FAA | AVIATION NEWS

JULY 1963

FEDERAL AVIATION AGENCY

FAA | AVIATION NEWS

F E D E R A L A V I A T I O N A G E N C Y

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COVER

Fairchild F-27, short-haul turbo-prop used by an increasing number of feeder lines.

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CONTENTS

AIR TRAFFIC CHIEF, WINNER OF PRESIDENTIAL AWARD, NAMED TO NEW POST

David D. Thomas, Director of FAA's Air Traffic Service since 1958, last month was named to the new FAA post of Deputy Administrator for Programs.

Thomas will have management responsibility in Washington headquarters for planning and coordinating the operating programs of FAA's Air Traffic Service, Flight Standards Service, Airports Service, and Systems Maintenance Service.

The announcement followed a White House ceremony in which President Kennedy presented the 1963 President's Award for Distinguished Federal Civilian Service to Thomas and four other career Government officials.

"The activities of the FAA have been growing so rapidly in scope and complexity," FAA Administrator Halaby said, "that it has become necessary to supplement our top management levels for administration, operations, and development with expert practical knowledge of the Agency's day-to-day and near term operating programs.

"Dave Thomas' broad range of experience, wisdom, and initiative demonstrated so capably in his management of the Air Traffic Service not only reflects in the quality of air traffic control service FAA provides today, but will help speed up the attainment of the modern national airspace system we envision to meet tomorrow's aviation problems."

On February 1, 1962, President Kennedy, with the advice and consent of the Senate, appointed Lieutenant General (then Maj. Gen.) Harold W. Grant, USAF, as the Deputy Administrator as provided in the Federal Aviation Act.

Thomas is the third Deputy Administrator to be appointed by Halaby since he took office in March 1961. As in the case of Alan L. Dean, Deputy Administrator for Administration, and Robert J. Shank, Deputy Administrator for Development, Thomas will report to the Administrator through General Grant.

Mr. Halaby also named Lee E. Warren to succeed Thomas as Director of the Air Traffic Service, and Clifford P. Burton, Deputy Director.

President Kennedy congratulates David D. Thomas.

Warren, who helped organize the first Federal air traffic control service 27 years ago at Newark and Chicago, has been Deputy Director of the Air Traffic Service since June, 1961. Burton has been chief of the Airspace Utilization Division in the Air Traffic Service since January, 1962. Burton has held a variety of positions, in and out of Federal service, in the areas of international aviation, air traffic control, communications, and other aviation fields.

"The Agency is fortunate in having men like Warren and Burton," Halaby said, "I am confident that in them we will have the same outstanding leadership that Dave Thomas showed during his tenure as head of the Air Traffic Service."

Lee Warren

Clifford P. Burton

The White House statement announcing the President's selection of this year's Award recipients said of Thomas: "Through exceptionally effective advance planning and outstanding leadership, he has vastly improved the safety of the nation's controlled airways for civil and military aviation and expanded them from 160,000 to 356,000 miles. The present air traffic control system is acknowledged as the finest and most efficient one in operation in the world today as a result of his distinguished accomplishment."

The President's Award for Distinguished Federal Civilian Service is the highest honor bestowed upon career Federal employees. Recipients are selected by the President. The Award is given for exceptional achievement in advancing important domestic and international programs. It includes a gold medal and citation.

In April, Thomas won the 1963 Laura Taber Barbour Award for Air Safety. Administered by the Flight Safety Foundation, the Barbour Award cited Thomas as ". . . one of the outstanding experts in this country, if not in the world, on the management of air traffic control."

Thomas is 50 years old, a native of Texas, and holds a commercial pilot's certificate with multi-engine and instrument ratings. He attended the University of Tennessee and George Washington University. He is a graduate of a number of Air Force indoctrination courses for pilots in fighter/interceptor and bomber aircraft.

His first job in air traffic control was at the Pittsburgh Air Traffic Control Center in 1938. After a number of field assignments he came to Washington in January, 1946, to work in the headquarters of the Civil Aeronautics Administration, FAA's predecessor.

CABOT TROPHY AWARDED TO HALABY FOR CONTRIBUTIONS TO AVIATION

Robert M. Ross, president of Aero Club of New England, presents Cabot Trophy to FAA administrator.

Serving the public is FAA's most important responsibility and its sole reason for existence, Administrator Halaby told the Aero Club of New England at Boston last month.

The occasion was the presentation of the Club's annual Godfrey L. Cabot award to Mr. Halaby for outstanding contributions to aviation. Dr. Cabot was a pioneer in aviation and former Aero Club president.

"FAA was created to serve the public," Mr. Halaby said. "Every activity in the Agency must be measured against the standard of whether it is in the best interest of the public, the people, the nation."

He added that it will be difficult for us to go far wrong when we are convinced that our action will benefit air travelers, shippers, the aviation community—civil and military—and their neighbors on the ground.

Maintaining that education is more effective than regulations in preventing accidents, the Administrator said that FAA will proceed wherever possible on this theory.

Mr. Halaby praised the National Aeronautic Association, of which the Aero Club of New England is a member, as being in the forefront of "those enlightened organizations advocating pilot self-discipline and increased airmanship through voluntary methods."

In order to serve properly the ever-increasing aviation industry, Mr. Halaby pointed to proposed changes in the Federal Aid-Airports Program and a new set of standards for small airports which provides for airport construction for as little as half the price under old standards. The number of general aviation aircraft has now passed 80,000 and is expected to reach 105,000 by 1970, the Administrator added.

FAA Facilities Provide Flight Aid To Nearly 2300 Pilots in Trouble

During the nine-month period from July, 1962, through March, 1963, FAA Flight Service Stations, Air Route Traffic Control Centers and Towers provided nearly 2,300 flight assists to pilots in trouble.

The assists fell into nine types of situations, with *lost aircraft*, the largest category, accounting for 863. Next was *engine or other mechanical failure* with 492, while 280 were classified as navigational gear out. *Low on fuel* was responsible for 191; *unsure of position* 181; *caught on top* of clouds or *in weather*, 151; *lost and low on fuel*, 62; *unable to locate airport*, 37; and *lost and navigational gear out*, 33.

Flight Service Stations headed the list of facilities, providing 974 assists. Of this number, 488 were lost aircraft and 172 fell into the unsure-of-position class.

Towers rendered 949 assists. Here, too, lost planes topped the group of pilots in trouble with 328. Next were 266 in the engine or other mechanical failure category.

The largest group among the 367 Center assists was in the navigational-gear-out classification with 139, followed by 124 resulting from engine or other mechanical failure.

Most frequently used method of assistance to distressed planes was radar.

Wired For Science

Researchers at FAA's Civil Aeromedical Research Institute are seeking data on pilots' physical and mental reactions under near-flight conditions. In this cockpit simulator, which can "perform" a variety of flight maneuvers, devices measure brain waves, pulse beat, blood pressure, etc. Doctors say the device is so sensitive that it can tell—by skin tension—subject's urge for a cigarette.

PRESIDENT LAUNCHES SST PROGRAM AS GOVERNMENT-INDUSTRY PARTNERSHIP

President Kennedy acted decisively last month to launch the Nation's supersonic transport program as a government-industry partnership.

In a letter to Congress, the President described the program, which will be the responsibility of the FAA, as "principally a commercial venture" in which aircraft manufacturers would be expected to pay a fourth of the development costs. In addition, purchasers of the aircraft would be expected to pay a royalty to help the government recover part of its development costs.

Congressional hearings on the proposed SST development program commenced June 20 before the House Commerce Committee under Rep. Oren Harris (D-Ark.).

The objectives of the Federal Aviation Act of 1958, said the President, clearly require this program to develop a supersonic transport that is safe for passengers, economical in airlines service, and superior to comparable aircraft in operating performance. He noted that prime objectives of the act were to "further our domestic and international commerce and the national defense."

Although the cost of such a development program could be as much as one billion dollars over approximately a six-year period, the President limited government investment to $750 million. Moreover, no subsidies to manufacturers or airlines are planned.

The President emphasized that industry participation as a "risk-taking partner is an essential of this undertaking." As a consequence of this, he said, "the degree of government control and the size of the government staff required to monitor the program can be held to a minimum." Only in this way can private effort be impaired as little as possible.

The national interest requiring such a program is based on these considerations, said the President:

- An efficient, productive SST can provide swift travel for the passengers and a promise of developing a profitable market;
- It will "advance the frontiers of technical knowledge" as an outgrowth of a commercial—not a military—venture;
- America's historic leadership in aircraft development will be maintained;
- It will demonstrate the "technological accomplishments which can be achieved under a democratic, free enterprise system;"
- The Nation's international trade will expand as a result of the manufacture and operation of an SST;
- Our aircraft industry will be strengthened and will provide jobs for thousands.

Air-Minded Senators and Congressmen Form Flying Club on Capitol Hill

Under mural that bespeaks their avocation, legislators meet in Capitol room for weekly ground school.

Rep. and Mrs. Don H. Clausen (Calif.) and daughter.

The bang of the gavel on Capitol Hill on Thursdays doesn't quite end the day for 16 legislators. It merely signals the start of another session—the once-a-week ground school class for members of the Congressional Flying Club.

The club, presided over by Rep. John Bell Williams, Chairman of the House Transportation and Aviation Sub-committee, was formed with the help of the National Aeronautic Association in May. Its membership, now 31, is limited to Members of Congress, key staffers and members of Congressional families.

Ground school classes are held for club members who are not already pilots each Thursday at 5:15 in the Interstate and Foreign Commerce Committee Room in the New House Office Building. Volunteer instructors from the Federal Aviation Agency and the Weather Bureau teach the course, using the students as subjects on which to test a variety of new audio-visual training aids. Actual flight instruction is conducted at the club's headquarters at Friendship Airport.

Legislators who are club members are Sen. Clair Engle (Calif.), Sen. Peter H. Dominick (Colo.) and Representatives John Bell Williams (Miss.), Robert W. Hemphill (S.C.), Thomas G. Morris (N.M.), William E. Minshall (Ohio), Thomas L. Ashley (Ohio), Richard H. Ichard (Mo.), John W. Davis (Ga), Ralph R. Harding (Idaho), Don H. Clausen (Calif.), Robert H. Stafford (Vt.), Hastings Keith (Mass.), Robert R. Barry (N.Y.), William Cahill (N.J.) and James Bromwell (Iowa).

JOINT FAA-MILITARY RADAR USE SAVES $30 MILLION

Joint use of long range radar by FAA and the military services has saved taxpayers $30 million since 1956, and the figure will climb above $50 million under presently programmed plans.

Under the program, initiated at the recommendation of Congress, 44 FAA and military radars already are in joint use with 23 others scheduled for commissioning in the near future. Because the joint use plan is a continuing program, it may extend well beyond the present schedule of joint use of 67 radars.

Under the joint use agreement, FAA performs all maintenance work, using a group of highly trained electronics technicians and engineers throughout the United States.

The project is under the guidance of a Joint Radar Planning Group composed of FAA and Air Defense Command representatives. It provides for adapting long range radar units to serve both military and civil functions. This is accomplished by transmitting signals from a single radar to display scopes located at both military sites and FAA Air Route Traffic Control Centers. Where a military radar already is installed, FAA uses it along with the military; conversely, where FAA has radar in an area of military requirement, it provides coverage for military purposes. New installations are programmed for joint use where applicable.

Of those now in joint use, 17 are FAA radars and 27 are military units. The 23 still to be put into joint operation include two FAA and 21 military radars.

The saving of more than $50 million is based only upon initial land acquisition, equipment and installation costs. It does not include additional savings through elimination of duplicate maintenance, power, spare parts and personnel.

Although the program is basically an FAA/Air Defense Command project, it sometimes becomes a three-way joint use saving with FAA, the Air Force, and either the Army, Navy or National Guard also sharing in the use and resultant savings.

Double use of long range radar is not the only area in which FAA is joining with other federal and civil agencies to effect substantial savings. Thirty-four Air Force radar approach facilities (RAPCONs) and nine Navy radar air traffic control centers (RATCCs) have been taken over for operation and maintenance by FAA. They are used for both civil and military traffic control. In addition, 200 VORs, radio ranges and other navigational facilities owned by the military, states, municipalities and individuals are in the process of being absorbed by FAA into the Common System of air traffic control. The additional savings is estimated at $10.5 million.

Film on Air Traffic Control Is Available to Public

A 16-mm color movie which follows a jet airliner on its high-altitude, cross-country flight, has been produced by the FAA to explain the role of air traffic control in commercial aviation.

Entitled *A Traveler Meets Air Traffic Control,* the 28½-minute film may be borrowed after August 1 from the FAA Film Library, Aeronautical Center, P. O. Box 1082, Oklahoma City. It will be available to the public, aviation groups and for showing on television.

Airmen Get Maximum Protection In Cases of Alleged Violations

If a pilot or aviation mechanic finds his certificate suspended or revoked for violation of FAA regulations, it isn't because he hasn't had ample opportunity to present his case.

Under the Agency's Hearing Officer system, initiated a year and a half ago, the airman has a choice of being heard formally before a Hearing Officer or informally by an FAA Counsel. If he selects the latter and is dissatisfied with the outcome, he may request and receive a formal hearing. If he feels the determination of the Hearing Officer is unjust, he can take his case to the Civil Aeronautics Board. At the Board the case is reviewed by a CAB examiner. If the examiner's decision is unfavorable, he has further recourse—he can ask for a hearing before the full five-member Board.

Since the system was inaugurated, Hearing Officers have handled 74 enforcement cases. Decisions have been made in 63 with the remainder still under consideration. Action of Regional Counsels was upheld in 22 of the 63, while 30 rulings were modified and 11 were terminated for lack of sufficient evidence.

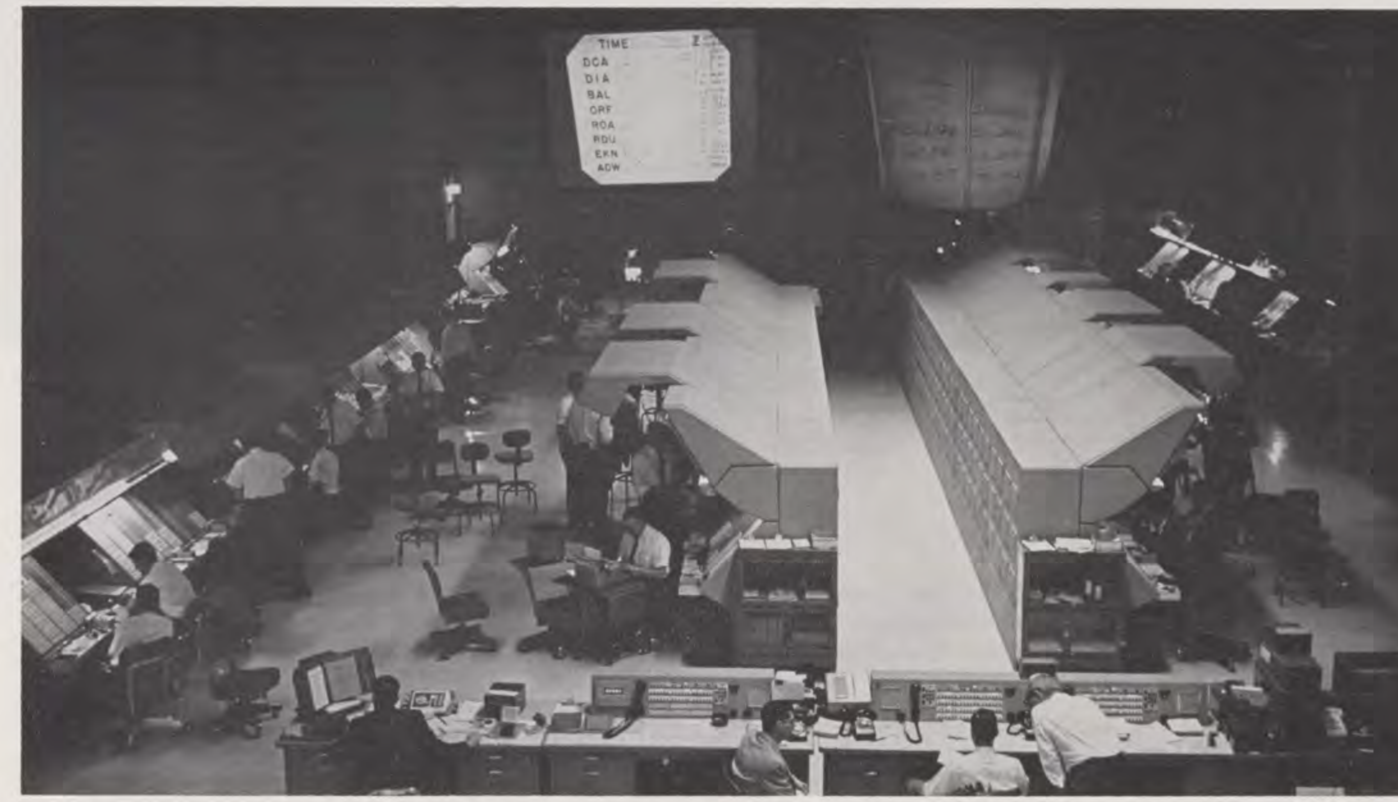
Included in the 63 were decisions that suspended the certificates of 41 airmen and revoked the certificates of 10. Nineteen of the airmen chose to appeal FAA decisions to the CAB.

CAB examiners have rendered decisions in five cases to date: Four in favor of the FAA, and one in favor of the airman. Two losers continued their cases before the full Civil Aeronautics Board. Both cases are now pending.

Prior to establishment of the Hearing Officer system by FAA Administrator N. E. Halaby, the Agency suspended or revoked certificates without a hearing. Airmen could discuss their alleged violations informally with Agency attorneys, but they had no chance to cross-examine witnesses. Final Agency action was taken by the same Agency official who sent the initial notice of the alleged violation. The new system, which provides for a full-scale hearing before an independent official, eliminates the criticism that the Agency enforcement officer was both prosecutor and judge.

Four Hearing Officers, based in Atlanta, Kansas City and Los Angeles, travel throughout the country to hold proceedings at points convenient for the airmen involved. Attached to the Administrator's immediate staff, the Hearing Officers act as his direct representatives and have authority to modify or even dismiss Agency actions if warranted.

CENTER MODERNIZATION NEARING COMPLETION



Heart of air traffic is control room where all IFR flights are monitored by controllers. At Washington Center, latest weather information is projected on wall.

Dedication of the new Washington Air Route Traffic Control Center last month, the 17th of 20 new ones in the 48 States, completes another link in FAA's program to improve the efficiency and safety of air traffic.

In addition to the Washington Center, other new Centers now operating are Oakland, Atlanta, Cleveland, Jacksonville, Fort Worth, Kansas City, Memphis, Denver, Minneapolis, Seattle, Salt Lake City, Indianapolis, Chicago, Los Angeles, Boston and Albuquerque. Scheduled to be commissioned within the next few months are Centers at New York and Miami. The last of the new Centers, Houston, will be ready in early 1965.

Centers control all aircraft operating IFR within their jurisdiction, providing separation service so that each aircraft can, in effect, fly in its own reserved block of airspace.

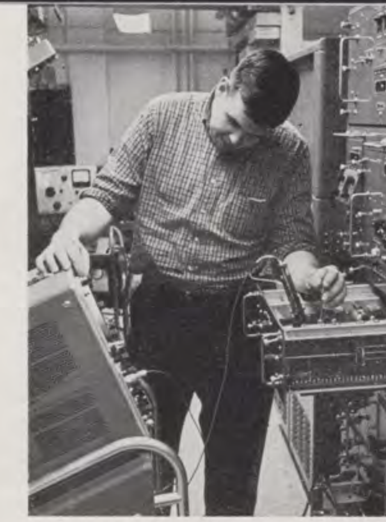
Washington Center facilities are virtually the same as those in the other new Centers built in FAA's modernization program. The Washington Center's control area covers 19,650 miles of airways located in 100,000 square miles of airspace. Information from four remote radar antennas is transmitted by microwave link to 28 radar scopes in the Center.

Enroute control is accomplished through radar and radio and interphone communications. This is augmented by a basic control tool, flight progress strips, which contain pertinent

Long banks of tape machines are needed to make recordings of all air-ground communications.

Controllers in the high altitude section receive a "handoff" of aircraft from Center in Cleveland to Washington Center.

Telephone communications room is the nerve center of building's communication system.



Above, technician uses synchroscope to check radar video mapping equipment. Below, radar scan conversion gear being aligned.

Above, students learn to become air traffic controllers in training class at the Center. Below, workers relax in the Center's attractive cafeteria.

information extracted from the pilot's flight plan in advance of take-off. The strips enable the controller to keep up with the progress of a flight as the pilot reports by radio the time he passes over a reporting navigational "fix."

At five Air Route Traffic Control Centers, including Washington, the strips are prepared by general purpose digital computers. Flight data is inserted by flight data operators into the computer through devices which provide for the automatic transmission and acceptance of information to and from the other on-line computer-equipped Centers. The computer system permits the storage of flight plan data collected from the other filing agencies over special teletype circuits and the print-out of flight progress strips.

The high-speed printer receiving processed data from the computer prints strips at the rate of 90 per minute. While the computer does have the capability of estimating an aircraft's arrival time over a navigational fix within a particular Center's area, it cannot update the estimated to the actual time in the event there is a difference between the two. The controller does this manually as the plane reports in. Future computers will have the updating capability.

The strips, one for each enroute point over which pilots will report their position, are posted on a slotted board in front of the air traffic controller monitoring the particular area in which the enroute points are located. At a glance, he is able to see certain vital data: the type of plane (airline, business, private or military), aircraft identification, whether beacon-equipped, routes, speeds, altitudes, and the estimated times of arrival over the reporting points.

As pilots call in their position, time and altitude over predetermined "fixes," the actual time over the reporting points and other important information are noted and any change from the original flight plan is noted on the strips as the flight continues. Reporting times over previous fixes are noted on strips containing the subsequent reporting points. Thus, from a quick study of his flight progress board, a controller can assess the overall traffic situation and can spot—and avoid—possible conflicts.

On a national average, a Center will have about six enroute reporting points for a flight passing through its area. A nonstop transcontinental flight, therefore, handled by seven Centers, would take from 40 to 50 flight progress strips.

The airspace within a Center's province is subdivided into sectors worked by teams of air traffic specialists. One is a manual controller who handles the telephone and interphone connections between other Centers and the Towers, Flight Service Stations, operations offices of the military services and scheduled airlines located in his territory. The other is a radio/radar controller who maintains direct contact with the aircraft. Centers, Towers and Flight Service Stations are in communication with each other.

Direct communications between pilots and Washington Center controllers are maintained through 73 air/ground frequencies. As an aircraft is about to cross from one sector to another, the pilot is advised when to change frequencies. Similarly, when the aircraft approaches a Center boundary, the pilot is advised of the frequency which transfers him to the next Center. This process is known as "radio handoff," and keeps the aircraft in uninterrupted communication with a ground station. Similarly, when under radar control, the plane is transferred to the adjacent facility via a "radar handoff."

When an IFR flight nears its destination, control is transferred by the Center controller to the controller in the approach control facility of the airport Tower for landing instructions.

Modern, functional Centers are built to a standard design of reinforced concrete and steel and are air-conditioned, not only for the comfort of personnel but also to protect the sensitive electronic equipment from harmful temperature changes.

The main building includes an operations wing with control room 60 feet wide and averaging 192 feet in length, plus rooms for communications and electronics equipment. A two-story administration building contains general offices and training areas. Space is provided in a connecting section for storage, utility, workshop, locker, and shower areas, and snack bars or cafeterias. A separate building houses two 550-kilowatt standby diesel engine generators to insure uninterrupted Center operation in the event of any commercial power failure.

The new Centers are designed to be completely self-sufficient for a period of at least two weeks in case of nuclear attack. In an attack, traffic control personnel would remain on duty to provide support to our military forces.

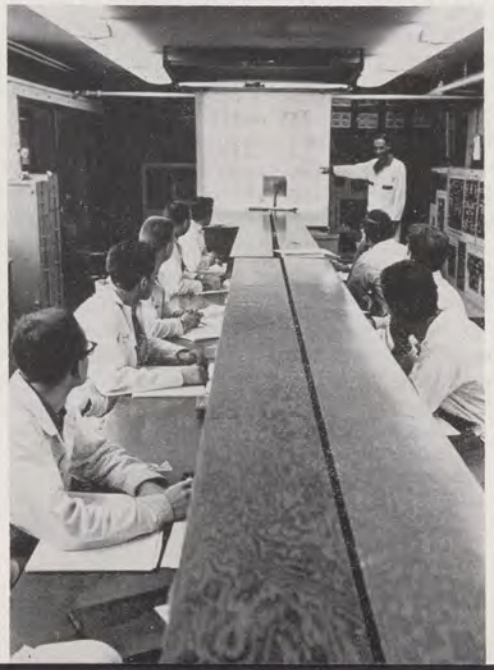
Control and equipment rooms are protected by 8-foot high concrete walls, 18 inches thick, as well as lead-lined doors. Each Center has a basement shelter and a completely self-contained water system. Roofs are covered with zinc and equipped with sprinkler systems for washing down radioactive fallout and debris.

The new Washington Center, located in Leesburg, Va., was constructed at a cost of $6.5 million and employs nearly 500. Among the three busiest in the nation, it handled 536,000 aircraft movements last year, being surpassed only by Chicago and New York.

FAA Certificates Aviation Mechanics Only After Exacting Training

FAA inspector gives practical examination on aileron control travel.

Above, instructor demonstrates aluminum welding and brazing technique. Practical application in various fields is preceded by extensive lectures *(below)*.



For the nation's approximately 80,000 licensed aviation mechanics, professionalism is symbolized by a small card—the coveted mechanic certificate with Airframe and Powerplant (A&P) ratings issued by FAA.

The A&P certificate, and its allied ratings—the A or the P, represent both challenge and achievement. The challenge is to fulfill the trust implicit in maintaining aircraft on which the safety of crew and passengers depend. Commensurate with this trust, in which lives are at stake, are FAA's high standards of training. The aviation mechanic must prove his proficiency by passing rigid FAA written, oral, and practical exams. It can take longer to learn how to repair an airplane than to fly one.

More than half of today's licensed aviation mechanics learn their skills at schools approved and certificated by FAA. The remaining get their training on-the-job.

To be eligible to take the examination for either A or P based on experience only—working under the supervision of a certificated mechanic in a repair station, for an operator—the budding mechanic must have 18 months of experience. If he wants the combined A&P, it takes 30 months.

Formal vocational training in an FAA-approved school takes from eight to twelve months for either of the single ratings, or about a year and a half for the combined A&P.

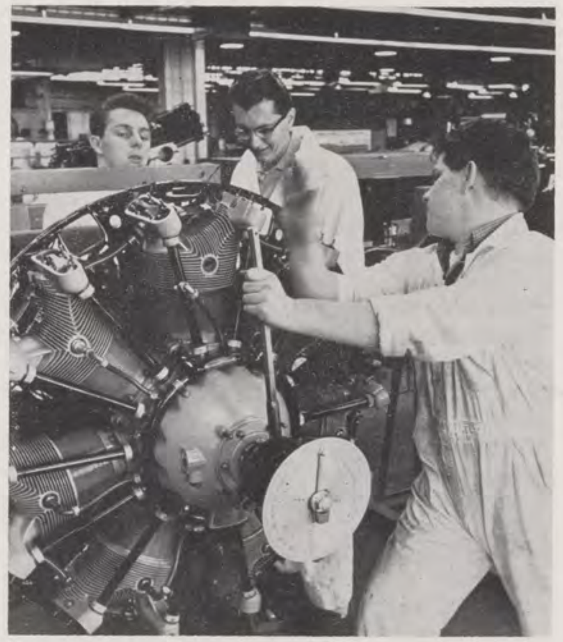
There are 68 FAA-approved aviation mechanic schools in the country. Although their courses may vary slightly, each adheres to prescribed FAA curriculum standards. These include a minimum of 960 hours of work for the A or P certificate or 1,650 hours for the combined A&P rating. Schools are monitored by FAA inspectors who work closely with officials to assure that standards are maintained.

The Pittsburgh Institute of Aeronautics is an example of one of the approved schools helping to meet the ever increasing demand for aviation mechanics. Its curriculum, which offers both classroom and practical experience, is typical—basic science, elementary powerplants, powerplants and electrical system accessories, advanced powerplants, elementary airframe, sheet metal and welding, advanced airframe, alternating and direct current, basic electronics, and final airframe and powerplant, including jets and helicopters.

A faculty of 23 instructors teach approximately 300 students. A new class starts every 27 working days with about 300 graduating each year.

Graduation does not certificate the student as an aviation mechanic. It prepares him for about 24 hours worth of FAA examinations that will prove—or disprove—that he is qualified to take his place on the line, either for an airline, in general aviation, or with a manufacturer. Examinations include 12 hours devoted to written tests and at least 12 hours to practical and oral tests. The written exam must be administered by an FAA maintenance inspector; the oral and practical may be given either by the inspector or by an FAA-designated mechanic examiner.

FAA maintenance inspectors are frequent visitors where they observe and often help students. Throughout the course, inspectors monitor student and school activity to assist fledgling mechanics toward their goal—assuming the demanding responsibilities of a key position in aviation.



Above left and clockwise: FAA inspector tests student proficiency; students work on engine; class in spray painting; fabric needlework.

Under some conditions, a nearly solid line of thunderstorms may form ahead of a cold front, resulting in a squall line like this that may go to 40,000 feet.

COLD FRONTS

This is the fourth article in a series prepared by meteorologists of the Weather Bureau.

Mention the word "front" and some pilots are already on instruments in the mistaken belief that it implies nothing but bad flying weather. Actually, some fronts bring little or no weather of any importance. And, of course, bad weather can occur where no front exists.

Another common misconception pictures fronts as sharp walls of weather. Only rarely does a front present a well-defined surface on the ground or in the air. Perhaps this false picture arises from the use of lines to indicate fronts on the weather map. Each of these lines shows the surface location of a front as determined from observations of windshift, pressure change, temperature change, and other factors. But frontal weather may occur over an area that is 5 to 50 miles or more wide. In flight, *the weather associated with a front may be encountered well ahead of or behind the line on the surface map.*

A front is a transition or buffer zone between two large air masses with different properties of moisture or temperature. A single air mass may spread over several hundred thousand square miles. Everywhere along its boundary, there is a front if the temperature or moisture of the air mass differ significantly from those of the adjacent air mass. Thus, while fronts may rise only a mile or two vertically and may be from 5 to 50 miles wide, they usually extend for hundreds of miles in length.

When two air masses meet, natural forces try to neutralize the differences between them. The denser, heavier cold air seeks the lowest levels, and the temperature attempts to mix evenly. In the process, clouds, precipitation, turbulence, icing, and windshifts may be produced. Not all of these conditions occur with every front. In some cases, all of them are present, sometimes only a few, and occasionally none. Furthermore, one set of conditions may be reported at the surface, while something quite different is encountered by the pilot in flight.

When a mass of heavy, cold air comes in contact with a mass of light, warm air, the cold air forces its way under the warm air. As the warm air is pushed upward, it expands and cools. Clouds and precipitation are likely to result. If the warm air is unstable, cumulus clouds and showers will usually form when it is forced to rise. This occurs because the condensation of moisture adds heat to the rising air columns, making the columns warmer and more buoyant than their surroundings and enabling them to rise freely to great heights. Turbulence will be found in such clouds. On the other hand, if the warm air is stable it will form stratus clouds with steady precipitation and little turbulence.

Some fronts do not produce clouds and precipitation because the warm air is very dry or because it is not lifted enough to cause condensation to occur.

Heavy cold air forms a wedge under light warm air. The angle of this wedge is called the slope. Gently sloping frontal surfaces tend to bring extensive cloudiness and large areas of precipitation. These gentle slopes occur when the difference in temperature and wind velocity between the air masses is small.

Steep frontal surfaces usually produce narrow bands of cloudy weather with precipitation localized along the immediate front. Ordinarily, fronts have steep slopes when the difference in temperature and wind velocity between the two air masses is large.

Visualizing the slopes of a front can be of great assistance to the pilot. Consider, for example, a front with a slope of 1 in 50 (which is average for cold fronts) that intersects the surface along a north-south line through Chicago, with the wedge of colder air to the west. A pilot flying 50 miles west of Chicago could expect to find the frontal surface one mile above the ground.

In the United States, weather systems and storm fronts generally move from west to east. Their movement follows the large-scale wind pattern in our hemisphere. This doesn't mean that the entire motion of weather is always directly from west to east. But the pilot planning his flight can be fairly certain that the moving pressure centers and fronts on today's weather map will be found farther to the east tomorrow and the next day.

Meteorologists classify fronts according to their relative temperature, their location with respect to the surface, and other factors, but pilots can be mainly concerned with just two broad categories—cold and warm.

A cold front is the leading edge of cold air which is displacing warmer air ahead of it.

The term "cold" is only relative and implies no specific numerical temperature values. The temperatures in a cold air mass may range from the 70's in summer to well below zero in winter. Cold air masses moving southward from northerly latitudes are caught by prevailing westerly winds and pushed eastward. Thus, a cold front in the United States most often moves from northwest to southeast.

A cold front may extend for hundreds of miles along the boundary of an air mass, making an "end run" impractical. For the pilot planning to cross a front, the cirrus cloud tops of frontal cumulonimbus or thunderstorms serve as route markers. These cirrus clouds travel in the direction of frontal movement. Noting their direction, the pilot can determine how to cross the front as quickly as possible and can make proper allowance for winds while on instruments.

The average width or distance across a cold front—measured in a straight line perpendicular to its leading edge—is approximately 50 miles. This figure varies with the speed of movement of the front and with the terrain. In the United States, cold fronts travel at an average speed of 25 to 30 miles per hour. Slow movement and rough terrain tend to broaden the zone of frontal weather.

The zone of weather in a cold front is usually not as extensive as that associated with a warm front. Though some of the most violent weather changes occur with fast-moving cold fronts, the weather at a fixed point on the ground tends to improve more rapidly after the passage of a cold front than after a warm front. In flight, the duration of turbulence, icing, or "in-the-soup" operation is shorter than with warm fronts.

On the ground, the passage of a typical cold front might begin with increasingly southerly winds in the warm air lying ahead of the front. High, dense cirrus clouds then appear on the horizon in the direction from which the front is approaching, and the barometric pressure decreases. Next, the clouds thicken and lower and rain begins, increasing in intensity as the front comes closer. The wind shifts to a westerly or northerly direction as the front passes and the pressure rises sharply. A cold front normally is followed by cooler and drier weather.

This sequence of events is typical, but not universal. Nearly every imaginable type of weather—except a hurricane—may occur with a cold front. In some cases, an almost continuous line of thunderstorms may form parallel to and some distance ahead of the cold front. This line, referred to as a "squall line," is often characterized by a wall of turbulent clouds building up to 40,000 feet or higher. The individual cells sometimes reach heights of 60,000 or 70,000 feet. Squall lines produce some of the most violent weather known.

In the air, the appearance on the horizon of a long line of altocumulus or middle-layer clouds is often the first indication of a cold front. There may be cumulonimbus or thunderstorm clouds apparently growing up through, and towering above, the altocumulus and possibly some cirrus above all the other clouds. *This is the proper time for the pilot to consider changing his flight plan.*

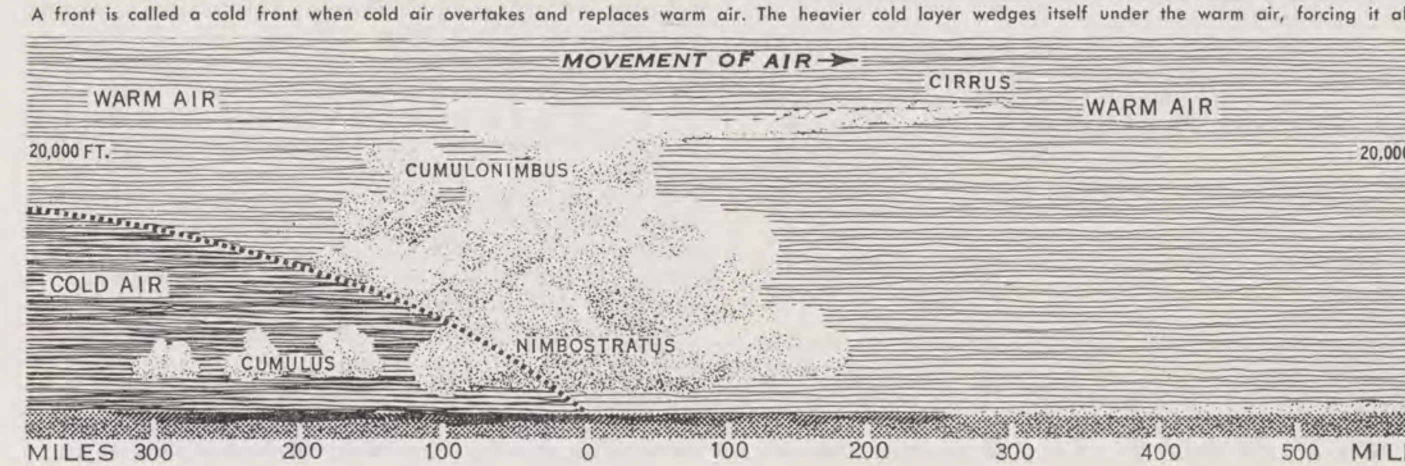
The strictly VFR pilot must keep out of all clouds. If he plans to stay beneath the clouds, he must determine this is possible from the standpoint of ceiling, visibility, turbulence, and terrain by checking all available weather, radar, and pilot reports and the forecasts for stations along his flight path.

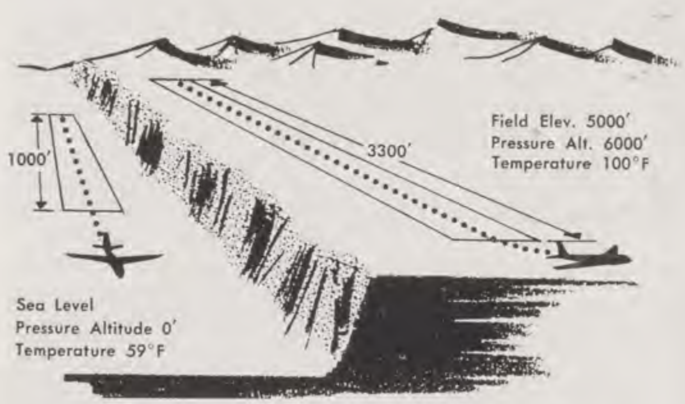
If he plans to go across on top, the pilot must consider the limitations of his plane. The clouds may build faster and higher than the aircraft can climb. For any sustained flight above 10,000 feet, he should have oxygen. At higher altitudes, winds may be half or even more than half the cruising speed of his aircraft, making fuel a very critical consideration.

Every pilot should develop his personal set of rules for flying cold fronts. The following rules can serve as a guide:

- Wait it out on the ground, especially if it is a fast-moving front.
- Fly the shortest course possible through the frontal zone.
- To avoid icing, select a flight level where temperatures are either well below or well above freezing.
- Check frequently for icing when in precipitation.
- Stay well below or well above clouds to avoid turbulence. If you go underneath, fly at an altitude that is about two-thirds of the distance from surface to cloud base; higher is too rough, and lower may be dangerous.
- Be sure you can see *all the way through* when you try to go underneath.
- Reduce airspeed for heavy turbulence.
- Beware of strong downdrafts in heavy showers.

A front is called a cold front when cold air overtakes and replaces warm air. The heavier cold layer wedges itself under the warm air, forcing it aloft.





Altitude-Temperature Effect On Aircraft Performance

SAFETY FIRST

Hot, High and Humid

Warm weather brings out airplanes the way a cookout attracts bugs. It's a time of flying vacations, fishing trips by air, plain pleasure flights and cross-country visits. It is also a time of accidents caused by the "Three H's"—hot, high and humid conditions.

Summer flying trips often take people to mountainous areas where the unwary pilot can get himself in an embarrassing position because of high altitude and heat. To avoid looking awkward, a pilot must make proper allowance for density altitude—pressure altitude corrected for temperature and humidity.

The altitude-temperature effects on aircraft performance are well known but, unfortunately, are frequently ignored. Failure to consider density altitude was a factor in three aircraft accidents taking the lives of 14 persons during one month in one western state last summer.

A pilot attempting to take off from an airport with an altitude a few hundred to several thousand feet higher than he is used to finds that the runway seems much shorter. He's still on the ground because the wings haven't developed lift in the thin air.

After he gets off, he will find his rate-of-climb substantially less. If the day is hot, the problem is compounded. High humidity further aggravates the problem. High altitude, high temperature and high humidity all mean less air density. Less density means less lift—and more runway needed to get you off the ground.

As an example of altitude-temperature effects on aircraft performance take an airport in a mountainous area. With a pressure altitude of 6000 feet and an airport temperature of 100 degrees Fahrenheit, the take-off distance for an aircraft increases 230 percent of its sea level standard day take-off distance. The rate-of-climb decreases 76 percent. An aircraft using 1000 feet for standard day sea level take-off requires 3300 feet. If its standard day rate-of-climb is 500 feet per minute, the rate drops to 165 feet per minute.

It isn't only lift that is adversely affected by hot weather and high altitude. Horsepower also is substantially reduced. Horsepower, unless the engine is supercharged—and most light aircraft are not—is based on sea level ratings. On the average light airplane, total horsepower output is required to maintain flight in the vicinity of 13,000 feet. If the temperature is high enough, these conditions can prevail at 8000 to 9000 feet or lower because of decreased density. In this situation the plane's angle of attack must be higher, which increases the drag, thus decreasing the lift and requiring more horsepower to maintain level flight. If no additional power is available, controls become less responsive and the aircraft is more prone to stall.

The aircraft stalls at the same indicated airspeed regardless of altitude but the rate of change between flying and stalling speed is much more rapid at higher altitudes. Although it may be necessary to maintain a nose-high attitude, any pilot flying at higher altitudes must be especially alert in avoiding too nose-high an attitude.

The best insurance against getting trapped by hot weather, high altitude operations is careful planning and reviewing the aircraft's performance charts in the owner's handbook or flight manual. In addition, many aeronautical charts for sections covering mountainous areas have a Koch Chart on the reverse side. The Koch Chart for altitude-temperature effects on airplane performance gives the pilot an excellent guide to performance based upon airport pressure altitude which he can obtain from the control tower. If a tower is not available, set the barometric window at 29.92 inches and read the pressure altitude directly from the instrument.

Here are a few guides for the pilot operating in mountainous areas, particularly in hot weather:

- Check aircraft weight and center of gravity. Don't toss in a poorly distributed overload of gear and passengers.
- Watch the aircraft's performance. Don't wait until you get into a tight spot to check power reserves.
- Altimeter settings can be inaccurate due to terrain. Because of ridges and narrow canyons, the air velocity may be accelerated, reducing pressure and giving a false reading.
- Approach a mountain ridge at about a 45 degree angle, rather than a 90 degree angle, so you won't have to make a tight 180 turn if you can't make it over the ridge.
- Approach the ridge at a sufficient altitude to see what's on the other side.
- If you are VFR, avoid clouds. Some of them can be "granite cumulus" with rocks in them.
- Mountainous terrain seldom looks the same way twice. Although you feel you may know it like the back of your hand, don't follow the flat country practice of getting down low and following a road—you may find yourself boxed in a box canyon.
- If you file IFR, remember the minimum enroute altitude must provide 2000 feet of terrain clearance in designated mountainous areas. That may put you up so high it will be difficult to hold altitude without supercharged engines.
- The last and perhaps most pertinent advice is *plan*. Plan take-off distance, rate-of-climb, best routes, altitudes, weather and winds.

And plan a way out of any conceivable situation, for to the "Three H's" might well be added a fourth—Human Factors, the greatest cause of accidents.

Letters

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

• Flight Recorder Location

The location of the flight recorder in the wheel well on aircraft requiring this device (*FAA Aviation News*, Feb. 1963) is somewhat surprising.

In view of the fact that this is usually a high-damage area in aircraft accidents, it would seem that a tail cone or other aft fuselage location for the recorder might be more appropriate. The aircraft rear fuselage sections seem to be the most likely to stay intact during break-up in aircraft accidents.

R. Larro
Silver Spring, Md.

FAA currently has no regulation governing the location of flight data recorders in aircraft required to have this equipment. Location varies with aircraft type and recorder model. However, the Agency is considering a proposal which would require installation of flight data recorders in the aircraft tail section to improve its crash resistance.

• Inspection Cost

I agree with your article, "Recognizing the Aviation Mechanic" (*FAA Aviation News*, April 1963). Generally, these men are well qualified and deserve recognition. I note that Mr. Halaby says, "We also need to update some of our educational material and licensing requirements to make them more responsive to our present jet age . . ."

I wonder if Mr. Halaby will consider that perhaps some licensing and inspection requirements are outdated and too strict? For example, it seems to me that a 150 or even 200 hour or two-year inspection for licensing a private aircraft would be perfectly adequate with the highly competent maintenance and construction standards which are commonplace today. I recall hearing an A&P mechanic boasting that he performed an annual inspection for the small sum of $27. The airplane had been flown only seven hours since the last annual.

Why should a man have to pay $27 to operate his machine which has been inspected so recently. It is such things as these which keep hundreds of little guys from buying airplanes and becoming fliers.

Bob Rutledge
McCook, Neb.

Although the cost of inspection is not a problem within our direct area of responsibility, $27 should be considered a very reasonable figure over a one-year period to assure that the structural integrity of an aircraft measures up to the minimum standards established by FAA. Recognizing that aircraft structure is subject to various types of deterioration during periods of inactivity, FAA believes it necessary to require a periodic inspection to assure an adequate level of safety. Time has proven that one inspection within 12 calendar months is a reasonable and justifiable requirement in the interest of safety.

• Limited Certificates

I am a limited flight instructor whose LFI license expires soon. Since LFIs no longer exist, would you please inform me what's necessary to obtain a standard flight instructor's certificate.

Leroy J. Paulsen
Vale, Oregon

Your valid limited flight instructor certificate may be exchanged for a flight instructor certificate without further showing of competence as provided in section 61.9 (b) of the Federal Aviation Regulations. *We suggest you make application on Form FAA 342 to your nearest General Aviation District Office before your present certificate expires. Your current limited flight instructor certificate should be submitted with your application.*

• Aviation Mechanics

Congratulations for the timely article on aviation mechanics in the April *FAA Aviation News*. I agree with you that the aviation mechanic must get his due. Without the combined efforts of all in the aviation industry, progress will be limited. Recognition for a job well done and training are the keystones of professionalism. I shall be looking forward to more articles on this subject.

Tony Gaudiello
SM/Sgt. USAF
APO 202
New York, N. Y.

• Weather Reports

The transmitted weather reports with area forecast, such as those broadcast over the low frequency station at Elmira, are an excellent FAA program which I hope will be continued in spite of the phasing out of the low frequency ranges. They provide a fine basis for a continuing study of day to day weather changes at home as well as in the air. This alone is an educational program that with a little additional cost can enhance general aviation safety on a nation-wide basis. The weather map at the weather station is no longer a surprise in pre-flight planning.

T. I. J.
Rochester, New York

Although low frequency range stations are gradually being phased out, 86 will be converted to H beacons and will continue to provide weather service. In addition, a pilot may obtain weather information from VOR stations which offer weather broadcasts at 15 and 45 minutes past the hour.

• Non-Resident Pilot Licenses

My son is considering enrolling in a school in the United States for a course as a missionary pilot. As part of the course it is necessary for him to obtain his private and commercial pilot's licenses. What are the restrictions regarding the licensing in the U. S. of both legal residents and students who are not legal residents but are attending college under a visitor's visa?

H. J. Scott
Don Mills, Ontario

United States pilot certificates are issued to all qualified applicants without reference to their nationality. The use of a pilot certificate to engage in a gainful occupation in the United States, however, does not fall within the scope of the responsibility of the FAA. Any questions on this point should be taken up with the Immigration Service.

• "Lost Pilot" Story

Better than a thousand reasons for instrument training and proficiency is this simple statement, without any additional comment. Its printing was a service to all pilots, instrument-rated or not.

Richard D. Bach
Flying Magazine
New York, N. Y.

I was utterly fascinated by the narrative and I'm still amazed that we have pilots with so little knowledge about themselves, their airplanes, and the limitations of both.

Martin A. Snyder
Van Nuys, Calif.

Please send us 50 copies of the reprint of the article on the lost pilot incident near Red Bluff, Calif. We want these reprints to distribute to flying clubs here in Oregon. We believe this can be a most useful tool to teach safety to our pilots.

Roger G. Ritchey
Board of Aeronautics
State of Oregon
Salem, Ore.

Free reprints of the "lost pilot" story—a transcript of the actual dialogue between the lost pilot and other pilots and traffic controllers who came to his assistance—are available from: FAA Aviation News, ID-20, Federal Aviation Agency, Washington 25, D. C.

FEDERAL AVIATION AGENCY
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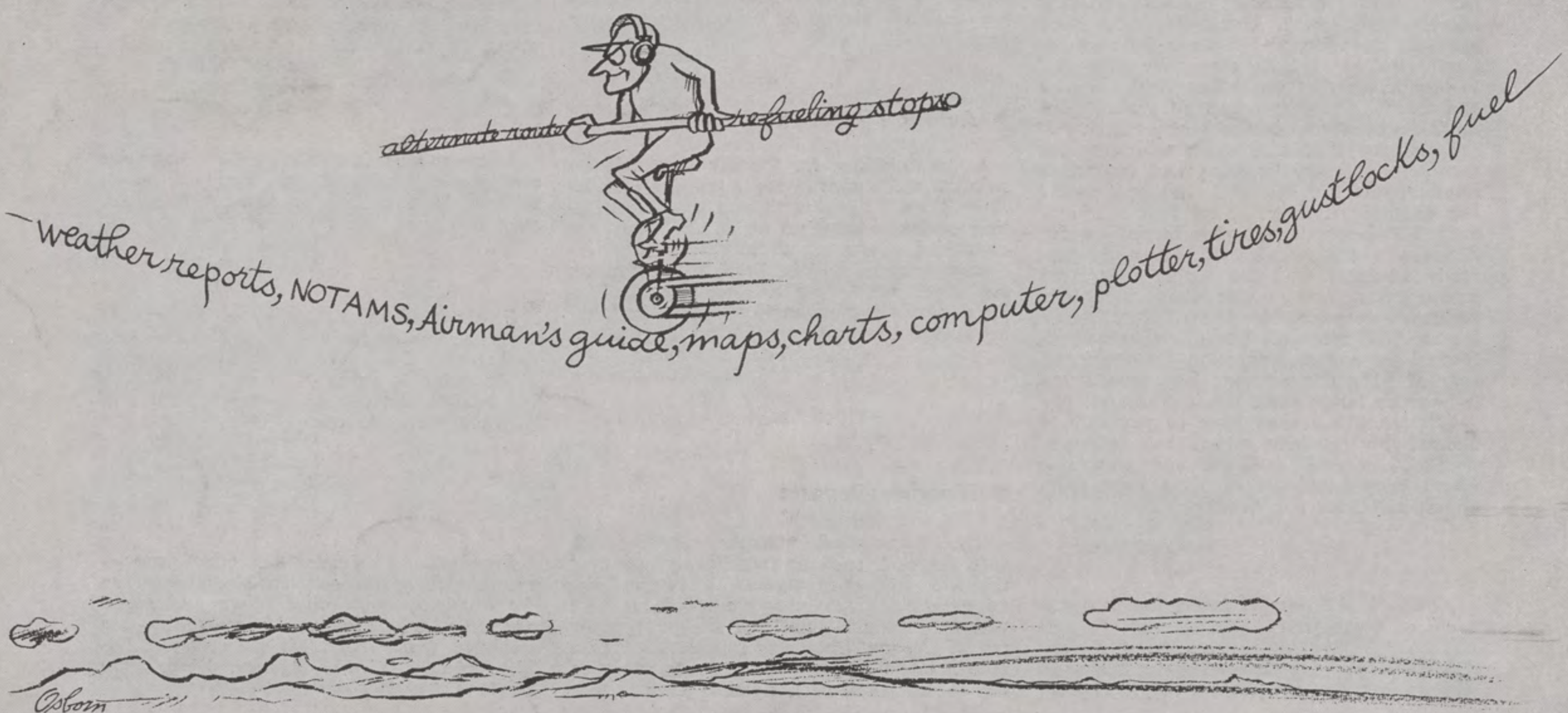

Safely