mechanic for which I had some schooling from the Air Force. How can I find out how to get into this field in civilian life?

L. N. Jaynes
Chicago, Ill.

Anyone interested in aircraft mechanic requirements should talk to an Airworthiness Inspector at the nearest FAA Flight Standards or General Aviation District Office; they will be glad to advise you. (In Chicago your nearest GADO is at DuPage County Airport.) You may be interested to know that a shortage of aircraft mechanics is being forecast for the years ahead.

• More Radar Myths

You have a fantastic magazine—very helpful and informative articles. But I disagree with your statement in "Radar Myth-Conceptions" (January 1977) recommending that the transponder be left on constantly during flight between control areas. Since there are 4096 possible transponder codes, the odds of being seen are one in 4096. Besides, if your transponder just happened to be dialed to the same code as another airplane was using in another control area, his controller might see two squawk returns, resulting in a possible traffic mix-up.

John A. Ritchie, Jr.
Pleasant Garden, N.C.

There are a couple of "myth-conceptions" here. First, the pilot does not just "happen" to dial in a transponder code. He is either assigned a "discrete" code by the controller or, if he is VFR and has not been assigned another code by ATC, he squawks the VFR code, 1200. The VFR code is generally displayed on scopes of all "low altitude" controllers (airspace below 18,000 feet).

Secondly, a specific discrete code is assigned by the controller to only one aircraft, and it is selected from a block of codes allocated to that particular facility. The same block of codes are not used by any other facility in the same part of the country. Thus the possibility of two aircraft being assigned the same code in the same area is remote.

Incidentally, pilots and others who are interested in learning more about how radar and transponders work are urged to visit FAA radar rooms at Control Towers or Centers. We suggest you phone ahead to be sure the time is convenient.

• Airmarking

My oh my, what has happened to town or municipal lettering on water tank, tower and/or buildings? Also, those directional arrows with one numeral to indicate statute miles to nearest airport—a very definite aid to VFR flight and a blessing for lost pilots.

Lack of funds seems poor justification, considering the aviation safety factor.

William C. Dowmont
Salem, Ohio

Most of the airmarking that includes arrows, mileage, etc. is carried out by civic organizations, state aviation departments, and pilot groups such as the Ninety Nines. FAA does not have this responsibility, although we do endorse this type of program. If you feel there is a need in your area, you might be able to get one of the local aviation groups interested. Names on water tanks, of course, are up to the municipality involved.

INSTRUMENT CORNER

• The Profile Descent

On a recent flight to Atlanta in my single-engine four-seater I heard a jet pilot asked if he had the "profile descent procedure", and shortly after be assured them he had it, he was given an approach clearance. I kept waiting to see if they would ask me the same question. Fortunately they did not, because frankly I have never heard of a "profile descent procedure." Can you enlighten me?

Name withheld
Americus, Ga.

The "profile descent" procedure is designed to keep arriving high-performance aircraft above 10,000 feet as long as possible in the interest of safety, noise reduction and fuel conservation. Atlanta and Denver were the first locations where the procedures were put into effect. All airports serving high-performance aircraft will use the procedures by mid-1978.

According to a new FAA Advisory Circular on the subject, the profile descent generally consists of an uninterrupted descent from cruising altitude down to the interception of a glide slope (or to a specified minimum altitude appropriate to the approach to be made.) The publication defines high-performance aircraft as "all turbojets and any turboprop over 12,500 pounds." (That is why you were not expected to have the procedure).

Even though most general aviation pilots are not affected by these procedures, they are urged to familiarize themselves with the system in order to avoid areas and routes used by high-performance airplanes during descents and approaches. For a description of the system in general, see "Local Flow Traffic Management" (AC 90-73), free from DOT/FAA Distribution Unit, TAD 443.1, Washington, D.C. 20590. For details on local procedures, check with your control tower.

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