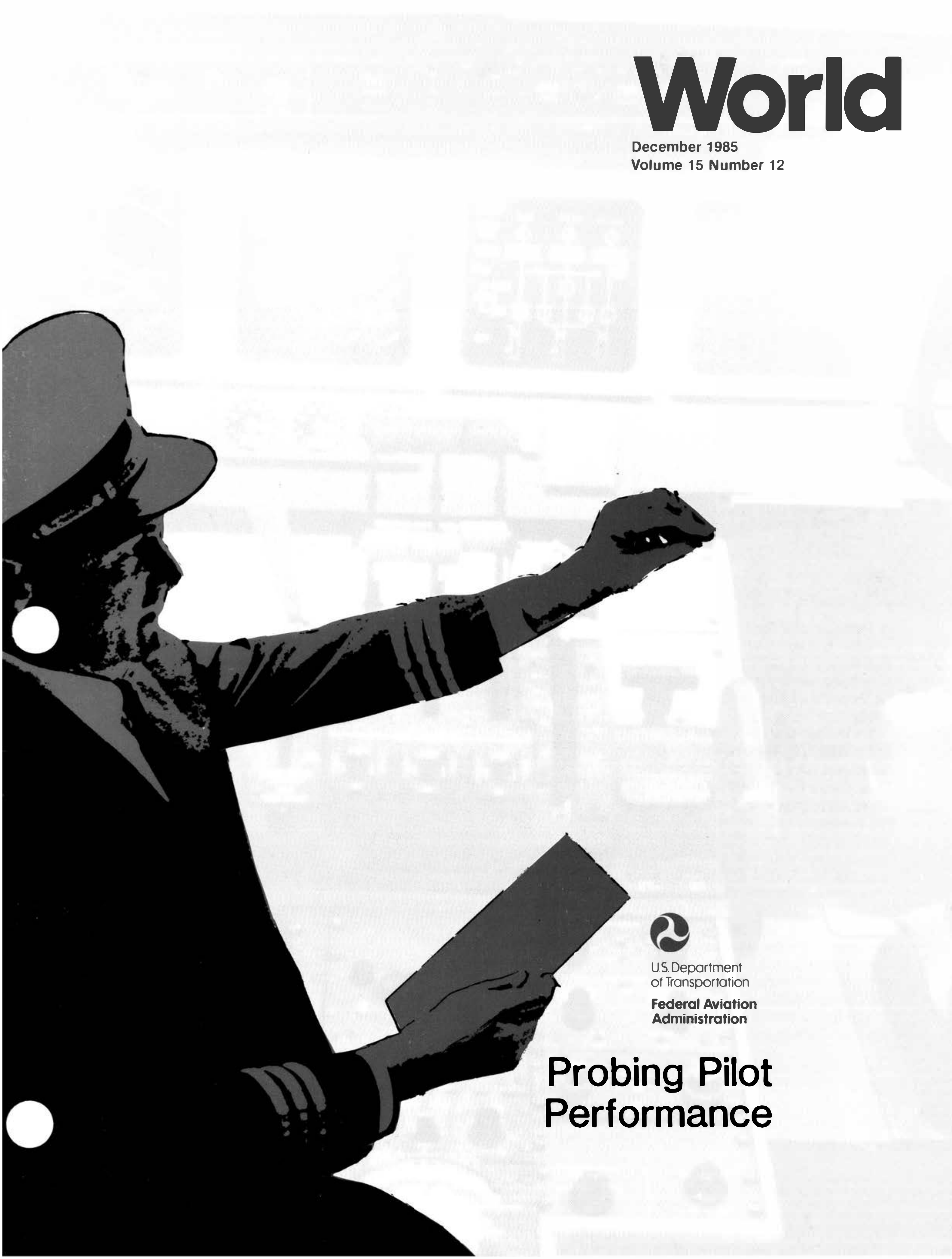

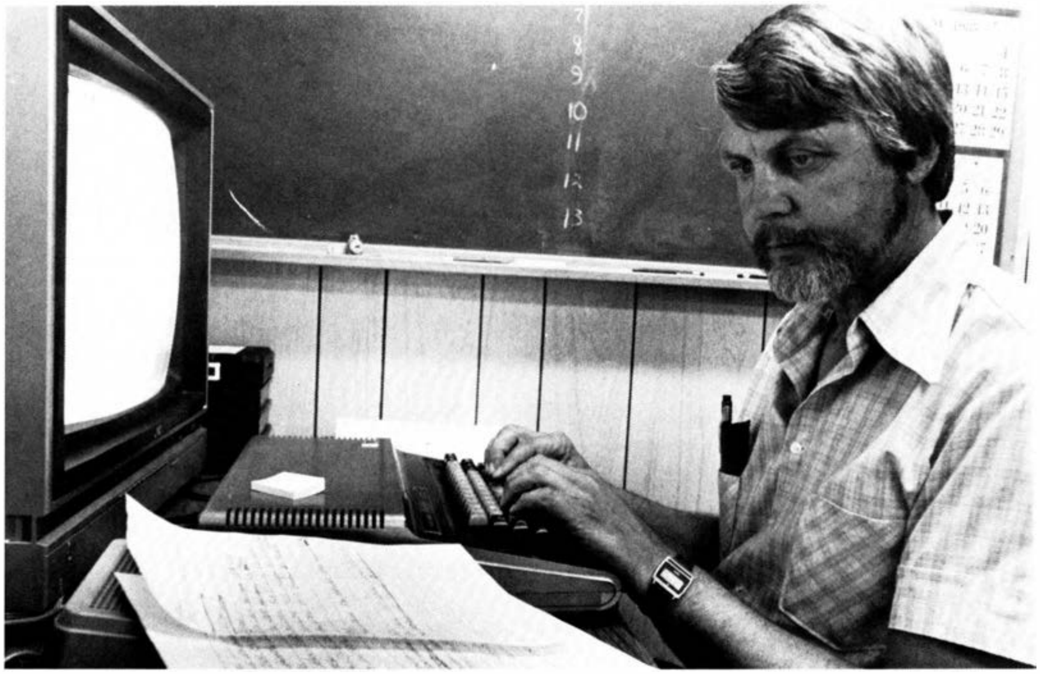

Redmond, Ore., FSS Manager Mike Hammer received high praise from his employees as a manager.

A Paragon of a Boss

What human relations is all about became crystal clear at a Northwest Mountain facility when its employees let their boss know exactly what they thought of him.

While shooting the breeze about Mike Hammer, the manager of the Redmond, Ore., Flight Service Station, the station's staff decided to set down their thoughts about him. Having generated quite a few pages, they distilled them into a single page, signed it and then casually forwarded it to the Air Traffic Division with a note, "You might be interested in this."

The message was clear enough to division. The letter was laminated onto a plaque and presented to Hammer with ceremony by Region Director Chuck Foster.

The employees' letter highlighted aspects of Hammer's managerial style: "Because you care about the people who work with and for you," "encouraging us to participate in Agency work groups and to take training," "the many hours you spent adjusting staffing schedules [for outside assignments]," "open communication," "never too busy . . . to help one of us," " 'Redmond FSS Facts' cassette tapes you make to keep all of us informed," "the local manuals you have developed" and "your ability to lead and to motivate the people who work with you."

More needn't be said. ■

Aviation continues to be an individual pursuit with the spirit of adventure one of the rewards. Alone, however, man is unable to fly far. As long as he might want to circle aloft, the pilot—sooner or later—must return to the aviation system that enabled him to soar. Americans could never be content with an aviation achievement that did not become accessible to all of our people. And no small part of the greatness of our nation rests in our dedication to making this solitary achievement contribute to enriching the lives of more and more people."

—Donald D. Engen

World

December 1985
Volume 15 Number 12

U.S. Department
of Transportation
Federal Aviation Administration

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FAA World is published monthly for the employees of the Department of Transportation/Federal Aviation Administration and is the official FAA employee publication. It is prepared by the Public & Employee Communications Division, Office of Public Affairs, FAA, 800 Independence Ave. SW, Washington, D.C. 20591. Articles and photos for FAA World should be submitted directly to regional FAA public affairs officers:

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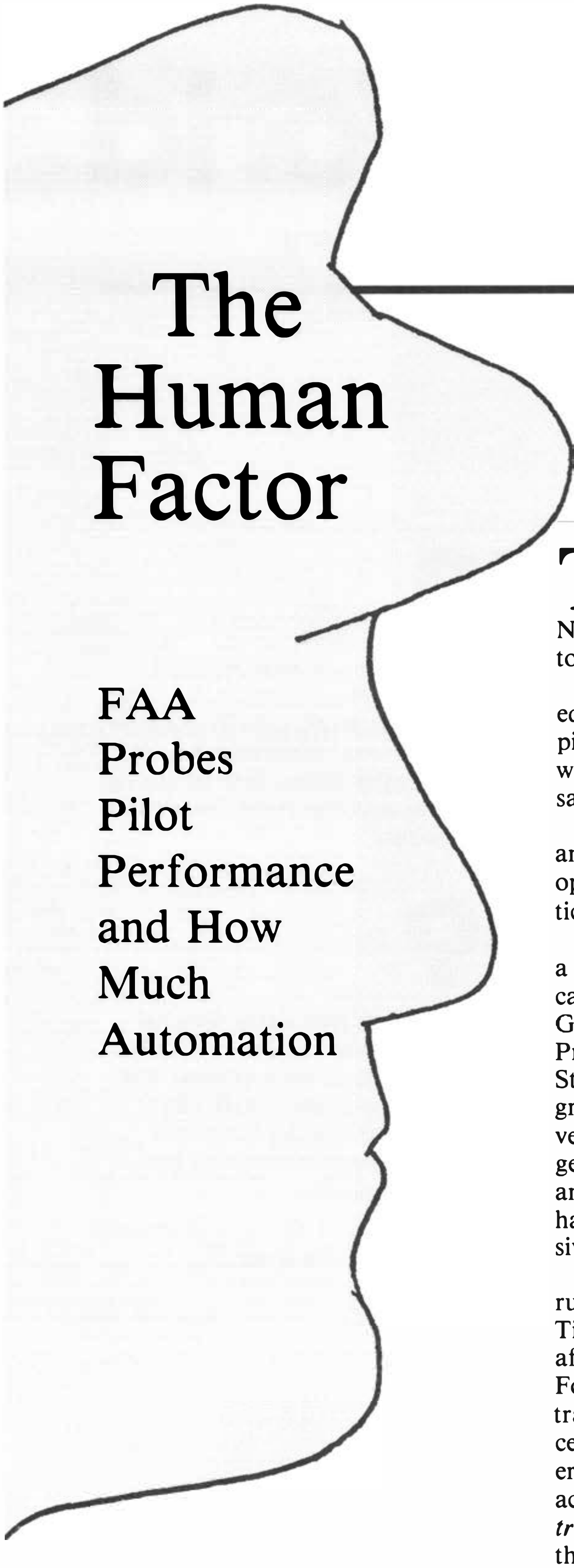
Barbara Abels—Western Pacific Region

By Frank Clifford
A former writer for FAA and DOT Offices of Public Affairs, now retired, he has also been published in military aviation magazines.



The Human Factor

FAA Probes Pilot Performance and How Much Automation

The performance and dependability of the equipment in the National Airspace System is a marvel to behold.

Barring a breakdown—which the equipment itself will signal and often pinpoint—the system will do exactly what it is designed to do: provide for safe flight, again and again.

But what about the performance and dependability of the people who operate and use the system, particularly the pilots?

"Pilot error has been identified as a causal factor in 66 percent of air carrier fatal accidents," says H. Guice Tinsley of the Flight Technical Programs Branch, Office of Flight Standards. He's the technical program manager of FAA's sweeping investigation into one of aviation's biggest safety problems—pilot performance. This is the first time that FAA has taken a coordinated, comprehensive look at the problem.

"This figure is tricky and invites rushing to a false conclusion," says Tinsley, who came to FAA in 1976 after 10,000 flying hours as an Air Force pilot, most of it in heavy air transport-type planes. "The 66 percent is not a flat statement that pilot error caused 66 percent of the fatal accidents, only that pilot error *contributed* to 66 percent of the accidents that did occur."

In fact, air carrier pilot performance is very good, he points out. For example, from 1964 to 1984, air carrier accidents fell at a steady rate from 59 to 12. Major American air carriers flew 30 months without a fatal crash until a Boeing 737 hit a mountain in Bolivia last January.

Elsewhere in American aviation, pilot error was a contributing factor in 79 percent of fatal commuter accidents and in 88 percent of fatal general aviation accidents.

"We intend to do something about these numbers," said Administrator Donald Engen, pointing to a proposal published this year to investigate 30 human-factor areas affecting flight safety, most of them aimed at preventing pilot error. "Call it our game plan."

Commonly called the "Aviation Human Factors Research Plan," it proposes to scrutinize cockpit crew performance. In the past, the development and application of new technology in air traffic control and flight systems had been focused on increasing the traffic "put-through" capacity of the National Airspace System. The pilot was assumed to be capable of adjusting to the aircraft and the ATC system.

Now underway, the plan originated in 1980 when the FAA certified the Douglas DC-9-80 as safe for operation with a two-person crew, a decision that eliminated the flight engineer. Pilots and engineers protested the decision, resulting in a Presidential task force to determine if "operations of the new generation of

The cockpit of a Boeing 767 reflects the state of the art in cockpit information transfer, showing six electronic displays in place of electro-mechanical ones, including, for example, CRT displays of artificial horizons.

commercial jet aircraft by two-person crews is safe."

In addition to affirming the FAA's decision, the task force recommended the use of sophisticated workload measurement techniques in aircraft certification and formal guidelines for evaluating the effect of the air traffic control system on aircrew workload. This was the takeoff point for the present project, which promises to be a flight of several years duration to a realm scarcely visited before.

Then six public forums were scheduled, the first in Cambridge, Mass., in November 1980 at DOT's Transportation Systems Center. Others were conducted at the FAA's Technical Center in Atlantic City and at the Civil Aeromedical Institute (CAMI) in Oklahoma City. Another was arranged to coincide with a symposium of commuter and air taxi operators in Arlington, Va.

The thrust of the forums was uncomplicated and direct: "From where you sit, what do you see as the critical human factors affecting aviation safety?"

The conferees identified 137 cockpit-related human performance problems that could be addressed through research. This formidable number was trimmed to 30, which were handed to the Society of Automotive Engineers' (SAE) Aerospace and Behavioral Engineering Technology Committee (G-10) with instructions to rank them according to their importance to civil aviation.

The G-10 committee, chaired by Dr. Bill Connor, a Delta Airlines captain, includes all facets of the aviation industry in its membership. In addition to providing expert consultative services to the FAA, the committee conducts sessions on significant human factors issues at the annual SAE Aerospace and Technology Conference.

From the list, five broad areas of research emerged: advanced cockpit technology, pilot error, rotorcraft display and control, crew training and flight publications. Twenty-three research projects embracing the 30 problem areas were slated to address these subjects.

Topping the list of projects was *cockpit crew workload*—developing sophisticated methods of measuring performance in relation to advanced technology. Other high-priority items were *pilot workload*—developing procedures to ensure that modernization of the National Airspace System and cockpit design do not increase pilot workload; *manual reversion*—developing design specifications for future automated systems that would permit the pilot to take immediate and safe control when needed; *cockpit displays*--developing standards for the structure, formatting and presentation of flight system and navigation information in advanced cockpits; and *data entry*—devising ways to reduce the possibility of operator error when using data entry devices in the cockpit.

Increased pilot training and more rigorous FAA Standards would not cancel out the need for the FAA study, Tinsley said. One of the main

The study is looking into the possibility of less-complex flight simulators than this Boeing 727 unit at the Aeronautical Center that will provide adequate training at less cost. Simulation supervisor Lester Groves stands on the catwalk.

Photo by the *Sunday Oklahoman*

problems being addressed is whether there can be too much of a good thing in automation. Researchers will seek the line that separates maximum automation from optimum automation.

"In the traditional aircraft certification process, any improvement in automation that lowered the pilot workload was considered a plus-factor," the program manager continued. "There is evidence that this isn't necessarily so—evidence in some cases that advanced automation tends to detach the pilot from control of the plane."

For example, it is already within the state of the art to have a completely automated coast-to-coast flight, including takeoff, power settings, altitude changes, course correction, letdown and landing.

Lest there be any misunderstanding, such fully automated flight is *not* now authorized, Tinsley said. Moreover, the air traffic control system is not now geared to handle such flights.

"No aircraft system that has the potential of placing human life at risk can be allowed to run unattended," he explained. "There is still no substitute for the human ability to diagnose new complex and unusual situations and make judgments based on partial information."

Tinsley said the pilot must be involved; he must know that he is getting full feedback from his automation in the form of dials, gauges and electronic display.

Associate Administrator for Aviation Standards Anthony J. Broderick assumed overall responsibility for the identification and planning of operational requirements for the plan, which is managed by the Office of Flight Standards and supported by the Transportation Systems Center's Operator/Vehicle Systems Division. The Associate Administrator for Development and Logistics has the responsibility for conducting the necessary research programs.

The limiting element on undertaking all 30 human factors problem areas is money, according to Tinsley. On hand at the moment is less than $1 million slated for eight projects now underway:

■ *Model of Pilot Errors.* Under a contract with Ohio State University, reliable computer models will be developed of the most common types of general aviation accidents involving pilot error. The models will be used to evaluate training strategies and enhance accident investigations.

■ *Pilot Judgment Training.* Under the management of Alan H. Diehl of the Office of Aviation Medicine, 10 fixed-base operators in the Eastern Region are developing and evaluating training and techniques for improving pilot judgment.

■ *Color Deficiency.* Evan Pickrel, also of the Office of Aviation Medicine, is directing a study looking into color vision perception as it relates to advanced instrument design and the use of symbols to supplement or replace color.

■ *Crew Fatigue.* The National Aeronautics and Space Administration is studying the effects of fatigue on crew interaction and the means for neutralizing adverse effects.

■ *Simulator Fidelity.* Under a headquarters private sector contract, this study seeks the appropriate level of complexity in a simulator for training pilots at minimum cost.

■ *Voice Systems.* The object of a study by the Air Force Dynamics Laboratory at Wright-Patterson Air Force Base, Ohio, is to develop guidelines for cockpit devices activated by a pilot's voice when he's too busy to press a button or turn a knob.

■ *Aviation Behavior Technology.*

This experimental cockpit panel by the National Aeronautics and Space Administration shows a wide array of cathode-ray tube displays and the use of color and symbols that may help pilots in discriminating among functions.

This private sector contract is for establishing a computerized file of aviation behavior technology research data already amassed.

■ *Glossary.* The University of Massachusetts is compiling a dictionary of aviation human factors terms to standardize the industry's language.

Projects planned but as yet unfunded include redesigning approach procedures and charts for easier readability, improving cockpit information transfer, identifying the data needed by pilots in an evolving air traffic control system and investigating why pilots' actions or inaction contribute to an accident.

Because of the broad scope and complexity of this exploration into flight safety, the research and development effort involves not only the FAA but also DOT's Transportation Systems Center, the Department of Defense, the National Aeronautics and Space Administration, industry and university laboratories—all under the direction of the Office of Aviation Standards.

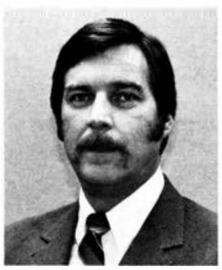
It's a monumental task for a problem of growing significance as the National Airspace System is automated heading into the 21st Century. ■

The Secretary's Awards
Gold Medal and 28 Other Honors Captured by FAAers

Award for Outstanding Achievement


James A. Wilding
Director
Washington
Metro. Airports

Award for Valor

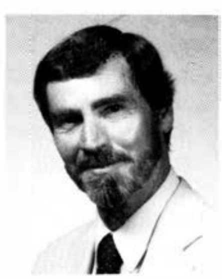

Richard W. Bain
Area Supervisor
Jacksonville, Fla.,
ARTCC

Award for Meritorious Achievement


William C. Beavers
Manager, Airmen &
Aircraft Registry
Aeronautical Center


Henri P. Branting
Aerospace Engineer
Office of Airworthiness


Robert E. Brown
Manager, Communications
& Surveillance Div.,
Prog. Engrg. & Maint.


James G. Cain
Deputy Director
Advanced Automation
Program Office


Milton J. Ferris
Manager
Los Angeles CASFO


Edward J. Phillips
Manager, Great Lakes
Airway Facilities Div.


Eugene D. Slyman
Prog. Review Spec.
Associate Admin.
for Administration


Vincent Laurentino
Manager, New York
ARTCC Airway
Facilities Sector

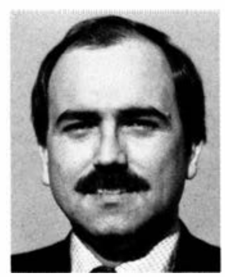

Michael J. Sarli
Manager
Baltimore Washington
Airport Tower


Quentin S. Taylor
Deputy Associate
Administrator
for Airports

Award for Outstanding Achievement in Equal Opportunity


David A. Field
Sup. Civil Engineer
Seattle, Wash.,
Airports Dist. Office


Frederick E. Gilmore
Director
Acquisition and
Materiel Service


David P. Medina
Area Supervisor
Love Field Tower
Dallas, Texas


Eleanor J. Williams
Area Supervisor
Anchorage, Alaska,
ARTCC


Thomas A. Olsen
Manager
Great Lakes
Employment Branch

Award for Volunteer Service


Duane L. Thomas
Inspection Pilot
Air Transport Div.
HQ Flight Standards

Secretary of Transportation Dole congratulates Jim Wilding, director of Metropolitan Washington Airports. He received the Gold Medal for his work in developing "the full potential of Washington Dulles International Airport."

As his wife looks on, Richard W. Bain (right), area supervisor at the Jacksonville, Fla., ARTCC, is congratulated on his Award for Valor by Deputy Administrator Richard H. Jones. Bain had prevented a man from killing a wounded police officer.

Mary B. Hogan, a paralegal specialist in New England's Office of the Regional Counsel, and her husband flank Deputy Administrator Jones. She won a Secretary's Award for Excellence.

Twenty-nine FAAers were honored at The Secretary's 18th Annual Awards program held by the Department of Transportation on October 17.

DOT Secretary Elizabeth Hanford Dole said of the 129 departmental honorees that "you have stretched yourselves to extraordinary bounds, confronted challenge and in the process reshaped policies that affect us as a Department and as a nation. . . . the sum total of your efforts is resulting in time, money and—most importantly—lives saved."

The single Gold Medal—the Secretary's Award for Outstanding Achievement—went to James A. Wilding, director of Metropolitan Washington Airports.

Of the 50 recipients of the Award for Meritorious Achievement, 10 FAAers received the Silver Medal for service or achievement encompassing improvements in human relations, airline safety, automation or just good leadership in their respective functions.

continued on page 23

Award for Excellence

Linda S. Booth
Secretary
Airport Planning
and Programming

Elizabeth A. Brothers
Secretary
Program and
Regulations Management

Barbara C. Chiarolanza
Secretary
Houston, Texas,
AF Sector

Vivian W. Grissinger
Secretary
Office of Organ.
Effectiveness

Mary B. Hogan
Paralegal Specialist
New England Regional
Counsel

Patricia M. Jennison
Secretary
Office of Flight
Standards

Linda Rogers
Staffing Assistant
Southern Region
Human Relations

Linda R. Smith
EEO Assistant
Southwest Region
Civil Rights

Florence D. Talk
Admin. Program Asst.
Dallas-Ft. Worth,
Texas, Tower

Nancy F. Tinney
Gen. Supply Spec.
Anchorage, Alaska,
ARTCC AF Sector

Barbara T. Yamada
Admin. Asst.
Honolulu, Hawaii,
ARTCC

Air traffic control has come a long way since the Federal Government got involved in managing traffic nearly 50 years ago, but Uncle Sam actually stuck his finger in the ATC pie nearly 60 years ago when air traffic rules were promulgated with the passage of the Air Commerce Act.

In 1926, the entire set of "Air Traffic Rules" consisted of about 225 lines of type, compared to the hundreds of pages today.

The following are excerpts of whole sections of the rules, the major omissions relating to aerobatics, lighting and signaling:

Aircraft Keep to Right

First Air Traffic Rules Were Simple

•Sec. 82. Take-off rules.

The take-off shall not be commenced until there is no risk of collision with landing aircraft and until preceding aircraft are clear of the field.

•Sec. 83. Flying rules.

(A) Right-side traffic.—Aircraft flying in established civil airways, when it is safe and practicable, shall keep to the right side of such airways.

(B) Giving-way order.—Craft shall give way to each other in the following order:

1. Airplanes.
2. Airships.
3. Balloons, fixed or free.

An airship not under control is classed as a free balloon. Aircraft required to give way shall keep a safe distance, having regard to the circumstances of the case. Three hundred feet will be considered a minimum safe distance.

(c) Giving-way duties.—If the circumstances permit, the craft which is required to give way shall avoid crossing ahead of the other. The other craft may maintain its course and speed, but no engine driven craft may pursue its course if it would come within 300 feet of another craft, 300 feet being the minimum distance within which aircraft, other than military aircraft of the United States engaged in military maneuvers and commercial aircraft engaged in local industrial operations, may come within proximity of each other in flight.

(D) Crossing.—When two engine-driven aircraft are on crossing courses the aircraft which has the other on its right side shall keep out of the way.

(E) Approaching.—When two engine-driven aircraft are approaching head-on, or approximately so, and there is risk of collision, each shall alter its course to the right, so that each may pass on the left side of the other. This rule does not apply to cases where aircraft will, if each keeps on its respective course, pass more than 300 feet from each other.

(F) Overtaking—

1. Definition: An overtaking aircraft is one approaching another directly from behind or within 70° of that position, and no subsequent alteration of the bearing between the two shall make the overtaking aircraft a crossing aircraft within the meaning of these rules or relieve it of the duty of keeping clear of the overtaken craft until it is finally past and clear.
2. Presumption: In case of doubt as to whether it is forward or abaft such position it should assume that it is an overtaking aircraft and keep out of the way.
3. Altering course: The overtaking aircraft shall keep out of the way of the overtaken aircraft by altering its own course to the right, and not in the vertical plane.

(G) Height over congested and other areas.—Exclusive of taking-off and landing, and except as otherwise permitted by section 88, aircraft shall not be flown—

1. Over the congested parts of cities, towns, or settlements except at a height sufficient to permit of a reasonably safe emergency landing, which in no case shall be less than 1,000 feet.
2. Elsewhere at height less than 500 feet, except where indispensable to an industrial flying operation.

(H) Height over assembly of persons.—No flight under 1,000 feet in height shall be made over any open-air assembly of persons, except with the consent of the Secretary of Commerce. Such consent will be granted only for limited operations.

•Sec. 84. Landing rules.

(A) Up wind.—Landings shall be made up wind when practicable.

(B) Course.—If practicable, when within 1,000 feet horizontally of the leeward side of the landing field the airplane shall maintain a direct course toward the landing zone.

(C) Right over ground planes.—A landing plane has the right of way over planes moving on the ground or taking off.

(D) Giving way.—When landing and maneuvering in preparation to land, the airplane at the greater height shall be responsible for avoiding the airplane at the lower height, and shall as regards landing, observe the rules governing overtaking aircraft.

(E) Distress landings.—An aircraft in distress shall be given free way in attempting to land.

•Sec. 88. Deviation from air-traffic rules.

The air-traffic rules may be deviated from when special circumstances render a departure necessary to avoid immediate danger or when such departure is required because of stress of weather conditions or other unavoidable cause. ■

By Michael Ciccarelli
The New England Region public affiars officer, he has been a UPI bureau chief and a corporate publicity manager.

Mass Marketing Aviation Careers

Aviation Education Exhibits Draw Crowds in Shopping Center

The term "aviation education" may conjure up programs taken into schools by enthusiastic FAA volunteers, computer programs to introduce elementary school children to aviation, aviation as a medium of instruction for high school curricula or the adopt-a-school program.

The New England Region has a new wrinkle on the idea—mass marketing it. Thousands of persons in all age brackets were exposed to aviation education for three days in October at the Burlington, Mass., Mall.

Normally the province of auto shows and arts & crafts fairs, the corridors of the shopping mall hosted 16 aviation-related exhibits, which included an experimental aircraft, a space suit and jet engines, featured by aerospace companies, Civil Air Patrol, Experimental Aircraft Association, colleges of aeronautics, DOT's Transportation Systems Center and, of course, FAA.

"Aviation Education—Flight Into the Future" was the theme of the event sponsored by New England's aviation education program, headed by Dr. Dolores B. Thomas, Human Resource Management Div. Assisting her by planning, soliciting cooperation and organizing the event were Bradley A. Davis, civil engineer in the Airports Division, and Raymond E. Gonzalez, manager of the Manufacturing/Inspection/Qasar, Aircraft Certification Division. Fifty-five FAAers volunteered to assist in the event.

Speaking of the exhibition's purpose of enlightening the public,

Photos by Michael Ciccarelli

Among the visitors to the aviation education exhibits were local high school classes. Here, New England Region Director Robert Whittington fields some students' questions and urges them to think seriously about careers in aviation.

Young men stop at a college booth to ask about its aviation programs.

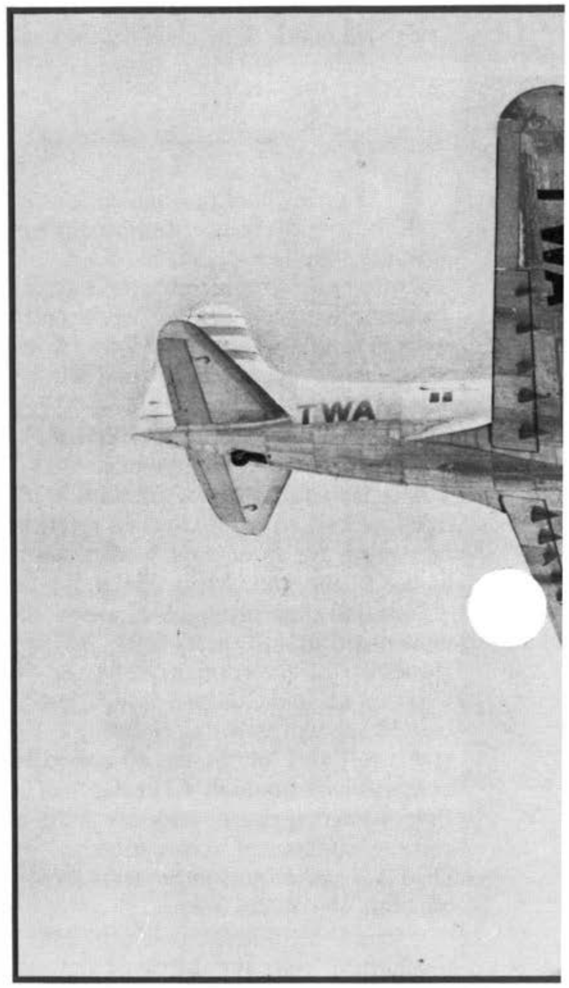
Software in two computers offered aviation technology and navigation teaching programs. The teenage girl above was so fascinated, she kept her mother waiting almost an hour as she called up information and asked questions on the display.

especially students, about the economic, social and career values in the aviation field, New England Region Director Robert Whittington said, "We are trying to accentuate the very strong partnership between aviation and the educational growth and development of the community, now and in the future."

Was the exhibition a success? Said one of the college exhibitors: "We appreciate having an opportunity to be part of such an impressive exhibition. The faculty and I enjoyed it and found the exposure to the public most beneficial for our college." And the mall's management said, "We want you back anytime." ■

Aviation's Indispensa

War Years Brought Eyes



America's love affair with commercial air travel began following World War II.

From 1945 to 1955, the number of passengers traveling in domestic service on board certificated air route carriers increased nearly six times, from 6.7 million annually to 38 million annually. Over the same period, nearly seven times as many Americans were flying overseas—another clear sign that air travel was no longer a luxury reserved for the very wealthy. The introduction of cheaper tourist fares and larger aircraft passenger compartments were two factors pushing up the volume of passengers.

With the return of peace and continuing prosperity, the airways became increasingly crowded. There were 1,480 air transports in service in 1956, compared with 260 in 1938. The propeller-driven planes of the postwar period were also faster. The 182-mph prewar DC-3, for example, had given way to the DC-6 in 1947, which could cruise at 265 mph. The numbers of general aviation and military aircraft had climbed to 60,000 and 23,000, respectively, and these aircraft both competed with the transports for the same airspace and were governed by different and separate air traffic control procedures.

At the urging of the War Department during World War II, CAA had taken over virtually all air traffic control towers at U.S. airports (it was already running the air route centers) and had been able to upgrade procedures and standardize equipment throughout much of the ATC system.

The first Washington National Airport Tower opened for business in 1941.

By the last year of the war, the Civil Aeronautics Administration was employing 7,836 air traffic controllers.

CAA retained control over all but a handful of airport control towers following the war, and by 1956 it had

By Joseph Garonzik
A historian and a free-lance writer on aviation and urban affairs, he was on the staff of the Office of Public Affairs one summer.

Partner Turns 50

o Air Traffic Control

The first airliner with a pressurized cabin and four engines, a Boeing Stratoliner flies over the Chicago Municipal Airport Tower in 1940, wearing Transcontinental & Western Airlines colors. Today, the airport is known as Midway.

Shirtsleeves were not in vogue when controllers Jay Van Derveen (left) and Robert Helmuth and chief George Niles (right) operated the O'Hare Tower. It was Oct. 22, 1946, the day that the City of Chicago took over the tower from the military.

In 1944, O'Hare Tower—then known as Orchard Place Tower (hence, ORD)—sat atop a paint hangar fronting for the Douglas Aircraft bomber plant, called the world's largest wooden structure.

jurisdiction over 26 en route centers and 182 airport control towers throughout the continental U.S.

The CAA mission was to control takeoffs and landings of aircraft at civilian airports in the United States, and to separate and control all traffic flying under Instrument Flight Rules (IFR) within controlled airspace. Generally speaking, the immediate postwar period saw privately owned aircraft flying at low altitudes under Visual Flight Rules (VFR) that placed them outside the system of air traffic control, except on takeoff and landing at controlled airports. Military aircraft, too, could choose to fly VFR off airways and completely independent of CAA air traffic control.

These jurisdictional divisions com-

Chicago Municipal Airport Tower chief George Niles shows the latest in communications equipment to visiting women Weather Bureau employees during World War II.

plicated the burden of the CAA controller and the search for a common airspace system.

The existing system of civil air traffic control, fashioned in the 1930s, was "more technique than technology." Lacking the visual means for tracking aircraft, a controller had to calculate the estimated position of flights over his sector, record them on flight data strips, post them on boards and pass them on to the controller with responsibility for the next sector. Flight data was subsequently radioed from one control center to the next until the plane reached its final destination.

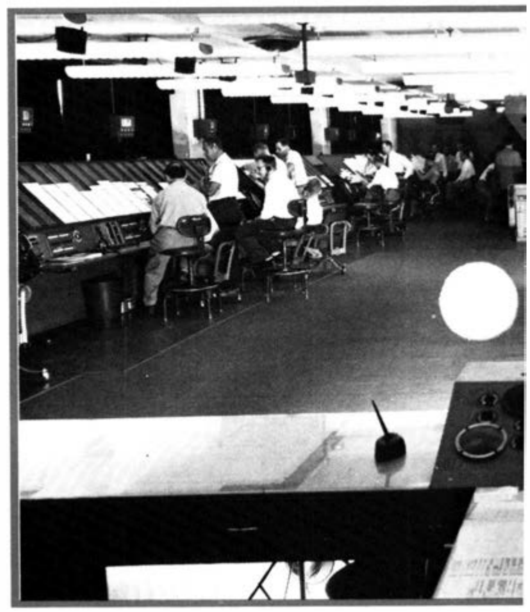
The system was also heavily dependent on voice communications. Direct controller-pilot radio communications, while in place at most air carrier airports since the 1930s, were instituted at all air route ATC centers only by 1955. These radio transmissions, which have been likened to old fashioned telephone party lines, were especially vulnerable to static interference.

Emerson R. Mehrling, former chief of FAA's En Route Division, illustrates the latter problem with an incident that occurred during the war:

"We lost communications once in the New York area with 18 bombers coming in from Dayton. . . . You can imagine what a scramble that was. . . All we could do was tell the civil pilots, 'There's 18 bombers flying up there somewhere in the overcast. . .' "

Under conditions of marginal visibility, VFR general aviation aircraft and IFR transports often came dangerously close to one another on their approach patterns.

Instrument Flight Rules went into effect for all aircraft when foul weather dictated. Only planes equipped with appropriate navigational instruments were allowed to fly in those situations, and controllers kept transports apart at the same altitude with a flying-time separation of 10 minutes or more.



If World War II had been indirectly responsible for the growing pains on the airways that eventually led to an airways crisis and for jurisdictional disputes between the CAA and the Pentagon, it was also the source of radar, the technology that would transform air traffic control from an art to a science.

What was needed to resolve the postwar crisis of the airways was some form of positive air traffic control with a new, visual technology that would make it practicable.

Chicago photos from the George Niles Collection

In November 1943, the Washington National Airport Airway Traffic Control Center was a first-generation facility. The presence of women and soldiers marks this as a wartime setting.

The New York Airway Traffic Control Center in 1955.

In a positive control environment, pilots are required to file flight plans and fly under Instrument Flight Rules in certain portions of the airspace, regardless of weather conditions.

When the CAA experimented with positive control using first-generation (manual) ATC methods, it became apparent that the separation distances imposed by estimating aircraft positions were too wasteful of airspace to handle the growing traffic volume. For positive control to work at all, controllers would require access to a technology that could put them in constant, visual communication with aircraft—and that was radar.

An acronym for Radio Direction and Range, radar is an electronic device for determining the presence and location of an object by measuring the time for the echo of a radio wave to return from it and the direction from which it returns.

With primary radar, as an aircraft moves through airspace, its displayed electronic pulse, or blip, is trailed by luminous light. These trails tell the controller the direction the aircraft is traveling and its velocity relative to other aircraft within range of the radar antenna. Each radar scope is fitted with an electronic map, which indicates the location of ground navigation sites and other markers—too low for the antenna to pick up.

Primary radar began to become the "eyes" of the ATC system immediately after the war. It was eventually adapted to four ATC functions: long-range radar for the air route traffic control centers, airport surveillance radar for aircraft nearing or overflying the terminal, precision-approach radar (precise form of radar for controlling aircraft on their final approach or under conditions of low minimums of ceiling and visibility) and airport surface detection equipment, a radar for controlling aircraft taxiing to or from runways at large metropolitan airports during low-visibility conditions.

Primary radar now afforded the controller a fix on the aircraft's position and distance from the control station precisely as it was occurring. Radar thus promised to reduce the separation distances between aircraft because the separations were based on actual distances, not estimates.

During the late 1950s, a form of radar known as the Air Traffic Control Radar Beacon System (ATCRBS) went into development. ATCRBS—termed secondary radar—made use of an airborne transponder and a ground interrogator sited at radar or air navigation installations to portray an aircraft's identity on the radar scope.

Aircraft equipped with transponders automatically show up as single- or double-lined bright slashes, not as the usual blips. After the pilot is assigned a transponder code, the controller can then obtain positive identification by instructing the pilot to "ident." This results in a momentarily brighter blip on the scope, distinguishing that plane from all other aircraft.

ATCRBS further reduced the

The Washington ARTCC in 1955 used surplus Navy VG (video generator) "battleship" radars with plastic shrimp boats. Along the walls were plan position indicators, radars used to service certain airspace sectors.

necessity for voice communications between pilot and controller (such as for routine position reports) and freed many pilots from having to perform time-consuming identification flight maneuvers—as had been required with primary radar. Although ATCRBS' full potential would not be realized until it was combined with automation in the Third-Generation ATC System, its ability to identify aircraft in a matter of seconds represented such an improvement over primary radar in enhancing radar target reception that it would become the *sine qua non* for assuring positive control.

Primary radar and ATCRBS' use for positive control of aircraft embodied the way to the Second Generation ATC System but not the will. For example, the introduction of radar at civil airports had been recommended by the Radio Technical Commission for Aeronautics' Special Committee-31 as early as 1948. In December of the following year, a demonstration conducted by CAA's Air Coordinating Committee at Wright-Patterson Air Force Base in Dayton, Ohio, had proven the operational feasibility of radar's application to peacetime air traffic control.

By 1955, however, only 32 airport surveillance radars and two used long-range en route radars were in place. Despite Congressional hearings about the increasing number of near midair collisions during the early 1950s, particularly in the mixing bowl of commercial aircraft and military jets, there was as yet no consensus about the airways crisis.

Certainly the jurisdictional disputes between CAA and DOD were an obstacle to such a consensus. The Department of Defense used its considerable clout to hold out for a common air navigation system that was configured to its liking. Military air traffic, moreover, while under a single CAA umbrella during the war, was controlled by a separate corps of military controllers in the postwar period. While this arrangement worked when jet trainers flew solely within restricted airspace, the rules permitted DOD to refuse to relinquish control to CAA when military aircraft entered common airspace. This could and did lead to real safety problems.

For its part, general aviation was opposed to seeing its access to the airspace curtailed or to being saddled with requirements for installing expensive IFR navigational equipment.

The outbreak of the Korean conflict, moreover, diverted federal resources from the purchase of radar and other ATC hardware. The fiscal conservatism of the Eisenhower Administration was yet another factor.

As Emerson Mehrling recalled, "A week before the Grand Canyon crash, we were at a point of laying off 10 percent of our air traffic controllers."

The public lethargy ended abruptly on June 30, 1956, when two airliners collided in midair over the Grand Canyon with a loss of 128 lives. The Grand Canyon crash accelerated the modernization of air traffic control almost overnight.

One month later, Congress appropriated enough money for the purchase and installation of 82 long-range (200-mile) surveillance radars for joint civil-military use. The first second-generation radar was installed in September 1959; by May 1960, 20 ARSRs were in operation.

Two months after the Grand Canyon disaster, the longstanding controversy between CAA and the Pentagon over the configuration of the common civil-military air navigation system was resolved. The outcome was the VORTAC, which would utilize the VOR (Very High Frequency Omnidirectional Range) component of the CAA's ground-based system with the distance-measuring component of the military's airborne navigational system known as TACAN.

The adoption of the VORTAC occurred just in time for the airline industry to acquire the appropriate airborne navigational equipment for its new generation of jetliners, then on the assembly line.

In 1963, air route centers had radar bright detection equipment (RBDE-5). In some, the supplemental vertical display was just for backup; in others for split sectors or ranges or for separating approaches and departures. Controllers used plastic shrimp boats, grease pencils and cleaning pads all day long.

The other jurisdictional dispute between CAA and DOD—control over the common airspace—was resolved in 1958, following two midair collisions involving military jets and commercial transports, when CAA gained control over all airspace designation and reservations.

With the installation of radar underway and the interagency disputes resolved, the stage was set for making positive control a reality. Controllers would now be able to segregate IFR from VFR traffic and fast-moving from slow-moving traffic.

Positive control was developed first—in the late 1950s and 1960s—for the en route portion of flight (area positive control) and then—in the 1970s—for the airspace over America's most crowded airports (Terminal Control Areas, or TCAs).

In 1957, CAA established control of all continental airspace above 24,000 feet. On June 15, 1958, it designated three airways as positive control routes—that is, portions of airspace between 17,000 and 22,000 feet, to a width of not more than 40 miles, within which *all* VFR traffic was prohibited.

When experience showed that the route concept of positive control had serious limitations, FAA scrapped it during the 1960s in favor of area positive control. By October 1971, all airspace between 18,000 feet and

This was a classroom session in a terminal IFR room in the early '60s, where a plan position indicator (PPI) radar display was used for surveillance.

60,000 feet was reserved for IFR flights at all times. All aircraft flying within that area would have to be equipped with an ATCRBS transponder.

Unlike the midair threat of the 1950s and early 1960s, which centered on possible collisions between military jets and commercial transports operating under VFR flight conditions, a greater threat in the late 1960s was posed by the unprecedented growth in civil aviation and the mixture of jet aircraft flying under instrument rules and general aviation aircraft operating under visual rules together in terminal areas.

The urgency to reduce the risk was underlined by the knowledge that the new generation of wide-bodied jets, capable of carrying two or three times the number of passengers on a Boeing 707, were already being flight tested. The July 19, 1967, midair collision between a Boeing 727 airliner and a Cesna 310 near Hendersonville, N.C., that killed Secretary of the Navy-designate John T. McNaughton and one between an airliner and a small private plane near Fairland, Ind., punctuated that urgency.

The FAA's solution to the problem was the Terminal Control Area, or TCA. A TCA was an airspace area in the configuration of an upside down wedding cake within which control would be exercised over busy terminals. According to the proposed rulemaking, issued on Sept. 29, 1969, and implemented in May 1970, any aircraft entering a TCA must be equipped with a two-way radio, beacon transponder and a VOR or TACAN navigational receiver.

Within months, TCAs reduced dramatically the number of near midair collisions, and the TCA went on to become one of the most important advances in air safety rulemaking in ATC history.

The elements of the Second Generation ATC System—primary and secondary radar and positive control—are still at the center of ATC. However, even as that second generation configuration was just being put into place in the early 1960s, perceptive observers sensed that it wouldn't be enough.

On Dec. 10, 1958, National Airlines inaugurated domestic jet airliner service on its New York-Miami route. David D. Thomas, former FAA Deputy Administrator, summarized the implications for air traffic controllers of that revolutionary moment in aviation history: "Using a pilot's eyes is fine when you're doing 180, but when you're closing at a thousand miles an hour, then human eyesight isn't that good."

For all its advances, the Second Generation ATC System was still too labor-intensive for the jet age. Seventy-five percent of the controller's time was still being spent in voice communications, in the preparation of flight progress strips and in marking shrimp boats, albeit no longer on table maps as in the 1930s but on radar screens.

The continuing growth of both commercial and general aviation and the specter of a midair collision between high-performance jet aircraft placed a new premium on the controller's time and judgment. What was needed for ATC in the jet age was a new technology that could: (1) relieve the controller of paperwork; (2) display an aircraft's identity, air speed and altitude in alphanumeric form on the radar scope; (3) anticipate a potential conflict between neighboring aircraft or between an aircraft and the surrounding topography long before it became apparent on the scope; and (4) perform these functions more rapidly and accurately than the controller could on his or her own.

The newly independent Federal Aviation Agency was born with the jet age and with the second generation of air traffic control. But from the start, it threw much of its talent and resources into developing a semi-automated ATC system that could meet the airspace system's growing need and those four requirements.

So it was that the computer became the distinguishing technology of the Third Generation ATC System, which handled aviation's growth and helped bring forth a safety record that would become the envy of the international aviation community.

Air traffic control, in the process, would move even further from the realm of art to that of science. ■

This is the second in a series of FAA World *historical articles to be published as part of a year-long commemoration of the July 1986 fiftieth anniversary of federal responsibility for the nation's air traffic control system. The first article appeared in October.*

FAAers' Bonds Not Easily Severed

Flight Standards Retirees Meet Annually by the Hundreds

New Flight Standards Retirees secretary treasurer Roger Boggs (left) and outgoing president A.J. Prokop (right) flank guest speaker and X-15 test pilot Scott Crossfield.

Old FAAers never die; they don't even fade away. There's a bond between aviation and its practitioners that keeps many retirees wanting to keep abreast of the field and their co-workers.

Nowhere is this more in evidence than with the Flight Standards Retirees (FSR), an organization that just held its 14th annual convention. Perhaps that sounds pretentious, but FSR has 900 members, of whom 280 were registered for the event in October.

Test pilot Scott Crossfield addressed the group and showed films of his own era involving the X-1 to X-15 experimental aircraft. According to past president Andy Prokop, members attending the Washington, D.C., convention were particularly interested in seeing the aircraft restoration work at the Paul Garber Facility of the Smithsonian Institution.

The purpose of FSR is to gather Flight Standards people, past or present, 50 years of age or older, to share their common interest, keep up with old friends and make new ones and "exercise" their love of aviation. This is accomplished by means of the annual meeting, periodic newsletters and a membership location roster. Membership is $7.50.

FSR's newly elected officers are three air carrier operations inspectors: Roscoe D. Foster, 1947-1975, president; Wayne Garrison, 1959-1981, vice president; and Roger Boggs, 1948-1980, secretary-treasurer.

The next reunion will be in Santa Rosa, Calif. ■

Air carrier maintenance inspector Clyde Angel took up a new career as an Episcopal minister. From the left are his wife, Regelia, Joseph Zizzi of the Eastern Region and headquarters and his wife, Katherine, a headquarters secretary.

Recent retiree Bernie Geier from headquarters' General Aviation and Commercial Division attended with his wife, Beverly. Geier now works for AOPA.

Having a tête à tête are Jim Rudolph (left), Flight Standards director; Jessie Thwaites and Dick Thwaites from Alaska.

People

Aeronautical Center

■ **Gary G. Armfield,** unit supervisor, Avionics Maintenance Section at Scott AFB, Illinois, Aircraft & Aviation Maintenance Branch, A/C Maint. & Engineering Div., Aviation Standards National Field Office, promotion made permanent.

■ **Sherman L. Cravens,** manager, Aviation Systems Branch, Data Services Division, promotion made permanent.

■ **Robert M. Davis,** manager, Operations Center.

■ **Alex Friedman,** group supervisor, Atlantic City, N.J., Flight Inspection Field Office, promotion made permanent.

■ **Harry B. Grindstaff,** supervisor, Automation Section, Airway Facilities Branch, FAA Academy.

■ **James D. Lenning,** unit supervisor, Receipt and Packing Section, Storage and Transportation Branch, FAA Depot, promotion made permanent.

■ **Edwin D. Mitchell,** chief, Systems Development and Analysis Staff, FAA Depot, promotion made permanent.

■ **Douglas R. Murphy,** manager, Air Traffic Branch, FAA Academy, from the Kansas City ARTCC.

■ **Donald K. Tye,** manager, General Accounting Branch, Accounting Division.

■ **Lyle G. Wink,** manager, Flight Inspection Policy & Standards Branch, Flight Programs Div., Aviation Standards National Field Office, promotion made permanent.

Alaskan Region

■ **Maurice W. Batt,** manager, Yakutat Flight Service Station, from the Kotzebue FSS.

■ **Noel S. Bernaldo,** unit supervisor, Engineering Services Section, Establishment Branch, Airway Facilities Division.

■ **Edgar P. Billiet,** unit supervisor, International Sector Field Office, South Alaska Sector, AF Division.

■ **Robert F. Hoffsetz, Jr.,** area manager, Kodiak Tower, from the Reno, Nev., Tower.

■ **Monte M. Larsh,** unit supervisor, Anchorage AF Sector Field Office, South Alaska Sector, AF Division, from the King Salmon AFSFO.

■ **Girard W. Lucore,** area supervisor, Anchorage ARTCC.

■ **Wendell L. Nelson,** supervisor, Electronics Section, Establishment Branch, Airway Facilities Division.

■ **John W. Williford,** supervisor, Program/Staffing Support Section, Program Support Branch, Airway Facilities Div.

Central Region

■ **Kenneth D. Baker,** supervisor, Salina, Kan., Airway Facilities Sector Field Office Unit, from the Goodland, Kan., AFSFO.

■ **Ronald M. Calder,** area supervisor, Sioux City, Iowa, Tower, promotion made permanent.

■ **Dale R. Engel,** assistant manager for automation, Kansas City ARTCC, from the Minneapolis, Minn., ARTCC.

■ **Arnold E. Hessler,** manager, Air Security Branch, Civil Aviation Security Division.

■ **Raymond A. McMillan,** manager, Columbus, Neb., AF Sector Field Office, Grand Island, Neb., AF Sector, from the Omaha, Neb., AF Sector Field Office.

■ **Richard C. McMillen,** manager, Kansas City, Mo., Civil Aviation Security Field Office.

■ **Keith W. Nease,** systems engineer, Kansas City ARTCC AF Sector, promotion made permanent.

■ **Ronald E. Noe,** manager, Topeka, Kan., Tower at Forbes AFB, from the Brownsville, Texas, Tower.

■ **Jerome E. Tegen,** aviation safety inspector, Operations Section, Air Carrier—General Aviation Branch, Flight Standards Division.

■ **Robert M. Wade, Jr.,** area supervisor, Omaha, Neb., Flight Service Station.

■ **Frank W. Webb,** aviation safety inspector, Maintenance Section, Air Carrier—General Aviation Branch, FS Div.

Eastern Region

■ **William J. Armknecht,** manager, Buffalo, N.Y., Flight Service Station.

■ **Charles E. Boone,** crew chief, New York TRACON Airway Facilities Sector Field Office, Metro New York AF Sector, promotion made permanent.

■ **Robert P. Brandon,** manager, Remsen, N.Y., AF Sector Field Office, Empire AF Sector, from the Albany, N.Y., AFSFO

■ **Charles Cassella,** supervisor, Communications/Interfacility Section, Electronics Engineering Branch, AF Division.

■ **Samuel L. Combs,** systems engineer, New York TRACON AF Sector Field Office, Metro New York AF Sector, promotion made permanent.

■ **Dennis V. Damp,** watch supervisor, Coraopolis, Pa., AF Sector Field Office, Pittsburgh AF Sector, promotion made permanent.

■ **Edward M. Doherty,** unit supervisor, Wilkes-Barre, Pa., AF Sector Field Of-

The information in this feature is extracted from the Personnel Management Information System (PMIS) computer. Space permitting, all actions of a change of position and/or facility at the first supervisory level and branch managers in offices are published. Other changes cannot be accommodated because there are thousands each month.

fice, Harrisburg AF Sector, from the JFK Airport AFSFO, Metro New York AF Sector.

■ **Adam Colin Greco,** area supervisor, Philadelphia FSS, from the Poughkeepsie, N.Y., FSS.

■ **Billy W. Harper,** assistant manager for automation, Washington National Airport Tower, from the Washington ARTCC.

■ **Wayne C. Johnson,** unit supervisor, Pittsburgh Air Carrier District Office, from the Flight Standards Division.

■ **James Knoetgen,** area supervisor, New York TRACON, Garden City, N.Y.

■ **Francis D. Nash,** crew chief, New York TRACON AFSFO, promotion made permanent.

■ **James W. Sherwood, Jr.,** systems engineer, New York TRACON AFSFO, promotion made permanent.

■ **David R Sprague,** supervisor, South Section, Operations Branch, AT Div.

■ **William J. Stehling,** manager, Charleston, W. Va., Tower, from the Rochester, N.Y., Tower.

Great Lakes Region

■ **David K. Alred,** assistant manager, Minneapolis, Minn., Flight Service Station, from the Decatur, Ill., FSS.

■ **Norman D. Atchison,** manager, Muncie, Ind., Tower, from the Indianapolis, Ind., Tower.

■ **Kenneth W. Baenen,** area supervisor, Huron, S.D., FSS, from the Jamestown, N.D., FSS.

■ **William L. Calhoun,** facility coordination officer, Minneapolis ARTCC Airway Facilities Sector.

■ **Robert F. De Roeck,** state program officer, Chicago Airports District Office, from the Detroit, Mich., ADO.

■ **Ellis L. Ekker,** area supervisor, Duluth, Minn., Tower, promotion made permanent.

■ **Larry E. Ellison,** facility coordination officer, Indianapolis ARTCC AF Sector.

■ **James S. Graves,** facility coordination officer, Indianapolis ARTCC AF Sector.

■ **Mark L. Grefrath,** area supervisor, Pontiac, Mich., Tower, from the Flint, Mich., Tower.

■ **Janet V. Heard,** area supervisor, West Chicago, Ill., FSS.

■ **Bertrand R. Ouellette,** manager, Appleton, Wis., Tower, from the Youngstown, Ohio, Tower.

■ **Charles L. Pine,** unit supervisor, Grand Rapids, Mich., General Aviation District Office, promotion made permanent.

■ **Juanita A. Pollock,** area supervisor, West Lafayette, Ind., Tower, promotion made permanent.

■ **Daniel E. Sandoval,** area supervisor, Springfield, Ill., Tower, from the Rockford, Ill., Tower.

■ **Gerald S. Skorski,** area supervisor, Traverse City, Mich., FSS, promotion made permanent.

■ **Peter J. Sober,** area supervisor, Chicago ARTCC.

■ **Horace R. Vial,** area supervisor, Evansville, Ind., Tower, promotion made permanent.

New England Region

■ **Clement R. Dion,** assistant manager, plans and programs, Boston Logan International Airport Tower.

■ **William N. Frennier,** unit supervisor, Westfield, Mass., Flight Standards District Office, from the Pittsburgh GADO.

Northwest Mountain Region

■ **Susan D. Cornell,** area supervisor, Denver, Colo., ARTCC, from the Jacksonville, Fla., ARTCC.

■ **William E. Drew,** manager, Salt Lake City, Utah, Tower, from the Denver Tower.

■ **Roger E. Kleinsasser,** area supervisor, Seattle, Wash., Flight Service Station, from the regional Operations Center.

■ **Jack G. McDonnell,** assistant manager, programs, Salt Lake City Tower.

■ **J. T. Moore, Jr.,** assistant manager, airspace and procedures, Seattle ARTCC, promotion made permanent.

■ **William A. Shoemaker, Jr.,** manager, Miles City, Mont., Flight Service Station, from the Spokane, Wash., FSS.

■ **Suzanne E. Stevens,** group supervisor, Technical and Administrative Support Staff, Aircraft Certification Division, promotion made permanent.

Southern Region

■ **Thomas D. Carlton,** assistant manager, plans and procedures, Nashville, Tenn., Automated Flight Service Station.

■ **Thomas G. Christian,** area supervisor, Memphis, Tenn., ARTCC.

■ **Charles F. Criswell,** area supervisor, Miami, Fla., ARTCC, from the Macon, Ga., Tower.

■ **Thomas Dougherty,** area supervisor, Memphis ARTCC.

■ **Ronnie O. Farmer,** assistant manager, Charlotte, N.C., Airway Facilities Sector, from the Airway Facilities Division.

■ **Daniel G. Howorth,** area supervisor,
continued

Bill Wines, manager of the Telecommunications Staff, Western-Pacific Region's Airway Facilities Division, and his wife, Jackie, beam over the USAF Auxiliary Certificate of Appreciation presented by Lt. Col. Ernie Pearson (right), California Wing Chief of Staff, Civil Air Patrol. Wines was recognized for 25 years of assistance and enhancing operational flexibility consistent with the requirements of the NAS. Looking on is Regional Director Mac McClure. Photo by Barbara Abels

Macon, Ga., Automated FSS, from the Savannah, Ga., FSS.

■ **Reginald C. Matthews,** area supervisor, West Palm Beach, Fla., Tower, promotion made permanent.

■ **Melville J. Norgart,** manager, Fort Lauderdale, Fla., Flight Standards District Office, from the South Florida FSDO, Miami.

■ **Robert L. Snyder,** area supervisor, Memphis ARTCC.

■ **Bernard F. Tiffault,** manager, Pompano Beach, Fla., Tower, from the Miami International Airport Tower.

■ **Wallace F. Watson,** manager, Albany, Ga., Tower, from the FAA Academy.

Southwest Region

■ **Jeffrey L. Abney,** area supervisor, De Ridder, La., Automated Flight Service Station, from New Orleans, La., FSS.

■ **Donald G. Brumbaugh,** area supervisor, Ponca City, Okla., FSS, from the Oklahoma City FSS.

■ **Clarence G. Chrissinger,** area supervisor, De Ridder AFSS, from the New Orleans FSS.

■ **Harold R. Johnson,** assistant manager for training, San Antonio, Texas, FSS.

■ **Jack R. Oxford,** manager, Oklahoma City Airway Facilities Sector Field Office, Oklahoma City AF Sector, from AF Div.

■ **Larry A. Young,** assistant manager for technical support, Austin, Texas, AF Sector, promotion made permanent.

Technical Center

■ **Janis I. Ceres,** supervisor, Staffing & Position Management Branch, Human Resource Management Division.

■ **Murray R. Karlin,** manager, Systems Requirement Branch, ATC Systems Technology Division.

■ **Joseph A. Liposky,** section supervisor, Accounting Branch, Financial Management Division.

■ **Charles O. Masters,** technical program manager, Flight Safety Research Branch, Aircraft & Airport Systems Technology Division.

■ **Laurel A. Tootell,** manager, Management Analysis Branch, Management Systems Div.

Washington Headquarters

■ **Jerry W. Bradley,** manager, Systems Studies Branch, Systems Studies/Advanced Concepts Div., Systems Engineering Service.

■ **Carol V.J. Carmody,** manager, Budget Reports Branch, Budget Review & Reports Staff, Office of Budget.

Western-Pacific Region

■ **Sidney R. Allen,** area supervisor, Los Angeles ARTCC.

■ **Robert V. Blanton,** group supervisor, Los Angeles Flight Standards District Office, promotion made permanent.

■ **Kenneth G. Borrego,** area supervisor, Reno, Nev., Automated Flight Service Station, from the Phoenix, Ariz., FSS.

■ **Nick Boyiazis,** supervisor, F&E Program Section, Program and Planning Branch, Airway Facilities Division.

■ **Richard B. Browder,** unit supervisor, Radar Automation Section, Maintenance Operations Branch, AF Division, from the Las Vegas, Nev., AF Sector.

■ **Duane L. Christensen,** section supervisor, Flight Standards Branch, Flight Standards Division, from the San Jose, Calif., FSDO.

■ **Frederick D. Cooley,** area supervisor, Hawthorne, Calif., AFSS, from the Los Angeles FSS.

■ **Marion B. Dittmann,** group supervisor, Los Angeles FSDO, promotion made permanent.

■ **Grant A. Eccles,** area supervisor, Reno AFSS, from the Las Vegas FSS.

■ **Richard N. Ellis,** area manager, Coast TRACON, El Toro Marine Corps Air Station, Santa Ana, Calif.

■ **Jose S. Flores,** unit supervisor, Oakland Calif., ARTCC AF Sector, promotion made permanent.

■ **Ronald E. Freeman,** area supervisor, Prescott, Ariz., AFSS, from Phoenix FSS.

■ **James W. Greenwood,** area supervisor, Hawthorne AFSS, from Los Angeles FSS.

■ **Jimmie L. Haralson,** manager, Hawthorne AFSS, from the Los Angeles FSS.

■ **James R. Harvey,** assistant systems engineer, Los Angeles ARTCC AF Sector, from the Airway Facilities Division.

■ **Ronald L. Herda,** area supervisor, Orange County, Calif., Airport Tower, Santa Ana.

■ **Kenneth R. Key,** unit supervisor, Environmental Engineering Section, Maintenance Operations Branch, AF Division.

■ **Michael Lammes,** area supervisor, Hawthorne AFSS, from the Los Angeles FSS.

■ **Gary D. Mourning,** area supervisor, Sacramento, Calif., TRACON at McClellan Air Force Base, promotion made permanent.

■ **Walter F. Ryness,** manager, Finegayan, Guam, AF Sector Field Office.

■ **Michael L. Walker,** area supervisor, Tonopah, Nev., FSS, from the Sacramento FSS.

■ **Charles L. Wallace, Jr.,** assistant systems engineer, Los Angeles ARTCC AF Sector, from Lancaster, Calif., AF Sector.

■ **Finley E. Walter,** area supervisor, Hawthorne AFSS, from Los Angeles FSS.

■ **Jack J. Washington,** aviation safety inspector, Oakland FSDO, from the Flight Standards Division.

■ **Edd S. Woslum,** assistant manager, traffic management, Oakland ARTCC.

Awards *continued from page 9*

One of the two Awards for Valor went to a Southern Region FAA employee—Richard W. Bain.

Five out of nine honored for Outstanding Achievement in Equal Opportunity were FAAers, and Duane Thomas of the Air Transportation Division of the Office of Flight Standards was the sole recipient of an Award for Volunteer Service for his work with the students of the adopted Hine Junior High School.

Eleven FAA women were among the 58 recipients of the Secretary's Award for Excellence.

They were, in Mrs. Dole's words, "splendid accomplishments." ■

Photos by Dennis Hughes and Robert Laughlin.

A Silver Medal went to Vincent Laurentino, manager of the New York ARTCC Airway Facilities Sector, for leadership and efficient operation at one of the busiest ATC complexes in the world.

Eleanor J. Williams, then an area supervisor at the Anchorage, Alaska, ARTCC, now at headquarters, displays her Award for Outstanding Achievement in Equal Opportunity with Deputy Administrator Jones. She received it for aiding women and minorities in pursuing successful careers in the Civil Service.

Retirees

Forrest, Lee, Jr.—AC
Jackson, Elvin B.—AC
Mercer, Marie C.—AC
Osborn, Frederick E.—AC
Steen, Jo Ann—AC
Walde, Paul R.—AC

Clark, Dudley J.—AL
Forsyth, Ronald W.—AL
Heck, Herbert L.—AL
Moore, Calvin L.—AL
Allin, Marvin G.—CE
Behne, Roger C.—CE
Horvath, Richard E.—CE
Royer, Norman G.—CE
Weir, Matthew L.—CE
Wilson, Coad R.—CE

Mayer, William M.—CT
Wharton, Robert F.—CT

Cohen, Adele W.—EA
Hardy, Richard P.—EA
Pfost, Leonard—EA
Ritmiller, John W.—EA
Shinn, John W.—EA
Utnehmer, Herbert S.—EA

Brasfield, Eleanor A.—GL
Gero, Robert C.—GL
Hoss, George W.—GL
Johnson, Carl R.—GL
Kalver, Rose D.—GL
Lemmon, Donald L.—GL
Ringling, Donald R.—GL
Rockford, Kevin G.—GL
Scanish, Robert J.—GL
Schaller, Norman L,—GL
Shaw, Louise M.—GL
Urbanski, Stanley J.—GL
Willis, John B.—GL
Zahuranec, John P.—GL

Carroll, Maxwell G.—MA
Harrison, Stanley A.—MA
Moore, Glenwood M.—MA
Carlsson, Erland R.—NE
Dailey, George H.—NE
Girard, Joseph E.—NE

Adair, Doak—NM
Kiker, James E.—NM
Smith, Barbara J.—NM

Daniel, John E.—SO
Davidow, Melvin H.—SO
Forcht, Bernard E.—SO
Gonzalez, Ronald J.—SO
Kraus, Edward W.—SO
Penney, John M.—SO
Reynolds, Wilden E.—SO
Rivera, Jose A.—SO
Shepherd, William E.—SO
Tritt, B. Elizabeth—SO
Wartenbe, Lawrence R.—SO
Woodsby, Amos G.—SO

Brown, Paul C.—SW
Fox, Rex—SW
Kubiak, Gerald E.—SW
Maxedon, Wendell J.—SW
McKinney, William H.—SW
Norsworthy, Harry C.—SW
Rhine, Roy A.—SW
Sanderson, Dudley B.—SW
Schneider, Ellis, Jr.—SW
Spychalski, Leon—SW
Vardeman, Adella P.—SW

Bauer, Frederick J.—WA
Brewer, Marcia B.—WA
Ryles, Evelyn T.—WA
Siedsma, John H.—WA
Standifer, G. Van—WA

Benton, Frank B.—WP
Berger, David W.—WP
Clemente, Rudolph—WP
Gipson, Richard W.—WP
Herbert, Thelma J.—WP
Kefaliotis, Theodore—WP
Kohl, Edward J.—WP
Meyer, Henry K.—WP
Walley, Frank H.—WP

U.S. Department
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**Federal Aviation
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