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of Transportation
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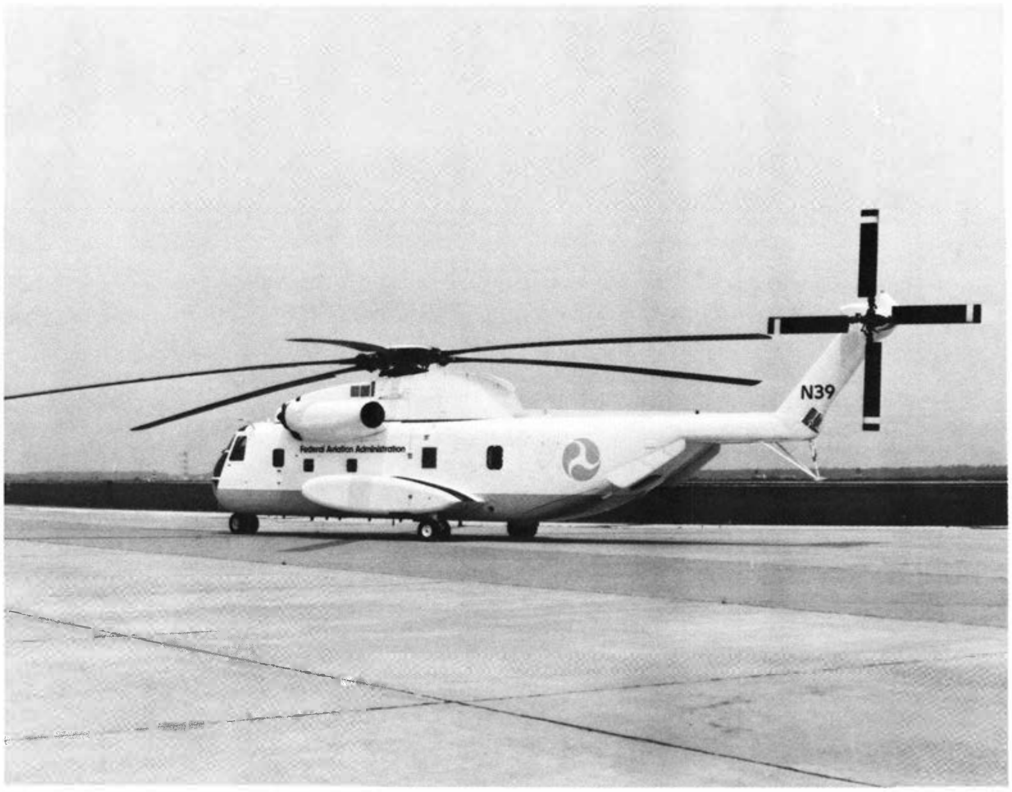

Research Highlights

Man has always turned to the heavens for guidance, both spiritual and navigational. Instead of consulting the stars and the sun, however, navigators soon will turn to man-made satellites for the latter guidance.

Last summer, the agency's Sikorsky CH-53 helicopter at the FAA Technical Center navigated a 100-mile course over Cape May, N.J., using the Department of Defense's Navigational Satellite Timing and Ranging Global Positioning System (NAVSTAR GPS) and a low-cost receiver called a "Z" set.

The military uses NAVSTAR GPS for weapons delivery, vehicle rendezvous and positioning of ground troops, but the Tech Center is looking into its feasibility for helicopters and fixed-wing aircraft in civil aviation use. It could mean all-weather navigation and ATC coverage, even in low-altitude airspace.

There are now five operating satellites, but the military expects eventually to have 18 to 24 satellites aloft to provide continuous worldwide coverage of the sky. The Z set uses four satellites to obtain three-dimensional positioning information and time.

The Tech Center designed and built circuitry to link the Z set to the pilot's course-deviation indicator, to a tape recorder and to an on-board computer. By so doing, project manager Robert Till estimates it saved $75,000 in procurement costs and perhaps a year's acquisition time.

The center is testing the equipment to see how it could be integrated into the National Airspace System, first with en route tests, then approach and terminal tests and later tests over the Appalachian Mountains, oil rigs in the Gulf of Mexico and in metropolitan areas.

Front cover: **Except in this Technical Center test, aircraft aren't likely to face down this way when they start carrying collision-avoidance equipment in a few years.** **See story on page 4.**

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By John G. Leyden
Chief of the Public & Employee Communications Division, Office of Public Affairs, and a former reporter for the *Washington Star*.

TCAS Program Moving Forward

Collision-Avoidance System Is For All Airspace Users

> [TCAS] does not involve a dramatic departure from where we have been but builds on everything that has been done.

The time had come to bite the bullet.

Two decades of research by government and industry in the collision-avoidance area had produced a broad range of system designs and test hardware but not a single piece of off-the-shelf equipment that a pilot could stick in his airplane to protect himself and his passengers from other traffic.

FAA Administrator J. Lynn Helms proposed to change all that. Speaking to the Aero Club of Washington on June 23, 1981, he announced his first major technical decision since assuming the FAA's top job earlier in the year. That decision was to push ahead immediately with the implementation of the Traffic Alert and Collision Avoidance System—TCAS, for short.

The FAA chief told his audience of high-level aviation executives that he personally had reviewed the full range of collision-avoidance options and settled on TCAS as the best bet for meeting the basic criteria he had established for the review. Those were:

- Capable of operating without dependence on any ground equipment;
- Inexpensive enough to meet the needs of general aviation and provide higher-order services and functions desired by large airplane users;
- Full compatibility with the air traffic control system; and
- Available in 36 to 48 months.

Helms emphasized that he considered the timetable for implementing TCAS to be of critical importance, indicating that this was not going to be another government program that began with great expectations and went nowhere. "I absolutely and firmly intend to have in being a threat and collision avoidance system before I leave office," he said.

In general, the aviation community applauded the TCAS announcement, expressing relief that "20 years of debate and indecision" had come to an end. As one editorial writer put it: "Work on anti-collision systems has been going on for years. But this is the first time the FAA has moved to put one into operation. We hope the system is accepted readily by both private and commercial aircraft."

Still, a great many questions about the TCAS program remained. The Aircraft Owners and Pilots Association, to cite one example, wanted to know such things as whether TCAS would have enough capacity to work in busy terminal areas, whether it would be interference-free, and whether it could

Two FAA Technical Center aircraft—a B-727 and a Convair 580—really fly at each other deliberately to trigger collision-avoidance equipment installed in their ockpit panels.

accommodate growth and how much growth.

On July 22, FAA held a TCAS symposium in Washington to address the concerns of the airspace users. Associate Administrator for Engineering and Development Albert Albrecht opened the meeting by noting that "our phones have been ringing off the hook" since the Helms announcement.

"Everyone can agree that something important has transpired," Albrecht added, "and as always happens when intelligent people reflect on new events and balance them against the perspective of what they already know and what their common sense and technical judgment tells them, it is inevitable that many questions arise, and for each answer, a new question arrives to take its place."

But Albrecht emphasized the point that Helms, himself, had made in his Aero Club speech—that is, that the "TCAS concept is an outgrowth of the years of FAA, industry and user participation in the development, test and evaluation of aircraft separation assurance systems." So, Albrecht added, "while the decision is important, what we are discussing today does not involve a dramatic departure from where we have been but builds on everything that has been done."

As detailed by Albrecht and the other symposium speakers, the TCAS concept includes two separate but compatible systems—TCAS I and TCAS II.

TCAS I is the low-cost, minimum-capability version designed for general

This FAA B-727 will be a test bed for TCAS II engineering prototypes.

aviation users. For about $2,500, it will alert pilots with a light or buzzer to the close proximity of other aircraft. Pilots then would make a visual scan to locate the so-called "intruder" aircraft and determine if evasive action were necessary.

TCAS II, on the other hand, is a full collision-avoidance system that will run between $45,000 to $50,000 per installation. The unit will detect potential traffic conflicts and advise pilots of the danger. It also will have the capability of displaying appropriate collision-avoidance maneuvers, if required.

A TCAS installation—whether it's I or II—will provide pilots with protection from any aircraft equipped with a radar-beacon transponder. At present, there are about 170,000 airplanes with the basic Mode A transponder, with approximately 90,000 of these having the additional Mode C, or altitude-reporting, capability needed for full TCAS utilization. TCAS II, for example, can provide advisories on all transponder-equipped airplanes, but it can only generate collision-avoidance instructions on Mode C replies because it needs to know the altitude of the "intruder."

Appropriately, both TCAS I and II are built around an advanced new version of the radar-beacon transponder. It's called the Mode S transponder, although the former name—Discrete Address Beacon Transponder—is more descriptive of its special functions.

The Mode S transponder performs the same basic functions as the present Mode C transponder—that is, it automatically transmits aircraft identity and altitude data when triggered from the ground or the air.

The principal advantage of the Mode S transponder is its discrete, or selective, address capability. The equipment can be addressed on an individual basis and respond in the same way, thus setting up a "private line" for automatic transmission of data to and from the aircraft. By contrast, present transponders reply to "all call" signals in much the same way that everyone on a telephone party line picks up on the same ring.

Low-cost TCAS I will have enhancements that will increase its discrimination of threat aircraft locations.

The selective-address capability of the Mode S transponder results from the fact that it utilizes new signaling formats and protocols that provide over 16 million available codes or call numbers, as compared with 4,096 for Mode C equipment. That means each Mode S unit can be assigned a permanent call number, just like most Americans have a Social Security number.

In use, the Mode S transponder transmits a periodic "squitter" signal that tells all TCAS-equipped aircraft in the area who it is. This identification process, in effect, establishes the party line between Mode S transponders and nearby TCAS installations and permits the use of data-link communications for relaying TCAS advisories and collision-avoidance information.

In addition to the Mode S transponder, the basic TCAS I also will include a passive transponder detector and a cockpit display panel. The passive transponder detector does exactly what the name implies: It listens for transponder replies from other aircraft in the area and triggers a visual and/or aural alarm when the signal strength indicates the traffic is close enough to warrant special attention.

To minimize nuisance alarms from aircraft that actually present no threat, TCAS I would include a sensitivity control that would permit the user to dial down the range of the equipment. This would be especially useful in terminal areas where traffic levels are high but aircraft are moving at slower speeds, so less advance warning of a potential conflict is required.

Normally, TCAS I will not provide pilots with position information on other traffic, leaving it up to them to locate the other aircraft visually and determine what actions to take. The exceptions will be conflicts with TCAS II-equipped airplanes. In these cases, the TCAS II aircraft will transmit advisory information, via the Mode S data link, showing its position relative to the TCAS I airplane and what evasive maneuvers it plans. This communication between TCAS II and TCAS I is called the "crosslink" feature.

For example, the advisories might convey the essence of the following information to the TCAS I pilot on his cockpit display: Alert! You are in conflict with a TCAS II aircraft, range 2 miles, altitude 10,500 feet, in your 3 o'clock position. TCAS II intends to pass above you."

In addition, FAA expects TCAS I buyers will be able to add enhancements that would further reduce nuisance alarms and perhaps provide more detailed information on nearby traffic.

For example, an altitude-filtering circuit could be added to TCAS I for a small increase in price. Such a circuit would analyze altitude reports from Mode C and Mode S transponders and reject those from aircraft that are too high or too low to present a collision threat.

A more-expensive enhancement would be the addition of a direction-finding antenna that would permit TCAS I users to obtain bearing information on all transponder-equipped aircraft. This would permit them to locate the intruder aircraft more quickly.

But despite the enhancements to TCAS I, general aviation will remain its principal user. TCAS II is a full collision-avoidance system intended for use in airliners.

TCAS II essentially represents a follow-on development to the Active Beacon Collision Avoidance System (BCAS). The major technical improvement is the use of a directional antenna that permits it to operate reliably in high-density terminal areas.

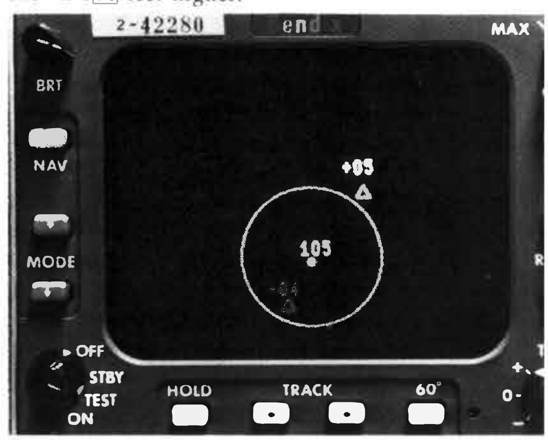
Like Active BCAS, TCAS II determines the position of other aircraft in the vicinity by interrogating their transponders and analyzing the replies. It then presents appropriate traffic advisories and conflict-resolution advisories to the pilot on his cockpit display.

In addition, TCAS II will generate collision-avoidance advisories for all conflicts involving aircraft with altitude-reporting transponders. Initially, the equipment will provide only vertical escape maneuvers and the pilots will be advised either to "descend" or "climb." Horizontal maneuvers are a possibility for later versions. Moreover, when two TCAS II aircraft are in conflict, the avoidance maneuvers will be coordinated via the Mode S data link. For example, one pilot will be advised to climb and the other to descend.

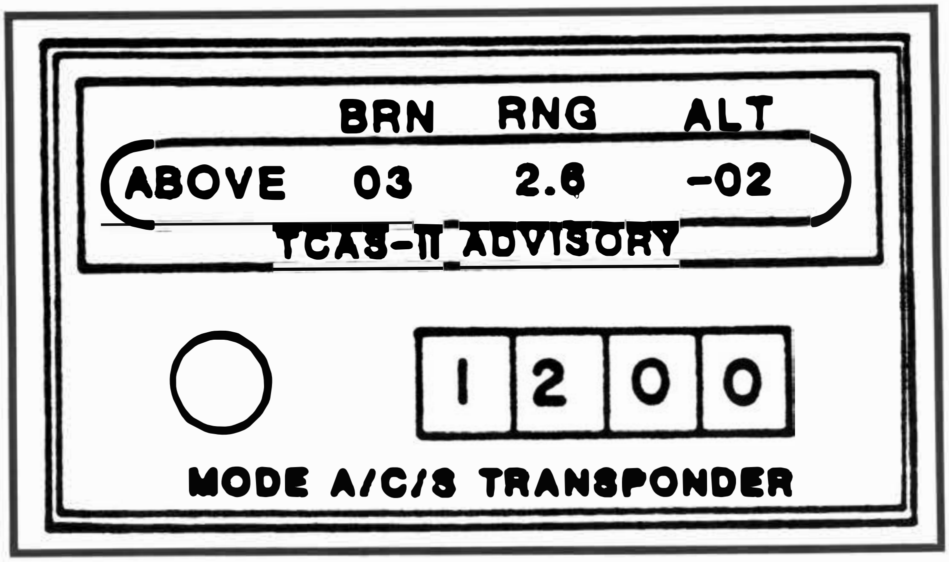
As already noted, TCAS II also communicates its position and intended collision-avoidance maneuvers to TCAS I-equipped airplanes using the crosslink feature.

FAA recently awarded a contract to the Bendix Corporation for two

On its time-shared weather-radar cockpit display, a TCAS II-equipped aircraft is shown at the center of a two-mile range ring at a 10,500-foot altitude. An "intruder" at seven o'clock is 400 feet below the TCAS II plane, while another proximate aircraft is shown 500 feet higher.



Another display to be found in a TCAS II-equipped plane is a modified instantaneous vertical speed indicator (IVSI), here indicating the resolution advisory "do not descend" by means of the lighted bars. The pilot must keep the IVSI pointer out of the descent rates covered by the illuminated segments. An alternate climb or descend advisory could be displayed by lighting the appropriate arrow in the center of the instrument.



The TCAS I transponder will display bearing, range and altitude information from intruding TCAS II-equipped aircraft.

During a demonstration of collision avoidance aboard an agency B-727, Bob Hager (left) of NBC is briefed by Technical Center project engineer Richard Cleary and program manager Dr. Clyde Miller (right), acting chief of SRDS' Separation Systems Branch.

engineering models of TCAS II units capable of providing collision-avoidance maneuvers in the horizontal and vertical planes. Bendix will deliver the first of these units this summer to the FAA Technical Center for test and evaluation.

Initially, the two TCAS II engineering units will be so-called "Model A," which provides only vertical collision-avoidance advisories. After testing of these units is completed, they will be returned to Bendix for upgrading to Model B status. This enhanced TCAS II would have the capability to predict horizontal miss distances and advise pilots of horizontal escape maneuvers. Providing horizontal maneuvers requires a more precise directional antenna than that required for the vertical-only, or minimum, TCAS II. Engineering development activities for minimum TCAS II are underway at the Massachusetts Institute of Technology's Lincoln Laboratories, the Mitre Corp. and Dalmo Victor, a division of Bell Aerospace Textron.

Meanwhile, the agency is gaining operational airline experience with an Active BCAS that will help it define the capabilities of the TCAS II design. The equipment, which was built by Dalmo Victor under an FAA contract, is being installed in two Piedmont Air Lines 727s where it will be monitored during actual passenger-carrying flights by an observer who sits in the cockpit jump seat. The flight crew cannot see the BCAS displays and will not respond to its commands during the evaluation period.

"The objective of this effort is to assess the probable impact of alarms encountered during normal air carrier operations," according to TCAS Program Manager Dr. Clyde Miller. "In particular, alarms will be assessed to estimate the impact they would have had on flight path, crew workload and overall safety had the display unit been in the pilot's position and had the pilot followed the command," he added.

Miller said the agency expects to complete the Piedmont evaluation and concurrent simulator studies early this year. The results then will be incorporated into an experimental TCAS installed in an FAA 727, which will become a flying test bed.

Other efforts underway within FAA include the development of TCAS II National Standards. Miller said the agency expects to publish draft standards for the minimum TCAS II this month and have the final version ready by June. The Minimum Operational Performance Standards being developed by the Radio Technical Commission for Aeronautics also are expected out in June.

Miller concedes that the TCAS implementation schedule—36 months for TCAS I and 48 months for TCAS II—is an ambitious one but expresses confidence that the dates can be met with the full cooperation of industry. "Our job has been defined by the Administrator as developing the minimum standards and then letting industry bring its creativity to bear to make the system better at lower prices," he said. ■

By Samuel Milner
Now on the FAA historical staff, as an Army historian, he wrote *Victory in Papua,* a volume in the Pacific series of *The U.S. Army in World War II.*

The Hybrid Experiment

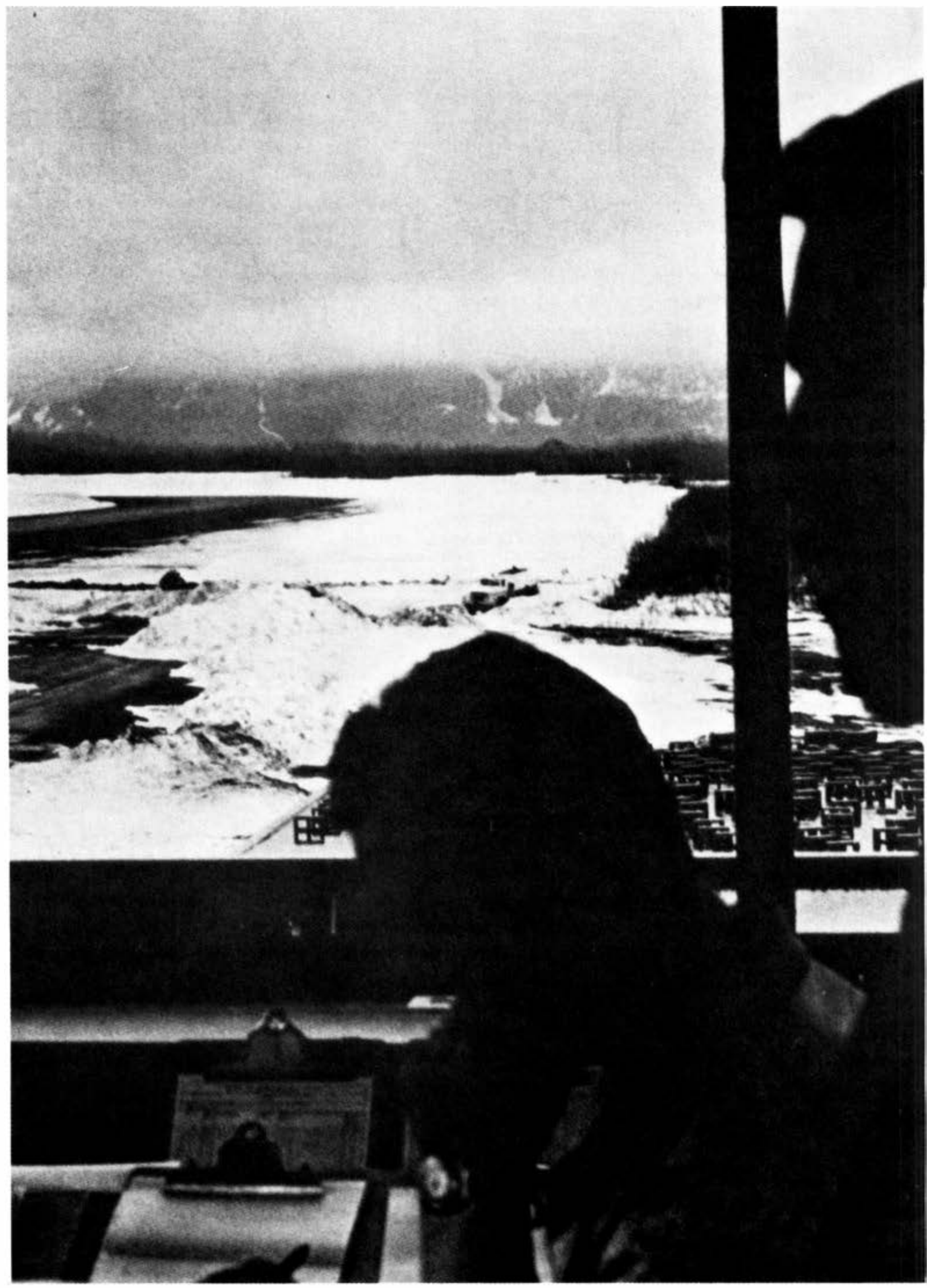
Outliving Their Usefulness, CS/Ts Vanish

Another era has passed. The last domestic combined station/tower became history when the Valdez, Alaska, CS/T was "decombined" on November 30, 1981.

The CS/T was an agency fixture for just over three decades, but it wasn't entirely clear that it served a worthwhile purpose after the first few years had passed.

The Korean War had just gotten under way in 1950, and air traffic controllers were becoming increasingly scarce because of military needs. To conserve manpower, the Civil Aeronautics Authority in August began consolidating its low-volume towers with Interstate Aeronautical Communications Stations (INSACS)—the successors to Airway Communications Stations and the precursors of Flight Service Stations.

As Dave Thomas—then the director of Air Traffic and subsequently the Deputy Administrator of FAA—recalls it, the idea was to use personnel from both types of facilities interchangeably—that is, to train each in the other's duties. In addition to conserving manpower, combining would save substantial sums of money.



Controllers Thomas Meismer and Eugene Wehe manned the Valdez, Alaska, CS/T during its heyday in 1976, when the Alaskan pipeline was still abuilding. Photo by Cliff Cernick

CAA went ahead, beginning with Tyler, Tex., to see whether combining the two functions at less-busy airports in the National Aviation System was worth pursuing on a large scale. By the end of 1950, 16 INSACS out of 450 in the system had been combined with towers. By the end of the next year, it was 65, and by the end of 1958—when CAA became FAA—the program had reached its high-water mark of 85. Thereafter, the number went into a slow decline. By 1980, there were four left.

If the idea was so good at the outset, why didn't it remain a winner, especially as Federal budgets grew tighter?

An omen of the CS/T's demise came almost before it was born. The INSACS had been telegraphic and radio relayers of messages, including weather. On Sept. 15, 1950, CAA and the U.S. Weather Bureau concluded a Memorandum of Agreement in which CAA agreed to give preflight and inflight pilot weather briefings in locations where there were no Weather Bureau personnel, something heretofore restricted to the latter. Still, CAA specialists were allowed only to pass on weather reports without interpretation.

The reason for the Weather Bureau abdication became more apparent after the Korean War was over. The bureau was being swamped with a growing number of special requirements for weather service, such as hurricane forecasting and weather analysis for agriculture, and was busying itself investigating computerization. The growing workload cast doubts on its ability to continue providing pilot weather briefing service from its own resources.

As the Weather Bureau progressively withdrew from the pilot briefing business because of its increased commitments elsewhere, the Federal Aviation Agency in 1960 codified this in a message to the field spelling out the roles of the (now) flight service stations and combined station/towers, which would be to provide "one-stop pilot briefings." This meant that a pilot could by one call or visit receive all necessary weather and aeronautical data and file a flight plan. However, the weather was still provided without interpretation, which was reserved for qualified meteorologists.

In 1963, a Bureau of the Budget circular stated that while the Weather Bureau would continue to provide basic weather services and forecasting and do weather research, special weather services would have to be provided by the users under Weather Bureau supervision and training.

Under a Memorandum of Agreement in 1965 between FAA and the bureau's successor, the National Weather Service—a part of the National Oceanic and Atmospheric Administration (NOAA) in the Department of Commerce—FAA would assume responsibility for the distribution, presentation and *interpretation* of NWS forecasts and charts of observed and forecast weather for aviation users.

FAA personnel would be trained and certified for the task via a National Weather Service course established at the FAA Academy.

All of this meant an increasing workload for flight service station specialists. In the CS/Ts, however, the load was increasing but the training wasn't. The specialists originating from either option were exempted from taking the Weather Service course, making the quality of the briefing inferior to that from a regular station with certified briefers.

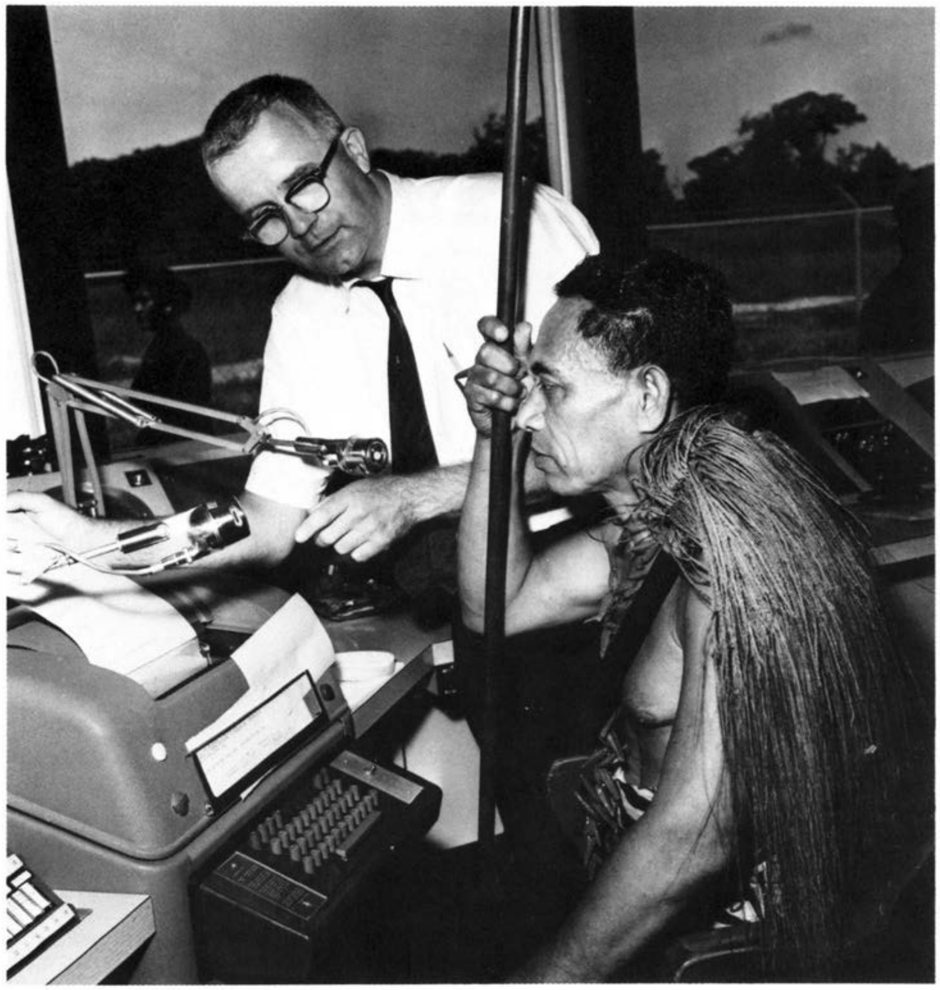
While all at the CS/Ts were tower controllers, those who had originated at towers often resented the station chores, which were growing—passing on weather forecasts, running weather sequences, punching in flight plans on the teletypewriter and flight following. Reluctantly, they did the job when traf-

The Tyler, Tex., CS/T was the nation's first in 1950. It was decombined in 1977. Note teletypewriters in foreground.

Tyler (Tex.) Star Publishing Co. photo by Marybeth Vaughn

fic was light, but gave station duties short shrift when the tower got busy.

Grade diffeiences between those reporting to the CS/Ts and those reporting to FSSs plus unionization exacerbated the tensions and gave the idea of interchangeability between station and tower controllers its lumps. The Air Traffic Control Association formed as a professional group for all ATCSs in 1956, but by 1960 the National Association of Air Traffic Specialists (NAATS) had formed and been certified as a union for station specialists alone. The Professional Air Traffic Controllers Organization (PATCO) formed as a union for controllers in 1968. The twain were further apart.



The only remaining combined station/tower is really a station/approach control; it's the Pago Pago, Samoa, International Flight Service Station. About a decade ago, ATCS Emil Lohrke explained a teletypewriter to a Samoan "high-talking chief."

As traffic increased for these low-volume towers and station duties increased, training in both terminal and station skills became less workable. As that growth led to greater sophistication in equipment, the physical space became less workable.

There was insufficient room for proper preflight briefings and virtually no room at all for chart displays and new equipment when the facility had originally been a tower. When it was a station with a tower added, progress also squeezed the tower functions for more space. In either event, the controller function usually gained the upper hand over the increasing weather functions.

Under these conditions, it's no wonder that pilots quickly learned that they could get better service from regular flight service stations and avoided using the CS/Ts for that purpose when they could.

Conserving manpower, the shortage of which had been brief, and saving money by doubling up low-activity facilities had seemed logical and had had its justification, but by the early Sixties it was becoming clear that mixing the two skills in one facility was counterproductive. With its problems and the expansion of air traffic and more sophisticated systems to the quieter backwaters of the National Aviation System, the combined station/tower's days were numbered and became a memory in 1981. ■

FAA Eyes New Landing Aid

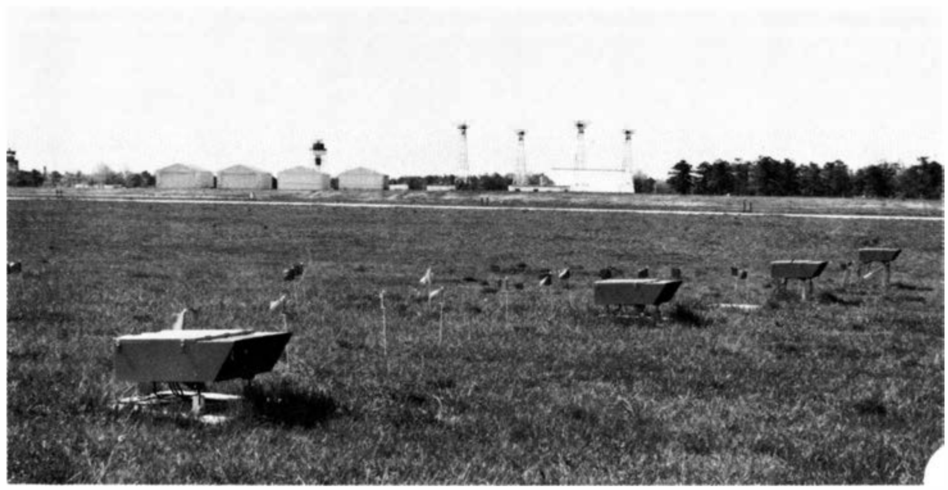
A New ICAO Standard May Be in the Offing

A new visual landing aid may be recommended to the International Civil Aviation Organization for adoption as a standard this year when the FAA Technical Center wraps up some final tests it's doing for the Office of Airport Standards.

Replacing the VASI (visual approach slope indicator) in the affections of VFR pilots may be the PAPI (precision approach path indicator). New to the U.S.—it was developed by the British and is in use in England—PAPI has been operationally evaluated in the air-carrier atmosphere of Newark (N.J.) International Airport and Atlantic City (N.J.) Airport and is being tested in the more heavily general-aviation-oriented Teterboro (N.J.) Airport. In addition, the Tech Center has done durability testing of the equipment in its laboratories.

Following the completion of the Teterboro tests, the Tech Center's Airport Airside Branch will turn its findings over to Washington headquarters for a decision on whether to recommend its adoption.

PAPI is a visual landing aid that indicates to pilots with a pattern of red and white lights whether they are on the proper glidepath for a safe landing. A pattern of two white and two red high-intensity lights side by side—the red innermost—indicates a proper angle of descent. Other combinations of red and white lights indicate the aircraft's position above or below the glidepath. The PAPI lights, which can be positioned close to the threshold, can be seen up to five miles out.



Four PAPI units are lined up at Teterboro, N.J., Airport to test the British glideslope system in a general aviation environment.

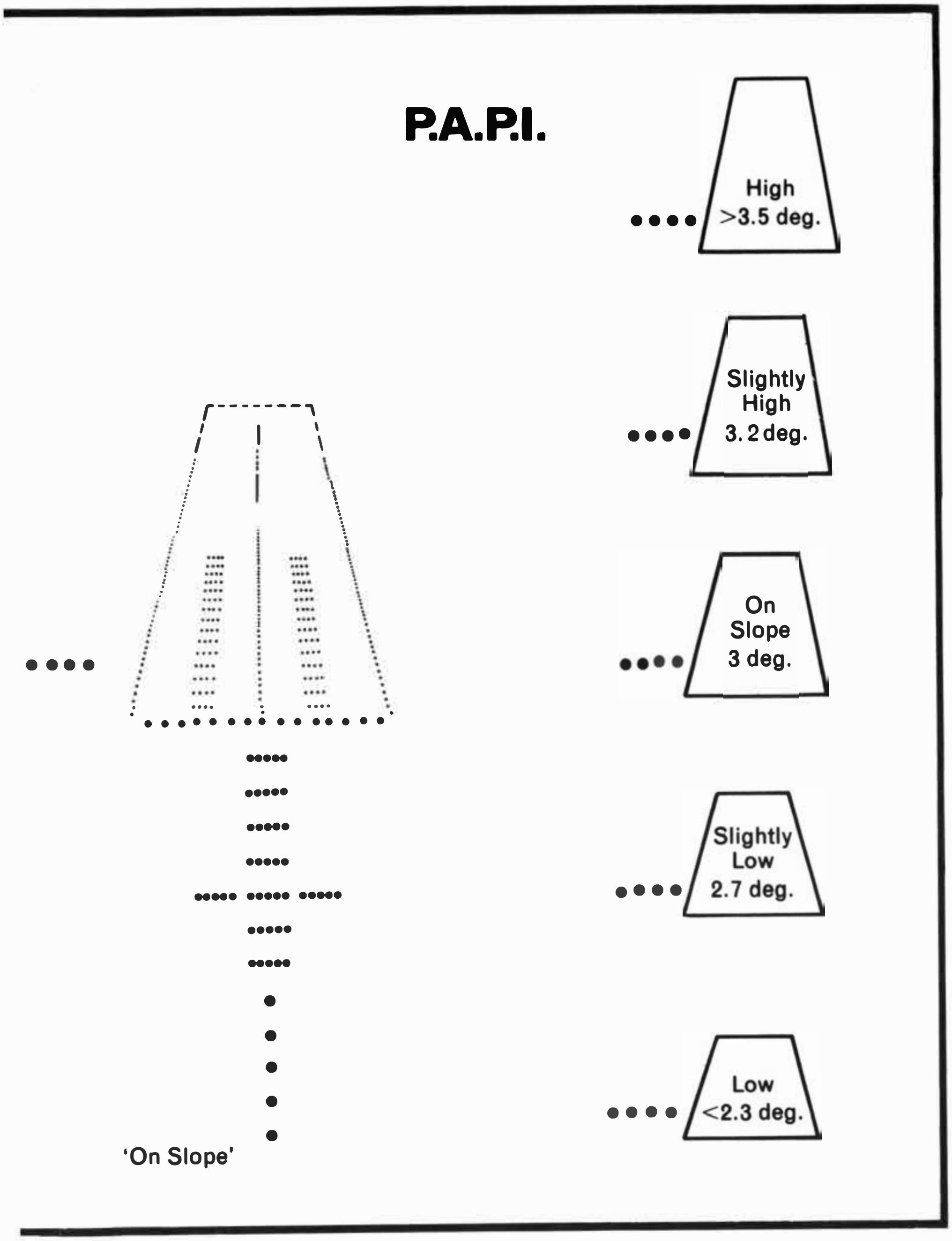
The VASI unit projects a horizontally split beam of light, white above and red below. However, the pilot must look at two units. On a correct glidepath, the pilot sees a white light from the first VASI unit and a red light from the second one further along the runway—red above white. If the pilot is too high, both lights appear white; if too low, both appear red.

The improvement with PAPI is its ability to show a deviation from the proper glideslope more quickly and precisely than VASI. With VASI, a deviation leads the pilot to see a pink transition area that is sometimes difficult to interpret. PAPI, however, appears to snap from one color to the other.

"We have found that pilots do tend to follow the PAPI system at a more specific angle than with the VASI system," says Bret Castle, a member of the Tech Center's research team. "Whether the pilots realize it or not, when they see the colors snap, they also snap to attention and correct."

The basis for that statement were tests with a phototheodolite tracking system, which provides a photographic record suitable for computer analysis. During 120 approaches monitored at the Atlantic City Airport, the system showed that pilots followed the PAPI glideslope more closely.

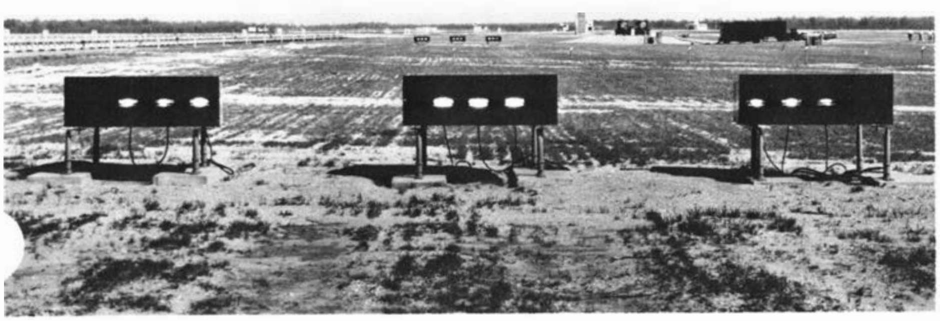
Other countries have claimed that 80 to 90 percent of their pilots prefer PAPI to VASI, although only two out of three American pilots in the earlier tests



were favorable. Castle believes that it's just resistance to change—VASI has been around for 15-20 years.

Another advantage to PAPI is that it's a one-bar system. The pilot doesn't have to shift his eyes 300 or more feet from a downwind bar to an upwind bar; he or she knows instantly if on the glideslope or not. In addition, because only one bar is needed, less land for installation and less wiring are needed.

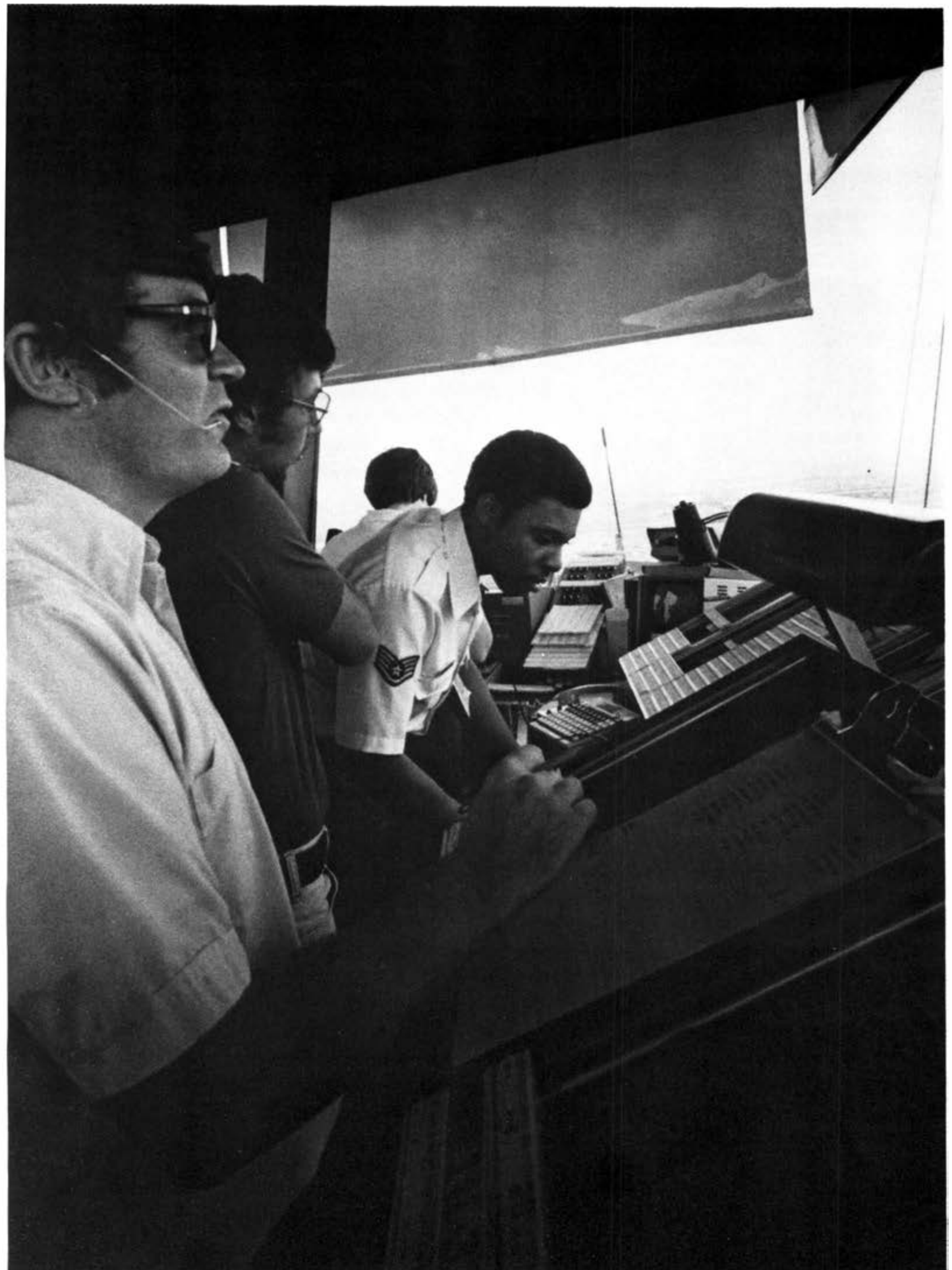
The general-aviation tests are being drawn out because of unfavorable winds on the runway devoted to PAPI and the cutbacks on general-aviation flights in the aftermath of the controllers strike. But a final report from the Technical Center is imminent. ■



The standard VASI unit requires a downwind bar and an upwind bar and the associated additional land commitment and double the wiring.

By TSgt. Alan Prochoroff
Photos by TSgt. John L. Marine

Military Controllers Jumped Into the Breech



Larry Trapp, a commercial airline pilot with USAir, didn't seem at all concerned about the air traffic controller situation as he piloted Flight 235 through uncrowded skies toward Chicago's O'Hare International Airport.

"I'm not worried a bit about the ability of military air traffic controllers," he said during the flight in answer to a question posed by an *Airman* staff member among the passengers. "In fact, I have a high regard for them."

If concern wasn't on the captain's mind, safety certainly was. He was, after all, responsible for the lives of the 120-plus passengers in his care.

Safety was on their minds, too. It had been the hottest topic of conversation since most members of the Professional Air Traffic Controllers Organization had gone on strike in August. But Trapp echoed the reported remarks of countless other airline pilots around the country, saying, "I wouldn't be up here if it wasn't safe."

Keeping the skies safe. That seemed to be a monumental task when more than 11,000 controllers walked off their jobs, leaving, it was thought, the nation's airlanes in shambles. While there were serious problems at first, the shambles never materialized, thanks in large measure to the efforts of about 850 military air traffic controllers who, with Federal Aviation Administration supervisors and non-striking controllers, filled the void.

An Air Force controller at a flight data board assists Chicago O'Hare tower controllers in the early strike aftermath.

Military controllers from Dover AFB, Delaware, and McGuire AFB, New Jersey, reported to JFK International in New York only hours after the strike began.

They had their work cut out for them, for they had been sent to assist the FAA at some of the nation's busiest airports. Almost immediately, military controllers stood next to their civilian counerparts in towers and radar facilities in Chicago, Atlanta, New York and 10 other cities that together account for more than half of the country's regularly scheduled commercial air traffic.

Most Air Force members found the assignment more challenging than intimidating. "An airport like New York's JFK tells you quickly if your controlling skills measure up," said Sgt. Larry Cannedy of Dover AFB.

To their credit, the Air Force controllers hit the airports with afterburners lit and immediately began classes to learn the details necessary to operate at their new duty stations.

"We arrived in New York at six in the morning and started academic training four hours later," said SMSgt. Clarence Jaynes of Tinker AFB, Oklahoma. "The next day we began 12-hour shifts [that included work in the tower as well as academics] so we could complete the classroom work as quickly as possible."

It's a process all air traffic controllers must go through when they begin working at a new airport, and is the same for Air Force as well as FAA controllers. "Even the sharpest FAA controllers would have to go through this same qualification training if they changed airports," explained SMSgt. Jaynes.

Navy Air Controlman Second Class Susan McDonald moved from the Miramar NAS, San Diego, to the Los Angeles Tower cab.

Photo by Barbara Abels

It's a process for which Air Force controllers are particularly well suited. Because of ever-changing service tours, veteran military controllers generally have worked in more facilities than their FAA counterparts. For example, TSgt. Jim Burrow, from Sheppard AFB, Texas, had been checked out in three military facilities last year alone, and in late summer was being trained to handle air traffic at Chicago's O'Hare.

Classroom training for Air Force controllers at civilian facilities varied, according to the complexities of each particular location. At Washington National's radar facility, SSgt. Robert Davey was required to memorize 75 separate radio frequencies and the purpose of each. And before military controllers would be allowed to move aircraft, even on the airport's ramp, they first had to be able to identify each and every structure, gate location, runway and taxiway heading and other essential information about the airport.

The blue-suiters finished the book-learning phases with flying colors, and they did it quicker than their FAA chiefs anticipated.

"To be perfectly honest, we were pretty upset when we first heard we'd be getting the military in here," admitted Jamison Hurst Jr., the deputy chief at Washington National. "We were afraid we'd get rookies with low- or no-skill levels."

But once he saw them hit the books and get to work, Hurst was totally im-

pressed. "The military people actually took their books home and studied at their hotels," he said, still a little amazed at it all. "That's something we weren't used to."

Norbert Owens, chief of the Eastern Region's Air Traffic Division, echoed those thoughts. "The performance of the 191 military controllers in my 15 facilities exceeds our most optimistic expectations," he said.

For Owens' Eastern Region at least, the Air Force meant the difference between a moderate and a severe cutback in civilian flights.

"We're flying seventy-five to eighty percent of the number of flights we had operating before the strike. Without the military's help, we wouldn't have been able to operate at much more than twenty-five percent of our prestrike level," Owens said.

Many in the Air Force have solid backgrounds gained from working busy base air traffic both in the United States and overseas, and workloads at some of those air bases are comparable to those at busy civilian airports. Then, too, of the Air Force's 13 million air traffic control operations last year, 23 percent involved civilian aircraft flying near Air Force air traffic control facilities.

"Handling flights at McGuire Air Force Base in New Jersey can easily be compared to handling those at Baltimore or New Orleans," said Washington National's Hurst. "And Dover Air Force Base air traffic could be said to be as challenging to work as that at Dulles airport or Buffalo, N.Y.

TSgt. Ernie Pearce would certainly agree with that. He is working at the New York TRACON, which controls traffic for the three major airports in the New York area: JFK, LaGuardia, and Newark, N.J. It's a tough job, but he's had one like it before. While stationed in Europe, he served as a controller in West Germany's Eifel Approach Control facility, which sorted traffic going into and out of six German air bases.

As qualified as the military controllers might be, there were adjustments that had to be made and lessons to be learned by the new folks in the towers. SSgt. Mark Mohammed, Dover AFB, said working at Washington National surprised him. "This airport is only about the size of a shopping mall's parking lot, so I sometimes find it amazing we're able to handle as many airplanes as we can each day."

The secret at Pittsburgh, said MSgt. William Merritt, Griffis AFB, New York, was in learning the directions of flight. "Planes taking off travel north, south, east, and west. Arriving flights come in from the northwest, northeast, southeast, and southwest," he said. "So airplanes aren't traveling at each other head-on."

First Lt. John McCoy, who heads the Air Force contingent helping to operate four airports in the Chicago area, said, "Civilian airports are able to handle a lot of airplanes because, day-to-day, they have a similar 'canned' operation. Their schedule is pretty much the same, with few deviations.

"But in controlling military traffic, there are different missions each day—air-to-air intercepts today, special operations tomorrow—with the airplanes leaving by different routes and operating in various sectors of a base's controlled area."

Military controllers immediately hit the books at Pittsburgh Tower to familiarize themselves with the airport, airspace sectors and regulations.

The short- and no-notice departures from bases to civilian airports and facilities naturally created some problems among military controllers—not the least of which was money. Some had to leave with little or no chance to draw advance TDY per diem, which would be badly needed, since many are working in high-cost-of-living areas.

Finance officers from bases near civilian airports and facilities entered the action soon after the first deployment with enough money to tide the controllers over. And, within a month after the strike began, Air Force Communications Command senior enlisted advisers visited each location where Air Force people were sent to explain the "ins and outs" of TDY pay and allowances and listen to the controllers' concerns.

An almost universal concern among Air Force controllers was the lingering uncertainty of just how long they would be away from home. Maj. Gen. McCarthy told the Air Staff he expected the requirement for Air Force controllers would be about a year but that he doesn't want any individuals to be

An Air Force controller learns the ropes in the New York TRACON, comparable to combined facilities the military operates.

An experienced FAA controller is flanked by a pair of Air Force controllers manning the radarscopes in the Washington National Airport TRACON.

away from home station longer than six months, except those who volunteer to remain longer.

Some problems were addressed immediately. Because of the extraordinary demands placed on them, many controllers would have lost accrued leave at the end of the fiscal year had Air Force officials not taken immediate steps to allow them to carry this excess leave into the next year. Problems pertaining to medical care and promotion-testing opportunities were also studied with an eye toward quick solutions.

While important to individuals, all those problems pale in comparison to a larger, more serious crisis that is looming for the Air Force.

From the time the PATCO strikers were fired, the Federal Aviation Administration was looking toward rebuilding the nation's air traffic control system. And the military, in the interim, was counted on to play a major role in the process.

The military may ultimately play a much larger role than that. While the FAA says it won't actively recruit military controllers, civilian controllers traditionally have learned their trade while in uniform. And Air Force officials don't see any likely change to that trend.

Within the next year, for instance, 19 percent of the Air Force's air traffic controllers will be eligible to leave the service, either through retirement or separation. Col. Derrel L. Dempsey, AFCC's deputy chief of staff for air traffic services, fully expects to lose a significant percentage of them. "It's simple arithmetic," he explained, pointing to the typical FAA salary of $30,000 or more each year.

"The FAA will have to rebuild itself first—and it will probably use some of our resources to do it. We are increasing our training quotas simultaneously with FAA efforts to rebuild the national air traffic control system."

The picture, while bleak, is not totally out of focus. Re-enlistment bonuses for air traffic controllers were increased, and, for whatever reasons, not every Air Force controller wants to jump to the FAA.

SSgt. Robert Brown, a McGuire controller working at Washington National, has 12 years of military experience and isn't about to cash it in. "I don't re-up again until 1986, but if I had to make the decision today, I'd stay in the Air Force."

The sentiments are echoed by SSgt. Charles Conway in Chicago. "There's more to life than money," he said. "I like the work I've done in the military and the people I've done it with."

That's a hopeful sign. The FAA is counting on Brown, Conway and others like them now. But the Air Force will be counting on all of them just as much later. ■

This story is excerpted with permission from "A Towering Effort" in* Airman *magazine, November 1981.

People

Aeronautical Center

■ **Daniel M. Harrington**, chief of Non-radar/VFR Development-Revision Unit, National Program Support Section, FAA Academy, from the Special Services Section.

■ **William J. Kane**, unit chief in the Terminal Section, Air Traffic Branch, promotion made permanent.

■ **Larry J. Little**, unit chief, Terminal Section, from the National Program Support Section.

■ **Gerald W. Pennington**, unit chief in the Terminal Section, from the Special Services Section.

■ **Lawrence L. Ruby**, unit chief in the National Program Support Section.

Alaskan Region

■ **Leon F. Chesler**, chief of the Frequency Management Staff, Airway Facilities Division, from the Merrill Field Sector Field Office, Anchorage.

■ **Albert L. Eggebroten**, chief of the Juneau AF Sector Field Office, from the Fairbanks International SFO.

■ **Ralph A. Fredrickson**, unit supervisor in the Flight Inspection Technicians Section, Anchorage Flight Inspection District Office.

■ **Kenneth L. Hill**, maintenance mechanic foreman in the Fairbanks International Sector Field Office.

■ **William T. Ipock**, assistant chief at the Kenai Flight Service Station, from the Anchorage FSS/IFSS.

■ **Cecil C. Osborne**, chief of the Electronics Section, Planning/Establishment Branch, Airway Facilities Division, from the Engineering Branch.

■ **James M. Pearson**, chief of the Anchorage ARTCC.

■ **Wallace L. Tharp**, team supervisor at the Fairbanks TRACON, promotion made permanent.

■ **Norman R. Weeks**, team supervisor at the Fairbanks FSS.

Central Region

■ **William M. Diehl**, computer specialist at the AF Sector of the National Communications Center, Kansas City.

■ **William Leseberg, Jr.**, assistant systems engineer at the Kansas City ARTCC AF Sector.

■ **Carl D. Mittelhauser**, team supervisor at the St. Louis FSS, from the Columbia, Mo., FSS.

■ **Keith W. Nease**, assistant systems engineer at the Kansas City ARTCC AF Sector.

Eastern Region

■ **Robert D. Barber**, systems engineer at the Washington ARTCC AF Sector.

■ **Frank Di Blasi, Jr.**, team supervisor at the Poughkeepsie, N.Y., Tower.

■ **Sheldon Gross**, chief of the AF Sector Field Office at the JFK International Tower.

■ **Robert D. Lamb**, assistant chief at the New York TRACON in Garden City, Long Island, N.Y.

■ **James F. Miller**, deputy chief of the Andrews AFB Tower, Camp Springs, Md., from the Washington National Airport Tower.

■ **Clubert G. Poff**, unit supervisor in the Norfolk, Va., AF Sector, from the FAA Academy.

■ **Harvey L. Scolnick**, team supervisor at the Harrisburg, Pa., Tower, from the New York TRACON.

Great Lakes Region

■ **Kenneth C. Dressel**, chief of the Lucas County, Ohio, AF Sector Field Office in the Detroit, Mich., Sector.

■ **Maurice E. Fowler, Jr.**, team supervisor in the Detroit FSS.

■ **Richard N. Koch**, team supervisor at the West Chicago, Ill., FSS, from the South Bend, Ind., FSS.

■ **Jacqueline L. Wilson**, deputy chief of the Cleveland ARTCC, from the Air Traffic Operations Branch, AT Division.

Northwest Mountain Region

■ **John M. Cook**, team supervisor at the Eugene, Ore., Tower, promotion made permanent.

■ **Paul C. Eubanks**, team supervisor at the Pueblo, Colo., Tower.

■ **Orvie N. Jensen**, unit chief in the Felts Field AF Sector Field Office of the Spokane, Wash., AF Sector, from the Pasco, Wash., AFSFO.

■ **Luther P. Koehler**, chief of the Olympia, Wash., Tower, from the McChord AFB, Wash., RAPCON.

■ **Donald A. Rizer**, team supervisor at the Colorado Springs, Colo., Tower, from the Denver, Colo., Tower.

■ **James E. Stevens**, chief of the Broomfield, Colo., Tower, from the Denver Tower.

Southern Region

■ **Richard L. Haskins**, deputy chief of the Miami ARTCC, from the Operations, Procedures & Airspace Branch, Air Traffic Division.

■ **Robert A. Larson**, team supervisor at the Melbourne, Fla., Tower, from the Opa Locka, Fla., Tower.

■ **Thomas T. Martin**, deputy chief of the San Juan, Puerto Rico, center-RAPCON.

James J. McGrath, chief of the Pompano ach, Fla., Tower, from the Ft. Lauderdale, Fla., ower.

■ **Tilton C. Meuninck**, assistant chief at the Miami, Fla., International Airport Tower.

■ **Wayne R. Rives**, watch supervisor at the San Juan AF Sector.

■ **Alexander Sambolin**, data systems officer at the San Juan CERAP, promotion made permanent.

■ **Pete C. Signorelli**, team supervisor at the Panama City, Fla., Tower.

Southwest Region

■ **Joel D. Oakley**, team supervisor at the Fort Worth, Tex., ARTCC, from the Washington ARTCC.

■ **Edward J. Pierson**, team supervisor at the Moisant Tower, New Orleans.

■ **Francis D. Pracheil**, programs officer at the Moisant Tower.

Technical Center

■ **Richard Manhardt**, chief of the Labor Relations Branch, Personnel Management Division.

Western-Pacific Region

■ **Stanley E. Albright**, team supervisor at the Oakland, Calif., ARTCC, promotion made permanent.

■ **James W. Braithwaite**, team supervisor at the Santa Monica, Calif., Tower, from the Burbank, Calif., Tower.

■ **William A. Brown**, team supervisor at the Reid-Hillview Tower, San Jose, Calif., from the San Jose Municipal Tower.

■ **Norman H. Carp**, chief of the Salinas, Calif., Tower, from the Monterey, Calif., Tower.

■ **James A. Caudle**, deputy chief of the Honolulu, Hawaii, ARTCC.

■ **Merle D. Clure**, chief of the Honolulu ARTCC, from the Oakland, Calif., ARTCC.

■ **James W. Dunklin**, team supervisor at the Kona, Hawaii, Tower, from the Maui Tower.

■ **Michael J. Fitzgerald**, team supervisor at the McClellan AFB, Calif., RAPCON, from the Reno, Nev., Tower.

■ **Frank B. Garcia**, assistant chief at the Imperial, Calif., FSS.

■ **Raymond F. Gromacki**, team supervisor at the San Carlos, Calif., Tower, from the San Jose Municipal Tower.

■ **Johnny C. Price**, data systems coordinator at the Oakland ARTCC.

■ **Charles A. Register**, team supervisor at the El Monte, Calif., Tower.

■ **Louis W. Rosgen**, team supervisor at the Las Vegas, Nev., Tower, from the Spokane, Wash., International Airport Tower.

■ **Joseph F. Savage, Jr.**, team supervisor at the Stockton, Calif., Tower.

■ **David A. Smith**, team supervisor at the Napa, Calif., Tower, from the Edwards AFB, Calif., RAPCON.

■ **George L. Spahn**, data systems coordinator at the Oakland ARTCC.

■ **Richard V. Tarantino**, team supervisor at the Van Nuys, Calif., Tower.

■ **James T. Turner**, deputy chief at the Los Angeles TRACON, from the Van Nuys Tower.

Photo by William A. McCord
Tallahassee AF Sector Field Office

Rather than some alien ear emergent from its landing crater, this is a more prosaic moving-target-indicator reflector planted among the cornstalks on Tallahassee, Fla., Municipal airport property.

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