FAA | AVIATION NEWS

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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

First woman to span Pacific alone shows route to President and FAA Administrator at White House (see page 4).

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Models of some varied concepts show what commercial supersonic transport may look like.

BLUEPRINT FOR DEVELOPMENT OF SUPERSONIC TRANSPORT OUTLINED BY FAA

Step-by-step plans leading to the development of an American commercial supersonic transport for passenger service were announced this month by the Federal Aviation Agency.

FAA was given the responsibility for managing the program by President Kennedy, who has requested Congress to provide $60 million in fiscal year 1964 to start a design competition among U.S. airframe and engine manufacturers. The goal, said the President, is to place in the air "a commercial supersonic transport aircraft which is safe for the passenger, economically sound for the world's airlines, and whose operating performance is superior to that of any comparable aircraft."

With the approval of Congress, the FAA is prepared to make a request for proposals, or an RFP, available to the aviation industry. This RFP would establish in detail the performance requirements for the aircraft and its associated systems, as well as funding and development plans. Industry would be invited to submit proposals in a design competition to select the contractors for the airframe and engine.

The initial phase of competition, concluding early in 1964, could result in the actual selection of the winning contractors, but only if clearly superior design entries appear at this early stage of the program. If there is no clear "winning combination" in this initial phase of competition, two airframe and two engine contractors will be selected to go forward in a "detailed design competition" to run for a year. From this second phase of competition, the developers of airframe and engine would then be chosen.

Flight by Mid-1970

The ground rules for competition, the method of selection, and values assigned to different design features would be spelled out in the request for proposals. The Federal Aviation Agency, with the recommendations of other government agencies and the airlines, would make the selections.

The airplane to be developed by the winning contractors, chosen in either first or second phase of competition, may be test-flying within four-and-a-half years of the start of initial competition. This would be in 1968 should the program get underway this summer. The first passenger-carrying commercial flights could then take place by mid-1970.

Under the proposed development plan, government and industry would cost-share the development contracts. The estimated over-all development cost would be approximately $1 billion. The government would pay 75 per cent of the total or $750 million in the event of a $1 billion total. Development contractors would pay 25 per cent under cost-share contracts, or $250 million if the total is $1 billion.

Repayment to Government

Airline financial participation in the proposed program would reimburse the government for development costs under a royalty system. This would include advance royalties when an airline orders a supersonic transport and a percentage of revenues from operation of the aircraft after it enters service.

The advance royalty would be $200,000 on an airplane ordered within the first six months after selection of the developing contractor. The royalty would be $500,000 on an airplane ordered after this six-month period. After the transport entered commercial service, an airline would pay 1.5 per cent of revenues from its SST operation. These payments would cease when the government development costs were repaid.

Estimates of the unit cost of an SST to an airline vary widely depending on design characteristics of the aircraft. Estimates for an aluminum, Mach 2.2 airplane are between $13 and $15 million per unit. Average estimate for a steel-titanium transport is $22.6 million.

The government would withdraw from the picture with the completion of development. A development organization to be established within FAA to manage the program would be dissolved. The government would not engage in the operation of this commercial supersonic transport, nor does it contemplate the payment of production, purchase, or operating subsidies for those phases in the life of an SST.

FAA Administrator N. E. Halaby has characterized the aircraft to be developed as "the fastest supersonic transport with good handling qualities that we can get." He said in an address in Los Angeles, "We want the optimum safety-economy-speed combination, something well above Mach 2.2, I expect." Selection of primary structural material, he noted, would be closely related to design speed.

Performance Outlined

Halaby told the Harris Committee hearing in the House:

"The American supersonic transport should serve the major markets of the world on a nonstop basis. Thus, we seek a range of approximately 4000 statute miles, which will accommodate 85 per cent of the potential traffic for intercontinental transports.

"The aircraft should have a maximum gross weight in the order of 350,000 pounds with a payload of approximately 35,000 pounds, and will carry as many as 163 passengers and 2000 pounds of cargo and mail. The aircraft needs to accelerate through the transonic speed regimes at altitudes above 42,000 feet, and must cruise at altitudes which will reduce the sonic boom and, thus, the adverse reaction from people on the ground.

"It should be capable of operating from airports designed to accommodate today's international subsonic jets and should produce no more noise on landing and takeoff than today's jets create."

To provide over-all program management, the FAA would set up a supersonic transport development organization of fewer than 100 highly technical personnel and administrators. This group, under an FAA Deputy Administrator, would have authority to request assistance from NASA, Defense and other government agencies during various phases of the program. The SST development organization would consult continually with the airlines, the ultimate users of the transport, and public and private groups concerned with the development program.

AUTOMATIC LANDING SYSTEM PROGRAM ADVANCES

FAA's program to develop an automatic all-weather landing system took another step forward last month with the award of a $1,082,603 contract to Airborne Instruments Laboratory for an experimental, second-generation system.

This contract augments a program started in 1959 and in which approximately $2.5 million previously has been spent testing several contractors' designs.

A first-generation system, built around the existing ILS, is expected to be available to the airlines by 1966 for inclusion as a feature in new aircraft or retrofit into existing aircraft. Airborne elements in the system, which operate in conjunction with ILS, are a radio altimeter and a computer.

An FAA DC-7 test plane equipped with a test version of this "radio altimeter flare-out system" has made more than 1,000 automatic landings at the National Aviation Facilities Experimental Center (NAFEC), Atlantic City, N. J., and elsewhere in this country and abroad. An operational version of this system will be installed in a turbojet airliner in the near future for continued evaluation aimed at making a complete, safe, dependable, all-weather landing system available to the aviation community for the first time.

Essential elements in the second-generation system, to be developed by Airborne Instruments Laboratory, will be two ground-based electronic scanners to provide the aircraft with lateral and vertical guidance and an interrogator transponder combination to measure aircraft range. The interrogator will be airborne, the transponder on the ground.

Potentially, a fully-developed ground-scanning all-weather landing system could prove superior to the highly efficient ILS–radio altimeter system in several ways:

(1) The new experimental system could provide broader, more flexible approach paths for incoming aircraft than is possible in a system based on ILS. The latter, in essence, establishes fixed approach slots.

(2) By replacing the ILS–radio altimeter system with an integrated ground-based system, it would eliminate problems inherent in use of a radio-altimeter over rough terrain or in over-water approaches.

(3) The transition at low altitude from ILS glide-slope-guidance to radio altimeter guidance, a feature of the first-generation system, would be eliminated. The same electronic beams would provide guidance from the time the aircraft enters the system, five-to-eight miles out, until touchdown.

(4) Signals transmitted by the new system would, it is hoped, be free of electronic distortions that occur in ILS signals under some conditions.

Both the radio altimeter flare-out system and the ground-scanning system will include an independent, pilot-monitoring circuit to enable the pilot to take control of the aircraft from the automatic system at any point in the approach and landing.

The ground-scanning system being developed by AIL should be ready to enter testing at NAFEC in about two years, roughly at the same time that FAA's radio altimeter flare-out all-weather landing system is expected to become available for operational use. If development effort proves successful, the ground-scanning system could reach the operational stage as an available follow-on to the radio altimeter system in the 1970's.

Vigor of General Aviation Shown to Congressmen

Aviation-minded Members of Congress received a demonstration of the expanding role general aviation is playing in development of small communities and suburban areas during a three-day congressional aerial survey last month.

Sponsored by the recently organized Congressional Flying Club, the 850-mile tour covered Maryland, Delaware, New Jersey, New York, Connecticut and Pennsylvania. It included stops at Ocean City, Md.; the Flying-W Ranch, Medford, N. J.; Westchester County's business plane terminal at White Plains, N. Y.; the Bradley Jet Terminal, Hartford, Conn.; Reading Aviation and Air Taxi Center, Reading, Penn.; and the Piper Aircraft plant at Lock Haven, Penn.

Community groups at each stop explained the area's growth programs and the importance of airports and air transportation in stimulating new business and commerce. The trip was made in small twin-engine and single-engine airplanes.

Congressman Robert W. Hemphill (D-S. C.), a pilot and executive vice-president of the Congressional Flying Club, was chairman of the flight. James T. Pyle, former Federal Aviation Agency deputy administrator, was in charge of cooperating organizations and community assistance groups.

First Woman to Fly Solo Across Pacific Honored with FAA Medal

Mrs. Betty Miller

Mrs. Betty Miller, the first woman to fly solo across the Pacific, was awarded FAA's first Decoration for Exceptional Service last month.

Her citation, presented by Administrator N. E. Halaby, reads: "For her historic and courageous flight alone across the Pacific Ocean—Santa Monica, California-Brisbane, Australia—April 30-May 12, 1963. Her 7400-mile journey marked the first time the Pacific was spanned by a woman flying alone. Her valor and skill give her a special place in the legendary history of American aviation."

Following the presentation, President Kennedy personally congratulated Mrs. Miller, a senior flight instructor at a Santa Monica flying school where her husband, Charles, is chief pilot.

Mrs. Miller flew over the same area in which Amelia Earhart disappeared in 1937. She completed the flight in 54 hours and 8 minutes of flying time, making stops in Honolulu, Canton Island and the Fiji Islands. She was delivering a twin-engine Piper Apache to Australia.

A former CAA employee from 1944-1954, Mrs. Miller served as a communicator in Oakland and Riverside, Calif.: Lovelock, Nev.; and Wendover, Utah.

She has logged more than 6500 hours of flying time, and is one of 51 qualified women helicopter pilots in the free world. She first soloed in 1952 and is a member of the International Whirly-Girls and the 99's, a women fliers organization established by Miss Earhart.

Mrs. Miller has a Commercial Pilot Certificate and a Flight Instructor Certificate. She has ratings for instruments, multi-engine, helicopters, helicopter instructor and instrument instructor.

National Survey of General Aviation Launched

Information on the extent and scope of general aviation is being sought in a nation-wide survey now under way by the Federal Aviation Agency.

The survey is being conducted to obtain specific data concerning the 1962 operations of general aviation aircraft owners in the United States. An analysis of the data will help FAA and industry assess the future needs of this phase of flying activity which includes 85,000 planes—40 times the number of airline aircraft. The last such survey was made in 1957 when there were only 66,000 general aviation aircraft.

Recipients of a two-page questionnaire, selected at random from the list of aircraft owners on file at FAA's Records Center at Oklahoma City, are being asked such questions as types of radio equipment, hours flown during 1962, length of trips, average number of passengers carried, fuel consumption, cruising speed, and estimated amount of IFR flying.

Also covered is the type of flying done —whether instructional, passenger, pleasure, business, or aerial application (dusting, spraying, or seeding). Other data concerns the pilot's age, training, and business and reasons for using general aviation aircraft in business rather than commercial means.

In announcing the survey, FAA Administrator N. E. Halaby said that "much less is known about general aviation's characteristics than any other kind of flight activity."

Answers to the completed survey forms, which have been mailed to aircraft owners, will be consolidated for statistical purposes and will be treated confidentially. They will not be used in connection with any regulatory matters.

After results have been compiled, a general report on the findings is expected to be issued by the spring of 1964.

Greater Flexibility Sought in Training of Pilots

FAA has proposed a new rule which would provide greater flexibility in student pilot training by permitting the student to make solo flights within a local area before he receives instrument instruction.

The proposal would amend Part 61 of the *Federal Aviation Regulations*, which requires applicants for a private pilot certificate to receive instrument instruction in primary flight maneuvers both before and after solo. This rule has drawn sharp comment from industry sources objecting to the pre-solo requirement.

As a result of these comments, FAA has concluded that the present rule might not provide enough flexibility in the student's training curriculum and should be changed to require instrument training only before solo cross-country flight rather than any solo flight.

The proposal would give certificated flight instructors the authority to determine whether their students should be introduced to instrument operations before or after local solo flight. This approach would permit the flight instructor to begin instrument training at a time tailored to the individual student's needs.

New Aircraft Certificated

Left to right: Bell 204B has 900 hp. Lycoming turbine engine that provides cruising speed of 120-138 mph, 230-mile range and 13,000-ft. service ceiling at 7,500 lb. gross weight. Jamieson J-2-L1b is a four-seat, all-metal airplane with retractable landing gear, large single slotted flaps and a four cylinder Lycoming engine providing 150-mph cruising speed. Helio Twin H-500 is a six-place aircraft with unusually short takeoff run: 290 feet at full 4,500-lb. gross weight.

Drug Hazard Guide, Booklet for Instructors and Pilots Available

Undesirable side effects of tranquilizers, stimulants and other drugs which could make flying a hazard is the subject of the FAA's newly issued publication *Guide to Drug Hazards in Aviation Medicine*.

The first of its kind, the *Guide* is intended primarily for the use of the Agency's Aviation Medical Examiners in counseling pilots and other airmen on the use of drugs which can be incompatible with safe flying.

The publication consists of a comprehensive list of all commonly used prescription drugs, suitably indexed. The text of the "Guide" treats in groups those drugs with similar pharmacological effect. For each group a concise statement is made concerning: 1) the side effects, if any, which make them undesirable for fliers, and 2) recommendations concerning the length of time a pilot should wait after taking a drug before resuming flight activity.

Although a Federal Aviation Regulation prohibits a pilot from "using any drug which affects his faculties in any manner contrary to safety," before the issuance of the *Guide* there was no readily available reference to determine which drugs can have such an effect.

This material has been published as a *Guide* rather than a formal clarification of the existing rule. This is consistent with the Agency's desire to promote aviation safety by education in appropriate circumstances.

It was prepared for the Agency, at the request of its Aviation Medical Service, by Dr. Windsor C. Cutting, Professor of Therapeutics at Stanford University. A number of other eminent pharmacologists throughout the country and the staff of the Aviation Medical Service assisted Dr. Cutting in its preparation and review.

Guide to Drug Hazards in Aviation Medicine may be purchased for 55 cents from the Superintendent of Documents, Washington 25, D. C.

Also available is a new pocket-size publication for flight instructors as well as student pilots.

The publication, *Private Pilot Flight Training Guide*, provides lesson guides for instructors and also serves as a reference guide for students. In addition, it can be used as a flight log by the student and has provisions for instructor signatures certifying work accomplished by the student.

Private Pilot Flight Training Guide is available from the Superintendent of Documents, Washington 25, D. C., for $1.

UP-TO-DATE MEDICAL FACILITIES AT BOSTON–LOGAN

Most common ailment treated: foreign body in eye.

Modern medical facilities are serving the emergency health needs of air travelers, visitors and employees at the hospital-type medical center recently opened at Boston-Logan International Airport.

Staffed by the Massachusetts General Hospital and sponsored by the Massachusetts Port Authority, the new medical facility is the first in the United States to be administered by a major hospital.

It is completely equipped to take care of injuries and emergency illnesses among the 25,000 people who pass through the airport each day, in addition to the 5000 airport employees. Nurses of Massachusetts General Hospital are on 24-hour-a-day, seven-day-a-week duty, with physicians on call. Facilities include a reception area for patients, a doctor's office, conference and examination room, treatment room, recovery room, laboratory and x-ray room.

In addition to providing emergency treatment, the medical station augments the established crash-rescue program of the Port Authority.

Test Value of 'Copter Down-Wash in Fire Control

Use of helicopters to increase passenger survival chances in aircraft accidents involving fire will be evaluated in a series of tests scheduled to begin early next month at FAA's National Aviation Facilities Experimental Center near Atlantic City, New Jersey.

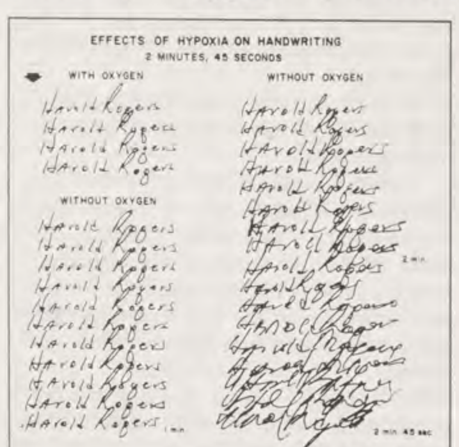
Five surplus Air Force KC-97s, a military version of the four-engine Boeing Stratocruiser, will be set afire during the test series. They will be fitted and insulated to simulate commercial aircraft and will be fully instrumented to measure the effects that heat and toxic fumes would have on passengers.

Helicopters will be used in the program to see if rotor down-wash can significantly increase the time passengers have to escape from a crashed and burning aircraft by dispersing the flames and cooling the fuselage. The Kaman H-43 helicopter, already used by the Air Force for crash-rescue work, is scheduled to participate in the tests along with single and tandem rotor craft.

Various ground fire-fighting methods, including the use of fire-swathing foam, also will be evaluated.

More than 20 fires are programmed for the test series. They will be increased in severity as the series progresses, culminating in a simulated major survivable crash involving a fire fed by some 5,000 gallons of jet fuel.

Lack of Oxygen a Potential Threat to High Fliers



Hypoxia—insufficient oxygen—can be a hazard to high flying pilots, causing incapacitation without the individual realizing what has happened. Hypoxia is insidious because it commonly creates a feeling of well-being that may be fatal. The effects can be seen in a test in a relatively short time, as the handwriting specimen shows. Paradoxically, as total incapacitation nears, the pilot feels that things are improving. The unknowing or inattentive pilot can easily succumb to the effects of hypoxia and ride his plane into the ground, unseeing and uncaring. The best advice: Use oxygen when flying at altitude (above 10,000 feet); descend if there is any danger.

Proposed Rule Designed to Curb Abuses of Written Examinations

FAA has proposed written examination prerequisites for certain pilot certificates and ratings to curb the practice of "cribbing" on these tests.

The proposal would affect persons applying for private and commercial pilot certificates, flight instructor certificates, and instrument ratings. Prerequisites for the written examination leading to an airline transport pilot certificate have been in effect for many years.

Admission to written examinations would be limited by the proposed rule to persons (1) who have soloed an aircraft if they are applying for a private pilot certificate, or (2) who hold at least a private pilot certificate or have at least 50 hours of flight instruction and solo flight time if they are applying for a commercial pilot certificate, flight instructor certificate, or an instrument rating.

The examination also would be open to persons who have completed an appropriate pilot ground school course.

No one would be permitted to take a written examination for a certificate or rating if he already has passed the test or if he already holds that certificate or rating or a higher one.

The absence of prerequisites for various pilot written examinations has resulted in persons taking these tests for the sole purpose of passing on information to their friends. It also has contributed to the preparation of "sample" examinations or examination "keys" which are sold to applicants for pilot certificates and ratings.

These practices lessen the effectiveness of written examinations since they encourage applicants to concentrate on learning the answers to specific questions instead of obtaining a comprehensive knowledge of the required aeronautical material.

Comments on the proposed rule (No. 63-24) will be accepted until August 26 at the FAA Dockets Section, Washington 25, D. C.

NOTICE

Change of address notices from airmen should be addressed to:

Airmen Certification Branch,
FS-960
FAA Aeronautical Center
P. O. Box 1082
Oklahoma City, Oklahoma

WATCHMEN OF THE SKY

A squadron of electronics technicians will fly nearly 17,000,000 miles this year checking the accuracy of navigational aids that daily guide civil and military aircraft safely to their destinations.

These aerial monitors—600 of them—are the Federal Aviation Agency's flight inspection crews. They man a fleet of 80 aircraft used in assuring the accuracy of 5,179 air navigational facilities—VORs, VORTACs, TACANs, ILS, low frequency ranges, terminal approach facilities, radar, and other traffic control facilities. Also included in the flight inspection program are the proper operation of approach lights, sequence lights, homing beacons, markers, and all other navigational aids. A navigational aid putting out wrong directions is worse than none at all. It could be fatally misleading.

FAA also is responsible for flight checking military facilities throughout the Free World and, on a reimbursable basis, the navigational aids of many foreign nations under this country's commitment to the International Civil Aviation Organization.

Flight inspection aircraft qualify as airborne electronics laboratories with their complex of sensitive measuring equipment. As the aircraft flies over or in the vicinity of a navaid, accurate readings are obtained. When an error is detected—by comparing the known aircraft position with information the navaid is broadcasting—ground technicians are immediately notified and the facility is adjusted or repaired. Where the correction cannot be made immediately, a NOTAM is issued.

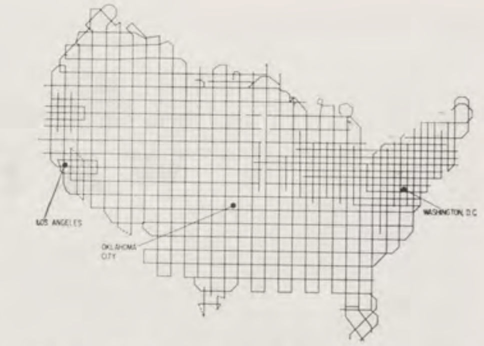
Although many obvious errors are spotted by the technicians aboard the aircraft, final determination of facility accuracy is made by computers at Oklahoma City where the tapes and recordings go for processing and analysis.

Because of the performance differences in aircraft and the altitude at which they operate, and because facility signals are not always the same at all flight levels, the program is divided into three major phases. Each phase uses different types of aircraft for inspection work; each also employs somewhat different inspection techniques.

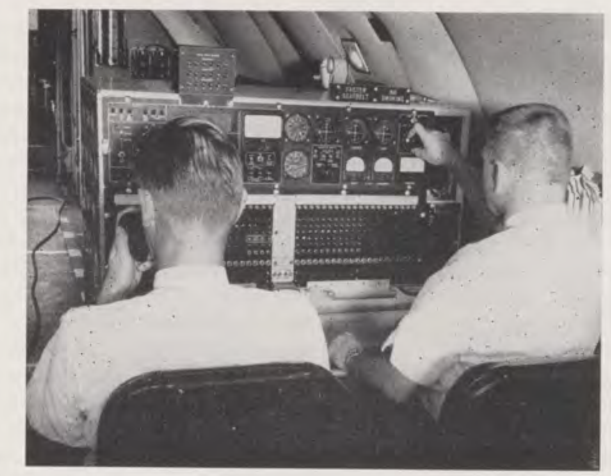
Operating out of FAA's seven domestic regions are more than 50 DC-3s, Constellations, C-54s and a C-123. Their crews use an orbiting technique to check individual navigational facilities, primarily at flight levels up to 15,000 feet.

Above, an airliner flies past an Instrument Landing System (ILS), one of many navigation aids checked by FAA. Below, jet route inspection crew.

VORTACs, which provide aircraft with both distance and direction information, are key navigational facilities whose accuracy must be maintained by FAA.



Grid covering entire nation is used with electronic computer for semi-automatic flight inspection.



Upper left, electronic technicians of C-135 flight inspection crew monitor sensitive measuring equipment. Left, Convair crew operates control panel in checking facility performance. Above, analog recorder gives instant readout information.

This basic program uses two systems of checking navaids.

In one system, the aircraft is flown over a visually determined position and then the accuracy of the facility signals is checked. In the other system, the aircraft's position is determined by theodolite from the ground at the facility site. By flying an orbit around the facility they can determine the accuracy of its signals from numerous bearings.

At flights levels between 10,000 and 23,500 feet FAA's turbo-prop Convairs fly a grid system to cover the entire United States. An electronic pulse time count technique determines their exact position in relation to the facilities being checked. The nation is divided into squares and by flying a grid pattern, the crew can check the accuracy of all navaids in that area by means of semi-automatic flight inspection (SAFI) which uses electronic computers. Grids are squares, 80 miles to a side. In high density areas, the grid sides are reduced to 40 miles because of the increased number of facilities.

Above 24,000 feet, jet operations crews fly the jet route in two C-135s (military version of the Boeing 707), a twin-engine jet B-57, and TV-2s (Navy version of the Air Force T-33). They also use the pulse time count system. By flying jet routes and filling in gaps between established routes, they obtain a route grid inspection similar to the grid system of the Convairs.

Although operating basically at altitudes flown by aircraft designed for those flight levels, the crews and planes of the three phases may overlap in the low, intermediate, and high altitude areas. However, the low level phase is devoted primarily to individual facilities. The Convairs specialize in surveillance of the entire system. The high altitude jets are responsible for jet route system surveillance, using the route grid method.

While crews of the basic group are busy inspecting individual facilities within their regions each day, aircraft of the intermediate group and the jet operations crews are overhead, patrolling the airways to maintain accuracy of aids on a national scope.

A regional DC-3 flight inspection daily mission may take six hours and cover 900 miles. A normal mission for a Convair working the grid system will be the 80-mile sides of 12 grids for a total of 960 miles, plus the distance from take-off base to the place the inspection begins. A normal daily jet mission will cover 3,500 miles but by carrying two crews and 16 hours of fuel, a C-135 may fly as far as 8,000 miles on a single mission. The jets are based at Oklahoma City. Convairs also are based there as well as at Los Angeles and Washington.

The Convair crews fly a complete grid pattern of the United States every eight weeks. Jet facilities are checked on a semi-annual basis plus additional "demand" missions flown as necessary.

A number of different types of check missions are flown. They include:

- Selecting a site for a facility before it is installed.
- Flight check after installation.
- Periodic inspections.
- Operational inspections, done between periodic inspections.
- Special checks.

Crew size varies from two men—a pilot and an electronics technician—in the B-57 or TV-2 to as many as eight in a C-135. The DC-3s operate with two flight inspectors (pilot and copilot) and a flight inspector technician. The Convairs carry a pilot and copilot, flight supervisor who is also a pilot, and two or three electronics technicians. The C-135 crews include pilot, copilot, flight engineer, and electronics technicians. Flight inspection crew members are required to be pilots or electronics experts.

After joining the flight inspection program, crewmen are trained at FAA's Aeronautical Center at Oklahoma City in a four-to-six-week basic course in theory of radio propagation, antenna design, operating theory of ground and airborne equipment, methods, techniques, and tolerances. Periodically, crews return to the Center for refresher courses as well as a four-week advanced course.

The task of assuring the accuracy of navigational aids keeps flight inspection aircraft in the air 90,000 hours a year, the equivalent of 10 aircraft on airborne inspection missions every minute of every day of the year.

WARM FRONTS

This is the fifth in a series of articles on aviation weather prepared by meteorologists of the Weather Bureau.

The warm front is a gentle relative of the cold front, moving in a slow, orderly way and announcing its arrival well in advance. Although its effects are usually less violent than those produced by a cold front, its influence extends over a much broader area. As a result, it can be a trouble-maker for the unwary pilot.

A warm front is the leading edge of a mass of warm air that is overtaking and replacing cooler air. In the wintertime, the temperature of this "warm" air may be below zero and still be warmer than the air it replaces. In summer, this air temperature may be in the 90s.

Normally, warm air masses come from the south and are caught up by winds blowing toward the east. Thus, a warm front in the United States generally moves from southwest to northeast.

Because warm air is lighter and less dense than cold air, warm air has to work hard to displace cold air. For this reason, warm fronts travel at a slow pace—15 to 20 miles per hour on the average.

As the light, warm air flows over cold air in a gently sloping wedge pattern, it produces an orderly progression of clouds that gives the pilot plenty of warning. If he is alert, he can recognize the signs of an approaching front before he gets into it.

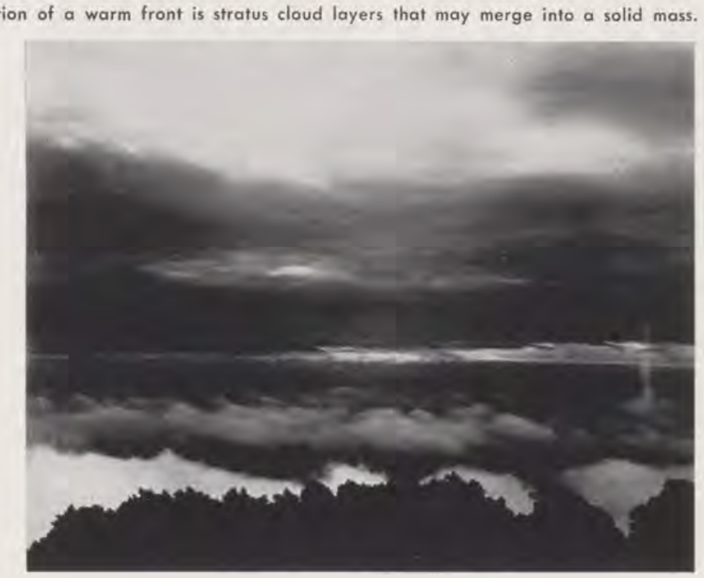
On the ground, a sequence of gradual changes accompanies the approach of a warm front. Often, after several clear days, high-flying jets begin leaving condensation trails in the sky. These "contrails" are the result of the condensation of water vapor that accompanies engine combustion at high altitudes. At first, the contrails are short and disappear quickly. During the day, they tend to lengthen and persist, sometimes spreading and forming cloud layers. Careful observation with the aid of sunglasses may reveal thin, delicate cirrus clouds over most of the sky, although a casual observer would call the sky clear.

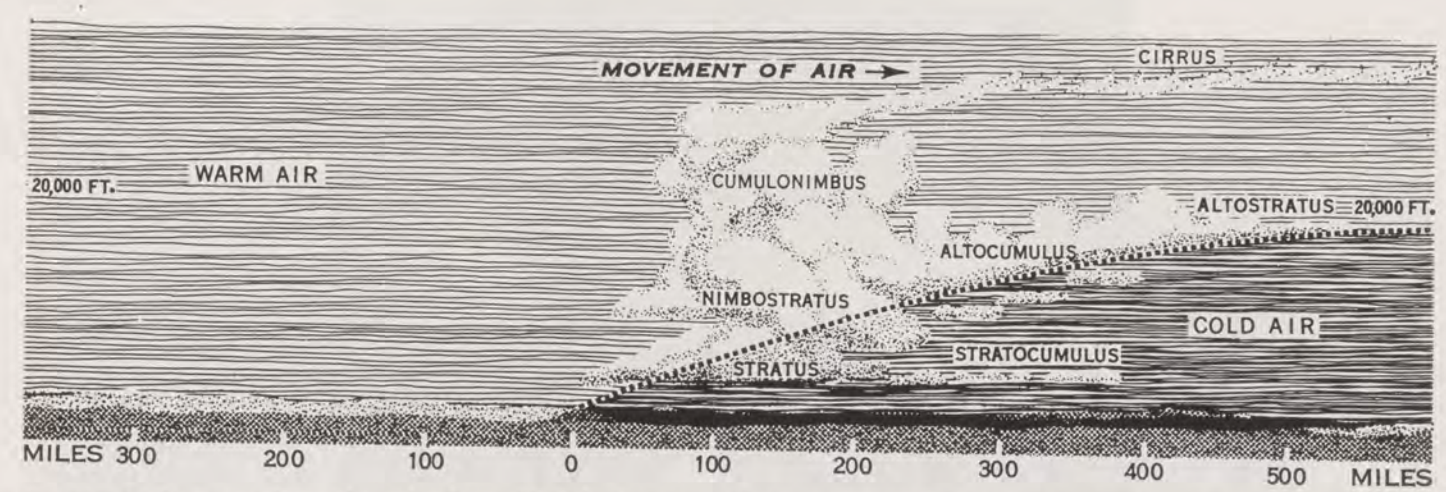
As the warm front moves nearer, cirrostratus cloud cover creates a halo around the sun. Visibility decreases and distant objects become hazy and indistinct. Winds tend to blow from a southerly direction, slowly gaining in strength. Clouds gradually thicken and lower until the sun disappears. Visibility decreases further, winds intensify, and precipitation begins.

In flight, the first indications of an approaching warm front are thin, high cirrus clouds that persist and tend to become thicker toward the horizon. The leading edge of the continuous layer of cirrostratus is roughly parallel to the intersection of the frontal surface with the ground, providing a clue to the orientation of the front.

Closer to the front, the high-level cirrostratus gradually becomes middle-level altostratus or mixed altostratus–altocumulus clouds, hiding the sun. Even lower level clouds such as nimbostratus and stratocumulus appear. As these lower layers merge into a solid cloud mass, precipitation begins or increases in intensity. The cloud mass may slope all the way to the ground. The pilot who tries to sneak under may be in for a surprise.

Left, familiar contrails that often foretell a warm front. Right, another indication of a warm front is stratus cloud layers that may merge into a solid mass.





In a warm front the warm air overtakes and replaces cold air, flowing up over the thin wedge of heavier cold air below it and forming a broad band of clouds.

A VFR pilot can find himself trapped where the cloud layers suddenly merge. He may lose all visual reference to the horizon before he has a chance to execute a 180 degree turn.

In a cold front, warm air is pushed upward by the wedge of cold air underneath. Warm air overtaking cold air is lifted more gradually. Warm fronts, therefore, are generally of a milder nature than cold fronts. An exception occurs when the warm air is unstable.

In a stable atmosphere the normal flow of the winds tend to be horizontal. A stable atmosphere resists any upward or downward displacement and tends to return to normal horizontal flow. An unstable atmosphere allows upward and downward disturbances to grow. Stability, then, is the tendency of the atmosphere to resist vertical motion. It depends on the relative density of the air at various levels and also on the changes in density which may take place at various levels.

When unstable warm air overtakes cold air, thunderstorms often develop. As the warm air glides up the frontal surface it rises to levels where it is warmer and lighter than the surrounding air, thus increasing its buoyancy. As a consequence, rapid turnover develops, including strong up and down currents, and a thunderstorm is born. The thunderstorm may be embedded within the solid cloud structures, hidden from a pilot's view. The unwary VFR pilot, trapped between layers, faces the possibility of running into the thunderstorm while trying to extricate himself.

Warm fronts, as a rule, spread low ceilings, poor visibilities, and precipitation over extensive areas. If the warm air is sufficiently moist, the precipitation area may precede the front by a hundred miles or more.

A pilot flying through a warm front should plan to be on instruments for some time. He cannot expect to find rapid improvement in surface conditions on either side of the front. Visibility is often poor in the warm air behind the front, and marginal weather is quite extensive in the cool air ahead of the front. When heading for an airport on the warm side of the front, it is wise to *check on two alternate airports in case should go below minimums.*

Extensive areas of freezing rain or drizzle are often associated with winter warm fronts. These can be troublesome even to large aircraft equipped with de-icing gear. A small aircraft without de-icers may build up an unmanageable load of ice in a few minutes of freezing rain. When this occurs, and wide areas underneath report less than landing minimums, IFR pilots may escape icing conditions by climbing into the warm air aloft.

VFR pilots should not plan to fly under an active warm front because ceilings often lower to the surface. Extensive clouds cover also makes it unwise to attempt VFR on top. The best policy is to land at an open airport and wait out the front's passage.

After a warm front has passed, the air is noticeably warmer and more humid. Visibility usually remains restricted to some extent, although the sky may clear considerably. Surface winds blow from a more westerly direction. When the area between the warm front and a following cold front is large, weather improves slowly for perhaps a day or two before the approaching cold front makes its presence known. When the warm front is followed closely by a cold front, the period of mild, improving weather may be brief or there may be no perceptible improvement in flying weather until the cold front has passed.

These weather patterns are generalized and fit only a small number of actual situations. In reality, conditions vary widely from case to case. Each frontal situation should be evaluated on an individual basis using the available weather reports, forecasts, and advisories and considering the limitations of the pilot and his aircraft.

When flying in warm frontal conditions:

- Beware of freezing precipitation and check frequently for icing.
- Determine the best flight level before penetrating the warm front. As a general rule, fly high (above 18,000 feet) or low (below 6,000) to avoid icing and turbulence;
- When flying toward an approaching warm front, expect ceilings to lower at the rate of at least 5,000 feet every 100 miles;
- Fly the most direct course across the front;
- Prepare for prolonged instrument flight. You can't plan to be IFR for just a minute or two;
- Remember that as you fly toward a front, it is moving also. Learn its direction of movement and compute your rate of closure;
- Land early to avoid being trapped. In pre-warm front conditions, ceilings and visibilities often lower abruptly with the onset of darkness.

Aviation Mechanic Vital to Safety

For every aircraft in the sky there is a man on the ground who has helped put it there, staking his reputation and professional skill that it is airworthy.

Often unheralded, he is the FAA-certificated aviation mechanic who has meticulously checked the aircraft to insure that it meets rigid safety and performance standards. He not only repairs it and then certifies that the repairs were made in accordance with strict FAA and factory standards, he also is responsible for performing exhaustive inspections at specific intervals to help prevent future malfunctions.

As many as 130 or more items are checked during these inspections. The list includes the propeller group, engine group, cabin group, landing gear, wing group, fuselage and empennage, and engine run-up inspection.

To meet FAA approval for operation, all of the 85,000 general aviation aircraft in use must be given at least an annual periodic inspection. In addition, aircraft carrying passengers for hire or used in flight instruction must have an inspection each 100 hours of flight.

Some owners use a progressive inspection system which exempts them from the periodic inspection. Under this progressive method, portions of the inspection may be made at one time, with others being conducted at a later date. This permits the operator to get greater utilization of his aircraft by working in the inspection piecemeal between flights.

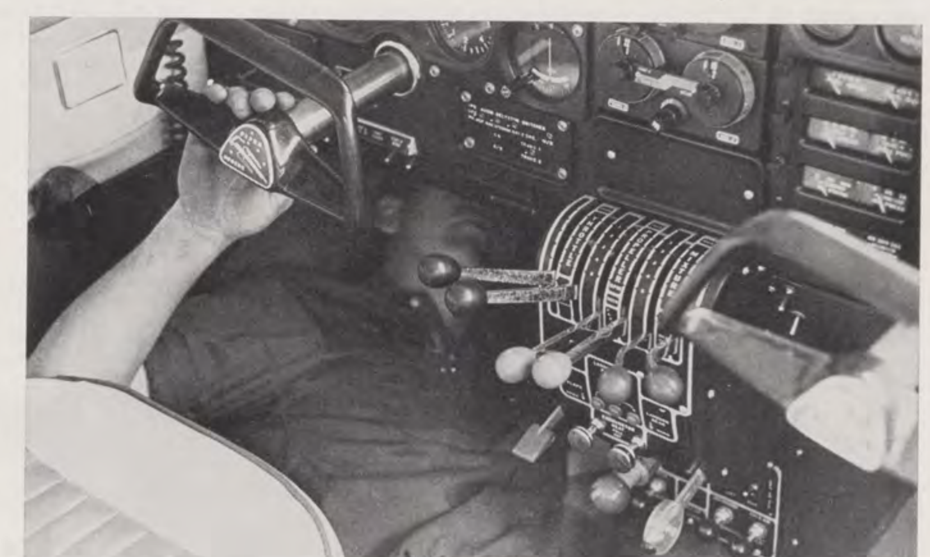
To be eligible to perform a 100-hour inspection, the aviation mechanic must have an Airframe and Powerplant rating (A&P). To conduct the periodic inspection, he must also be an Authorized Inspector (AI). His authorization is an additional privilege of his mechanic's certificate that is earned by passing an examination.

Obtaining the A&P rating and the FAA approval as an Authorized Inspector doesn't come easy. To be rated as an A&P, an aviation mechanic must have three years of experience or be a graduate of an FAA-approved school. He also must pass rigid written, oral and practical tests. To obtain his AI, he must have been an A&P for three years and pass a written test.

The FAA maintenance inspector and the AI work closely together, with the AI often calling in the inspector to discuss a malfunction or service deficiency in the aircraft.

In addition, the AI's work is scrutinized by FAA maintenance inspectors who appear unannounced to do surveillance checks on the quality of inspection and repair being accomplished.

The aviation mechanic who repairs or performs a scheduled check on an aircraft not only relies upon his training and professional skill, he also is guided by manufacturers' manuals and FAA standards that are designed to help him achieve a mutual goal—safety in the air.



Clockwise from top left: Inspection sequence begins with engine run-up, after which mechanic checks to see if plane conforms to directives. AI and FAA inspector discuss a malfunction. Torque wrench is used for proper checking of propeller mounting bolts. Instrument lines and attachments in the cabin get once-over. After thorough examination from propeller to the tail and landing gear to wing tips, mechanic ascertains that plane's papers are in order before signing off on the job and sending aircraft back into service. A visual indicator is put in prominent place showing year and date the next inspection is scheduled.

SAFETY FIRST

Weight & Balance

An aircraft is somewhat like a woman concerned with her weight. It isn't only pounds that count; it's also where they're put.

An airplane is a delicately balanced machine whose behavior in the air depends on its weight and balance. Add weight on either side of an airplane's center of gravity, and the CG changes. If the change goes beyond well-established limits, the pilot and his passengers are in for trouble.

A major contributor to the overloading or improper loading of airplanes is the tendency to carry too much baggage. Often, women attempt to jam in too many pieces of luggage for a vacation trip. Or men, on a fishing, hunting or business trip, overload the baggage compartment with gear.

A pilot should know the maximum gross weight of his aircraft. He should also use the loading schedule in accordance with the manufacturer's loading information found in the owner's manual, flight operations handbook, or aircraft data sheets in the aircraft. Unfortunately, many pilots forget or ignore the information—and each year a number of accidents occur that could have been avoided.

Example: A pilot recently landed at an airport and ordered gasoline. However, he failed to notify the attendant *not* to fill the auxiliary tank under the rear seat since he had three other passengers and a load of baggage. The attendant topped off all tanks, including the aux tank, while the pilot and his passengers were in town making some purchases. When they returned, the added weight of their purchases in the baggage compartment—plus full tanks (including the auxiliary tank) —gave them a gross weight of 120 pounds above maximum and moved the center of gravity outside the maximum rear limits. They attempted to take-off, stalled just after becoming airborne, and crashed.

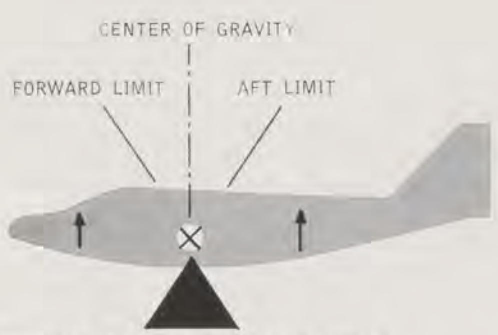
Example: An experienced pilot took off with a piece of drilling equipment weighing 280 pounds but well within the maximum weight for the light aircraft. However, because of its length, it extended back from the cabin into the fuselage, placing the aircraft's center of gravity well aft of the allowable limits. Although the pilot managed to become airborne, the plane was extremely difficult to control. Realizing his problem, he attempted to return to the airport but was forced down in a nearby field. Fortunately, he managed to land without damage or injury.

Even if an overloaded aircraft does make a successful take-off, metals and others structural materials have a "memory." If they are stressed repeatedly, they eventually will break.

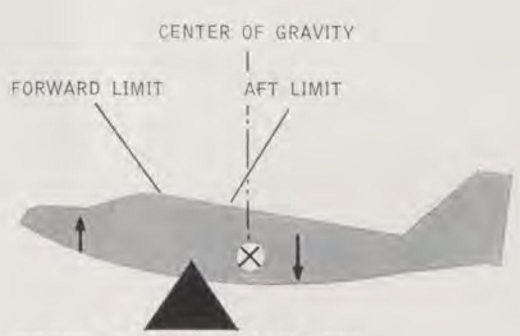
Another factor that may trip up the unwary pilot is the baggage compartment placard listing the maximum allowable baggage weight. This baggage allowance is based upon maximum allowable structural load for that particular location in the aircraft, as well as on the plane's gross weight.

But on many airplanes it is not possible to fill all seats, the baggage compartment and tanks and still remain within the approved weight and balance limits. Therefore, with a maximum gasoline and passenger load, the addition of any baggage at all may bring the total aircraft load above the plane's maximum gross weight.

Weight and balance problems can be solved quickly by using the authoritative publications that are available. Their use will save lives and airplanes.



WEIGHT PROPERLY DISTRIBUTED



EXCESS WEIGHT PLACED AFT

Letters FAA

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.

• Tower Communications

What does a pilot do when he is unable to raise the tower on entering the control zone of a large airport with intentions of landing? Do you keep on boring in and enter traffic according to instructions that you hear being given to other aircraft, or must you stand off five miles and keep on calling?

I've had instances where the only one that would pay any attention to me was ground control, but all they will tell you is to call the tower again.

Ralph Simpson
New York City

Regulations provide that in event of either radio transmitter or receiver failure during a VFR flight, the pilot is authorized to enter the airport traffic area and land if the weather is equal to or above VFR conditions, and if the pilot maintains visual contact with the control tower, and obtains a light signal clearance from the tower prior to landing.

This does not relieve the pilot from responsibility for taking every reasonable measure to establish radio contact. On occasion the tower workload may be so heavy that an immediate answer is impractical. But even under these conditions, the tower should acknowledge the call and request the pilot to standby momentarily.

• Instrument Flight Off Airways

Can an instrument-rated pilot fly a properly equipped plane, on actual instrument conditions, off airways and control areas without filing a flight plan or notifying any tower or FAA facility?

This question recently was asked a group of pilots and while we realize that ATC controls only traffic on airways or in control areas, it is rather shocking to believe that several aircraft can be flying on instruments, uncontrolled in an uncontrolled airspace. While the majority seem to feel it is illegal, we can not find it written in the regulations.

Ben Wrobel
Rockville, Conn.

Section 60.41 of the Civil Air Regulations *requires the filing of an instrument flight plan with air traffic control before operating in controlled airspace under instrument flight rules. Controlled airspace by definition in CAR 60.60 includes the "airspace of defined dimensions designated in Part 601 . . . as continental control area, control area, control zone or transition area, within which air traffic control is exercised."*

Instrument flight is not prohibited outside these areas, provided the pilot is properly rated and the aircraft is suitably equipped. But no traffic control service is provided. Air traffic control clearances for instrument flights apply only to those portions of such flights which extend through controlled airspace. However, it is recommended that a pilot remain in controlled airspace whenever practicable in order to receive the protection provided by Air Traffic Control.

• Traffic Control System

I suggest that FAA eliminate the intermediate airways system and lower the jet routes down to 14,500 feet. This would be the first step in placing the entire United States under positive control from 14,500 feet to infinity.

Then a special code could be used for coded radar beacon transponders for loss of radio communications—either transmitter, receiver or both. I think this would simplify several aspects in handling aircraft in this area with radio difficulties.

Leroy Scott
Memphis

A Federal Aviation Agency plan to establish the base of the jet route structure and the upper limit of the low altitude structure at 18,000 feet MSL was initiated on August 29, 1962 and is scheduled to take effect July 1, 1964. We also plan to lower area positive control to 18,000 feet MSL when the modified structures have been implemented.

A special code for radar beacon transponders to indicate loss of radio communication has been reserved. The concept and procedures for use of such a code are presently being evaluated at our National Aviation Facilities Experimental Center (NAFEC), Atlantic City, N. J.

• Helicopter Operation

What are the specific requirements for a commercial helicopter pilot license so that I can carry passengers for hire? What are the regulations for maintenance of helicopters used for this purpose? What are the regulations as to the number of hours a pilot may work per month? What are the regulations concerning insurance on the aircraft and passengers?

Herman L. Stephens
Mainstee, Mich.

Pilot certification requirements are specified in Part 61 of the Federal Aviation Regulations, *a copy of which has been sent you.*

Any aircraft in which passengers are carried for hire or is used for flight instruction for hire must receive a maintenance inspection each 100 hours of flight time. Aircraft engaged in other types of general operations must receive a maintenance inspection ever 12 months. Maintenance standards are established by Part 18 of the Civil Air Regulations.

Rules governing the number of hours a pilot may fly in a month vary with the type of flying performed. Pilots engaged in scheduled aircarrier helicopter operations are limited to 100 hours commercial flight time per month. The same limitation applies to pilots operating large aircraft engaged in air taxi operations. FAA has no regulation pertaining to insurance requirements for aircraft or passengers. Any helicopter certificated in the Normal or Transport Category may be used for commercial flight operations.

• Night Spraying

What are the regulations which prohibit aircraft which have type and airworthiness certificates issued under Part 8, agricultural spraying aircraft, from spraying at night? Would night spraying of crops be permitted if the type and airworthiness certificates were issued under Part 3?

W. E. Ripper
Khartoum, Sudan

Civil Air Regulations *do not prohibit agricultural aircraft certificated under Part 8 from conducting night operations. Operators of these aircraft are required to abide by the operating rules of* Civil Aeronautics Manuals *43 and 60 with the exception that minimum altitudes may be waived to permit satisfactory application of the chemical. Waivers are issued on an individual basis and contain conditions and limitations necessary to afford safety to persons and property. Waivers have been issued for night aerial applications. However, operations conducted under the terms of such waivers are restricted to non-congested areas.*

• Hunting by Air

I am very concerned with the use of aircraft for hunting big game in Alaska? I feel it is a great shame for men to indulge in this evil practice. I would strongly urge strict law against this type of hunting and I feel that you are in a position to help stop this terrible way of "hunting."

Paul P. Dauk
Brookville, N. Y.

The authority of the Federal Aviation Agency is restricted to activities associated with the safe operation of aircraft. As long as the aircraft is flown in accordance with pertinent rules and regulations, we are unable to restrict its operation. The conduct of its occupants in connection with activities other than flying must necessarily fall within the jurisdiction of other agencies of the government.

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