AFCC

AFCS
1961-1979

AACS
1938-1961

1991

AIR FORCE COMMUNICATIONS COMMAND: 1938-1991 AN ILLUSTRATED HISTORY

Third Edition

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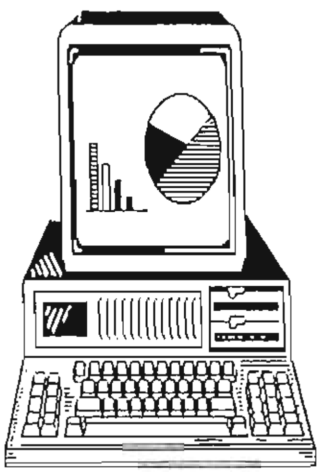

AFCC OFFICE OF HISTORY
Scott Air Force Base, Illinois 1991

PREFACE

For over fifty years the men and women of the Air Force Communications Command and its predecessors have played a key role in the evolution of the Air Force's command and control systems. Responding to wars, political and military crises, diplomatic needs, and humanitarian requirements, the people of AFCC have met every challenge. They have established a proud and commendable record which will serve admirably as a stepping stone into the future.

ROBERT H. LUDWIG, Lieutenant General, USAF
Deputy Chief of Staff/
Command, Control, Communications,
and Computers
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Although 1991 marks the Air Force Communications Command's thirtieth anniversary as a major command, its roots go back to the 1930s. Formally organized in 1938, AFCC gradually evolved from an original complement of about 300 men, providing air traffic control in the continental United States only, to a worldwide command of several thousand men and women with a multitude of missions. During this evolution, the command also acquired the equipment and technology to make communications not only faster but also more accurate. Communications today is of the type that only science fiction writers dreamed of fifty years ago. AFCC, however, is about more than equipment; it is about people. People have always been at the heart of Air Force communications, whatever name the organization happened to carry. That was the way it was in 1938; that is the way it is today.

A book of this nature can do little more than skim the surface of the command's past. It cannot possibly portray all the countless personal stories of ingenuity, hard work, and sacrifice by the men and women who created this command and its legacy of service. It is my hope, however, that this volume will provide a flavor of those times, and stand as a tribute to those thousands of individuals whose tireless efforts and personal sacrifices over many years and in a thousand different places made this command one to be proud of. They served with pride and established a tradition of excellence.

JOHN S. FAIRFIELD
Major General, USAF
Commander

ACKNOWLEDGEMENTS

The purpose of this illustrated history is to put the heritage of the Air Force Communications Command into perspective as it celebrates its twenty-fifth anniversary as a major air command. This volume is an updated and enlarged version of a similar book prepared in 1981. It is not meant to be a critical, analytical account, but a narrative highlighting the growth of this command since 1938 from a simple system with 300 men operating only within the continental United States to a major air command with over 60,000 people, worldwide responsibilities, and a highly complex mission.

Historians from the Headquarters Air Force Communications Command, Office of History, prepared this history. Dr Thomas S. Snyder prepared the plan for writing the original volume and this updated version, served as overall editor, and wrote the first chapter on the establishment of the Army Airways Communications System and its activities through World War II as well as parts of the last chapter on the command during the 1980s. Dr Laurence B. Epstein prepared the second chapter, detailing the activities of the Airways and Air Communications Service, 1946-1961. Mrs Shelley L. Davis wrote the third chapter on the first decade of the Air Force Communications Service as a major command, 1961-1970. Dr Daniel R. Mortensen prepared the fourth chapter which describes the activities of the command, 1970-1981. Dr Larry R. Morrison wrote the sections on systems for the chapter on the command in the 1980s. Mrs Cora J. Holt updated the appendices, helped edit the text, and readied the manuscript for printing. Ms Melinda Wigginton and Dr Larry Morrison selected the photos used to illustrate the new chapter. Dr. Tommy R. Young reviewed the entire history and his comments on the new chapter were especially helpful.

Many civilian and military personnel at Headquarters Air Force Communications Command read and commented on the draft manuscript. Their suggesions were invaluable and substantially improved the manuscript. Special acknowledgement must go to Lt Col Eric L. Peterson, Executive Officer to the Commander, and Dr Timothy J. Mucklow, Office of History, who took the time and interest to read and comment on the chapter on the period 1981-1986.

Retyping of the original volume was done by the Directorate of Administration. Ms Tana Nordaker, Supervisory Printing Assistant, 375th Air Base Group, coordinated the photographs to the text and made the text camera-ready in preparation for publication.

This illustrated history is based almost entirely on the official histories of the Air Force Communications Command and its subordinate organizations plus documents and interviews contained in the Headquarters Air Force Communications Command historical collection. Without the work of the command's full-time and additional duty historians, who prepared these official histories through the years, the present writers would not have been able to produce this volume. I especially want to acknowledge Dr William McClintock, Tactical Information Systems Division historian, whose history on the Grenada rescue operation was particularly helpful.

In addition, this office is indebted to the Headquarters Air Force Communications Command Public Affairs Office; many Air Force Communications Command subordinate units; the Air Force Museum at Wright-Patterson AFB, Ohio; the Defense Audiovisual Agency at the Pentagon; and the Air Weather Service Office of History, all of whom kindly provided photographs for this history. This office is particularly indebted to members of the Army Airways Communications System Alumni Association who either donated or loaned photographs from their personal collections for use in this project.

ACKNOWLEDGEMENTS TO THIRD EDITION

The purpose of this latest revision of the command's illustrated history is to put the heritage of the Air Force Communications Command into perspective as it celebrates its thirtieth anniversary as a major air command. This volume is a revised edition of similar books published in 1981 and 1986. The major changes are in the appendices which were updated, and the chapter on the eighties which was updated and expanded. As with the earlier versions of this history, several military and civilian personnel, including everyone in the Office of History, at Headquarters Air Force Communications Command read and commented on the revised chapter. The finished version is a better product because of their comments and suggestions.

A special acknowledgement is due the following people: Dr Larry R. Morrison who revised and expanded the last chapters for this edition; Mr Robert T. Cossaboom, AFCC Command Historian since July 1990, who managed this latest edition through its birth pains; and Mrs Linda G. Miller who designed the cover of the third edition and helped Dr Morrison in the final selection of photographs for the last chapter.

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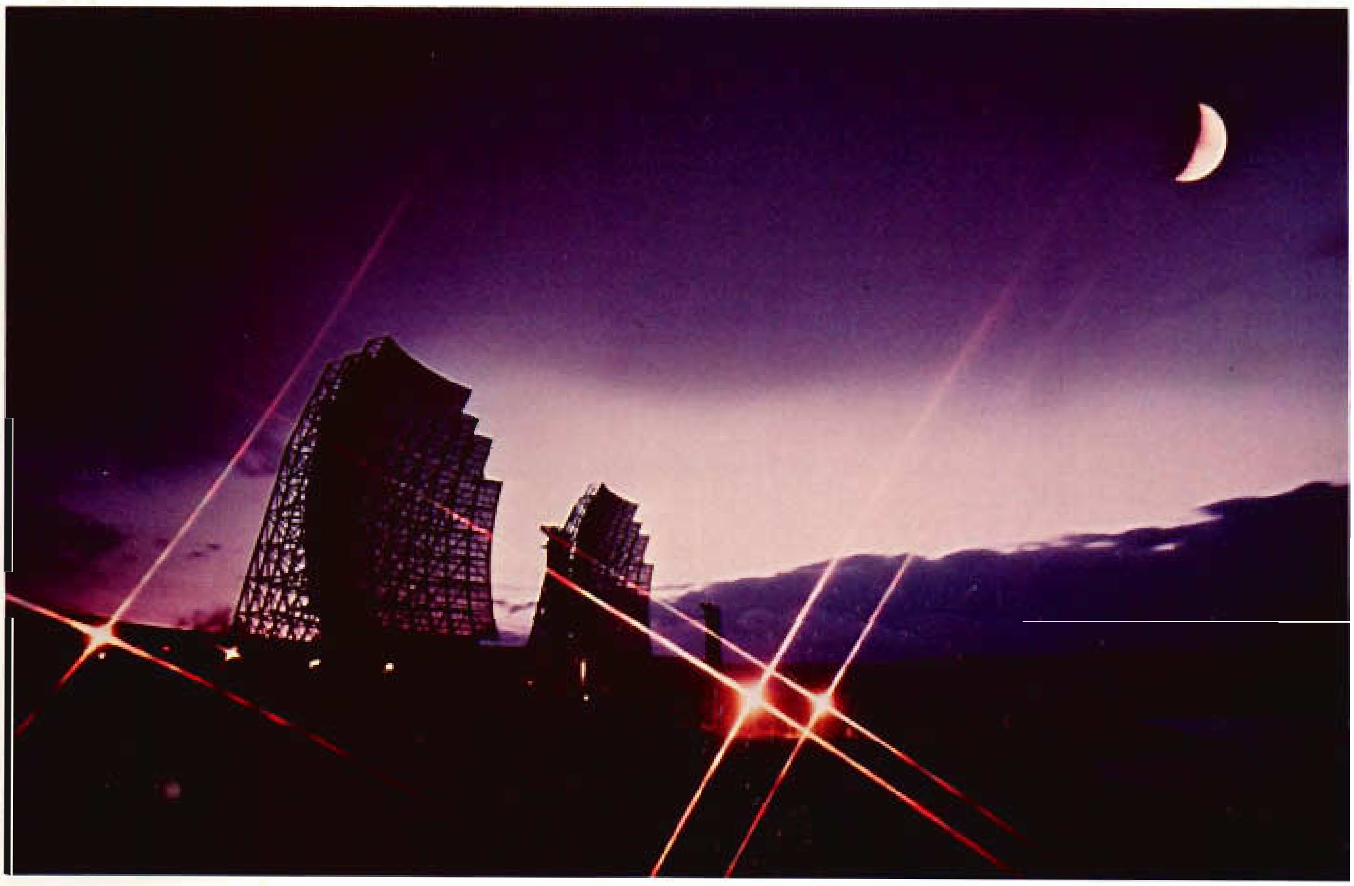

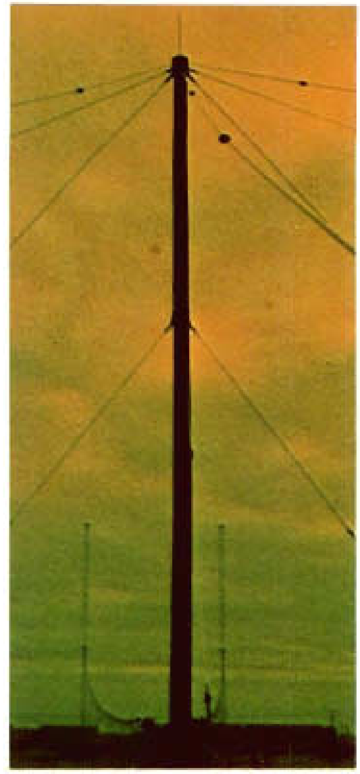


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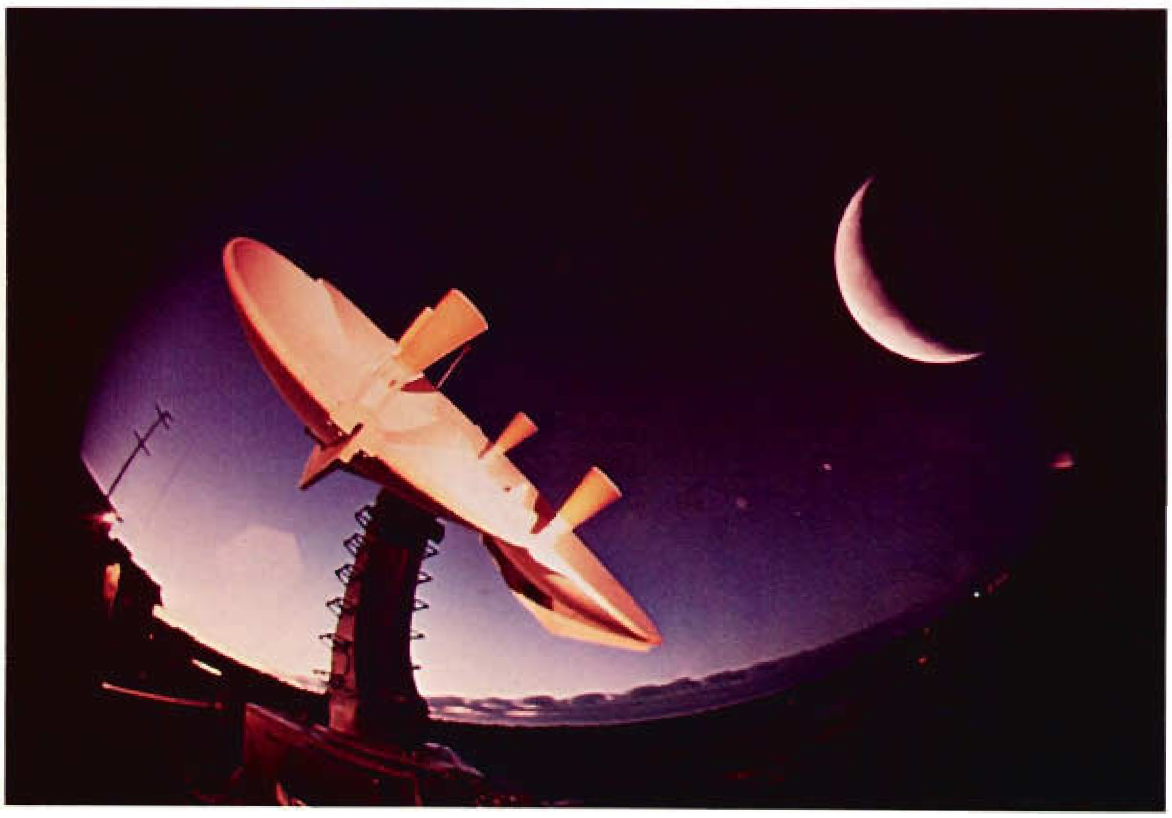
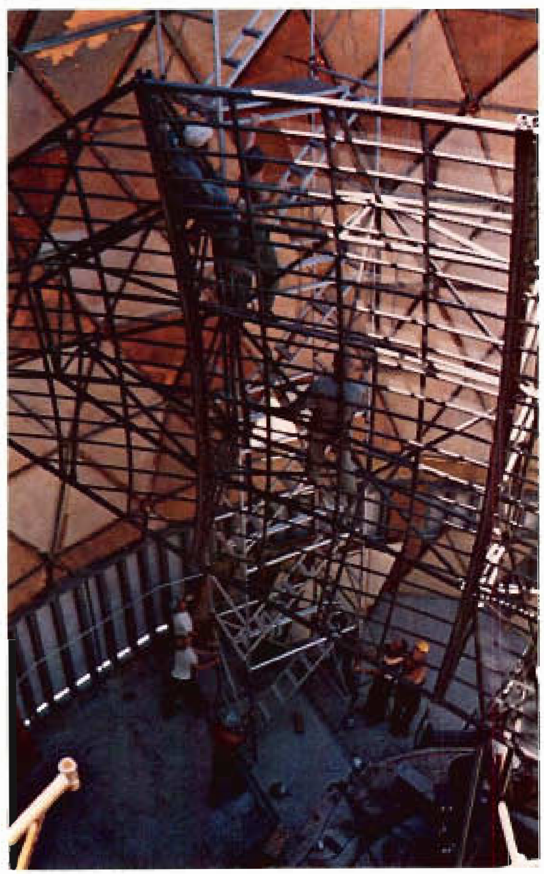
A Proud Past

Providing the Reins of Command

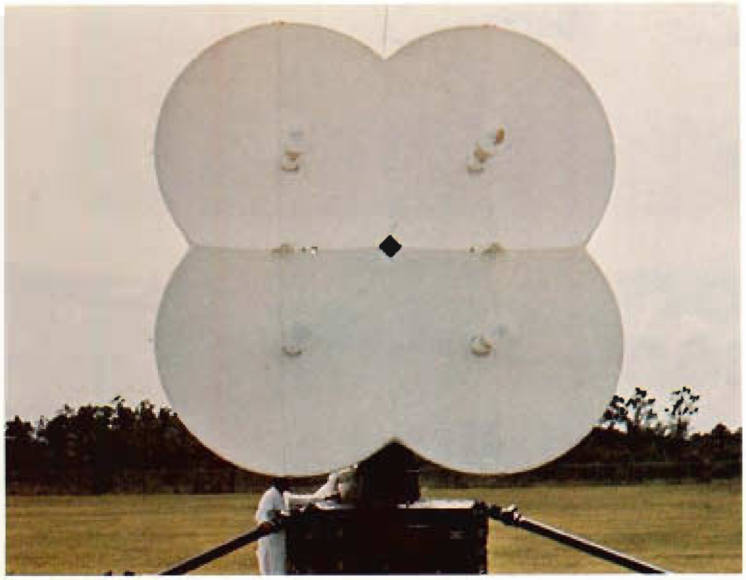


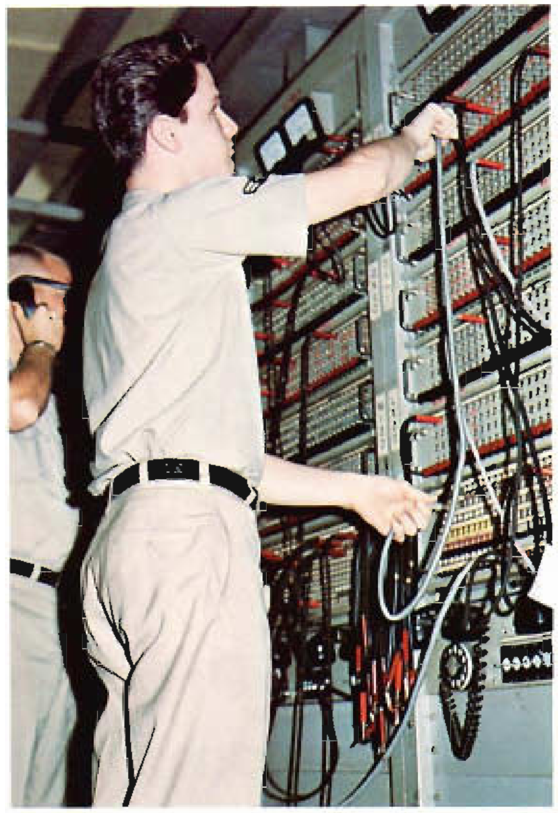
Over 50 Years
Providing Specialized
Communications Support

1938 - 1991



An Exciting Future



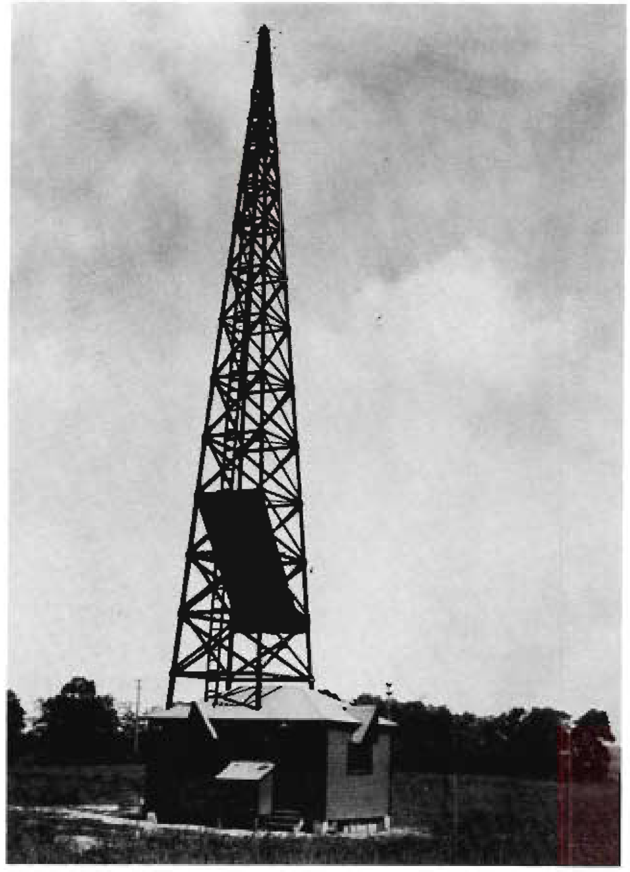


30 Years as a Major Command
1961 - 1991

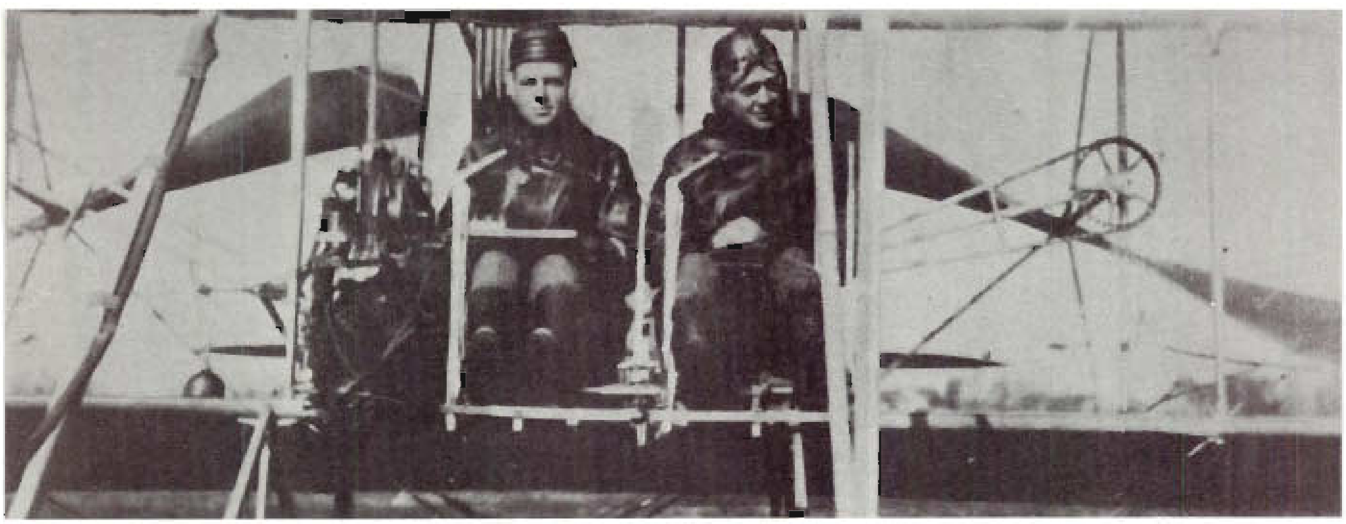
ARMY AIRWAYS COMMUNICATIONS SYSTEM
WORLD WAR II ERA: 1938—1946

INTRODUCTION

From the early days of manned flight, farsighted individuals predicted that the destinies of aircraft and communications would be closely linked. The Army transmitted the first radio message from an aircraft in 1910 and by the end of the decade, the Aviation Section of the Army Signal Corps was actively experimenting with air-to-ground and ground-to-air communications. In 1923, prompted by Gen William (Billy) Mitchell's interest in cross country flights, the Air Service began to establish an Air Alert Net consisting of radio stations which provided air-to-ground and point-to-point communications as well as the dissemination of weather data. But by 1938, only 33 such stations existed.

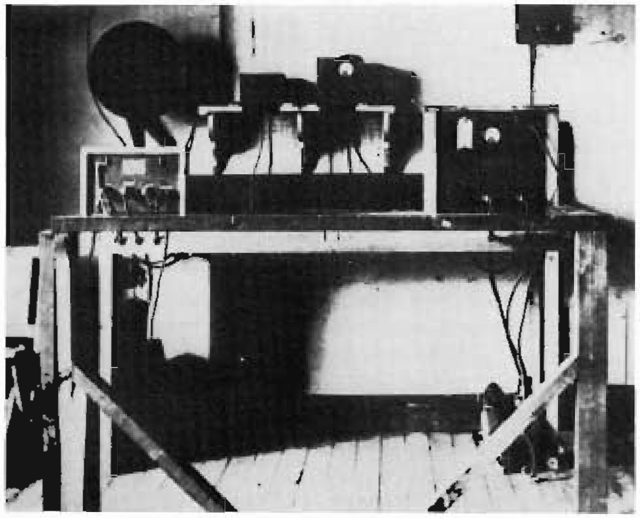

Radio beacon and tower, Wright Field, April 1928.

Service, clearly inadequate, suffered for various reasons. Each station was the responsibility of the individual post commander who quite commonly did not give airways communications a high priority. Aircraft regularly reached their destinations ahead of the flight message heralding their departure. Radio operators could be assigned to other duties such as KP and guard duty which virtually prevented the kind of continuous watch essential for safe flight. Moreover, the lack of centralized direction over all the stations prevented any uniformity of procedures. The impact on operations was even more serious. Air maneuvers went awry because of just such faulty communications and planes missed their rendezvous or never arrived at all. One irascible general, disgusted with the


World's first successful air-directed bombing demonstration using air-to-ground radio occurred at Ft Riley, Kansas, on 5 November 1912. Pictured from left to right are Lt Follett Bradley, Observer and Radio Operator, and Lt Henry H. Arnold, Pilot.

slowness of air communications, had in exasperation filed his message with Western Union. And the story is told that during one of these maneuvers, a message intended for Gen George C. Marshall ended up in the hands of Admiral Richard E. Byrd in Little America, Antarctica.

Not only was the existing system woefully inadequate, but pilots were reluctant to use radios. Until the mid-1930's, aircraft engines were not bonded and shielded. Consequentlly radio reception was difficult, if at times not entirely impossible, because of engine ignition interference. Moreover, the complex wiring for receivers and transmitters often caused fires in the aircraft. Finally, early radio sets weighted so much that the payload and fuel load had to be reduced when radios were carried. As a result, many pilots developed an antipathy to radios so violent that many of them tossed sets overboard and reported their accidental



Radio station of 1st Observation Sq., Mitchel Field, 1923.

The radio compartment on board an aircraft in the early 1930s was often cramped. This radio operator was Lt Ivan Farman, who later, as a Brigadier General, commanded AACS.

loss. Charles A. Lindbergh, for example, did not carry a radio on his record flight to Paris in 1927.

Fortunately not all pilots held a hostility toward radios. One man in particular, Lt Col (later Gen) Henry H. (Hap) Arnold was a strong believer in the need for efficient airways communications. He gathered around him a cadre of men such as Capt (later Maj Gen) Harold M. McClelland, Maj (later Brig Gen) Wallace G. Smith, Ist Lt (later Brig Gen) Ivan L. Farman, Ist Lt (later Col) Lloyd H. Watnee, and MSgt (later Lt Col) Walter B. Berg who all shared his ideas. When the Army Air Corps flew the mail briefly in 1934, Colonel Arnold, who managed one leg of the route, placed special emphasis on effective communications. Then in July 1934, in an event which precipitated development of a rational airways communications system, Arnold led a flight of 10 Martin B-10 bombers on a record setting, long distance flight from Bolling Field, Washington D.C., to Fairbanks, Alaska, and back. Again, special arrangements for communications had been made and contributed markedly to the success of the flight. Motivated, by these successes, Arnold and McClelland initiated a campaign to establish an effective, integrated, centrally managed, military airways communications system. Four years later, these efforts culminated in the establishment of the Army Airways Communications System (AACS).

One of the 10 B-10 bombers of the Army Alaskan flight, flying beneath the clouds to obtain air map pictures of the territory between Anchorage and Fairbanks. The territory shown here is Broad Pass.

The flight of 10 B-10 bombers return from the Alaskan flight to Bolling Field, Washington, D.C.

Col. H.H. (Hap) Arnold, pictured here aboard one of the Martin B-10 bombers, established a long-distance flight record on 19 July-20 August 1934, flying from Bolling Field, Washington, D.C., to Alaska. The B-10 used by Arnold was the first Army plane completely bonded and shielded to prevent engine ignition interference with radio reception. All 10 aircraft were equipped with a new type of interphone vacuum tube and the 183 command set. A crude radio compass was also installed in each aircraft.

ORIGINAL AACS OFFICER CORPS

1938

Major Wallace G. Smith
AACS Control Officer
HQ Army Air Corps

Capt Russell A. Wilson
Regional Control Officer
1st AACS Region

1st Lt Dudley D. Hale
Regional Control Officer
2nd AACS Region

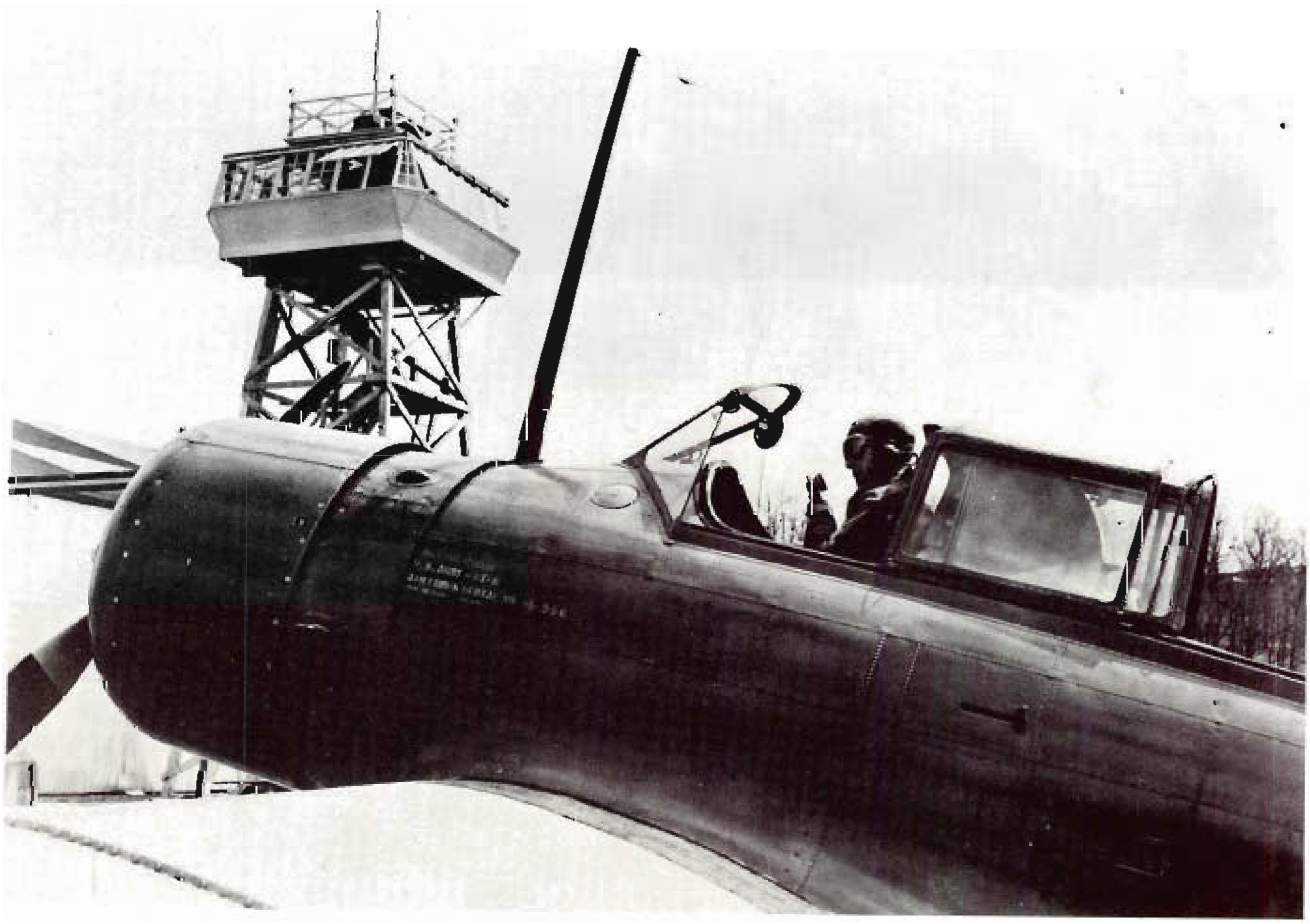
1st Lt Lloyd H. Watnee
Regional Control Officer
3rd AACS Region

ESTABLISHMENT OF THE ARMY AIRWAYS COMMUNICATIONS SYSTEM

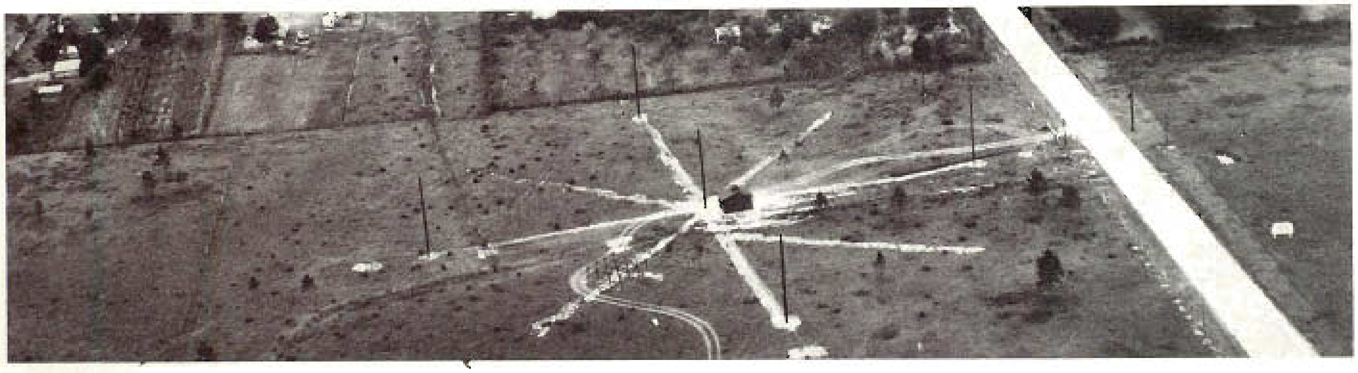
On 15 November 1938, following directions from the War Department, Headquarters Army Air Corps established the Army Airways Communications System (AACS) to operate all fixed Air Corps radio facilities which aided air traffic between Army flying fields located in the continental United States. Since the system would be operated under the direction and control of the Chief of the Air Corps, it was placed as a function of the Headquarters Army Air Corps Directorate of Communications, within the Training and Operations Division. The mission of AACS was to provide three basic services: communications from station to station along the airways and between ground stations and the man in the air; dissemination of weather data from points of observation throughout the system to every unit having need of this information; and contorl of air traffic through radio and other navigational aids. Maj Wallace G. Smith, the Air Corps Communications Officer, became the AACS Control Officer as an additional duty. What was thought of in the field as Headquarters AACS was actually a single manila folder in the third left-hand drawer of Major Smith's desk. By June 1939, when Major Smith gained Capt Thurston H. Baxter as an assistant to help with AACS, "Headquarters AACS" was housed in a four drawer steel file cabinet.

To operate this system, Major Smith divided the continental United States into three communications regions and a communications squadron was assigned to each region. One commissioned officer served both as regional control officer and as squadron commander. Capt (later Brig Gen) Russell A. Wilson controlled the First Communications Region, comprising stations in the Rocky Mountains and far west states. The Second Region, controlled initially by Ist Lt (later Maj Gen) Dudley D. Hale, and after a few months by Capt (later Maj Gen) Wendell W. Bowman, consisted of eastern and northeastern states. The Third Region, controlled by 1st Lt (later Col) Lloyd H. Watnee, included stations in the south and midwest states.

The fledgling AACS was beset with problems, chief of which was personnel. In 1938 and early 1939, AACS was authorized only three officers and 300 enlisted men to man 33 stations scattered across the continental United States. Despite the limited personnel, most of these stations were operating on a 24-hour, seven days a week schedule. AACS also found it difficult to find qualified people. It was almost impossible to attract technically qualified radio operators and technicians for a salary of only \$2l a month, especially when the men had to spend \$3 of their own



Receiving flight instructions from the tower, 1943.

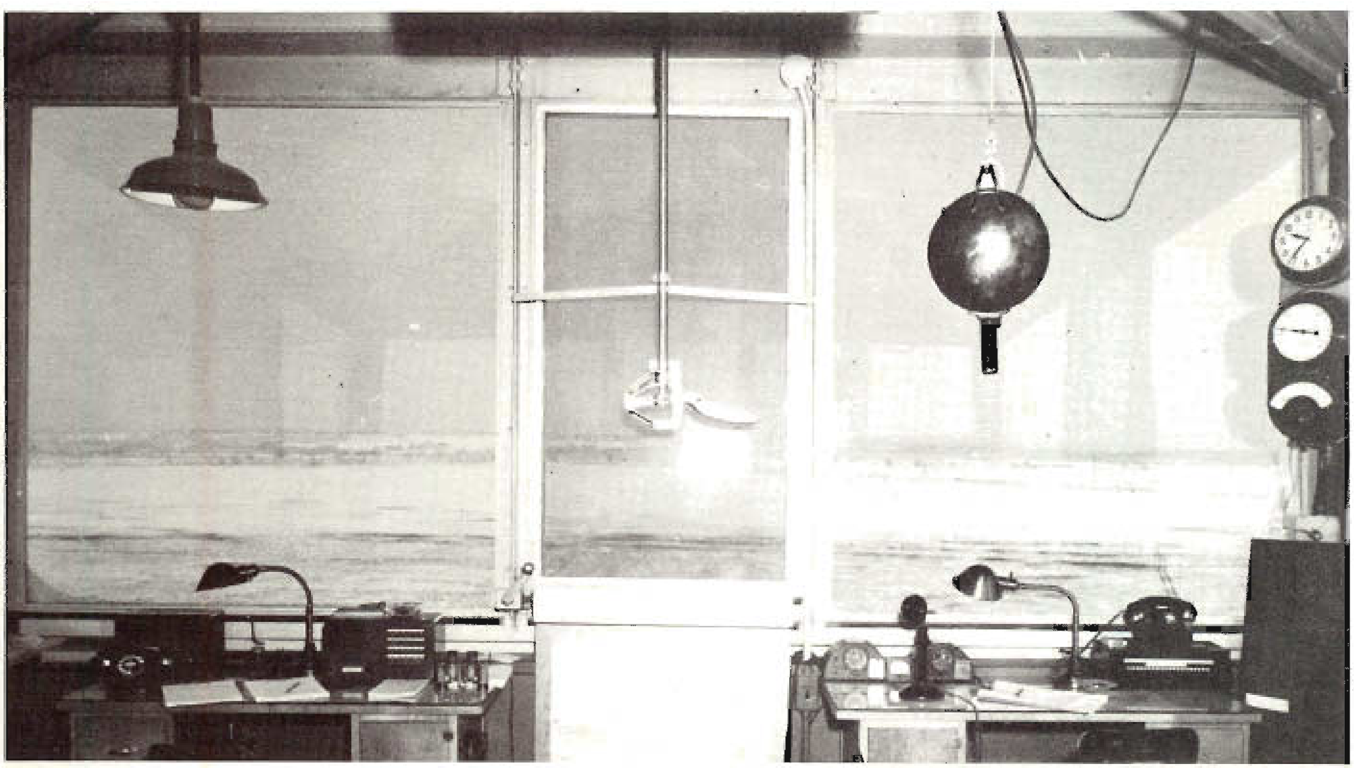


The "Beam" for a course to steer by.

money each month for the rental of a typewriter that the Army could not afford to buy. Radio maintenance men had to use their own cars and buy their own gasoline in order to travel from the station to the transmitter shack, usually several miles away.

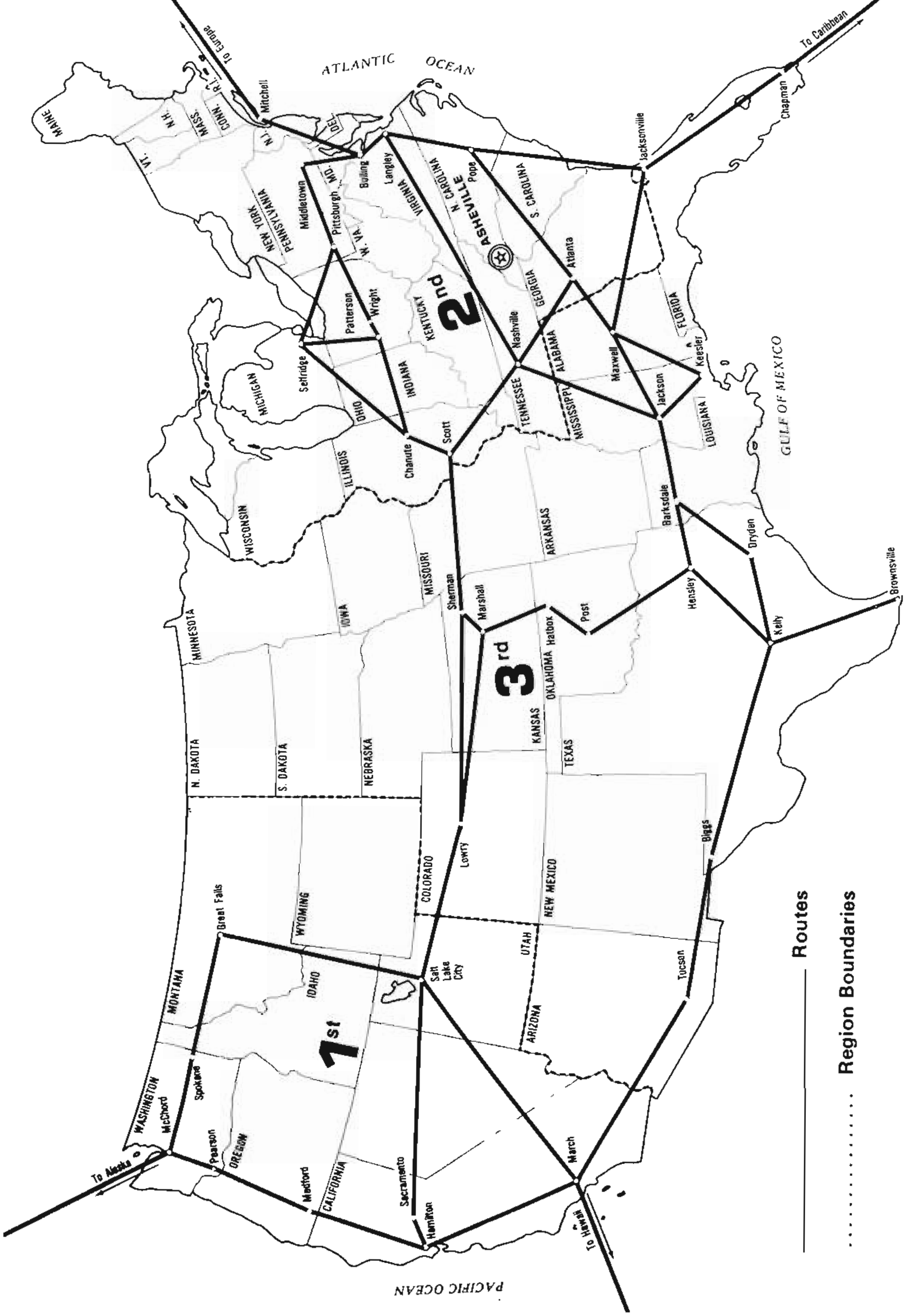
Amateur radio operators, popularly called "Hams" became the best source for recruits and during the early days of WW II they provided the technical expertise to command and operate a rapidly expanding AACS. But if they had the technical knowledge needed, they often lacked training as soldiers. So urgently were operators needed that there was not enough time to give them even the usual six weeks basic military training. When one base commander complained to Col Ivan Farman, who was then AACS Regional Control Officer, about this lack of training, Farman replied: "I can give you a G.I. or I can give you a communicator. I cannot give you both. Which do you want?" The commander chose the communicator.

Still, personnel was only part of the problem confronting AACS in 1938. By regulation, the Signal Corps was charged with procuring, developing, maintaining, and installing adequate equipment for AACS use. Equipment, however, was not plentiful at that time, nor was it fully suited to the demands of air communications. Moreover, there was a political problem. Congress looked suspiciously at what appeared to be a duplication of the civilian airways administered by the Civil Aeronautics Administration, the forerunner of today's Federal Aviation Administration. The fact that these civilian airways connected cities rather than military bases, that their operations were geared to peacetime passenger and cargo transport rather than to fighter, bomber, and combat cargo missions for defense was superficially brushed aside by economy-in-governments blocs. During the next two years, the system grew at a snail's pace. By early 1940 the enlisted strength had only risen to 424.



Interior of the control tower at Wright Field (now Wright-Patterson AFB), near Dayton, Ohio, in 1938.

THE ORIGINAL THREE AACS REGIONS
1938-1939



PRE-WAR EXPANSION

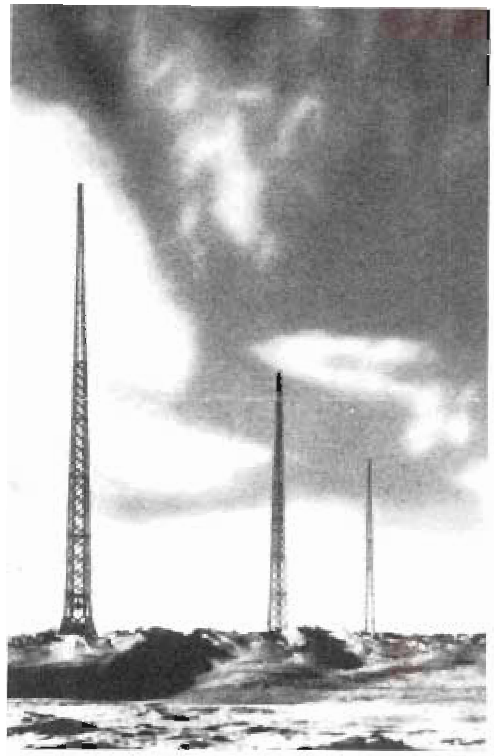
NORTH ATLANTIC THEATER

Not until 1941, as the United States daily moved closer to active warfare, did AACS really begin to expand. As new air bases were established for training purposes and for flyaway delivery of lend-lease aircraft, requirements for traffic control and communications grew rapidly. This in turn prompted the growth of AACS. AACS's first big assignment was the North Atlantic ferry routes to Britain. Communications and navigational aids were vitally needed if pilots were to ferry lend-lease aircraft along this route with any regularity. The primary route followed a path over Nova Scotia and Newfoundland and then directly over the cold and stormy Atlantic. Alternative routes added later extended far into the perpetual snows above the Arctic Circle. AACS established its first foreign station at Gander Lake, Newfoundland, in May 1941. Next AACS moved into Goose Bay, Labrador, then expanded on to Greenland, Iceland, and finally to the British Isles.

The establishment of these stations involved severe hardships. There was bitter cold with temperatures reaching as low as 50 degrees below zero, temperatures so cold that even the Eskimos refused to work. Violent winds ripped up antenna masts. Freak midwinter thaws washed away some stations. Men were lost. In the far north, adequate living quarters were often unavailable; some crews spent the winters in tents. To conserve the small supply of fuel available, no personal communications were permitted and all amusements were limited. Occasionally, fuel shortages forced the shutting down of all power except during transmitting period. This, of course, meant no electricity for lighting purposes. When equipment broke, the men often had to make the repair parts from whatever materials were at hand. Many stations used coke and beer bottles for insulators. The intense cold often damaged the equipment. Even at the best equipped stations in the far north it was a hard life—isolated, lonely, and cold. The men made furniture from packing crates and improvised cooking utensils. Trained medical personnel and cooks were unavailable and the men were forced to be their own doctors and chefs. The men received mail every two or three months if they were lucky and every six months if they were not. In some isolated locations, a ship with supplies could only get in once a year.

Despite these hardships, these AACS stations, under the direction of Maj Ivan Farman, provided essential weather information and airways communications so much in demand for safe and efficient ferrying of aircraft across the North Atlantic to Britain. Undoubtedly, AACS's performance contributed to the fact that 98.5 percent of the aircraft starting out on this run reached their destination. None of the transports were lost and in many cases the crews of combat ships forced down were rescued with AACS help. During the Bolero Project, the mass movement of aircraft to Britain between July and September 1942, AACS handled over 1,000 aircraft during each month.

The AACS weather station at Simiutak, Greenland, designated Bluie West 3, was established in late 1942. Both climate and terrain were equally inhospitable to the AACS men stationed at this site.



AACS radio operators guided planes across the North Atlantic to Europe using signals transmitted from these towering steel masts of an AACS radio range station.

Within storm-swept stations such as this one, AACS men helped establish an amazing safety record on the route to England.

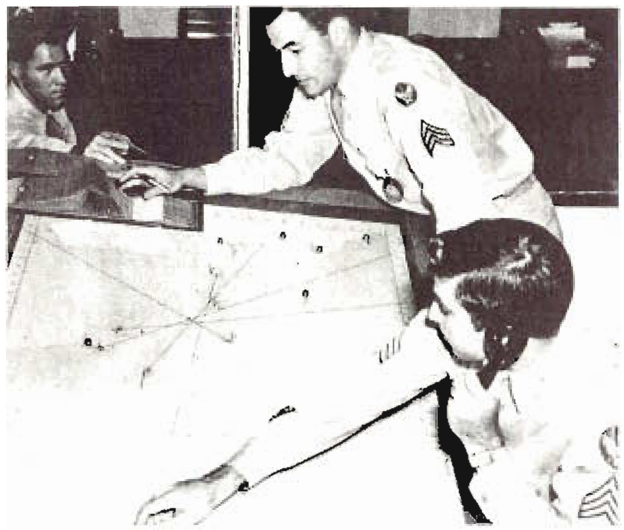
Receiver building at Goose Bay, Labrador, early 1940s

A radio receiver site somewhere on the North Atlantic ferry route.

CARIBBEAN THEATER

During 1941, even before America entered the war, AACS expanded into other regions. By August, something like a Caribbean net was shaping up when two independent AACS detachments formed earlier in the year in Panama and Puerto Rico were unified into a squadron—Air Corps Communications, Caribbean. During the same summer and fall, AACS also established radio stations on the islands of St. Lucia, Jamaica, and Antigua in the British West Indies, at Atkinson Field in British Guiana, on the island of Trinidad off the coast of South America and on St. Croix in the American Virgin Islands. Likewise an AACS detachment of 34 enlisted men, headed by a warrant officer and a borrowed officer, established four airways stations along the coast of Alaska. These stations located in the southern and northern hemispheres gave greater substance to our defensive posture in a time of growing crisis.

The control tower at Smyrna Army Field, Tennessee. This field was used as a processing and training center for AACS men.



Direction finder nets covered most of the earth's surface. These nets, upon request from pilots, obtained bearing from a continuous signal transmitted by the plane, determined the direction from which it was received, and filed results to central stations for plotting. The position fix was then radioed to the pilot. Each net covered approximately 1,000 square miles of territory. Air routes over oceans and desolate foreign regions were blanketed with this system. A position fix could be gotten in four or five minutes.

For all instructions and information regarding traffic and weather, the pilot communicated with the control tower by way of a radio.

Air traffic control, 1944.

PACIFIC THEATER

Nor did AACS neglect American possessions in the Pacific. Even before the creation of AACS, Lt Roger Williams had pioneered and Lt (Later Lt Gen) Gordon A. Blake had developed a small airways radio net for point-to-point communications between four air fields in the Hawaiian Islands. When the War Department created and Air Corps Detachment, Communications, for AACS in November 1940, Blake, by then a captain, became its commander. In the months preceding the attack on Pearl Harbor, Blake strengthened the Hawaiian air net and expanded it into the Pacific, establishing a two-man station on Wake Island and a one-man station on Midway Island. In an attempt to open an air route in the central Pacific, Blake served as communications officer on the first experimental flight from Hawaii to the Philippines. Between 5 and 12 September 1941, the flight of nine B-17 bombers literally picked their way over uncharted sea routes, making scheduled stops at Midway; Wake; Port Moresby, New Guinea; Darwin, Australia; and finally at Clark Field in the Philippines. Without adequate weather information and the benefit of customary navigational aids and control towers, the B-17s made their way across the Pacific, landing in grass fields, on hard packed dirt, rough coral, or any clear, flat space big enough to take off from again. The trip was a feat of the first magnitude and the War Department recognized it as such by awarding the Distinguished Flying Cross to every man who participated in the flight. Plans for further development of a trans-Pacific route were cut short by the attack on Pearl Harbor.

When Imperial Japanese Navy aircraft attacked Pearl Harbor on 7 December 1941, they struck without warning, in large numbers, and at great speed. They badly crippled the American Navy and devastated the air fields, neutralizing any possible retaliation. Everywhere in the Hawaiian net, AACS men worked expertly, under fire, to keep AACS on the air during the attack. Gordon Blake, by then a major, for example, working from the Hickam control tower, successfully landed a flight of 12 B-17 flying Fortresses arriving from California. One by one Blake brought the B-17's in, holding them out of enemy range and sneaking them in one at a time between waves of enemy aircraft. Around the control tower, havoc reigned. Planes burned on the ground; bullets ricocheted; nearly every building except the control tower had been hit at least once. Miraculously, no AACS people were killed during the attack even though the Japanese made repeated strafing runs against the control towers. For AACS, the bombing of Pearl Harbor meant that the airways communications facilities which had been planned as an aid to air navigation were now a necessity. Facilities would have to be installed in sufficient numbers to do the job, and they would have to be installed quickly.

Wheeler Field, Hawaii, the morning of 7 December 1941. Some 90 aircraft were destroyed by the Japanese attack. Here, smoke billows up from the Wheeler hangar line.

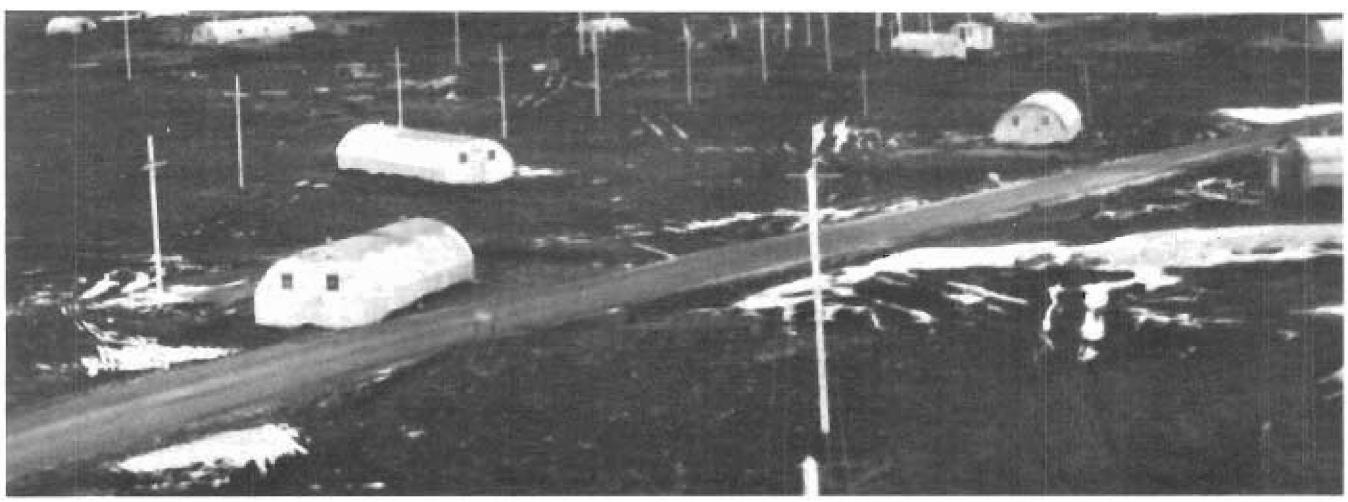
"Talking them in" from an AACS control tower, 1944.

Air traffic control training, 1944.

WARTIME EXPANSION

ALASKAN THEATER

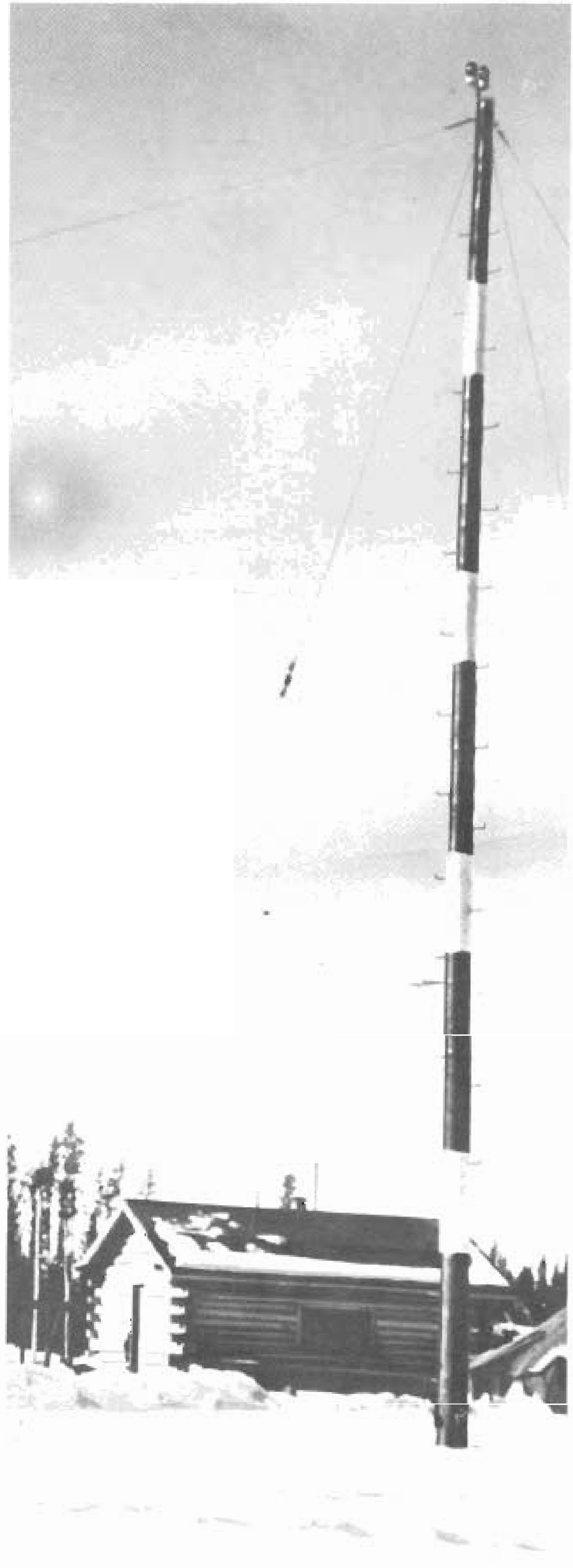
The outbreak of war in December 1941 prompted a flurry of feverish activity as AACS expanded its airway communications to meet wartime requirements. At the tip of the Alaskan peninsula, pointing toward Dutch Harbor, was Cold Bay. There, in March 1942, AACS secretly set up a hidden airways station under the cover of the Blair Packing Company who ostensibly continued to pack fish. At the same time, over on the first Aleutian island of Unmak, another AACS detachment moved in with Saxton and Company, Canners. On 2 June, two Japanese aircraft carriers were sighted less than 400 miles from Alaska. From the secret Army Air Force bases at Cold Bay and Unmak, B-26 and B-17 bombers took off, catching the Japanese completely by surprise. Meeting such stiff resistance in their attack on Dutch Harbor, the enemy withdrew and occupied instead two other Aleutian islands, Kiska, and Attu. Following the battle at Dutch Harbor, AACS established a ferry route through Alaska to the Soviet Union to send aircraft promised to the Russians by the Lend Lease Program.



Fort Glen on the Aleutian island of Umnak was the AACS headquarters of the Aleutian Sector of its 11th AACS Region. Pictured here is the Fort Glen loop range.

AACS facilities on the Aleutian island of Adak left something to be desired. Army Air Forces ground personnel, including AACS men, landed on this island on 30 August 1942, just ahead of the invading Japanese. This was a critical island. If it had fallen to the Japanese, U.S. continental bases would have been within their air range. In U.S. hands, we could begin a counteroffensive from Adak against Attu and Kiska. Within 12 days an airstrip was built, and by mid-September, planes were taking off.

Living and working conditions in Alaska required stamina. Pictured here is one of the AACS's Alaskan operating sites and living quarters.



A high frequency antenna system at one of AACS's Alaskan operating sites.

SOUTH ATLANTIC THEATER

The South Atlantic communications line also assumed critical significance, providing aid in the defense of the Canal Zone and the anti-submarine campaign. The Caribbean soon became a crossroads of communications airways. During the early part of 1942, AACS supplemented existing stations in the Caribbean and the Canal Zone with additional stations in Mexico, Guatemala, Costa Rica, Nicaragua, Panama, Peru, and the Galapagos Islands. From the latter base, aircraft could fly the AACS radio beam out into the Pacific as far as 600 miles and detect the approach of any Japanese aircraft. To counter the serious threat of German submarines which were sinking U.S. ships in full view of the Florida coast, the War Department instructed all Army and Navy planes, as well as surface craft, to alert AACS as soon as a submarine was sighted. AACS would then signal the enemy's position to all air patrols. To aid this enterprise, AACS established stations in Dutch Guiana, British Guiana, and Brazil. From there AACS moved into the South Atlantic, establishing an airways station on lonely Ascension Island, located half way between South America and Africa.

Flight control tower and nose hangar, Atkinson Field, British Guiana.

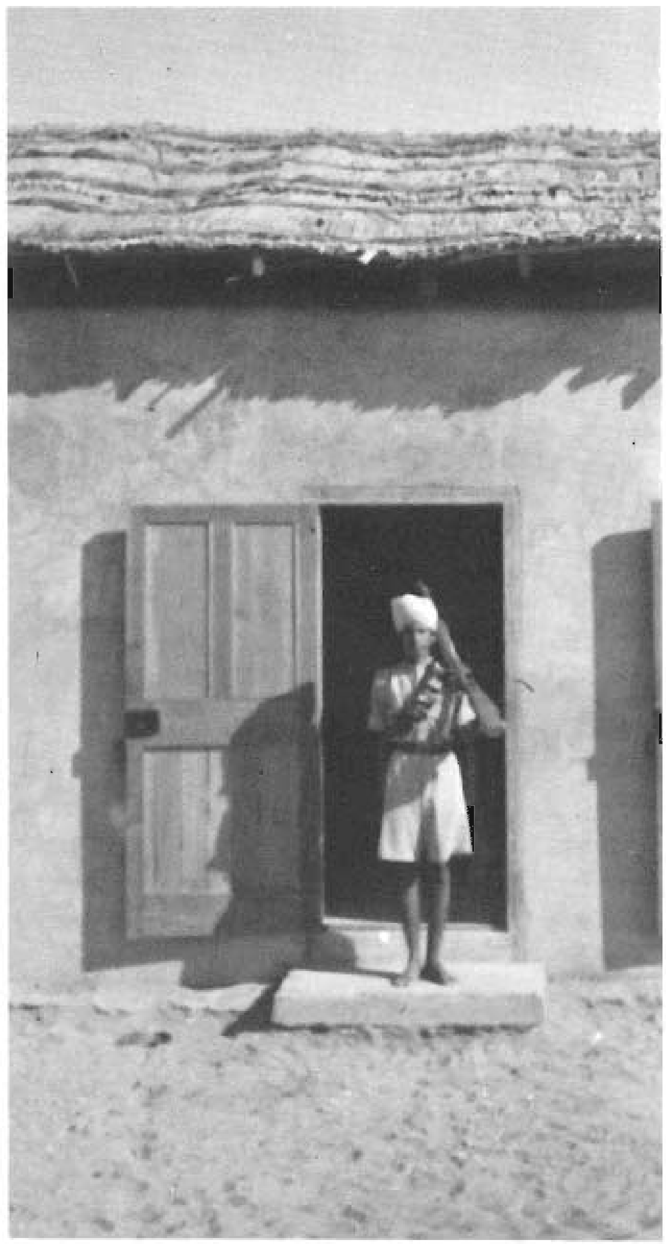
The AACS site on Wideawake Field, Ascension Island, half way between South America and Africa, May 1943.

AFRICAN THEATER

The next step was to Africa. In April 1942, Headquarters Army Air Force decided to establish a ferry and supply route across the middle of Africa to link America, Africa, India, and the Middle East. Pan American Airways, under contract with the U.S. Army, already operated an air service across Africa which joined the British Overseas Airways in Arabia and India. The approach of the North African invasion by the Allies, however, required absolute military secrecy and it became necessary for AACS to take over the Pan American Airways stations and establish additional stations across Africa. Colonel Watnee, then Control Officer of AACS, selected Lt Col Wendell Bowman to be the architect for this system. Bowman in turn selected Maj (later Brig Gen) Haskell E. Neal to be commander of the new 13th AACS Region and Squadron in Africa. Under his direction, the men of the 13th built radio stations across the heart of Africa, north of the Equator, from Roberts Field in Liberia to Khartoum in Sudan and ultimately to both Cairo, Egypt, and Aden on the Arabian peninsula. Between July and August 1942, in mountains, in dense tropical jungles, and in hot desert sands, AACS personnel built their stations with equipment flown in by plane and from improvised materials at hand—mahogany, mud, tin, and bamboo poles. One station even cannibalized an alarm clock for spare parts and at one desert station, a radio shack was made from camel dung cemented with straw. Planes, ox carts, camels, elephants, and natives were employed to transport supplies to these remote locations.

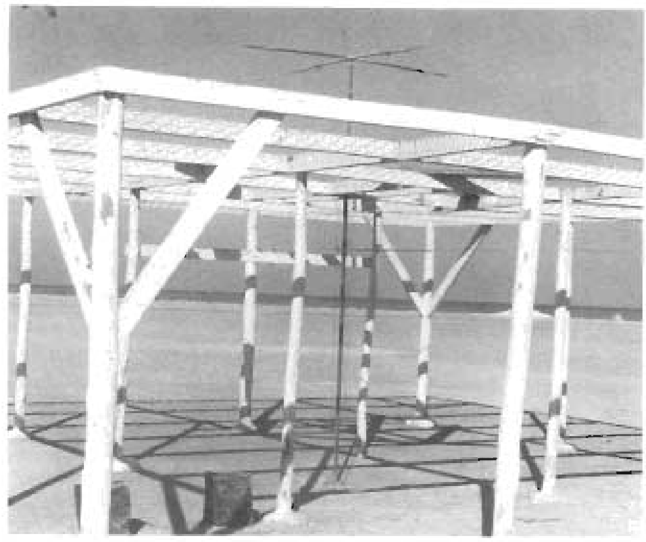
During the summer and fall of 1942, the war did not go well for the Allies in North Africa. The German Gen Erwin Rommel, the Desert Fox, and his Afrika Korps seriously threatened the Suez Canal, Cairo, and the existing AACS airways system across Africa. In late September, at El Alamein, the forces of British Gen Bernard Montgomery were backed up against their last defense position before Suez. Colonel Bowman prepared for the worst by establishing an alternate route across Africa, south of the Equator, but paralleling the one created by the 13th Squadron. In only eight days Neal and four of his men established stations at Pointe Noire, French Equatorial Africa; Leopoldville and Elizabethville, Belgian Congo; and Nairobi, Kenya; to create the alternate route. Once operational, this route was turned over to the newly created 14th AACS Region and Squadron commanded by Maj Glover B. Brock.

The British position at El Alamein was desperate. They needed antitank shells to stop Rommel's Mark IV tanks, they needed them in large quantities, and they needed them in a hurry. Between the assembly lines and Montgomery's forces lay thousands of miles of submarine-infested ocean, and if the cargo ships could successfully get through, it would take six to eight weeks. It was doubtful whether Montgomery could hold out that long. Fortunately, in the weeks before the battle, the AACS men of the 13th Squadron established a radio station in Cairo which meant that the AACS highway in the sky now reached from the United States to the battle front at El Alamein. The decision was quickly made to move the vital antitank shells over the AACS skyway rather than by the slow and perilous sea route. Planes of the Air Transport Command (in numbers that approached the Bolero movement over the North Atlantic) immediately began ferrying the shells to Egypt.



A native guard stands watch over an AACS code room in Arabia.

On 23 October 1942, Montgomery's forces attacked Rommel's Afrika Korps and forced them to retreat, thanks in part to the AACS airways. Two weeks later, on 8 November, the United States forces, under General Dwight D. Eisenhower, invaded French North Africa thus catching the Germans in a pincer move. Again AACS provided assistance. The 18th and 19th AACS Squadrons were activated to keep pace with the advancing American and British forces. Colonel Bowman shifted men and equipment from the 13th and 14th Regions to operate airways communications in Morocco, Algeria, Tunisia, Libya, and French West Africa. On 12 May 1943, when all enemy resistance on the African continent ceased, AACS had been in Africa 11 months and during that time had established a network in the skys so effective that it revolutionized the entire science of logistics. The AACS men had linked the East to the West, had made possible the transporting of antitank shells by air to Montgomery, and had provided vital support to the forces who drove the Germans and Italians out of Africa.



A radio antenna of the 2d AACS Wing at an airbase at Bahrain, Muharraq Island, in the Persian Gulf.

2d AACS Wing control tower and radio receiving station at Teheran, Iran.

Members of the 2d AACS Wing at the radio receiving station at an air base at Bahrain, Muharraq Island, in the Persian Gulf.

Interior of the radio receiving station at Teheran, Iran.

Having accomplished this, the Allies entered Europe through Italy, invading Sicily in early July 1943 and the Italian peninsula two months later. With the invading armies went AACS. The 18th AACS Squadron sent its first detachment into Sicily on 4 August and by 6 September it had two stations in operation at Palermo and Catania. In early October, a detachment set up a station at Capodochino, the first AACS station on the Italian peninsula. By November, when winter weather slowed the Allied advance, men of the 18th AACS Squadron were busily crisscrossing southern Italy with its radio nets. As the focus of combat operations moved up the Italian boot, the 19th Squadron, in March 1944, was divided into the European and African sectors, each of which received a separate AACS group in the reorganization that followed in May. The European sector became the 58th AACS Group and a new squadron was established to operate from headquarters in Rome.

Even while the Italian end of the Axis' coalition was collapsing, preparations were underway in the United Kingdom for the main assualt. The first AACS detachment in the United Kingdom—two officers and nine enlisted men—reached Prestwick, Scotland, on 1 July 1942, to assist in the movement of the Eighth Air Force across the North Atlantic. They had come to Scotland on detached service from units stationed along the North Atlantic route. As their numbers grew, they were assigned in April 1943 to the newly activated 24th AACS Squadron and Region commanded by Lt Col Kenneth W. Klise. In May 1944, as a part of the overall AACS reorganization, the 24th Region became the 64th Group. Although the chief responsibility of the 64th Group was to monitor and guide Army Air Forces traffic along the transatlantic airways, it found another outlet for its energies in planning for the invasion of Normandy. AACS readily accepted the Bradley Plan in the fall of 1943 which required AACS to organize, equip, and train mobile communications units that would move onto the beachheads with the first wave of the ground forces. By means of these mobile units, the Allies' air forces were to fly against enemy targets, supplies would be directed to where they were most needed, and they would assist in the medical evacuation of the wounded. As the invasion advanced, permanent stations would be installed in the rear to keep the airways open to the front lines.

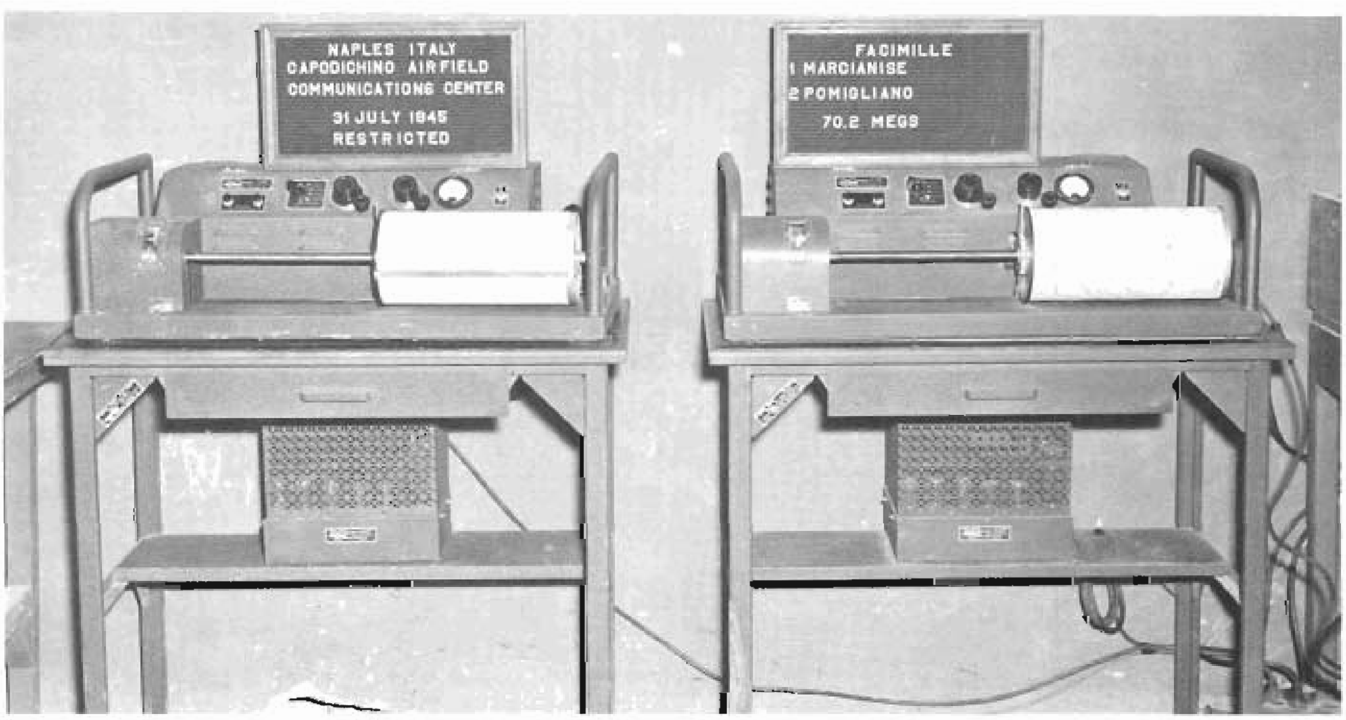
To meet anticipated demands on the European continent, AACS formed the 65th AACS Group, commanded by Lt Col Klise with it headquarters near London, and the 133rd AACS Squadron with eight detachments to operate the mobile units. These detachments and the stations for which they would ultimately be responsible on the continent were lettered from A to H since it was not known precisely in what town or at what point they would operate. Stations A through F were designated mobile, but stations G and H were to be airborne. Ultimately, the detachments were numbered through S. Methodically, the men prepared for the invasion. In the final days before the invasion, they held full dress rehearsals. The men put their stations together under simulated fire and water conditions, practicing until each man could do his job blindfolded.

American troops hit the Normandy beaches on 6 June 1944, and close behind the shock troops came the AACS men. The two airborne units arrived first. Detachment G reached Normandy, near the Saint

Great Britain—in AACS policy—began as a satellite of Iceland, which had begun as a satellite of Greenland and Canada, which had begun as a satellite of the domestic regions. Two AACS lieutenants and nine enlisted men arrived at Prestwick, Scotland, on detached service on 1 July 1942, to become the first AACS contingent in Great Britain. Their first headquarters is shown in the photograph on the left. By the spring of 1943, the detachment had grown into the 24th AACS Region with its headquarters housed in the building on the right. In April 1943, the headquarters moved to London.

An airborne detachment of the 133d AACS Squadron landed in Normandy on 12 June 1944, six days after D-Day. The above two photographs were taken at Carentan, France, on 18 June 1944.

Laurent strip, on 12 June and Detachment H arrived the next day. Other detachments followed, especially after the breakout at Saint Lo in July. Detachment I, for example, reached Colleville on 18 July. The men set up their pup tents on the beaches, dug fox holes, and unloaded their supplies. That very night they were greeted by intense enemy action which prompted the unit historian to quip: "Each made a mental note to see his CO about a transfer somewhere where people were not so careless about hurting others." Their first task was to erect a control tower. Lacking materials, they spread out over Omaha beachhead bringing back whatever they could find. Using a glider fuselage, a pilot's seat, and a glider nose, they built the first allied control tower in the northern half of the continent. During the months of June, July, and August, AACS's mobile detachments raced into air strips snatched from the unwilling enemy only hours before. When General Patton broke loose across the width of France, the AACS detachments chased after him. The men of AACS were consistently the first Air Force personnel to appear in newly conquered territory. By September 1944, AACS was in Paris using the Eiffel Tower as an antenna. By the spring of 1945, AACS had 25 stations operating in Belgium and France.



Facsimile transmission was first used in AACS in 1943 to relay weather maps. This system worked over ordinary telephone lines. Using 96 lines to the inch, it took 20 minutes to transmit a standard map covering the approximate area of the continental United States. The machines shown here were employed at Capodichino Airfield, Naples, Italy.

On 4 April, AACS men of Detachment 305 crossed the German border to set up the first AACS station on German soil at Strasfeld, southwest of Bonn. Other stations soon followed. One detachment, ordered to set up an airways station on a German landing strip, complied without being aware that Patton's army had not yet taken it. Calmly, their work completed, the men turned in for the night only to find themselves the next morning surrounded by German tanks and supply trucks. Without hesitation, the AACS men boarded their own vehicles and raced past the startled German drivers before they could react. Three miles down the road, the AACS men came upon Patton's advance patrols, who showed no less amazement. Said one, "Bud, ain't you a little premature?" The AACS men agreed and adjusted their operations thereafter to following, instead of preceding Patton's army.

Typical quarters of the 24th AACS Region, London, 1943.

AACS air traffic control men, working from a foxhole on a Ninth Air Force airstrip somewhere on the Normandy peninsula, signal with their "bisquit gun" to a pilot about to take off, June 1944.

This landline teletype equipment was used at the communications center of Capodichino Airfield, Naples, Italy.

All through April and into May the tempo accelerated constantly, and by the end of the first week of May, the war in Europe was over. Through all the weaving and reweaving dictated by the shifts in battle fortune, AACS had succeeded in building a vast airways network throughout Europe. This network was marked by a system of radio ranges strategically located to provide interlocking beams which were reinforced with radar and radio navigational aids such as direction finding for lost planes and ground controlled approach and instrument landing approach for bad weather landings. Supporting these navigational aids was a growing system of point-to-point communications along the airways. With so many aircraft moving overhead, the risk of collision in midair increased alarmingly. Consequently, in the spring of 1945, the 5th AACS wing assumed full responsibility for air traffic control in Europe, including such neutral countries as Sweden and Spain. With full cooperation from the other allies, AACS developed a system comparable to that in the United States. The 5th Wing established centers in Paris and London with additional subcenters at Brussels and Marseilles. AACS also established a central clearing house for weather information at Orly, just outside Paris, which disseminated approximately 20 million word-groups of weather information each month.

Carefully camouflaged, this mobile control tower directs incoming and outgoing traffic at Hebert, in Normandy. A sod emergency landing strip was completed at Hebert by 2115 on D-Day, 6 June 1944. St. Laurent-sur-Mer became the first operational American field in France.

A remote receiver site at Eleusis Field, Athens, Greece, 1945. The equipment in the tent is two PE-1278 power units.

This was the first AACS station built on Tontouta, New Caledonia, in the early days of April 1942.

Point-to-point communications from one station to another was an important part of AACS's job. Sometimes messages were sent by Morse code over radio (known as continous wave), teletype, or by radioteletype. A variety of messages could be transmitted by point-to-point communications, but the primary uses were to relay information on the movement of aircraft or weather conditions. These AACS men in Berlin are receiving continous wave (CW) transmission.

PACIFIC/CHINA/BURMA THEATERS

With the war in Europe over, AACS turned its full attention to winning the war in the Pacific. After Pearl Harbor, there was little left of the ambitious peace plans for a Pacific airways. Wake, Guam, and the Philippines fell to the Japanese and the Pacific possessions of our allies were rapidly overrun. It became imperative for the United States to have a safe airways route between Hawaii and Australia, the one large land mass left to the Allies in all of the vast Pacific. This task fell to AACS. Between January and September 1942, Col Gordon Blake, Regional Control Officer of the 7th AACS Region, with only 50 men and virtually no equipment, established the needed route. Almost under the very noses of the Japanese, the AACS men set up stations on the islands of Christmas, Canton, Nandi in Fiji, and Tontouta in New Caledonia, with a final station at Amberley Field near Brisbane, Australia. In September 1942, AACS activated the 5th AACS Region for Australia, so designated because the American Fifth Air Force operated from there. After 1942, AACS was forced repeatedly to adjust its organization in the Pacific to the demands of several advancing battlefronts. In January 1943, the Pacific Airways Communications Area was activated at Hickam Field for control of the 5th and 7th Regions. A year later, in May 1944, this area became the 7th AACS Wing with jurisdiction over the 5th, 7th, and 20th Squadrons which were in their turn redesignated the 68th, 70th, and 71st AACS Groups.

While Blake built his airways route between Hawaii and Australia, the 10th AACS Squadron worked to link the African and Middle East air routes to India and China. The Allies planned a great pincers movement for their offensive against the Japanese with one claw coming up from Australia and the other closing across China. The situation in the China-Burma-India theater was very grave in the spring of 1942. All of French Indo-China, Thailand, and Malaya plus nearly all of Burma had fallen to the Japanese. China was reeling under the concerted blows of the enemy and India was threatened. To hold on, the Allies needed supplies in a hurry and could not wait the three months it would take ships to reach Karachi, India, the closest safe port to endangered China. Even then the ships would have to elude the German and Japanese submarines which were exacting a high toll. As at El Alamein, the alternative was an air route and the 10th AACS Squadron, under the leadership of Maj Walter B. Berg, was given the job. The most formidable part of the task was providing communications along the famed "Hump" formed by the Himalayas, the highest mountains in the world and a natural barrier between India and China. Despite continual harassment by the Japanese and woeful shortages of men and materials, the 10th Squadron established stations at both ends of the Hump route. A new unit, the 25th AACS Squadron, was given responsibility for the Hump itself. Later these two squadrons were placed under the

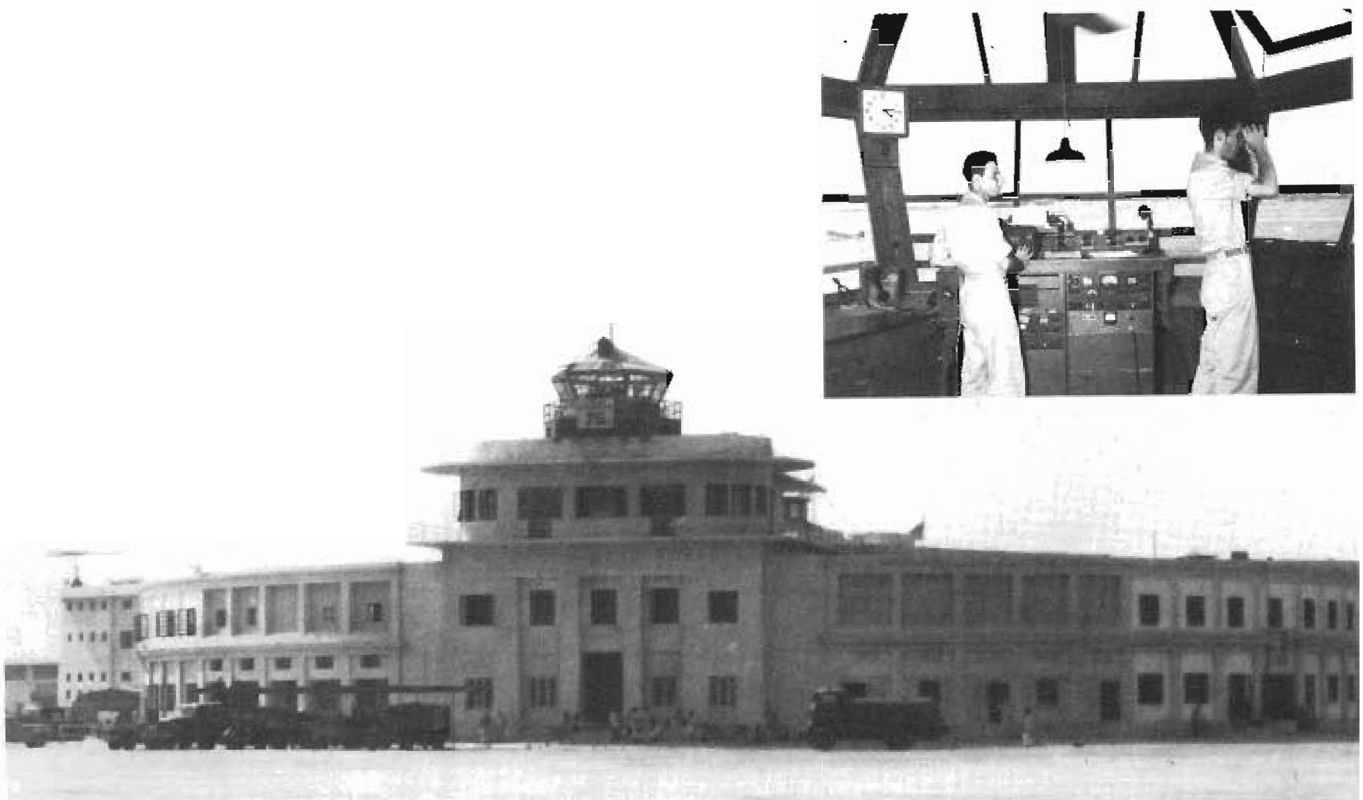
The entrance to the AACS receiver dugout on Tontouta, New Caledonia. The dugout was built in early April 1942.

Only Tarzans need apply for duty in this Indian operations tower. The ladder sways a foot in each direction during the well camouflaged climb to the trap door.

4th AACS Wing. Once completed, this route allowed the Air Transport Command to ferry large quantities of vital supplies to China. Flying the Hump was still difficult, but it was made easier and safer by the vigilance of the men of AACS who monitored the airways around the clock and under enemy fire.

AACS's responsibilities in the China-Burma-India theater were not limited to maintaining the supply trail across the Hump. Under Col Albert J. Mandelbaum, who replaced Major Berg, the 4th AACS Wing assumed a tactical mission as well. From the start, he made it clear that the 4th Wing would serve not only the Air Transport Command, but Combat Cargo, the 10th and 14th Air Forces, and American and British ground forces as well. In fact, he established stations at Hengyang and Kweilin, China, exclusively for combat use by the Flying Tigers against Japanese shipping in the China Sea. When the Japanese overran these stations in 1943, the AACS men were the last to evacuate. They stayed on, clearing all aircraft from the field but one. Then they destroyed all radio equipment and ciphering devices before embarking on the remaining plane. Gradually, through 1944 and into 1945, the Allies forced the Japanese back and in record time, the AACS men had planes flying safely in and out of the landing strips wrested from the enemy only a few hours before. While AACS played a major part in the successful employment of the pincer

Operations office and control tower at Jorhat, India.



During World War II, Karachi, India (now part of Pakistan), was the major port, both by sea and by air, into the China-Burma-India theater. From here, men and materiel could move across India to reach embattled Burma and China. AACS personnel first reached Karachi in the fall of 1942. Pictured here is the administration building and control tower at Karachi. The inset is the interior of the control tower.

Original 20th AACS Region HQ and transmitter dugout on Tontouta, New Caledonia, built in the summer of 1942. This station was part of the attempt to connect Hawaii and Australia in the early days of the war.

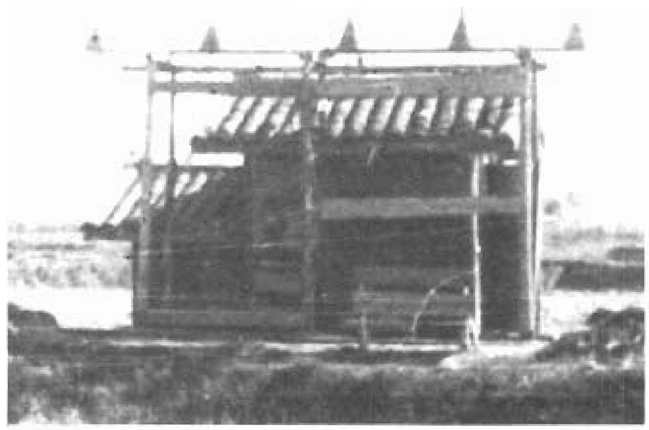
strategy in this theater, their counterparts in the Pacific theater were also making strides forward.

Nowhere were arrangements for communications more complex than in the Pacific. An early need for hard-pressed Army and Navy units to pool their resources in the face of threatened disaster set a pattern that was perpetuated by the complexity of command arrangements in the Pacific area. Because the South Pacific was a Navy theater, all communications personnel and equipment on each island were pooled to form a single signal center that served air, ground, and naval units. The system of communications used in the Southwest Pacific, on the other hand, was under Army control where each headquarters had its own signal center, connected laterally to adjacent headquarters and vertically to higher and lower echelons in the chain of command.

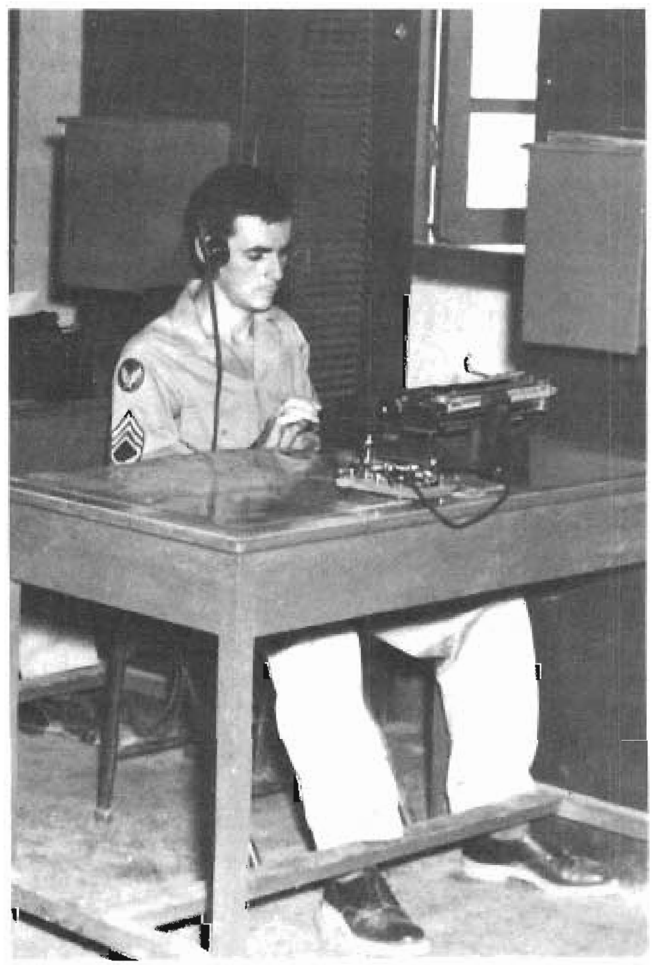
Assignment of communications duties in the Southwest Pacific varied with time and circumstances. Initial responsibility for air communications was at first vested in the tactical units, with AACS becoming responsible for control towers and most other navigational aids only after installation of more or less permanent facilities. In 1943 this policy was changed to assign such responsibilities to AACS immediately upon the capture or completion of an airstrip. For that reason, AACS mobile control tower teams were formed to serve with tactical forces. In some cases they were not far behind the assault troops who hit the beach or spearheaded an advance.

Many hardships confronted AACS men in the Pacific campaign. AACS detachments were generally short of people and the men compensated by working 12 and 16 hour days. Unfortunately, operators could work their best only six hours a day for five days a week if the flow of messages was heavy. Some detachments were stationed in extremely isolated places where they had to be self-sufficient and the men doubled as cooks or carpenters and did whatever there was to be done. This strain was magnified by nature. The lush tropical jungles were natural habitats for a variety of snakes and insects. Malaria and other tropical diseases constantly harassed the men. At one time, for example, 85 percent of the AACS detachment at Gusap were sick with tropical fevers. Add to this the strain of air raids and counter attacks on the ground and it is not surprising that many men became psychiatric cases when pushed beyond their endurance.

Equipment and personnel shortages were only aggravated by the weather. AACS units generally had to make the best of inferior sites and housing because they had to get on the air as soon as possible and were not prepared to do engineering work. It was not uncommon for radio operators to stand ankle deep in mud while sending important operational messages or for rain water to seep through cracks in the roof and drip on communications equipment and message



SCS-51 instrument landing system of the 130th AACS Squadron of the 4th AACS Wing at Kwaghan, China, November 1944.



Point-to-point communications sometimes required relatively simple equipment. This facility was in Karachi, India.

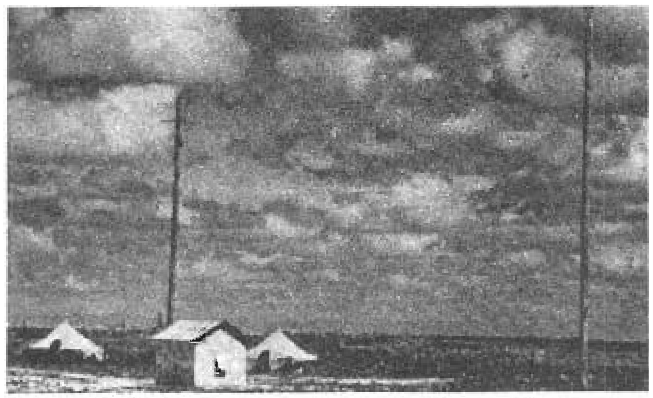
To primitive places, AACS brought modern airways communications, 1944.

AACS message center at Chengtu, China, 1943.

paper. Such primitive conditions improved with the arrival of additional people and the erection of better buildings at the more important stations. In out of the way places, however, the period of rugged pioneering continued almost to the end of the war. Communications equipment, not built for the rigors of the tropics, broke down at an alarming rate as fungus coated delicate instruments and salt water rusted metal surfaces. As in other theaters of the war, scrounging, improvising, and bartering allowed AACS stations to remain on the air. More than one unit learned that critical equipment might be secured more readily through the judicious use of a bottle of liquor than through official requisitions. Many a poker game in the wee hours of the morning settled the difference between a fair and super AACS station.

The 130th AACS Squadron, part of the 1st AACS Tactical Group (later redesignated the 69th AACS Group, 4th AACS Wing), had a tactical station at Hsingching, a town in northwestern China.

Heavy jungle had to be cleared and sites leveled before this tower in Burma could be built and before any airstrip could function efficiently. The tower belonged to the 4th AACS Wing.



When AACS began assisting large numbers of naval aircraft, a joint Army-Navy Facility Chart was devised to take care of their needs. This was known as JACSPAC (Joint Airways Communications System Pacific Ocean Areas). This is the installation on Christmas Island.

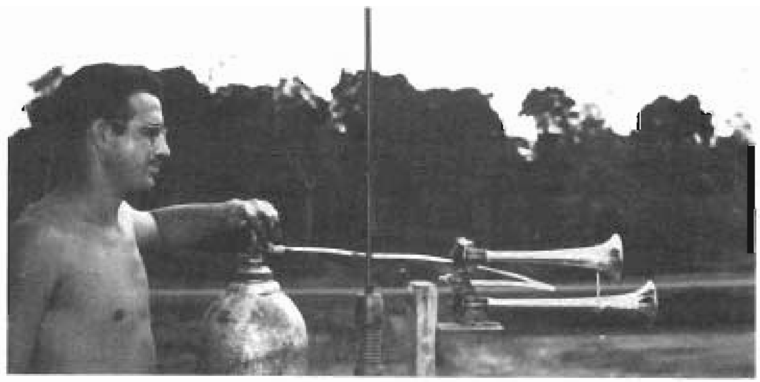
This was the communications shack at Kunming, China. The building was at least protection from the monsoons. Its scars attest to the beating it took from the repeated Japanese attacks.

In all theaters of World War II, AACS men often had to improvise. Shortages were a fact of life and the AACS men proved the adage that necessity is the mother of invention.

"No Nothin'": Espiritu Santo, New Hebrides, 1944.

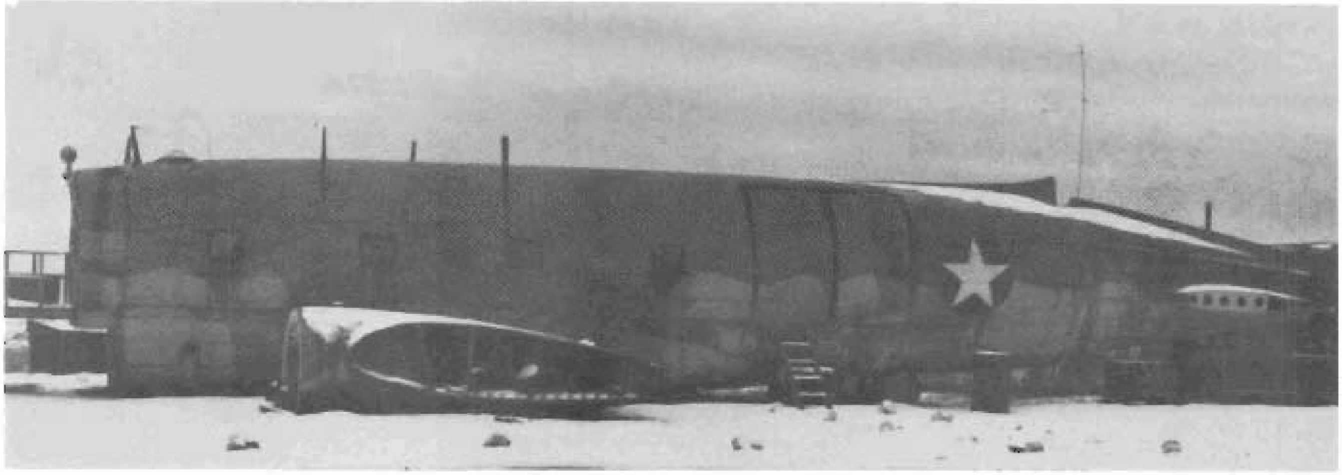
Wash day at Carney Field on Guadalcanal using a homemade washing machine.

An AACS member improvises by using a blowtorch to cook his meal.



The control tower at Carney Field on Guadalcanal used sirens made from the horns of a Japanese auto.

This swirling stream in Burma served as a swimming hole and wash basin for an AACS detachment. The Japanese had used it before them.



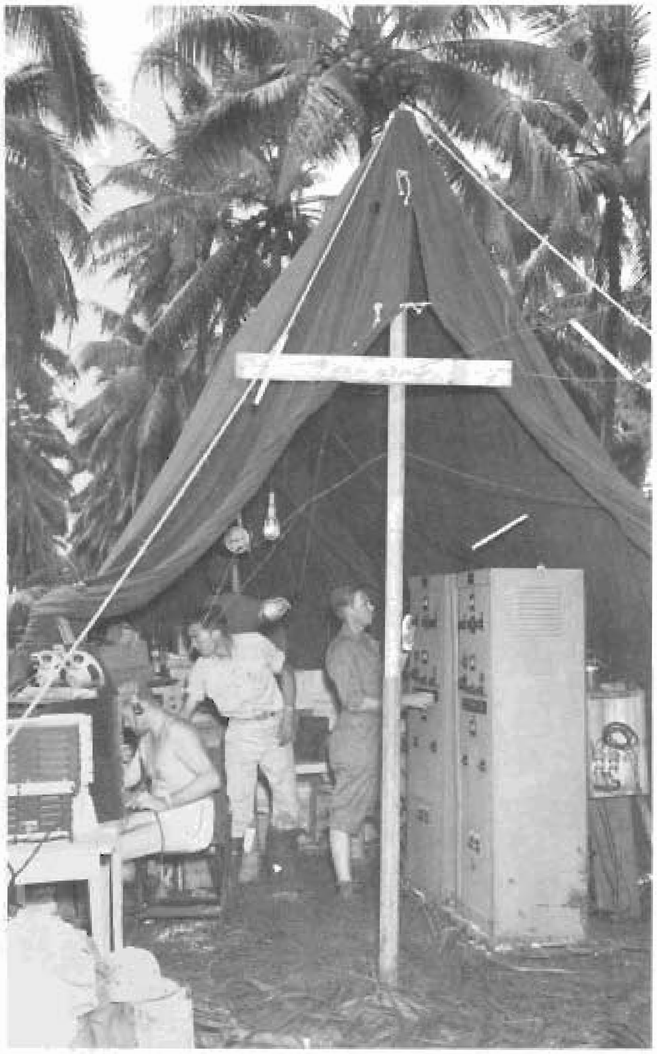
Radio installations located in the fuselage of a C-46 at Kunming Army Air Base, China, 11 February 1945.

Temporary tower on completed Bolo Strip, Okinawa, part of the 148th Army Airways Communication System.

Interior shot of the radio installations in the C-46 fuselage.Equipment includes command transmitters and receivers and a BC-348 high frequency receiver.

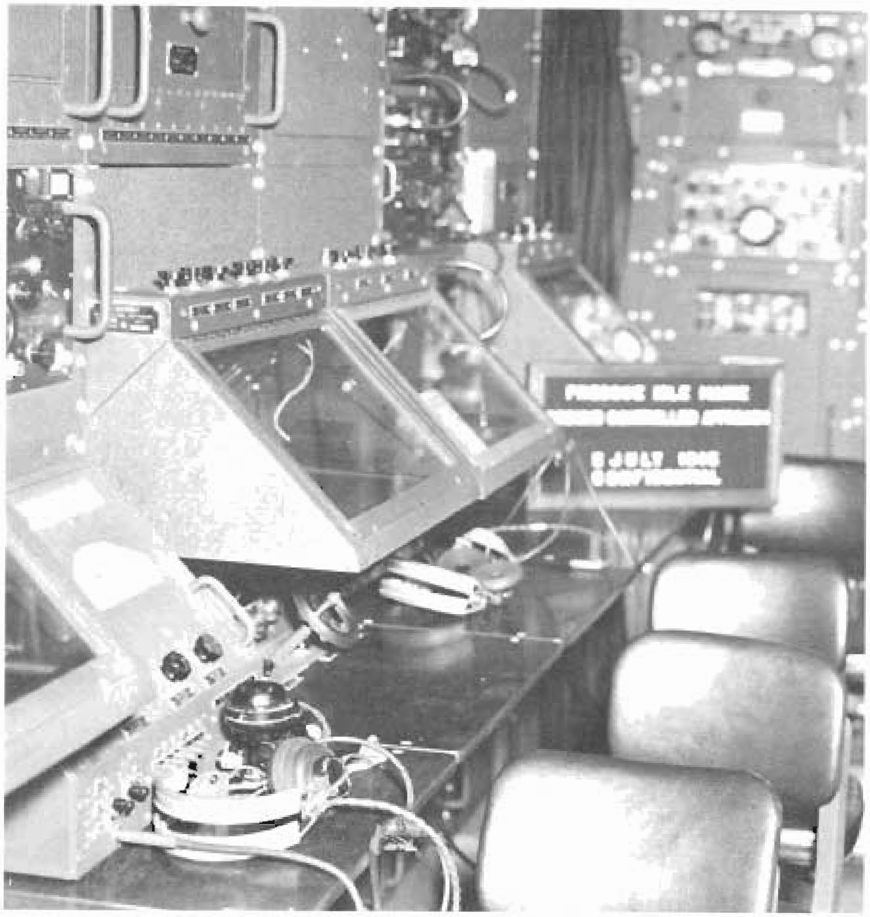
Cryptographers coded and decoded all communications to guard in every way possible against enemy intelligence. The Karachi, India, crypto facility is pictured here.

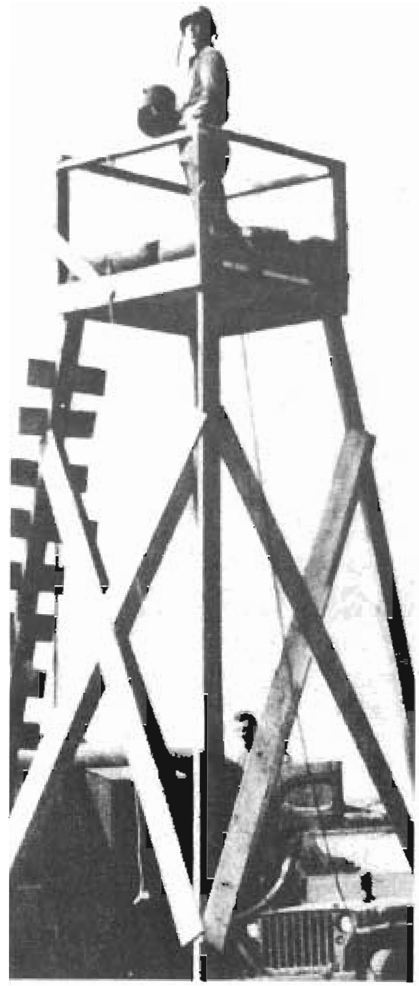
Nansin was a Japanese airfield in Burma wrested from the enemy by British forces in late 1944. Within hours of Nansin's capture one of AACS's tactical teams moved into the airfield to make it serviceable for allied pilots.



Despite ankle-deep mud, the radio station on Mission Island, in the Green Island Group, is in operation. The transmitting and receiving equipment has been set up; the generators have been started, and the first powerful signal has been sent out, March 1944.

Pictured here is one of AACS's mobile range stations used to broadcast radio beams, which served as highways in the air for Army Air Force planes. These stations enabled the armadas of Boeing B-29 bombers striking Japan to return to bases on pinpoint islands in the vast Pacific in instrument weather.





Ground control approach radar was probably the most significant navigational development during World War II. This new system, first employed by AACS in England in the spring of 1944, enabled aircraft flying in extremely bad weather to land safely. An approaching aircraft could be sighted via radar through the heaviest fog when it was within a radius of 30 miles from the airfield. The aircraft could then be guided in by means of instructions from the control tower via radiotelephone. These two photographs display the exterior and interior of a ground control approach installation.

The first control tower at Iwo Jima was built by SeaBees under enemy shelling.

In some cases, AACS relied on prefabricated control towers to shorten the time required by a detachment to become operational. Such a tower could be shipped by air and could be erected in 100 man-hours. These photographs show the tower ready for shipment and after being assembled.

Not a campaign can be named in which AACS did not play an important part. Munda, Saipan, Guam, Leyte, Luzon, Bougainville, Iwo Jima, and Okinawa all found their way into the history of AACS's Pacific units. As the Americans and Australians pushed the Japanese back along the coast of New Guinea, up the island chain of the Solomons and out of the Gilberts and Marshall Islands, the men of AACS went in with the first wave, sometimes as soon as a beachhead had been gained. Across beach after beach, or in one of the first planes to land on hastily prepared or repaired airstrips, advanced AACS detachments followed on the heels of assaulting forces to establish emergency facilities that would be improved as increased personnel, equipment, and circumstances allowed. In the Central Pacific, AACS detachments served with Admiral Nimitz's Navy-directed task forces to the Philippines and then to Tokyo. Throughout the Pacific campaign, AACS men gained praise for their attention to duty while under fire. Conrtrol towers were prime targets during an enemy attack, but AACS operators calmly stayed at their posts, bringing crippled planes to safety.

Technically, AACS troops were considered noncombatant, but when necessary they took up arms to defend themselves and their stations. The Buri incident is a good example. On 22 October 1944, the third day of the invasion of the Philippines, a detachment of AACS men went ashore at Leyte and within two hours had an operating station at Tacloban airstrip. Two weeks later, they established a second station at the Buri airstrip near the village of Buraun. During the steady advance of the U.S. infantry, our forces became too thin and on 6 December, the Japanese broke through the American lines one mile from Buri. For three days and nights the AACS men formed a cordon around the station. When it became clear that the

"Japs keep out: This one didn't," reads this gruesome signpost at the entrance of a foxhole for AACS men at Carney Field, Guadalcanal.

Control tower on Espiritu Santo, New Hebrides, June 1943.

An underground radio station in the Far East, 1944. The Japanese sometimes located AACS radio beams and tracked them down for merciless bombing. This one was bombed as often as ten times a day.

Japanese bombs damaged this station in China, but radio communications continued without interruption.

Life in the Pacific was not without relief. Even in the midst of war, AACS men could find the light side.

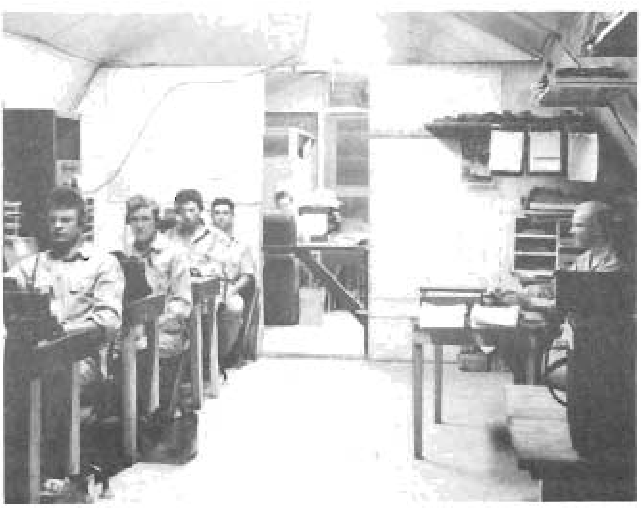
An evening at the movies, Munda, New Georgia, 1944.

An officer of Detachment 10 at Bougainville, Solomon Islands, attempts the hula, 1944.

The AACS/Air Transport Command theater on Tontouta, New Caledonia, built in 1943 or 1944.

On 29 June 1944, the 70th AACS Group made its entry into the Marianas Islands, and set up installations on Saipan Island. On the first day, the AACS detachment settled in amidst six bombing attacks. The portable range was in operation on 1 July, and despite Japanese raids, AACS had permanent and continuous direction/finding service on Saipan by 27 July. This island later became the departure point for 20th Bomber Command B-29s in raids over Tokyo. This photograph shows a general view of AACS facilities at Isley Field, Saipan, on 7 July 1944.

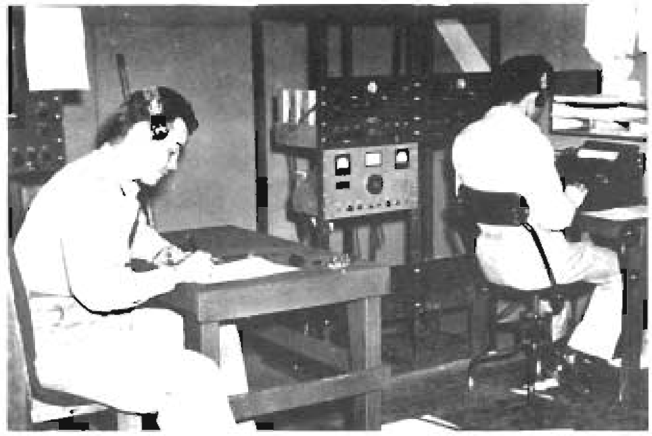
Control tower at Tontouta Field, New Caledonia, September 1942.



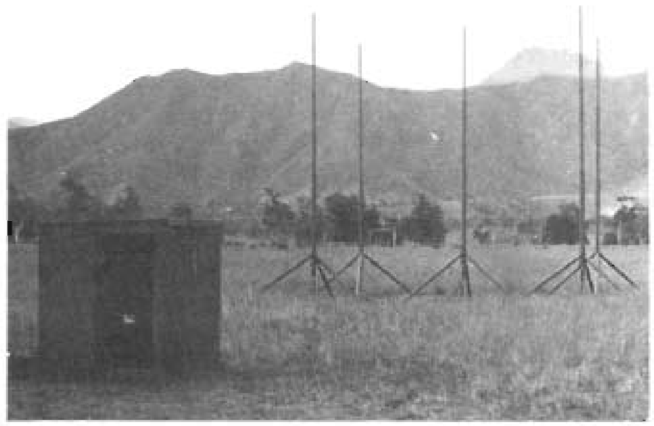
The heart of long-haul communications during World War II was the radio operating room.

Control tower at Plaines des Gaiacs, New Caledonia, June 1943.

This barricaded, camouflaged tower in the South Pacific was prepared to withstand enemy bombing. The operator on the platform used the light-gun to signal landing instructions to incoming aircraft.

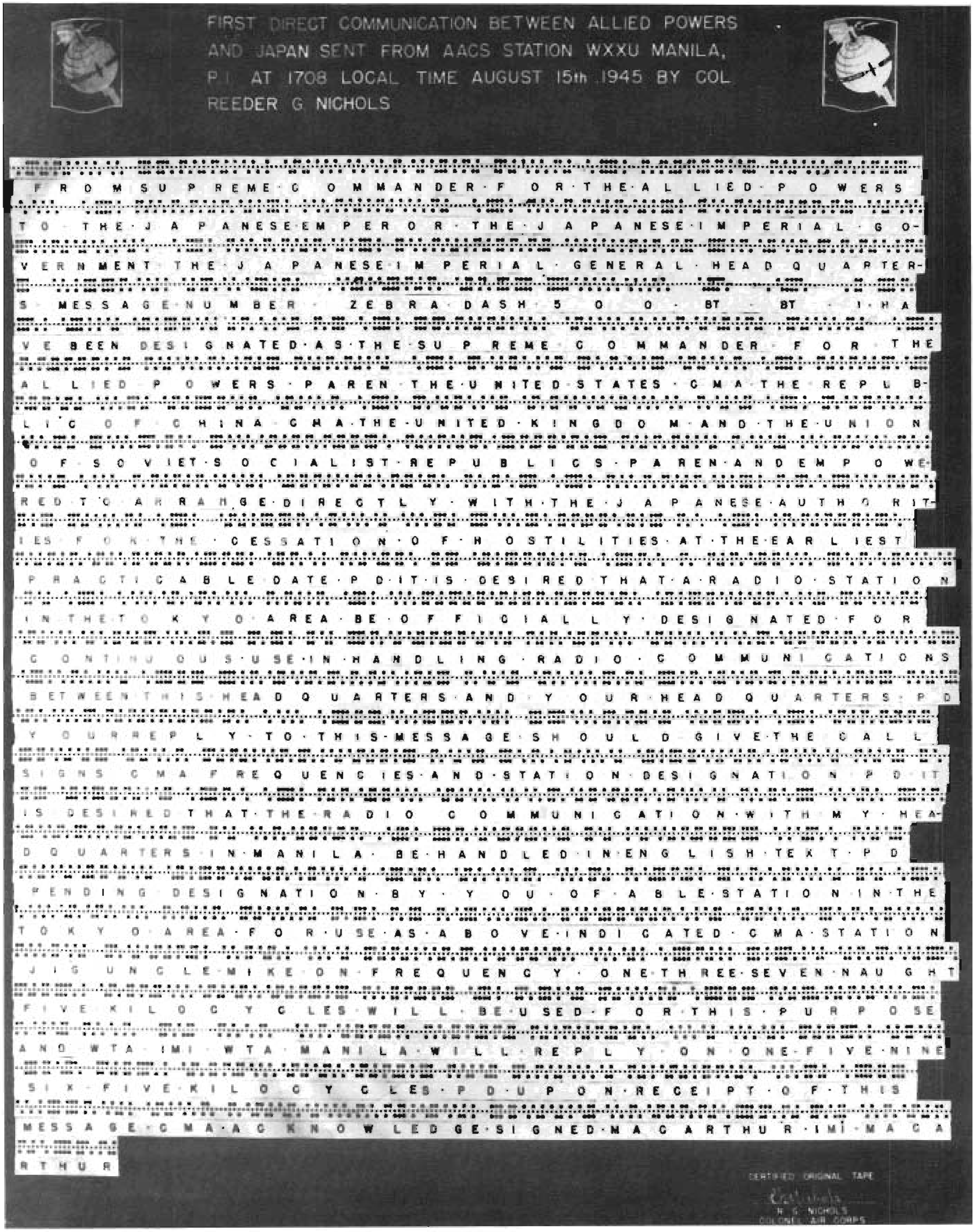


Operating positions at Plaines Des Gaiacs, New Caledonia, 1943, Detachment 1.



Direction/Finding site and station on Tontouta, New Caledonia, 1944.

Two GIs operate a ground control communications system in the Isley Field control tower on 7 July 1944. These men kept in constant contact with airplanes in the air.



FIRST DIRECT COMMUNICATION BETWEEN ALLIED POWERS AND JAPAN SENT FROM AACS STATION WXXU MANILA, P.I. AT 1708 LOCAL TIME AUGUST 15th 1945 BY COL. REEDER G NICHOLS

FROM SUPREME COMMANDER FOR THE ALLIED POWERS
TO THE JAPANESE EMPEROR THE JAPANESE IMPERIAL GO-
VERNMENT THE JAPANESE IMPERIAL GENERAL HEADQUARTER-
S MESSAGE NUMBER ZEBRA DASH 5 0 0 BT BT I HA
VE BEEN DESIGNATED AS THE SUPREME COMMANDER FOR THE
ALLIED POWERS PAREN THE UNITED STATES CMA THE REPUB-
LIC OF CHINA CMA THE UNITED KINGDOM AND THE UNION
OF SOVIET SOCIALIST REPUBLICS PAREN AND EMPOWE-
RED TO ARRANGE DIRECTLY WITH THE JAPANESE AUTHORIT-
IES FOR THE CESSATION OF HOSTILITIES AT THE EARLIEST
PRACTICABLE DATE PD IT IS DESIRED THAT A RADIO STATION
IN THE TOKYO AREA BE OFFICIALLY DESIGNATED FOR
CONTINUOUS USE IN HANDLING RADIO COMMUNICATIONS
BETWEEN THIS HEADQUARTERS AND YOUR HEADQUARTERS PD
YOUR REPLY TO THIS MESSAGE SHOULD GIVE THE CALL
SIGNS CMA FREQUENCIES AND STATION DESIGNATION PD IT
IS DESIRED THAT THE RADIO COMMUNICATION WITH MY HEA-
DQUARTERS IN MANILA BE HANDLED IN ENGLISH TEXT PD
PENDING DESIGNATION BY YOU OF ABLE STATION IN THE
TOKYO AREA FOR USE AS ABOVE INDICATED CMA STATION
JIG UNCLE MIKE ON FREQUENCY ONE THREE SEVEN NAUGHT
FIVE KILOCYCLES WILL BE USED FOR THIS PURPOSE
AND WTA IMI WTA MANILA WILL REPLY ON ONE FIVE NINE
SIX FIVE KILOCYCLES PD UPON RECEIPT OF THIS
MESSAGE CMA ACKNOWLEDGE SIGNED MACARTHUR IMI MACA
RTHUR

CERTIFIED ORIGINAL TAPE
R G NICHOLS
COLONEL AIR CORPS

station could not be defended with small weapons and that the entire AACS force might be wiped out, the AACS men evacuated. During the three day siege, one AACS man was killed and eight others were wounded-12 percent of the defenders. But the loss was not in vain. The time allowed our infantry to consolidate its positions and pin down the enemy. The airstrip was quickly recaptured and the radio station was soon on the air again.

During the final stages of the Pacific campaign, when an Allied victory became a certainty, Gen Douglas MacArthur was named Supreme Commander of the Allied Forces. He first tried to communicate with Tokyo using the War Department signal facilities, but when he received no reply, he turned to AACS. On 15 August 1945, the AACS Manila station tapped out General MacArthur's instructions to the Japanese using the frequency over which AACS had been broadcasting uncoded weather information. Within less than two hours, the Tokyo reply came back. This was the first direct communication between the Allies and Japan.

A foxhole installation, during invasion, somewhere in the Pacific in 1944.

One hour after landing at Atsugi Airfield, near Tokyo, Japan, the AACS transmitter plane, a radio equipped C-47 (Gooney Bird), similar to the receiving station plane shown above, was on the air sending out signals to Okinawa. There was only one hitch in operations, when on the second day rains and motor traffic shorted out the five lines which ran to the receiver plane. Damage suffered by the field can be seen in the foreground.

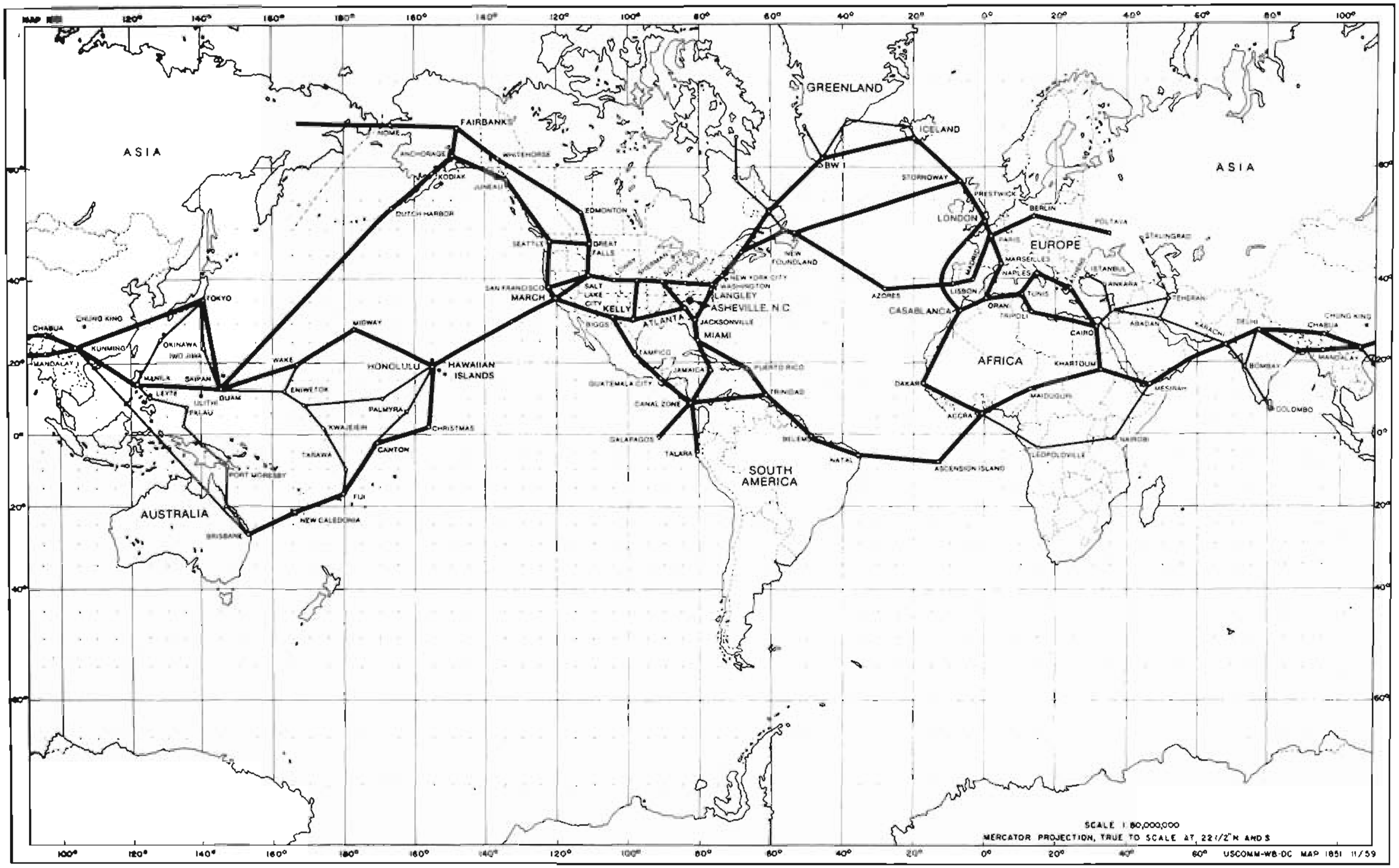
When news of the Japanese proposal for surrender came, the 68th Group of the 7th AACS Wing received orders to fly into Atsugi Airfield near Tokyo and set up the communications equipment necessary to guide in the first contingent of occupation troops. AACS's mission was to provide navigational aids, point-to-point communications with Okinawa, air-to-ground communications for planes in flight, weather data, and air traffic control. Col Gordon Blake quickly assembled a special unit of four sergeants and two officers. On 28 August 1945, Colonel Blake and his AACS men, part of a 150 man task force, flew from Okinawa to Atsugi with 13 C-47 aircraft laden with equipment. In order to carry as much equipment as possible, the load was lightened by carrying only enough fuel to reach Atsugi. Although the Japanese had surrendered unconditionally, Blake and his communicators still did not know whether some might still be hostile. The sight of hundreds of Japanese Navy guards lined up along the airfield was not encouraging to the occupants of the first aircraft to land, but they were met by a group of courteous, English-speaking Japanese military personnel. The navy guards were in their honor. The AACS men lost no time in getting operattions into full swing, and by the 29th, the Atsugi control tower was completed. The first planes to arrive on 30 August were five additional C-47s carrying components to set up the first airborne radio station in Air Force history. Within a few hours, the first C-54 aircraft of the official occupation forces landed at Atsugi and by mid-afternoon Blake's AACS crews had directed more than 340 takeoffs and landings at the rate of one every two minutes. On 30 August, Atsugi was the busiest airport in the world. As the vanguard of the occupation forces, AACS played a pivotal role in the conclusion of the war. In addition to providing essential advance support, AACS solidified the concept of communications as an indispensable element of military operations.

A side view of "Image Tower," the control tower at Atsugi Airfield. It is framed by a dummy wooden propellor used by the Japanese to deceive aerial photographers. The pile of lumber is a demolished dummy plane. A unit of the 68th AACS Group, which is now the 1956th Information Systems Group, operated the tower.

All usable Japanese gas trucks and ambulances are lined up at Atsugi on 30 August 1945. The C-54s which brought in American occupation troops are waiting to take off.

Smoking his cob pipe, Gen Douglas MacArthur views landing operations at Atsugi Airfield, Japan, 30 August 1945.

The first American control tower in Japan after the war was built at Atsugi Airfield in eight hours on 28 August 1945.On top of the base operations building was a wooden platform which the Japanese had used as a tower, but the AACS radio equipment and plans for all weather operations demanded a better structure. At the first meeting of the officers of the reconnaissance party, Col Gordon Blake, Commanding Officer of the 7th AACS Wing, voiced the desire for a tower and the engineering officers sent over a workforce of conscripted Japanese. At first, they said that it would take them through the next day to finish the job, but when they heard that lights would be provided and that the structure had to be ready by five the next morning, they promised to finish it by seven that night. When the AACS men returned from dinner, they found the tower complete with a built-in desk for the equipment and one of the Japanese sleeping on the desk, waiting for approval so that he could go home.



— INDICATES MAJOR ROUTES

— INDICATES AUXILLARY ROUTES

AACS NETWORK IN 1945

ORGANIZATIONAL RESTRUCTURING

In early December 1941, AACS still had very little to work with. Despite its growth since 1938, only a small nuclei existed for the extension of military communications airways into foreign theaters. AACS possessed only six officers and 2,043 enlisted men to operate 65 domestic and 23 overseas stations. Moreover, AACS was a loosely knit system, not a true organizational entity.

Hardly had war begun when AACS was confronted with the threat of disintegration. Traditionally in time of war, theater commanders had almost total control over activities and assets within their jurisdiction. Everything in the theater belonged to the theater commander to do with as he pleased. Consequently, when the War Department established autonomous theaters in the early days of WW II, the various theater commanders expected to exercise operational control over that portion of AACS's airways in their theater. AACS would retain control only of some technical questions and procedures. Since at that time AACS was still just a system controlled from Headquarters Army Air Forces and without a separate headquarters organization of its own, it simply lacked the authority necessary to assure the development of a truly centrally controlled, unified system of airways communications. To the chagrin of many airways communicators, AACS in the early days of the war was relegated to a position of secondary importance because the significance of communications was not yet realized.

The first step toward achieving a unified Army Air Force communications system under a separate command came with the overseas extension of the squadron and region concept to manage the detachments already stationed abroad. By the end of 1942, Col Lloyd H. Watnee, who had replaced Col Wallace Smith as head of the AACS branch of Air Corps Communications, had established 10 overseas regions, each with its own squadron and regional control officer.

Although basically the same everywhere, regions overseas had varied relationships. In some theaters, a region was attached to an Air Force, an Army Department, or a Theater. In the latter case, the region doubled as a communications agency for both local and through traffic. Although initially a region's attachment to some local unit was a virtual necessity from the military point of view, this connection was not always fortunate from a communications point of view. By such division, the system tended to fall into segments, some under local control.

February 1943 brought another step toward unified control in the activation of five area headquarters for the North Atlantic, the Caribbean, Africa, the Northwest, and the Pacific. These area headquarters, each having supervision over more than one region, enabled AACS to achieve a better coordination of communications activity among the several regions, but did not solve the more serious problem of control. The success of AACS as a worldwide system depended on it being an integrated unit with centralized and uniform control both in the domestic and foreign regions.

On 26 April 1943, following the decision to abandon the system of directorates at Headquarters Army Air Forces and to move all operations into the field, AACS was activated as a wing of the newly created Flight Control Command. The history of AACS as an official unit began with this action. Colonel Watnee, previously the AACS Control Officer, became AACS's first commander. One week later, on 3 May, AACS moved to Asheville, North Carolina, with the name of Headquarters AACS Wing, Flight Control Command.

The increased status derived from this improvement in organization, however, was not sufficient to overcome the basic difficulty arising from the uncertainty as to where the ultimate authority lay. The Flight Control Command, of which AACS was a part, had jurisdiction only within the continental United States. During the spring and summer of 1943 assignment of AACS overseas regions to the Air Transport Command or theater commands seemed to indicate a drastic reversal of the previous trend toward centralization. This new trend was countered on 14 July 1943, when the War Department reassigned AACS from the Flight Control Command to Headquarters Army Air Forces. On 13 October 1943, AACS became an independent unit under the general supervision of Headquarters Army Air Forces. Seven months later, on 26 April 1944, AACS dropped the "wing" designation and became a completely independent activity enjoying the full status of a "command." Three weeks later, Colonel Ivan Farman, who had replaced Colonel Watnee in November 1943, reorganized the command into eight wings which in turn absorbed the former areas and regions and replaced them with groups, squadrons, and detachments. This structure existed through through the end of the war. At last AACS was organized along standard Air Force command patterns and possessed the unified structure to operate a worldwide communications system.

When the war ended in the Pacific on 2 September 1945, AACS was a major Air Force command with a worldwide mission. It possessed eight wings, 21 groups, 55 squadrons, and more than 700 detachments. Its 49,400 military personnel operated 819 different stations throughout the world with a total of 1,173 point-to-point positions, 574 control towers, 448 ground-to-air positions, 219 message centers, and 1332 different navigational aid facilities. Thirty-eight allied nations, including the USSR, used AACS facilities in WW II and as the enemy nations fell, AACS set up airways systems in them as well. AACS operated in all theaters of the war and in all of the campaigns, establishing a reputation for being the first in and the last out, a characteristic of operations that exists yet today. AACS assisted at the Teheran and Yalta conferences, came to the rescue of the U.S. Embassy at the height of the 1945 Communist insurrection in Greece, provided airways communications to Berlin before joint administration in that city had been settled, enabled General MacArthur to communicate with Emperor Hirohito more rapidly than had been possible through the circuitous diplomatic channels of Switzerland, and finally flew in first to Atsugi and set up a beam so that our airborne troops might enter Japan safely.

During the war years, the people of AACS saw themselves as a unique group of people. Only a few of the officers were on career status while the heart and core of the system was comprised of ham radio operators and men whom the Army considered too old for actual combat-men in their late 30's and early 40's. The majority of these men were highly educated and had been college professors, lawyers, and successful businessmen before the war. The Army Air Force trained them as cryptographers and since they were "over-age-in-grade" they were only given the temporary rank of lieutenant. Women also served in AACS. AACS gained its first members of the Women's Army Corps in October 1943, and by June 1945, the command had approximately 1,025 women serving as radio, control tower, teletype operators, crypto technicians, and administrative clerks. About one third of them served in Alaska, Labrador, Bermuda, and London. Among the tower operators, many had Civil Aeronautics Administration certificates. Women were frequently considered better control tower operators than men because their voices carried better than men's and the resultant joking between pilot and operator boosted the pilot's morale.

Throughout the war years, AACS had steadily introduced new equipment and new techniques into its operation. To supplement the old standby, manually-operated radio telegraph, AACS quickly seized upon radio teletype, facsimile, and automatic high speed transmission equipment to speed up its message handling. Because of security requirements, almost every message transmitted by AACS was coded before it was sent over the air. In the realm of navigational aids, which was greatly accelerated by wartime research and development, AACS kept pace in its installations. To supplement the homing beacons and the radio ranges in guiding the airman along his way to his destination, AACS installed special markers designated "Z" and "FM." These devices gave the pilot notice of his position as he approached airfields. AACS also used radar, perfected during the war, as a navigational aid. Radar beacon, radio direction finding, instrument landing approach, ground controlled approach, and long range navigation all were aids AACS adopted to assist in safe flying, particularly in bad weather.

Instrumental in establishing AACS first as a system and then as a separate major command were Gen Henry H. (Hap) Arnold and Maj Gen Harold M. McClelland. From the Alaskan long-distance flight of 1934 onward, these two men were key players in shaping the development and destiny of AACS, and, therefore, of the present-day Air Force Communications Command. McClelland later became AACS's third commanding officer.

The end of hostilities, however, brought rapid changes to AACS. In March 1946, AACS lost its status as an independent command to become a subordinate field service of the Air Transport Command (later the Military Airlift Command). This association lasted through June 1961. At the same time, in March 1946, AACS was redesignated from Army Airways Communications System to Air Communications Service. This name, however, proved unpopular and in September 1946, the name was changed to Airways and Air Communications Service to retain the acronym AACS. Always somewhat of a gypsy, headquarters AACS moved twice during the first 15 months of peace. From Asheville, North Carolina, it moved first to Langley Field, near the city of Hampton, Virginia, in December 1945, and then to Gravelly Point, Washington D.C., in December 1946. During the same period, the worldwide responsibilities of AACS shrank as the armed services demobilized. AACS turned many of its foreign stations and installations over to the local governments while simply closing others. At the end of December 1946, AACS's network consisted of only 249 stations around the world with 155 point-to-point positions, 179 control towers, 141 ground-to-air positions, and 90 message centers. It possessed only four wings, 11 groups, 25 squadrons, and 279 detachments. A corresponding decline occurred in personnel. By June 1946, AACS's strength had shrunk to 8,635 military personnel which was only 63 percent of its authorized strength. Plagued by a shortage of replacements, AACS was hard pressed to maintain its operating efficiency for the next few years.

Women served in AACS in many non-hazardous jobs thus freeing men for the more isolated or hazardous areas of the war effort.

The city building of Asheville, North Carolina, served as headquarters for AACS from 3 May 1943 to 17 December 1945.

System Teletype Room, 10 April 1945.

ARCHITECTS OF AACS WORLD WAR II EXPANSION

Col Ivan L. Farman
North and South Atlantic
Routes

Col Lloyd H. Watnee
Caribbean Route

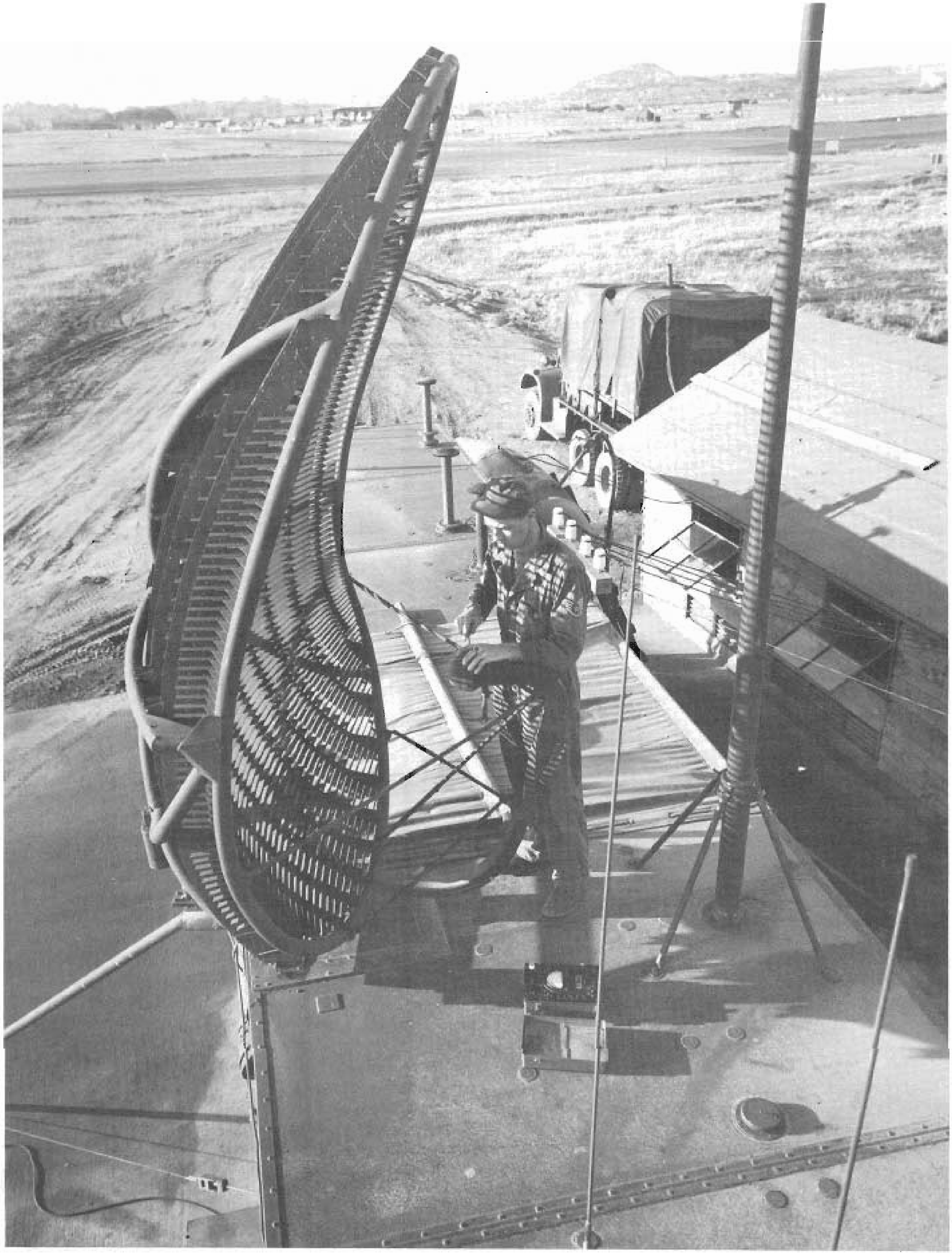
Col Edgar A. Sirmyer
Alaskan Route

Col Wendell W. Bowman
African Route

Col Gordon A. Blake
Pacific Route

No Photograph
Available

Lt Col Walter B. Berg
India-Burma-China Routes



AIRWAYS AND AIR COMMUNICATIONS SERVICE 1946-1961

POSTWAR RESTRUCTURING

The dramatic conclusion of World War II in August 1945 found the Army Air Forces just past their peak with 16 numbered air forces, 2.2 million men and women, and 68,400 aircraft. The Army Airways Communications Service (AACS) was an important component of this global aerial force. Its 4,454 officers and 44,946 enlisted personnel were serving at 819 stations, most of them overseas. AACS's basic mission of providing wire and radio communications and navigational aids wherever the Air Force flew had not changed since its conception in 1938. But expansion had exceeded anything thought possible five years before.

With peace came rapid demobilization. The Army Air Forces shrank to 889,000 people by 1 January 1946, a drop of 60 percent. One year later, there were only 341,000, 15 percent of its wartime strength. Not exempt from these reductions, AACS's personnel strength plummeted to 8,635 by October 1946. Formerly organized into eight wings of 24 groups with a total of 59 squadrons, it was reduced to four wings made up of 11 groups with 25 squadrons which now operated 249 stations, less than a third of the wartime number. Furthermore, AACS lost its wartime status as a separate command in March 1946. It became a subordinate command of the Air Transport Command and, ultimately, was redesignated the Airways and Air Communications Service.

AACS's drastic decline in personnel seriously affected its ability to operate effectively during the immediate postwar period, since occupation duties and other American obligations around the globe required it to maintain its worldwide air networks. The government's demobilization policy first released those men and women with the longest service. Since people with the most seniority and experience left first, the less experienced and skilled people remained to train their replacements. Not only was AACS faced with a shortage of people, it was forced to operate with those whose skill levels were often far less than satisfactory. To counter this lack of manpower, available personnel met operating schedules by working longer hours. AACS unit commanders voiced concern that the lower skill levels and longer hours often reduced the margin of safety below the minimum standards.

This manpower shortage continued into 1947. One of the most critical areas was the Pacific, which was the responsibility of the 7th AACS Wing. Of the authorized 570 radio operators, only 262 were available for duty in early 1947. All but 56 of these were scheduled to leave the service by April 1947. To avert this crisis in the Pacific, the Joint Chiefs of Staff drafted a memorandum to the Secretaries of War and Navy asking them to provide an adequate number of men to operate the system until the ranks of AACS could be filled. Hundreds of communication specialists were borrowed from the Navy, while 275 civilian technical representatives were hired to train replacements and perform maintenance.

Another 412 civilian radio operators and technicians were recruited under a program called Project HYPO. These people were hired through the airlines under contract to the Army Air Forces. Expectations that this program would provide the needed personnel were soon dashed. Few civilians were interested in short-term jobs, especially overseas. Discord erupted because the military personnel resented the civilians doing the same jobs, but at much higher pay.

The year 1947 was a momentous one for AACS and the entire Air Force. The passage of the National Security Act on 18 September 1947 made a reality the long-sought goal of a separate Air Force coequal with the Army and Navy. AACS remained an essential service of the newly formed Air Force, but a number of administrative changes followed. AACS moved its headquarters a few miles from Gravelly Point, Virginia, adjacent to Washington National Airport, to Andrews AFB, Maryland, where its parent headquarters, the Military Air Transport Service, was located. At the same time, all the AACS wings, groups, squadrons, and detachments were changed from one- and three-digit designations to the 1800 and 1900 series. For example, the 7th AACS Wing and 68th AACS Group, both located in Tokyo, became the 1808th AACS Wing and the 1809th AACS Group respectively.

Military aviation communications of the postwar period contrasted greatly to what had existed before AACS had been created in 1938. Aviation communications had been primitive in the late 1930s. When an airplane left the ground, its whereabouts remained in doubt until it landed again. Flying was usually undertaken through clear skies during daylight hours. It was in attempting to circumvent some of these limitations that AACS was created. During the war years, the state-of-the-art made a quantum jump as military planners reacted to conditions and needs imposed by war. For example, the Army Air Forces' frustrating efforts to achieve precision bombing led to renewed American efforts to plot accurate courses, which in turn prompted the development of improved navigational aids.

This research developed tools, such as the ground controlled approach (GCA) radar, that greatly enhanced AACS in the performance of its mission. First used in 1944, this unforeseen offshoot used both radar and the radio-telephone to pick up the airplane miles from the airfield and instruct the pilot in the proper speed, altitude, and direction needed to stay on the correct glide path to the runway for a safe landing when either darkness or weather conditions prevented the pilot from seeing the runway. It was an economical system, not only in the lives and aircraft it saved, but because the aircraft required no special equipment and the pilot needed no special training. Its inventor, Dr Luis W. Alvarez, was presented the coveted Collier Trophy by President Harry S. Truman in 1946. The Collier award selection committee called ground controlled approach radar "the greatest achievement in aviation in America." Once AACS had demonstrated its utility, the system was quickly adopted by civil aviation.

These advances in technology proved to be a mixed blessing, for they created many new problems while solving the old ones. Maj Gen Harold M. McClelland, AACS Commander, addressing the Scientific Advisory Board in 1947 on these achievements, stressed AACS's continued need for further research and development. The Air Force's goal of creating an organization capable of operating anywhere in the world under all types of weather conditions necessitated research into new areas such as arctic operations and supersonic flights. Radio waves, for example, were strangely affected by conditions in the frigid arctic weather. Also, dependable automatic navigational aids were needed to eliminate the need to station men in hostile arctic wastes where getting supplies was difficult and the duty harsh and dreary. In the case of supersonic aircraft, faster and more reliable communications were needed to ensure that messages arrived at the destination before the airplanes.

General McClelland also emphasized that one of the fundamental wartime lessons in Air Force communications was the need for integrated systems. A centralized system would allow AACS to provide all its customers wider and better service than a collection of autonomous and unconnected command communications operations, while preventing a duplication of resources.

This AACS transmitting station at Bluie West 1, Greenland, had a continuous wave, voice and air-to-ground capability.

The first such integrated communications system, called the Military Flight Service Communications System, was installed in 1947. It handled flight plans and aided in the control of aircraft for all the Air Force bases within the continental United States. The system's nine centers forwarded to their respective destination departure times and routes to be taken for every Air Force flight. Rescue operations were automatically taken when an airplane was thought to be overdue.

AACS set up navigational aids along established air routes to enable aircraft to reach their destination safely. Aircraft warnings, weather changes, and alterations in flight plans were instantaneously relayed to the aircraft by high and very high frequency (VHF) radio. The airfields were connected to one another by interphone and teletype. The need for these permanently established and extensive communications capabilities was demonstrated during Project COMET when very high frequency radios and direction finders had to be installed on short notice at 10 airfields for the transcontinental flight of a P-80 jet fighter.

A long-range program to install and operate ground controlled approach radars at 72 airfields was begun by AACS in 1947. Thirty-two sets were operating within the borders of the United States by the end of the year. Another 20 were in service overseas. They were used in 75,000 landings that year and credited with preventing 372 crashes. The Civil Aeronautics Administration approved AACS using this new system to assist civilian aircraft in emergencies.

In September 1948, a flight of B-29s flew from Tokyo to Washington, D.C. to celebrate the first anniversary of the Air Force. Although long-distance flights were common, this one was different because the flight was in continuous communication with its destination. Equipping the ground station with the rotary beam parasitic antenna, which could be rotated to point transmissions directly at the aircraft, made this possible. This antenna design allowed for more reliable contact and, hence, better control over their aircraft.

Another dramatic event took place on 2 March 1949, that was to have an important impact upon AACS. An Air Force B-50 Superfortress completed the first nonstop flight circumnavigating the globe with the aid of aerial refueling. Gen Curtis E. LeMay, Strategic Air Command Commander, noted that this accomplishment meant that the Air Force was able to drop an atomic bomb "anywhere in the world." To change this demonstration into a daily operational capability required a worldwide communications network to provide the necessary command and control. The AACS role was to be expanded in the process of developing such a system.

Instrument landing trucks such as this one enabled aircraft to land safely. This truck is assisting a B-24 Liberator at Smyrna, Tennesee.

THE BERLIN AIRLIFT

The political situation was very bleak in Europe during 1948. An "iron curtain" had descended on those areas of eastern Europe occupied by the Soviet Union after the collapse of Germany. The fall of Czechoslovakia to a Communist coup in February and the growth of the Communist parties in France and Italy alarmed the West. The turning point was the Berlin Airlift, in which AACS was to play a critical role.

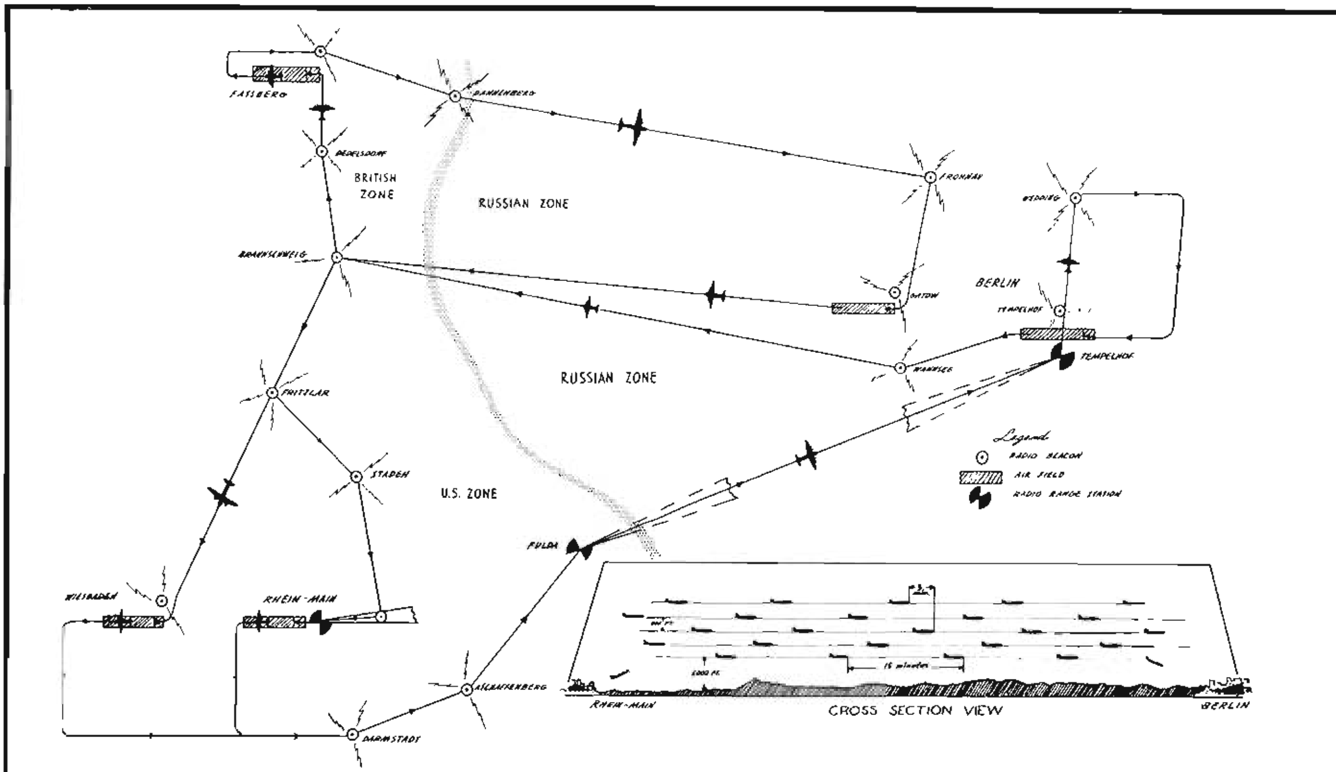
After the war, Germany had been divided into four occupation zones by Britain, France, the United States, and the Soviet Union. Berlin, which was also divided among the four powers, lay 110 miles inside the Soviet occupation zone. The Soviets granted its former Allies three 20-mile-wide air corridors and several land routes into the city.

AACS control tower operators react to an emergency situation at Tempelhof Aerodrome during the Berlin Airlift. At the peak of the airlift, these men directed landings at three minute intervals as blocks of planes swept in from the west.

tours. In spite of round-the-clock duty and the need to improvise in order to make obsolete equipment do the job, everything was done and done well until additional help arrived and modern equipment could be brought in to replace the worn, outdated equipment.

The volume of traffic all but swamped the AACS traffic control operators in Berlin. Their pre-airlift average workload had consisted of handling 30 to 40 flights a day. Communications traffic varied from 70 to 160 messages daily. During April 1948, before the airlift, they logged 7,738 separate radio contacts with aircraft arriving and departing Berlin airfields. For the same month one year later, during the airlift, the number of contacts was over 127,000. The number of filed flight plans rose from 1,800 to over 42,000 for the same two months. The airlift reached its peak on Easter Sunday in 1949 when 1,400 aircraft were landed and sent aloft again within the 24-hour period. A record of almost 13,000 tons was flown into Berlin on this date.

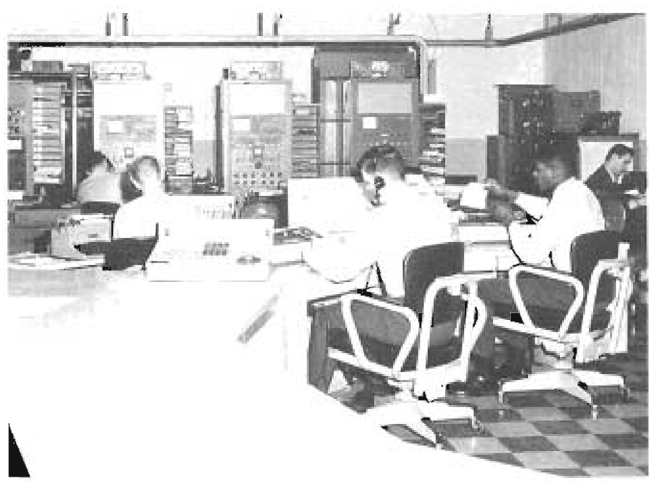
At Tempelhof, the glare of high intensity lights silhouetted the tombstones of the cemetery at night.



This illustration shows the airlift corridors and the placement of AACS navigational aids. U.S. Air Force planes left from three bases, Rhein-Main and Weisbaden ABs near Frankfurt, and the Royal Air Force Base at Fassberg in the British Zone. Aircraft from Wiesbaden and Rhein-Main flew to Berlin along the lower corridor and returned via the center corridor. Aircraft from Fassberg flew to Berlin along the top corridor and returned via the center corridor. Radio beacons and ranges guided them along their routes.

Help was badly needed. To meet the need for personnel, reserve officers, civilian technicians, and replacements who had to be trained on the job were rushed to the airlift airports. One Civil Aeronautics Administration reservist was notified on a Saturday that he was activated for 90 days duty on the airlift. The following Friday, he was controlling aircraft from the Tempelhof control tower. In admiration, he stated, "Actually I didn't believe that it was possible for the Air Force to move that fast." By November 1948, the 1946th AACS Squadron's strength had risen to 79 officers, 208 enlisted personnel, and 148 German Nationals. Altogether, 90 AACS officers and 700 enlisted personnel were serving the entire airlift at the peak.

Named "Operation Vittles," the airlift forced AACS personnel to improvise new methods of air traffic control to handle the volume of traffic needed to bring the minimum 4,500 tons of coal and food into Berlin daily. An area control radar, model CPS-5, was installed which detected the airplanes approaching Berlin when they were 60 miles away. The area control operators kept in touch with the aircraft until they turned them over to the ground controlled approach radar operators who talked them down to a safe landing. Airplanes that missed their first landing approach were dispatched back to their home base unless they could be later vectored back into the landing pattern. Flight plans, position reports, and clearance phraseology were streamlined to limit the length of radio transmissions and accelerate operations.



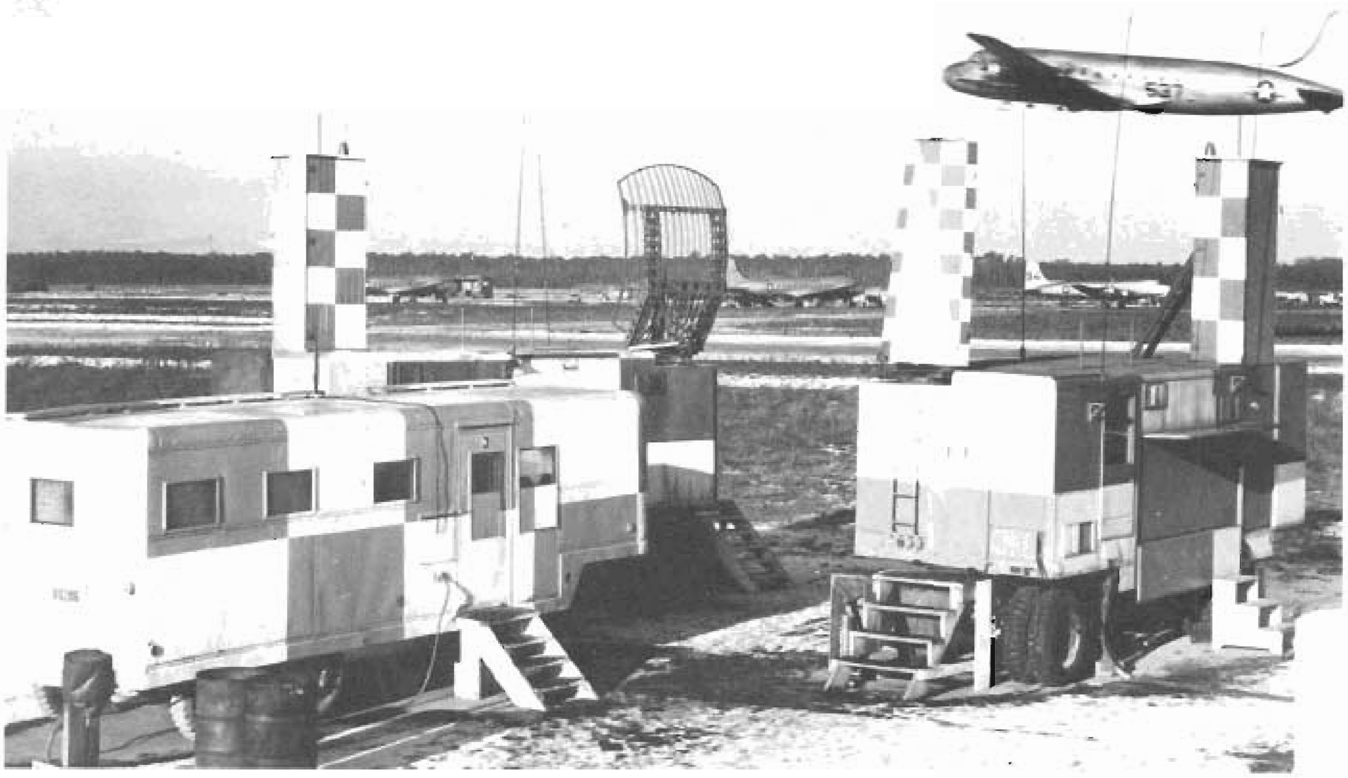
A telephone patching unit for connecting local lines to air/ground circuits.

Ground controlled approach radar was the keystone upon which the airlift system was built. Maj Gen Robert W. Douglas, Jr., the Chief of Staff of the United States Air Forces in Europe, stated ". . . ground control approach . . . can rightfully be credited with assuring the success of the Berlin airlift . . . ." There were times when this radar made it easier to land an aircraft than to navigate on the ground. A case in point occurred at Tegel, in the French Zone of Berlin. One C-54 aircraft, mistakenly dispatched to that airfield when it was closed due to dense fog, was brought to a successful landing by the AACS-operated ground control approach radar there. The pilot called for a "Follow Me" jeep to lead him to the unloading ramp. It took the jeep 25 minutes to find the airplane on the runway and another 30 minutes to get it to the ramp, after losing its charge three times in the fog.

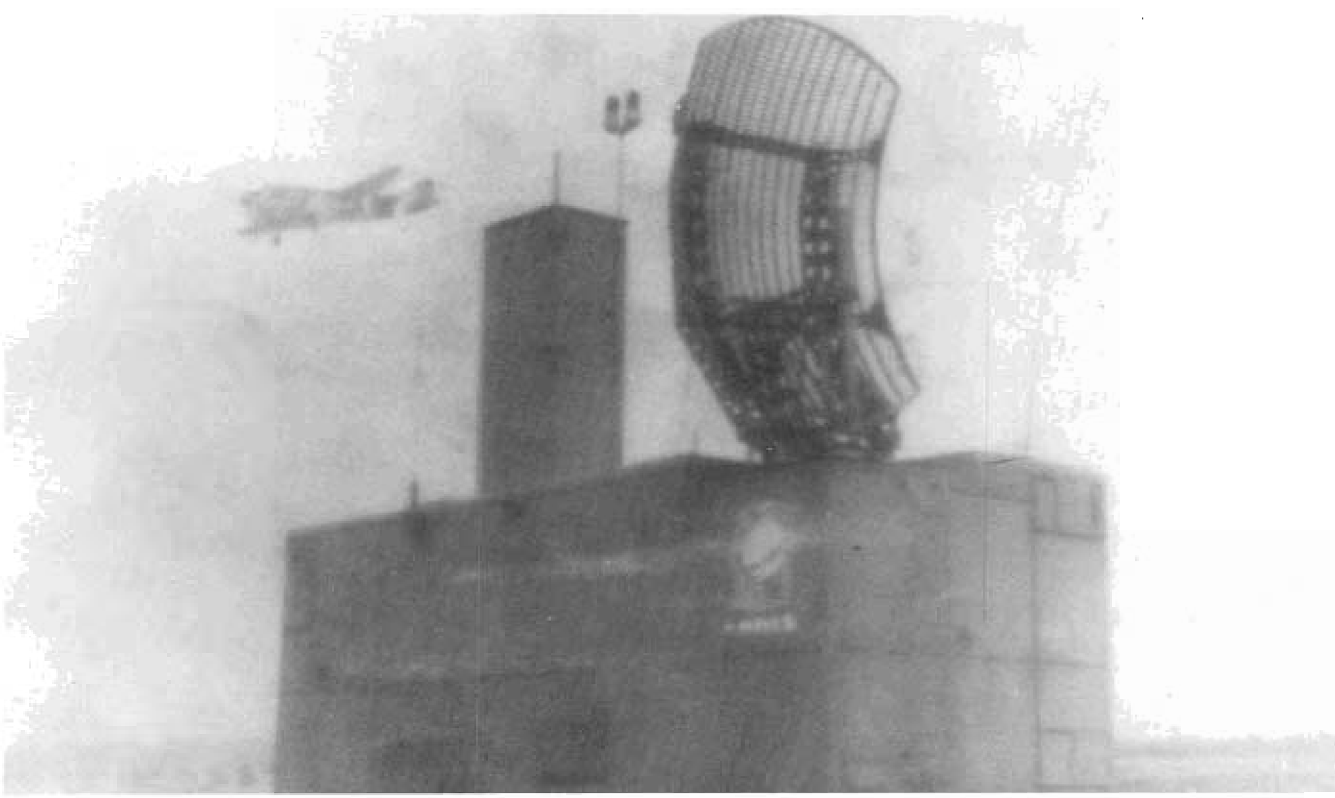
Other AACS navigational aids assisted the airlift. The ground controlled approach radar operators were greatly aided by a modified area approach radar which allowed for excellent separation and control of large

AACS radar operators remain alert at Tempelhof to insure the safety of aircraft and crews. Operators peered into their scopes hour after hour so that flight safety would be at its maximum, despite weather conditions.

One AACS CPS-5 area control radar set was placed atop the I.G. Farben Building in Frankfurt, West Germany. The set was used in conjunction with the AACS Radar Control Center in 1950.



A C-54 aircraft passes over the mobile ground control radar as the aircraft takes off from Rhein-Main AB, West Germany, on its way to Berlin.



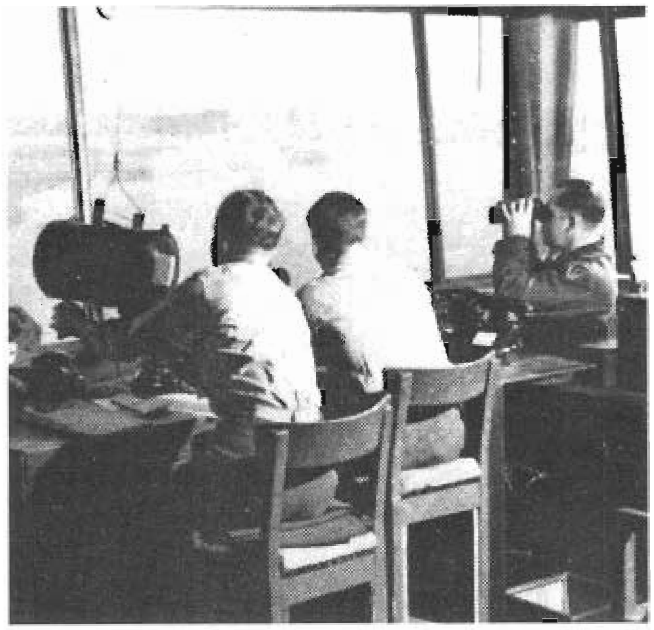
Ground control approach allowed airlift operations during the foulest of weather. Such operations fostered the saying that "AACS enabled planes to fly when birds walked."

An AACS mobile, low frequency transmitter was used during the Berlin Airlift as a homing beacon.

A mobile detachment radio operator sends a message from the field.

numbers of aircraft, something that had not been possible before. Radio beacons and ranges were installed, operated, and maintained by AACS personnel. Beacons mounted on trucks were improvised to speed their placement. They were frequently moved as adjustments were made in the air routes. As the airlift continued, the mobile aids were replaced by more permanent ones. Facilities were set up to repair and rebuild this navigational equipment. Control tower and ground controlled approach radar detachments were organized to handle the traffic at Gatow and Tegel as well. Later, the British took over operating the AACS facilities at Gatow.

After 14 months, the Soviets, recognizing that the airlift had defeated their blockade, ended it. The airlift was continued for another month to build up a reserve of food and fuel. The 276,926 airlift flights, all handled by AACS personnel, had brought in over 2.3 million tons of supplies, two-thirds of which was coal. Only 17 American and seven British airplanes were

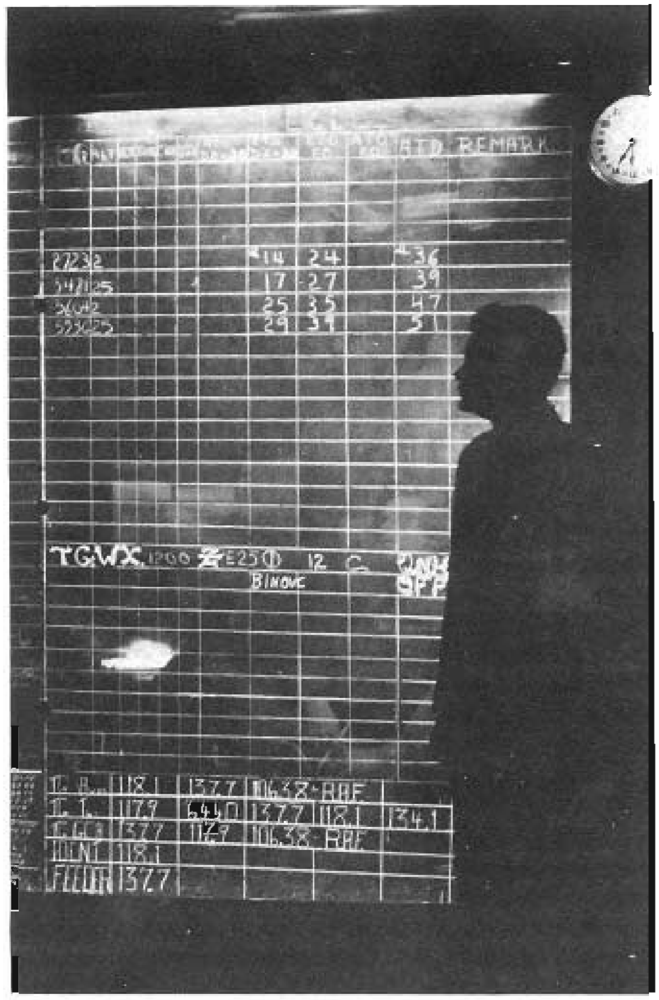


From the control tower at Tempelhof, air traffic controllers direct landings which came at three-minute intervals as blocks of planes swept in from the west.

C-54 aircraft at Weisbaden AB, Germany, stand out against the background of snow as the Berlin Airlift continued operations in the heaviest snowfall of the year on 1-2 March 1949.

lost, none while under AACS ground controlled approach radar control, at a cost of 48 lives. Most of the other 30 lives lost occurred on the ground in the process of loading, unloading, or taxiing. It was a brilliant safety record, for which AACS deserved much of the credit, being less than half the Air Force accident rate within the continental United States for the same period.

As a result of the airlift, which the Germans called "the bridge in the sky," Berlin remained free, the spirit of the Free World rallied, and an explosive situation that could have led to another world war was defused. Maj Gen William H. Tunner, Commander of the Combined Airlift Task Force, wrote that "Without the wholehearted support, cooperation, and technical assistance of the Airways and Air Communications Service, the success of the Berlin Airlift would never have been possible."



The CPS-5 area control radar board in Berlin was an important facility during the days of the airlift because it helped keep track of each aircraft.

THE KOREAN WAR

Soon after the successful completion of the Berlin airlift, AACS assisted during another world crisis. The invasion of South Korea on 24 June 1950, caught the West by surprise. Gen Douglas MacArthur, commander of the American forces in the Far East, was authorized to commit American air and sea forces under the United Nations flag. On 30 June, when it became apparent that the US-trained Republic of Korea Army was disintegrating, the first American ground units were flown in to slow down the North Korean

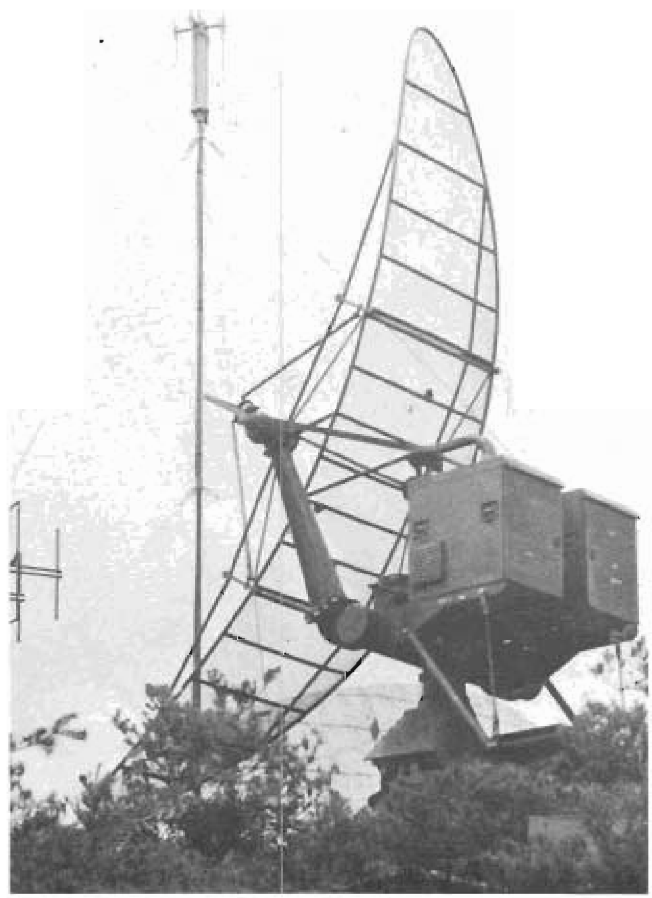
A section of the transmitters used by the point-to-point communications section of the AACS Group stationed in Munich, West Germany.

Personnel of the 1812th AACS Group operate a continuous wave, point-to-point communications station in Munich. Direct continuous wave communications could be carried on with Berlin, Rhein-Main, Furstenfeldbruck, Neubiberg, Wiesbaden, and Erding, Germany.

advance. AACS quickly became involved, continuing their World War II tradition of being among the first in and the last out.

The 1808th AACS Wing, with headquarters in Tokyo, was responsible for air traffic control and air communications services for the entire Far East and Pacific areas. The wing commanded the 1809th AACS Group based in Japan, the 1810th AACS Group in Hawaii, and the 1811th AACS Group on Okinawa. Each of these groups was assigned squadrons and detachments for the various airfields, operating control towers, direction finder stations, and several Military Air Traffic Control (MATCon) communications centers. The only AACS facility in Korea at the time, however, was a low-power homing beacon at Kimpo Airport, outside the capital city of Seoul, which soon fell into enemy hands.

Representatives of the 1808th AACS Wing and Headquarters, Far East Air Forces, met on 26 June 1950, to determine air traffic support needs in Korea. The 1809th AACS Group, stationed at Nagoya, Japan, was tasked with getting air navigation aids into Korea to help the airlift of men and supplies. It was a race to infuse enough aid to prevent the total collapse of the Republic of Korea Army before American ground forces could arrive in force. A two-man AACS team, sent to ascertain what were the immediate needs for navigational aids and air traffic control decided that



A radar antenna somewhere in Korea in 1951.

the first priority was installation of a homing beacon at Pusan. This port on the southeastern tip of the Korean peninsula had been selected to be the main United Nations logistical base.

There was also an urgent need to provide men and equipment to operate 10 advance airfields in Korea. Since the necessary equipment was not in depot supply, it was quickly gathered from the emergency backup equipment at operating airfields in Japan and from reserve stocks in the United States. Three hundred AACS officers and enlisted personnel skilled in the installation, operation, and maintenance of mobile communications equipment, were selected, processed, and rushed from the United States.

The 1808th AACS Wing had requested permission in 1948 to organize a mobile communications squadron for just such emergencies, but Headquarters USAF had denied the request because of monetary restraints. However, the Korean War was to emphasize the value of these units, which remain an important part of AFCC today. On 20 July 1951, the long-sought and badly needed 1859th AACS Mobile Communications Squadron was organized in Tokyo to provide mobile units to handle emergency situations.

AACS veterans found Korea, with its mountainous terrain, choppy dirt airstrips, heavy rains, and impossible flying weather, even worse than the Pacific campaigns of World War II. One news correspondent, who made several flights to Korea during the first weeks of fighting, described the primitive facilities on one of her first flights. The cargo plane was forced to wait in Japan for 36 hours for the weather to clear because there were no navigational aids yet set up in Korea to assist in landing. The airplane finally landed on a single muddy airstrip ringed by rugged mountains. There were no flare pots to mark the edge of the airstrip if the visibility turned bad. There was no control tower, no operations office, and no shelter to protect the unloaded supplies from the heavy rains that had turned the field into a thick, gooey carpet of mud. "Fortunately," she commented, "the field was open when we sat down."

AACS detachments were operating at Pusan, Taegu, and Pohang within a week after President Truman authorized American military involvement. Beginning with the original two-man team sent to determine AACS's requirements, the number of AACS personnel in Korea soon swelled to over 400 men. They

Troops stand guard over the Korean countryside next to a large radar antenna.

AACS detachments were operating at Pusan, Taegu, and Pohang, Korea, within a week after President Truman authorized American military involvement. The first unit to go into action was this radio jeep which served as a control tower at Pusan.

operated under the control of the 1955th AACS Squadron in Japan for the first several weeks. On 1 August 1950, the 1973d AACS Squadron was organized and established at Taegu to handle the growing AACS responsibilities on the peninsula.

AACS requirements throughout the Pacific increased geometrically as a result of the growing conflict. The air routes over the Pacific to and from the war zone needed to be fully staffed to handle the increased volume of traffic already winging its way from the United States. Japan became the logistics base for the United Nations forces fighting in Korea.

The northern route over the Pacific from the United States to Japan traveled north to Alaska and down the Aleutian Islands chain. There were air bases at Anchorage, Adak, Shemya, Cold Bay, and Kodiak. Several of these former World War II bases had to be reactivated. AACS operated control towers, ground controlled approach radars, radio and radar beacons, radio ranges, high and very high frequency direction finders, cryptological facilities, and point-to-point communications. These facilities, all of which were operational by mid-July, were under the control of the 1804th AACS Group in Alaska.

The central route over the Pacific via Hawaii, Guam, the Philippines, and Okinawa was already fully established and did not require the reactivation of any additional airfields. But, additional facilities and

A control tower at Hoengsong AB, Korea, in 1951.

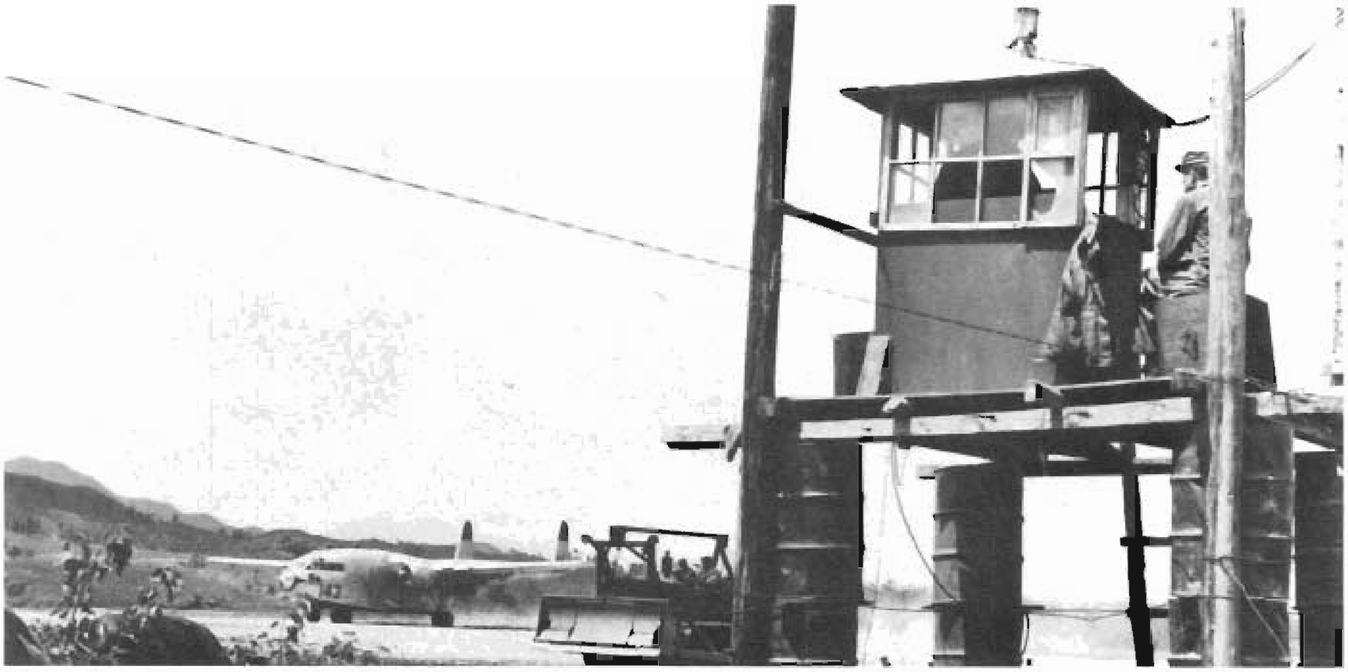
personnel had to be provided to control the increasingly crowded skies over Japan. By the end of 1950, the 1808th AACS Wing had an authorized strength of 283 officers and 3,375 enlisted men.

It was touch and go for weeks as American and Republic of Korea forces were forced back into a small pocket around Pusan. Just when it appeared that they were going to be pushed off the peninsula, General MacArthur's amphibious assault at Inchon, far behind the enemy's lines, dramatically reversed the situation. As the trapped enemy fell back, AACS detachments occupied and made operational airfields that often were not yet completely cleared of the enemy.

Although not combat troops, AACS personnel frequently had to take up arms to either defend or secure the airfields they operated. In the first dark weeks of combat, Taegu was overrun by the enemy three times, but the Fifth Air Force Joint Operations Center's weather intercept facilities there were never out of operation. Sometimes AACS personnel found themselves behind the enemy's lines. After the recapture of Kimpo Airport by the Marines on 15 September 1940, AACS personnel immediately put the airfield back into operation. Over 200 North Korean

An AACS technician repairs a complicated piece of radio equipment.

Directional finding antennas, such as this one in Japan, were the lifeline for aircraft flying between Japan and Korea. These systems, operating 24 hours a day, provided radio navigational aid to hundreds of aircraft daily.



An AACS operator in this crudely constructed but serviceable control tower has cleared a U.S. Far East Air Forces C-119 Flying Boxcar to land at an advanced Korean airstrip in June 1951. Air traffic control services such as this enabled United Nations ground forces to chase a retreating enemy.

soldiers were killed around the perimeter during the first night, and artillery fire harassed operations for three days afterwards.

The victorious United Nations forces crossed the 38th Parallel into North Korea in pursuit of the fleeing North Korean Army units. AACS detachments traveled with the forward units often entering captured North Korean airfields before the enemy had fully vacated them. The war appeared to be nearly over as allied units approached the Yalu River, the country's northern border, in November 1950.

Then, unexpectedly, the war took another dramatic turn when the Chinese Communist Army entered the conflict in overwhelming numbers. The United Nations forces were rapidly pushed back out of North Korea. Everything had to be packed up quickly and sent south to safety as the Fifth Air Force evacuated the recently won airfields.

For 24 hours after enemy pressure forced the evacuation of the airfield at Pohang, the ground controlled approach radar detachment remained to direct the air evacuation of the wounded. AACS personnel spent their last two nights in foxholes with rifles defending the doomed airfield. They finally trucked their radar equipment 12 miles over sniper-infested roads to the coast where it was loaded onto a waiting Landing Ship Tank (LST). The entire 45-man detachment escaped without injury, losing only a jeep and two small power units to the enemy.

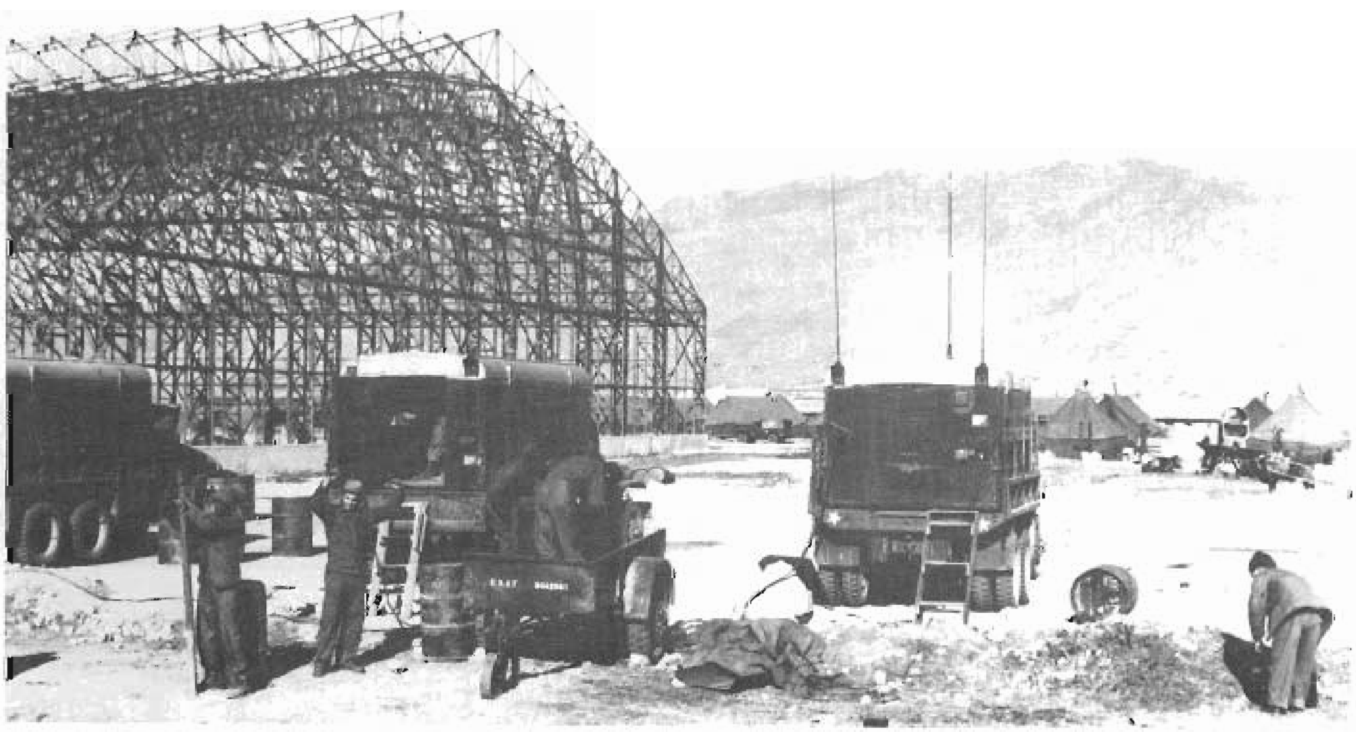
The control tower at Kimpo Airport, outside of Seoul, Korea, in December 1951, after its recapture. Note the shell holes on the wall.

The 1973d AACS Squadron received a Distinguished Unit Citation for the "extraordinary heroism and fidelity" its detachments displayed in remaining at their stations until the last minute, directing the landings and takeoffs of cargo airplanes evacuating United Nations soldiers and wounded, often under fire.

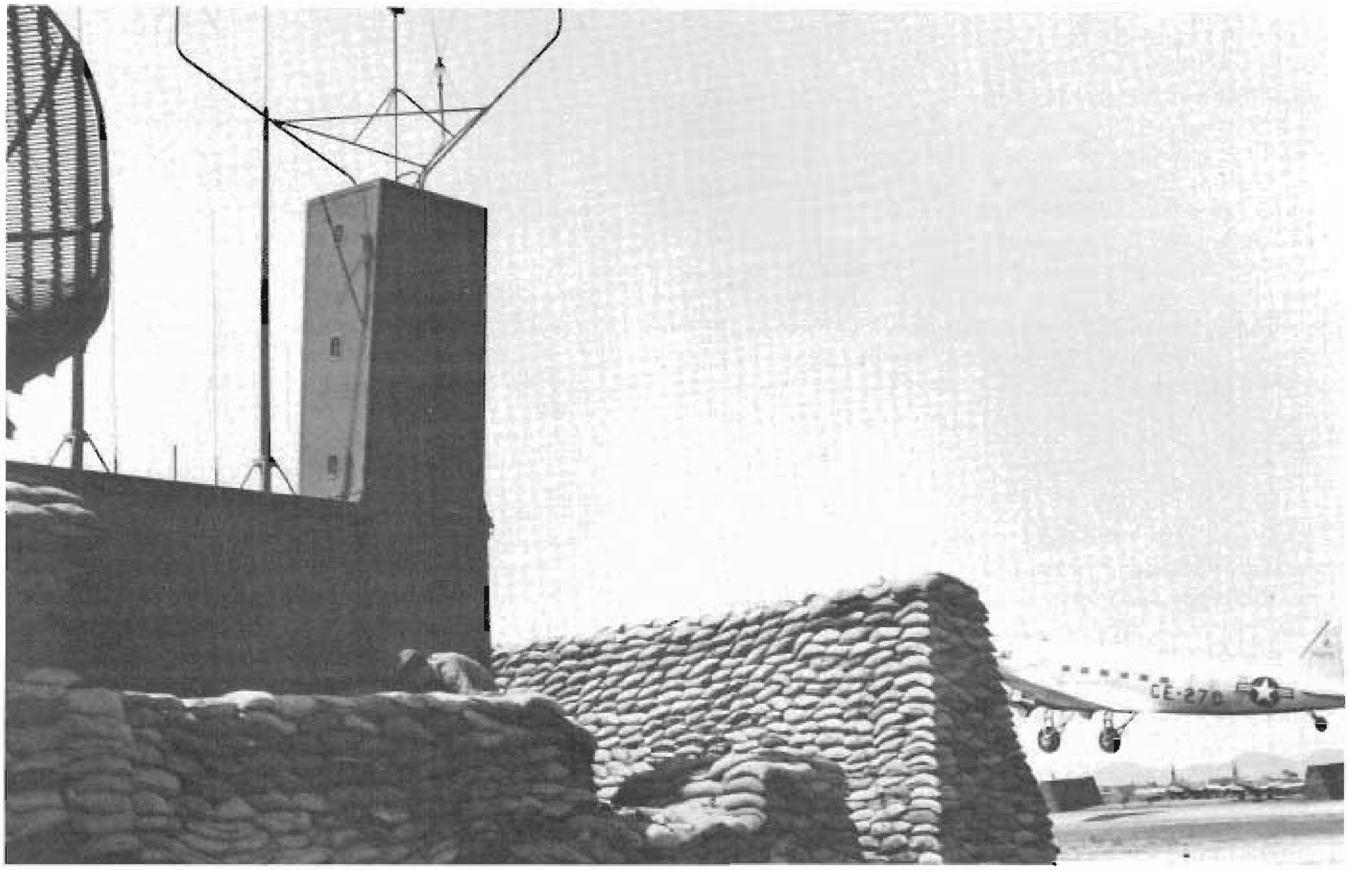
The intervention of the Chinese Communists brought increased air operations and the first air combat between jet aircraft. The system of controlling aircraft, geared to piston-engine airplanes, proved inadequate for the faster jets. The mountainous terrain of Korea and Japan, often shrouded in rain and fog, compounded the problems.

The 1808th AACS Wing, accordingly, received approval for a reorganization, effective on 1 July 1951, to provide expanded functions and services, as well as closer supervision of AACS duties in Korea. The 1818th AACS Group was established at Pusan to command the 1973d and 1993d AACS Squadrons at Taegu and Kimpo. They operated the MATCon centers and controlled airfield operations in their respective sectors. The 1818th AACS Group moved briefly to Seoul, but soon returned to Taegu.

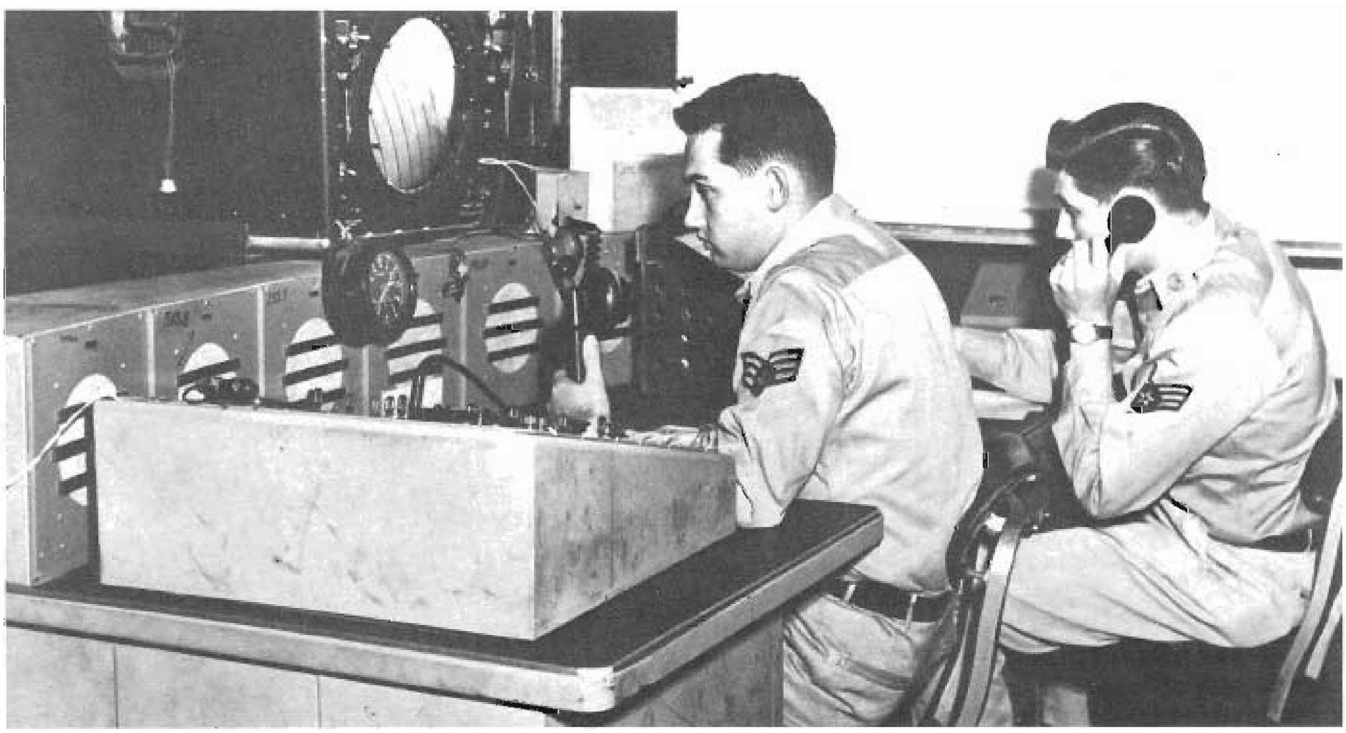
Typical of the ingenuity of the U.S. Air Force in Korea is the addition of the perch atop an old Korean building at Taegu, in order to provide an "open air" control tower for operations of our fighter strips located here, October 1950.



An AACS installation team at work somewhere in Korea, 17 February 1951.



AACS placed revetments around some of its equipment to protect it from enemy attack. This ground control approach radar unit successfully aided over 4,000 United Nations aircraft to land in bad weather or darkness between June 1951 and April 1952. Such assistance was a contributing factor to the ability of United Nations aircraft to bomb Communist targets in North Korea on a 24-hour basis.



Two servicemen operate a radar approach control facility at Taegu AB, Korea.

The volume of traffic at several of the South Korean airfields often exceeded the traffic at Tempelhof Airport during the height of the Berlin Airlift. The overcrowded airfields handled everything from speedy jet fighters to slow, lumbering, piston-engine cargo aircraft. Even in good weather, the airfields' traffic patterns were saturated, requiring the highest degree of skill from AACS personnel operating the control towers and other air control facilities. The AACS detachments at Brady, Ashiya, and Pusan East airfields, for example, were commended for the emergency airlift of the 187 Regimental Combat Team to Korea in May 1951. During this operation, AACS personnel at Pusan East handled a takeoff and landing every three minutes.

Headquarters, Far East Air Forces stated that it could not have operated without the AACS-operated ground control approach radars. In an emergency at Itazuke airfield on 21 June 1958, AACS personnel successfully guided 26 cargo aircraft, which arrived unexpectedly, to safe landings at three-minute intervals under minimum weather conditions.

AACS even operated some of its homing beacons on ships anchored off the Korean coast. One of these was a 114-foot vessel designed to transport passengers and freight between the offshore islands. Christened the USAF Little Mo, it was stationed at a pivotal point on the air route between Kimpo Airport and Japan. Fortunately, the enemy never attempted to jam or otherwise interfere with these important navigational aids.

A draftsman of the 5th AACS Wing prepares General Ridgeway's message to Korean and Chinese forces calling for negotiations to end hostilities. This copy was transmitted by AACS facsimile facilities in Tokyo in 1952.

During the Korean War, the officers and airmen of the units of the 1818th AACS Group supported an orphanage in Seoul, Korea.

AACS organized an Air Traffic Control Committee in February 1951, to handle the increasingly crowded airspace over Japan and Korea. It determined the requirements and priorities for the use of available air space and handled procedural conflicts. The different characteristics and speeds of the multitude of aircraft types operating in the theater made air control difficult. The weakest link in the system was created by aircraft arriving at and departing from the airfields. It was under these circumstances that mission-bound tactical aircraft intermixed with aircraft on the regular air routes. Congestion often led to aircraft being stacked up over the airfields waiting to land. Jets returning from missions, with their high rate of fuel consumption at lower speeds, often did not have the endurance to linger in the air.

AACS had implemented and conducted a Republic of Korea Air Force training program to develop their Korean counterparts. This program was operated in conjunction with the Mutual Defense Assistance Program. After the war, Koreans who trained under this program assumed the functions of their former AACS teachers.

In spite of everything, AACS managed the heavy burdens of the Korean War with distinction. Even so, it was obvious that changes in aviation technology would require new types of AACS equipment, techniques, and training. Although the fighting ended on the embattled peninsula in 1953, the war's implications continued to have a far-reaching impact upon the United States, the United States Air Force, and AACS.

AIR TRAFFIC CONTROL

The AACS air traffic control mission included engineering, installing, operating, and maintaining ground electronic aids to air navigation, maintaining air traffic control at, and in the vicinity of, the Air Force's airfields, ensuring air traffic control along the air routes outside the borders of the United States, and providing military flight services within the continental United States.

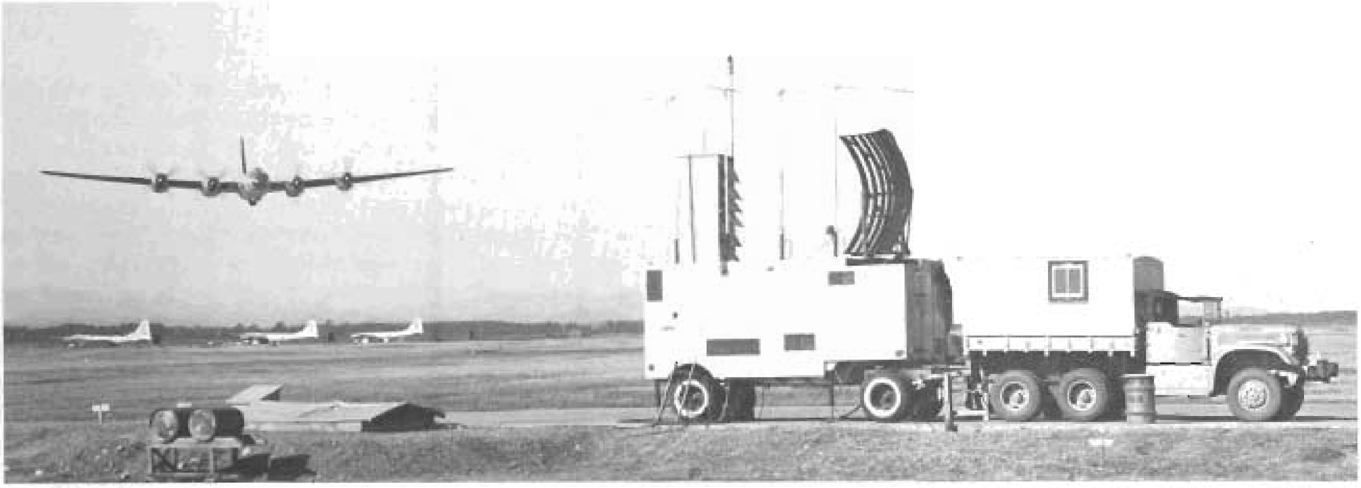
The number of AACS personnel involved with the air traffic control mission continued to increase throughout the 1950s until almost half of AACS's manpower was dedicated to tnis task. AACS personnel strength grew from 20,000 in 1951 to 29,000 in 1956, of whom nearly 13,000 were involved with air traffic control. They operated 2,000 facilities at approximately 250 strategic locations, nearly twice as many facilities as in 1951.

Despite the increased size and scope of Air Force activities since 1950, technological advances enabled AACS to provide more services at a larger number of bases with fewer personnel than previously possible with the older, more manual-type equipment.

Control tower construction was constantly and radically changing during the postwar years, both to improve effectiveness and to incorporate the improvements in electronics. Much of this research and development was directed by the Headquarters AACS Supply and Maintenance Directorate, Technical Division. A variety of improved consoles, power units, and recorders were developed and steadily improved, relieving the tower from its dependency upon the eyes and reactions of operators alone. Not only was landing and taking off made less hazardous, but these changes also enabled the Air Force to fly 24 hours a day regardless of the weather.

AACS installed, maintained, and operated radio and radar beacons, radio and radar ranges, and air-to-ground communications, which provided regulated highways in the skies. Aircraft used standard radio compasses to take bearings on radio beacons, while special receivers were needed to use the radar beacons and ranges. Air-to-ground stations along the routes provided a system of exchanging information with the aircraft through high frequency voice or radio telegraph transmissions. The pilot was kept informed of changing weather conditions, other aircraft in the area, and any necessary alterations in flight plans.

Ground control approach was one of the main navigational aids used by AACS units to bring aircraft into the base during bad weather. Here, members of the Women's Air Force work in a ground control approach trailer, May 1951.



A B-29 "Superfort" passes by a ground controlled approach unit.

Most of these navigational aids were operating on ultra high frequencies by 1957. High frequency radio had declined in usage because it lacked the selectivity and stability needed for air/ground communications. It experienced, however, a major comeback during the 1950s when improvements in single side band (SSB) techniques did much to eliminate these defects. Single side band modulation used less of the radio spectrum and could travel greater distances than the amplitude modulation equipment in use since World War II. These long-range capabilities led the Air Force to develop extensive point-to-point and air/ground high frequency networks utilizing single side band radios.

Beginning in 1951, all Air Force air/ground radio stations were converted from continuous wave Morse code to radio telephone. The smaller crew sizes on the new jet bombers did not allow for a radio operator, hence the conversion to voice communications. AACS was directed to install, operate, and maintain these integrated voice air/ground facilities on a global basis. The demands of both military and civilian agencies for use of the radio spectrum led to the adoption of the ultra high frequency band. It was used for short-range communications with aircraft as well as radio relay. Newly developed equipment permitted the rapid selection of a large number of channels. Its use was extended to NATO to enable all Allied military aircraft

Learning "stacking" procedure by hand was part of classroom instructions at Keesler AFB, Mississippi, that gave control tower operator students a good mental picture of the relationship of aircraft when traffic was heavy under inclement weather conditions and required instrument flight rules.

to communicate with one another and with each other's ground stations as well.

Ground controlled approach radar became the primary means of bringing aircraft in for safe landings when the weather prevented visual approaches. It was often used in conjunction with the Instrument Landing System which sent out a beam that aligned the aircraft with the runway and allowed for correct angle of descent.

AACS's air traffic control and navigational aids interfaced with those of its civilian counterpart, the Civil Aeronautics Agency-now called the Federal Aviation Administration. AACS maintained uniform procedures and standards of operations so that Air Force pilots flying anywhere would be familiar with its methods and equipment. The civil and military systems were generally interchangeable, except for those functions and equipment that were essential for performing missions unique to the Air Force.

This AN/FRN-12A very high frequency omnidirectional range (VOR) provided an infinite number of radial courses, thereby permitting great flexibility in the establishment of routes.

Improvements were also made in the avionics which interacted with AACS equipment and facilities on the ground. In the late 1940s, aircraft were equipped with detection and navigational radars of limited range and accuracy. Navigational aids included the Adcock four-course radio range and manual determination of the lines of position with LORAN. Voice communications between the airplane and the ground were transmitted primarily by low and high frequency radio.

This AN/CRD-6 ultra frequency, crystal-controlled, automatic direction finder operated on one of 10 preset channels and could be remoted. Its range was limited to line of sight.

By the end of the 1950s, air-to-ground communications used the electronic spectrum from low to ultra high frequencies. Modulation techniques included AM, FM, single sideband, data link, and digitalized command. Navigation aids used operational radio, radar, stellar, and inertial guidance systems. LORAN-C eliminated time-consuming manual operations by automatically computing the airplane's position. Not only were the position reports obtained quickly, a requirement in operating supersonic aircraft, but they were also more accurate.

The very high frequency omni directional range (VOR) was one of the early improved navigational aids. This omni directional radio range system told pilots their direction from the station by transmitting timed pulses at very high frequency. These signals, which travel in a straight line, did not follow the curvature of the earth and hence were limited to line-of-sight ranges.

The Tactical Air Navigation System, called TACAN, came into use in 1957. This system employed a ground radio beacon which produced a steady stream of ultra high frequency pulses that were received by a transponder in the airplane which translated the signal into the distance of the airplane from the beacon whose location was known. Some were later combined with VORS to create VORTAC. These systems eventually replaced most radio ranges, beacons, and direction finders. They were developed with AACS technical engineers working in concert with the Air Materiel Command, the Navy, and commercial firms.

AACS absorbed the Flight Service, one of its fellow five subcommands under the Military Air Transport Service on 1 October 1956. The two-fold purpose was to reduce costs and help standardize flight services throughout AACS's operations. Meshing the point-to-point flying aids of the Flight Service, which operated within the boundaries of the continental United States, with those of AACS outside the continental United States, was the first step in standardizing such services. Each overseas command was operating its own version of flight service at the time. AACS took over the personnel and equipment, designating the former Flight Service headquarters as the 1925th AACS Group (Flight Service) at Orlando AFB, Florida. Flight Service estimated that over $36 million in aircraft, flight time, and personnel time was saved during 1955 alone. The merger gave AACS 11 new functions. The three most important were flight clearance authority; inflight advisory service such as position reports, weather, and air navigation hazards; and the handling of aircraft movement messages and flight plans.

This facility is a tactical air navigation (TACAN) system.

During the 1950's, AACS employed various types of specially configured aircraft to flight test and calibrate navigational aids and flight control facilities. The AC-47D pictured here remained active in the command's inventory until 1962.

AACS maintained its own group of aircraft to flight check AACS-operated electronic aids in air navigation and air/ground communications facilities. It was necessary to ensure that these facilities were functioning within the tolerance levels required for the safe operation of aircraft by the Air Force. The majority of the aircraft, which were specially equipped with the necessary electronics, were used for these calibration functions. Some aircraft were assigned to the installation and maintenance squadrons for locating and evaluating new facility sites, while others transported mobile units to their destinations. A few aircraft were used for administrative support and did not differ from similar aircraft in other Air Force commands. In the late 1950s, AACS operated as many as 14 aircraft types with a total inventory of 86 aircraft.

Many AACS activities were esoteric and little known to many members of the Air Force it served. That was not true of air traffic control. Here a strong bond had been established between AACS personnel, who helped take the terror out of flying and the men who do the flying. One pilot wrote: "You'll never be able to describe what it means when you're lost up there—maybe with your fuel running low—and AACS comes through and brings you home. I'm not particularly a praying man, but many a time I've said 'God bless 'em' .... And sooner or later, every pilot does the same." An oft-quoted expression of the 1950's was that "AACS enabled the Air Force to fly when birds walked."

AIR DEFENSE

The expansion that AACS experienced during the Korean War continued through the end of the decade. Fear that the Korean conflict was only a prelude to a Soviet conquest of Western Europe led the United States to general rearmament in which the Air Force occupied a prominent position. Sixty-seven air bases were built overseas within striking distance of the Soviet Union while the combat size of the Air Force was more than doubled. These bases required long-distance communications as well as air traffic control and navigational aids. Consequently, AACS steadily increased its personnel strength to meet these new obligations.

Scientific changes greatly influenced AACS and served to direct it into new areas beyond its traditional functions. The Soviets had the atomic bomb by 1949 and detonated their first thermonuclear weapon in 1953. Jet aircraft rapidly replaced piston-engine aircraft. Air defense systems needed earlier detection, faster analysis, and more rapid and accurate communications to defend the North American continent against Soviet nuclear air attacks. Although AACS did not command or operate these systems, it did play an important part in their installation and provided the communications upon which their effectiveness depended. No longer a local affair, air defense covered the entire northern hemisphere and was dependent upon reliable long-distance communications.

This had not been true in the immediate postwar period when air defense systems were basically the same manned systems that had been used during the Battle of Britain in the critical summer of 1940. Short-distance radar scopes were watched by operators who directed defending fighters to their intercepts via voice radio. Control was passed to the next sector when the aircraft reached the edge of the radar scope. This slow, manual system proved adequate because the aircraft were subsonic.

The Base Air Defense Ground Environment system, called BADGE, was designed against jet aircraft. It was soon outdated when the launching of Sputnik I in 1957 demonstrated that the Soviets had the potential to develop an intercontinental ballistic missile with a nuclear warhead. When this weapon became a reality two years later, the warning time needed to defend against an enemy attack was now drastically cut to minutes. The Soviet missile threat led to the construction of the Ballistic Missile Early Warning System, known as BMEWS, which was able to survey the air space over the Soviet Union itself. Again AACS played an important role in the establishment of this new system by aiding in its installation and providing much of the long-distance communications that enabled it to function.

The requirements for Air Force communications were changing so rapidly and drastically that the basic systems and techniques which had once proved satisfactory were soon outdated. Adaptations and extensions of existing systems were no longer adequate. New capabilities had to be provided. Weapons, radar, and communications could no longer be operated as separate systems held together by human operating links. The need to reduce time lapse by the greatest amount possible and then attain the highest reliability called for stringent new requirements. New capabilities became possible with the electronic computer and the development of its associated data-processing, conversion, and transmission equipment. The electron tube, the transistor, and a common-language system of digital data gradually reduced the human functions to maintenance and decision-making.

The Semi-Automatic Ground Environment system, called SAGE, was the first to incorporate these new elements into a single system. Operational in 1957, it provided earlier detection, reliable identification, quicker and surer communications, deleted extraneous data, and presented the critical information in a form that enabled air defense commanders to make quick and accurate decisions.

Tropospheric scatter facilities were extensively installed from 1954 on to connect the radars of the Distant Early Warning Line, the Ballistic Missile Early Warning System, the Labrador-Newfoundland Air Defense System, and the Alaskan Air Defense System, known as Project WHITE ALICE. Tropospheric scatter was also extended to Western Europe. It was particularly valuable in the Arctic and sub-Arctic regions where it proved to be over 99 percent reliable even under those harsh conditions. Depending upon the size of the antennas and the power of the transmitters, their links could handle from 36 to 72 voice channels. The first of these systems was in operation only two years after completion of the initial study.

The long distances, rugged terrain, and the need for reliability required new technologies and techniques. Ionospheric scatter systems followed tropspheric scatter circuits and other programs were begun. A simplex test circuit, called Forward Propagation Ionospheric Scatter (FPIS), was set up between Labrador and Greenland to determine the feasibility of this technique. The success of this thousand-mile link in 1952 led to the employment of further extensions to Great Britain via Iceland. The system was completed in 1954.

AACS helped to engineer, install, and operate much of the communications that tied this complex system of computers, radars, and communications together. The Strategic Air Command the Air Defense Command operated the systems with their own communications personnel assigned, but AACS's involvement and participation with air defense systems led to its major participation in newer and larger long-haul communications systems.

ENGINEERING AND INSTALLATION

The 1823d AACS Group was established at Andrews AFB in 1954 to coordinate engineering, installation and supply efforts involved in providing new facilities. The Army Signal Corps had furnished communications and limited electronics support during World War II, but most of it was tactically oriented. The Army's Plant Engineering Agency did the limited amount of installation engineering needed since there were no massive or complex permanent installations involved. Often AACS found it necessary to perform its own installation, using its own personnel for the purpose. This system remained in effect until the Air Force became independent in 1947. Even then, the limited communications resources were shared by the Army and the Air Force on a pro rata basis.

The major air commands, the Air Weather Service, and AACS had been dissatisfied with both the Army Signal Corps service and methods. Consequently, the Air Force gave communications and electronics responsibility, along with its limited resources, to the commands. During 1950, AACS was given full responsibility for worldwide installation and maintenance of communications facilities under Air Force Regulation 20-51. However, other commands were to continue to perform this function until 1958.

Service improved under this system, but management control continued to suffer. There was little interchange on communications between commands other than that occasionally directed by Air Staff. As a result, there was little effort to assure standardization and eliminate duplication of systems.

There were 24 Air Force agencies, each with its own communications systems. When later attempts were made to join these systems together, extensive engineering was required because there were fundamental differences which prevented interface.

Each agency was beset with the problems of correlating the problems of each facility: construction, power, installation tools and machinery, personnel, funds, operational support, monitoring, as well as actually doing the installation. This decentralized method proved both uneconomical and unsuccessful. From 1950 through 1957, every program slipped drastically. There were approximately 8,000 Air Force personnel involved, mostly full-time, in these installation programs.

It was obvious that a single agency was needed to manage all Air Force engineering and installation. General Lemay, Vice Chief of Staff, picked the Air Materiel Command over AACS to command the new agency. The Ground Electronic Engineering Installation Agency, better known as GEEIA, was the result. Established in June 1958, this military construction organization began full-scale operations in July 1959. Initially, two out of every three people in GEEIA were from AACS. The entire 1823d AACS Group was reassigned to the new agency.

GEEIA supported 300 major air bases and 3,000 off-base sites around the world. Organized into Regions and Squadrons based at strategic location, it ensured maximum support in planning, programming, engineering, and installing fixed ground communications facilities-at a minimum cost. GEEIA consolidated all the Air Force's technical skills and set priorities. Most importantly, it ensured that the installed systems were technically compatible with related systems and capable of interfacing with them.

Headquartered at Griffiss AFB in New York, GEEIA provided centralized management of its decentralized units. Mainly a field organization, about 1,400 of its 5,700 personnel were engineers who traveled from site to site in the accomplishment of their tasks.

LONG-LINE COMMUNICATIONS

During the 1950's, AACS was retailored to meet the growth of Air Force responsibilities. Operations needed to be centrally coordinated for strategic control. Air Force personnel were deployed in 73 foreign geographic areas. The increase in Air Force strength, revised war planning, the vast increase in the number of aircraft flights, and the greater amount of intelligence and weather information required all served to overload the existing point-to-point and air/ground communications systems.

Air Force missions and operations, particularly after Korea, shifted away from the theater commander concept where joint operations and functions were centralized under a single commander. Instead, they now were under functional commands which exercised vertical control. The result was that each of the major commands, such as the Strategic Air Command, had their own communications networks tying their command headquarters in the United States to their activities around the world. This allowed them complete and instantaneous control of their components in a precise time frame, whether it was scheduling in-flight refueling, providing weather information, or conducting airlift operations. This was to change somewhat during the 1950s with the establishment of the Global Communications System (GLOBECOM). This system, which was to play a critical and important part in the Air Force Communications Network, was a project in which AACS played a key role.

Until 1947, AACS's pattern of operations for point-to-point communications was based upon the World War II-organized Army Command and Administrative Network. This system, called ACAN, utilized single-channel voice, teletype links, and torn-tape relays which were carried over both low and high frequency radio as well as wire. This system, outdated by its slowness and low volume of traffic it could carry, was replaced by GLOBECOM in 1951.

GLOBECOM was originally a modest program calling for the installation of a globe-encircling system of high power trunk circuits and modernization of the major AACS point-to-point circuits. Planning, which began in 1946, continued into 1950. The Korean War led to the expansion of the plan and caused Congress to free the monies needed for construction.

Construction began in 1951 with no agreement on the proper organization or management of the system. Nor was such an agreement reached even after GLOBECOM'S completion. AACS wanted it operated as a system under centralized control of one command to satisfy the long-line communications needs of all Air Force commands and activities. This could not be realized if the relay stations were operated by several different agencies. The fixed, or relay, stations were not to serve, by themselves, any specific airbase or command headquarters.

AACS was made responsible for installing, maintaining, and operating GLOBECOM, thereby fixing responsibility and ensuring uniformity in methods and

The Global Communications System, which was basically a radio system, was the first integrated communications system to span the world. Construction began in 1951. Pictured here is one of the system's torn-tape relay centers.

procedures. It operated the system in the same manner that American Telephone and Telegraph's Long-Lines Department serviced the entire Bell System. Therefore, it did not infringe upon the prerogatives of the various commands.

GLOBECOM was basically a radio system and was the first integrated communications system to span the world. It was an extension of the Air Force Communications Network which was primarily a continental wire system. Larger than any commercial system in the world, its cost of a quarter of a billion dollars by 1953 made it already about eight times the worth of the Radio Corporation of America and slightly more than that of Western Union. It came to represent one-half of AACS's effort and one-third of the Air Force's entire communications manpower resources.

It was an integrated and engineered system of interconnected Air Force radio stations, together with other leased commercial or allocated Army and Navy long-haul wire and radio channels, the necessary terminal equipment, relay facilities, communications centers, and cryptographic facilities. The facilities were all permanent and similar to civilian commercial systems. Internal, tactical, and special purpose communications systems of the various commands, used to accomplish specific missions within their organizations, were excluded.

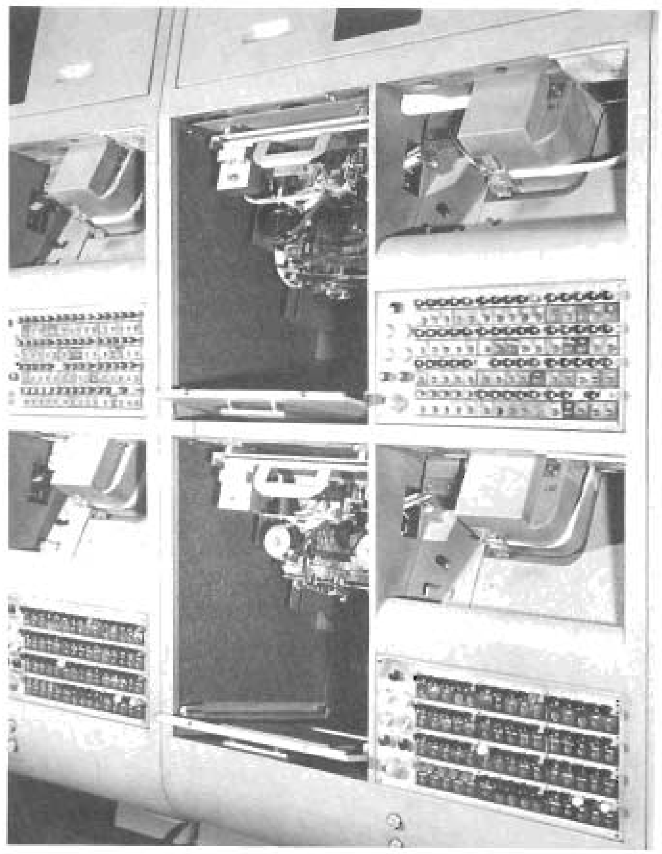
Its central nervous system consisted of seven main or "beltline" stations, which were interconnected by high-power, multi-channel radio circuits. Each station had spare multi-channel transmitting equipment to ensure reliability. Voice, teletype, and facsimile circuits, along with torn tape relay and offline encryption, were used on four-channel low and high frequency radio and landline circuits that employed semi-automatic switching. Linear amplifiers, boosting transmitter power to 50-kilowatts, were installed on special circuits to offset the effects of jamming and overcome adverse atmospheric conditions prevalent over the Atlantic Ocean. These beltline stations served 36 other stations.

Each GLOBECOM station had four separate facilities; a relay or message center and a technical control facility serviced by remotely located transmitter and receiver plants. The last two were placed far apart to avoid being affected by local noise or transmitters. Microwave connected them all because cable was expensive and difficult to protect in overseas areas.

AACS was designated as the responsible agency for engineering and the installation of all GLOBECOM facilities, except for those portions done under civilian contract. It operated all stations with the exception of several key stations in Europe and some in the United States which were operated jointly with other agencies. Those major commands that used the system were responsible for organizational and field level maintenance.

Each major command wanted individual ownership of all its own communications and support. But the quantum jump in the volume of communications and the sheer size of the networks they required, plus the skyrocketing costs, served to curb independent ownership of all command-needed communications.

Air-to-ground capability, added in 1952, allowed commanders to talk to aircraft up to 3,000 miles away. The system was renamed AIRCOM, which stood for the Air Force Communications Complex, in 1955. Under this system, both 16-channel single side-band facilities and 36-channel ionospheric and



This switching console of the Global Communications System was located at the Headquarters USAF Communications Center. Messages were received on perforated tape from the typing reperforators (center of photo), and were electrically relayed by depression of a selected button, using the transmitter pictured under the push-button panel, February 1956.

tropospheric-scatter systems were added. Four-channel multiplex circuits for high frequency radio and landlines became standard. Microwave relay systems with 24-voice channels, each channel capable of carrying 16 teletype channels, became common. The first fully automatic switching equipment was added in 1957. Operated by Western Union for AACS, these automated switches saved millions of dollars annually by eliminating the need for hundreds of operators. One operator could do the work formerly done by eight.

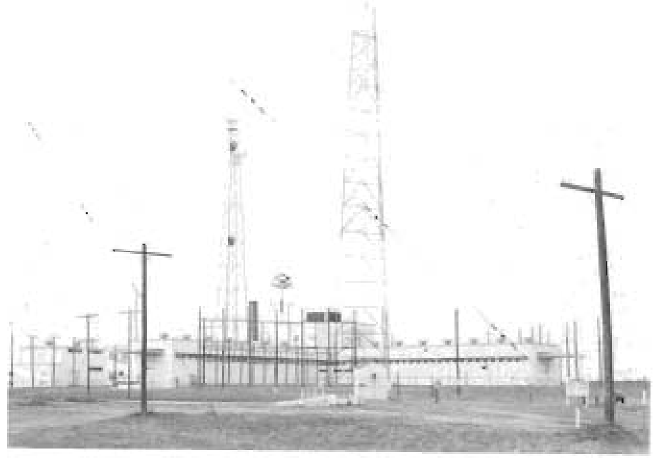
In 1956, AIRCOM was renamed Strategic Communications System or STRATCOM. It integrated the important military and civilian circuits and terminals, operated until then by other commands, with the GLOBECOM system. These included the Air Force Communications Network, the Air Force Operations Network, the Air Force Global Air-to-Ground Communications System, the Air Force Weather Teletype and Weather Facsimile Networks, the Air Force Global Weather Broadcasts and Intercept System, and the Strategic Air Command Communications Network. STRATCOM was a $350 million investment which handled a monthly average of 3.5 million messages and 232,000 aircraft contacts.

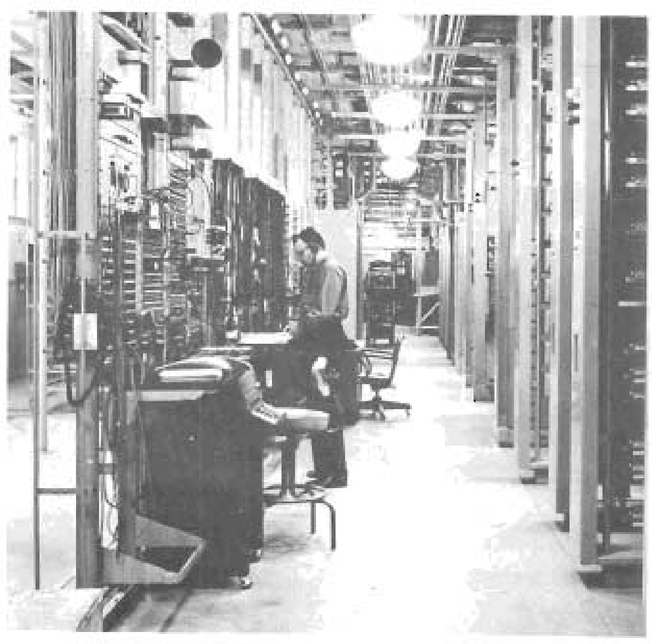
The terms GLOBECOM and STRATCOM were dropped in 1959 to return to the term AIRCOM. By 1960, the system consisted of 33 major and many minor stations, all of which were compatible with the Army and Navy portions of the Armed Forces integrated communications network. Messages were handled via speech, teletype, facsimile, Morse code, and data.

A new network was added to the AIRCOM system in 1960. Called the Combat Logistics Network, its purpose was to furnish the communications needed for the Air Force electronic data processing equipment programs. AACS was given full operational control and responsibility for the new network.

The Air Force Communications Network and the Air Force Operations Network were the busiest subsystems in the AACS-operated Air Force communications complex, known as AIRCOM. During the second half of 1960, relay stations of the Air Force Communications Network handled 33 million messages, while those of the Air Force Operations Network handled another 7.5 million. Altogether, AACS operated approximately 1,350 channels of communications that connected its major relay stations alone.

In 1955, AACS expanded the Global Communications System, and renamed it the Air Force Communications Complex. Pictured below are two types of transmitter stations and one of the system's terminal facilities.





The Air Force's nationwide, push-button communications system was inaugurated on 9 April 1951. The high speed telegraphic communications network linked 179 stations in the United States. Five switching centers replaced the 28 centers of the previous system. The Air Force leased the system from the Western Union Telegraph Company, but staffed it with its own operators. The five centers were the continental portion of the Air Command Communications Network.

MARS

AACS also became involved in a number of other communications and electronics programs. One of these programs, the Military Amateur Radio System, better known as MARS, was jointly formed by the Army and Air Force on 26 November 1948. In 1952, it was renamed the Military Affiliate Radio System. Its main purpose was to create interest among amateur civilian radio operators in military radio communications practices and procedures in order to provide a pool of trained personnel in case of national emergency. Its predecessor, the Army Amateur Radio System, was formed in 1925 with the coordination of the civilian American Radio Relay League. When all amateur radio broadcasting was terminated following Pearl Harbor, the program was disbanded. Many of the more than 8,000 civilians it trained in military radio procedures during its 16-year existence served as radio operators during the war.

Originally, membership in the Military Amateur Radio System (MARS) was restricted to off-duty active or reserve personnel, but on 26 September 1950, membership was opened to Federal Communications Commission-licensed amateur radio operators. MARS was to provide backup communications for normal military communications systems in times of domestic emergencies and to provide communication facilities for use in implementing contingency plans of the Army and the Air Force.

The MARS mission was enlarged in 1952 to allow transmission of quasi-official communications and messages from the Red Cross. It also served the Federal Civil Defense Agency and carried official Air Force message traffic during emergencies when established systems were not operating. During 1954, the Air Force Chief of MARS authorized mobile units capable of sustained operations for use at disaster scenes. By 1959, MARS was empowered to back-up all Air Force communications circuits which, in turn, brought it into the domestic contingency planning of the numbered air force in whose jurisdiction they resided.

The MARS program grew to over 8,000 members by 1956. The size of the program was outdistancing the ability of the MARS directors, one Air Force officer for each major Air Force command, to adequately and effectively control them. Therefore, the Air Force decided in 1955 to create a civilian MARS coordinator for each state to help manage the program.

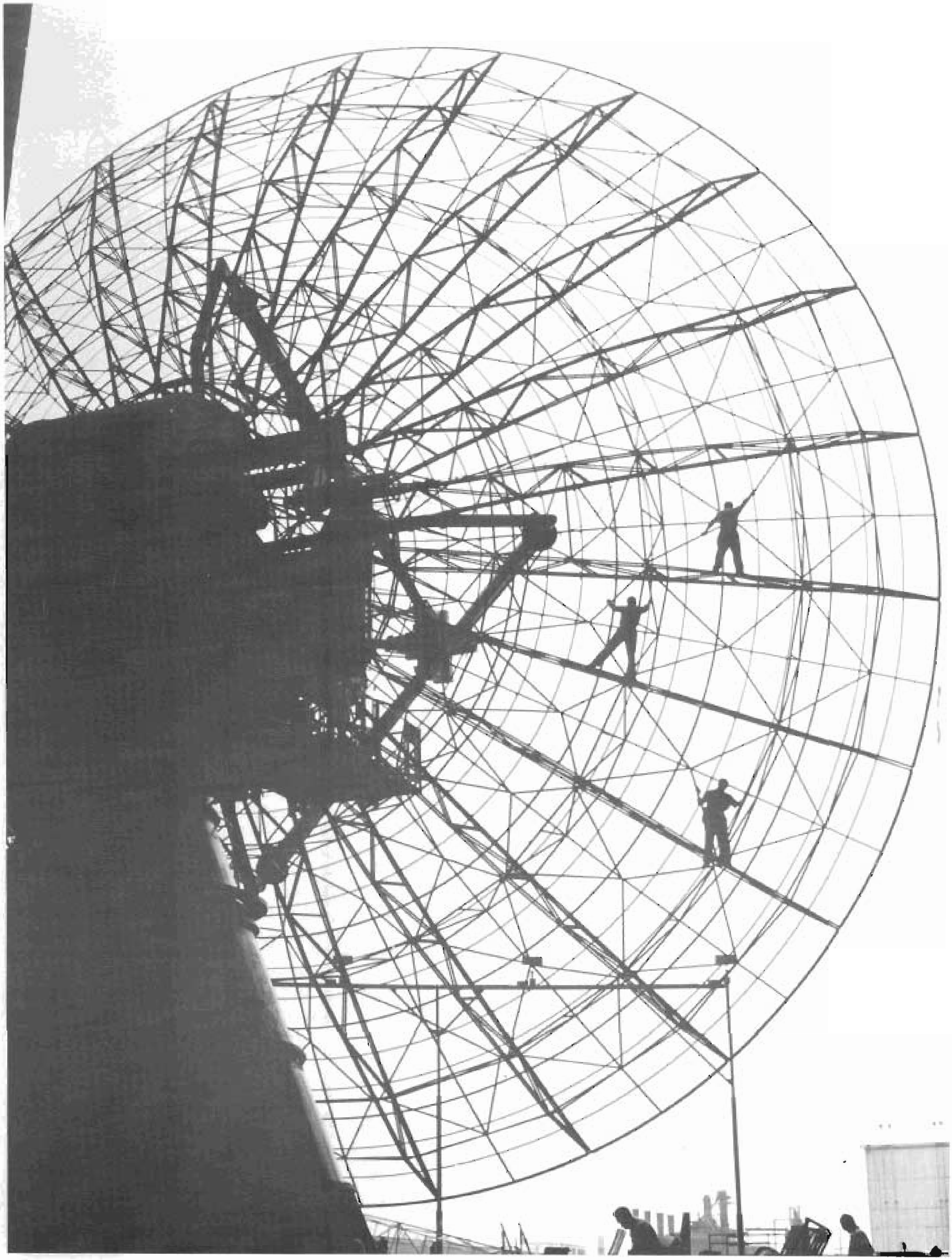
During the 1950s, the Air Force MARS program provided communications assistance during military operations and emergencies as envisioned by its founders. For example, MARS stations were authorized in Korea in 1953. A MARS station was established in New Zealand in 1956 to support Antarctic explorations during Project DEEP FREEZE. In addition, MARS members provided radio aid on many occasions during rescue operations following airplane crashes and during natural disasters.

The Military Amateur Radio System, better known by its acronym, MARS, was jointly formed by the Army and the Air Force on 26 November 1948. Here, Maj Gen Francis L. Ankenbrandt (left) and Maj Gen Spencer B. Akim try out the new system on 30 December 1948.

MARS stations have played an important role in Air Force communications since 1948, not only as a backup system but as a means of boosting morale. This station at Taegu, Korea, in 1955, was one of many which enabled servicemen to communicate directly with their facilities at low cost.

AACS was a key element in the postwar period throughout the 1950s. A whole new generation of highly sophisticated electronic facilities was available for handling the large quantities of data that were now essential for the centralized control of widely dispersed forces. Punched cards, perforated tapes, magnetic tapes, teletypewriters, computers and digitized voice transmissions—all were now reduced to a common digital form for transmission and reconstitution in any required form by the receiving station. Computers and machines could now talk to each other. Besides data transmission, AACS facilities of the Air Force Communications Complex were handling video, automatic switching, on-line encryption, and airborne command facilities to communicate with both manned and unmanned satellites in space.

From the essential but relatively limited functions it performed at the end of World War II, AACS's role and functions had expanded to the point that at the end of the 1950s its services were indispensable. AACS furnished the invisible hands that transformed men, missiles, and airplanes into air power.



AIR FORCE COMMUNICATIONS SERVICE
THE SIXTIES

ORGANIZATION AND MANAGMENT

The decade of the sixties marked both a challenge and a revolution in Air Force communications. Rapid advancements in electronic communication technology, coupled with dramatic changes in the world political situation, prompted the establishment of AACS as a major air command in 1961 and its simultaneous redesignation as the Air Force Communications Service (AFCS). The formidable developments in communications in the years immediately preceding the birth of AFCS created a need for new procedures and centralized management to assure that communication services would function in harmony with the new technology and that the United States would maintain its leadership in this vital field.

In past years, communications had been an integral part of the various military commands, and each commander owned and operated most of the facilities he needed to support his mission. The evolving character of military operations dictated centralized control over widely dispersed forces and the mounting costs of communications made individual command ownership and support increasingly prohibitive. By the late fifties it was apparent that command, control, and communications were inseparable and the Air Force had to find a way to achieve a new management concept for its growing global networks which already transcended geographic, political, and military boundaries.

The transition of AACS, administratively assigned to the Military Air Transport Service, to AFCS and its designation as a major air command was the result of an Air Staff decision and the last of three organizational steps taken by the Air Force since 1958 to improve the management of its communications. The first step, in 1958, included the creation of a central communications and electronics procurement and logistics agency, the Rome Air Materiel Area, and an organization to provide installation and engineering of ground equipment for the Air Force, the Ground Electronics Engineering and Installation Agency. Both of these new organizations were assigned to the Air Force Logistics Command and were located at Griffiss AFB, New York. The second step was the establishment of the Electronic Systems Division, formerly the Command and Control Development Division, located at L.G. Hanscom Field, Massachusetts. This organization was assigned to the Air Force Systems Command for development, integration, and procurement of command and control systems under the management of a single Air Force agency.

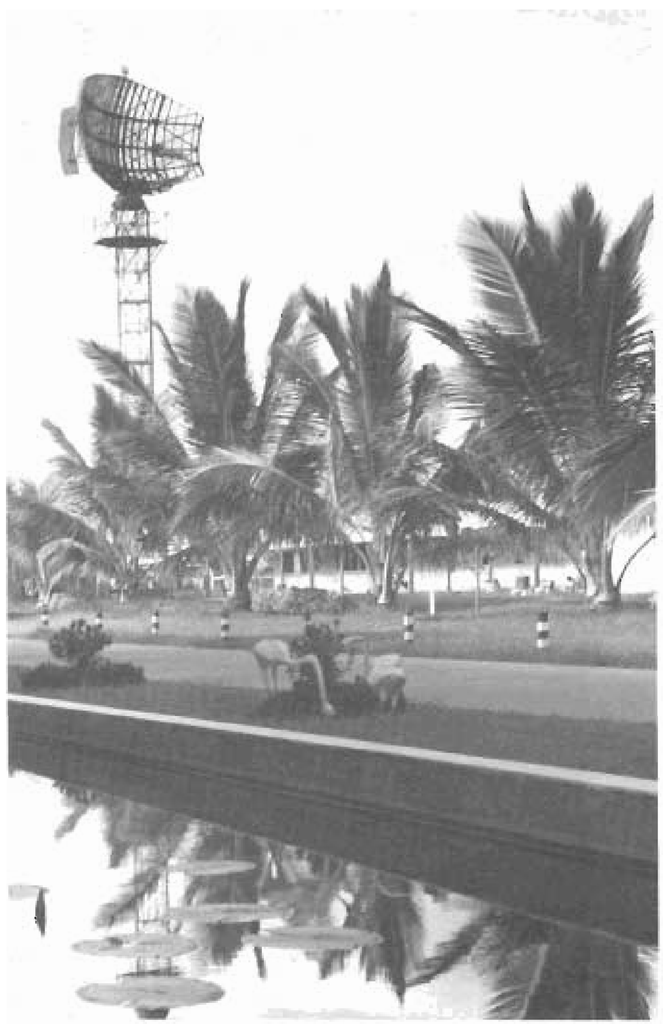
As a prelude to the third and final step in the reorganization of comunications management, the Air Force tested the feasibility of a "single manager" concept for meeting its communications needs by having AACS assume responsibility for all nontactical communications operated by the Pacific Air Forces and the Alaskan Air Command in 1959. Planners visualized that the acceptance of a single point for management of Air Force telecommunications would result in a potential reduction of more than 3,000 manpower spaces and annual monetary savings of nearly $8 million through more efficient employment of equipment and facilities. Despite such perceived advantages, the major reason underlying the transition of AACS into a major air command cannot be simplified to one of manpower and monetary savings. Rather, the desire to improve operational effectiveness and to keep pace with technological advancements dictated that the organizational structures of the Air Force be geared to meet the compressions of time and rapidly evolving requirements.

As a result of studies conducted throughout 1959 and 1960 which validated the concept of single management of Air Force communications, the Air Staff established AFCS as the Air Force's sixteenth major command on 1 July 1961 to absorb telecommunications responsibilities previously assigned to other major commands. This action was designed to be a time-phased transition over the next two years. The decision to organize Air Force communications on a global scale under a single manager was the result of AACS's more than 20 years of experience in developing communications specifically responsive to the needs of airpower.

AFCS continued to provide the basic services previously performed by AACS—air traffic control and long haul message handling—and began to gradually ex-

Providing communications in a variety of locations, from the remote radar unit in the central highlands in Vietnam (above), to the luxurious surroundings for this radar antenna installed at the Bangkok Air Traffic Control Center (below), required centralized management within the Air Force.

pand its ability to meet the global communications and flight service requirements of the Air Force. This expanded mission fell into four principle categories. First, AFCS coordinated most on-base communications systems, base cable plants, and maintenance networks. Second, long-line communications provided by AFCS included global radio, teletype, and telephone networks to link Air Force activities around the world as well as other special networks to transmit data from aircraft and missile early warning systems. Third, the air traffic control services of AFCS included both point-to-point and ground-to-air radio stations, airdrome control towers, precision radar approach control services, navigational aids, and flight service evaluations. Fourth, AFCS provided emergency mission support through its mobile units which could be quickly transported to any point in the world to establish essential communications, navigational aids, and air traffic control to support Air Force emergency operations.

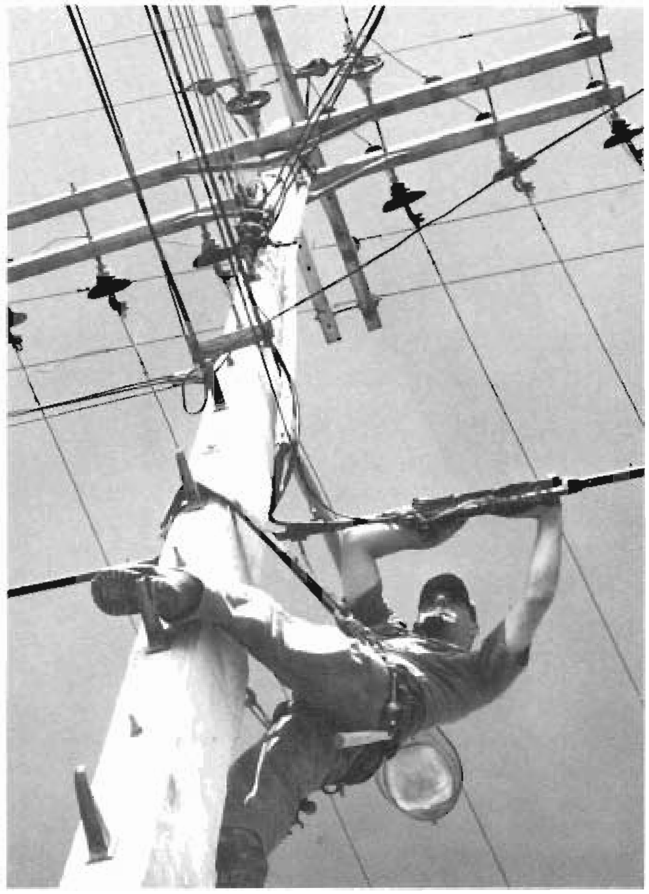


Appropriately, the ceremony at Scott AFB, Illinos, to officially recognize the new organization climaxed when USAF Chief of Staff Gen Curtis E. LeMay picked up a Pentagon telephone, probably the most common communications device, and welcomed both the new system for Air Force communications management and Maj Gen Harold W. Grant as its first commander. On the same day, the first of several planned management transfers occurred as AFCS assumed responsibility for providing communications to the Military Air Transport Service, the Air Force Accounting and

Finance Center, the Aeronautical Chart and Information Center, and the Caribbean Air Command.

Functioning as the most widely dispersed command within the Air Force, AFCS assumed administrative and operational responsibility for 11 lower echelon units, consisting of two areas, seven regions, the 3d Mobile Communications Squadron, and the 1865th Facility Checking Flight. The areas were the European, Africa, and Mid East Area and the Pacific Area, while the regions included the Alaskan, North Atlantic, Southwestern, Midwestern, Western, Continental, and Southeastern Regions. Organized unlike any other Air Force command, each AFCS area headquarters was comparable to a numbered Air Force and the independent regions equated in stature to air divisions.

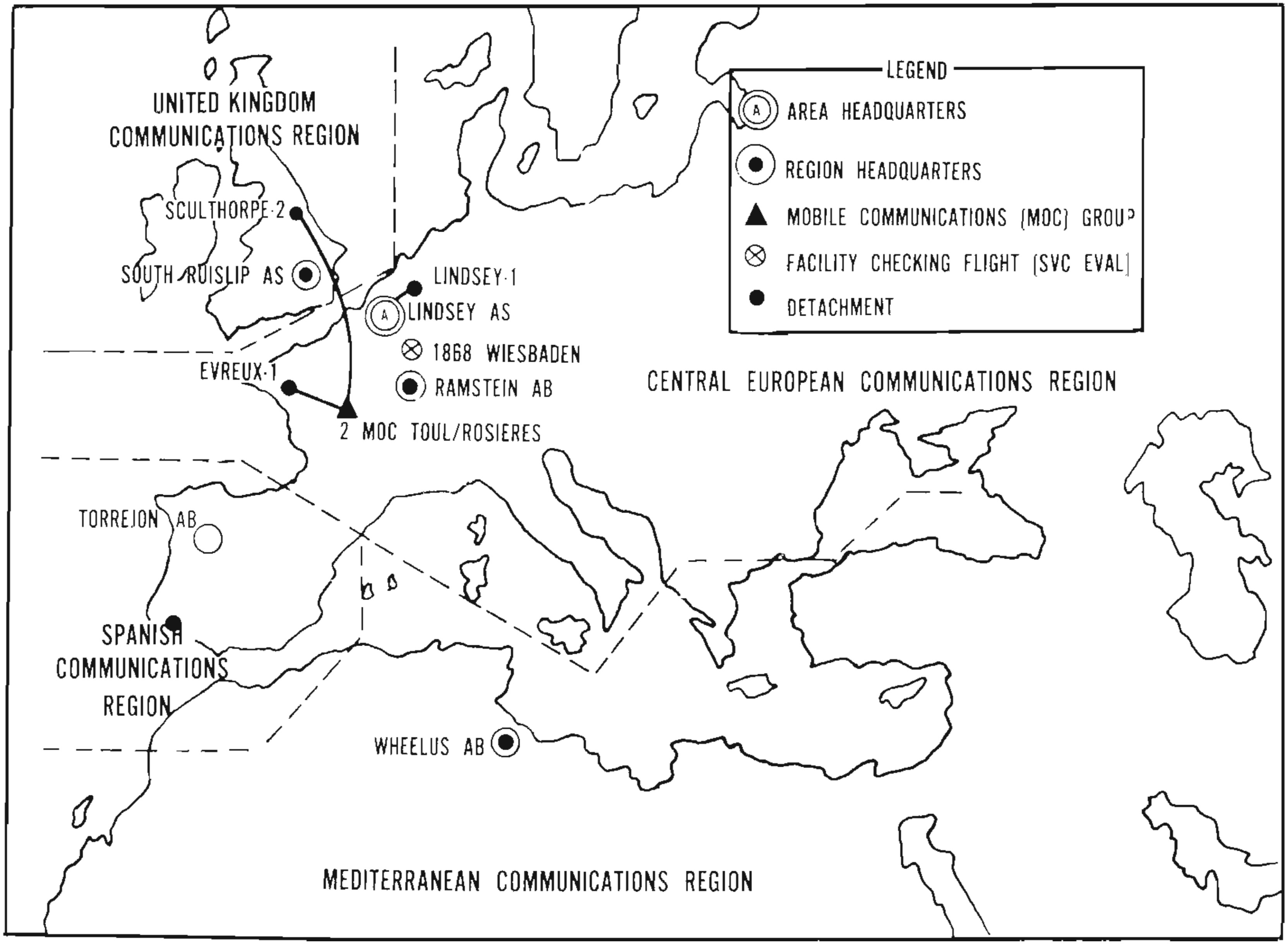
AFCS provided direct dialing systems throughout Vietnam and Thailand in the sixties.



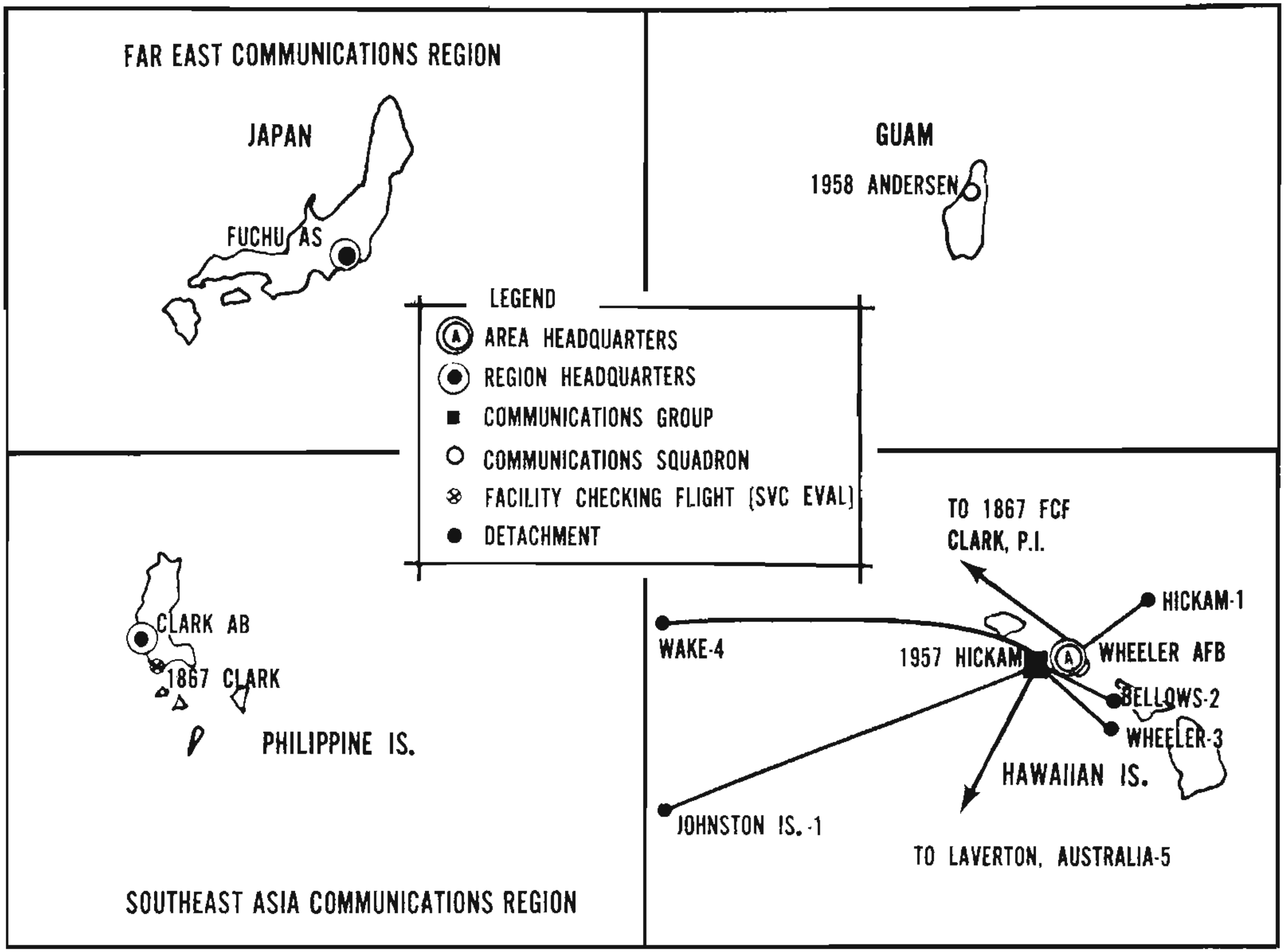
An AFCS technician splices cable on high wire to ensure efficient on-base communications.

AFCS air traffic controllers worked out of control towers such as this one at Pleiku AB, Vietnam.

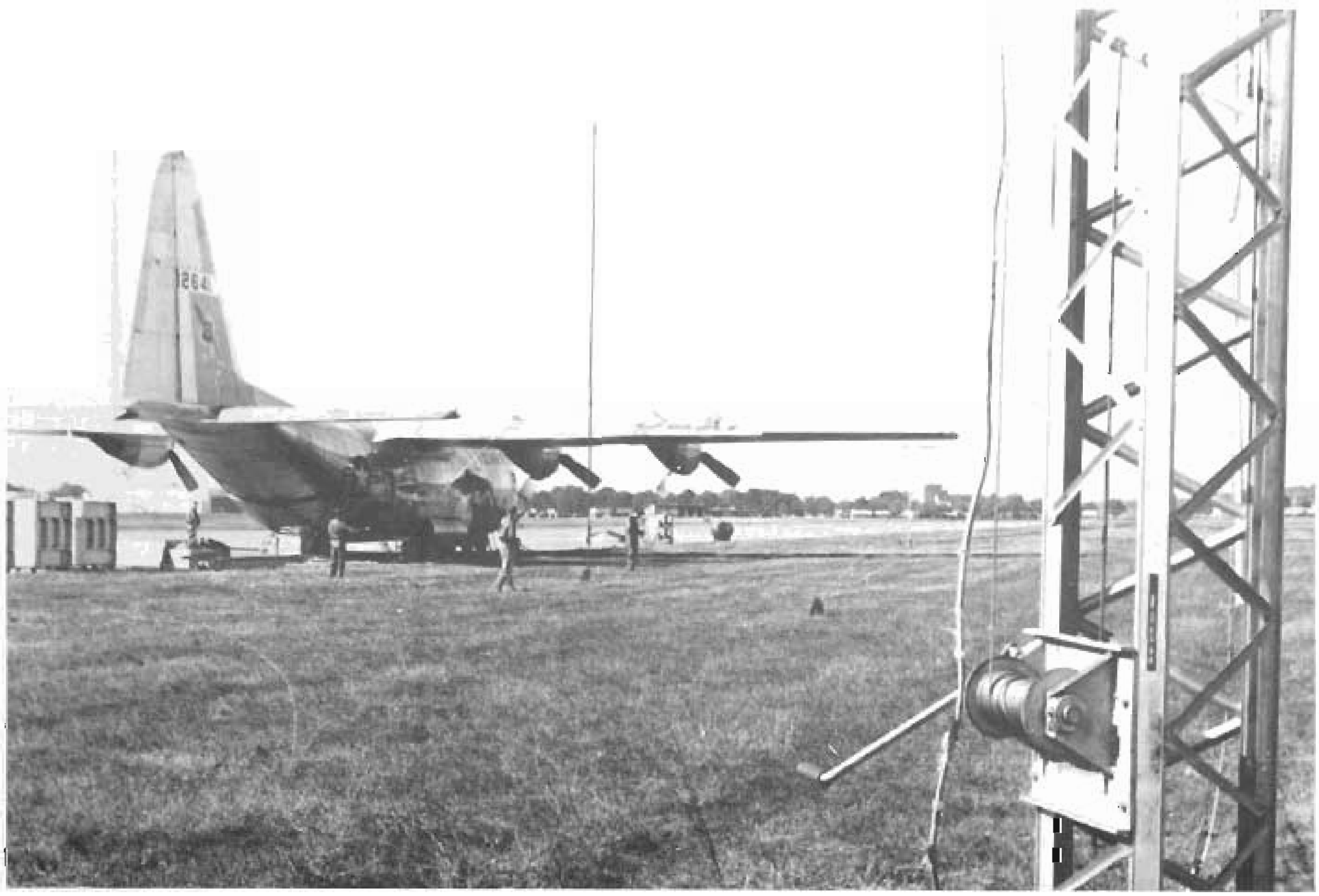
EUROPEAN-AFRICAN-MIDDLE EASTERN COMMUNICATIONS AREA



PACIFIC COMMUNICATIONS AREA



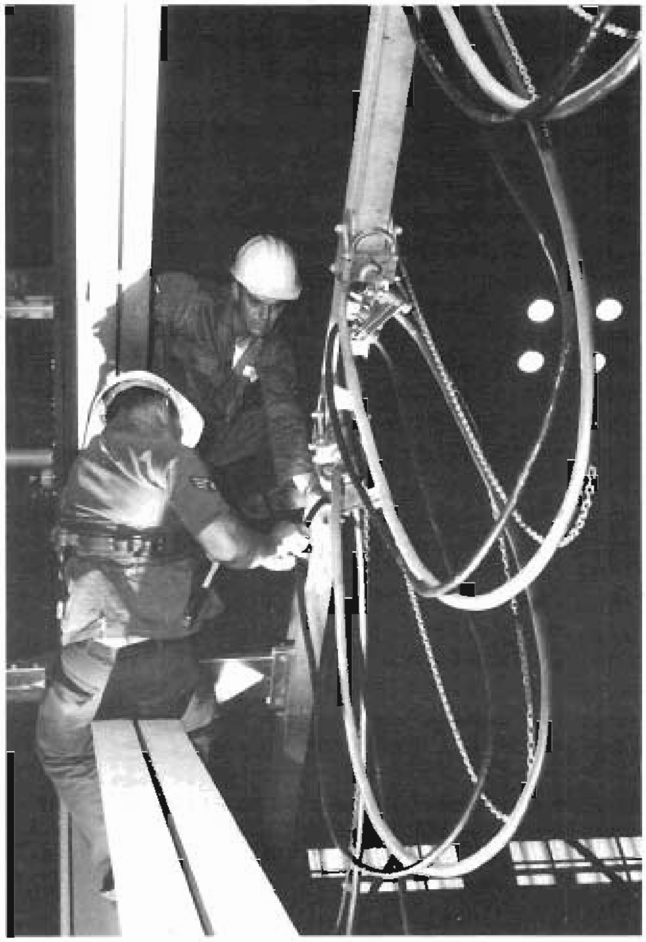
This mobile radar approach control unit provides essential navigational aid to aircraft.



The "Talking Bird" aircraft provided AFCS with the ability to establish essential communication facilities in a minimum amount of time.

The gradual consolidation of communication responsibilities continued during the next year when on 1 January 1962 AFCS assumed communication functions from the Air Force Logistics Command, the Air Force Systems Command, the Alaskan Air Command, Air University, Pacific Air Forces, the Air Force Academy, and the Air Defense Command's sites at Thule and Sondrestrom, Greenland. On its first anniversary as a major command, 1 July 1962, AFCS assumed communication responsibilities from the Continental Air Command, the United States Air Force in Europe, the Air Training Command, and began the first phase of the transfer of United States Air Force Security Service communications, a process not completed until the late seventies.

Attempts to assume the communications of the Air Defense Command and the Strategic Air Command, however, met resistence. The two commanders believed that the tremendous importance of the air defense and strategic bombing missions of their commands demanded that they own, control, and operate their own communications. Also, they believed that AFCS, as a growing and developing organization, would be unable to provide the high caliber of communications they required. On 1 July 1962, the Air Staff directed that participation of the Strategic Air Command and the Air Defense Command in communication consolidations would be held in abeyance indefinitely and the issue remained unresolved until the late seventies.

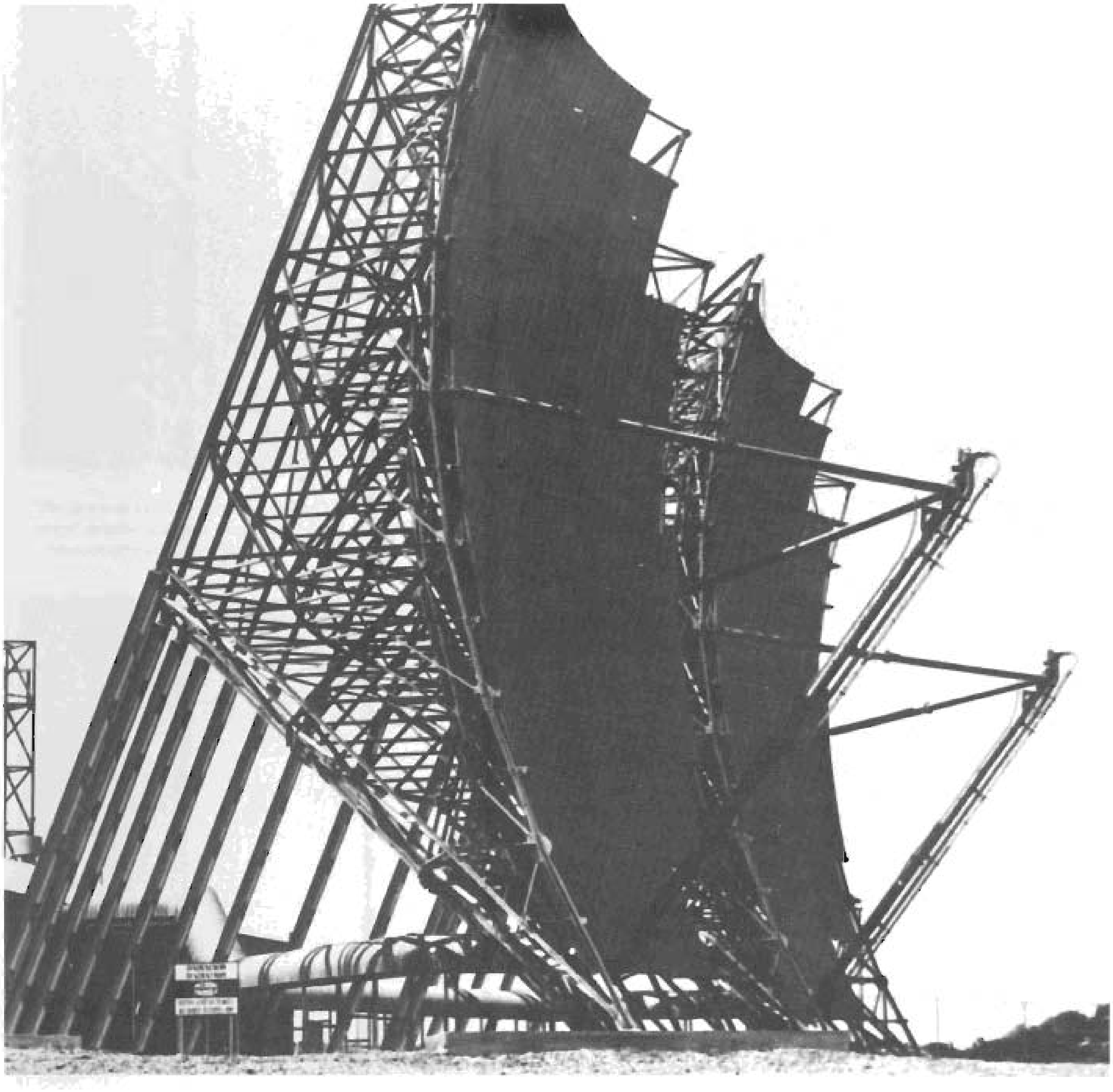


High riggers from the Ground Electronics, Engineering, and Installation Agency install cables on a mobile service tower at Cape Kennedy AFS, Florida, prior to a missile launch.

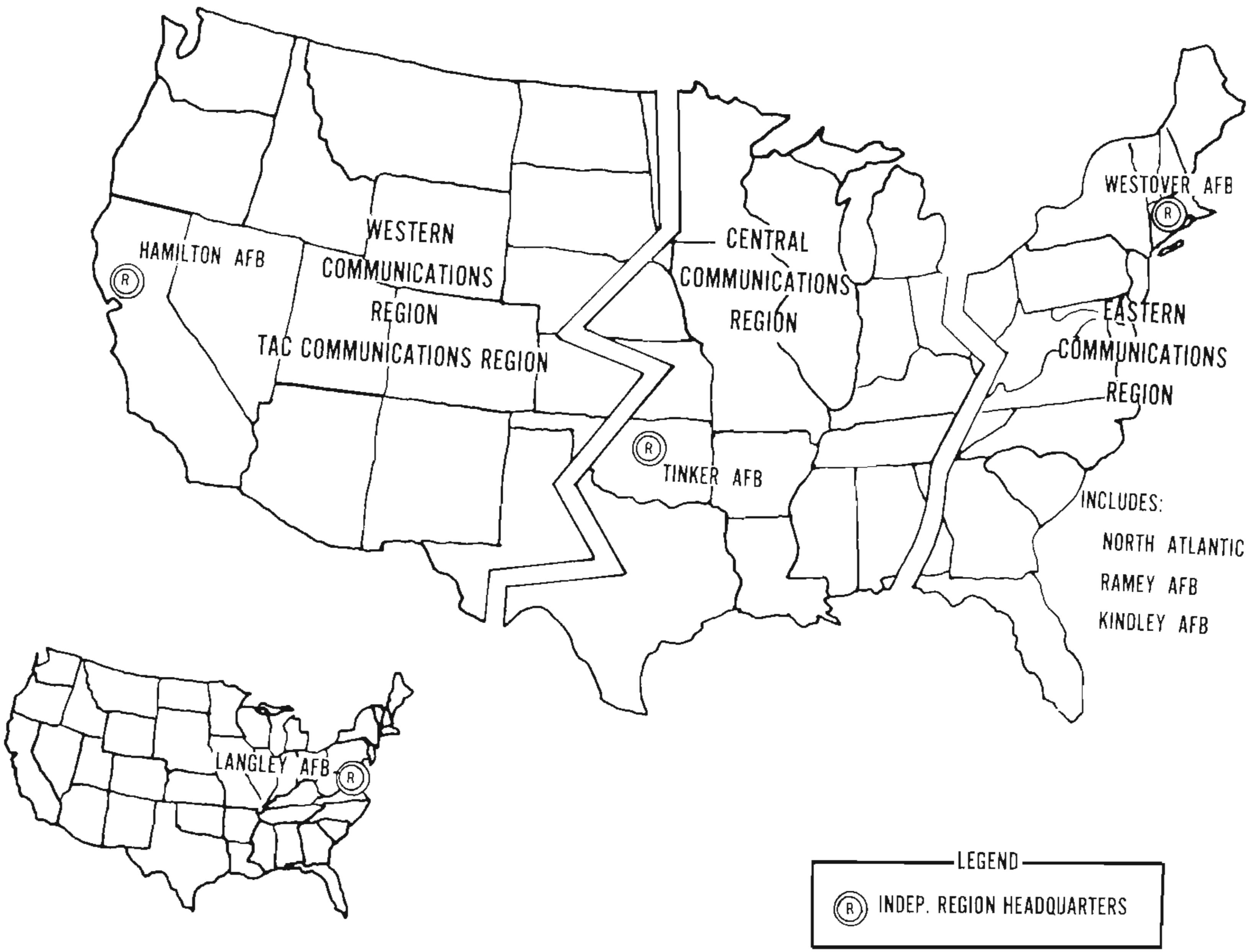
AFCS personnel worked closely with members of the Vietnamese Women's Armed Forces at the Binh Thuy AB switchboard.

On 1 January 1963, AFCS activated its first organization that provided direct support to an individual command when it established the Tactical Communications Region with headquarters at Langley AFB, Virginia. This new region assumed responsibility for the operation and maintenance of all fixed base ground communications, air traffic control, and navigational aids to support the operation of the Tactical Air Command. The formation of this region marked the end of the rapid, phased growth of AFCS and the command paused to consolidate its gains.

On 1 July 1963, in an effort to simplify internal command channels, reduce the number of intermediate contact points, and lower costs, AFCS deactivated three of its communication regions located within the United States: the Midwestern, Southeastern, and Southwestern Regions. The command also redesignated the North Atlantic Region as the Eastern Region and the Continental Region became the Central Region. Five years later, on 1 July 1968, AFCS redesignated its European, Africa, and Mid East Areas as the European Communications Area.



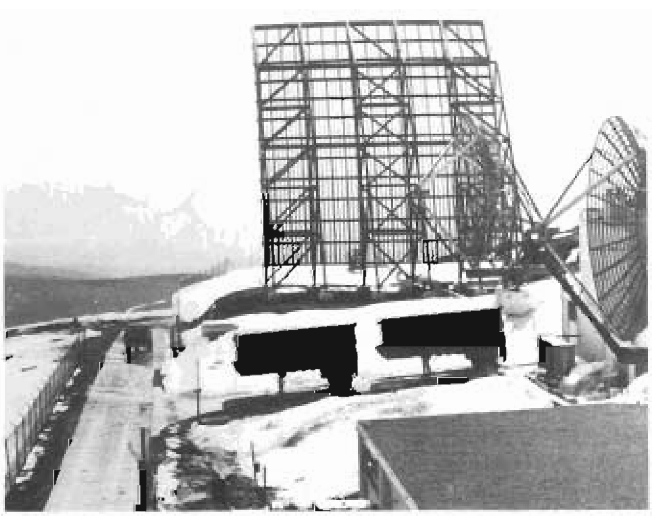
Development of tropospheric scatter technology was only one of many innovations in communications handled by AFCS in the sixties.


WESTERN COMMUNICATIONS REGION
TAC COMMUNICATIONS REGION
HAMILTON AFB
CENTRAL COMMUNICATIONS REGION
TINKER AFB
WESTOVER AFB
EASTERN COMMUNICATIONS REGION
INCLUDES:
NORTH ATLANTIC
RAMEY AFB
KINDLEY AFB
LANGLEY AFB
LEGEND
INDEP. REGION HEADQUARTERS

An increase in personnel paralleled the absorbtion of communication responsibilities in the sixties. By December 1961, AFCS possessed slightly over 32,000 communication and air traffic control technicians, 30,000 of whom were former members of AACS, while the other 2,000 came from initial consolidation actions. By June 1962, the commmand total reached 36,480 and by December 1963, AFCS boasted 50,149 members, surpassing the World War II high point of AACS. In June 1970, because of the war in Southeast Asia, the total strength of AFCS reached 57,825 people, a sum not equalled again until 1985.

The rapid growth in the early sixties, which had to be maintained and then accelerated because of the Southeast Asia conflict, brought with it a number of personnel problems.Compared to an Air Force average of 47 percent, 80 percent of jobs in AFCS required people possessing highly technical skills. The resultant demand for well trained people strained the ability of the Air Force to recruit and retain the requisite numbers of qualified people.

Worldwide commitments compounded AFCS's personnel problems by creating an imbalance of personnel stationed overseas and at remote or very isolated locations, such as parts of Alaska. Perched sometimes on impassable and completely isolated mountain peaks strategically located throughout the world, these lonely, remote sites provided a vital link in a network of radio relay stations. One third of all AFCS personnel assigned to the Alaska Communications Region were stationed at remote sites. At some locations, the temperatures rarely rose above 50 degrees and winds occasionally approached 70 miles per hour. The airstrip at Cape Newenham, Alaska, ran up the side of a mountain, at an incline steeper than many planes could climb. A junior officer stationed there in the late sixties called it a "test of character" to live at a remote site. These locations became a strange kind of small community for AFCS people.



Providing worldwide communications required that many AFCS personnel be stationed at remote sites. A narrow road provides access to this remote site at Elmadag, Turkey.

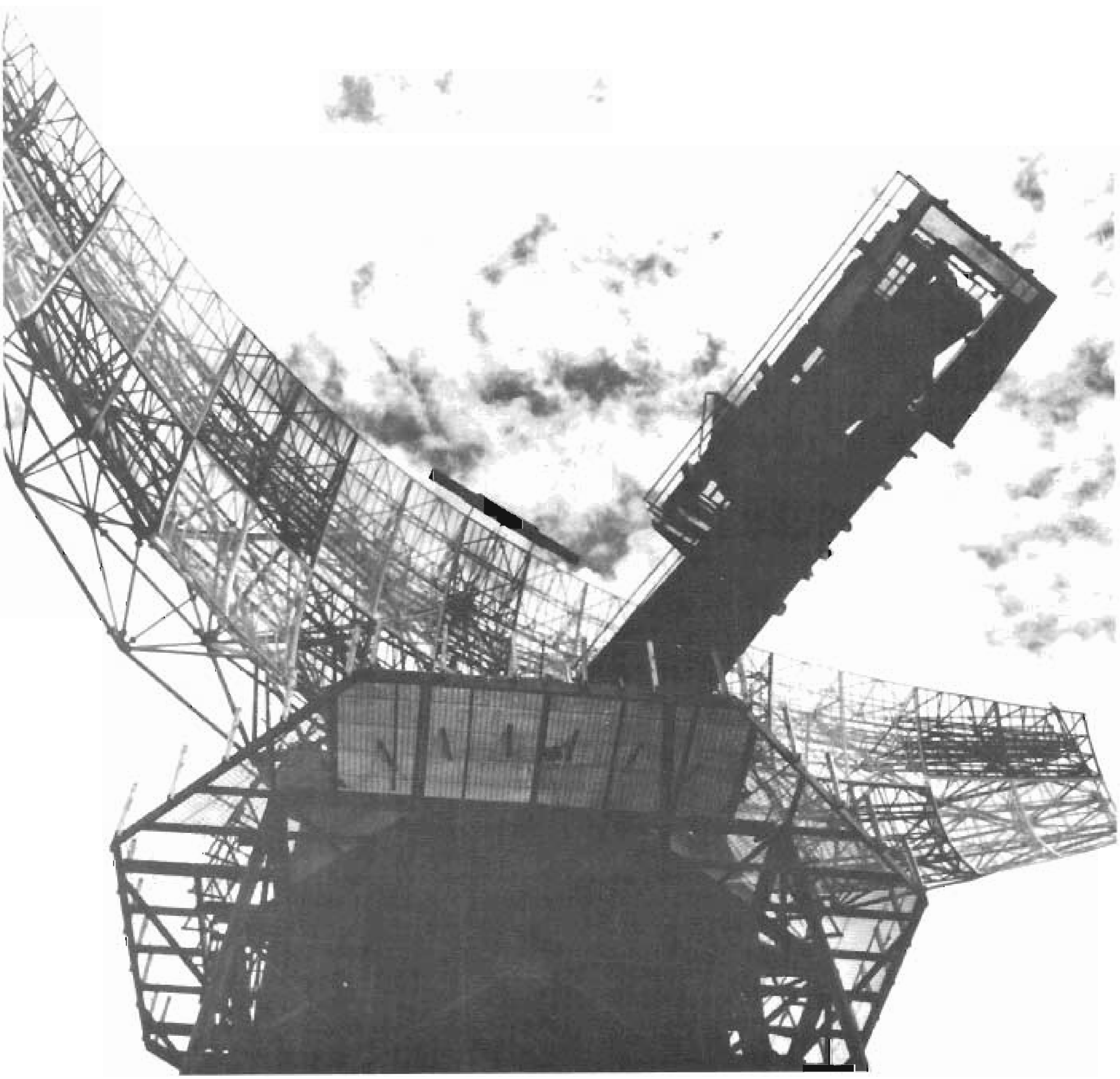
Intensified air traffic figures in the sixties required an increase in training efforts by AFCS.

The war in Southeast Asia also placed severe demands on AFCS's personnel system. In addition to meeting its other worldwide responsibilities, the command had to rapidly increase its strength in the Pacific to keep up with the expansion of United States involvement in Southeast Asia. These deployments, combined with long term requirements for communications in that part of the globe, created serious shortages among personnel who could be assigned to other areas.

This combination of factors—rapid growth in the early sixties, highly technical jobs, worldwide commitments many of which were at remote sites, and the war in Southeast Asia—pinched AFCS throughout the decade. Lack of trained personnel resulted in low skill manning in some career fields, increased training requirements, and reduced personnel stability, all of which adversely affected morale and retention and increased operating costs. Gone were the days of World War II when the command could recruit ham radio operators to operate its equipment, which in comparison to the highly technical facilities of the late sixties was relatively simple. A partial solution to its manning problems was increased system automation, an answer which the command increasingly pursued in the sixties and into the seventies.

OPERATIONS

Upon its activation in 1961, AFCS assumed a four-faceted mission. As already mentioned, this included providing on-base comunications, long-haul communications, air traffic control services, and emergency mission support. By the late sixties the communications explosion was exceeding the population explosion and necessary improvements were evident, largely as a result of developments spurred by AFCS. The use of computers that permitted large scale data recording and analysis and the introduction of miniaturized electronic components using integrated and high-speed data circuits opened new avenues in the communications field. Predictions indicated that in the seventies satellite communications, refined frequency stabilization, complete circuit encryption, and standardization and automation of equipment would greatly increase the speed and efficiency of communication systems. Such developments were possible due to the emphasis AFCS, as the single manager for Air Force communications, placed upon testing and acquiring new facilities.



This large radar antenna was only one of a multitude of modern communication systems managed and developed by AFCS in the sixties.

ON-BASE COMMUNICATIONS

As one of these key areas of support, AFCS was charged with the responsibility for establishing procedures and techniques for operating facilities associated with base communication functions. This included such equipment as telephone exchanges, record communications centers, base cable plants, public address and intercom systems, intrusion alarm systems, and vehicular radio systems. On-base facilities also included terminal connections with long-haul communications, the maintenance of on-base logistics computers at some bases, and the maintenance of radio and television stations at major overseas bases. These communication services were customized to meet the needs of each of the more than 200 Air Force bases served by AFCS throughout the world.

In addition to performing such routine functions as standardizing base telephone directory services, switchboard operations and procedures, AFCS assumed the responsibility for operating the Air Force weather system.

Before 1960, Air Force communicators had recognized the need to modernize and expand weather networks so that they could satisfy present and future requirements. In 1962, AFCS converted the Weather Communications Center at Tinker AFB, Oklahoma, from manual to semi-automatic operation and commissioned it to receive and transmit weather data from 143 strategically located stations. Establishment of this system made Tinker AFB the central military weather data collection and relay point within the United States. AFCS monitored the progress of the weather network station at Tinker AFB and developed a program to expand and modernize the command's weather intercept facilities to meet foreign weather data requirements.

As the Department of Defense expanded its efforts to provide more weather transmission services, the Automatic Weather Network began operating in July 1965. As a worldwide computer system, this organization collected and edited weather information and distributed this data to military forecasting facilities. Three dispersed automated digital weather centers, operated by the AFCS personnel and located at Tinker AFB, Oklahoma; High Wycombe AS, England; and Fuchu AS, Japan, provided these services for the Air Force.

In November 1969, the Carswell AFB, Texas, automatic digital weather switch replaced the similar facility at Tinker AFB and became the focal point for the

This storm-detection radar, an AN/FPS-77, was part of the Air Force weather network, operated by AFCS.

Automatic Weather Network. Carswell AFB received weather data from all over the world and transmitted it to the Air Force Global Weather Central at Offutt AFB, Nebraska. There, forecasts were developed and sent to individual users through the Automatic Weather Network.

In providing communication services to a variety of commands and locations, AFCS found that some of its needs could best be met through the use of civilian contractors. As a new major command, AFCS was concerned that new communication systems be fully tested before accepting operational responsibility for them. Within the military structure, AFCS depended on the Electronics Systems Division of the Air Force Systems Command for the latest information on the development and design of communications equipment. Despite the resources available through this command, the trend towards civilian contractual operation and maintenance of Air Force communications that appeared in the late fifties required AFCS to develop a system for coordinating its affiliations with commercial organizations.

Information from this UNIVAC tape facility at Carswell AFB, Texas, provides a complete history of transmissions in the Automatic Digital Weather Switch.

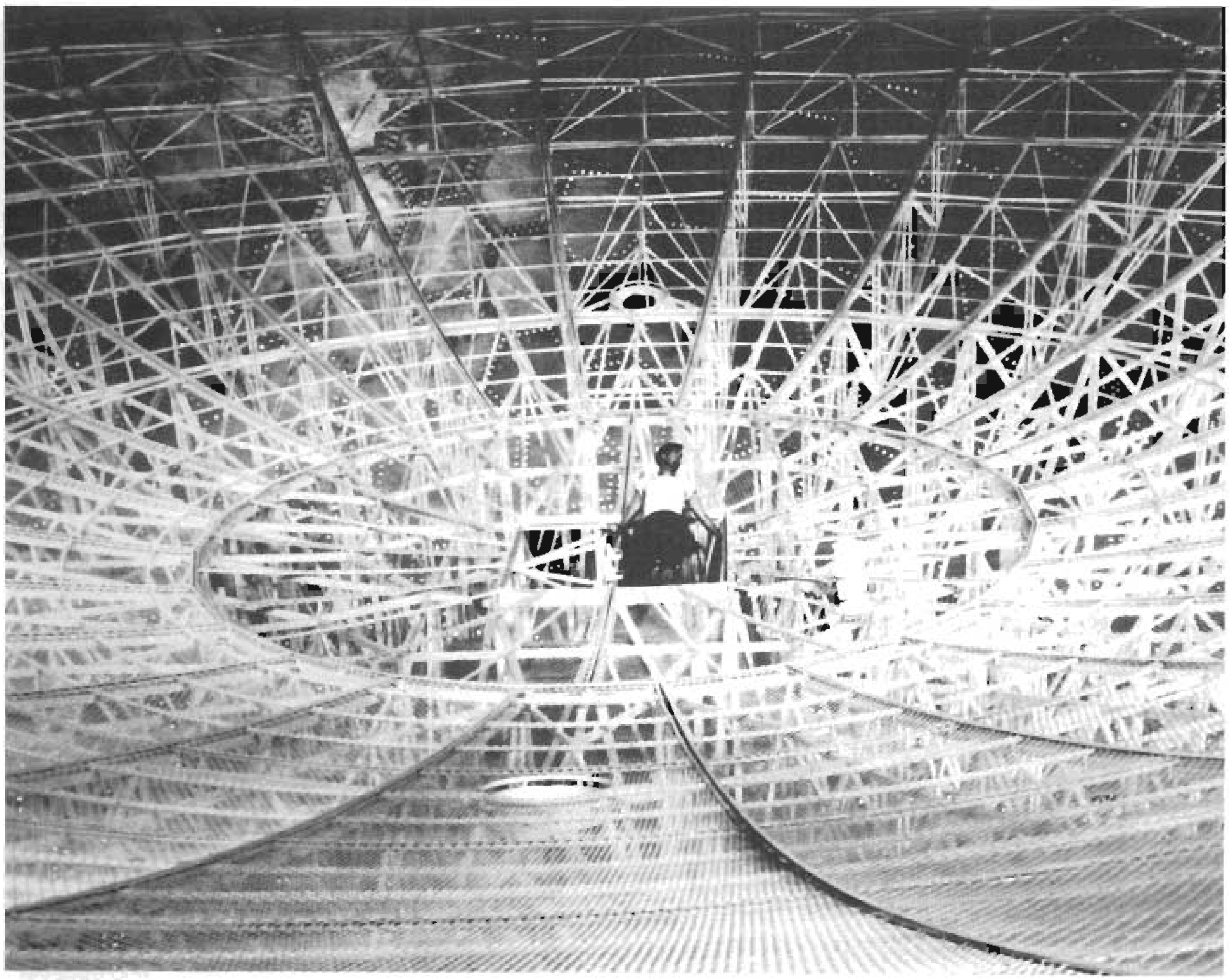
Maj Gen Russell K. Pierce, Jr., Commander of the Global Air Weather Service and Major General Paul R. Stoney, AFCS Commander, cut the ribbon that officially accepted the Automatic Digital Weather Switch at Carswell AFB, Texas, in 1969.

Because the Air Force was the largest customer of commercially leased facilities within the continental United States, the dispersal of responsibility for ordering leased commercial communications among 18 different agencies that existed in the late fifties was a cumbersome and inefficient method of meeting defense needs. In January 1961, to rectify this situation, the Secretary of the Air Force ordered a gradual consolidation of commercial communications with AFCS to be the sole leasing authority for the Air Force. The results of this consolidation were immediately evident, and by June the effort had already resulted in a savings of $4 million. On 1 July 1961, the Office of Commercial Communications Management was established at Colorado Springs, Colorado, and assigned to AFCS, with responsibility of negotiating, ordering, and managing leased communication services for all major commands. On 1 January 1962, the Office of Commercial Communications was transferred from Colorado Springs to Scott AFB, Illinois, and collocated with AFCS headquarters. Subsequently, the Air Staff redesignated this organization as the Defense

Commercial Communications Organization on 31 December 1962. Under direct authority of the Defense Communications Agency, this organization became the focal point for leasing all commercial communications throughout the Defense Department, and AFCS lost this function.

By 1964, it was obvious that a central management point of contact between the Air Force and the Defense Commercial Communications Organization was necessary, due to the rapid increase in annual expenditures for leased communications. In fiscal year 1960, the Air Force spent approximately $122 million for leased communications, but by 1964 this had increased to nearly $191 million. As a result, AFCS assumed management responsibilities for coordinating Air Force leased communication requirements with the Defense Commercial Communication Organization.

An AFCS airman operates the UNIVAC 1004 high speed printer and reader. This small computer is used in the Automated Weather Network for transmitting weather data.



This huge radar antenna is used by RCA to train personnel and test equipment for the Ballistic Missile Early Warning System. RCA was the prime contractor to the Air Force on this project to give prompt warning of enemy missiles approaching the United States from over the polar regions.

LONG-HAUL COMMUNICATIONS

The first year of operation for AFCS was one of continuous testing and steady progress towards "single management" of the most extensive military communications network in the world. Rapid advancements in weapons system technology and control and support techniques brought increased needs for a rapid exchange, categorization, and display of data. Long-haul communication services provided by AFCS included record and voice systems as well as satellite and tropospheric scatter radio communications for the Air Force.

In the sixties, AFCS was also involved in the development of a long-range proposal for measuring and evaluating the performance parameters and capabilities of the communication systems it operated and maintained. In February 1968, the command completed testing of technical specifications for a new program aimed at improving future system engineering, dubbed SCOPE CREEK. This program expanded into the seventies and served as a focal point for determining areas that needed improvement.

AFCS airmen check equipment in the "Plan 55" Automatic Teletype Relay at Andrews AFB, Maryland. Incoming teletype messages, received at 60 to 100 words per minute are read, automatically "switched" across the center at a rate of 200 words per minute, and sent to the addressee at the speed his equipment will receive it.

AUTODIN

In the fifties AACS developed an advanced system to provide point-to-point and ground-to-air communications for the Air Force, known as AIRCOM. In 1961, the new command assumed operational responsibility for this system, the nucleus of which was a 10-station network of Plan 55 automatic communication relay centers. Despite increased capabilities from earlier years, there existed a need to integrate all command teletype traffic into a single network. A study conducted by AACS in 1960 revealed that there were 13 major networks within the continental United States. As a result, AFCS recommended that it be designated the implementing command to integrate these networks into a single long-haul transmission system.

In addition to problems created by the dispersion of individual networks over many commands, the manual operation of these systems hampered effectiveness and speed of service. To alleviate this situation, AFCS demonstrated a prototype of a new system in 1961, the Combat Logistics Network, designed to be an automatic, fully electronic, transistorized, high-speed data communications network. Plans indicated that

A communications center specialist operates a UNIVAC 1004 AUTODIN computer.

The Air Force established a new era in long-haul communications when it activated the Automatic Digital Network, commonly known as AUTODIN. Here, Air Force personnel work in the switching center at McClellan AFB, California.

this would be the largest and most advanced digital data system in the world, with a capability of connecting 450 bases, air stations, and civilian suppliers.

By November 1962, the first Air Force Data Communications (AF DATACOM) center opened at Norton AFB, California, replacing the Combat Logistics Network station. With a second center activated at McClellan AFB, California, in December, AF DATACOM served as the initial increment of an even more extensive data system to be known as the Automatic Digital Network (AUTODIN). As the first high-speed, digital communications system to use advanced techniques of information handling in the Air Force, AF DATACOM enabled subscribers to send messages originating from teletypewriters, punched cards, accounting machines, paper tapes, and magnetic tape devices. The system used automatic electronic switching centers to convert the differences in codes, formats, speeds, and control, as well as to forward priority messages.

In February 1963, when the AUTODIN network became fully operational, AFCS initiated the most extensive communications data system ever built. With the primary objective of integrating the advancements in automatic switching into a single long-haul system, AUTODIN would make use of all circuitry available at any given time for fulfilling the priority of the user.

Introducing equipment that would transmit and receive messages in a variety of formats was one of the advanced features of the AUTODIN network. Here, an airman prepares a message on paper tape.

As originally constituted, AUTODIN could handle seven million punched cards daily, the equivalent of 100 million words, and could exchange data freely between a variety of information forms. To handle the gigantic capacity of the AUTODIN network, AFCS managed five automatic switching centers, located at Norton AFB and McClellan AFB, California; Tinker AFB, Oklahoma; Gentile AFS, Ohio; and Andrews AFB, Maryland. By the end of 1963, the system was already saturated and the Secretary of Defense approved 14 additional switching centers to enhance AUTODIN's capacity.

The development of high-speed, inter-base record communication systems provided the most dramatic accomplishments in communications in the early sixties. Department of Defense communications progressed rapidly toward use of fully automatic switching systems, yet the lack of effective base communications impeded rapid message delivery.

As demands for more rapid and accurate communications increased, AFCS responded by coordinating Air Force and Defense Department efforts to implement and expand the entire long-haul communications network. Rapid increases in the volume of AUTODIN traffic, exemplified by a 66 percent increase in total activity during 1966 was a matter of crucial concern due to the inability of facilities to handle the traffic loads. To alleviate this problem, AFCS ordered new computers which would allow card, paper tape, and magnetic tape media to transmit and receive AUTODIN traffic.

The chief of operations for the 2187th Communications Group at Aviano, Italy, checks tapes from the electronically controlled Digital Subscribers Terminal Equipment.

Upon its activation in 1961, AFCS assumed control of telephone systems for the Air Force. The next ten years witnessed many advancements in providing an internal telephone capability for the entire Defense Department with AFCS providing the initiative in development. Here, operators connect calls at the Washington switchboard in the USAF Communications Center at the Pentagon.

AUTOVON

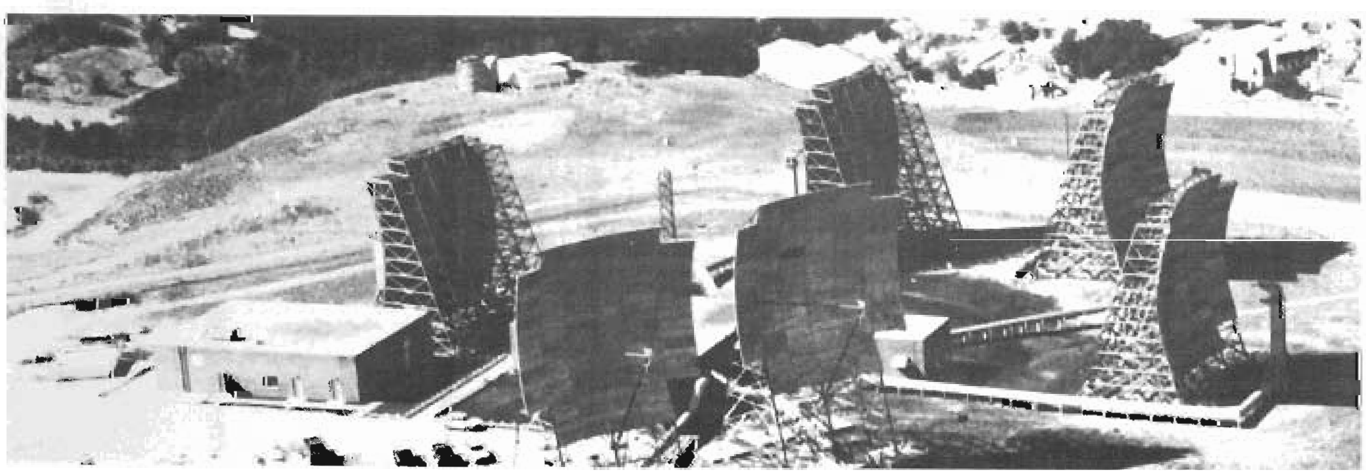
Another major development began in 1963 when the Automatic Voice Network (AUTOVON) was activated in December. Derived from the Army's Switched Circuit Automatic Network, AUTOVON was designed to provide the Defense Department with an internal telephone capability to replace toll and WATS calls and to allow precedence preemption for high priority users.

During World War II communications between major commands were conducted through high frequency radio with only a few channels available. Following the Korean War a number of radical changes occurred with a profound impact on communication requirements. Development of the AUTOVON network represented one of the most significant and comprehensive telecommunications programs ever undertaken by the Defense Department. While the dedicated circuits used in earlier networks provided good response time, weakness in survivability and reliability was a significant problem. The loss of a single circuit between two points disrupted communications between subscribers and each termination placed on the dedicated circuit required a separate instrument.

Although the AUTOVON network continued to expand rapidly, the Defense Communications Agency placed a moratorium on the installation of any new AUTOVON access lines in February 1965 due to the lack of inter-machine trunking facilities at some bases. This situation was gradually remedied and the Air Force was operating 1,249 AUTOVON access lines by the middle of October. For further expansion, the command ordered 869 more lines as well as completed plans for providing AUTOVON services to Alaska during the year.

The maximum funding effort directed in support of Southeast Asia limited progress in modernizing telephone systems throughout the Defense Department, yet AFCS continued to expand the AUTOVON network wherever feasible throughout the sixties.

There's more to using the phone than just dialing a number. A constant check on telephone circuitry is necessary to ensure that phone service is kept reliable. Here, a telephone repairman checks a trouble call to keep the AUTOVON network running smoothly.



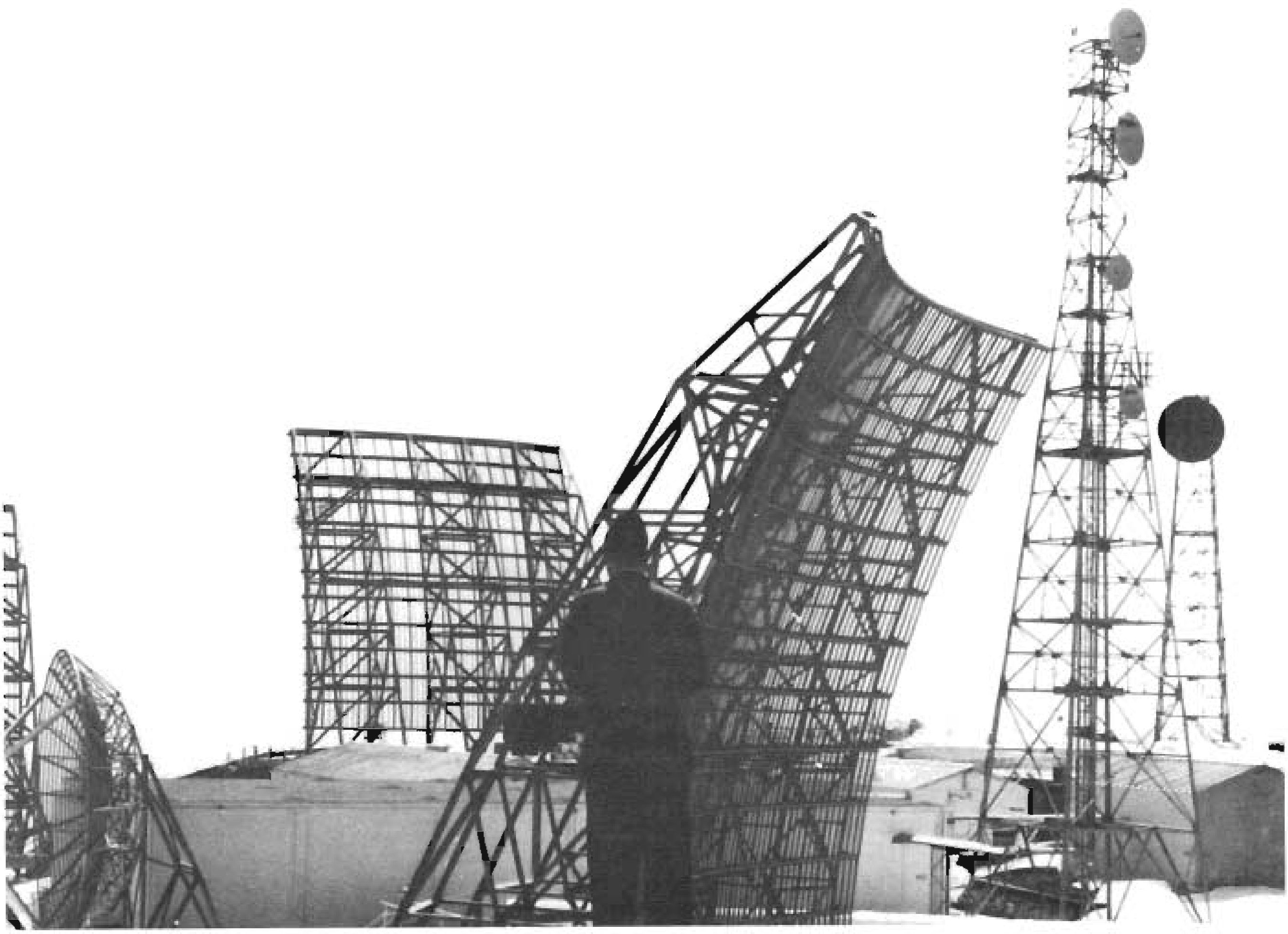
Development of tropospheric scatter technology in the sixties allowed AFCS to erect sites throughout Europe, vastly increasing the long-haul communication ability of the command. This site, at Humosa, Spain, provided both tropo and AUTOVON services to the Spanish Communications Region of the European Communications Area.

TROPOSPHERIC SCATTER AND SATELLITE COMMUNICATIONS

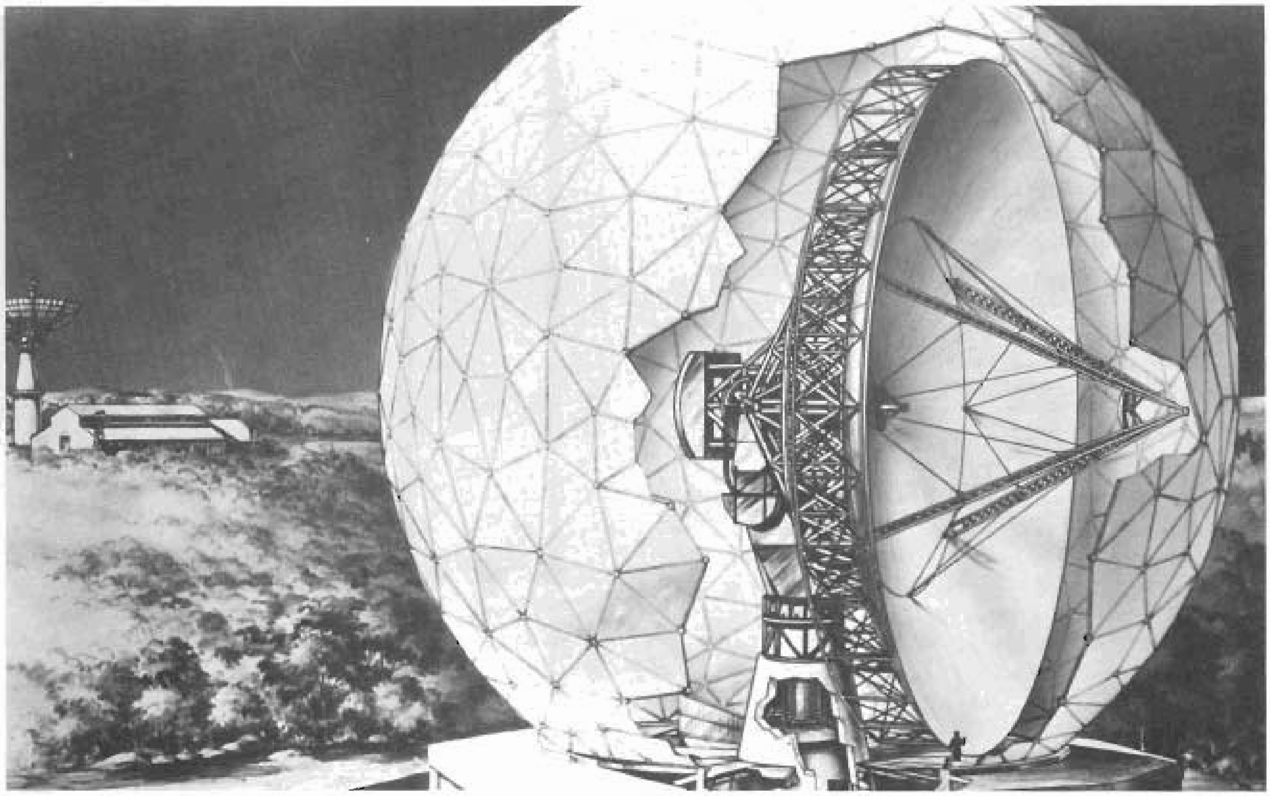
AFCS worked to expand its research and development efforts in the recent evolution of satellite and other advanced techniques of long distance communications during its first months as a major command. In 1961, AFCS personnel activated the first Forward Propagation Tropospheric Scatter circuits into Sondrestrom, Greenland, and added new stations to the Ballistic Missile Early Warning System in Alaska. Integration of these facilities into the White Alice tropospheric scatter system provided Alaska with the most modern, flexible, and reliable communications system of any military theater.

Development of tropospheric scatter technology expanded AFCS's ability to meet long distance communication requirements with increased economy, accuracy, and efficiency. With the lowest area of the atmosphere as its environment, tropospheric scatter used the distinctive layers of temperature and moisture content to reflect and refract radio energy.

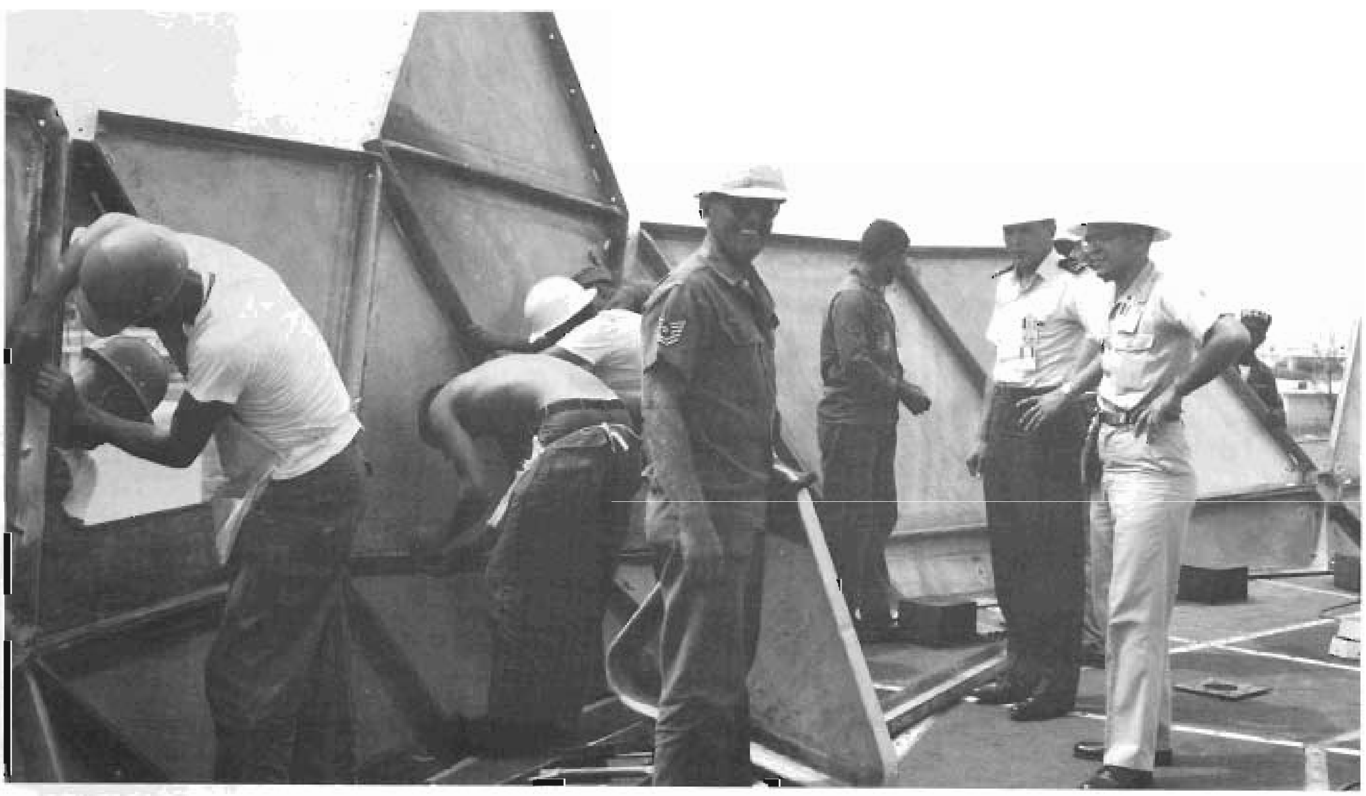
An AFCS technician makes equipment adjustments in a tropospheric scatter van used in SEATO exercises in 1963.



A Turkish native looks over the various antennas used at this main control station at Elmadag, Turkey, maintained by AFCS for communications systems throughout the country.



New developments in sensitive satellite communication equipment in the sixties required a parallel development of protective devices. This diagram depicts a fiberglass and aluminum metal frame radome to provide protection from wind pressure and other environmental factors for the saucer-shaped antenna.



Construction of a radar dome at Patrick AFB, Florida.

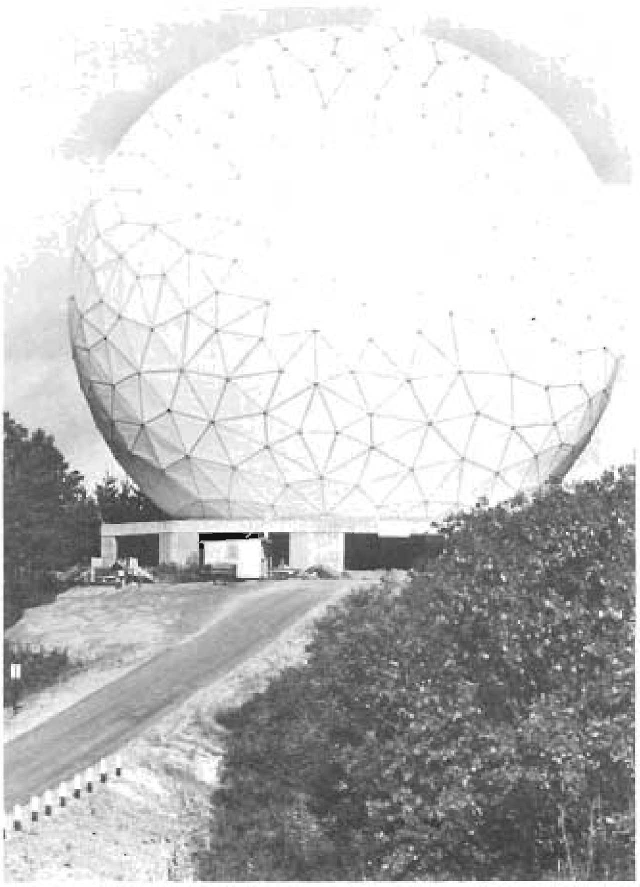
The introduction of powerful transmitters and sensitive receivers permitted the transmission of many separate telephone conversations and telegraph messages over a single radio signal which was relatively free from atmospheric interference.

As data processing and management techniques became more sophisticated and demanding, communication requirements were expected to grow at a pace far beyond the 10 to 25 percent per year growth rate in the early sixties. To meet these increased demands, microwave and tropospheric scatter systems played a dominant role and served as both a primary and backup means of reliable transmission. As a result, it was imperative that these new techniques and equipment possess the sophistication and capabilities required to support high-density digital data networks.

Military use of satellite communications became a reality in 1967. Under a project labelled the Initial Defense Communications Satellite Program, AFCS activated its first satellite terminal, an AN/MSC-46, at Clark AB, Philippines, on 1 July 1967 and placed a second in operation at Brandywine, Maryland, in November.

Improvements in satellite communications systems proceeded and by November 1968, tests performed by the 3d Mobile Communications Group proved the feasibility of a mobile ground satellite communication terminal (the AN/TSC-54), with an 8,000-mile range of reception and transmission. In July, additional tests by an AFCS KC-135 aircraft flying above Antarctica demonstrated the feasibility of long-range tactical communications between aircraft and satellite by communicating through the Lincoln Experimental Satellite.

The increasing demand for satellite communications prompted the Air Staff to direct AFCS to establish an Air Force planning office for testing and development of new systems. By April 1969, AFCS accumulated sufficient equipment and facilities to activate the Satellite Test Control Terminal at the Belleville, Illinois, Communications Annex to Scott AFB.



This aluminum and fiberglass radar dome protects a communications and space research antenna in Massachusetts.

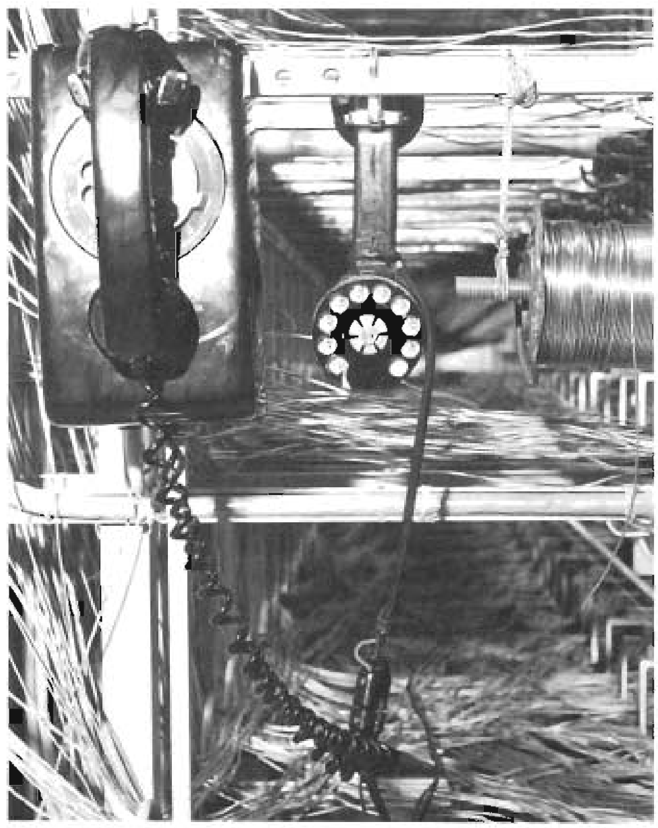
GEEIA member construct a microwave antenna at Izmir, Turkey, for use by AFCS.

LONG-HAUL COMMUNICATIONS IN ALASKA

As part of a series of Defense Department management consolidations, the transfer of the Alaska Communications System from the Army Signal Corps to AFCS occurred on 1 July 1962. Since the Air Force already had the major communications responsibility in Alaska, this was a natural move towards a more efficient and economical situation. As the system operator in Alaska, AFCS gained a network of long-line communication facilities supporting both military and civilian needs, as well as the developing radar systems on the Alaskan borderlands. Radar stations designed to spot flights of enemy bombers stretched across the northern rim of Canada, Alaska, and Greenland. Known as the Distant Early Warning Line, radar readings were fed into an electronic control center, the Semi-Automatic Ground Environment, with computers programmed to display air attackers and their positions, direct interceptors to their targets and launch missiles within seconds.

Ice and snow driven by the severe arctic winds accumulate on antenna supports at Cape Lisburne AFS, Alaska.

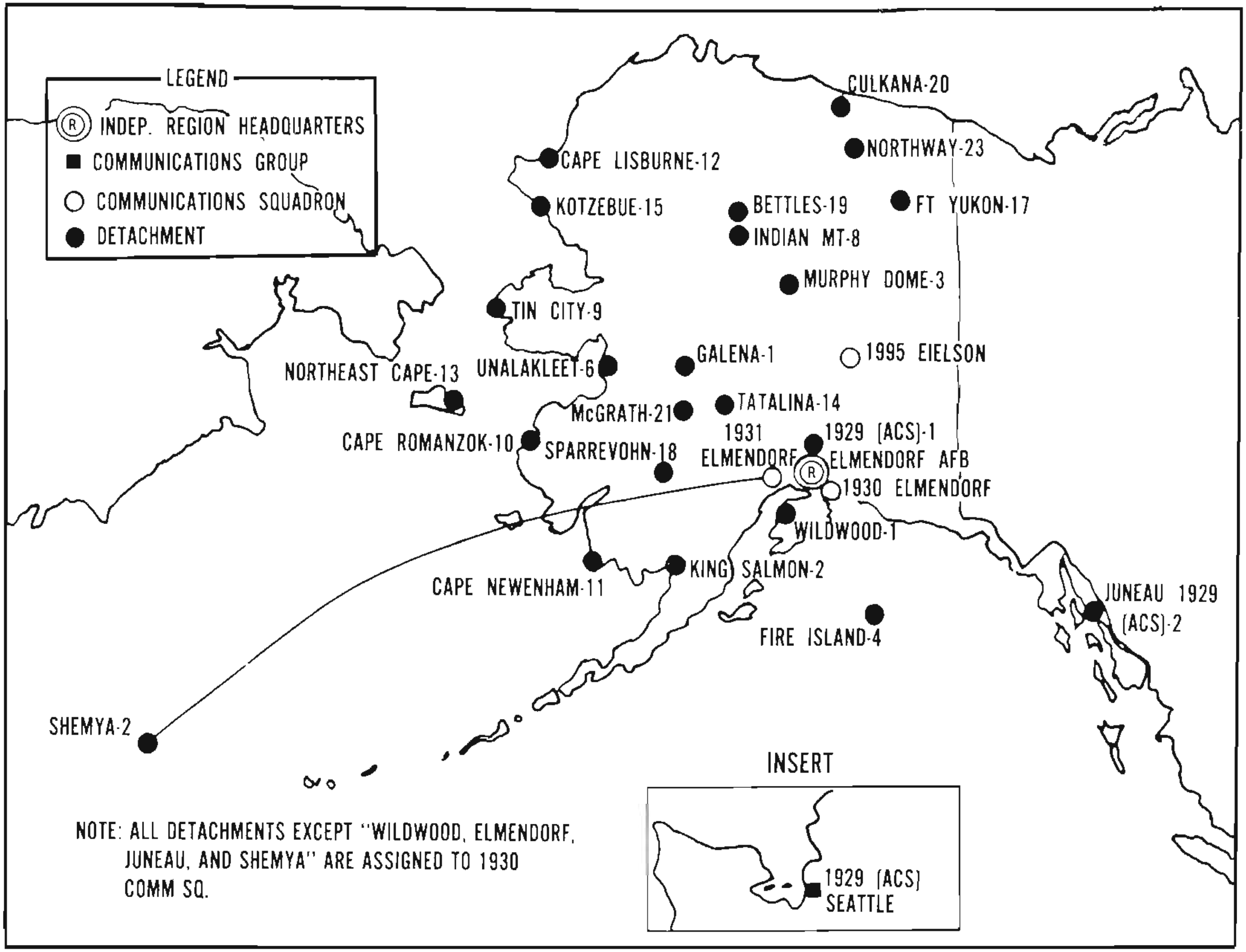
AFCS also managed communications for the Ballistic Missile Early Warning System in Alaska, designed to provide an advance warning of ballistic missile attacks on Canada and the United States. Building these new communication routes in the Arctic presented unprecedented problems for AFCS. Under conditions of extremely cold weather and high winds, coupled with limited transportation capabilities, ocean submarine cable was placed above the Arctic Circle to support these radar systems. Such working conditions were reminiscent of AACS experiences during World War II.



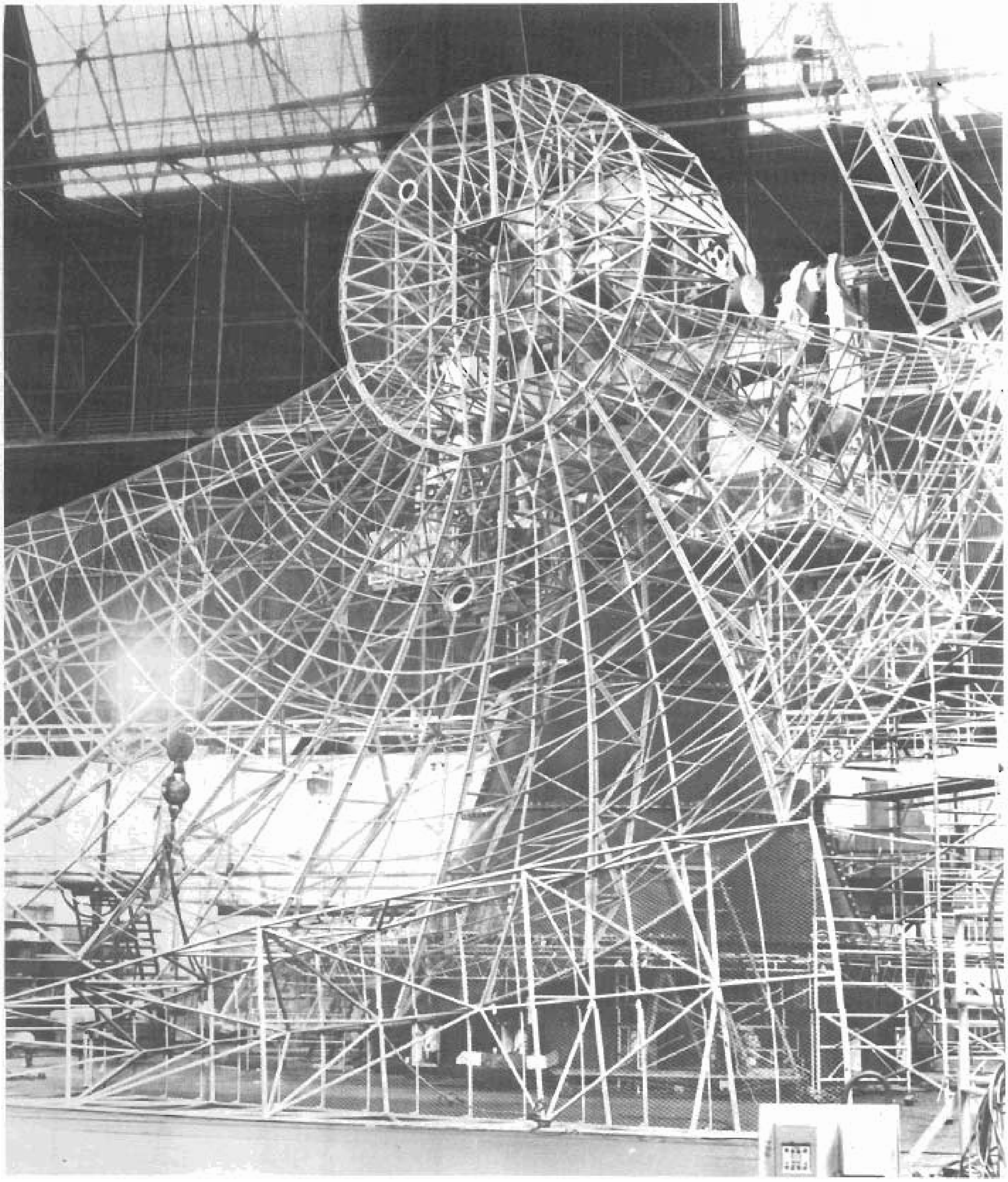
Instant communication was possible through telephones like this one located throughout underground Semi-Automatic Ground Environment sites. This one is at North Bay, Ontario, Canada.

In the late sixties, the Air Staff moved to dispose of government-owned long-line communication facilities in Alaska. On 22 May 1967, the Air Staff designated AFCS as the Air Force manager for disposal of the Alaska Communications System. As such, the command became responsible for developing sales policies, procedures for soliciting bid proposals, and management of the actual sales transaction. The long distance facilities of the Air Force's defense operations in Alaska were the backbone of the entire system. In addition to the Air Force, the Federal Aviation Agency, and the Department of the Interior, other government and commercial agencies owned and operated facilities connecting the various geographical locations in Alaska. On 1 July 1967, the property transfer of the Alaska Communications System to AFCS represented the first real property for which the command had jurisdiction, control, and accountability. On 14 November, President Lyndon B. Johnson signed an act authorizing the disposal of the system

ALASKAN COMMUNICATIONS REGION

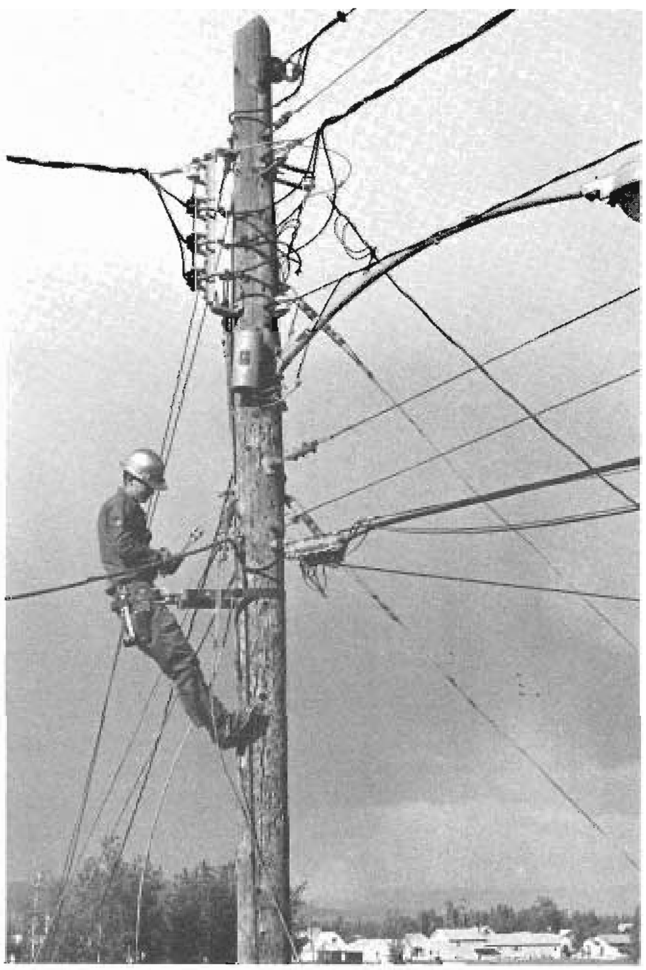


and AFCS moved ahead with developing plans to complete this transfer. In June 1969, the Secretary of the Air Force recommended to President Richard M. Nixon that the Alaska Communications System be sold to RCA Global Communications, Inc., and the final contract was signed by the end of the year.



The huge, concave radar tracking antenna for the Ballistic Missile Early Warning System consists of 24 pie-shaped sections. The segments are interchangeable, augmenting system maintenance. Overall, the antenna weighs more than 13,000 pounds.

White Alice sites such as this one provided the heart of the long-haul communications system in Alaska.



River flooding required the replacement of telephone cables over this Alaskan stream.

MILITARY AFFILIATE RADIO SYSTEM

Besides handling increased communication functions of individual commands, AFCS assumed responsibility for several specialized communication systems throughout its first years as a major command. The Air Staff assigned operation of the Military Affiliate Radio System (MARS) to the new command. MARS stations located at Air Force bases were to be used primarily as a back-up or emergency communication

Military Affiliate Radio System operators have made it possible for military personnel overseas to contact their loved ones at home on matters that need immediate attention. They also aid in furnishing communications during natural disasters, such as tornadoes and hurricanes, when other communication facilities have been destroyed.

system for the Air Force. The main components of the Air Force MARS program were military radio stations located on bases and stations throughout the world and civilian amateur radio operators.

By 1964, AFCS controlled the MARS duties for all major air commands, and had become the single manager for the entire Air Force MARS program. The Vietnam conflict dramatically increased the use of MARS stations by AFCS in the sixties, providing an essential link between servicemen and their families. The 1964 Alaskan earthquake also demonstrated the importance of the MARS system by providing emergency communication support.

A communications technician installs an antenna for the Military Affiliate Radio System station at Pleiku AB, South Vietnam.

AIR TRAFFIC CONTROL

In the United States, the Federal Aviation Agency is responsible for the control of air traffic, with the exception of military aircraft. Although this agency wrote the basic regulations under which AFCS operated, the command contributed to overall control through coordinated planning, facility operation, and maintenance of Air Force air traffic control facilities.

Throughout the sixties, the command pursued an aggressive program to improve and modernize its air traffic control and navigational aid equipment and services. AFCS conducted operational tests and evaluations of new and improved air traffic control equipment required to accomplish the command's mission. Development of technical standards for performance and recommending acceptance or rejection of new or modified equipment was also a major responsibility for AFCS.

AFCS controllers direct aircraft traffic inside an approach control unit.

In the sixties, technological improvements in facilities, combined with the demands for improved services generated by the Vietnam conflict, increased the need for better navigational aid services at all bases and air fields. In this decade, AFCS monitored many traffic control, navigation and landing systems development and modification programs which were expected to bring significant changes in the equipment necessary to support air traffic control operations. Included in these programs were development and acquisition of surveillance radar, direction-finding facilities, all-weather instrument landing systems, video mappers, and weather dissemination systems to meet air traffic control requirements. Also, the publication of a new Terminal Instrument Procedures manual in 1966 culminated 10 years of research, planning and revision.

A C-130 Hercules aircraft flies over an extensive strobe-light system which points toward the landing strip at Cam Ranh Bay AB, South Vietnam. The lights are turned on by the control tower during inclement weather.

Monitoring the status of all its navigational aids is a big job for AFCS. Here, an airman posts this information on the Command Post status board for review and analysis. Updated on a 24-hour basis, this board helps personnel keep a vigil on minute-by-minute communication operations and air traffic control equipment status.

This manual would provide safer and more realistic air traffic control procedures and had the flexibility needed to keep pace with future aircraft design characteristics.

In the sixties, AFCS expended considerable effort in developing operational concepts for mobile air traffic control equipment. With the objective of replacing conventional radar and ground control approach facilities and control towers with lightweight and transportable facilities, the command made use of miniaturization and modular construction techniques to provide these services.

In addition to furnishing the equipment and systems necessary for air traffic control, AFCS monitored these facilities through flight check and service evaluation programs. To fulfill the responsibility of providing safe and efficient air traffic control services for the Air Force, the first Lockheed Jet Star C-140 aircraft scheduled to provide evaluation of navigational aids for AFCS arrived at Robins AFB, Georgia, on 17 August 1962, and was placed in operation by October.

One of the most demanding and intense jobs within AFCS is the ground control approach team which coordinates to direct pilots to safe landings in all weather conditions.

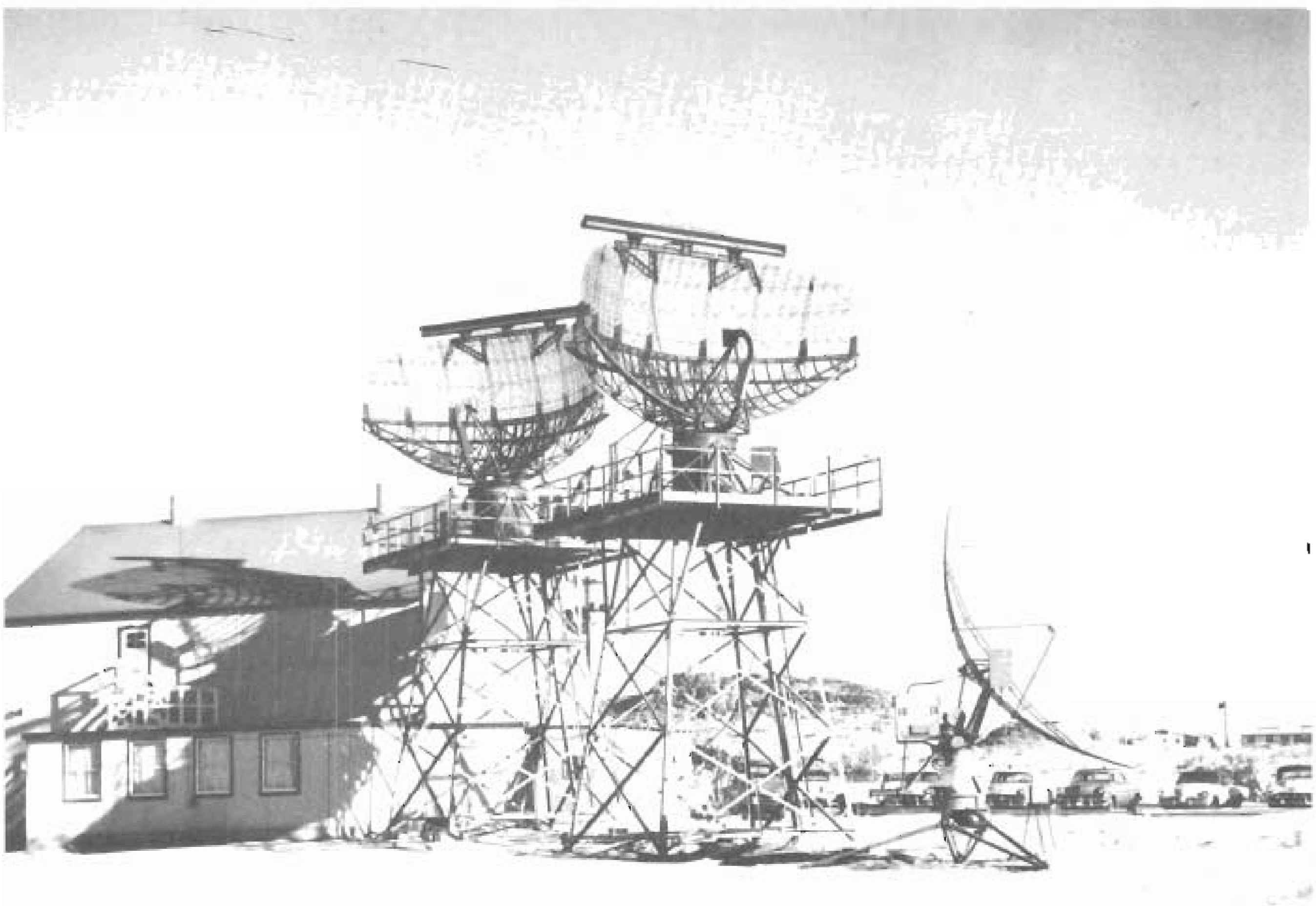
The speed, range, and special capabilities of this all-weather jet aircraft enabled it to reach any contingency area within 10 hours. The acquisition of this new aircraft enhanced AFCS's ability to evaluate the performance of its air traffic control equipment. Because every facility was required to undergo a flight check before it could be commissioned, the AFCS procedures ensured that no aircraft would be subject to hazardous conditions due to erroneous information obtained from the ground support and guidance systems.

AFCS and the Federal Aviation Agency worked toward mutual goals of providing safe and efficient air traffic control procedures and both organizations recognized the advantages that could be gained from cooperation and some sharing of aircraft control responsibilities. As a result, on 1 June 1963, AFCS completed the transfer of the Air Force flight inspection mission to the Federal Aviation Agency in all areas except contingency operations. This action allowed AFCS to reduce its aircraft inventory dramatically, from 59 to 16 aircraft. Also, the AFCS program to obtain Federal Aviation Agency facility ratings for all AFCS tower operation personnel within the United States was well underway.

A control tower is just as much an integral part of the Air Force as an airplane. Here, an AFCS technician rewires the control tower as part of the continual rehabilitation, modification, and maintenance efforts to ensure adequate support of aircraft.

A mobile runway supervisory unit directs aircraft at Phu Cat AB, South Vietnam, as a C-54 takes off in the background.

AFCS acquired several C-140 aircraft, similar to the one above, in the sixties to enhance its service evaluation and flight check responsibilities.



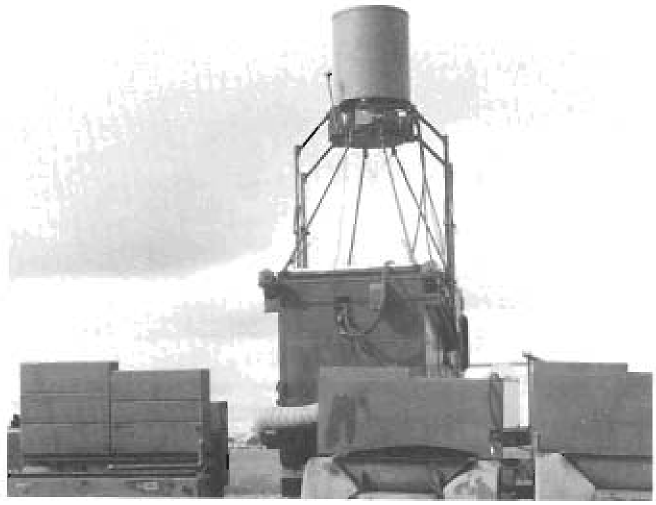
In defending the United States from enemy air attack the man on the ground has become equally as important as the aircrew. Ground control intercept radars such as these are essential in directing pilots to the exact location of their target, whether in training or combat.

The flight checking function of the command improved with the delivery of the first T-39 aircraft for use by the 1866th Facility Checking Squadron at Scott AFB, Illinois, in 1969. Management of flight checking responsibilities between the Federal Aviation Agency and AFCS also changed during the year, as the FAA agreed to reestablish the Air Force role in both contingency and fixed inspection in combat areas. The FAA maintained its responsibility for flight checking in the continental United States, its possessions and territories, and Central America.

To increase the effectiveness of its navigational aids, AFCS activated a central Notice to Airmen (NOTAM) facility at Tinker AFB, Oklahoma, on 20 June 1962, to cover requirements within the continental United States. To meet overseas requirements, AFCS established a European central NOTAM facility at Rhein-Main AB, Germany, on 15 October 1962. Both facilities collected and disseminated information for pilots via weather circuits.

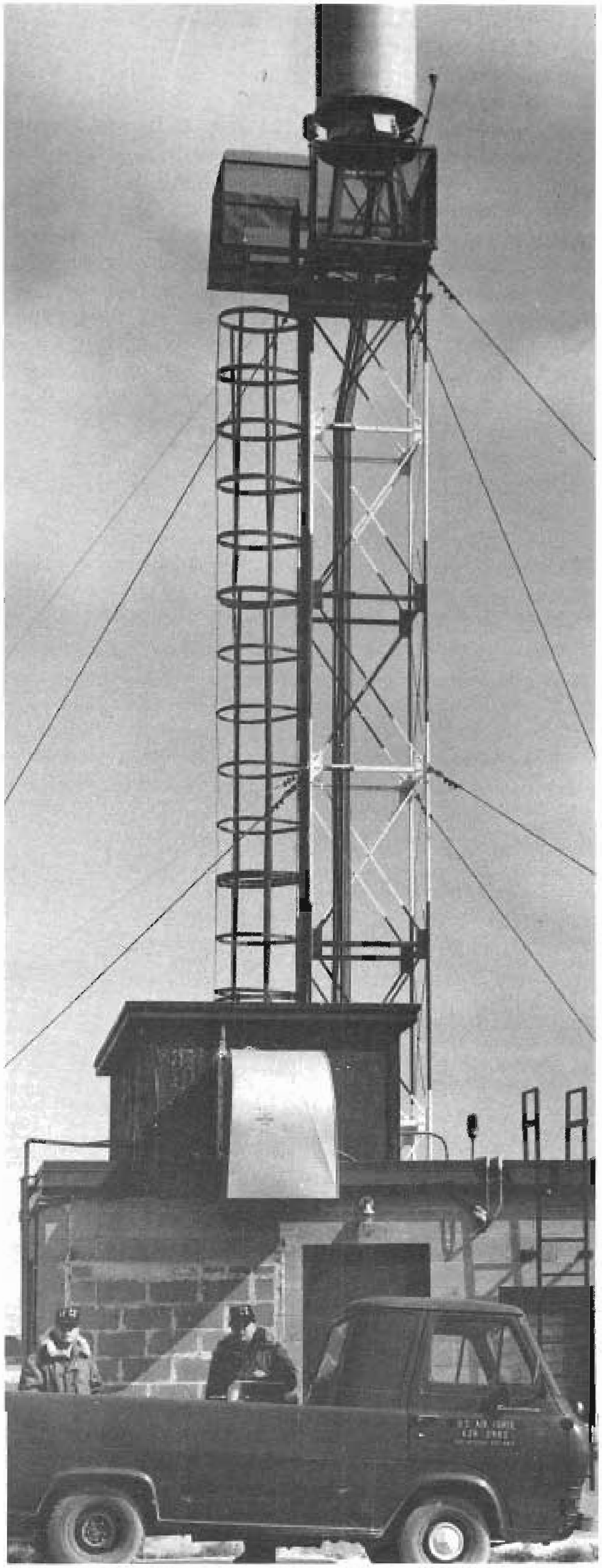
In September 1968, the automation of Notice to Airmen (NOTAMs) from base operations in the continental United States to the central NOTAM facility eliminated the previous manual relay function. Also, in the flight facilities areas, AFCS continued efforts to obtain an aircraft with increased range capability to expand its service evaluation function to additional bases.

As air traffic control operations continued to increase, AFCS sought a solution to the recurring problem of low-skill manning in the command's facilities. In January 1969, the first female Air Force air traffic controllers in 15 years graduated from technical school at Keesler AFB, Mississippi. The command had first utilized female air traffic controllers during the last 15 months of World War II.

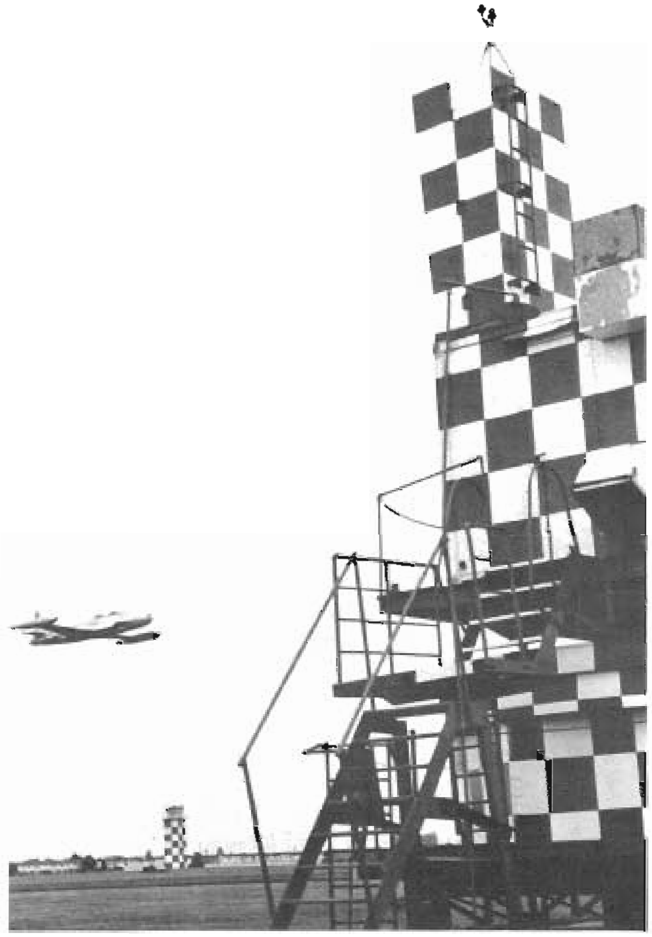


Mobile tactical air navigational facilities, such as this one at Udorn AB, Thailand, provided air traffic services to aircraft in areas that lacked fixed equipment.

AFCS increased its training efforts in the late sixties in an attempt to alleviate the problem of a lack of skilled air traffic controllers throughout the command. Here, an instructor and two students discuss a training problem in radar approach control in the air traffic control operator course at Keesler AFB, Mississippi.



This tactical air navigation equipment, maintained and operated by AFCS at Richards-Gebaur AFB, Missouri, provided essential air traffic control services to all Air Force aircraft in the area.



A T-33 Shooting Star aircraft flies over a precision approach radar site at Scott AFB, Illinois.

EMERGENCY MISSION SUPPORT

The "cold war" climate and the emergence of contingencies in "third world" countries such as Lebanon and the Congo prompted AFCS, as well as most other major air commands, to place increased emphasis on developing its quick reaction capabilities. Also, numerous events of this decade demonstrated the need for personnel and equipment to meet the demands of national defense in any emergency.

From its earliest days in World War II, AACS maintained combat or mobile communication units to support locations that lacked established communications and air traffic control facilities or to ensure continued operations in the event of a natural disaster or combat situation. Upon its activation in 1961, AFCS gained three mobile communication organizations which operated air transportable equipment to provide base communications, long-haul communications, and air traffic control in support of tactical environments and other situations where fixed facilities were not

Two AFCS members check control tower equipment during a field test of the 4th Mobile Communications Group.

available. The 1st Mobile Communications Group, at Clark AFB, Philippines, supported the Pacific Area; the 2d Mobile Communications Squadron, at Toul-Rosieres AB, France, supported the Europe, Africa, Mid East Area; and the 3d Mobile Communications Squadron, at Tinker AFB, Oklahoma, supported the Western hemisphere.

Throughout the sixties, these organizations remained in an alert status to meet needs resulting from the world political environment, to respond to emergencies caused by natural disaster, as well as to support exercises or projects that required temporary facilities. An increase in situations that required the use of AFCS's mobile units in the sixties prompted the command to expand its emergency mission support facilities. On 1 August 1963, the 2d Mobile Communications Squadron attained group status, as did the 3d Mobile Communications Squadron on 1 July 1964. On this same date, AFCS activated two additional units: the 4th Mobile Communications Group at Hunter AFB, Georgia, and the 5th Mobile Communications Group at Robins AFB, Georgia. At the same time, AFCS rapidly acquired a plethora of specialized equipment which increased the effectiveness and versatility of its mobile units.

Command of all five mobile units was exercised by AFCS, yet each group was aligned to a specific "user" command to provide the responsiveness required in contingency operations. As a result, the command to which a group was aligned exercised

Mobile facilities, such as this control tower being swallowed by a Military Air Transport Service aircraft allowed AFCS to perform its emergency mission support functions.

The remodeling of the Mountain Home AFB, Idaho, control tower necessitated the use of a mobile air traffic control tower. This equipment was deployed and setup by Air National Guardsmen from Washington.

operational control over the unit. The complications of this arrangement were most evident in the Vietnam conflict, which required the deployment of a majority of the 1st Mobile Communications Group's equipment through the sixties. In late 1966, the 2d Mobile Communications Group moved from its French location to Sembach AB, Germany, and the 4th Mobile Communications Group moved to Altus AFB, Oklahoma.

Contingency operations, as well as abundant requirements for communications support in Southeast Asia, ensured that the mobile units of AFCS were used extensively throughout the sixties. These demands caused the units to grow to augment the emergency mission support capability of AFCS and the entire Air Force.

An AFCS controller checks out air traffic control equipment inside a mobile control tower during an evaluation of the 4th Mobile Communications Group at Fort Sill, Oklahoma, in 1967.

CONTINGENCIES

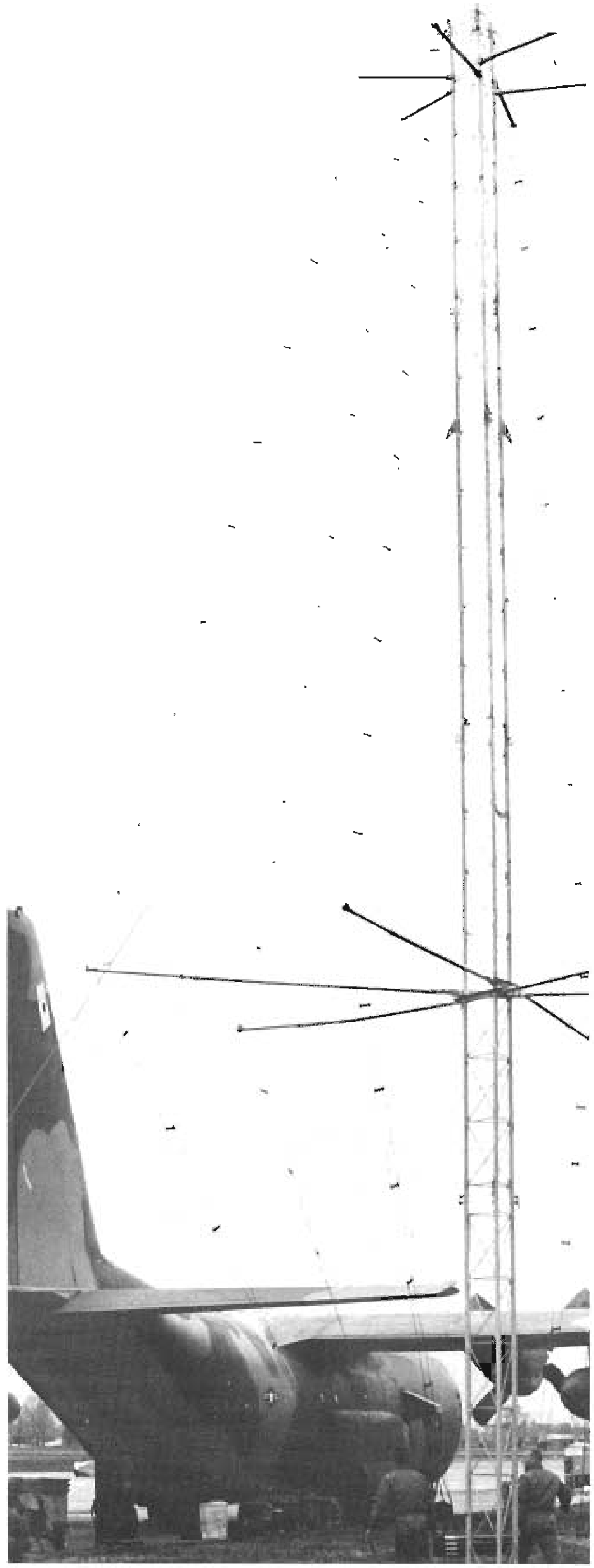
The evolution of United States defense policy in the sixties from a primary orientation towards massive nuclear retaliation to one that emphasized controlled response was the result of both gradual developments and situations that required immediate and selective responses. A series of events in this decade, highlighted by United States involvement in Southeast Asia, dramatically increased efforts to improve the responsive capability of the Air Force. It was a testimonial to the planners who established AFCS and a vindication of the single manager concept that the command was able at such times to effectively and efficiently marshal its resources to meet these challenges.

SHORT-TERM OPERATIONS

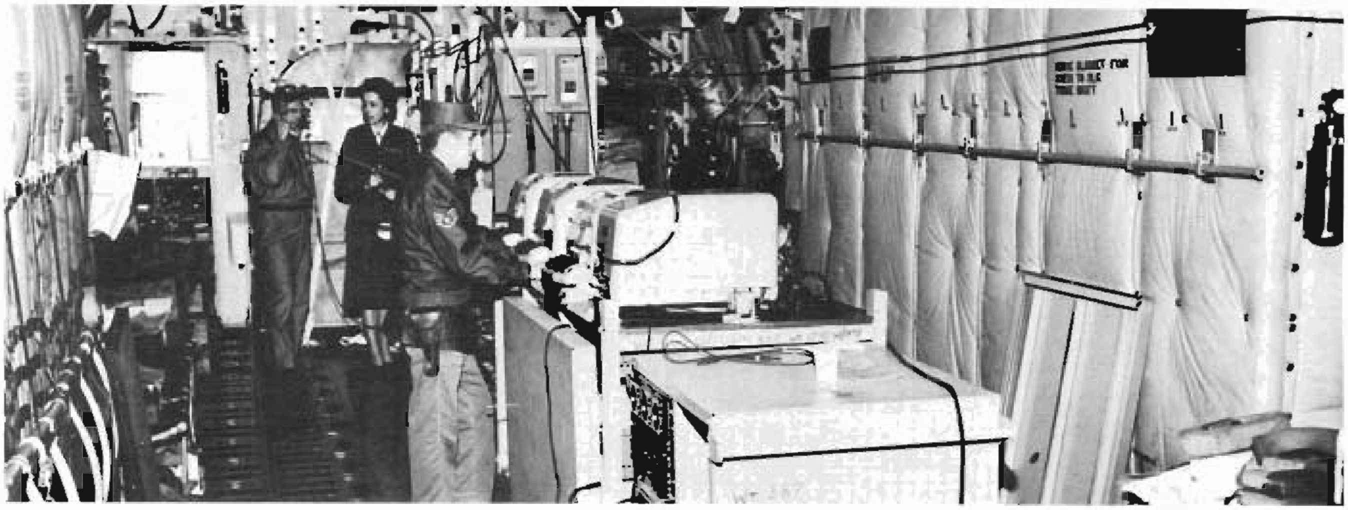
During 1962, AFCS supported two important contingency operations. In September, the command used the Talking Bird aircraft to support airlift disaster relief in Iran after a major earthquake devastated parts of that country. AFCS had developed this specially equipped C-130 aircraft in 1961 and 1962 to keep pace with the swift deployment policy of tactical forces. The Talking Bird aircraft provided airborne and initial on-site communications for contingency situations.

The second contingency supported by AFCS in 1962 proved far more dramatic. The discovery of Soviet missiles on the island of Cuba brought the nation to the brink of war when President John Kennedy demanded their removal. Without a noticeable effect on the reliability, speed, and accuracy of its global services, AFCS quickly responded by deploying substantial numbers of communication and air traffic control specialists to operational areas in the southeastern United States.

AFCS support in the Cuban Crisis began on 18 October, when the Tactical Air Command requested extension of the on-base weather circuits to the command post at Homestead AFB, Florida. By the end of the first week, AFCS technicians from the 3d Mobile Communications Group had placed air navigational equipment at strategic locations throughout Florida, had installed commercial circuit extensions, and had deployed weather teletype machines. The success of this rapid deployment of facilities and personnel demonstrated the ability of AFCS to respond to a crisis and emphasized the need for future planning in coordination with other commands to improve projections for AFCS services.



AFCS crews are shown setting up communication equipment from the "Talking Bird" aircraft.



The "Talking Bird" interior displays the variety of communications-electronics equipment packaged for delivery anywhere in the world to support emergency missions in advance of full-scale communications. The "Talking Birds" are operated by AFCS communicators to provide an immediately available "Command Post" for any emergency operation.

A "Talking Bird" crew is shown with its equipment laid out for display.

In a quick reaction operation, AFCS personnel load the "Talking Bird" aircraft in a minimum amount of time for deployment to Iran.

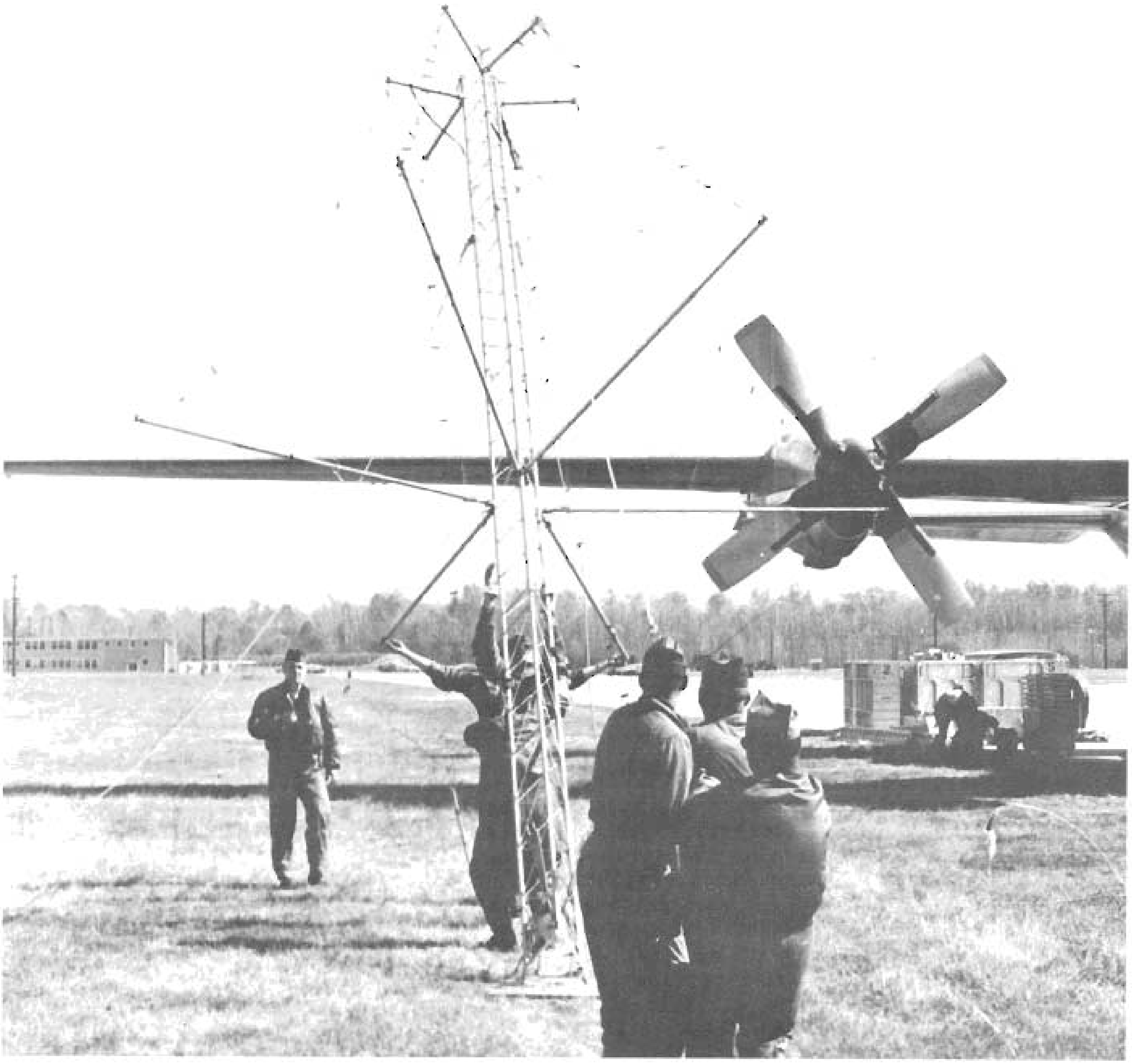
Developments in the Middle East in 1963 prompted the Joint Chiefs of Staff to task the 2d Mobile Communications Group to provide communication equipment to support a show of force to deter the United Arab Republic from harassing or attempting the overthrow of the Saudi Arabian government. To accomplish this, the Talking Bird communication package was deployed to the area on 4 May, and remained in operation until 13 May.

Alaska was the site of special AFCS activity early in January 1964, when MARS became the state's emergency back-up communication system. The timing was providential. In March, communication systems in Alaska were put to a critical test when the most severe earthquake ever recorded in North America crippled the state. The earthquake damaged terminal structures, communication equipment, cables, and open wires. Because of the damage, MARS was the only means to alert the lower 48 states of the disaster, and for several days MARS was the main system of communication in the earthquake area. Restoration efforts began immediately, and within 1-1/2 hours, AFCS had 11 circuits operating to Seattle and all priority circuits were restored within seven hours.

The Alaskan earthquake damaged or destroyed much of the state's communications facilities, including the air traffic control approach lights in this picture.

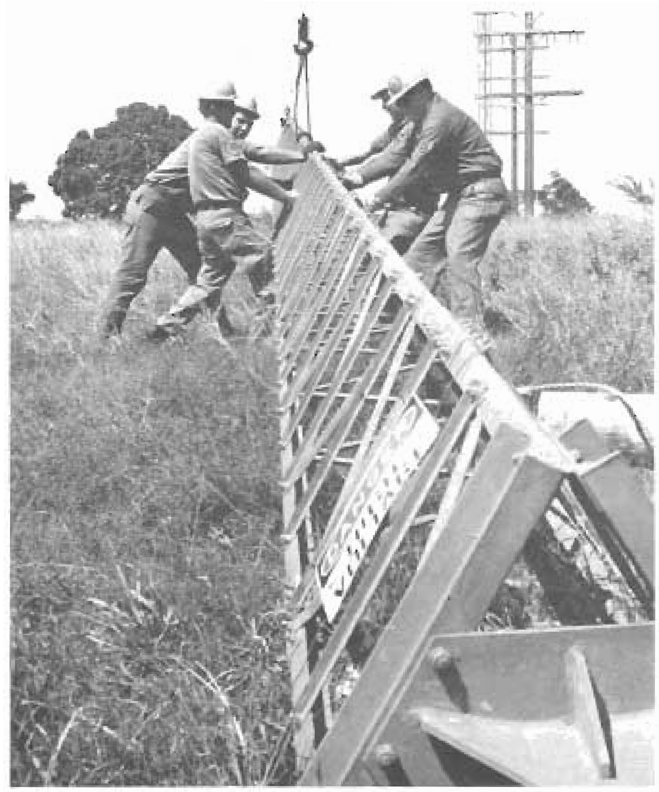
A mobile generator unit is loaded aboard a C-124 cargo transport aircraft at Tinker AFB, Oklahoma, for deployment to Alaska following the 1964 earthquake. The diesel-powered generator is part of the mobile control tower airlifted to Alaska to replace the damaged control tower at Elmendorf AFB.

When political turmoil disrupted the Dominican Republic in 1965, AFCS units became part of the response team called up by President Johnson, who directed that refugees and Americans living in the area be protected.Mobile controllers were among the first American troops to arrive on Dominican soil, and as they prepared to handle local air traffic, controllers in the United States were directing traffic to San Isidro AB. Within hours of the initial alert, AFCS technicians placed communication and navigational aid facilities into operation. The first AFCS unit into the area was a Talking Bird communications package which provided services within 55 minutes after its arrival, and for three days served as the initial command post for United States operation. This AFCS support was an indispensible part of what became the largest airlift from a single United States on-load base in transport history. From 29 April to 7 May, Air Force aircraft flew 16,515 persons and 16,068 tons of equipment and supplies in 1,649 missions from Pope AFB, North Carolina.



Members of an AFCS "Talking Bird" detachment erect an antenna alongside their C-130 aircraft during a training exercise at Scott AFB, Illinois.

The ability of AFCS and the entire Air Force to respond rapidly to crisis situations was tested with the seizure of the USS Pueblo by North Korea on 23 January 1968. This action abruptly altered the United States military posture in Korea from a peacekeeping force to a combat-ready force and precipitated a period of hectic activity to expand and augment existing communication and air traffic control facilities in Korea. The situation required immediate personnel actions, accomplished through extensive temporary duty assignments, and the mobilization of Air National Guard and Reserve forces. Within 72 hours, the 1st Mobile Communications Group planned, packed, and readied for deployment personnel and equipment for "bare base" telecommunications for five bases in Korea. In a matter of days, the Group deployed over one million tons of communications equipment, using over 40 C-141 aircraft. By February, the strength of the 2146th Communications Group in Korea had more than doubled, from 510 to 1,047 people. The four provisional squadrons established in immediate response to the Pueblo Crisis gave way to six squadrons subordinate to the 2146th Communications Group, and the transition from temporary to permanent assignment was in progress.



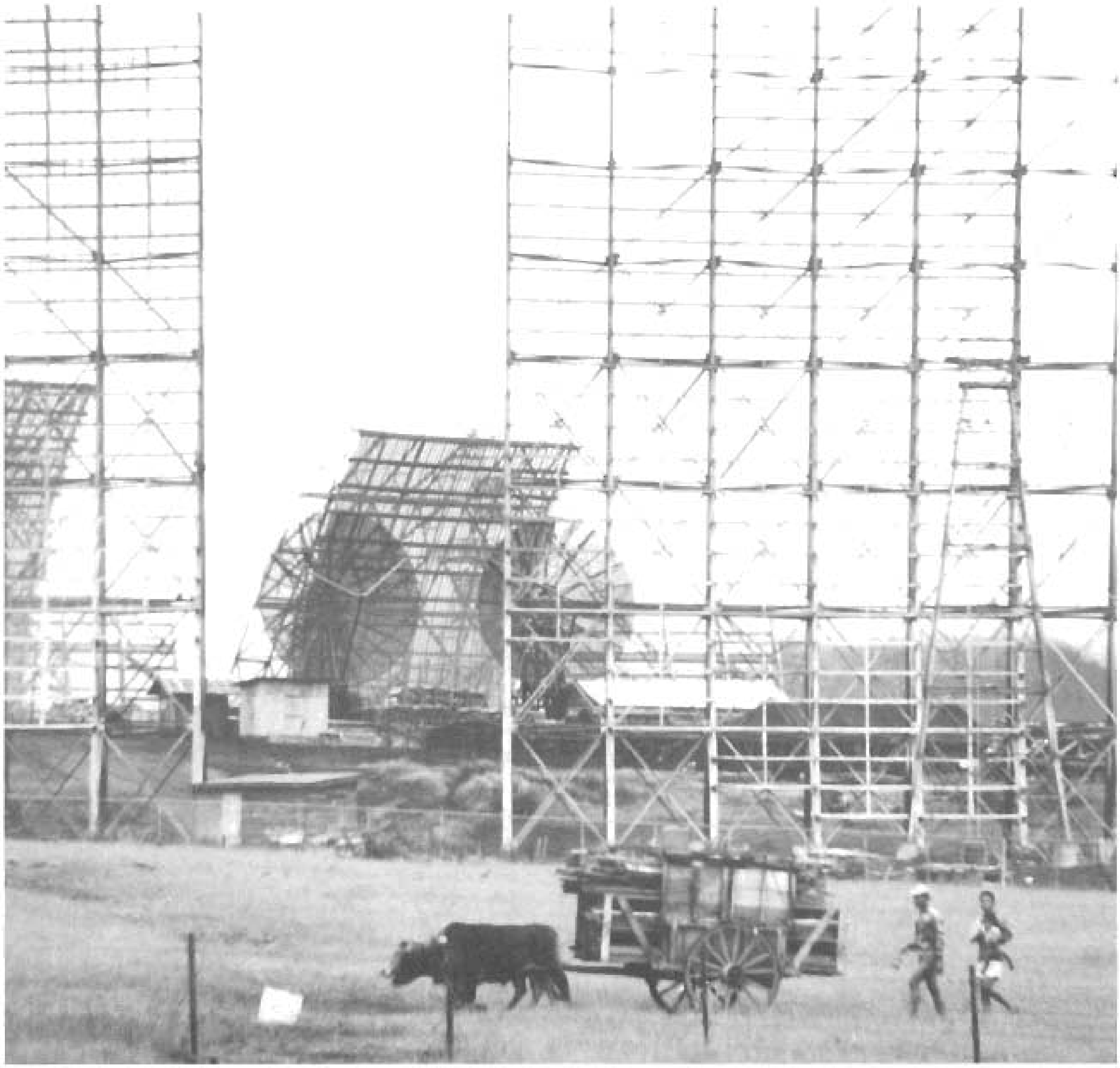
Members of the 217th Electronics Installation Squadron of the Illinois Air National Guard put some muscle into placing an antenna tower at Antigua AS, British West Indies, to aid the AFCS support of NASA projects.

In addition to supporting military contingencies, AFCS also provided important assistance to the United States space program. Although principally nonmilitary in nature, the space program used Department of Defense communication facilities and services wherever practical to support its missions. In May 1963, AFCS's 2d Mobile Communications Group deployed single sideband radio teams and equipment to several worldwide locations to support the Project Mercury "Man in Space" program. In 1965, AFCS increased its support of space projects when technicians were posted around the globe to provide communication service for the Gemini space shot launched from Cape Kennedy, Florida. Specialists from the 1st and 2nd Mobile Communications Groups established operations throughout the Pacific and Atlantic supporting the four-day flight. Mobile facilities were also poised in readiness to support recovery operations if needed as well as handled other communication traffic associated with the space shot. The communications teams worked hand-in-hand with the Air Rescue Service to assure instant recovery of the space capsule wherever it landed. In 1968, the Apollo Aircraft Control Center, operated by AFCS at Patrick AFB, Florida, provided support to the Apollo 8 lunar space flight by deploying mobile units to strategic positions around the world.

Air National Guard technicians, during their two-week training stint with AFCS, work on an antenna being installed on the island of Antigua in support of a NASA space flight. AFCS personnel have helped maintain the communications link with the astronauts on every manned space flight.

SOUTHEAST ASIA

Blazoned across the nation's headlines throughout the sixties were stories about United States involvement in Southeast Asia. Never before in the history of the United States did a military involvement receive such wide and diverse coverage, exemplified in the public response to events such as air strikes against Hanoi. Despite such prolific publicity, seldom mentioned were a comparative handful of men who provided services vital to those headline-making missions—AFCS communicators and air traffic controllers. Communication responsiveness to the massive operations in Southeast Asia brought together a legion of specialists performing every known communications-electronics function, and devising new ones as the combat situation dictated. The war in Vietnam dramatically tested the responsiveness of communication operations to the varied demands of tactical combat operations and counterinsurgency.

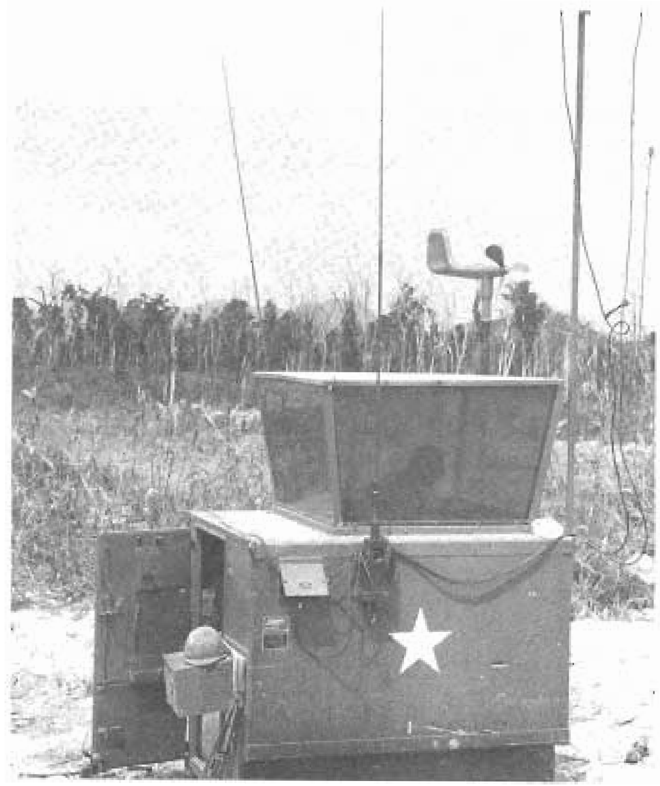


The installation of technologically advanced communication systems in Southeast Asia provided a stark contrast to the barren countryside. Here, native Vietnamese and their ox cart are dwarfed by tropospheric scatter communication antennas at Pleiku AB, South Vietnam, in 1966.

THE ADVISORY YEARS 1961-1965

One of the most important functions performed by the allied air control system was that of air traffic control. The first United States Air Force team deployed to Southeast Asia for this support was a detachment of the 1st Mobile Communications Group, which arrived in Thailand on 15 February 1961, to assist in providing air route traffic control for the Thai Air Force. Subsequently, other teams were deployed to the area to support the 2d Air Division, the Vietnamese Air Force, and other allied forces.

At the end of December 1961, because of rising tensions in the area, the Pacific Air Forces directed that a tactical air control system be installed and operational in South Vietnam within two weeks. At this time, mainland Southeast Asia was virtually devoid of modern communications systems. The available airfields and communication facilities were outdated, largely of French design, and difficult to maintain. In response to the request of the Pacific Air Forces, the 1st Mobile Communications Group was tasked to provide voice and teletype service at Tan Son Nhut, Pleiku, Da Nang, and Nha Trang, South Vietnam. This represented the beginning of a lengthy and heavy involvement for AFCS in Vietnam.



Portable air control towers such as this one were set up to direct planes into areas where permanent or fixed equipment did not exist.

Reminiscent of events at Atsugi Airfield in the closing days of World War II, the initial activity in Southeast Asia demonstrated the tradition of communications preceding other defense elements into an area. After the first aircraft landed without the benefit of navigational aids at a new bare base site, AFCS personnel immediately unloaded equipment to prepare for the installation of facilities to provide communications between operating locations. Getting the necessary facilities in and out of difficult locations validated the importance of inter-service teamwork.

AFCS mobile communication personnel and equipment supported combat operations through facilities such as this makeshift control tower at Fire Base Phouc Vinh, South Vietnam.

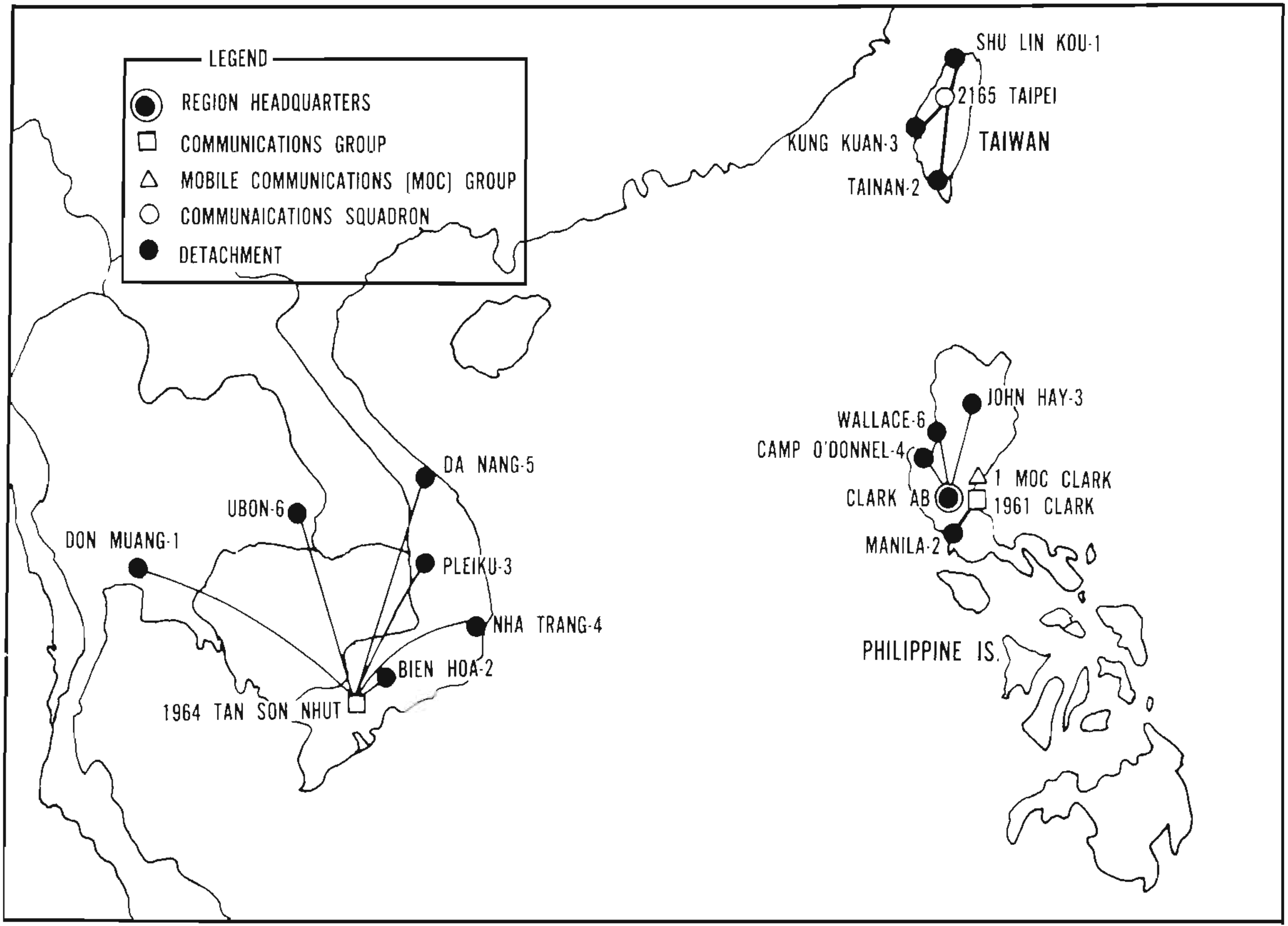
A C-141 aircraft rolls past the radar approach control vans located between the two runways at DaNang AB, South Vietnam. Inside the vans, air traffic controllers of the 1972nd Communications Squadron directed all aircraft in the DaNang area 24 hours a day.

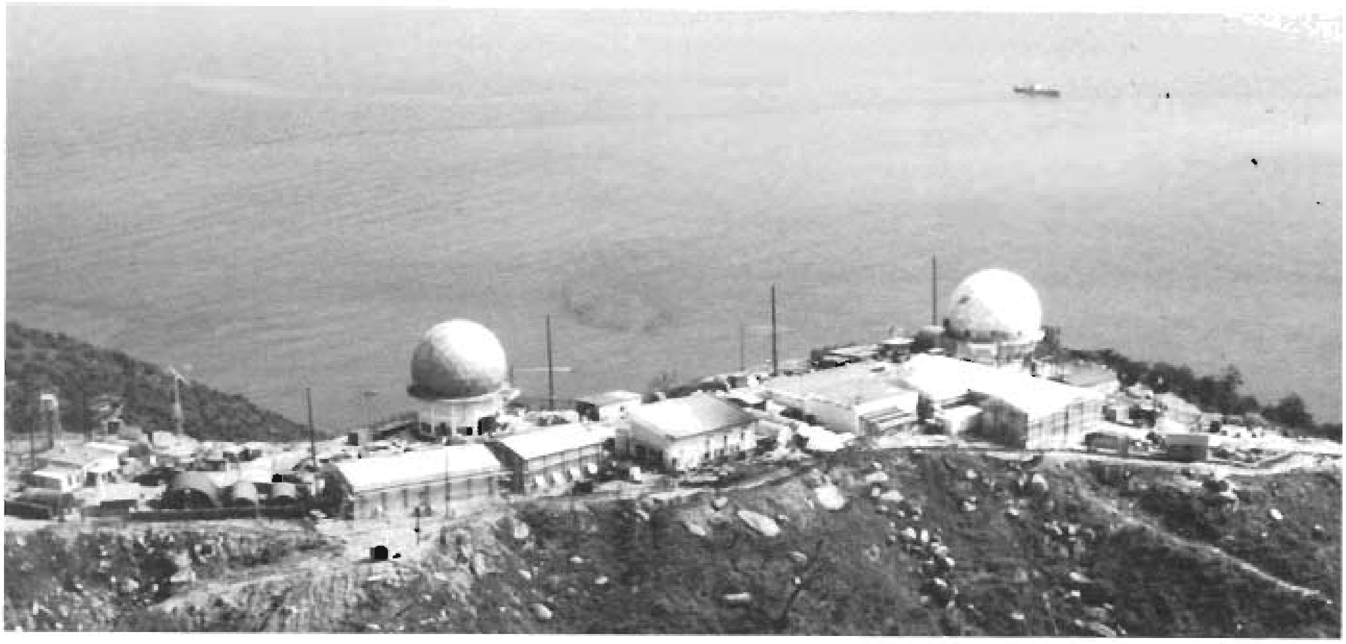
Transportable facilities, such as this mobile control tower operated by two members of the 1st Mobile Communications Group, gradually gave way to permanent facilities.

To unite the expanding number of AFCS detachments in Thailand and South Vietnam, Headquarters AFCS established the Southeast Asia Communications Region on 8 January 1962, with headquarters Clark AB, Philippines. Immediately following the creation of this region, requirements for fixed, rather than mobile communication and electronic, equipment were identified for several locations in Southeast Asia, including Tan Son Nhut, Don Muang, Bien Hoa, Pleiku, Nha Tran, and Da Nang. In response, on 1 May 1962, AFCS activated the 1964th Communications Squadron at Tan Son Nhut, South Vietnam. Lt Col Kenneth Keyte was its first commander. In October, this unit was elevated to group level and was given responsibility for four detachments in Vietnam and two in Thailand. As air operations increased in Southeast Asia, and as it became apparent that extended use of contingency gear was inefficient, efforts increased in 1963 to transfer most navigational aids and air traffic control facilities from the 1st Mobile Communications Group to the 1964th Communications Group.

Although the mobile communication detachments were used in a variety of emergency situations, their primary function was to provide combat support. Detachments of the 1st Mobile Communications Group were frequently deployed to Southeast Asia tactical air bases which consisted merely of a runway, a portable water supply, and the necessary air traffic control and navigational aid equipment to support Air Force operations. This responsiveness was illustrated, for example, during the Gulf of Tonkin incident on

SOUTHEAST ASIA COMMUNICATIONS REGION





A communications site near Monkey Mountain, South Vietnam.

4 August 1964. The Group deployed 134 people and 156 tons of equipment to Southeast Asia within only eight days.

Such large airlift operations and the general increase in air traffic in Southeast Asia generated several problems for air traffic controllers. During the early sixties, navigation throughout the area was based largely upon outdated equipment augmented by AFCS's mobile navigational aids and control towers. Often AFCS teams occupied control towers alongside Thai or Vietnamese personnel to facilitate local traffic handling at airfields shared by both nations. Large deployments of aircraft through sovereign airspace without prior notification to host air traffic control agencies caused some difficulties. Moreover, there was some dissatisfaction with host nation services at certain locations. These conditions created several delicate diplomatic problems for the Air Force. Although United States Air Force methods could not be forced upon the sovereign nation controllers, AFCS personnel worked closely with them, promoting "assimilation by example" as a primary training method.

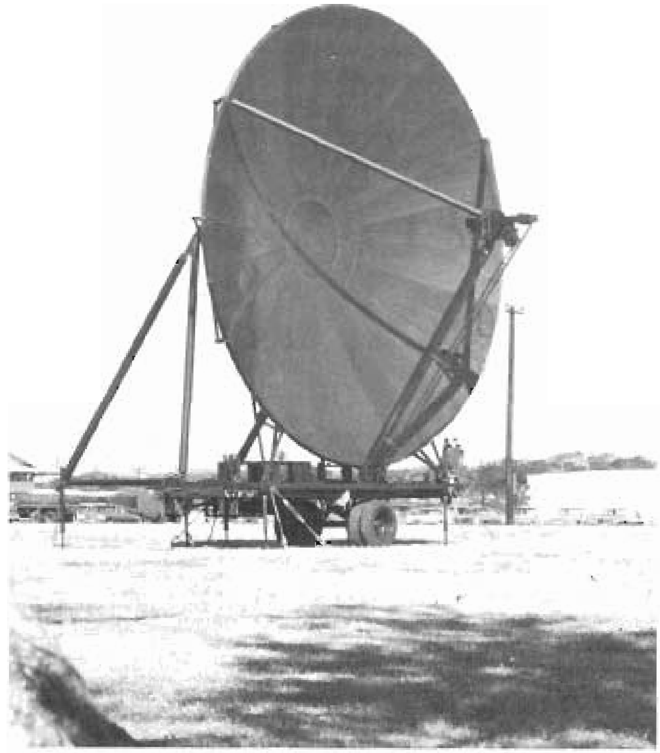
Requirements for support in various areas of communications-electronics increased with time. Teletype circuits in Southeast Asia caused many problems in 1962 due to serious logistics deficiencies. Premature deployment of nonsupportable new equipment in the lush jungle environment resulted in poor performance. Lack of air conditioning for the sophisticated, heat-sensitive equipment and the general lack of proper supply support for all equipment added to these troubles. Despite this situation, however, the teletype centers operated by the 1964th Communications Group at Tan Son Nhut, South Vietnam, handled 1,775,000 messages in 1963.

Teletype equipment shown in this photo of the communications center at Tan Son Nhut AB, South Vietnam, required increased air conditioning and supply support.

AFCS played a prominent role in the engineering, procurement, and installation of a vitally inportant tropospheric scatter system to handle long-haul communications throughout Southeast Asia. By September 1962, a 72-channel trunking system had been completed which provided the heart of fixed communications programmed for the area. This system connected Saigon, Pleiku, Da Nang, and Nha Trang, and was given final certification on 10 July 1963.

As requirements for weather data from Vietnam increased, the weather relay center at Tan Son Nhut became operational on 26 January 1964. AFCS personnel also installed a wideband communications system with 60 voice channels between Nha Trang, South Vietnam, and Clark AB, Philippines using submarine cable and microwave systems. This project was completed in December 1964.

The assumption of flight checking responsibilities for some Army navigational aids by the 1867th Facility Checking Flight also increased AFCS activity in Vietnam. Flight checking in Southeast Asia could be very dangerous. Navigation equipment often had to be set up outside the base security perimeter and low-flying, incoming planes were inviting targets for Vietcong sitting off the end of the runway. An increase in Vietcong activities in the area of Tan Son Nhut AB made ground fire a serious hazard to aircraft, prompting controllers to develop new procedures, calling for a higher altitude final approach.Despite such efforts, AFCS flight checking aircraft were hit by hostile fire 25 times by mid-1969.



A tropospheric scatter antenna (AN/TRC-103) at Clark AB, Philippines.

An AFCS sergeant measures the approach angle of an incoming aircraft during a check of the tactical air navigation unit at Chu Lai Marine Air Station, Vietnam.

THE BUILDUP 1965-1970

The mid-sixties was a period of dynamic growth for United States participation in the Vietnam War. The most dramatic increase in military personnel strength occurred in the last half of 1965, as troop levels rose from about 60,000 in July to nearly 250,000 by the end of the year. Late in the year, new troops arrived at the rate of over 300 per day. The requirements for initial and follow-on communications-electronics support proved monumental.

The situation in Vietnam presented American forces with unprecedented problems. For the communicators entering the area in 1965, there were no well-developed communication systems serving either government or commercial needs. Unpredictable guerrilla insurgents prohibited the use of cable or wire outside protected areas and only exacerbated this problem. In earlier wars in Europe and Korea, military forces could reconstruct and use buried cables and remnants of the previous communication structure, but in Vietnam, the only significant communication facilities available in 1965 had been installed by United States forces. These included teletype and telephone terminals at the eight main bases in Vietnam: Tan Son Nhut, Bien Hoa, Pleiku, Nha Trang, Binh Thuy, Cam Ranh, Phan Rang, and Da Nang. There was also a tropospheric scatter system linking Saigon with Thailand and Da Nang AB via Nha Trang AB; high frequency, single sideband radio to Thailand, Okinawa, and the Philippines; a technical control facility in Saigon; and a small telephone plant at each base.

The military buildup in Southeast Asia especially strained the fledgling AUTODIN network when traffic at Clark AB, Philippines increased from 500,000 to 950,000 messages per month in 1965. The result was an unprecedented demand for fast, accurate, and dependable communications throughout the area. AFCS responded to these demands by deploying parts of several of its mobile communication groups as well as assigning many of its communicators to combat zones. The command also expedited plans to upgrade and extend AUTODIN services in Southeast Asia and expand the Clark and Hickam relay centers.

Air traffic operations multiplied at a rate parallel to increases in personnel and communication equipment. At Tan Son Nhut AB the lowest volume of air traffic handled in any single month in 1965 was only slightly short of the traffic total in 1964. At peak periods, the single runway accepted as many as 180 aircraft

In 1965, many locations in Southeast Asia were forced to rely on revetted power units, such as these deployed to Phan Rang AB, South Vietnam.

Working together, a Vietnamese sergeant and an AFCS serviceman hoist radar equipment to a tower at Binh Thuy AB, South Vietnam.

Local children observe a communications technician splice cable at Don Muang AB, Thailand.

A technical controller verifies the status of a communications system in the Don Muang AB, Thailand, Navigational Aid and Communications Management Office.

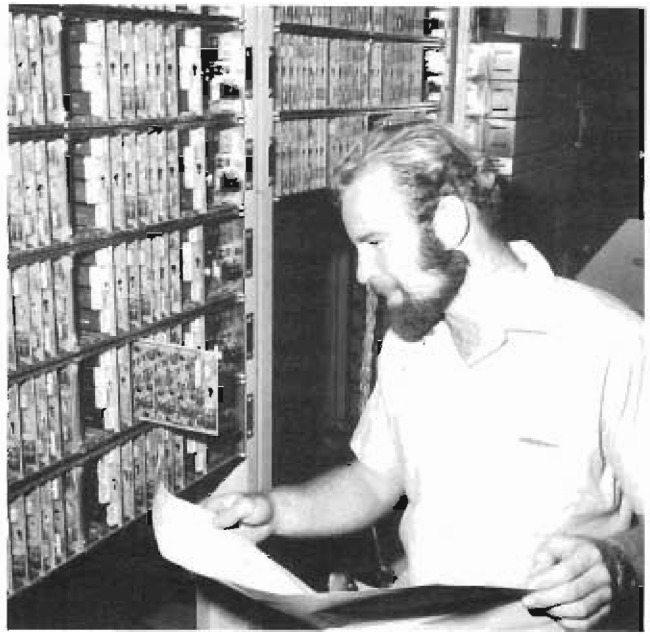
an hour. Air traffic figures for Bien Hoa AB exemplified this increase, rising from a total of 11,870 operations in January 1965, to 27,807 operations in June.

By the summer of 1965, navigational aid installations in Southeast Asia had expanded to the point that the two C-140A aircraft assigned to the 1867th Facility Checking Flight at Clark AB, Philippines, could not keep pace with flight check requirements. As a result, AFCS transferred the two C-140s assigned to the 1868th Facility Checking Flight, at Wiesbaden AB, Germany, to the Pacific.

The tremendous increase in military forces in Southeast Asia necessitated changes in the management structure of AFCS to meet communication requirements in a combat environment. The buildup affected every AFCS worldwide unit and the strategic location of portions of the Pacific Communications Area caused it to be committed heavily in the area. On 1 November 1965, a new organization, the 1974th Communications Group, was formed at Korat AB, Thailand, to augment United States forces in Southeast Asia. Lt Col Charles R. McMahan became its first commander. Overlaps in command and control complicated the military management structure during this period. The appointment of the commander of the 1964th Communications Group, Tan Son Nhut, Vietnam, as the Deputy Commander for the Southeast Asia Region meant that the 1964th Communications Group and the 1974th Communications Group in Thailand had a single commander, with the 1964th staff managing the communications-electronics effort for both countries.

The structure was further complicated with the realization that the 1st Mobile Communications Group functioned under the command control of AFCS, but the operational control of the Pacific Air Force. Because the Pacific Air Force had overall Air Force communication support responsibility in Southeast Asia, the Group's assets were often combined with those of other organizations to meet increasing commitments. This frequently resulted in the installation of a mobile communications or air traffic control facility as emergency mission support and subsequently having it transferred to a fixed unit. This forced the Group to continually reconstitute its equipment to maintain sufficient resources to support Southeast Asia efforts.

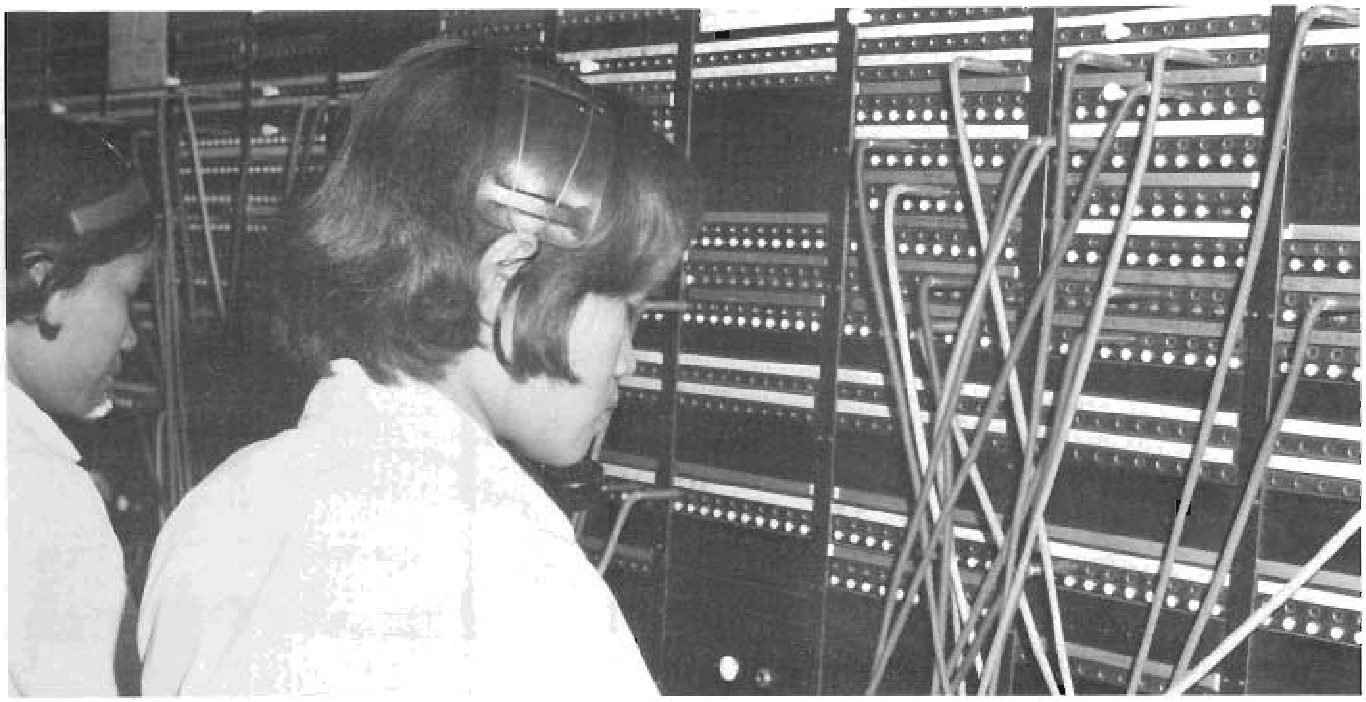
The military buildup required a parallel escalation of AFCS personnel. To augment their efforts, the command authorized extensive periods of temporary duty assignments and increased the length of the work week. Accomplishing the AFCS mission with too few people to meet constantly increasing requirements made long work weeks the norm in Southeast Asia. Because manpower requirements greatly exceeded the number of available military personnel, the Defense Department established Project Mix Fix, designed to replace military personnel in non-combat support positions with civilians. AFCS promoted an accelerated recruitment program to fill its 166 authorized Mix Fix positions by 31 December 1966.



Utilizing civilians to augment military personnel in Southeast Asia relieved some of the manning problems. Here, a civilian technician inspects a tandem switch at Pleiku AB, South Vietnam, which will give the base and the surrounding area direct, long-distance dialing capability.

Demands for increased weather support prompted the installation of fixed meteorological equipment throughout the combat area. This wind speed and direction set provided crucial data to Air Force personnel responsible for forecasting weather.

The switchboard at Don Muang AB, Thailand, manned by AFCS and Royal Thai Air Force personnel, provided telephone support to forces early in the sixties.



AFCS also used the native population to augment the work force. Here, a Thai national places a long distance call from Korat AB, Thailand.

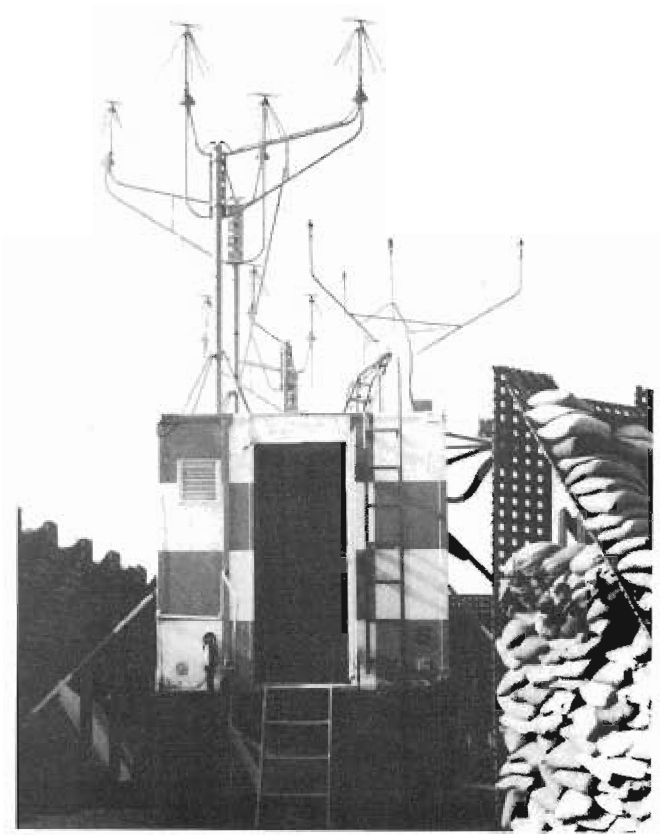
The intensification of combat and tactical supply operations in Southeast Asia generated a need for greater air conditioning and supply of communication facilities. What in other areas and under other operating conditions would seem abnormally high air conditioning requirements were considered absolutely essential in Southeast Asia.

Beyond the heat, dust, and high humidity that plagued communication equipment in the area, there were other virtually insoluble problems. Remote monitor and control lines were cut by water buffalo and the presence of poisonous snakes necessitated some rather unique actions. Special bridges were constructed in some areas to provide access to communication facilities that were cut off by snake-infested waters. Another problem arose with the need to remove trees to construct a runway in Thailand. In most places this would have been a relatively simple matter, but by Thailand custom, removal of the trees required a religious ritual. Untold manhours were also expended in Southeast Asia replacing and repairing cable damaged by contractors during the building and expanding of air bases.

Two airmen from the 1877th Communications Squadron at Bien Hoa AB, South Vietnam, repair underground telephone cables.

By 1966, the dramatic increase in air operations could be attributed largely to the steady increase of landings and take-offs in the Pacific area, primarily in Southeast Asia. The South Vietnamese airspace was rapidly becoming the most crowded in the world. Corridors used by non-tactical military and civilian aircraft were cluttered with tactical strike aircraft, battle-damaged and low-fuel aircraft emergencies.

At the busiest bases in Southeast Asia there were times when as many as 60 aircraft were waiting to take off while several aircraft circled overhead waiting for their turn to land. Further complicating these operations were enemy attacks on bases involved in launching and recovering aircraft. AFCS air traffic controllers displayed their professionalism on 13 April 1966, during a Vietcong attack on Tan Son Nhut AB. Although personnel evacuated the control tower due to a fire and the possibility of an explosion in a nearby fuel storage area, radar approach control personnel remained in the van and kept contact with tower traffic as well as maintained control over their own.



This radar approach control facility at Tan Son Nhut AB, South Vietnam, kept pilots out of trouble. AFCS technicians who manned this equipment were responsible for keeping aircraft separated while flying in bad weather, assisting with emergency landings and directing pilots away from restricted areas.

In March 1966, AFCS provided the first communication support for Project Sky Spot in Vietnam. This was a radar system in which controllers operating mobile radar sets tracked aircraft, corrected their direction and speed, and signalled pilots when they were over their targets. This radar permitted a controller to accurately direct aircraft through poor weather conditions, in darkness, and on strikes against enemy positions.

Members of the 1877th Communications Squadron at Bien Hoa AB, South Vietnam, feed telephone cable into a ditch.

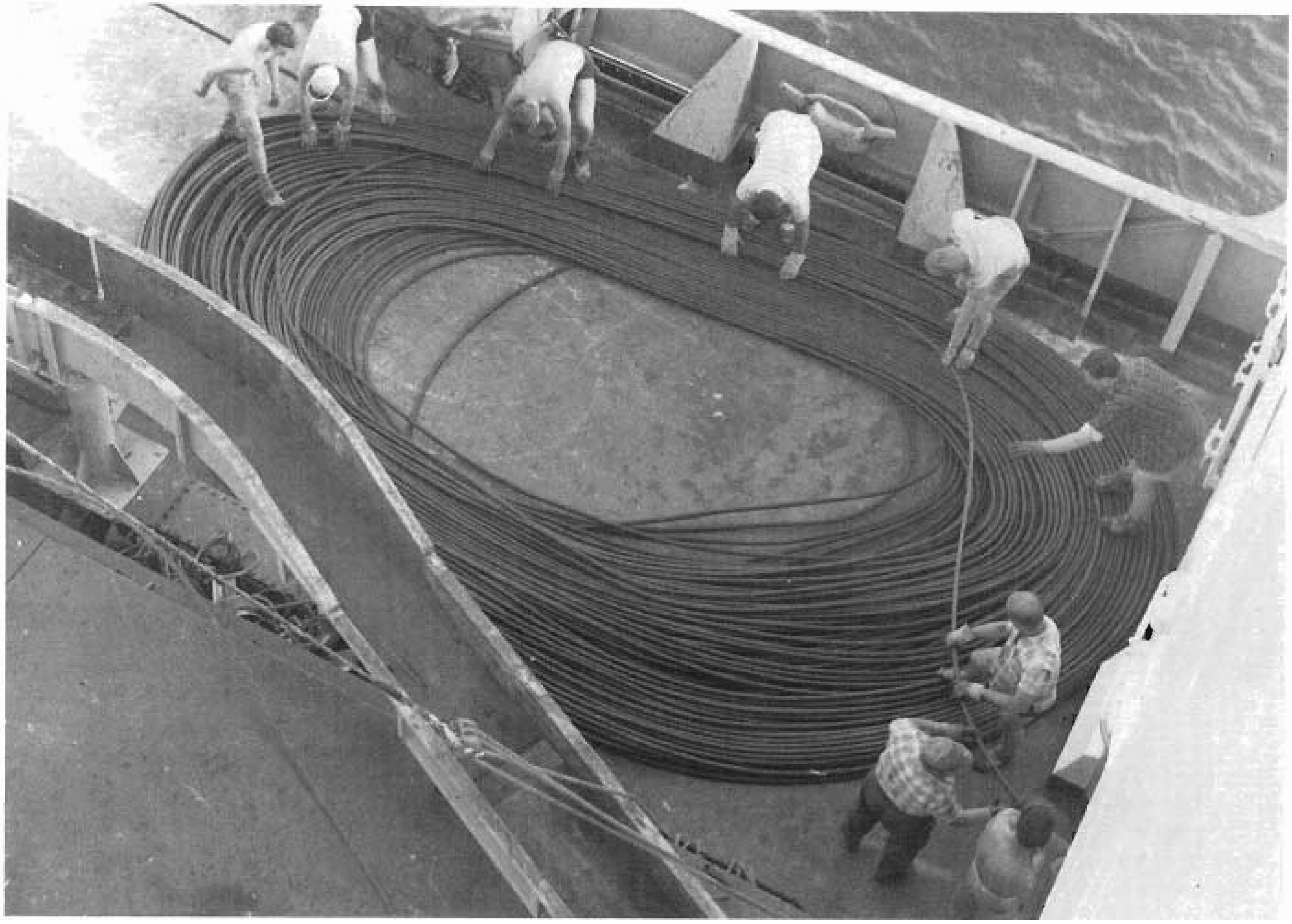
In contrast to earlier phases of the Pacific Communications Area effort in Southeast Asia, when rapid reaction to urgent communication requirements was the primary concern, by 1967, AFCS directed its efforts toward greater expansion of the fixed units and their capabilities. Another major development was the public acknowledgement of United States activities in Thailand and that country's affirmation that it was actively supporting the South Vietnamese effort.

Under the supervision of the Ground Electronics Engineering and Installation Agency, AFCS installed interim AUTODIN facilities in Southeast Asia, providing improved data services to commanders. Also, the Southeast Asia coastal cable began operating in November 1967. Known as Project Seed Tree, the system consisted of six submarine cable sections surrounding the coasts of South Vietnam and Thailand with cable heads at Da Nang, Qui Nhon, Nha Trang, Cam Ranh Bay, and Vung Tau in Vietnam and Satahip, Thailand.

The military buildup of forces in Southeast Asia had an impact on the area far beyond that of creating a modern communication network. Here, men of the 1880th Communications Squadron at Binh Thuy AB, South Vietnam, distribute clothing they solicited from families and friends in the United States to the people of Phong Dien, a hamlet near the base.

Two AFCS outside maintenance men work on telephone lines below the control tower at Tan Son Nhut AB, South Vietnam.

Youngsters from the Tan Mai Orphanage in the village of Tan Hiep exercise their lungs as they receive their weekly baths from the 1877th Communications Squadron, Bien Hoa, AB.



To expedite vital messages to Vietnam from Washington, the Air Force contracted civilian firms to lay an undersea communications cable. Here, members of the ship crew coil the underwater cable on the deck of the ship.

Vietnamese girls aided in the effort to complete the underwater communications system by digging trenches for the cable on the beaches.

The Vietnam conflict continued to drain AFCS resources of qualified airmen, since the manpower authorizations for Southeast Asia totaled 5,299, including 3,061 for Vietnam and 2,238 for Thailand. In July 1967, AFCS suffered its first battle casualty in Vietnam when SSgt David Fasnacht was killed during a mortar attack on Da Nang AB. In September, the command sustained two more battle casualties.

Requirements in Southeast Asia demanded cooperation between all American forces involved in the conflict. Units other than those assigned to the Southeast Asia Communications Region became involved in providing flight facilities to augment the forces in the area. The 1958th Communications Squadron at Andersen AFB, Guam, provided air traffic control for numerous Tactical Air Command fighter squadron rotations and thousands of B-52 sorties and tanker-support aircraft to service the fighters headed toward Vietnam. Also, more than half of the aircraft traffic handled by Clark AB, Philippines, was either inbound or outbound Southeast Asia traffic.

Emergency cable repairs in Southeast Asia often took AFCS technicians into deep quagmires.

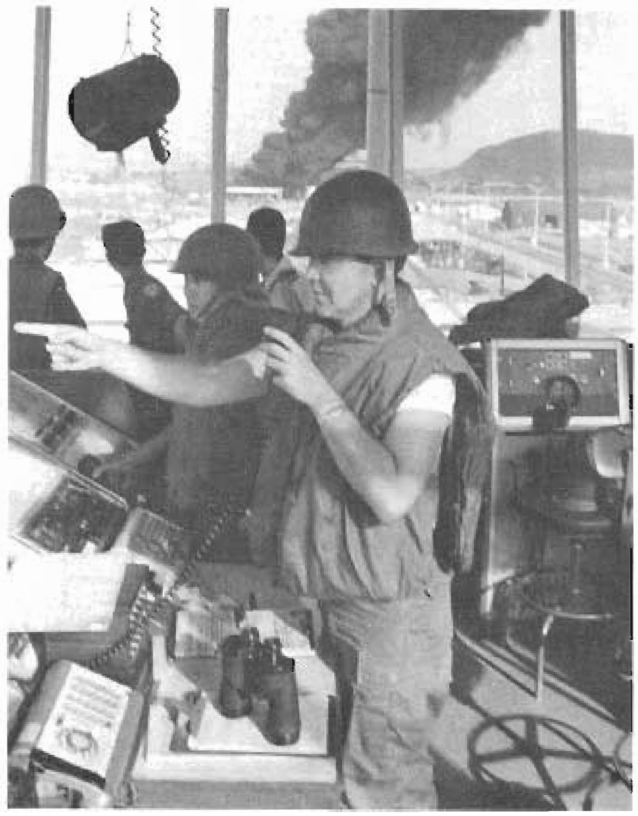
Ten bases in Vietnam provided air traffic services, six of which were Vietnamese Air Force bases where AFCS controllers supplemented the control tower personnel and fully manned the air traffic control radars. These bases included Bien Hoa, Binh Thuy, Da Nang, Nha Trang, Pleiku, and Tan Son Nhut. At the remaining bases, including Cam Ranh Bay, Phan Rang, Phu Cat, and Tuy Hoa, AFCS controllers fully manned both the control towers and the radars.

AFCS and Vietnamese controllers worked hand-in-hand in air traffic control facilities throughout Vietnam.

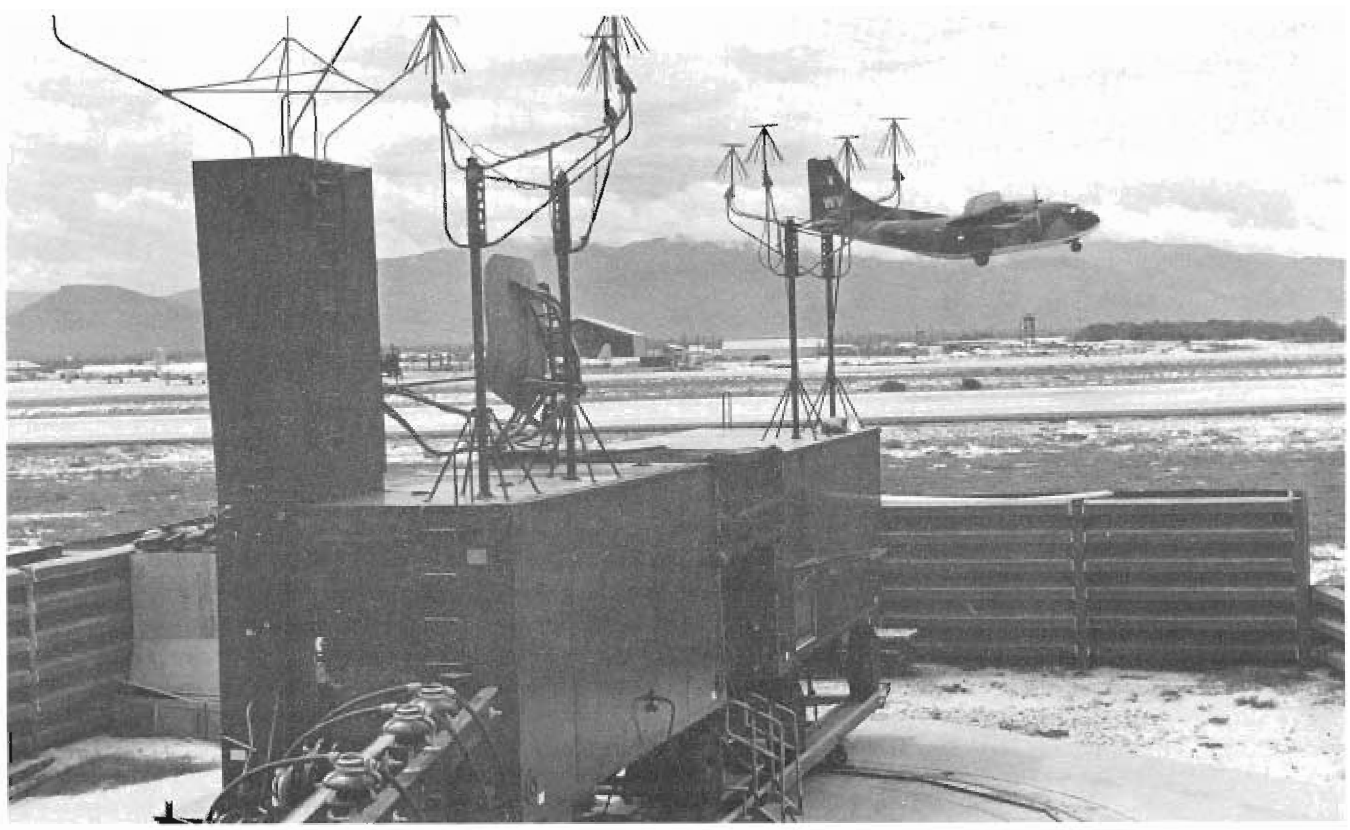
Towers such as this one high above the Tan Son Nhut AB, South Vietnam, flightline controlled all aircraft landing and taking off at airfields throughout Southeast Asia.

Air traffic control was a distinct problem for AFCS in Vietnam. Handling high-density traffic was no easy task for even the best-trained, experienced controller, and it was even more difficult for the relatively inexperienced controllers in Southeast Asia. These controllers operated some of the busiest bases in the world, as combined monthly control tower and radar operations at Da Nang and Bien Hoa ABs averaged more than 71,000 and 67,000 respectively in 1967. About 75 percent of the traffic into Da Nang was unannounced, with notification of intent to land seldom made before the aircraft was directly in the control area. The nature of the war being waged in Vietnam and the monsoon weather contributed to other air traffic control problems.

To provide improved service for air navigation in Vietnam, the Southeast Asia Notice to Airmen (NOTAM) center was completed at Tan Son Nhut AB in October 1967. With all four of the command's C-140 aircraft being used in support of Southeast Asia flight check and service evaluation functions, AFCS found its ability to provide these services throughout the remainder of the command limited. Still, in August 1967, increasing demands in the Vietnam conflict prompted AFCS to deploy two EC-47 aircraft from Tinker AFB, Oklahoma, to Clark AB, Philippines, to augment the C-140s.



As military operations increased in Southeast Asia, AFCS controllers often worked under fire to maintain control of aircraft traffic.



AFCS controllers used a variety of radar equipment to control aircraft. Here, a C-123 aircraft passes a radar approach control unit at Cam Ranh Bay AB, South Vietnam.

Mortar attacks damaged this signal site at Vung Chua, South Vietnam, in 1968.

Early in 1968, the United States Army mounted a major campaign in Southeast Asia, which required a massive airlift of troops and equipment to specified combat areas. To support communication requirements for this buildup, AFCS deployed portions of the 5th Mobile Communications Group to Southeast Asia on a temporary loan basis. The AFCS tradition of being the first in and the last out of combat areas was once again fulfilled during the Tet Offensive in January 1968. Since 1966, communicators from the 1st Mobile Communications Group had supported Special Forces and Marines at Khe Sanh. When the base came under attack early in 1968, AFCS communicators left only when the Marines abandoned the base for tactical reasons. Throughout the seige, a team from the group kept tactical air navigation equipment operating. When the facilities were destroyed during the heaviest enemy attacks, they were quickly replaced so that vital navigational aids for the critical airlift support to Khe Sanh was maintained. The highest military combat award for gallantry in action ever received by a member of AFCS, the Silver Star, was presented to SSgt Vernon O. Gentry, of the 1st Mobile Communications Group for actions at Khe Sahn in February and March, 1968. SSgt Gentry, an air traffic control team chief assigned to the 1972d Communications Squadron, exposed himself to hostile fire in an effort to keep vital navigational aids at Khe Sanh in operating condition. Extensive cable damage resulted from

Damaged circuits required that AFCS technicians be constantly ready to provide repair services to insure continued operation of important communications facilities.

the intensified enemy attacks during this period and caused temporary loss of hundreds of telephones and special circuits. During the Tet Offensive, there were 25 instances of cable damage due to mortar and rocket attacks at Tan Son Nhut AB. Monsoon rains caused additional damage as water seepage knocked out cables that had no other visible damage.

As a result of persistent high-level activity throughout the area, AFCS's global air traffic control operations reached an all-time high, handling 19,539,435 operations during 1968. Air traffic controllers at three bases in Vietnam routinely handled traffic exceeding that at America's busiest airport, O'Hare Airport in Chicago. With a single runway, controllers at Bien Hoa AB handled 857,679 operations in 1968 and the traffic count at the other two bases, Da Nang and Tan Son Nhut, was not far behind, recording 846,649 and 804,327 operations respectively on two runways apiece. Each base had about five controllers per shift who handled everything from routine flights to battle-damaged aircraft and Navy aircraft unable to return to their carriers. In contrast, O'Hare had six runways and 99 controllers, handling an average of 650,000 operations during the year. In May, air traffic operations at Da Nang AB reached 80,549, an average of 2,595 operations daily. This count was the greatest known to have occurred at any airport in the world at this time.

AFCS controllers handled a world record of aircraft traffic from the Bien Hoa AB, South Vietnam, control tower in 1968. In the foreground is an HH43B Husky helicopter.

In 1968, Bien Hoa AB, South Vietnam, earned the title of the world's busiest airport when air traffic controllers from the 1877th Communications Squadron handled more than 850,000 takeoffs and landings.

Civilian controllers at Chicago's O'Hare International Airport, operate from their modern control tower with the latest Federal Aviation Agency equipment. Although O'Hare is considered the busiest commercial airport in the world, three airfields in Vietnam-Bien Hoa, Da Nang, and Tan Son Nhut-each handled more aircraft per month than the busiest airport in the States in 1968.

Air traffic controllers direct aircraft at a busy airfield in South Vietnam.

In other actions, the responsibility and control of the Southeast Asia Military Altitude Reservation Facility was transferred from the 13th Air Force to AFCS's Pacific Communications Area late in 1968. This facility had been established in 1966 to coordinate the massive movement of military aircraft in the geographical areas of the 5th, 7th, and 13th Air Forces.

In July 1968, the 1974th Communications Group assumed operational responsibility for five Thailand sites of the Integrated Communication System for Southeast Asia, designed to provide long-haul intercountry communications. The Army maintained overall system responsibility for all but the sites in Thailand.

The extent of AFCS support in the Vietnam conflict was demonstrated through the amount of equipment deployed to the area. In 1967 and 1968, the 1st Mobile Communications Group deployed 162 sets of high frequency radios, 25 tropospheric scatter systems, 72 radio relay terminals, 44 telephone systems, 47 communications centers, 26 control towers, 22 ground control approach facilities, and 41 tactical air navigation systems, in addition to other equipment.

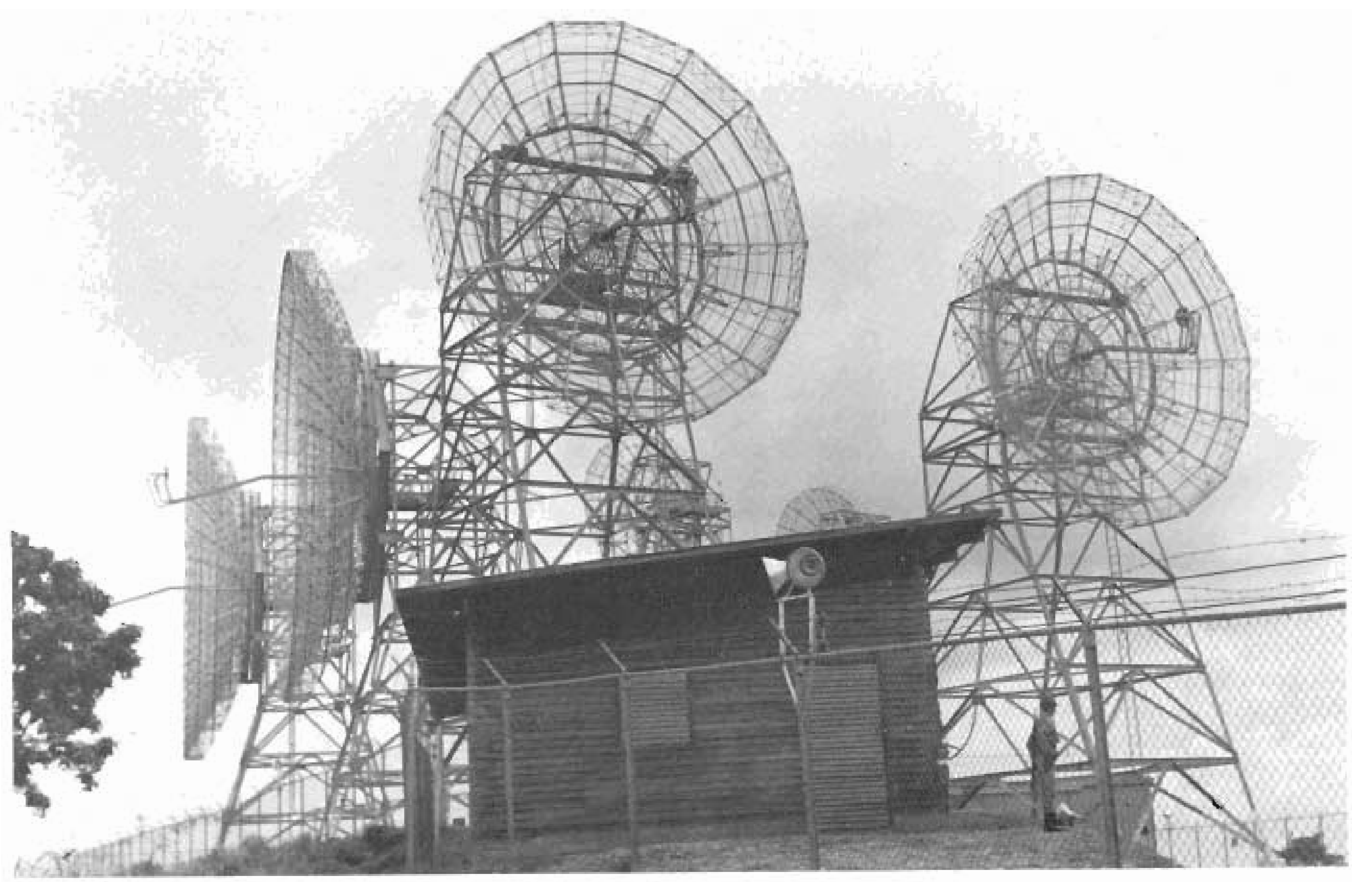
Although troop levels in Southeast Asia began to decline in 1969, AFCS continued to provide essential communications support throughout the area. Command personnel installed six Air Traffic Regulation Centers in Vietnam, and scheduled two more for

An AFCS airman assigned to the 1880th Communications Squadron makes a daily equipment quality check of a recorder used in the Binh Thuy AB, Vietnam, Air Traffic Regulation Center. The equipment is used to record all voice communications between aircraft and the center.

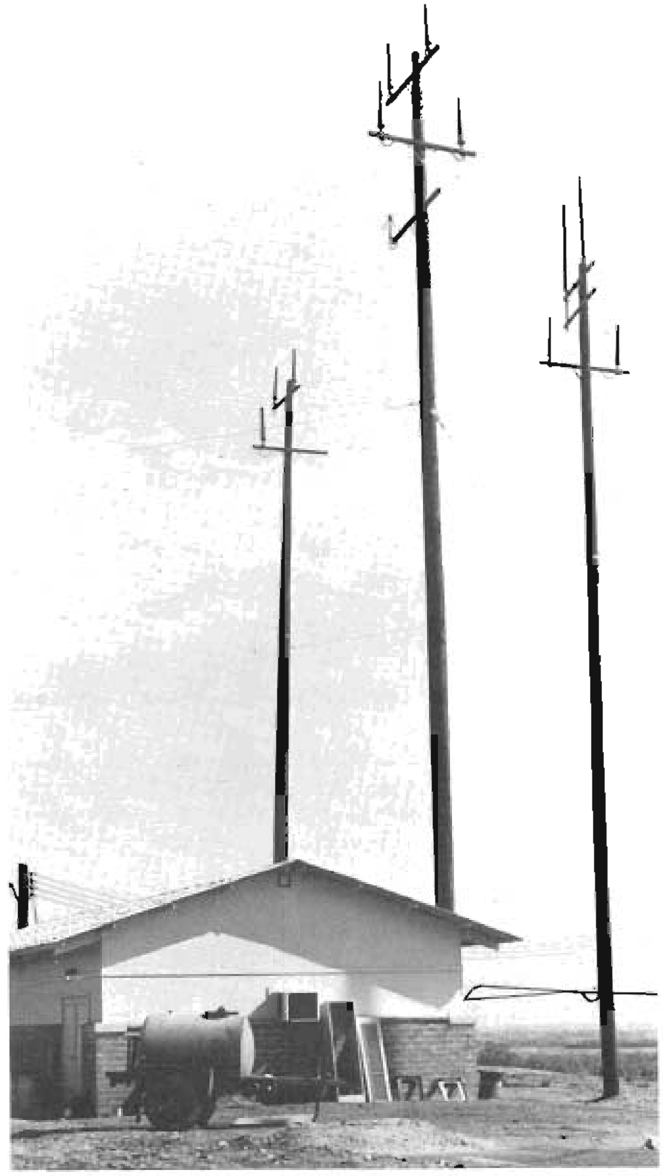
AFCS provided a wide variety of communication equipment to support the Air Force effort in Southeast Asia. This tactical air navigation facility at Pleiku AB, South Vietnam, provided en route and terminal navigation assistance to aircraft.

Thailand during the year. This equipment employed radar and ground-to-air radio to regulate distance and altitude between aircraft.

Probably nowhere in the world did the Military Affiliate Radio System (MARS) play a greater role in improving the morale of military personnel and their loved ones than in Vietnam. In late 1965, telephone facilities in Vietnam were limited to a single line to the United States, and at most could handle only 30 servicemen's telephone calls per day at a rate of about $12 for three minutes. High costs and shortages of both equipment and manpower prohibited installation of additional telephone facilities in that area. The chief of MARS offered a solution whereby portable MARS radio stations were airlifted immediately to Vietnam. Servicemen could then speak to the United States through the use of a telephone patch, or they could send a written message, called a MARSgram, which would be relayed by radio teletype to a MARS station equipped to receive the message. The MARSgram was then relayed by radio to a MARS station nearest the serviceman's home.



These radio relay antennas near Takhli AB, Thailand, were operated by the 1980th Communications Squadron.



Army "Chinook" helicopters from the First Field Forces Command at Nha Trang AB, South Vietnam, assisted in transporting 90-foot antenna poles for AFCS from Qui Nhon to the Phu Cat transceiver building pictured on the right.

By 14 December 1965, seven Vietnam MARS stations were operating, and more than 17,000 teletype messages and 400 telephone patches were processed during the 1965-1966 Christmas holiday season. By 1 May 1966, AFCS had established five MARS stations in Thailand and by November 1966, 11 MARS frequencies provided direct telephone patching from Vietnam to the United States. During 1966, the 1964th Communications Group placed more than 14,000 telephone calls by way of MARS. The number of messages and phone patches increased with each year. Between 1 January and 30 June 1968, MARS operators handled more than 80,000 phone patches and between 1 July 1968 and 30 June 1969, they handled approximately 210,000 phone patches. During the period between July 1969 and 30 June 1970, an average of 20,000 phone patches a month were made to bring Air Force personnel in Southeast Asia in contact with their families. The boost to morale was tremendous. As one operator in Da Nang put it, "When a soldier gets a letter from home, he's happy. When he sets down the MARS telephone receiver after talking to someone special back home, he's ready to scale 10-foot walls."

The phone patching was nearly a free service for the servicemen. The MARS service itself was free, but the caller might have to pay a dollar or two for the commercial phone call portion of the patch from the MARS civilian operator to the person called. A few MARS stations even paid this charge. A group of businessmen in Omaha, Nebraska, for example, picked up the cost for 70 percent of the MARS calls transmitted through that city. Their bill in 1970 ran about $1,500 a month. One of the most prominent MARS stations was Senator Barry Goldwater's station (AFA7UGA) in Phoenix, Arizona, which placed well over 100,000 phone patches between 1967 and June 1973.

Military Affiliate Radio Stations in Vietnam provided both backup for official communication systems and message/telephone service for military personnel wishing to contact their families in the United States.

A security policeman at Tan Son Nhut AB, South Vietnam, enters the Military Affiliate Radio Station to place a call to the United States.

Complex computers, such as the one pictured, assigned to the 1882nd Communications Squadron at Phan Rang AB, South Vietnam, supported the communication systems managed and operated by AFCS in Southeast Asia.

Air Force and Thai personnel use a "cherry picker" to install an antenna at the Military Affiliate Radio Station at Nakhon Phanom AB, Thailand.

While still providing extensive communications support throughout Southeast Asia, AFCS began preliminary planning actions in the late sixties to reduce the size of the 1st Mobile Communications Group. An orderly withdrawal without sacrificing all that had been built up in the way of facilities and equipment required thorough planning. Greater training efforts than those of earlier years were necessary to ensure that host nation communicators and air traffic controllers possessed the essential skills to operate and maintain these facilities. Despite preparations for the gradual reduction of American troops in Southeast Asia, the command expected that until the final resolution of United States involvement in the Vietnam conflict, AFCS units would be continually called upon to support contingency and emergency communication requirements in the Pacific Air Force theater of operations.

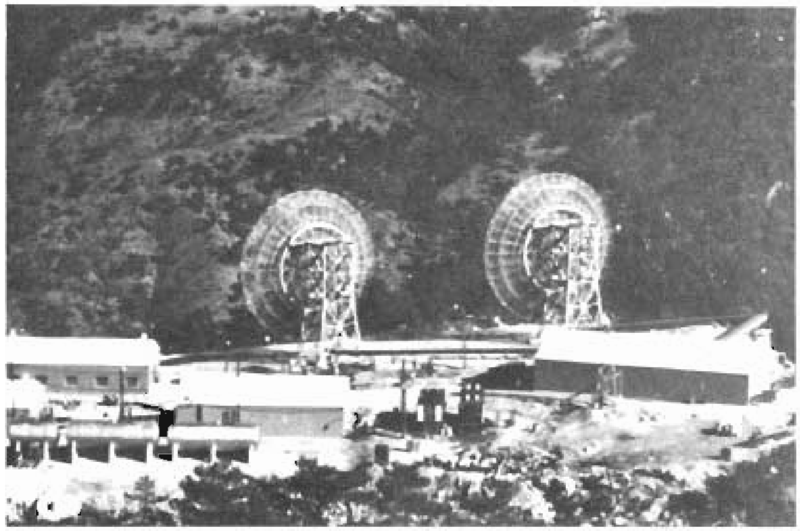
AFCS personnel found time to aid Vietnamese refugees from the Tet offensive. Men from 1880th Communications Squadron volunteered to build 16 houses for refugees they found living in an elementary school in Binh Lac, a hamlet near Binh Thuy AB, Vietnam.

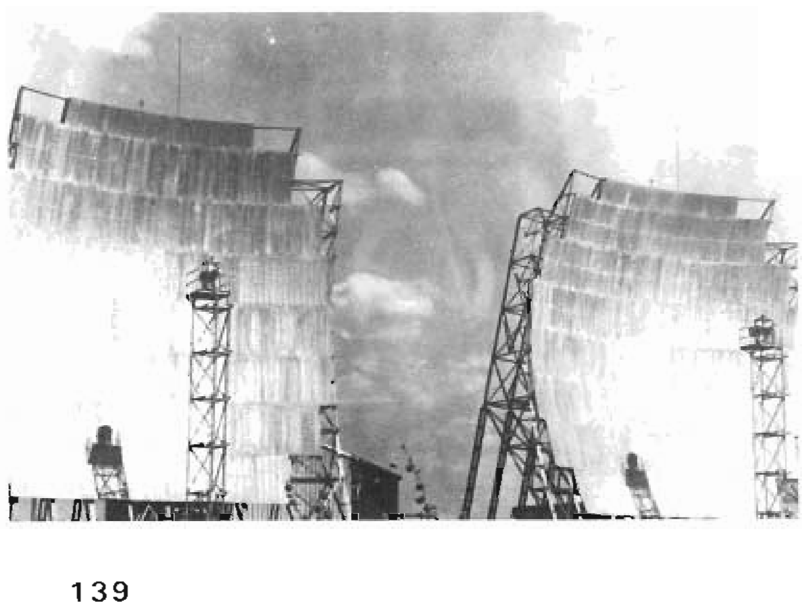
As combat operations escalated in Vietnam, AFCS personnel took increased measures to ensure their safety. With an M-16 ready in the background, members of the 1877th Communications Squadron man the telephone switchboard at Bien Hoa AB, South Vietnam.

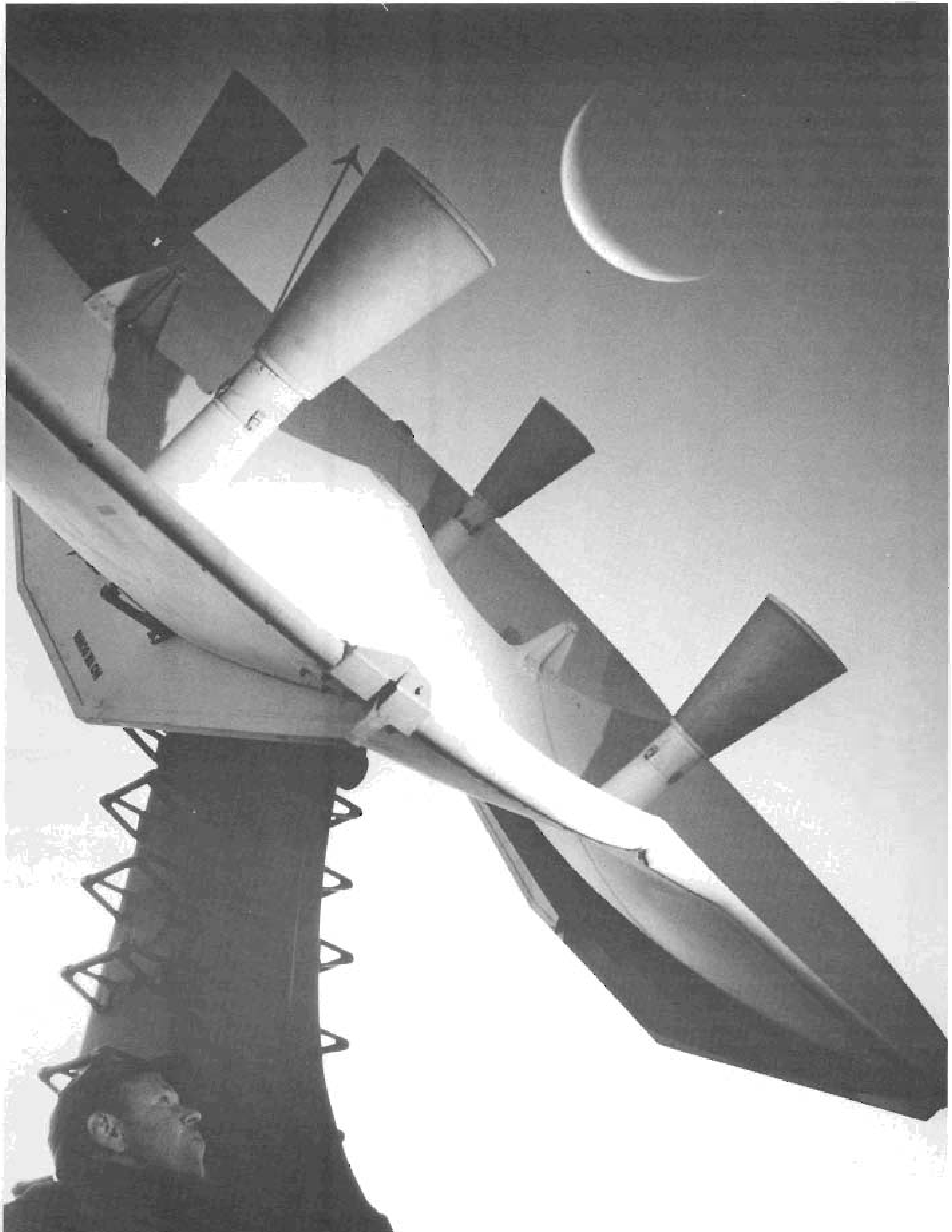
A vital preliminary to turning over dial central offices at Vietnamese bases to the Republic of Vietnam Air Force was the training of Vietnamese in maintenance procedures. Here, an on-the-job trainee soldiers a connection among the maze of wires making up the dial central office at Binh Thuy AB, South Vietnam, as a member of the 1880th Communications Squadron observes.

By the end of the decade, AFCS could look back at its first nine years as a major air command with justifiable pride. The command had established itself as the single Air Force leader in communications-electronics and air traffic control support. During these years, AFCS witnessed many significant events that affected the entire area of communications management. Diverse interests and needs, from direct operation and maintenance of systems to planning for future systems, caused the activities of AFCS to be interwoven with the interests of all Air Force commands, other government agencies, as well as United States and foreign commercial interests. In 1964, the Dickerson Committee, so named for its chairman, Col Robert W. Dickerson of Headquarters USAF Directorate of Command and Control and Communications, had evaluated the effectiveness of AFCS as a major command. The committee concluded then that the need for a true single management agency for Air Force communication planning, programming, maintenance, and operation was more urgent than ever before. Experience in Southeast Asia bore this out and it is to the lasting credit of AFCS and its dedicated personnel that the command was able to meet the challenges of the sixties so effectively.

By the end of the sixties, AFCS was firmly established as the single manager of Air Force communications and had been the leader in many developments and innovations throughout the decade in all areas of communication systems, including the long-haul tropospheric scatter sites, air traffic control, and microwave relay antenna pictured here.







THE SECOND DECADE OF MAJOR COMMAND STATUS

INTRODUCTION

While some would say the growth in responsibilities during the decade of the seventies could not match the dramatic gains by AFCS* in the sixties, AFCC could still look back in 1981 at some notable achievements in the preceding decade. Certainly, technological advances and the associated communications systems modernization meant constant change in the standard ways of doing things. New programs kept planners, program managers, engineers, and installers busy setting up new and updated communications systems, and, of course, operators busy learning how to twist new dials and adapting to new procedures.

Like other Air Force commands, AFCC faced the insatiable demand for new and better systems which, through technological advances, would make the Air Force weapons and managements systems not only more productive, but less costly. Technological imperatives in communications system development, modernization programs, and decreased Southeast Asia activity pressed against AFCC concurrently. However, consolidation, one of the popular ways to reduce forces, affected AFCS in a different way. Confidence in the AFCS service record to the Air Force, along with the more intangible or subjective and political factors that bring change to military organizations, prevented AFCS from returning to a subordinate position under the Military Airlift Command in mid-decade. Instead, during a period so marked by the drawdown of Vietnam, AFCS absorbed communications functions and data processing managership—a technology closely associated with communications—from other commands and agencies, which resulted in a larger role for AFCC in the total Air Force by 1981.

During the sixties, AFCS maintained a personnel force which represented 4 percent of the Air Force personnel, military and civilian. With acquisition of the Ground Electronics Engineering Installation Agency in 1970, AFCS increased to 5 percent of the Air Force personnel. That percentage remained relatively constant until 1976, when the acquisition of the Strategic Air Command communications responsibilities raised the percentage to 6 percent. Assumption of HQ USAF functions and the Air Force Data Automation Agency in 1978, and assumption of communications functions of the Aerospace Defense Command in 1979, assured the vitality of the Communications Command as it began its third decade in 1981.

The twentieth anniversary of AFCC as a major command was met with some new missions in engineering and installing of communications-electronics and meteorological equipment, and the appropriation of automated data processing functions. But the original mission, which dated back to 1938, remained constant: to provide the communications-electronics, meteorological, and air traffic control services for the Air Force and for other agencies as directed by the Chief of Staff of the Air Force. By rationale of the 1960 Williams Report and the single-manager concept, other Air Force commands relinquished their communications activities. By 1981, except in a few special situations, AFCC possessed operational and maintenance control of most communications responsibilities of the Air Force.

A cable splicer with the 1974th Communications Group works in a manhole at Scott AFB, Illinois.

*The Air Force Communications Service was redesignated the Air Force Communications Command in 1979. The command's two acronyms, AFCS and AFCC, are employed appropriately to fit the time period under discussion.

ORGANIZATIONAL CHANGES IN THE SEVENTIES

Two predominant ideas combined in the early years of the seventies to change the AFCS organizational structure. The first, the Air Staff decision to live with austere budgets coalesced with the second, the recurring effort to develop Air Force communications under a single-manager concept. Advancing technology resulted in worldwide, automated communications systems that required standardization rather than specialization according to an individual command's mission. Consequently, the Air Force conceived communications as functionally oriented, rather than mission-oriented, and AFCS continued with plans to consolidate Air Force communications functions under its own centralized, more efficient control.

Members of the 1842d Electronics Engineering Group at Scott AFB, Illinois, review circuit board negatives.

Civilian employees augment the AFCC work force.

AFCS/GEEIA MERGER AND ITS IMPACT

Actions taken by the Air Force to reduce cost and manpower resulted in, among other projects, the consolidation of the Ground Electronics Engineering Installation Agency (GEEIA) with AFCS in April 1970. Henceforth AFCS would not only furnish, manage, operate and maintain communications-electronics, meteorological, and air traffic control equipment, but would also engineer and install the equipment and facilities.

As part of the GEEIA/AFCS merger, AFCS combined its Western, Central, and Eastern Communications Regions with three newly acquired GEEIA regions, all located in the continental United States, into two geographic areas, which compared to that of numbered air forces. Effective 1 May 1970, the Northern Communications Area, with headquarters at Griffiss AFB, New York, and the Southern Communications Area, with headquarters at Oklahoma City AFS, Oklahoma, began management of AFCS continental United States activities. The Northern Communications Area included 39 communications squadrons, four groups, six electronics installation squadrons, and one electronics engineering squadron. The Southern Communications Area included 42 communications squadrons, four electronics installation squadrons, one electronics engineering group, and one electronics engineering squadron.

Along with the redesignation of the single GEEIA squadron in Europe, the area headquarters in Europe added an engineering and installation deputate to its staff organization. As part of the AFCS/GEEIA merger in the Pacific, four GEEIA squadrons came under control of the Pacific Communications Area, and the new 1843d Electronics Engineering Squadron was activated at Wheeler AFB, Hawaii. Although the consolidation costs for the AFCS and GEEIA merger reached nearly $5 million, an estimated $14 million would be saved the first year and $17 million henceforth. Approximately 2,000 manpower spaces were also eliminated.

One of the positive outcomes that came with the consolidation of GEEIA into AFCS was the need for a separate base to accommodate the expanded headquarters. Facilities at Scott AFB, Illinois, where Headquarters AFCS then resided, were saturated, leaving no room for expansion. Consequently, the headquarters moved to Richards-Gebaur AFB, Missouri, near Kansas City. For the first time since World War II, the Air Force Communications Service had its own base. The short move from Scott AFB to Richards-Gebaur AFB took place in the summer of 1970, with the official assumption of command taking place on 15 July 1970. To support the new command headquarters, the 1849th Air Base Wing, with associated consolidated aircraft maintenance, supply, and civil engineering squadrons, and the 1849th USAF hospital were designated, activated, and assigned to AFCS.

REDUCTION OF INTERMEDIATE HEADQUARTERS ORGANIZATIONS

Between 1971 and 1973, AFCS eliminated its regions, or intermediate headquarters organizations, in compliance with continuing Air Force budget austerity. When Headquarters AFCS inactivated the 9th and 12th Tactical Communications Regions, all their groups and squadrons, henceforth, reported directly to the Tactical Communications Area headquarters, making that organization similar to the Northern and Southern Communications Areas. The Alaska Communications Region was inactivated and its activities were assumed by the 1931st Communications Group, Elmendorf AFB, Alaska. Even though the Pacific Communications Area remained the largest AFCS organization, its two subordinate regions were also inactivated and its groups assumed some of the intermediate headquarters functions. Finally, the four regions reporting to the European Communications Area were eliminated and the groups and squadrons reported directly to the area headquarters. Eventually, this consolidation saved several hundred manpower spaces since only a few expanded support staff spaces were required to provide the necessary communications-electronics support to a particular command headquarters or base organization which an AFCS unit served. With this reorganization, the command structure had four echelons: headquarters at Richards-Gebaur AFB, areas reporting to the command headquarters, groups and squadrons that reported to areas and command headquarters, and squadrons, detachments and operating locations that reported to any of the first three echelons.

Members of the 5th Combat Communications Group install an 8-foot parabolic antenna at Eielson AFB, Alaska. The antenna is part of a system to provide communications and air traffic control services during mobilization.

WIDENING THE SCOPE OF SERVICE WITH COMMUNICATIONS-ELECTRONICS SUPPORT OFFICES

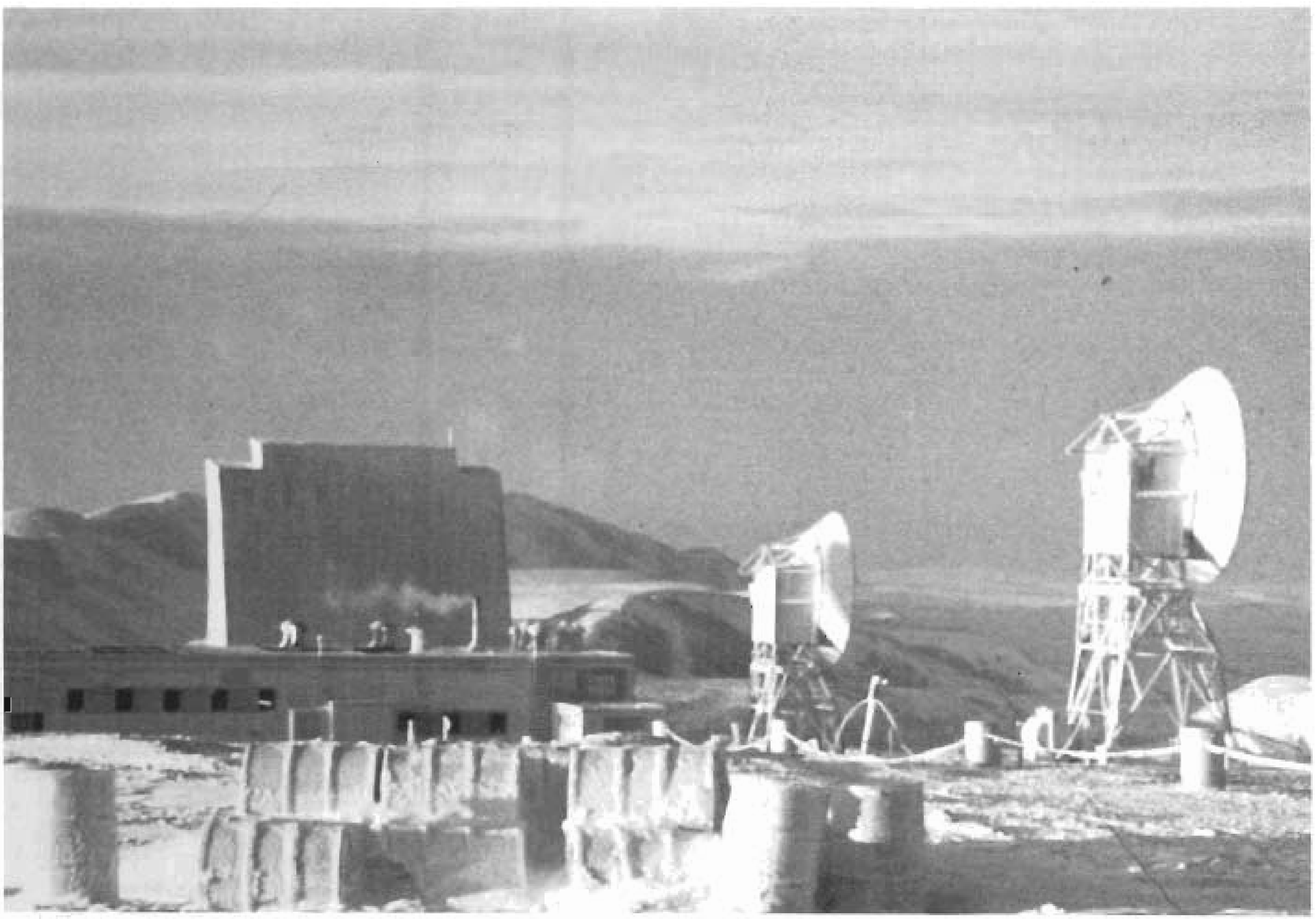
In 1970, following the dictates of lower budgets with centralized communications management, Gen Paul R. Stoney, AFCS commander, directed a feasibility study of AFCS providing communications-electronics staff support to selected commands. Savings of manpower positions did not prove as dramatic as with intermediate headquarters eliminations, partially because AFCS could not submit major reduction proposals without infringing on other commands which AFCS units, as tenants, served. Nonetheless, by providing this staff support to several commands in 1971 and 1972 some manpower was saved and AFCS could claim increased efficiency under the single-management concept. Accordingly, after negotiating joint agreements with the Air Force Logistics Command, Air Training Command, Air University, Air Force Systems Command and several Air Force Systems Command subordinate units, Headquarters AFCS established "Communications-Electronics Support Offices" (popularly called CESOs) to provide the traditional communications-electronics staff functions to the respective commands. Under the common dual-hat system, the CESOs served as operating locations of AFCS Headquarters and as a communications-electronics staff office at major command headquarters.

MAJOR PERSONNEL REDUCTIONS IN THE EARLY SEVENTIES

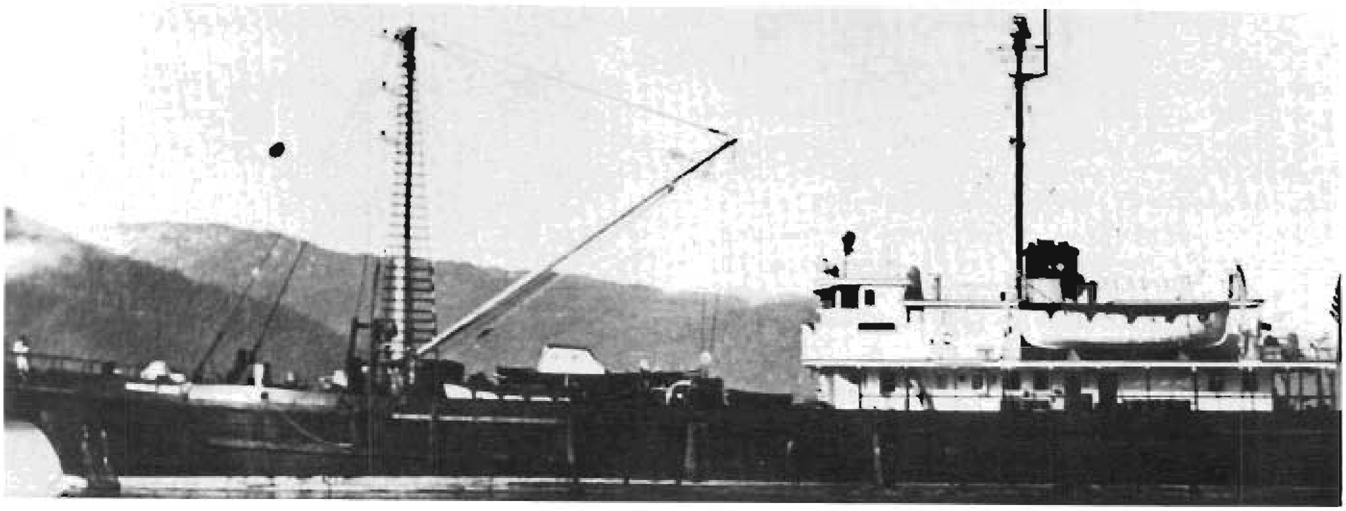
In keeping with American free enterprise traditions, AFCS lost part of its role in the Alaska communications business with the sale of the Alaskan Communications System to a commercial carrier. On 8 January 1971, Secretary of the Air Force, Dr Robert L. Seamans, signed the document transferring the Alaskan Communications System from the Air Force to RCA Alaska Communications Inc. By that action, AFCS began the transfer of 37 sites throughout Alaska, valued at $7.6 million. In addition, communications and support equipment at 82 locations in Alaska and Seattle, Washington, valued at $23.9 million were also transferred. The sale of the Alaskan Communications System, and the subsequent deactivation of the 1929th Communications Group at Seattle, and its detachments and operating locations on 30 June 1971, affected the lives of over 1,000 civilian and military personnel through reassignment, retirement, or separation from the service.

Only one problem remained after 1971 in the disposition of this system, that of establishing a final value for the cable ship, Colonel Basil O. Lenoir. The Lenoir, pride of Air Force seagoers, had been designed for submarine cable work in the Alaskan inland waterway, and therefore did not require Coast Guard certification as an ocean-going vessel. RCA Alaska Communications Inc., who was purchasing the ship, felt this limitation lessened the ship's worth far below the previously agreed upon price, and the debate and reconsiderations took a few years to resolve.

Although the sale of the Alaskan Communications System technically removed the Air Force and AFCS from commercial business, AFCS still owned and operated the White Alice Communications System, a military network which also transmitted commmercial long-distance traffic. The Air Force organized a project to withdraw completely from the commercial business by disposing of this system. However, problems—among them, difficulties assigning values to the system—delayed completion of the project into the eighties.



A White Alice communications site at Cape Lisburne, Alaska.



The only ship in the Air Force Communications Service's navy, the Colonel Basil O. Lenoir, was used to maintain the Alaska Communication System's submarine cable from Seattle, Washington, to Alaska.

SAC COMMUNICATIONS: A BIRTHDAY PRESENT FOR AFCS

When the Air Force first proposed the single management concept for Air Force communications, prior to the formation of AFCS in 1961, the Strategic Air Command (SAC) was allowed to maintain its own communications systems. This action was justified because of SAC's specialized, mission-oriented communications requirements. Between 1961 and 1975, a series of Air Force committees evaluated SAC/AFCS consolidation possibilities. A 1968 SAC proposal resulted in the 1970 consolidation of selected SAC/AFCS overseas communications maintenance work centers. When SAC acquired control of Griffiss AFB, New York, on 1 July 1970, the 2019th AFCS Communications Squadron remained manager for ground communications-electronics. Thus, the squadron commander became the first AFCS unit commander to serve in the conventional dual-hat role for SAC.

Between June 1970 and January 1975, both SAC and AFCS made comprehensive studies of the feasibility of AFCS assuming responsibilities for SAC's communications. By September 1975, both commands approved the formal plan to form the Strategic Communications Area. On 30 January 1976, the Air Staff gave its final approval. Similar to the Tactical Communications Area organizations, with only slight variations to be expected with complicated reorganizations, this new area organization would have a dual-hatted AFCS area commander serving as the communications deputy to the SAC Commander in Chief with the responsibility for managing SAC communications matters. On 1 July 1976, a realignment ceremony was held at Offutt AFB, Nebraska. Gen Russell E. Dougherty, SAC Commander in Chief, told the audience that AFCS could not have a better present for its 15th anniversary than the 5,000 SAC communicators. Maj Gen Rupert H. Burris, AFCS Commander, said that he was proud to welcome the dedicated SAC communicators into the AFCS organization.

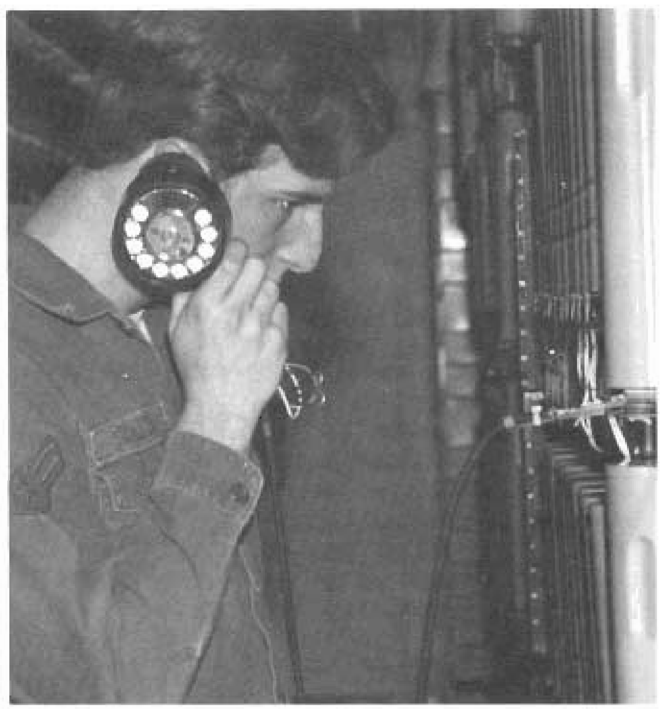
Finishing touches are completed on a new communications tower.

In mid-decade, the same kind of impetus provided by the Air Staff to evoke communications consolidations of SAC and AFCS produced consolidation plans for additional major commands' communications functions. Between July and November 1974, AFCS formed joint working groups with the Air Training Command, the Air Weather Service, the Air Force Security Service, and the Aerospace Defense Command. These commands struggled to retain responsibilities long considered their own, but technical necessity overrode traditions and AFCS assumed new responsibilities when the debates ended.

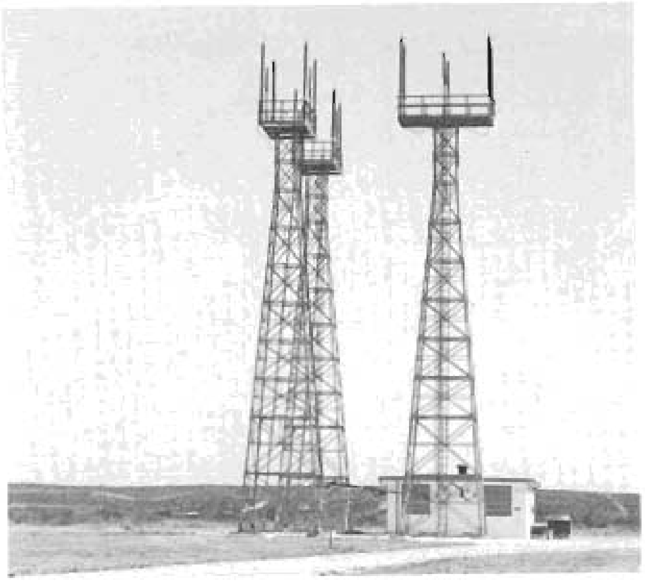
Members of the 1923d Communications Installation Group, Kelly AFB, Texas, install conduit on the glide slope antenna tower. The tower is part of a new electronic system (the GPN-29 solid state instrument landing system) that guides aircraft to the primary landing runway at Holloman AFB, New Mexico.

By April 1976, AFCS was providing telecommunications center maintenance for seven centers of the United States Air Force Security Service. Redefinition of that command's mission delayed further consolidations for two years. Early in 1979, as part of an overall reorganization of the United States Air Force Security Service, redesignated the Electronics Security Command, AFCS assumed operating and maintenance functions at 13 telecommunications centers as well as secure voice service within these centers. As the operating command, the Electronics Security Command maintained operational management responsibilities through the AFCS Communications Electronics Support Office.

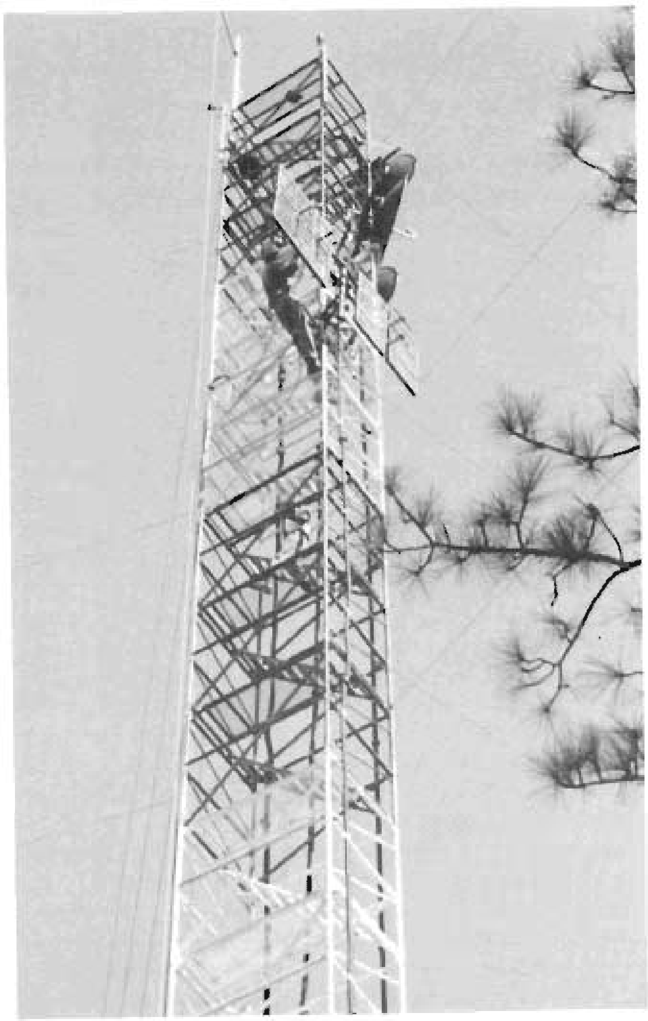
In June 1976, AFCS acquired the ground communications-electronics maintenance functions from four Air Training Command bases, and in October 1977, acquired similar responsibilities from the Air Weather Service. Also in 1976, AFCS assumed the maintenance responsibilities for the Aerospace Defense Command's ground-to-air transmitter and receiver antennas at 50 worldwide locations. Although this was not a large portion of the communications-electronics responsibilities of the Aerospace Defense Command, it served as a prelude to the larger assumption of that command's communications in October 1979, when AFCS gained 1,800 new people and new responsibilities as a result of the Air Force decision to inactivate the Aerospace Defense Command. These new responsibilities fell into two basic areas. The first, to provide communications support and electronics and sensor maintenance of specialized equipment for missile and space surveillance. The second, to provide the same support for the operation of the nation's air defense-force command and control network, AFCS assumed control of squadrons working on the ballistic missile radar sites, including the new PAVE PAWS, phased-array, radar located at Eglin AFB, Florida; squadrons



A maintenance technician with the 1974th Communications Group uses a handset to monitor a telephone line.



Radio receiver sites, such as this one at Laughlin AFB, Texas, are often located in desolate areas.



Members of the 1926th Communications and Installation Group from Robins AFB, Georgia, complete the installation of an antenna tower during an exercise at Eglin AFB, Florida.

working on communications monitoring functions for the Ballistic Missile Early Warning System at Clear, Alaska, and Thule AFB, Greenland; and squadrons providing communications support for the NORAD Communications Operation Center in Cheyenne Mountain, Colorado. AFCS also took over the unique 1954th Radar Evaluation Squadron at Hill AFB, Utah.

AFCS received other major increases in its mission responsibilities in the late seventies, raising the AFCS manpower percentage in relationship to the Air Force to almost 6 percent. The additional responsibilities came not so much from a continuing implementation of the single manager concept, but from congressional and Department of Defense desires to decrease management overhead. The Air Staff reasoned that by realigning certain headquarters functions they could enhance management control of various programs as well as lower costs and overhead expenses. The transfer of responsibilities tacitly expressed Air Force confidence that it could handle broadened communications responsibilities.

The first mission increase came in April 1978, when the Air Staff announced the elimination of the office of Assistant Chief of Staff for Communications and Computer Resources, and the assumption of 54 of that office's functions by AFCS. Many of the new responsibilities simply augmented or expanded previous command functions, including programs for telecommunications center consolidations, Automated Digital Network (AUTODIN), the Automatic Voice Switching Network (AUTOVON), the Automatic Secure Voice Communications, and the Digital European Backbone system. The most important responsibilities came with the AFCS assumption of the Air Force Data Automation Agency mission in June 1978.

On 30 June 1978, as a part of a general realignment of USAF Headquarters and selected separate operating agencies, the Air Force Data Automation Agency was disestablished. The following day, the Office of Deputy Commander for Data Automation was established within AFCS headquarters. The newly created organization assumed the responsibility of providing data processing support to the Air Force and other federal agencies as directed by Headquarters USAF. The consolidation of data automation resources under the Deputy Commander was intended to provide centralized management of data automation services within the Air Force. The Deputy Commander for Data Automation accomplished his mission through nine data automation centers described.

Three centers-the AF Data Systems Design Center, the AF Data Systems Evaluation Center, and the Phase IV Program Management Office-were located at Gunter AFS, Alabama. The Air Force Data Systems Design Center, the largest of the AFCC data automation centers, was charged with the design, development, programming, testing, implementation and maintenance of standard automated data processing systems. The center was also responsible for automatic data processing system management of three Air Force standard computer systems used at all bases and major command headquarters. A second center, the Air Force Data Systems Evaluation Center, conducted independent assessments of automated data processing systems during their life cycle. Evaluations were performed during the conceptual, definition, development, test, and operation phases of new systems, as well as during major modifications of existing systems, as presented and used, were effective and satisfied user requirements. In additon, the center also provided expert consultant support to program managers. A third center, the Phase IV Program Management Office, was charged with providing the management and technical direction necessary to replace current base-level computer systems with a new state-of-the-art system in order to adequately support the Air Force's mission. The Phase IV Program Management Office was also responsible for the acquisition of the Interservice/Agency Automated Message Processing Exchange.

Technicians enter data into a video display terminal in the computer operations center of the Air Force Communications Computer Programming Center, Tinker AFB, Oklahoma.

Automated data processing activities for the Air Force and other agencies of the government are managed by AFCC. This includes testing, program management evaluation, simulation, hardware and software acquisition, and computer performance evaluation.

Three other centers were located on the east coast. The Air Force Computer Acquisition Center, located at Hanscom AFB, Massachusetts, was responsible for providing assistance in the preparation of specifications and the technical guidance necessary for the selection and acquisiton of automated data processing systems, or elements thereof, for the Air Force. The Air Force Data Services Center, located in the Pentagon, processed and produced management data, consulting and program analysis, modeling and information systems design, and related progamming services for all elements of Headquarters USAF, the Office of the Secretary of the Air Force, the Office of the Secretary of Defense and other assigned federal agencies. The Federal Computer Performance Evaluation and Simulation Center, located in the Washington, D.C. area, was established in 1972 by the General Services Adminstration to provide computer performance evaluation services to all agencies of the federal government. The Air Force, in recognition of its expertise in the field of data automation, was designated as the operating agency by the General Services Administration. The Center, funded by the General Services Administration, provided, on a fully reimbursable basis, technical assistance, support and services for the federal government of simulation, analysis, and performance evaluation of automatic data processing systems.

In addition, AFCC had centers located at Scott AFB, Illinois, Tinker AFB, Oklahoma, and San Antonio, Texas. The 2199th Computer Services Squadron, provided automatic data processing services to Headquarters AFCC and the area headquarters. The AF Communications Computer Programming Center developed, implemented, maintained, and enhanced the operational software for designated communications-electronics-meteorological computer systems. The San Antonio Data Service Center provided data processing support to area Air Force bases and designated federal agencies. It was the first of several regional centers to be established by the Air Force. The efforts of the approximately 2,600 military and civilian personnel at the various centers ensured that the ever increasing demands of commanders for more information, provided ever more rapidly, were met. At the same time, the work done by AFCC maintained the Air Force's position at the forefront of the highly technical and rapidly expanding field of automated data processing.

The magnetic tape library at the Air Force Data Systems Design Center, Gunter AFS, Alabama.

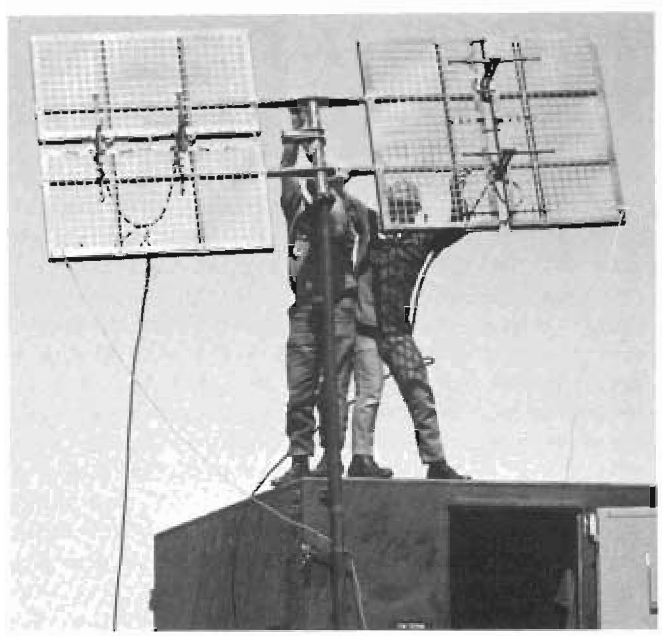
BACK TO SCOTT AND FURTHER REORGANIZATION

AFCS had managed its own base at Richards-Gebaur AFB, Missouri, for only four years when the Air Force, on 21 November 1974, announced the decision to terminate AFCS as a major command and to place it as a technical service under the Military Airlift Command at Scott AFB, Illinois. The Air Force, following congressional guidance, wanted to reduce management headquarters and other support function management, with an avowed purpose of maintaining the nation's combat capability with fewer resources. AFCS civilians, the civilian populace around Richards-Gebaur AFB, and Missouri politicians hotly contested the move before the federal district court. Environmental impact studies and further court-ordered delays prevented the move until late 1977. By that time, an Air Force alternative to the plan, one which maintained AFCS as a major command, with Headquarters Military Airlift Command assuming some common, non-technical, support functions in a shared-staff arrangement, was accepted as the final plan. By November, over 1,000 personnel made the move to their new home at Scott AFB. In the herculean moving task, AFCS relocated over 2.3 million pounds of government property, including office furniture, communications-electronics equipment, aircraft supplies, and computer assets. With an increase of over 2,000 total authorizations to Scott AFB, and a projected payroll of $35 million, the total economic impact of the relocation was worth over $100 million to the local economy.

Further evidence of AFCS's increasing role in the Air Force came on 15 November 1979, when the Air Staff exchanged the word "command" for "service" in the command's title, making it the Air Force Communications Command. The date was singularly appropriate since 15 November marked the 41st anniversary of the establishment of the original system, that was to evolve into AFCS, the Army Airways Communications System in 1938. In June 1981, shortly before its twentieth anniversary as a major command, AFCC underwent another reorganization.

The paramount objective was to improve the readiness of combat forces by providing more responsive support to the Military Airlift Command. Prior to this reorganization, the Military Airlift Command was the only unified/specified command with operational forces which were not supported by a dedicated communications area. Recent international crises to which the Military Airlift Command had responded, along with the worldwide scope of its mission, dictated the need for improved communications support. The establishment of an Airlift Communications Division with its headquarters at Scott AFB, Illinois, satisfied this need. Its formation, moreover, logically led to other AFCC reorganization initiatives. The Northern and Southern Communications Areas were inactivated and their units were divided according to mission between the Airlift Communications Division, a new

Continental Communications Division headquartered at Griffiss AFB, New York, and a new Engineering Installation Center with its headquarters at Oklahoma City AFS, Oklahoma. At the same time, the ground communications-electronics installation equipment, or scheme warehouse, and the scheme management functions were consolidated at Tinker AFB, Oklahoma, while the 1815th Test Squadron moved form Scott AFB, Illinois, to Wright-Patterson AFB, Ohio. The 1931st Communications Group in Alaska was realigned from Headquarters AFCC to the Continental Communications Division. As part of the reorganization, the Strategic Communications Area, the Tactical Communications Area, the European Communications Area, and the Pacific Communications Area were all redesignated divisions to conform to the new structure better suited to meet the envisioned needs, advanced technology, and complexity of the eighties.



Members of the 239th Combat Communications Flight, St. Louis, erect a flyswatter antenna during their unit training activity near St. Louis.

AIR TRAFFIC CONTROL

The operation and management of air traffic control services for the Air Force and other government agencies continued to be a primary function for AFCC throughout the seventies. With the exception of the Federal Aviation Administration (FAA), AFCC operated the largest air traffic control system in the world. Even with the decline in military forces through the seventies, AFCC managed over 150 control towers and radar facilities. Proud of its past record and sensitive about maintaining its reputation, AFCC worked constantly to ensure accurate and safe air traffic control services. Both explicit emphasis from the FAA on developing better equipment, facilities and procedures to handle the larger, more complex, and increasingly more expensive aircraft, and the experience learned in Vietnam prompted zealous effort by AFCC to update air traffic control services. The modernization program affected all of the standard facilities such as control towers, mobile equipment, radios, radar and landing aids, and navigational aids. AFCC also worked on flight information service systems and procedures to further safe air traffic control. By 1980, air traffic controllers could boast of an outstanding record of service, especially as illustrated by the AFCC "save" program. Aircraft saves, defined as the safe recovery of an imperiled aircraft by air traffic controllers when there was reasonable doubt that the aircraft could have landed without assistance, totaled over 1,700 military and civilian aircraft carrying nearly 7,000 personnel between July 1961 and December 1980. The total value of the saved aircraft reached nearly $2 billion.

CONTROL TOWERS AND EQUIPMENT

One of the most obvious air traffic control facilities, and certainly the most symbolic of air traffic control services, was the control tower, which came in varied sizes and shapes. In the mid-seventies AFCS monitored construction of over a dozen new towers. Many such as those completed at Hill AFB, Utah, and Pope AFB, North Carolina, had extra space in the control tower cab and supporting rooms to hold additional equipment required for modern operations. Towers at McGuire AFB, New Jersey, and Richards-Gebaur AFB, Missouri, combined control cabs with radar approach facilities. Keesler AFB, Mississippi, received the last

An AFCC airman works in the air/ground station of the 1974th Communications Squadron, Scott AFB, Illinois.

This BRITE II radar facility was added to many AFCC control towers to improve air traffic control services.

Two AFCS airmen check the AN/GSH-34 recorder installed as part of the control tower modernization program.

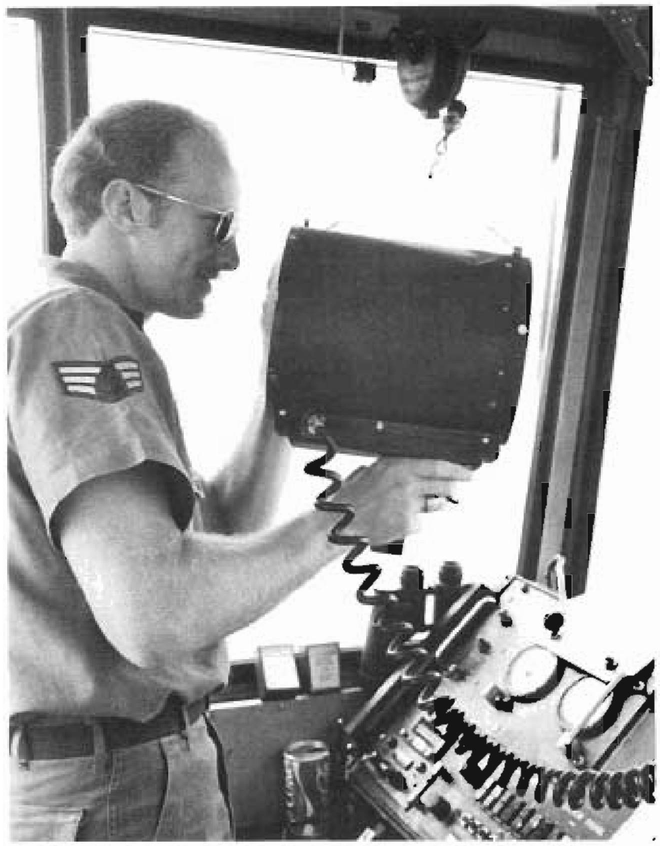
Modernized control tower and support offices at Richards-Gebaur AFB, Missouri.

new tower of the decade when the construction and fitting out was completed in December 1979.

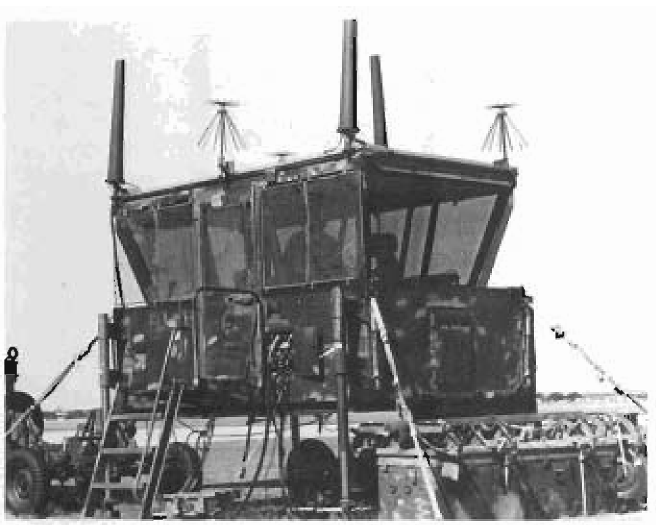
AFCC installed several new control tower equipment systems and programmed others for inclusion in the towers during the decade, both to replace worn out equipment and provide additional help to the operators. For example, beginning in 1979, AFCS worked toward installation of the BRITE system, a television type display which showed radar information in the control tower. Installers completed over a hundred systems by 1980. Another control tower modernization program, started in the late sixties, called for installation of new control consoles. However, with so many programs competing for limited funds, progress was slow and the program was not completed until 1979, when close to 100 units had been installed. Other aspects of the tower modernization program called for future installation of more adaptable and reliable voice recording equipment, for installation of a landline keying system, and communications control systems.

MOBILE AIR TRAFFIC SERVICE EQUIPMENT CHANGES

Mobile communications activities in Vietnam pointed to a need for a variety of new equipment and procedures. The need for increased radar coverage control and ruggedness, along with decreased weight for ease of transportation prompted development of a new mobile tower and new radar approach equipment. By the late seventies, AFCC had 22 transportable towers ready for emergencies. A new transportable radar approach control system required over 10 years of engineering and testing. By the late seventies, AFCC had nearly a dozen units that could be airlifted easily to provide tactical landing and control services. The equipment could be broken down into three component units-airport surveillance radar, precision approach radar, and an operational center-to provide the type of service required in a given situation. The equipment was very lightweight, had good capacity, and could operate in foul weather.

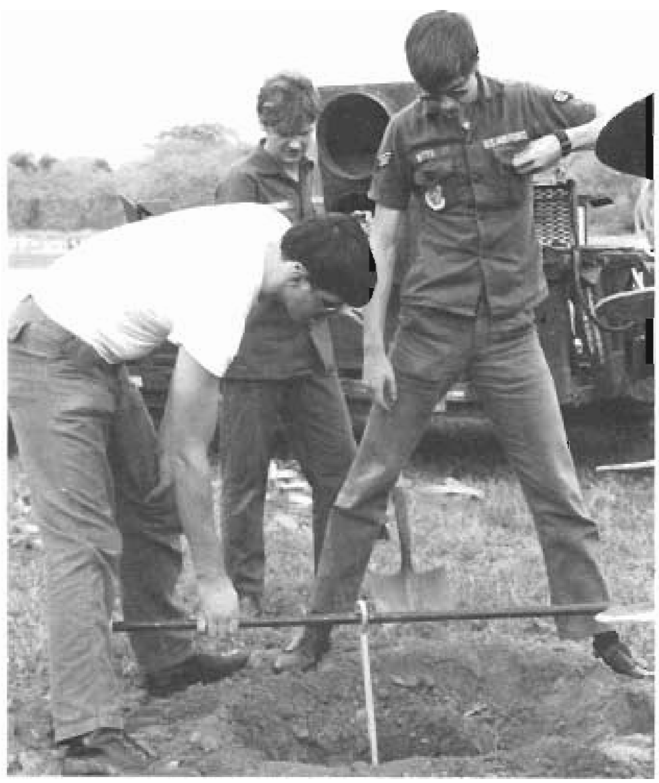


An air traffic controller from the 2187th Communications Group checks a light gun in a mobile control tower at Aviano AB, Italy.



Air traffic controllers from the 2015th Communications Squadron, Randolph AFB, Texas, work from a mobile tower during the remodeling of the permanent control tower.

Mobile air traffic control and navigation equipment such as this AN/TPN-19 allowed AFCS to direct aircraft traffic in a variety of contingency and emergency situations.



Three AFCS airmen install a ground rod for a mobile control tower.

In 1978, AFCS began a readiness program to identify equipment and procedures for employing air traffic control facilities for wartime restoral of damaged air traffic control and landing systems. AFCS promoted a program to provide chemical defense training for AFCS air traffic controllers and communicators, and it worked on developing chemical warfare masks and equipment which would facilitate communications between controllers and aircraft. Air traffic control planners also worked on a new procedure that would facilitate heavy volume aircraft landings and departures in reasonable safety during wartime situations. And finally, with recognition that air traffic control facilities were, by their very nature, quite vulnerable to attack and destruction, AFCC engineers began to give more emphasis to survivability when they constructed air traffic control facilities in potential war areas.

Air traffic controllers remove screens from a mobile control tower at Howard AFB, Panama.

SOLID-STATE RADIOS

Dedicated to the replacement of outdated air-to-ground radios, especially the radios used for air traffic control, the Rivet Switch program of the seventies epitomized, more than other AFCC modernization programs, the steady progress in meeting urgent Air Force requirements. The replacement of hundreds of tube-type radios with solid-state equipment required a multi-million dollar project. The first important milestone occurred in 1969 with an appropriation of $14 million and organization of a master implementation plan. AFCS was assigned as the program manager in 1970. Completion of the effort took until 1978. The advantages of the modernization in terms of a much better "mean time between failure" rate, better use of frequency, better frequency stability, and a lower power requirement verified the superb rationale for the program. But, because the civilian sector had already adopted solid-state technology years before, the Rivet Switch program seemed less than timely. As the initial Rivet Switch program neared completion, AFCS planners organized a follow-on program, with a mid-eighties completion date to modernize associated components such as antennas, multicouplers, radio control units, and audio lockout and override devices.

RADAR AND LANDING AIDS

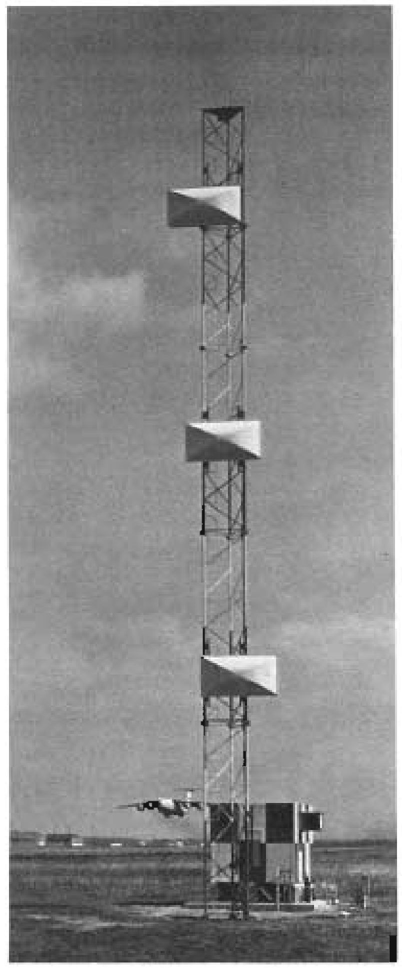
In 1971, AFCS obtained its first solid-state instrument landing system at Travis AFB, California. Several dozen additional systems were programmed throughout the decade. Although the new landing aids offered improvements in siting, accuracy, and reduced maintenance, solid-state instrument landing systems still would not meet longstanding Air Force requirements for highly accurate instrument landing systems.

In 1973, the Air Force organized a master program to correct problems with the precision approach equipment and by 1977 AFCS became the program manager. Besides working on the current solid-state instrument landing system and planning a future microwave landing system, a new program was started to replace the outdated airport search radars and precision approach radars with solid-state, relocatable facilities. Installation of these facilities, beginning in 1979, would fill the gaps between radar systems that were highly mobile, but had limited capability, and heavy fixed-base radars that provided full capability, but could not be moved easily. Ultimately, the Air Force hoped to eliminate most of these precision approach radars and radar operators and depend upon instrument landing systems. Long-term plans projected microwave landing systems, which would provide the desired precision guidance necessary to eliminate operator assistance to pilots in landing procedures.

As a result of numerous aircraft accidents in recent years, the Air Force recognized the need to alert controllers to potentially dangerous situations. In 1979, AFCS began to install a low altitude alerting system that notified the controller whenever a selected aircraft descended below a preprogrammed altitude. Eventually, 80 systems would be installed in AFCC facilities.

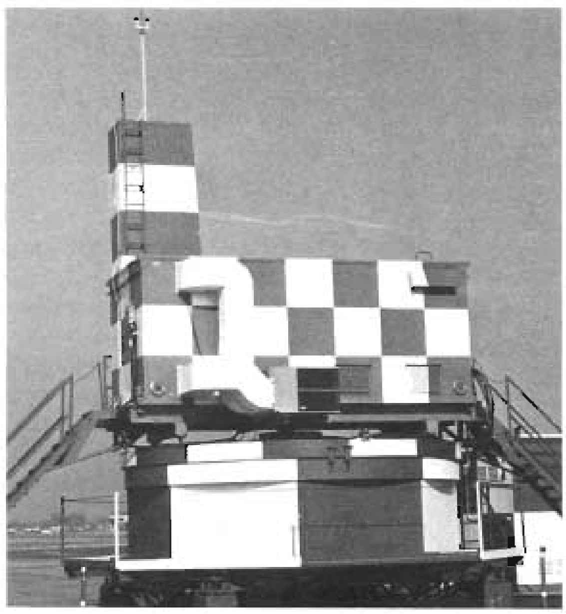
AFCC operates the unique Air Route Traffic Control Center in Berlin, West Germany.

The requirements of the air traffic control profession demand that controllers be thoroughly trained and updated on new procedures. Here, a controller in a radar approach control unit undergoes his annual recertification.



AFCC maintained a variety of air traffic control and navigational aids to support the Air Force flying mission.

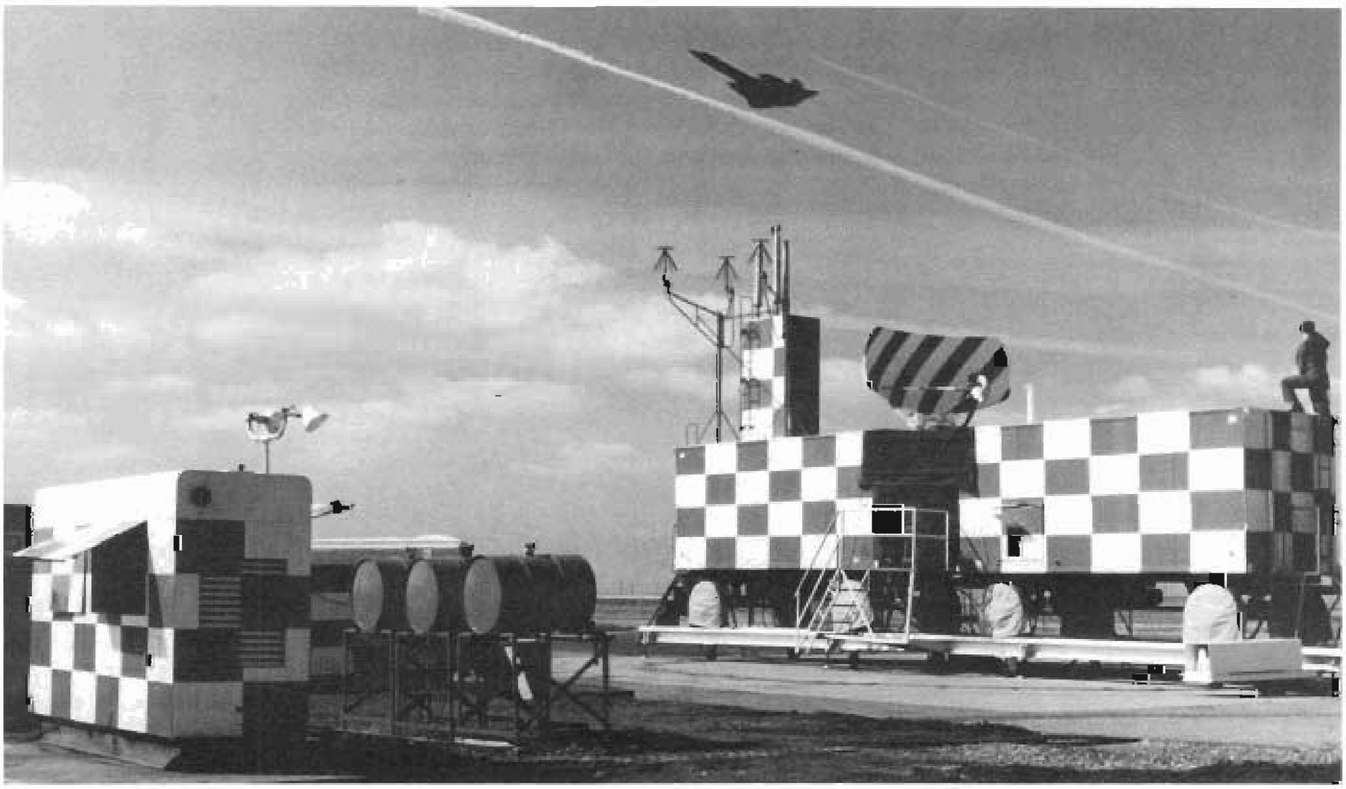
A radar approach control unit.



Solid-state precision approach radar at McClellan AFB, California.

This air surveillance radar is used to take aircraft from one airport to another under radar control. Its range varies from seven to 240 miles.

Inside a mobile ground control approach van, two AFCC controllers scan radar scopes.



A SR-71 aircraft flies over the ground control approach facility at Beale AFB, California.

A B-52 flies over an instrument landing system which gives glide slope and azimuth for aircraft on their final approach.

TACANS, OTHER NAVIGATIONAL AIDS, AND FLIGHT INFORMATION SERVICES

The last of the vintage directional finding navigational aids was removed from AFCS service in 1971. Other navigational aids like beacons, VORS, and TACANS, along with FAA navigational facilities continued to provide navigational assistance to pilots between air bases. One of the biggest navigational aid projects in the early seventies was the development and acquisition of mobile TACAN units, and a subsequent program to provide shelters for these TACANS. Also, late in the decade, the Air Force began to update fixed-base TACANS with solid-state components to reduce maintenance costs.

AFCS continued to work with a variety of pilot information systems, including the Notice-to-Airman System (NOTAMs), Flight Information Publications products, Terminal Instrument Procedures, and several weather collecting and dissemination systems to provide pertinent operational information for aircraft movements. As with other elements of AFCS communications, automation of these flight information systems became major programs.

AFCS took the first step towards automation of the system that exchanged flight plans and movements with FAA. Beginning in 1972, AFCS employed a computer to automate the computation and transmission of the exchange data between FAA's Air Route Traffic Control Centers and the various Air Force controllers. In 1977, AFCS received new automated equipment to acquire flight information from the National Aerospace System, and in 1978, the command considered expanding and upgrading the Air Force Flight Data Entry Printout to make it comparable to the FAA system.

In 1973, the Air Force assigned responsibility for Terminal Instrument Procedures to AFCS. The command provided this navigational aid to pilots in a manual form, but they also planned to automate the compilation of required data. A planner would take from 60 to 70 hours to develop an approach, whereas the proposed automated system would be capable of computing this information in less than 30 minutes. The problem of processing vast amounts of data would make this a diffcult task.

Tactical Air Navigation equipment and generator support buildings. This equipment provides aircraft omnidirectional azimuth, identification, and distance information.

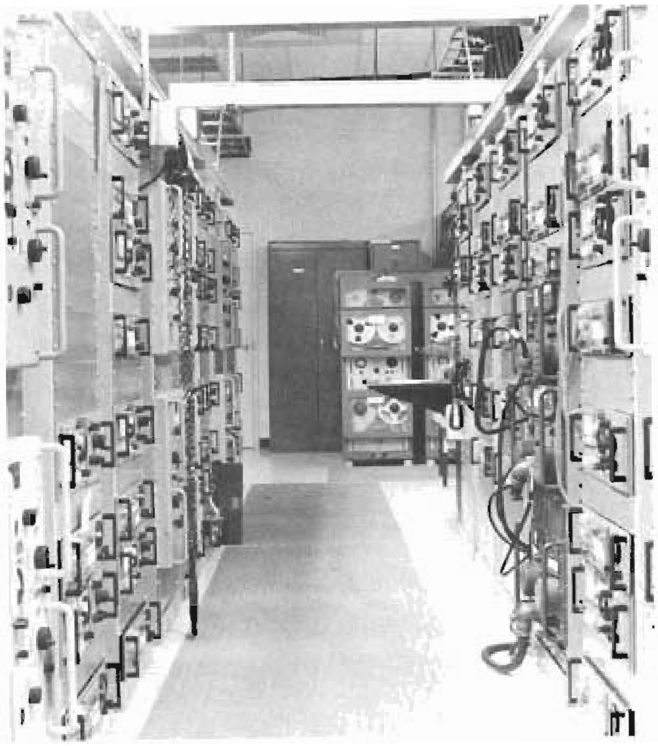
An AFCC technician inspects equipment at a Tactical Air Navigation site to ensure it is getting the proper amount of power.

When AFCS engineered and installed an automated weather collection and dissemination system for the Air Weather Service in the continential United States, and helped plan the development of modern automated system in Europe and the Pacific, it worked towards programming these systems for automated NOTAM information as well as providing pilots with weather information. In 1977, when AFCS assumed responsibility for maintenance of the base weather gathering equipment, this included developing plans to replace equipment that was increasingly difficult to repair and maintain. AFCC expected to replace the cloud height set indicators, temperature dew-point measuring sets, and wind measuring systems at hundreds of locations during the mid-eighties.

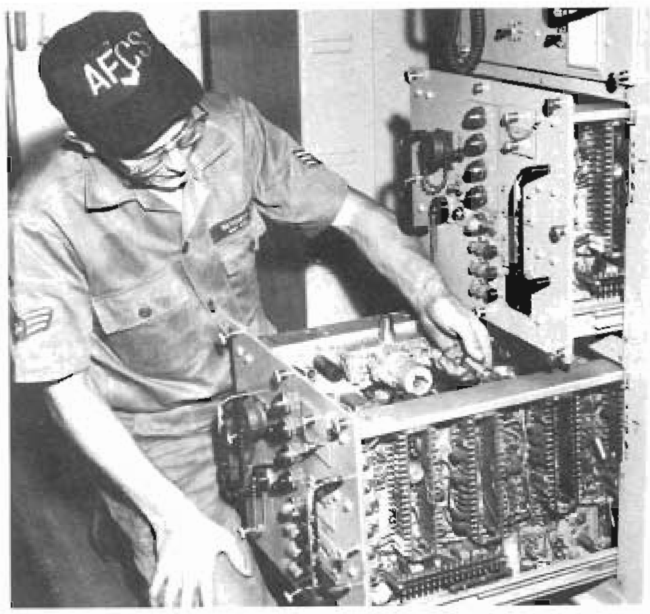
With assumption of the European Central NOTAM Facility in 1969, AFCS became the overall manager for the Air Force NOTAMs. The NOTAM service provided pilots with current information concerning the condition of or changes in any aeronautical facility, service, or procedure that might be a potential flight hazard. Along with the European Central NOTAM Facility, AFCS began the decade with responsibility for central NOTAM facilities in Washington, D.C.; Howard AFB, Canal Zone; Fuchu AS, Japan; and Tan Son Nhut AB, South Vietnam. AFCS also started the decade with a program to modernize the system with data processing plans and to consolidate the NOTAM processing centers.

In 1970, when the Air Force and the FAA cancelled plans to consolidate their NOTAM systems, the Air Force relocated the main Washington, D.C. facility to Carswell AFB, Texas, where computer and automated communications would be available.Between 1971 and 1977, NOTAM facilities in the Canal Zone, Japan, Vietnam, Hawaii, and Europe were closed down. With new data processing equipment at Carswell AFB, AFCS began management of the single, centralized NOTAM facility.

AFCS began to improve the NOTAM service with hourly updating of the NOTAM product using a computer data base and by using the high-speed terminals of the weather network to provide the data directly to the flight planning environment. By 1980, AFCC had made plans and tested an automated system that would respond directly to the request for a particular flight planner. The automatic response to query would eliminate current NOTAM summary boards, and decrease flight planning errors. Future plans called for automation of the central facility at Carswell AFB, Texas, and development of a system that would automate the information exchange with FAA NOTAM facilities.



Banks of air traffic control radio transmitters at Laughlin AFB, Texas.



An AFCC airman adjusts Tactical Air Navigation equipment. During flight, pilots rely on this navigational aid to give them bearing and range information.

AFCS/AFCC AIRCRAFT MISSION

Although AFCC owned only a few aircraft, it had a unique mission that required specially equipped planes to inspect and verify the proper functioning of various Air Force electronic navigational aids, and evaluate operational procedures of tower and ground approach controllers. Under the terms of agreement between AFCC and FAA reached in the late sixties, AFCC assumed worldwide responsibility for checking permanent facilities, thus becoming responsible for emergency missions, contingency, and combat area facilities. At the same time, FAA delegated back to AFCC some of the permanent facility checking mission so that AFCC could maintain flight checking proficiency. AFCS began the decade with 21 flight checking aircraft assigned to two flight checking squadrons in the United States, one squadron in Germany, and one squadron in the Pacific. The inventory included five T-29s, four C-140s, six T-33s, three EC-47s, two C-54s, and one new T-39. The acquisition of the T-39 aircraft initiated the AFCS aircraft modernization program of the early seventies. By the end of 1970, and concurrent with the move to Richards-Gebaur AFB, Missouri, AFCS acquired three T-29s, one T-39, and one VC-118 as support aircraft. Throughout the early seventies, AFCS replaced several of the old reciprocating engine aircraft with new aircraft, gaining four C-130As, two T-39s, and one NKC-135, and losing three T-29s, one EC-47, and two C-54s. In 1975, Air Force budget reductions called for the elimination of all reciprocating engine support aircraft, and AFCS lost all of its outdated support aircraft. Shortly thereafter, the Air Force dictated the consolidation of all support aircraft under the Military Airlift Command and AFCS lost its only T-29 support plane.

Along with this aircraft reduction in 1975, AFCS reorganized its flight checking squadrons, forming them into the present configuration. They deployed one T-39 with the 1867th Flight Checking Squadron and moved that squadron from Clark AB, Philippines, to Yokota AB, Japan; another T-39 aircraft to the 1868th Facility Checking Squadron, relocated from Wiesbaden AB, to Rhein Main AB, Germany; and four C-140As to the 1866the Flight Checking Squadron at Richards-Gebaur AFB, Missouri. Besides updating the electronic equipment in mid-decade, AFCS also repainted the six remaining aircraft with conspicuous high visibility markings. In 1979, shortly after four C-140s were relocated to Scott AFB, Illinois, in conjunction with the command transfer, AFCS repainted all its aircraft in camouflage to ready them for their prime combat mission.

Flight checking equipment on board AFCC's C-140A aircraft.

AFCS acquired a highly polished VC-118 for administrative support in 1970.

An AFCC C-140A freshly painted in camouflage, 1979.

AFCS operated several types of aircraft, including this C-130A.

LONG-DISTANCE COMMUNICATIONS

INTRODUCTION

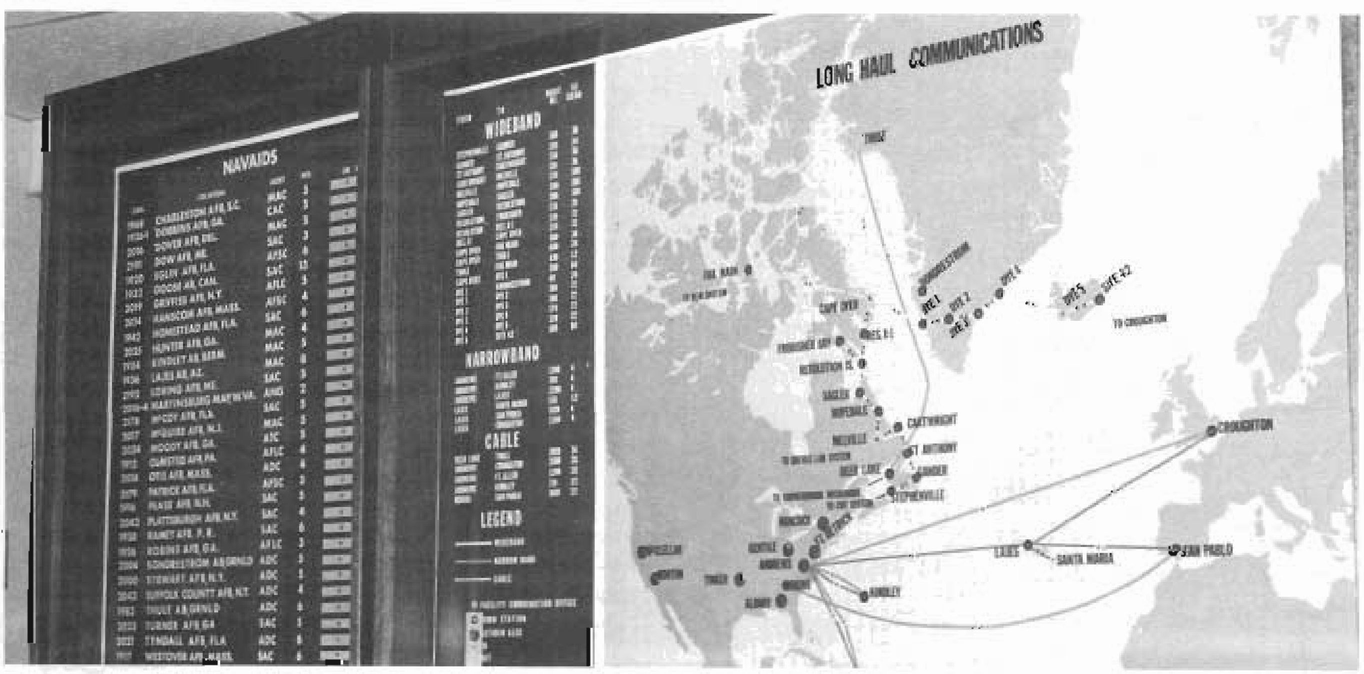
AFCC antecedents for providing long-distance communications service to the Air Force, as with air traffic control, go back to the pre-World War II period. By comparison, the responsibilities were much simpler in those years before communications technology blossomed. Because the United States public utilities, Bell Telephone and Western Union in particular, had such good systems, the Air Force could lease much of their long-distance communications from commercial concerns. Throughout the seventies, AFCC continued to manage some of the leased long distance telephone and message networks as well as the switching stations that sorted out the senders and recipients of communications. Overseas, AFCC operated and maintained most military-owned switches and communications networks. To carry out these overseas Air Force communications requirements, AFCC operated and maintained microwave, troposcatter, satellite, cable, and fiber optic systems. AFCC also provided much of the engineering and installation expertise for new and updated systems beginning in 1970 when the Ground Electronics Engineering Installation Agency responsibilities were re-absorbed. By the seventies, many of the long distance communications systems operated by AFCS were wearing out, and required excessive effort to maintain at the desired level of efficiency. Of course, throughout the seventies AFCS continued the maintenance efforts to keep the systems running, and they made constant updates and modifications to the equipment. The importance of technological progress led the command to put special effort into the common-user, long-distance systems, including AUTODIN, the record communications network; AUTOVON, the military telephone system; and AUTOSEVOCOM, the encrypted telephone system. AFCC continued updating long-distance transmission facilities and worked on disposing of the Alaskan Communications System to commercial corporations. The command also gave special effort to several dedicated or specialized communications systems.

COMMON-USER COMMUNICATIONS

By 1970 the Defense Communications Agency's, common-user, worldwide record communications system, the Automatic Digital Network (AUTODIN) was largely completed when the last of the old electromechanical switches was closed down. However, pressure for greater speed and error-free service, along with the increased quantity of traffic imposed by the growth of technological innovations in data processing, and a steady expansion of geographically dispersed, computer-based information systems meant that AFCC and other Department of Defense AUTODIN operators would continually modify and improve the system. In 1970, AFCS operated 10 of the 20 worldwide AUTODIN switching centers. Various improvements during the decade and decreased military activity in Southeast Asia allowed a reduction of the switching centers to 15, seven operated by AFCC, even though message traffic volume was increasing. By 1980, the traffic at each switch averaged one message per second, or over 35 million a year. Through all this, AFCC usually maintained an operational rate above the 99.5% required by the Defense Communications Agency.

Several dedicated record communications networks continued in operation throughout the decade. Attempts to consolidate them into the AUTODIN system proved difficult because special requirements prevented the modifications necessary for interconnection. In 1970, the Deputy Secretary of Defense

Three AFCC personnel work on the AUTODIN operation systems console.



A constant check is maintained on all AFCC equipment, as illustrated in ths status monitor board.

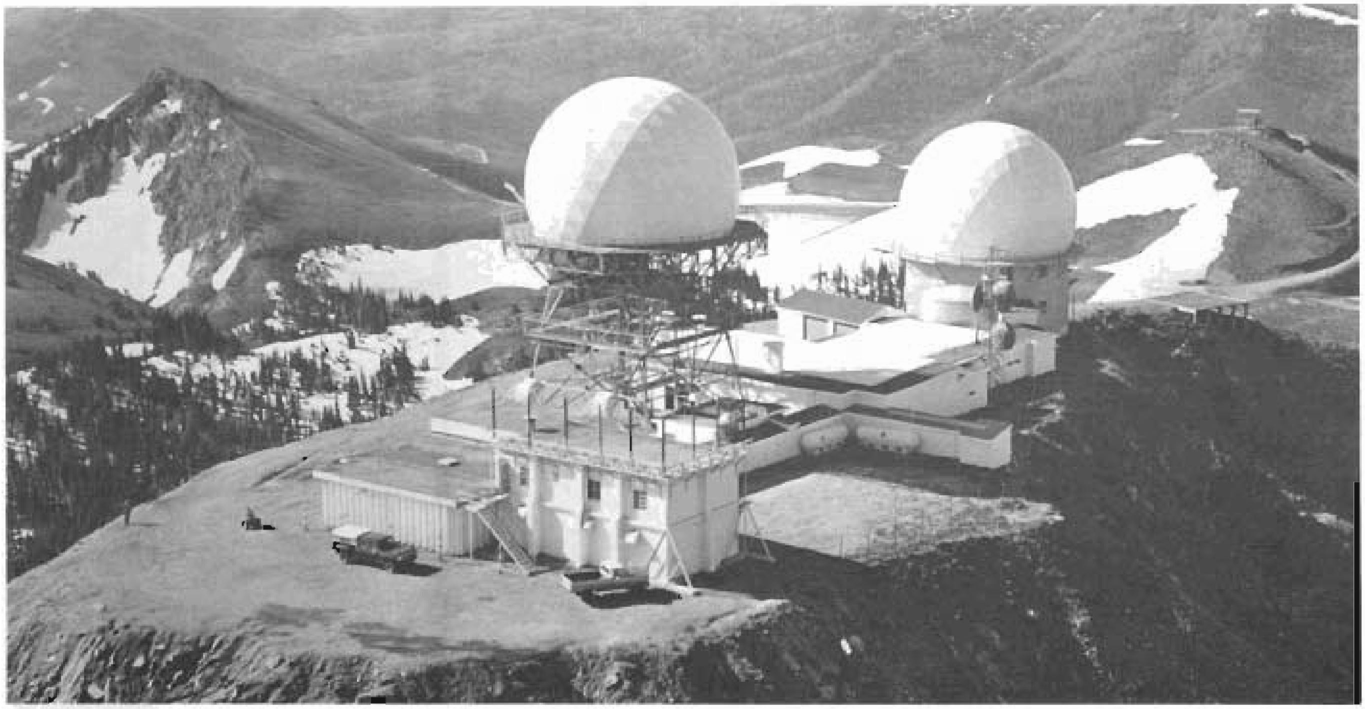
AFCC operated AUTODIN switching centers for the Air Force, like this one at Gentile AFS, Ohio. This completely automatic system is capable of handling any type of digital input teletype, data cards, or computer-to-computer information.

directed an exception to the standard when he requested the integration of the dedicated Defense Special Security Communications System into AUTODIN. The AUTODIN switching centers had to be modified and personnel given special security clearances, but when the consolidation was completed in June 1973, savings in operating costs were estimated to be $71.8 million over a five-year period. Furthermore, the integration saved the Air Force 392 manpower spaces, while transmission time and error rates decreased dramatically.

The AUTODIN enhancement program that began in 1973 provided new equipment for some of the automatic switching centers by 1975. A system command terminal, consisting of a cathode ray display with teletypewriter keyboard and a medium-speed printer, provided a record copy of all important computer control actions; a disc memory unit provided backup information storage, and a systems autoload module provided a fast means of reloading a disc memory unit after a stoppage.

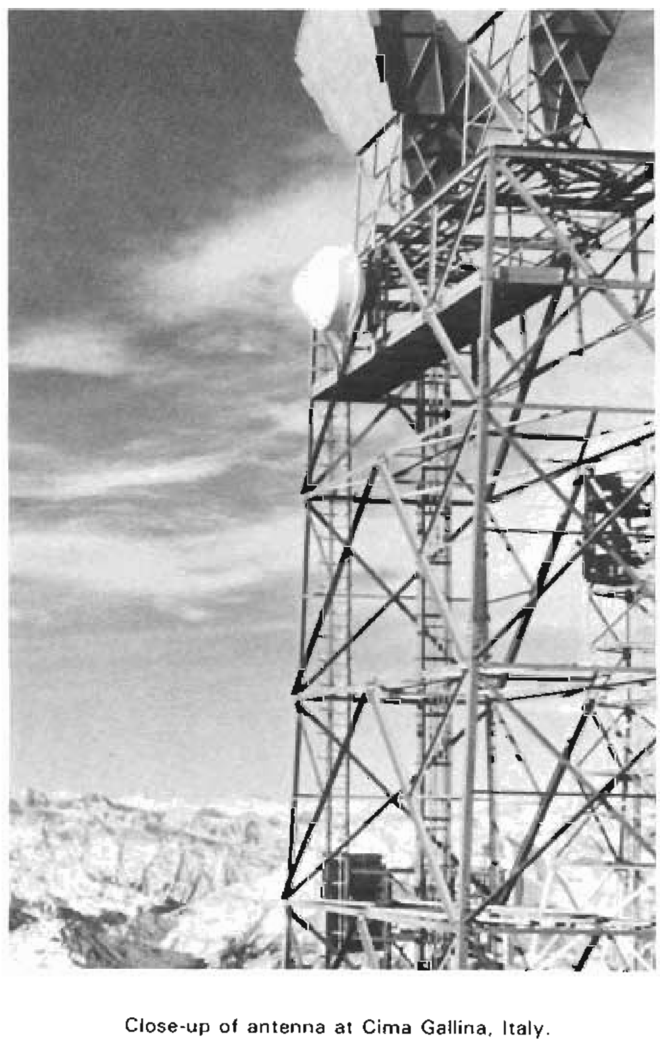
In mid-decade, AFCS began a program to provide a solid-state, uninterruptible power supply for overseas switching centers. The new backup equipment was needed to provide uninterrupted power as well as a smoother flow of power to keep the solid-state data processors running efficiently. Another modification later in the decade updated the memory capability at the switches. The Expanded Memory Storage System with additional computers and special software represented a quantum jump in the accession of large quantities of stored data and eliminated the delays associated with retrieval of information from magnetic tapes. Perhaps the most ambitious and dramatic modification of Air Force record communications systems in the seventies was the attempt to develop a sophisticated system to provide clean, computer-to-computer communications using packet-switching techniques. The initial effort, labeled AUTODIN II, was originally intended to provide fast and reliable record communications, especially where bulk information exchanges were desired.

A member of the 2045th Communications Group, Andrews AFB, Maryland, works at the AUTODIN Network Systems console.



A remote radar site is perched high atop Francis Peak, Utah, operated by the 299th Communications Flight of the Air National Guard.

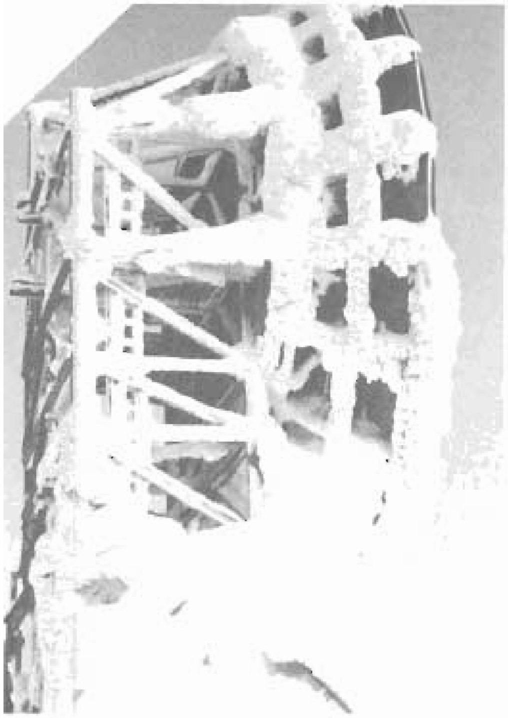
with technological needs of our European forces. The maintenance and modernization of the relay stations on the isolated and frigid mountain tops of Italy symbolized the difficult work facing AFCC communicators.

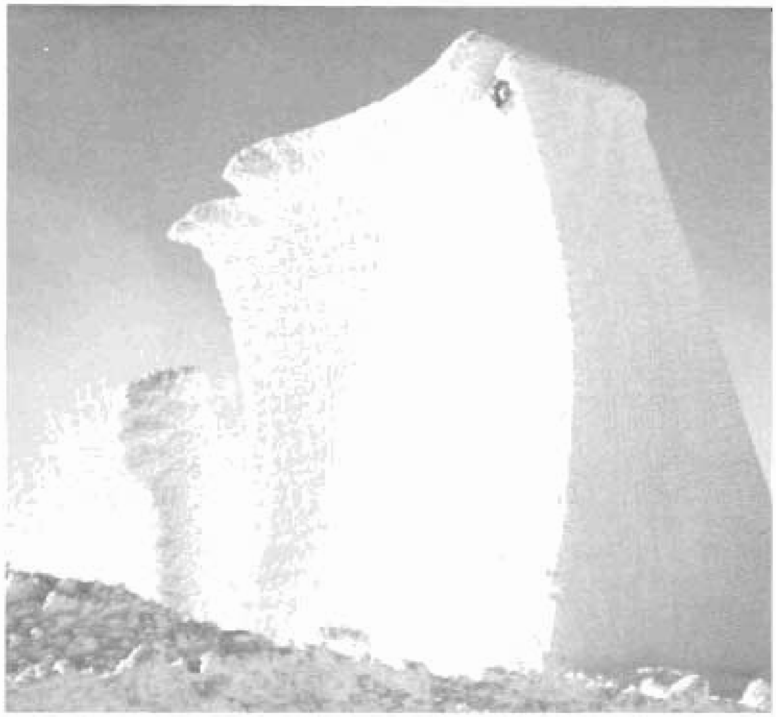


Close-up of antenna at Cima Gallina, Italy.

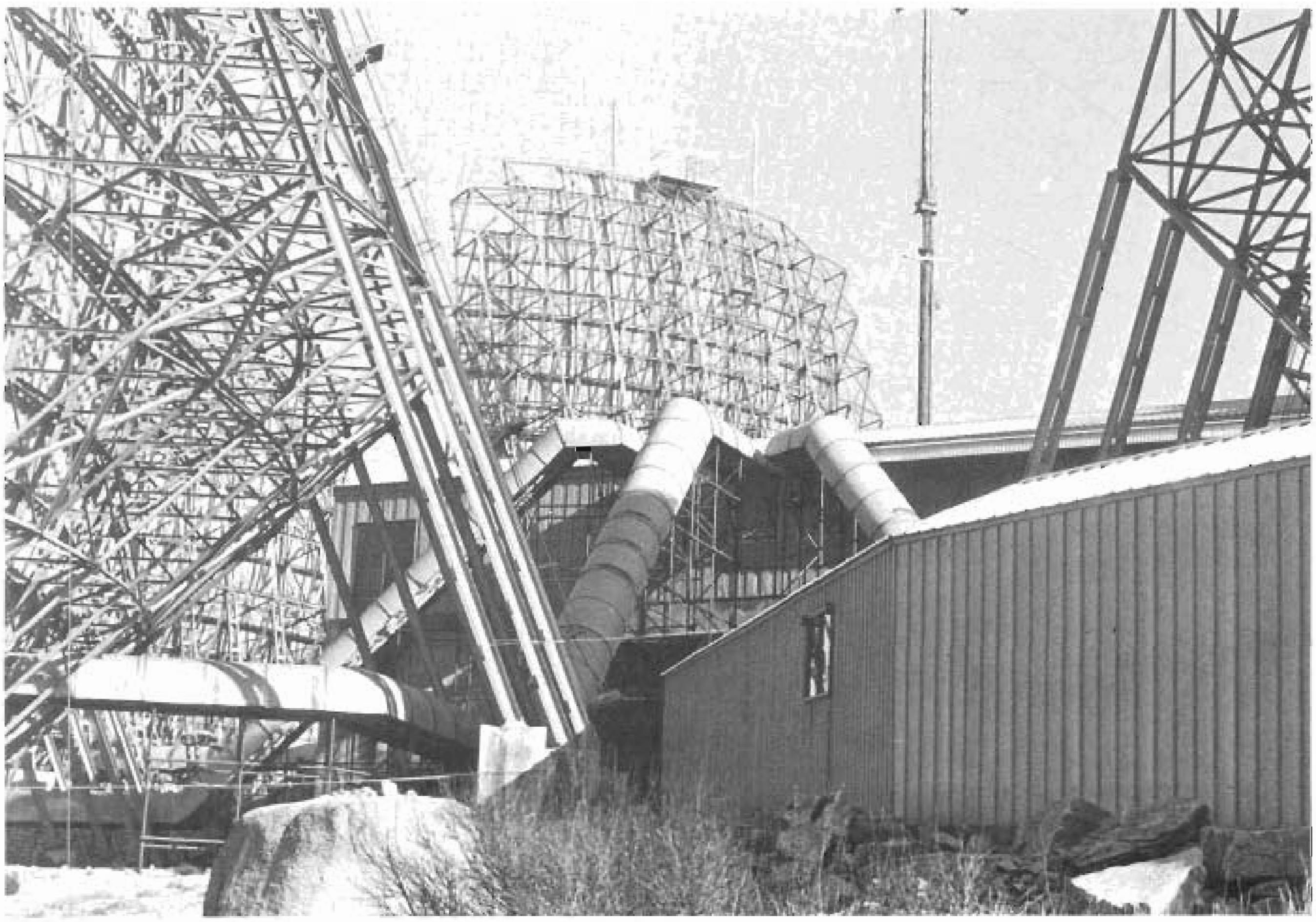
The Air Force lost most of its long-line communications duties in Alaska with the sale of its Alaskan Communications System to RCA Alaska Communications Inc. Though RCA did not purchase the White Alice Communications System of costly and obsolete tropospheric-scatter radio relay sites, it did lease parts of the system from 1974-1976. In 1976, AFCS decided to sell White Alice, but the process lasted more than four years due to difficulties in replacing the troposcatter sites with satellite stations, legal questions concerning land ownership, and questions about the quality of commercial services for military requirements.

AFCS engineers were heavily committed to transmitter and receiver modernization during the decade. AFCS was the lead command for the Air Force in directing channel-packing projects in overseas locations to develop systems comparable to American commercial systems. Channel packing combined several parallel-routed circuits into a single channel, thus saving money by reducing the number of leased channels. In simplified terms, the bits of one data stream travelled in empty spaces between the bits of





The winter environment in Alaska places unique and extreme stresses on the communication equipment located there as illustrated in these two photographs.



Tropospheric scatter antennas like these operated by the 2181st Communications Squadron at Mt Vergine, Italy, provided a vital link in the communications network in Europe.

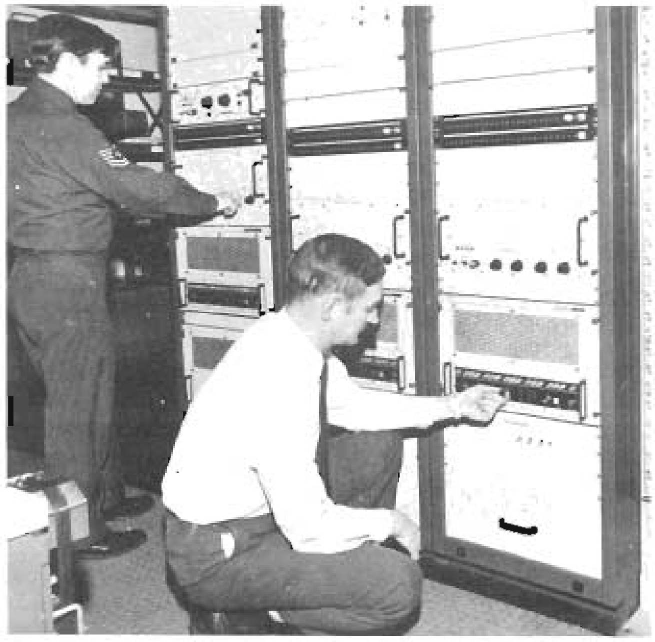
other data streams. The channel-packing equipment allowed up to four times the amount of data on one channel. In 1969, AFCS installed the first high-speed channel-packing circuit between Hawaii, Japan, and the Philippines. The success of this project led to new projects and installation of even better equipment and techniques, with completion of all projects by October 1974.

Starting in 1979, AFCS helped the Air Force Logistics Command replace tube components with solid-state components in AFCS-operated microwave equipment. Much of the initiative for this program could be attributed to a single individual, Master Sergeant Ivo Graciani-Benetti, who epitomized the expertise and purpose of AFCS technicians and engineers. This AFCS sergeant suggested as early as 1974, that by converting existing radios, the Air Force could eliminate degraded performance and costly maintenance and parts replacement without buying new equipment costing three times as much.

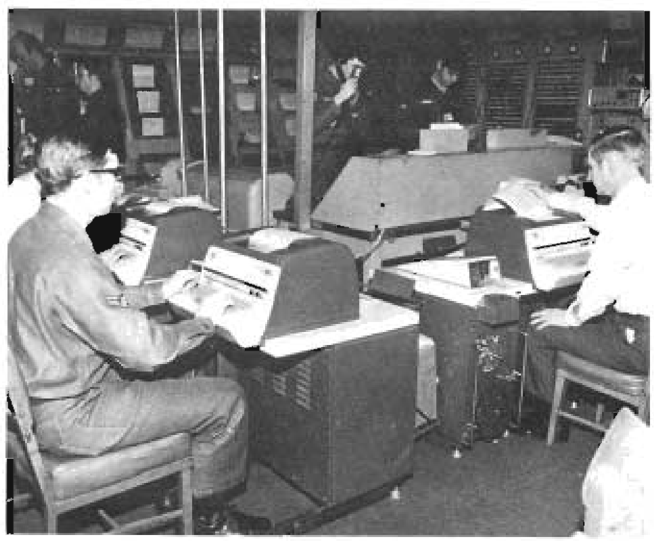
An often forgotten or unpublicized aspect of the communication transmission business involves efforts to maintain a quality signal. AFCS was vitally concerned that its increasingly complex and expensive long-haul facilities meet the advertised transmission expectations. To accomplish this, two special programs occupied AFCS attention throughout the last decade: the Manual Technical Control Improvement Program and the Automated Technical Control Program.

In 1970, the Defense Communications Agency started a technical control program, with projected funds of over $35 million, to improve its global communications commitment. This agency awarded a contract in 1972 to engineer and equip various trunking centers, but three years later they terminated the contract because of growing costs and decreased operational benefit expectations. Subsequently, AFCS was designated the program manager of a reorganized program called the Manual Technical Control Improvement Program. By 1978, AFCS program managers had worked through difficult procurement, engineering, and testing problems, as well as funding limitations. They started an installation program with completion scheduled in the early eighties.

The Automated Technical Control Program evolved concurrently with the manual program. The primary objectives of this program were to reduce the workload of technical controllers and improve the quality of communications service by means of computer assistance. Although the Defense Communications Agency exercised management control, the Air Force held technical management leadership and AFCS was the leading military representative. The first automated equipment was procured in 1971, but engineering specifications and conceptual changes delayed completion of the first operational test facility until 1977. The testing, cost, and ambiguity over potential manpower savings of the limited operational testing led to controversy about the effectiveness of such sophisticated technical control equipment, hindering program progress in 1980.



Automated technical control equipment at RAF Croughton, England.



Manual technical control facilities provide a background from the automated technical control teletypewriter as installed in the technical control facility at RAF Croughton, England.

An antenna tower on Mt Paganelia, Italy.

DEDICATED AND SPECIALIZED COMMUNICATIONS

Besides providing the common-user, long-haul communications service for the Air Force, AFCC worked with a number of specialized communications systems which were dedicated to a particular Air Force user for singular purposes. The systems which received particular emphasis in the seventies included (1) air-to-ground and point-to-point, high-frequency systems which gave commanders the ability to communicate with their aircraft throughout the world and also provided constant contact with aircraft carrying the President, cabinet members, and other senior government officials; (2) a Strategic Air Command (SAC) message communications system which connected the National Command Authorities, SAC commanders, and individual executing commanders; (3) a series of satellite communications programs that would give increased communications capability for strategic and tactical commanders, provide a global positioning system, and increase redundancy for other central communications systems; (4) the Military Affiliate Radio System; and (5) the Air Weather automated switched network.

A satellite station operated by the Strategic Communications Area at Offutt AFB, Nebraska.

These two antennas at Adak, Alaska, supported by the three vans in the center, provided communications support for tests conducted by the Defense Atomic Support Agency in the Aleutian Islands.

As aircraft travelled over long distances they were often beyond the communications range of air traffic control tower radios. In 1980, to provide necessary flight communications, the Air Force employed 16 aeronautical stations along the major air routes around the world. These high-frequency, high-powered radio stations helped relay air traffic control, weather, and other vital information. Part of the aeronautical radio system was dedicated solely to support the President and high ranking civilians and military officials. The President or other ranking officials had instant and virtually 100 percent reliable communication capability with the White House from any location in the world.

Several significant programs in the seventies kept the aeronautical stations operating efficiently. Between 1970 and 1976, the Scope Pattern program brought new transmitters, receivers, antennas, consoles, and associated equipment to selected aeronautical stations. The Air Force organized an expensive, multifaceted program called Scope Signal in the mid-seventies to upgrade, reconfigure, and consolidate all high powered, high frequency stations. Operating as program manager, AFCS completed one phase of the program which consolidated Tactical Air Command and Military Airlift Command facilities at the Scott Aeronautical Station, Illinois, in 1978. Ad-

The Aeronautical Station at Albrook AFB, Canal Zone, supports Department of Defense aircraft operating in Central and South America.

ditional phases of Scope Signal identified the need for equipment updates in other worldwide aeronautical stations. These phases, representing AFCC's rational, forward looking management, did not require installation of equipment until the mid-eighties. In addition, project funding problems prevented completion by the end of the decade. However, installation of a replacement record communication system, especially for the Air Force Security Service, was underway in the late seventies, with completion targeted for 1981.

AFCC operated and maintained several high-frequency, long-distance radio systems having both air-to-ground and point-to-point communication capability. These systems, dedicated to specific commands, allowed the commanders to communicate with and control their aircraft and other forces. In one phase of Scope Signal, AFCS programmed modernization of the Strategic Air Command's Giant Talk facilities. Since the fifties, these facilities had provided the backbone of SAC's airborne forces but changing requirements, combined with aging equipment, necessitated improvements in the equipment. Slated for completion in the early eighties, the program called for installation of state-of-the-art equipment to provide better service to SAC. AFCC communicators operated and maintained thousands of high-frequency, lower power, long-distance radios in several worldwide networks. Prior to 1978, logistics managers identified a maintenance time limit for support of this old equipment. In 1978, program managers organized a program to replace the equipment in the eighties.

The need to satisfy SAC's requirements for an improved direct communications link between the SAC Commander-in-Chief, the National Command Authorities and the individual executing commanders prompted development of the Strategic Air Command Automatic Total Information Network in 1976. High costs of the program concept caused reevaluation in 1977, and formation of a new program that would utilize the common-user AUTODIN II system when it came into operation. AFCS assumed responsibility for engineering, installation, and testing of the latest system design which was approved by Congress in 1978. Managers looked to a mid-eighties' completion date for the special system.

The promise of the fifties and sixties to find reliable long-distance communications via satellites was fulfilled as various Air Force satellite programs reached or neared completion in the late seventies. AFCC helped engineer, operate, and maintain ground terminals for Air Force satellite communications programs and systems. In addition, AFCC provided procedures to plan for and apportion operational satellite capacity, planned satellite access procedures, reviewed and screened new satellite users, and assisted in the preparation of future satellite applications. Throughout the decade, AFCC supported several satellite programs.

AFCC served as the Air Force technical manager of the Tactical Satellite Communications System, an interim program which went into operation in 1970. With a basic purpose of military research and development to test the feasibility of providing tactical communications via satellites, the program also provided

A communications antenna that supported the Strategic Air Command GIANT TALK program was felled by typhoon Pamela on Guam in 1976.

satellite communications for the National Military Command System and other high-priority customers between 1970 and 1976. After 1976 a revised program, called Scope Dawn, used commercially leased Navy Gapfiller satellites with research and development satellites, combined with Tactical Satellite Communications System ground terminals to continue providing the interim high-priority communication links. AFCS was designated the implementing and operating command for the Scope Dawn program, which would be used until the Air Force Satellite Communication System became operational in the eighties.

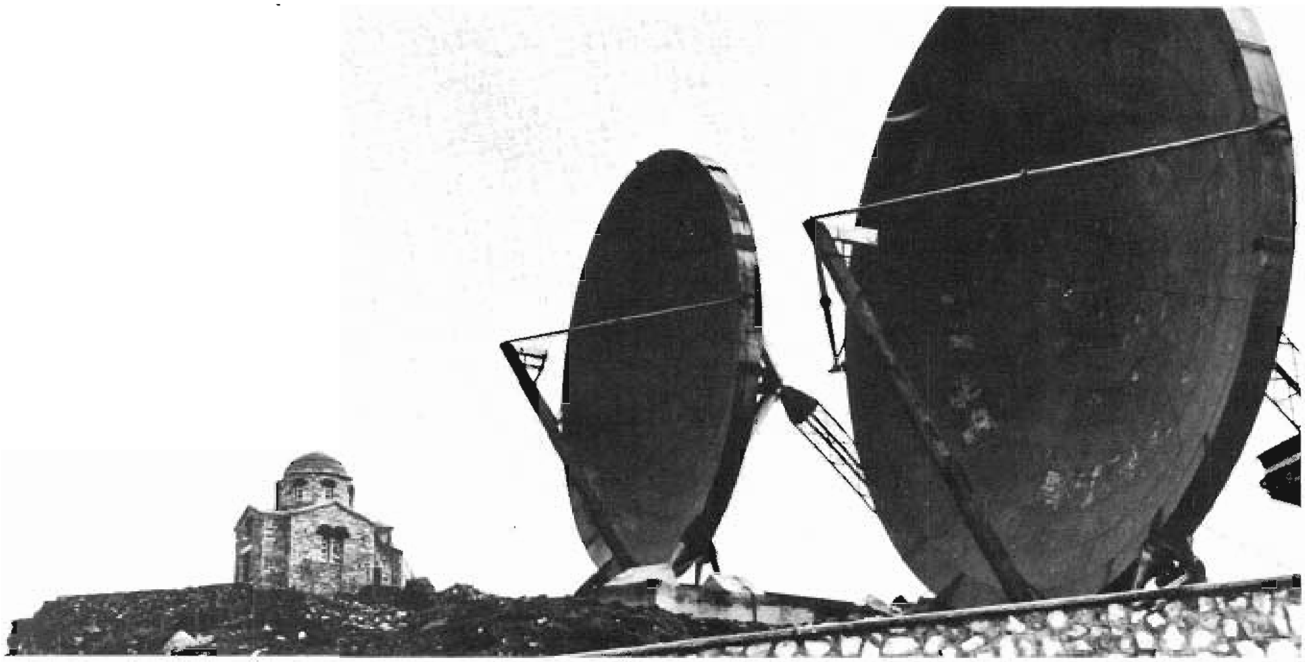
As a subsystem of the Defense Communication System, the Defense Satellite Communication System (DSCS) provided a worldwide long-distance communication service for Department of Defense and other federal agency users. Not only was DSCS employed to give further flexibility and transmission diversity, it provided critical services under electronic jamming conditions, provided general service for global transmission, and provided for quick reaction contingency operations. By 1980, AFCC operated DSCS earth terminals at 15 locations.

Planners were working on a new edition of the earth terminals to handle the more sophisticated satellites. Development of a new digital communication subsystem, started in the mid-seventies, was also coming to fruition by 1980. The digital subsystem would speed transmission, increase capacity, and very importantly, conserve the frequency spectrum so critical to satellite communications. In late 1978, AFCS received the first of the tactical earth terminals acquired through the Ground Mobile Forces Satellite Communication Program. Using the DSCS, the mobile terminals would support both tactical and contingency needs of the Air Force.

AFCC managed terminal installation along with planning responsibilities in the Air Force Satellite Communication System program. This program, started in the early seventies, would provide SAC and other priority users with a reliable and secure communication system between the ground and airborne terminal links. The system came into partial operation in 1979 with full operational status expected in the early eighties.

An AFCS technician performs a maintenance check on a piece of equipment at the 1931st Communications Group Aeronautical Station.

This satellite link terminal was operated by the 1935th Communications Squadron at Wildwood AS, Alaska.

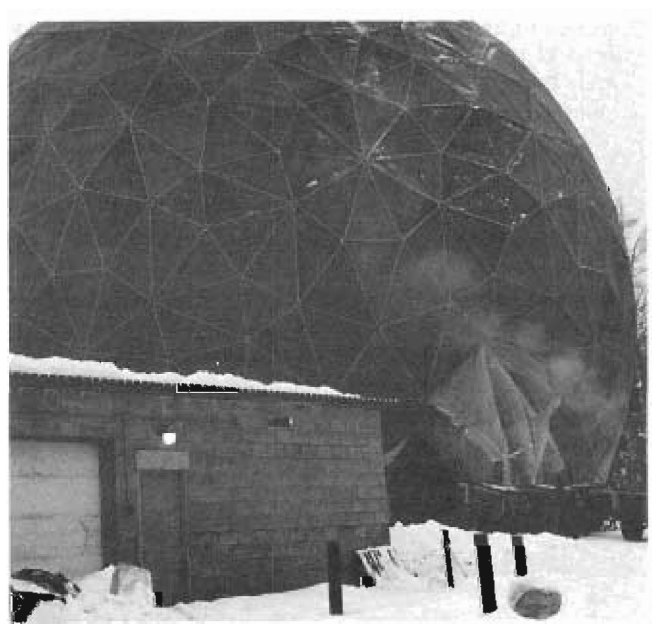


Modern communication satellites sit side-by-side with yesterday at this European Communications Area site in Greece.

In another satellite program, NAVSTAR Global Positioning System, AFCC worked to develop a vastly superior navigational system, envisaged to be precise enough to act as a landing system. The system would be used by all military forces to accurately determine positions of friendly and enemy forces and the relationship of their positions to each other. In the mid-seventies, AFCS served in an unofficial operations-and-maintenance role. In 1978, the Air Staff appointed the Strategic Air Command as operational manager, with AFCS directed to assist in development of a management plan for the program.

AFCC also operated and maintained Air Force Defense Meteorological Satellite Program earth terminals. Beginning in 1978, shortly after it picked up meteorological maintenance activities from the Air Weather Service, AFCS worked with the Space and Missile System Organization, Los Angeles AFS, California, to upgrade existing terminals. Installation of new components in the Mark II terminal, started in 1979, was completed at the four identified locations during the year. In 1980, AFCC began testing a new, highly mobile terminal, the Mark IV, which could be airlifted more readily than early models to fill contingency needs. Systems would be deployed in Europe, the Pacific, at MacDill AFB, Florida, and McClellan AFB, California, by 1982.

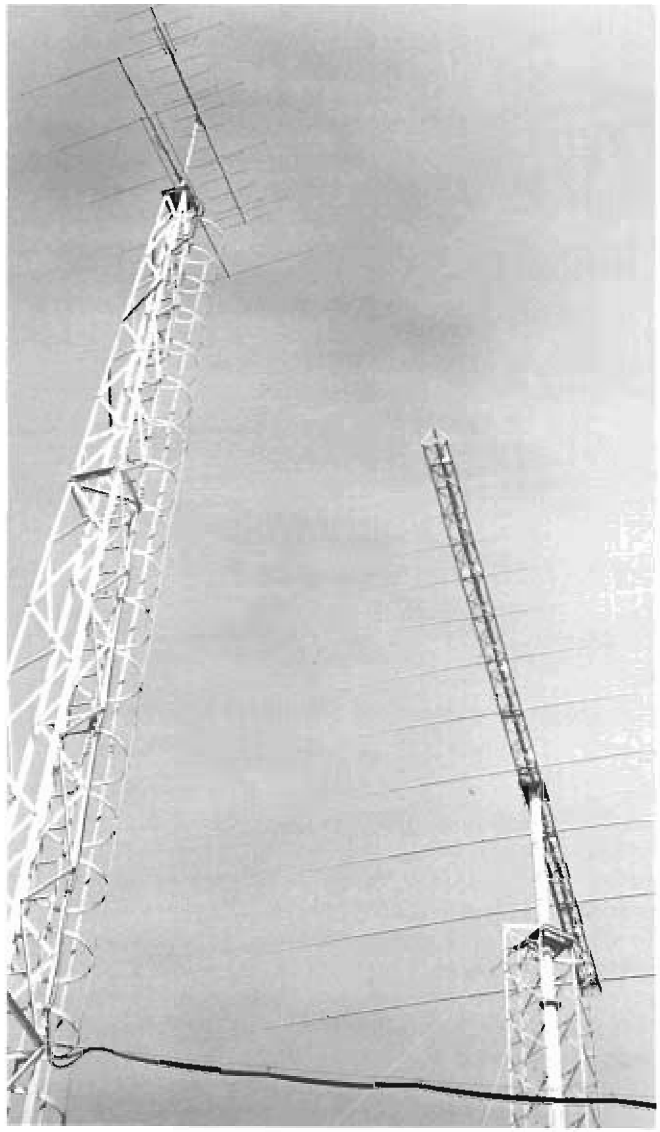
Since 1948, the Military Affiliate Radio System (MARS) program had amply demonstrated its utility as a backup or auxiliary communications system for military, civilian, and disaster officials during periods of emergency. Designed to create interest among civilian amateur radio operators in military radio communications and to provide an additional source of trained radio operators in case of a local or national emergency, the MARS program also proved to be a morale-building communications link between separated servicemen and their families. The main components of the program were the military radio stations and civilians who voluntarily operated their own stations in the MARS network.



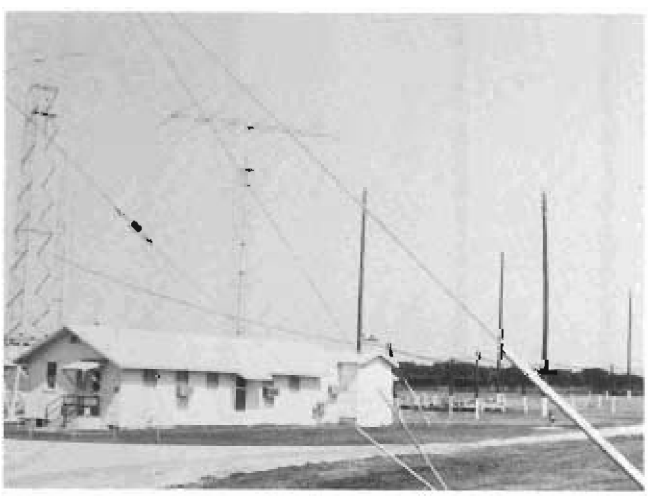
The radar dome to house the AN/MSC-46 satellite communications terminal at Elmendorf AFB, Alaska, was constructed during 1974.

A general disinterest and budget restraints threatened the program in the mid-seventies. These budget restraints were countered by centralized reorganization and consolidation of many stations into existing base command posts, thus helping lower cost without destroying the concept. Transfer of control of the program from Air Force headquarters to AFCS headquarters, and emphasis on the need for a simple communications backup supporting war readiness brought a new vitality to the system after 1978. War and contingency planners placed increased emphasis on MARS for emergency support. MARS radiomen remained confident that the reduced number of stations and membership could carry out the MARS mission in peacetime as long as the program was actively monitored.

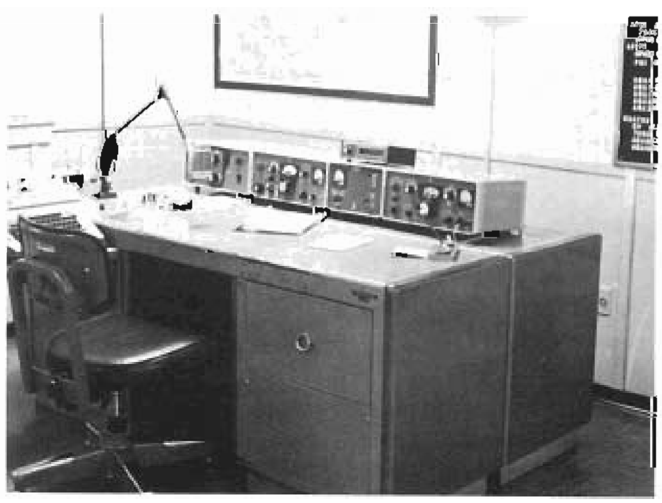
Using the voice communication capabilities of the AN/GRC-189 Ground Satellite Communications Terminal, an AFCS officer operates the radio control-head supporting the system.



Two of the many Military Affiliate Radio System antennas used are the Mosely "Beam," good for 200 to 300 miles, and the Collins "Log Periodic," good for worldwide use.



MARS site at Kelly AFB, Texas.



Transmitter/receiving consoles for monitoring the Military Affiliate Radio System.

MARS reestablished command and control communications between the Strategic Air Command headquarters and its wing at K.I. Sawyer AFB, Michigan, when the base cable was severed in 1970. In 1974, failure of the commercial telegraph cable isolated Williams AFB, Arizona, for six hours. Again, the base MARS station established communications with the Air Training Command headquarters until normal communications could be restored. In 1978, the MARS program saw its first seagoing station when AFCS headquarters granted a MARS license to the National Oceanic and Atmospheric Administration's marine research vessel, Miller Freeman. When the United States Embassy in Tehran, Iran, came under attack on 14 February 1979, normal communications with the continental United States and the western world were severed. For nearly a week, the MARS station located at Andrews AFB, Maryland, augmented vital communications. At times, MARS provided the only communications link between Iran and United States officials in Washington, D.C. As always, the MARS program stood ready to provide backup communications in cases of emergency, as it had for more than 32 years.

A communications satellite terminal stands ready to receive and send messages via satellite to points halfway round the world from its Clark AB, Philippines, site.

AFCC responsibilities included operation, maintenance, and planning improvement projects for the Air Weather network communication system. At the heart of the specialized network, AFCC operated and maintained automatic digital weather switches, which sorted out the transmitted weather data. In 1969, planners asked if the weather network would be incorporated into its sister automated digital switched communication system, AUTODIN. Research found that the unique business of weather communicatins hindered what seemed, on the surface, a compatible task. Over 8,000 weather observation stations fed the network perishable weather data within minutes of the observation to satisfy customers' requests. Weather information collected by the stations was transmitted to an appropriate weather switch where data was processed, sent out to local users, and sent on to the switch at Carswell AFB, Texas, and to the Air Force Global Central at Offutt AFB, Nebraska. At Offutt AFB, this data was further processed and readied for other users.

Facilities of the Defense Meteorological Satellite Program at Howard AFB, Panama.

ON-BASE COMMUNICATIONS

INTRODUCTION

In addition to the long-distance communications systems which tied Air Force and other Department of Defense facilities together, AFCC continued to provide the very visible and essential communications for the everyday on-base operations. These services included engineering, installation, operation, and maintenance of the telephones, on-base radio systems, telecommunication centers, intrusion and warning systems, meteorological equipment, as well as closed circuit television systems. Problems with aging equipment and promises of better service through technological advancements continued to affect AFCC management of base systems. Weather systems and the telecommunications centers attracted modernization efforts quicker than the base telephone or base security systems, but AFCC worked with consolidation, update, and replacement programs in all of its on-base communication services in the seventies.

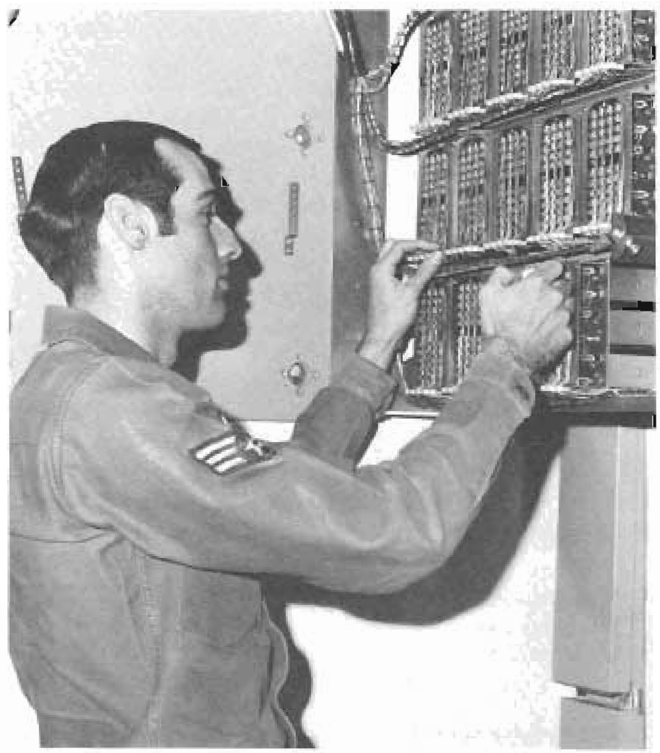
BASE TELEPHONE EXCHANGE UPGRADE AND REPLACEMENTS

For many years, particularly since 1974, the Air Force planners labored over solutions to the problematic base telephone systems, developing various plans to provide an efficient and economical system. Most Air Force base telephone systems used outdated, pre-World War II, electromechanical telephone exchange equipment. Much of the equipment had not been manufactured for years and, consequently, was difficult to maintain. The situation was complicated by fragmented equipment procurement practices and a variety of training, logistics, and maintenance support problems. Furthermore, the electromechanical switches would not consistently satisfy the growing need to expand telephone capacity, data transmission, and the word processing center.

With the aid of sponsoring commands, AFCC helped upgrade several base telephone exchanges. Some facilities survived through intensive cannibalization programs; others, including Edwards AFB, California, and Offutt AFB, Nebraska, received new electronic switching equipment by 1979. These modernization projects, however, were organized individually and the complicated and intensive programming and funding efforts required for each project produced repetition of effort and high costs.

Although AFCS engineers and planners attempted to eliminate the piecemeal approach to modernization as early as 1974, funding constraints and difficulties with system and programming definition caused delays for a number of years. Increased awareness of the telephone problems and a presidential policy to decrease civilian personnel intensified the Air Force desire to move ahead with a rational replacement and update program. In early 1979, Air Force Headquarters approved a replacement strategy known as Scope Dial. The multimillion-dollar program would replace about 27 government-owned dial central offices worldwide beginning in 1981. The new electronic equipment would require fewer operators and maintenance people and give better service with cheaper spare parts. Compact, desk-top consoles would replace bulky switchboards; troubles in the equipment would be signalled and isolated automatically; and the equipment would be able to record all accounting information on toll calls to simplify record keeping.

An AFCS technician performs preventive maintenance on the Norton AFB, California, telephone switchboard mainframe.



An AFCS airman checks the relays used in a telephone key system. A relay panel such as this one can carry as many as 50 dial or 20 direct lines.

AFCS technicians overhaul teletype equipment in a Communications Center shop area.

The base communications-electronics officer from the 2167th Communications Squadron at RAF Chicksands, England, checks the frame room in the Base Consolidated Switchboard, which handles commercial and AUTOVON lines.

Sensitive telephone lines require special maintenance. Here, an officer from the 1835th Electronics Installation Squadron, Norton AFB, California, uses an oscilloscope to examine telephone lines for possible trouble or defects.

TELECOMMUNICATION CENTERS

Telecommunication centers had a history of continual change as the Air Force adopted consolidation schemes, technologically advanced equipment, and new techniques and procedures to provide greater service at lower costs. While changes in the early sixties followed a pattern of modernization with computer-aided teleprocessing, the early seventies brought more capable automatic systems wherever justified by traffic loads. Through the rest of the decade, AFCC organized and managed a variety of programs aimed at standardizing, simplifying, and consolidating the costly, complex, and individualized automated telecommunication centers.

The Air Force Automated Message Processing Exchange program of the late seventies had antecedents in the 1970-72 Local Digital Message Exchange program, and the 1973-74 Pentagon Consolidation Project (managed by the Army). Because the Pentagon project was so costly, the Air Staff decided that more research and experimentation was necessary. A variety of automated processors used throughout most of the seventies had the capability of automatically collecting and distributing messages within an Air Force installation, and interconnecting with the AUTODIN system for inter-base communications. The system also connected computers both on base and between bases to transfer computer data. The data processing systems were usually commercially procured and maintained-a popular method of cutting back on military maintenance personnel and associated costs.

In 1975, AFCS and the Communications Computer Programming Center at Tinker AFB, Oklahoma, originated a new automation concept called the Automated Telecommunication Program which replaced the expensive computer-aided processing system then in use with mini-computers. These new computers, which AFCS began to install in 1979 under the new Automated Message Processing Exchange program, would satisfy expanded communications needs. The computers permitted store-and-forward processing to use transmission circuits more efficiently and they allowed centralization of local telecommunication processing and administrative functions. The Automated Message Processing Exchange program also involved updating the optical character reader equipment which facilitated quicker message processing. The success of the new program led to AFCS spinoffs in 1978. The command began developing a

Two AFCS airmen prepare message tapes in a Telecommunication Center.

The Communications Systems Officer for the 1986th Communications Squadron checks the quality of an important voice line on the Zaragoza AB, Spain, switchboard.

capability to process both defense special security communications and general service traffic. AFCS also assumed program management for an interservice expansion of the program.

Installation of the new computers helped ease the decade-long effort to consolidate communication centers. In 1974, AFCS initiated a study to reduce telecommunication centers through elimination, consolidation, or limitation of operating hours. AFCS accelerated the program in 1977 when Congress and the Secretary of Defense applied pressure for further reductions. As developed, the consolidation program called for a three-phase effort: (1) the consolidation of telecommunication center facilities on a base; (2) consolidation of all centers in a region; and (3) interservice consolidations. After identifying some 57 prospective consolidation sites, AFCS began the consolidation process at two locations in 1978. By 1980, 14 locations had been consolidated with more planned in the future.

BASE AND INSTALLATION SECURITY SYSTEMS

Interest in improving security for high-priority aircraft parking and munition storage areas influenced the development of the Base and Installation Security System program in 1971. Oriented towards electronic surveillance, detection, and identification of intruders, the program was broadened in 1973 to include all military services. The Air Force conducted its own research, under standardization guidelines, for acquisition and installation of equipment applicable to its own needs. The Air Force also divided the command-oriented program into the four areas of SAFE NEST for European installations, SAFE LOOK for Pacific area installations, SAFE RAMP for Strategic Air Command installations, and PAVE SAFE for all other Air Force base requirements. The Air Force eventually designated a wide variety of equipment and systems, modularly designed, to match the varied applications. Although the Electronic Systems Division of the Air Force Systems Command managed the research program, AFCC played an integral part in providing site engineering, installation, and maintenance, for both experimental prototypes and permanent installations.

Problems associated with technological innovations surfaced during research and development phases, slowing the installation starts until 1977. Additional problems with funding and operation of some systems slowed down installation. By December 1980, AFCC had completed 349 of 972 engineering scheme projects. In the next few months, equipment was installed at 58 of the 99 sites.

METEOROLOGICAL DATA GATHERING AND TRANSMISSION

AFCC operated and maintained a variety of on-base weather-gathering equipment and transmission systems for the Air Weather Service, especially after 1977 when the command picked up control of meteorological equipment maintenance from the Air Weather Service. Modernization efforts affected the meteorological systems as much as it did other communications in the seventies.

Base weather office systems was one of the areas modified in the seventies. Between 1970 and 1977, AFCS communications planned and installed new weather terminal equipment and a digital transmission network in the United States to replace the old manually operated information service and teletype network which had provided weather data to base flight operations through the Automated Weather Network switch at Carswell AFB, Texas. This new system, the Continental United States Meteorological Data System included high speed transmission and terminals located at base weather stations. The terminals consisted of page copy printers, keyboards, and electronic visual display screens. Advantages of the system included improved pilot weather briefings, better control of weather status documents, and quick call up of stored information, all of which required less time and manpower.

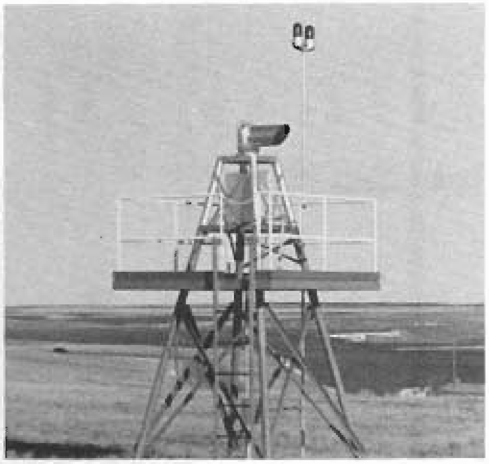
Even after official completion of the new system in January 1977, it expanded to Hawaii to provide service for the Navy, Marines, Air National Guard, as well as Air Force bases. In April 1977, AFCS expanded the system by installing 53 terminals in support of the Aerospace Defense Command. Subsequent deactivation of the Air Defense Tactical Weather Communications Network resulted in annual savings of over $200,000 to the Air Force. The success of the system gave further impetus to plans for expanding the system in Europe, the Pacific, and Alaska in the eighties.

Technological innovations, however, made the new system obsolete before installation was completed. As early as 1975, AFCS and Air Weather Service personnel began planning for an automated weather distribution system. The system would be a streamlined modular arrangement that would completely replace the clipboard storage of weather messages and bulletins and the wall display of facsimile charts, employed in base weather stations. The system would also alleviate many menial, labor-intensive tasks, and most important, it would keep pace with the critical requirements for more accurate and timely reporting of airfield weather observations and forecasts.

Two airmen perform preventive maintenance on an AN/FPS-77 radar.

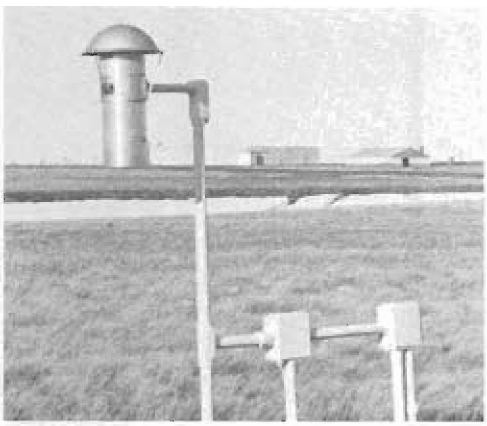
An AFCS airman adjusts the focus on a closed circuit television system in a base weather station.

Two airmen work on weather facsimile machines at Aviano AB, Italy.



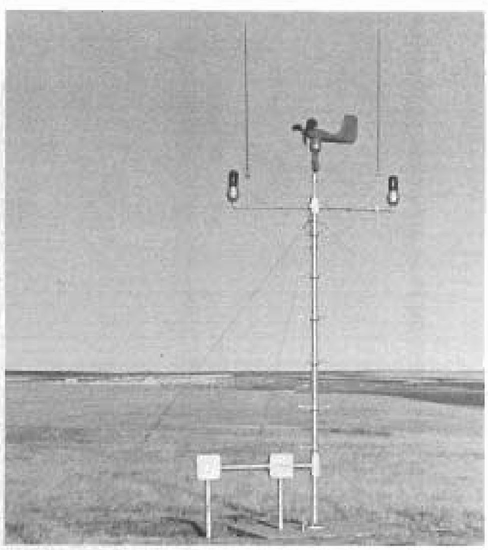
This portion of the AN/GMQ-10 weather system projects a narrow light beam to a receiver located several hundred feet away.

A terminal of the Continental United States Meteorological Data System, commonly known as COMEDS.



This remote temperature/humidity sensor transmits data to a remote indicator that displays current outside temperature and humidity.

This Weather Telecommunications Center at Howard AFB, Panama, processed a variety of messages, including weather data, flight plans, flight advisories, rescue coordination messages, and Notice to Airmen.



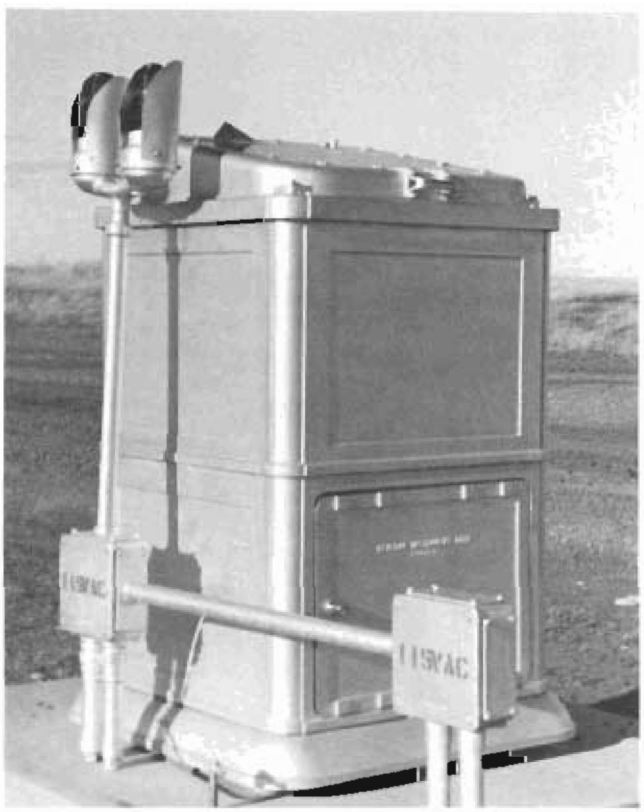
The AN/GMQ-20 senses wind speed and direction, and displays the information on a remote indicator.

This portion of the AN/TMQ-11 indicates the temperature and humidity information it receives from the remote transmitter located on the airfield.

A separate communication network, managed by AFCC, handled the exchange of weather charts. This worldwide facsimile system, consisting of transmitters at the Air Force Global Weather Central and overseas tactical forecast units and receivers generally located in the base weather station facilities, transmitted facsimile products—as opposed to the narrative and symbol traffic handled by the Automated Weather Network. The Air Weather Service, as the using agent, operated the receivers while AFCC maintained all equipment and operated the transmitters. Antiquated recorders and scanner equipment caused problems all through the decade. Industry's reluctance to provide new analog equipment for this obsolete technology only increased the problem. Beginning in 1970, the Air Weather Service and AFCS attempted to provide a new digital system, but equipment acquired by 1975 would not work over the European test bed communications network. A new Digital Weather Graphic Network, with new specifications was developed in the late seventies, and installed in 275 locations by the end of 1980.

AFCS engineers helped plan and develop new weather radar equipment to replace deteriorating systems worldwide. In 1977, AFCS helped install and test a prototype lightning-warning system which had been under development from the first of the decade. Engineered to detect and record cloud-to-ground lightning discharges, the system failed to meet technical operation requirements. Thus the deployment of the 27 worldwide systems was delayed until research produced a better system.

Two AFCS member check a cloud height projector.



This weather unit detects the modulated light beam transmitted by the cloud-height projector.

Another program, struggled with since 1972, was the provision for automated recording of base wind speed and direction. An initial installation in Yokota AB, Japan, in 1974, proved unsuccessful because of unreliable cathode ray tubes. New light-emitting diode displays promised to correct the problem and installation schedules were set up for the early eighties.

Although AFCS was not responsible for the entire Space Environment Support System, it managed the network that transmitted solar data collected by the space system. In 1977, the Air Staff designated AFCS as the command in charge of activating five solar optical telescope systems to provide continuous coverage of the sun. With all candor, AFCS could claim weather communications responsibilities around the world and into space.

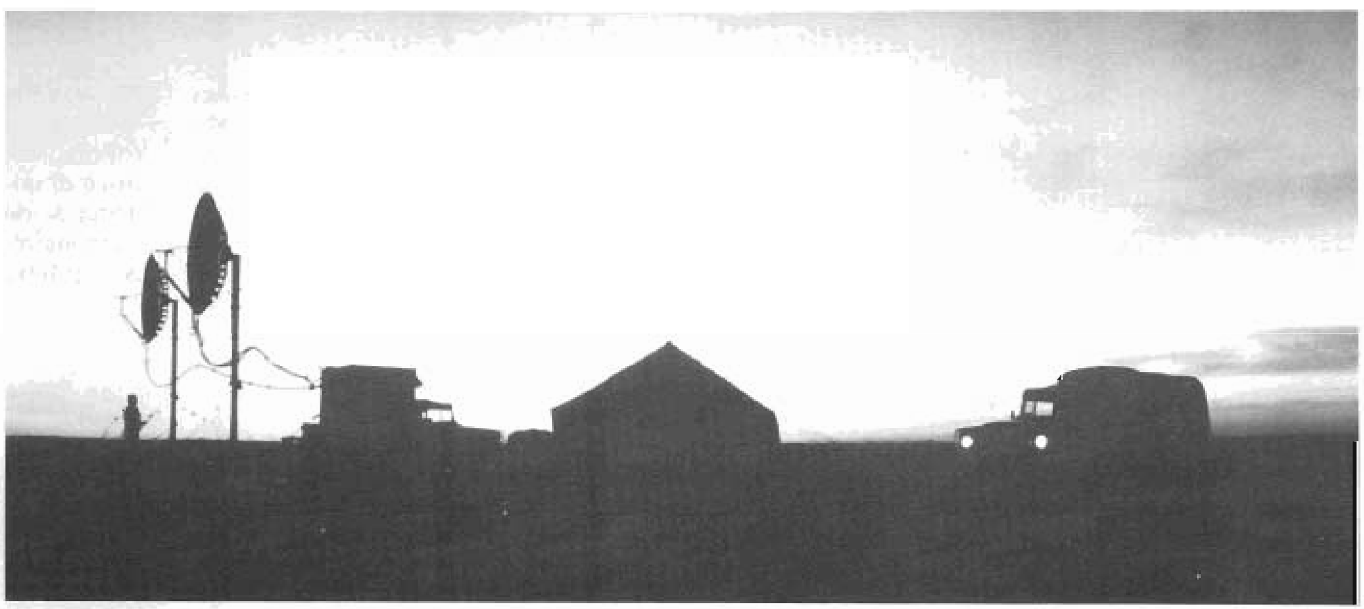
READINESS AND COMBAT COMMUNICATIONS

INTRODUCTION

In the seventies, the Air Force continued to emphasize the need to prepare manpower and weapons for sudden crises and conflicts. Developing a readiness posture involved more than just combat capability, it encompassed many factors such as contingency plans, the ability to deploy and supply, the motivation and attitudes of fighting and support forces, and the ability to communicate. AFCC contributed to this effort by introducing and operating new and improved communications and air traffic control facilities, equipment, and systems for combat and contingency operations. The command sustained this service with specially organized and equipped mobile combat communications units. Through most of the decade, five mobile units, three in the continental United States, one in Europe, and one in the Pacific, were employed by AFCC in a variety of emergency situations.

Cognizant of the fact that many AFCC-operated communications systems had been engineered and constructed for heavy administrative use in a peacetime environment, the command identified the need to provide an essential level of communications for wartime command and control. The command accelerated the effort in the late seventies to provide a modicum of communication capability in the eventuality of massive trunking facility destruction. AFCC began arranging interconnections for communications systems and circuits, and establishing alternate hardened routes and facilities for the most critical communications requirements.

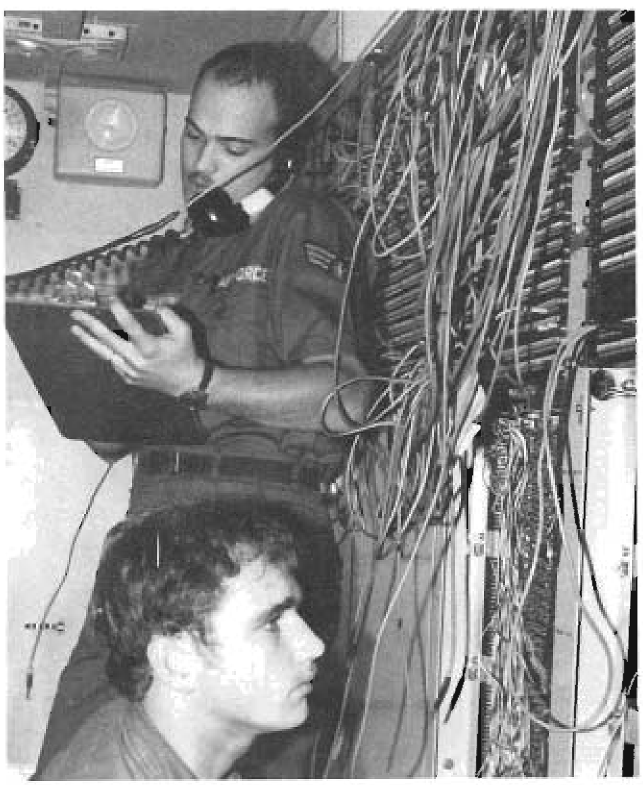
Members of AFCS's mobile communication groups performed a variety of assignments, including stints of guard duty.



Microwave relay antenna trucks of the 2d Combat Communications Group at Sembach AB, Germany.

COMBAT COMMUNICATIONS

By 1970, a combination of world political, military, and economic events demonstrated to United States defense policy-makers that future conflicts would not be limited to nuclear confrontations. Rather, experiences in the sixties confirmed the realization that the likelihood of smaller, regionally oriented conflicts was higher than had been anticipated in the aftermath of World War II. As a result, the wide range of potential military actions placed additional emphasis on mobility. The AFCC combat communications units (called mobile communications units before March 1976) were organized, equipped, and located geographically for optimum support to the operational commands. These units, highly mobile and air transportable, were used by the commands in directing, controlling, and coordinating combat air activities. They also provided tactical communications and air traffic control resources for emergency replacement of fixed facilities when damage, modification, or maintenance would result in extensive out-of-commission time. AFCC combat communications units provided temporary communications in electronic installation and restoration projects, but were primarily support elements for combat contingency situations and for the many military exercises that kept the forces trained for combat.



AFCS personnel from the 2d Mobile Communications Group work with a maze of patch cords and wiring in a technical control van to maintain circuit continuity between various communications facilities.

A silhouette of a 2d Mobile Communications Group and mobile tropospheric scatter antenna at Sembach AB, Germany.

Prior to 1975, the combat communications units generally excluded women from their operational forces, reasoning that the units faced the possibility of being temporarily assigned to combat or unusually arduous environments. The Air Staff provided new guidance in December 1974, which stated that, with an expected increase in the number of women personnel in the Air Force, restrictions on assignments to the mobile communications units must be held to an absolute minimum. In January 1975, AFCS decided that because the mobile units did not engage in high-risk combat missions, women could not be prohibited from any mobile communications unit position. Commanders were advised to be sensitive to the unique support aspects of deploying women. Separate living quarters might be appropriate and special latrine and shower facilities required, but these possible impositions should not restrict or prohibit the deployment of women. Consequently, women in combat fatigues became as common a sight around the combat communications units' headquarters as women in blues elsewhere in the Air Force.

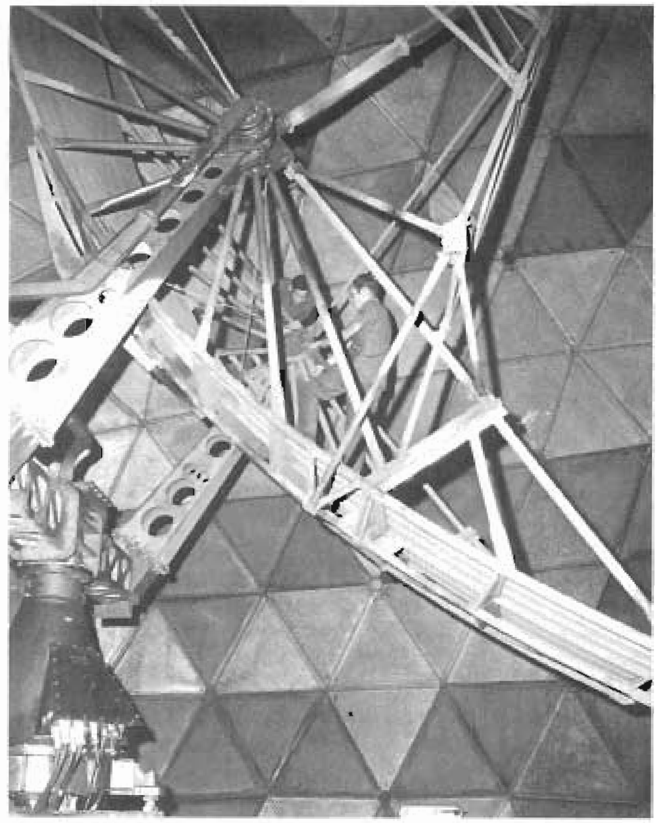
CONTINGENCY DEPLOYMENTS

AFCC combat communications units participated in hundreds of deployments each year with involvement ranging from deployment of a single piece of equipment to deployment of hundreds of personnel with a wide assortment of tactical communications gear. The combat communications units provided tactical communications equipment during national and international crises—natural and manmade—and miscellaneous other military deployments directed by the Department of Defense or other national agencies. In 1970, the war in Southeast Asia still demanded participation from the mobile communications units, but a number of contingency operations also captured the attention of communicators throught the command.

The combat communicator's role in Southeast Asia decreased significantly after 1970 for a number of reasons, including the comprehensive installation of fixed communication facilities in the sixties, the turnover of facilities and responsibilities to host nations, and the phasedown of activities in Vietnam. The year 1970 also marked the date of the last of 11 AFCS persons killed in action in the Southeast Asian War. Two of those 11 were members of the 1st Mobile Communications Group.

The United States commitment to decreasing its military forces in Southeast Asia required that the Air Force develop plans for an orderly withdrawal without sacrificing all the facilities and equipment built up in the sixties. These actions also demanded greater training efforts to ensure that host nation communicators and air traffic controllers possessed the essential skills to maintain and operate the facilities left behind by the Air Force. Early in 1970, AFCS identified those facilities which were to be transferred to the Vietnamese Air Force.

The combination of this action and the reductions in United States personnel intensified the training programs for Vietnamese Air Force members. From the time the decision was made to implement fixed communication facilities throughout South Vietnam, AFCS personnel devoted much of their effort to training Vietnamese forces to become self-sufficient. The bulk of communications training was conducted on an on-the-job or over-the-shoulder basis through the integration of Vietnamese and United States forces or contractor operation and maintenance teams. While this system of training had been effective throughout the sixties, it was not able to absorb the increased training workload. To relieve this situation, additional contractor personnel were used to train Vietnamese Air Force members in the early seventies.



Maintenance personnel from the USAF and the Royal Thai Air Force work together to perform a periodic check of the slip ring on an AN/FPS-89 radar set at Udorn AB, Thailand.

Despite the reduction in U.S. forces in Southeast Asia in the early seventies, members of the 1st Mobile Communications Squadron work to restore communications to Takhli AB, Thailand. The base was reopened to accommodate the arrival of additional F-4 Squadrons to support the air offensive in Southeast Asia.

An AFCS officer adjusts controls on a transportable technical control facility employed as part of the Defense Communications System contingency station. The technical control center is a semi-trailer van containing equipment that provides voice and teletype circuits and signal patching and monitoring.

Between 1971 and 1972, the number of AFCS personnel assigned to South Vietnam was reduced drastically, primarily due to the increasing self-sufficiency of Vietnamese forces in operating communications equipment. By 1 December 1972, the command's strength had diminished to only 390 personnel in South Vietnam, a sharp contrast to the peak strength of 3,000 in 1968. The base of Vietnamese Air Force personnel supporting AFCS sustained an increase complementary to the decrease in United States forces. In January 1970, Vietnamese communications personnel numbered 936, but by January 1972, this number jumped to 1,963 men assigned to meet communications-electronics requirements. These developments in training and personnel were conducted largely under the auspices of the Vietnamese Air Force Communications-Electronics Improvement and Modernization Program, established in June 1971.

Force reductions in South Vietnam, along with other reorganizations, were a factor in shaping the direction of AFCS in the seventies. Between September 1971 and May 1972, 10 AFCS squadrons left Southeast Asia. In keeping with the Air Force policy of maintaining the lineage of units no longer required in Southeast Asia, AFCS relocated its communications squadrons and groups, without their personnel and equipment, to other locations where they could replace existing units.

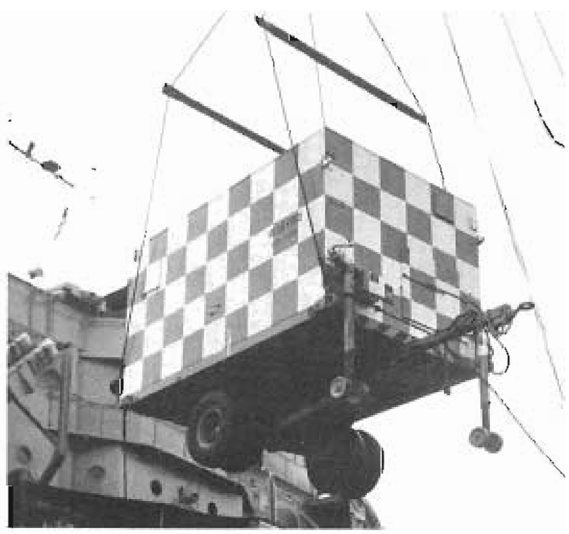
Antenna maintenance men of the 1st Mobile Communications Group add radiation domes to a 60-foot tower to provide ultra high frequency communications from airborne aircraft to the command center.

Mobile Digital Subscriber Terminal Equipment provides message service when system improvements or combat exercises preclude the use of fixed AUTODIN facilities.

Three members of the 2d Mobile Communications Group, Lindsey AS, Germany, study wideband communications test procedures during a Scope Creek training course at AFCS headquarters.

Mobile facilities are loaded onto a transport aircraft for speedy delivery.

Constant checks are necessary to ensure the proper operation of mobile facilities. Here, an AFCS officer from the 2d Mobile Communications Group checks electrical power connections on a deployed AN/TSC-62 communications control van.



The compact and lightweight features of AFCS's mobile facilities allow equipment to be transported to wherever they are needed.

Despite these force reductions, AFCS continued to provide air traffic control and communication services in Southeast Asia throughout the early seventies. In 1970, air traffic handled by control towers in South Vietnam still accounted for 85 percent of all traffic in the Pacific Communications Area, with Da Nang AB and Tan Son Nhut AB, South Vietnam, directing the most air traffic. Military Affiliate Radio Stations remained in operation until the actual day of base closure at each station and became the only contact with home for personnel during their final days in South Vietnam.

Probably the most fulfilling effort by AFCS in the long years of involvement in Southeast Asia was Operation Homecoming in 1973, the repatriation of prisoners of war held by the North Vietnamese and Viet Cong. Clark AB, Philippines, served as the initial reception point for returning prisoners, and in early 1973 combat communicators helped set up hundreds of telephone lines, and circuits for the welcoming home. Living up to its motto as the first in and the last out, the 1st Mobile Communications Group carried equipment and personnel on the first aircraft to land at Gia Lam Airport in Hanoi, North Vietnam, to pick up American prisoners on 12 February 1973, and on the last to depart with prisoners of war. Within 10 minutes of the initial landing, a radio loaded jeep backed out of the C-130 Hercules and established contact with the Clark AB aeronautical station and the first C-141 Starlifter medical evacuation aircraft already on its way to Hanoi. The participation of this organization was especially fitting, for members of the 1st Mobile Communications Group had been present 11 years earlier with the initial AFCS deployment to South Vietnam to support the 2d Air Division in August 1961.

The mobile communicators stationed at Clark AB, Philippines, in 1975 returned to Vietnam for the final pullout, thus giving further credibility to the AFCC tradition of "first in and last out." In April, four men and a jeep filled with radios were sent to Saigon to provide communications for the United States Defense Attache Office. By 28 April attacks on Saigon became so heavy the team was authorized to abandon the post. The Marine guards who protected the American compound asked that the communications jeep be left behind so they could communicate with their ships. Two Air Force communicators volunteered to stay behind to operate the equipment and finally, when they were airlifted by helicopter on 30 April, they could claim to be the last Air Force personnel evacuated from South Vietnam.

Many communicators today give great energy to operation, planning, maintenance, installation, engineering, and support of the wide range of AFCC communications facilities, but not all the excitement of World War II, the Berlin Airlift, Korea, and South Vietnam are necessarily gone in the computer-assisted

A mobile tactical air navigation unit sits near a permanent facility during repairs.

communications business of today. Some communicators still taste the excitement of the world in contingency activities such as the September 1973 deployment to Karachi, Pakistan, to help support flood relief; an October 1973 mission to Lod Airport in Tel Aviv, Israel, during the Middle East crisis; and an April to June 1978 deployment to Zaire to help a peace keeping mission.

Looking at the example of one year, 1980, illustrates the interesting activities of combat communicators. The year began with communication personnel aiding the community after the Azores earthquake. Communicators provided emergency aid during the floods in Riverside County, California, the Cuban Sealift, Mount St. Helens volcanic eruptions, brush fires in California, the MGM Grand Hotel fire in Las Vegas, and the earthquake that hit Italy at year's end. Training exercises brought AFCC Air National Guard and active units to two deployments in Egypt, one in Korea, and several closer to home, including Gallant Eagle, Busy Prairie, Red Flag, Medical Red Flag, and Brave Shield.

An officer from the 2d Mobile Communications Group coordinates field operation from the AN/MRC-107 radio controlled jeep.

An outside plant technician with the 2063d Communications Squadron, checks connections on some of the thousands of feet of telephone cable installed for news media and the State Department when the returnees were brought to the USAF hospital at Wiesbaden AB, Germany.

AFCC communicators in Germany will remember with pride their efforts in providing communication services for the arrival of the 52 American hostages at Rhein-Main and Wiesbaden Air Bases in Germany. Beginning months before the dramatic arrival of the hostages on 21 January 1981, five AFCC units contributed talent and equipment to the preparation of a variety of communications facilities. Technicians not only installed the 52 telephones, one for each individual, used by the returnees, but they also installed military and civilian telephones in the Air Force Hospital at Wiesbaden for the State Department and government officials working with the returnees. The communicators prepared a wide range of communications services for the event. They installed a press center at Lindsey AS, strung miles of cable for television and audio news reports, and revamped the base theater for international press conferences. They helped activate microwave links between Lindsey AS in Wiesbaden and Frankfort to carry television pictures to the United States. At Rhein-Main AB, technicians installed 150 telephone lines and instruments for the news media and they helped White House communication technicians install the special presidential links. Even most of the public address system that President Carter used belonged to AFCC. The communicators, undoubtedly, still felt the flow of excitement as they packed away their equipment and cables after the 52 Americans left Germany for the United States.

The former hostages make that first phone call home from the USAF hospital at Wiesbaden AB, Germany. The 52 telephones used by the returnees were just a small part of the special communications systems installed to support the hostages' return.

The 2063d Communications Squadron supports the hostages release with a yellow ribbon tied around a tree in front of their home in Wiesbaden, Germany.

TACTICAL EQUIPMENT AND ORGANIZATIONAL MODERNIZATION PROGRAM

The South Vietnam experience exposed the weaknesses of old mobile communication equipment that did not always meet the requirements, nor the evolving United States policy that emphasized controlled responses to potential and actual war situations. In the early seventies mobile communications units began receiving new equipment under a comprehensive program to provide new mobile data terminals, troposcatter and microwave radios, tactical weather systems, electronic telephone switches, centers, technial control centers, and teletype message centers. In 1973, the Air National Guard mobile communications units that reported to AFCS began to upgrade their operational capabilities with the new equipment or equipment that had become excess to the active units as a result of the new equipment program.

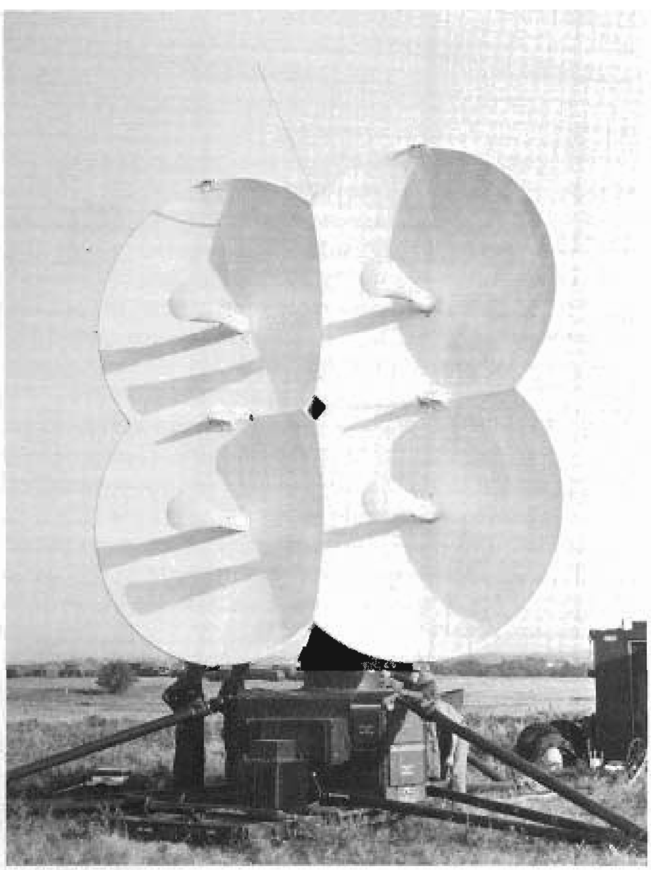
In 1978, AFCS promoted a readiness program to prepare AFCS manpower and equipment for potential wartime situations and peacetime contingencies. A new readiness directorate served as the center for readiness oriented activities, monitoring over two dozen special AFCS headquarters' taskings as well as innumerable other worldwide combat related projects relating to communications. Maj Gen Robert E. Sadler, AFCS commander, stressed the urgency of getting communications in a ready state quickly without waiting for future promised equipment and associated operational procedures. He pointed to four conceptual areas that would provide focus for readiness planners. The first area was interoperability—the development of procedures, doctrine, documentation, and training to facilitate the communications among the disparate and unique communications systems. These specialized, single purpose systems not only prevented communication among Air Force and other American armed forces, but also between the communication systems of American, European, and Pacific allies. In a second area, General Sadler stressed the need to find a way to improve the physical survivability of communications facilities, including both antennas and equipment buildings and vans, often exposed to battle damage. In a third area, he encouraged the prepositioning of communications equipment and supplies near projected battle areas so that the need to replace damaged equipment would not be dependent on strained airlift capacity. Finally, General

Sadler promoted more comprehensive plans to restore war damaged communications facilities and to prepare for minimal communication capabilities.

While the command made great progress fulfilling General Sadler's readiness philosophy and getting the Air Force communications business better organized for war, planners continued to implement the more established readiness and combat communications projects. AFCC worked with the Scope Response Program which was oriented towards preparing combat essential communications in Europe, and the Joint Tactical Communication or TRI-TAC program which, with antecedents in the sixties and South Vietnam experience, promoted lightweight and common communications equipment for tactical forces of all the services.

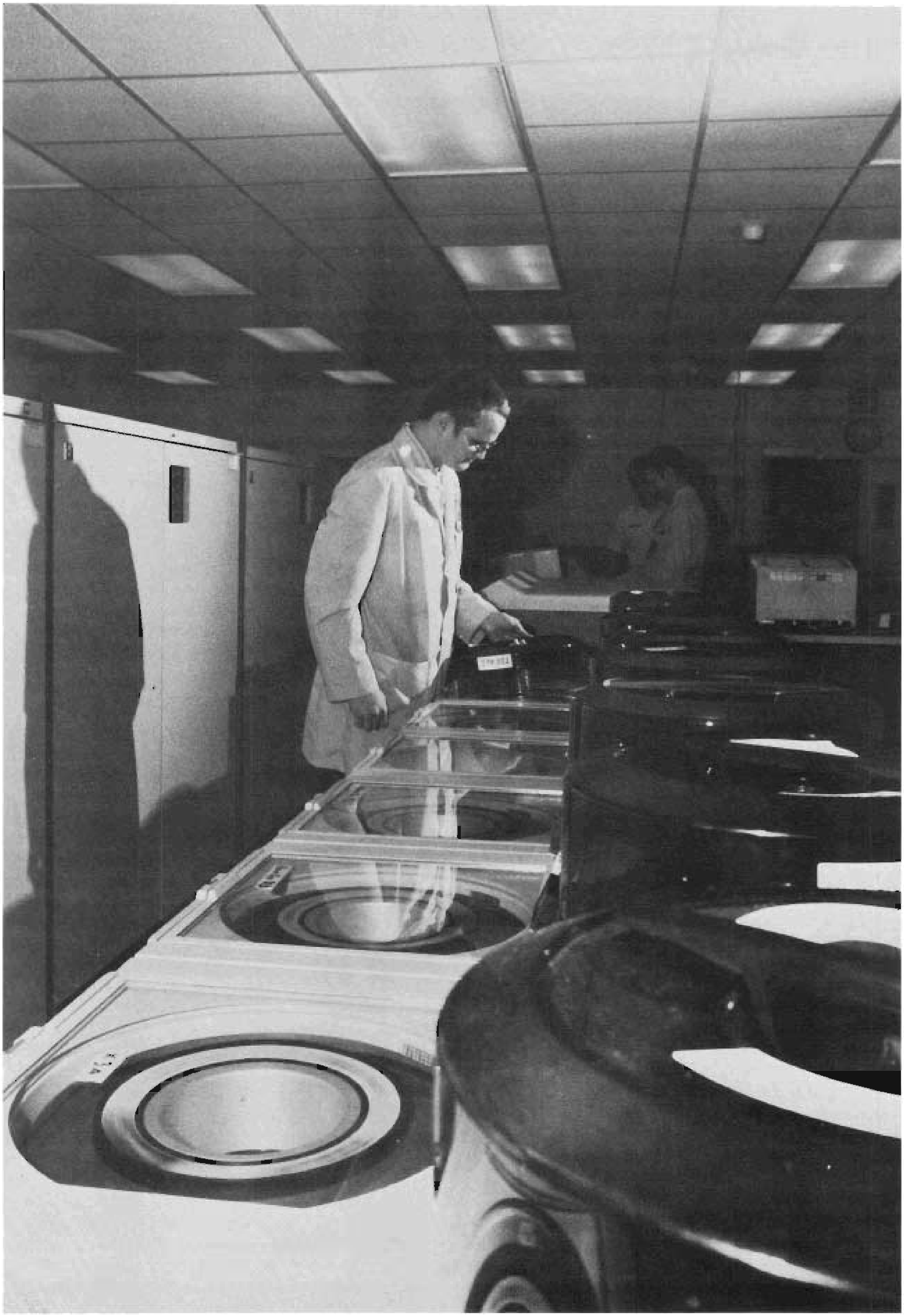
As AFCC entered its third decade as a major command, the resourcefulness of its men and women was to be tested by challenges as great, if not greater than those faced in earlier years. The technological advances being made in telecommunications, automated data and message processing, and air traffic control required a concerted effort on the part of everyone in order to keep pace with the changes and realize the benefits they offered. The responsibility for reaping the benefits afforded by new scientific accomplishments would fall, as it always had, on AFCC's people.

An AFCS airman and an Iranian Air Force officer discuss plans for an aircraft control and warning system, known as Peace Ruby, under the umbrella of an ancient Archimedian king at Persepolis, the ancient capital of Persia.



Four high-efficiency feed horns are centered in the four disc-shaped antennas ready for satellite communication operation. In the background is the opeations shelter which serves as the operators' location during satellite transmission.

Maj Gen Robert T. Herres, AFCC Commander, said that "the greatest strength we have is our people." Those people, nearly 63,000 active duty, Air National Guard, Air Force Reserve and civilians served at 420 locations all over the world. They installed, operated, maintained, and managed a vast assortment of information handling equipment and communications systems that were essential to the overall direction and daily operations of the Air Force. In addition to meeting daily mission requirements, AFCC personnel were continually planning and developing new and improved procedures and systems that incorporated new technological innovations. These new procedures and systems were intended to solve the problem of doing more and doing it better and faster with fewer resources, while keeping our Air Force the best in the world.



THE EIGHTIES: THE CHANGING FACE OF AIR FORCE COMMUNICATIONS

NEW AIR FORCE COMMUNICATIONS COMMAND HEADQUARTERS BUILDING

For the first fifty years of its existence and throughout its various moves, AACS/AFCS/AFCC never had a headquarters building designed and built specifically for the command. That situation changed dramatically in September 1989 when AFCC personnel moved into the new, three-story, 218,000-square foot facility which had been built especially for the headquarters.

In 1977, when AFCC moved back to Scott AFB, Illinois, from Richards-Gebaur AFB, Missouri, the command's headquarters was assigned to Building P-40 which had been built in 1931 for use as a barracks. Over 1,100 people were crammed into an area hardly suitable for 600. Office cubicles were placed in stairwells; hallways were converted to office space or used for storage; porches were enclosed; and over 300 people were placed in basements and attics, neither of which had restrooms. Moreover, during the summers, temperatures in the attics sometimes exceeded 100 degrees.

During the early 1980s, every AFCC commander tried to obtain approval for a new headquarters building. Originally identified as an essential military construction requirement in 1982, the project was postponed from year to year until Maj Gen Gerald L. Prather was able to get the building funded in the fiscal year 1985 Air Force construction program.

The first two times the building construction was put up for bid, the bids submitted were well over the Congressionally authorized funding levels. As a way of surmounting this problem, the Air Force decided to use a "design-build" process which allowed the concurrent design and construction of a building project, and, more importantly, gave potential contractors more flexibility in developing a cost-effective plan. Under this process, the prime contractor was responsible for providing and coordinating the technical engineering design effort, as well as constructing the building. This approach insured that the construction contractor was in charge when difficult issues, which could significantly impact construction time or costs, were decided during the project design phase. Such a design-build process had never been used by the Air Force before, but it had been used successfully in the commercial construction industry for many years.

Between April and August 1986, HQ AFCC engineers, working with the Air Force Regional Civil Engineering Office and a commercial architectural and engineering firm, developed the criteria for the proposed building. Eventually, the J. S. Alberici Construction Company of St. Louis, Missouri, was selected as the prime contractor.

Headquarters AFCC held the official ground breaking ceremonies on 11 August 1987, and the contractor began actual construction site work during the third week of November. The contract called for the building to be completed in 530 days from the start of construction, but there were a few delays, so the actual move to the new headquarters building did not begin until 5 September 1989. Over the next 16 days, 1,250 people and 1,200,000 pounds (the equivalent of 40 moving vans) of office equipment, records, and executive furniture from five separate buildings on Scott AFB were moved into the new building.

Headquarters AFCC groundbreaking ceremony, 11 Aug 87. From left: Maj Gen John T. Stihl, AFCC Commander; Senator Alan J. Dixon; Congressman Melvin Price; Gen Duane H. Cassidy, Commander-in-Chief, Military Airlift Command.

The Air Force Communications Command Headquarters Building, the Lt Gen Harold W. Grant Building.

Mrs Dorothy Grant and Maj Gen Robert H. Ludwig, AFCC Commander, unveil plaque of Lt Gen Harold W. Grant during formal dedication of the Lt Gen Harold W. Grant Building, 16 Oct 89.

Lt Gen Harold W. Grant, AFCC's first commander, presented the original command flag to Maj Gen Robert T. Herres during the 20th anniversary activities. The flag is preserved as a permanent part of the command's historic memorabilia.

Maj Gen Robert H. Ludwig, AFCC's Commander since May 1989, formally dedicated the building in special ceremonies on 16 October 1989. Appropriately, the new headquarters building was named after the late Lt Gen Harold W. Grant, and the dedication ceremonies coincided with what would have been his 83d birthday. General Grant had been instrumental in unifying much of the Air Force's communications under one central command in 1961, becoming the first commander of that major command on 1 July of that year.

The Lt Gen Grant Building was designed with a rectangular wing and a square wing that join together in an atrium running the height of the three-story building. The atrium features a visitor's center with a variety of exhibits highlighting the history of Air Force communications and honoring the command's past. Many of the displayed items were donated by former members of the command. In addition, special memorabilia of General Grant were donated by his widow, Dorothy.

The total cost of the building was $20,330,962 which included the original contract design. Another $3.5 million was spent on systems furniture for the facility. Important features of the building are relocatable floor-to-ceiling walls, a special floor system that allows easy access to electric power and communications cables throughout the facility, and easily disconnected lighting and in-floor electric power and communications receptacles. These special features provide flexibility in the floor plan and adaptability for any future changes in the building.

During the 20th anniversary activities in 1981, four former AFCC commanders and General Herres pause at the entrance to AFCC headquarters at Scott AFB, Illinois. Commanders are, clockwise from left, Maj Gen J. Francis Taylor, Jr, retired; Maj Gen Robert E. Sadler, retired; Maj Gen Robert T. Herres, AFCC Commander; Maj Gen Rupert H. Burris, retired; and Lt Gen Harold W. Grant, retired.

THE AIR FORCE COMMUNICATIONS COMMAND AND INFORMATION SYSTEMS

The full impact of technology is often felt only when separate but complementary threads of invention are drawn together to create new and powerful capabilities. In the 1980s this was exemplified by the merging technologies in communications and data automation. State-of-the-art technology in both disciplines changed at an unprecedented rate, and simultaneously, the price of small computers fell within the reach of the American family. The resultant rapid proliferation of microcomputers and the widespread introduction of computers into American schools and businesses were only symptoms of the changes being made in American society as the two technologies converged. The lines of demarcation between computers that communicated, communications devices with an innate computing function, and office automation equipment became blurred. The term coined to describe this merged technology was "information systems."

An Air Staff study conducted in early 1982 looked at the growth of information technology and concluded that the Air Force was no longer a leader in this area. As a result of this study, Gen Charles A. Gabriel, USAF Chief of Staff, directed the integration of communications and automation in the Air Force and established the leadership structure to do this on 1 June 1983 by reorganizing Headquarters USAF to form an Assistant Chief of Staff for Information Systems.

As part of this same trend, on 12 May 1982, over a year before the Air Staff reorganization, Maj Gen Robert F. McCarthy, AFCC Commander, had created a separate Deputy Chief of Staff for Data

Automation to serve as the command's single manager for automated data processing programs. Although the creation of the new deputate reflected the growing importance of data automation in the command, there was no attempt to merge it with communications. They were still seen as distinct technologies at AFCC.

With General Gabriel's decision to merge communications and data automation, AFCC quickly assumed a major role in information systems management. The time was right to introduce organizational changes within AFCC which merged the two fields. Consequently, on 1 October 1983, General McCarthy reorganized his staff and created a Deputy Chief of Staff for Teleprocessing from the resources of the Deputates of Data Automation and Operations, Plans, and Readiness, both of which were eliminated. The new Teleprocessing deputate, renamed Information Systems on 16 March 1984, was a visible sign of AFCC's intention to integrate the two technologies.

Besides reorganizations at Headquarters AFCC, the command also moved to enhance integration in the field. In the fall of 1983, at the direction of the Air Staff, AFCC initiated a test at Peterson AFB, Colorado, and Malmstrom AFB, Montana, of the feasibility of consolidating data processing installations and telecommunications centers. Even before these tests were completed, AFCC, on 1 December 1983, boldly deactivated the 2199th Computer Services Squadron at Scott AFB, Illinois. The mission and assets of this unit, which supplied computer support to Headquarters AFCC, merged with the 1974th Communications Group, also located at Scott AFB, to form the 1974th Teleprocessing Group. This was the first formal merger of data automation and communications at the unit level in the Air Force and was a precursor of things to come. The merger clearly demonstrated AFCC's ability to step forward and become the leader in information systems management.

A second merger occurred on 1 May 1984, when AFCC's two units at the Pentagon were merged into one. The Air Staff deactivated the Air Force Data Services Center and merged its mission and assets with the 2044th Communications Group which was then redesignated the Teleprocessing Services Center. The term "teleprocessing" was eventually discarded from unit nomenclatures and "information systems" used instead. Consequently, on 1 October 1984, AFCC redesignated the Teleprocessing Services Center as the 1st Information Systems Group, which later was redesignated the 7th Communications Group.

A third major initiative centered on the management of AFCC's data automation centers. The benefits that had been anticipated in 1978 when AFCC assumed responsibility for the Air Force Data Automation Agency's centers had not materialized. Although a Deputy Commander for Data Automation was established at Headquarters AFCC to direct the activities of the centers, the command still lacked an appropriate organizational structure to apply a systems approach to the management of automated systems as it did with communications systems.

A 2d Combat Communications Group member hooks cable to electronic equipment during the build-up phase of an operational readiness inspection.

To correct this situation, AFCC activated the Air Force Teleprocessing Center at Gunter AFS, Alabama, on 8 May 1984. The center was to provide specified general purpose data automation and related telecommunications systems design, acquisition, and life-cycle management at bases and major commands worldwide. At the same time, the Air Force Data Systems Evaluation Center at Gunter AFS was deactivated and its resources and functions became part of the new center. In addition, AFCC redesignated three other data automation centers and made them direct reporting units of the new center. The Air Force Data Systems Design Center and the Air Force Automated Systems Project Office, both located at Gunter AFS, became the Data Systems Design Office and the Automated Systems Program Office respectively. The Air Force Communications Computer Programming Center at Tinker AFB, Oklahoma, became the Command and Control Systems Office. On 1 March 1985, AFCC redesignated the Air Force Teleprocessing Center as the Standard Information Systems Center. These moves provided an organizational unity that could capitalize on the efficiencies and effectiveness of systems management.

While reorganizing the headquarters and working closely with the newly formed Headquarters USAF Assistant Chief of Staff for Information Systems, Maj Gen Gerald L. Prather, General McCarthy also accepted the Air Force challenge of integrating information systems management at base level. On 11 October 1983, General McCarthy responded to an Air Staff tasking to test the concept of a single manager for data automation and communications. He told the Air Staff and the commanders of the major air commands, "I think it makes sense to establish a single communications and data processing organization at base level. AFCC would be a logical choice to manage the merged function." On 5 January 1984, Headquarters USAF, after completing a major study of the single manager concept, directed the integration of communications, data automation, and office automation throughout the Air Force. AFCC would be "the implementor, operator, and maintainer of Air Force standard information systems [as well as] command-unique systems as deemed appropriate by each command."

Special AFCC teams, working against a schedule established by the Air Staff, repeatedly met with representatives of the 29 Air Force organizations involved in the merger. To cope with the almost overwhelming task of preparing 29 programming plans, these teams devised a generic plan, which, with only slight modifications, became the standard for most integration efforts. These plans, in nearly all cases prepared jointly with the other organization, created a Deputy Chief of Staff for Information Systems structure at each major command and separate operating agency.

The magnetic media library of the Command and Control Systems Office contains more than 3,000 separate tapes, discs, and cassettes.

The impact on AFCC's mission and structure was dramatic. The first integrations occurred on 1 July 1984 with the Strategic Air Command, Tactical Air Command, Alaskan Air Command, and the Pacific Air Forces. The last integrations of the major commands culminated on 1 January 1986 with the creation of three new AFCC divisions to support Air Training Command, Air Force Systems Command, and Air Force Logistics Command. Assets for these new divisions came primarily from the Continental Communications Division which was inactivated on the same date. The creation of the new divisions was a significant milestone, because all commanders of major commands were provided dedicated information systems support from a dual-hatted AFCC organization. The merged assets were placed under the administrative control of AFCC and the operational control of the host organization. The commander of the AFCC organization also served as the information systems officer on the host commander's staff.

AFCC completed its integration efforts with the last of the Air Force's separate operating agencies in the spring of 1986. Existing data automation support units merged with AFCC's communications units to form information systems organizations; and in a few cases, AFCC established new units to support the host organization. As part of the integration, AFCC also established wings to support Air Force information systems activities at Offutt AFB, Nebraska; Elmendorf AFB, Alaska; Sembach AB, Germany; Torrejon AB, Spain; and RAF Mildenhall, United Kingdom. These were the first wings in the command since 1 November 1957. There was a brief period when unit and division designations changed from "communications" to "information systems" to reflect the integration. This terminology, however, proved to be transitory, and the designations soon reverted to "communications" as a generic term that encompassed the transmission, storage, and dissemination of information, thus reflecting the mission of AFCC's units.

Because of the mergers, AFCC's authorized personnel strength increased to 60,509 by February 1986, making the command the largest it had ever been. However, this number soon began to drop because of overall Air Force reductions in addition to specific changes effecting AFCC alone. Such a growth-reduction cycle was not new to the command. Between 1968 and 1983, authorizations in the Air Force had dropped by 34 percent and AFCC's strength had also dropped. In January 1968, the command's authorized strength had been 52,873 and in June 1984, just before the first of the mergers, the strength was 51,391. At first, this does not appear to be a significant loss, but during the same period AFCC had acquired several new missions, including responsibility for all Air Force engineering and installation units, communications for Strategic Air Command and Aerospace Defense Command, and the centers from the inactivated Air Force Data Automation Agency. Although over 17,900 manpower positions transferred to the command with these missions, reductions of nearly 19,500 people also occurred over the same 16-year period. These reductions were possible because of synergism and economies gained from the dual-hatted organizational structure. In each case, AFCC had been able to consolidate and perform the merged function with less manpower, a ringing testimonial to the efficiency of the single manager concept.

One of the results of the integration of data automation and communications to form information systems was the merger of specialty codes for enlisted members. On the enlisted side, the merger involved the telecommunications center operator (291X0), the automatic digital switch operator (295X0), and the computer operator (511X0) into one skill. In late 1983, tests at Scott AFB, Illinois, and Peterson AFB, Colorado, to evaluate a possible merger convinced Headquarters USAF and the major air commands to create a single career field. A working group, hosted by Headquarters USAF in January 1984, developed the new specialty code and called it information systems operations (491XX). The merger occurred on 30 April 1985 and involved 9,900 people. Training began on 31 July 1985, shooting for 100 percent cross-training by the end of 1986. The skills merger would produce several benefits. Most importantly, it would make the people within the career field more versatile and better able to remain current with state-of-the-art equipment and technology. The single skill also would be needed to operate consolidated data processing facilities and telecommunications centers, thereby saving manpower. In addition, the combined career field created a larger manpower pool and improved manning in the telecommunications centers and the rotational balance for overseas tours.

In 1984, AFCC's communications officers (30XX) and data automation officers (51XX) comprised 81 percent of AFCC's officer force. Moreover, after the completion of the merger of the two career fields, over half of the combined information systems resources in the Air Force would be assigned to AFCC. When Headquarters USAF began to evaluate merging the two career fields into a single one, AFCC again became a driving force. The outcome was the creation of the information systems officer career field (49XX) on 30 April 1985. With over 6,400 authorizations, it was the largest nonrated officer career field in the Air Force.

The rapid technological changes that prompted the development of new military career fields had a similar impact on civilian career fields. On 10 March 1983, Dr. Thomas D. Conrad, Deputy Assistant Secretary of the Air Force for Information Systems, announced that the computer specialist and communications career fields would be withdrawn from the comptroller civilian career management program. A new information systems career field was formed later in 1983 that featured central referral for position vacancies, training and development, and career planning aids. Again, AFCC played a leading role in creating the new career field. After the integration efforts concluded in 1986, AFCC had over 2,500 civilians in this career field.

A member of the 254th Combat Communications Squadron, Texas Air National Guard, works with an HP-85 computer.

When General McCarthy retired in May 1984, he was replaced by Maj Gen Gerald L. Prather. General Prather had already spent many years in the command, and because of his experience at the Air Staff, he brought to the command unique insights into the prospective mergers. His expertise, insights, and flair for diplomacy greatly facilitated the merger with some of the major commands who were reluctant to include portions of their automation resources in the dual-hatted information systems units formed under AFCC's leadership.

The information systems merger brought a significant increase in mission responsibilities to AFCC, some of which went far beyond the simple integration of data automation and communications. For example, the Tactical Air Command and the Strategic Air Command transferred most of their automated support of intelligence operations to AFCC. In addition, the Strategic Air Command transferred responsibility for its war planning automatic data processing system to AFCC. The Air Force Chief of Staff acknowledged this growth in responsibility in September 1985 when he approved the designation of the AFCC commander's position as a funded, but unfilled, three-star (Lieutenant General) billet. (The three-star billet was not filled because of the Congressional restriction on the number of Lieutenant Generals in the Air Force.)

One element of the command's mission that continued to see marked growth was the responsibility for base-level communications-computer integration. In response to recommendations by the National Academy of Sciences and a special HQ USAF team known as the Leesburg Group, the Air Force Vice Chief of Staff in 1987 designated AFCC as the implementing command to establish an Air Force-wide structure and process to manage this integration at base level. The Air Staff selected AFCC to lead the integration effort because the command was the Air Force central manager for communications-computer systems.

Thus, in October 1987, operating under an Air Force program action directive, AFCC created the Air Force Communications-Computer Systems Integration Office at HQ AFCC. This office, headed by a Senior Executive Service director, reported directly to the AFCC vice commander. The role of this office was to provide a corporate Air Force perspective, to bring a disciplined approach to the integration of base-level communications-computer systems.

As the need for technical expertise and management continued to expand, AFCC created the Computer Systems Division at Gunter AFB, Alabama. HQ USAF gave its approval to this creation on 5 May 1989, and

HQ AFCC activated the new division on 1 July. Brig Gen Lester J. Weber became the first commander. Four other subordinate units were brought under the new division: the Standard Systems Center at Gunter AFB, Alabama; the Air Force Computer Acquisition Center at Hanscom AFB, Massachusetts; the Command and Control Systems Center at Tinker AFB, Oklahoma; and the 2d Computer Systems Group, redesignated the Computer Services Center, in San Antonio, Texas.

This division was created to provide centralized management of these units which plan, design, develop, acquire, and produce Air Force standard communications-computer systems. The division both coordinated and directed the efforts of its subordinate units. This gave the command one organization primarily responsible for the acquisition policies, long-range planning, and programming for future standard communications-computer systems. In addition, integration policies and technical architecture developed by the division would be used to guide the implementation of those systems. Such actions, in turn, would help the Air Force integrate and manage the myriad of communications-computer systems being developed for base level use.

One element of AFCC's mission in information systems management was the command's increasing role in acquisition. Although AFCC had performed an acquisition function for over 20 years, General Prather was the first AFCC commander to stress acquisition and program management as a major mission of the command. This mission involved acquiring commercially available, standard computer and communications systems, including those which were common to multiple commands. By 1986, AFCC was managing the acquisition of more than 165 programs whose total life cycle contract value exceeded $4 billion. Some of these programs consisted of more than 100 unique information systems that were implemented at bases worldwide.

The new command emphasis on acquisition stemmed from a combination of factors, but the principal ones were the deregulation and divestiture of the telephone industry, the heavy demand for computer technology, the ready availability of off-the-shelf equipment and technology to solve Air Force needs, and the resultant need for central management of information systems. By 1986, AFCC had evolved as one of the three major acquisition commands of the Air Force. In its acquisition role, AFCC did not research and develop items, nor did the command procure military unique items, rather it filled a void by acquiring commercially available automated information systems. In essence, AFCC complemented rather than competed with the other two acquisition commands. In the

A1C Mark Williams checks the status of Digital European Backbone remote unmanned sites using transmission monitoring and control equipment.

first two years of its acquisition responsibilities, AFCC procured more than $1 billion in nondevelopmental items for its various customers.

During 1988, AFCC's acquisition role greatly expanded and measures were taken by headquarters personnel to establish policy and streamline the command's acquisition process. Towards this end, on 8 June 1988, HQ AFCC published AFCC Regulation 700-15 which institutionalized a system for centralized policy development and oversight, decentralized policy delegation of authority to the lowest possible level, and management by exception. In particular, this regulation created the Command Acquisition Executive System, a three-tiered management and oversight system modeled after a similar Air Force one. This system applied to programs for which AFCC was the implementing command as designated in program management directives or other downward-directed documents.

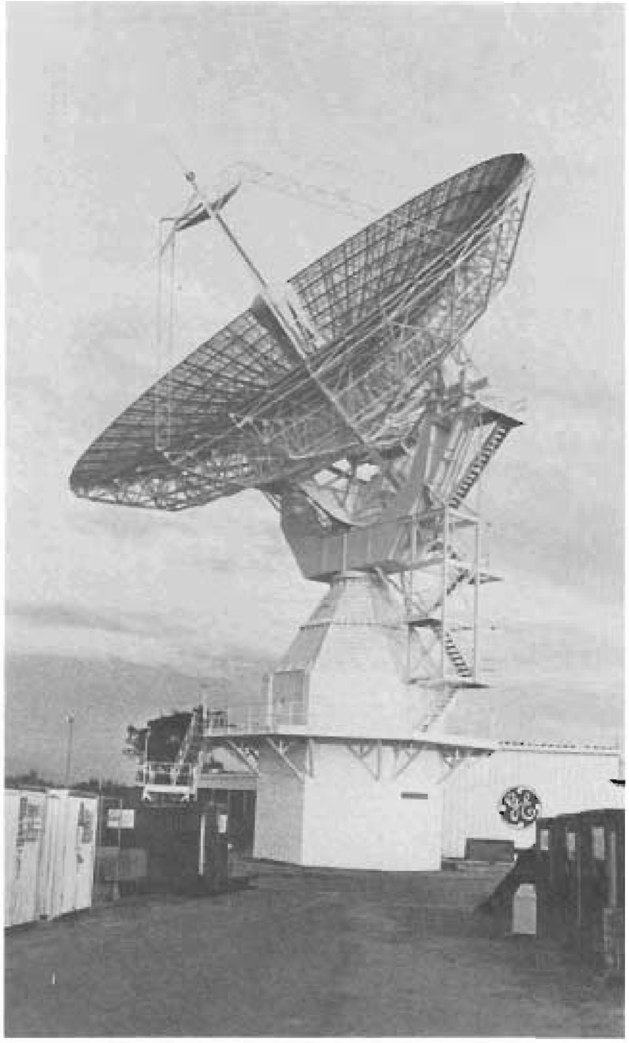
COMMUNICATIONS AND THE AIR FORCE SPACE MISSION

The increased involvement of the Air Force in space programs prompted the Air Staff in 1978 to investigate more effective ways of organizing the Air Force for future space missions. Two successive AFCC Commanders, Maj Gens Robert T. Herres and Robert F. McCarthy, argued for a separate space organization to provide strong effective management of Air Force space issues. Based on their long experience with communications, they recognized the dangers of a fragmented system, the possibilities for the use of space for communications, and the need for a centralized approach. Both also believed that AFCC had the potential to help provide that needed, strong, central management.

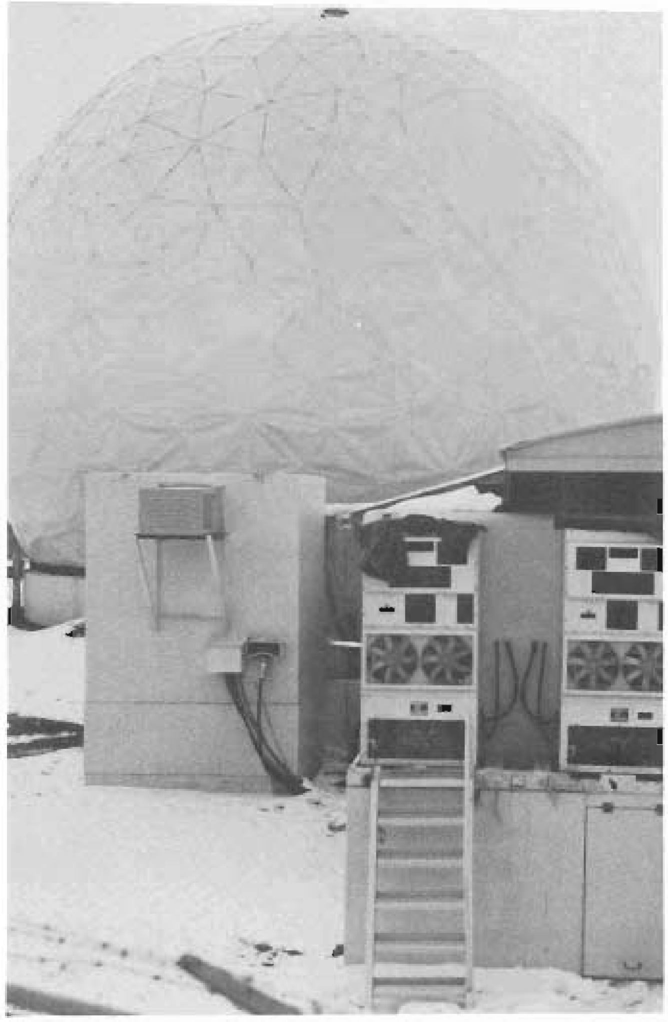
Consequently, after the Air Force activated Space Command in September 1982, AFCC created a Space Communications Division on 1 January 1983 to provide the new command dedicated support. This division quickly became involved in all levels of planning for the communications necessary to support the work of the Air Force's newly created Space Command. AFCC's involvement was not limited solely to the planning and writing of operational concepts, but also included connectivity and base communications support to strategic, tactical, and shuttle systems. From wartime preparedness to peacetime telecommunications, AFCC provided the communications support necessary to use equipment operating in space.

One of the major activities that occupied AFCC planners in the early 1980s was defining the role of communications in space. In November 1982, the Air Force Vice Chief of Staff requested a review of long-term Air Force goals in the context of an overall Air Force space strategy. A number of panels, consisting of representatives from various major commands and separate operating agencies, began assessing the Air Force's role in space. In terms of communications, AFCC's contention was that "the primary goal for developing an affordable space force structure should be to insure survivable and endurable communications."

Maj Gen Robert T. Herres, AFCC Commander, tours the receiver of the AN/FPS-85 phased array radar at Eglin AFB, Florida.



"Giant Sapphire" is an 85-foot AN/GPS-10 radar used to detect and track new foreign launches and orbiting satellites from its location at San Miguel Naval Communications Station, Philippines. Members of Space Communications Division, Detachment 2, maintain the communications-electronics equipment necessary to transmit information between San Miguel and North American Aerospace Defense Command's Cheyenne Mountain Space Surveillance Center in Colorado.



By the 1980s AFCC was actively involved in several Air Force satellite programs. These satellites could be monitored by satellite communications terminals such as this one located at Wildwood, Alaska.

The command's strategy was to develop a common user, multimission communications system consisting of a network of satellites. To achieve that goal, the command recommended developing programs that would balance data rates with antijam protection, and distributed satellite systems with integrated terrestrial systems. Hardening, redundancy, and other protective measures should also be considered.

AFCC was also deeply engaged in several specific Air Force space projects. This activity was a natural outgrowth of the command's long-standing management of Air Force communications. One example of this involvement was the Air Force Satellite Communications (AFSATCOM) program, a dedicated, ultra-high frequency, worldwide, satellite communications system. Its objective was to provide the Air Force and other selected users with secure, reliable and survivable satellite communications for the 1980s and early 1990s. This satellite communications program was specifically designed to send emergency messages, direct forces, and provide a network for commanders in chief. AFCC was responsible for four major areas: test support, engineering and installation, operational control, and maintenance of the ground terminals.

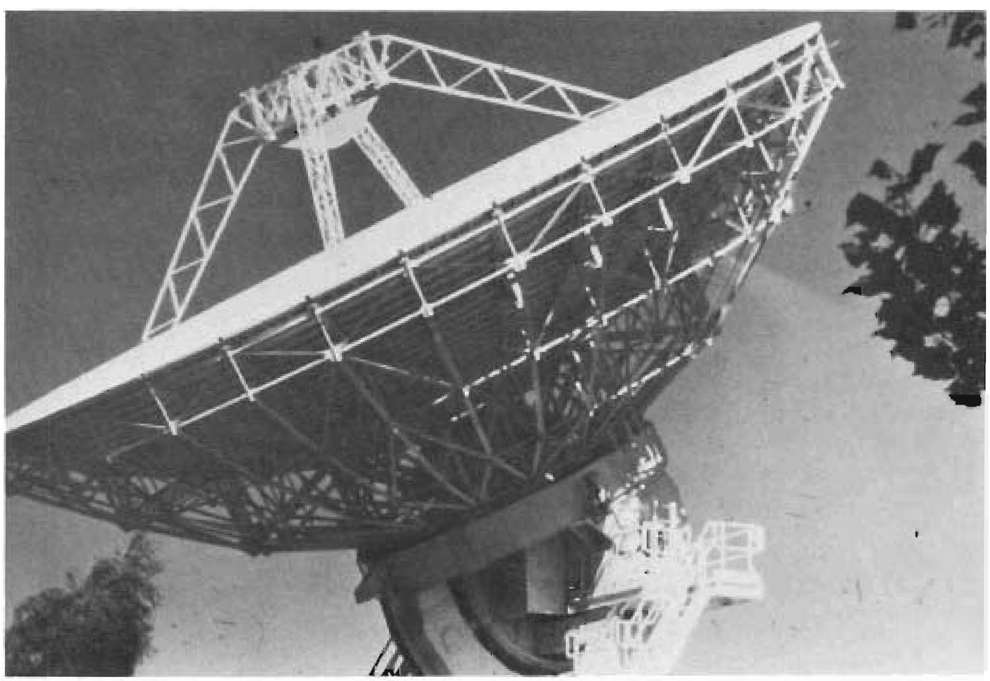
The first segment of AFSATCOM became operational in May 1979, and, on 15 June 1984, the Air Staff declared the entire system fully operational. It was a major accomplishment. The AFSATCOM installations had taken three-and-a-half years to complete, and represented the first new command and control system for the Strategic Air Command since 1967.

A1C Bill Lovins and Sgt Carol Burgwin, radio operations and maintenance specialists with the 1931st Communications Wing, adjust a satellite communications antenna during BRIM FROST 1985, a cold weather readiness exercise conducted every other year in Alaska.

Members of the 2d Combat Communications Group's Satellite Communications Branch assemble the TSC-100 satellite dish during an operational readiness inspection in which every aspect of the unit's wartime mission was evaluated.

A1C David B. King sends a message on the AN/USC-39 strategic transportable satellite terminal. These units are part of the Strategic Air Command's Giant Talk package.

A1C Timothy Cash of the Satellite Communications Branch, 3d Combat Communications Group, demonstrates the TSC-102 system, detailing its antenna operations, to Maj Gen William G. MacLaren, Jr.



An AN/FSC-78 AFSATCOM 20-meter fixed satellite communications dish, part of the Defense Satellite Communications System.

Another example of AFCC's expanding participation in space programs can be seen in its involvement with the development of Milstar. Although implementation of the Milstar System would not occur for several years, AFCC was actively engaged in the planning efforts to insure that the Air Force's communications requirements were met when the system became fully operational.

The Milstar Satellite Communications Program grew out of a series of studies conducted by the Assistant Secretary of Defense for Command, Control, Communications, and Intelligence and the various services. These efforts resulted in the publication of a requirement for a "new strategic/tactical satellite." To meet this requirement, Milstar would support tri-service strategic and tactical users by providing secure, survivable satellite communications.

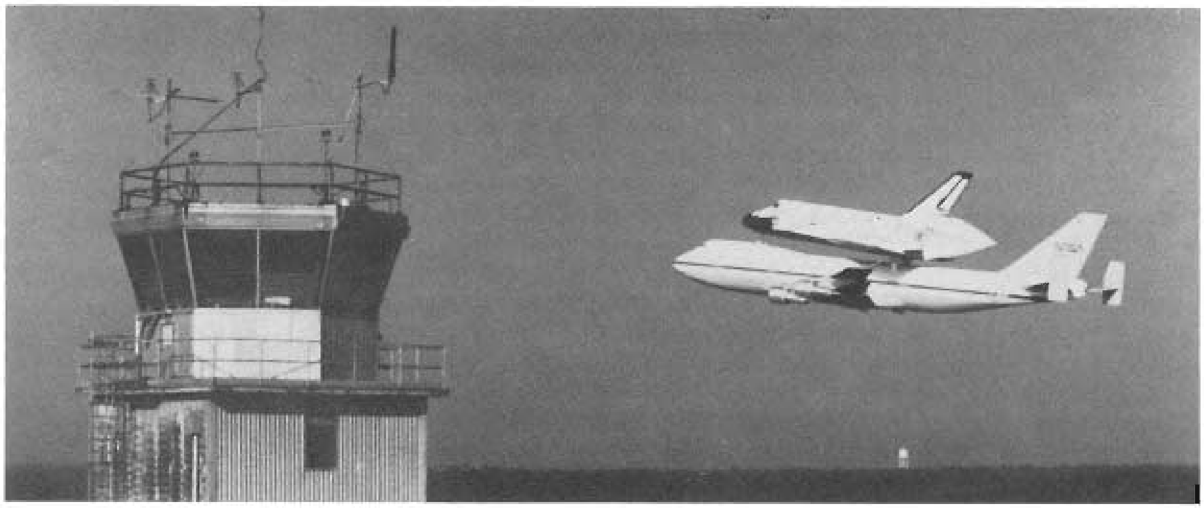
On 10 November 1981, the Office of the Secretary of Defense designated AFCC as the operating command for the Milstar system. In May1982, AFCC's Satellite Concepts Division issued the initial version of the Milstar Communications, Control and Operations Concept, a concerted effort to develop a comprehensive satellite communications system for the Department of Defense. AFCC would also operate and maintain Air Force ground terminals and perform other Air Force specific communications requirements. In December 1988, the command received additional Milstar responsibilities. In all, AFCC was tasked with planning, programming, budgeting, and funding all Milstar operations and maintenance or military construction-funded allied support construction for Air Force ground terminal installations, including Army and Navy operated and maintained Air Force terminals. AFCC was now responsible for the installation and allied support of more than 125 Milstar terminals.

By 1984 AFCC was also involved in the actual control of satellites as well as the communications sent over them. This major new mission for the command was a natural expansion of its involvement with the Defense Satellite Communications System operations centers which operated satellites by commanding the communications and directing the network operations on a day-to-day basis. AFCC was responsible for the first operations center at Sunnyvale AFS, California, and through it gained the ability to control a satellite.

In addition to satellites, AFCC also became involved in the Space Shuttle program, a logical extension of the command's historic air traffic control mission. During the early 1980s, the National Aeronautics and Space Administration (NASA), with Department of Defense support, continued to develop the Space Shuttle to deliver personnel and equipment, as well as other spacecraft, to and from space. To achieve this goal, in 1981 and 1982, NASA completed a series of space shuttle approach and landing tests at Edwards AFB, California, and then conducted four actual orbital flight tests.

The Department of Defense manager for Space Transportation System Contingency Support directed AFCC to provide support to NASA for these space shuttle flights. Specifically, he assigned AFCC two tasks: (1) providing navigational aid support to back up NASA

Maj Gen Gerald L. Prather, Commander of Air Force Communications Command, discusses equipment in the 2064th Communications Squadron's satellite communications facility at Shemya AFB, Alaska, with SSgt Brian Ramsay.



The space shuttle Challenger flies past the Eglin AFB, Florida, control tower. The Challenger, aboard NASA's modified Boeing 747, landed at Eglin AFB, where air traffic controllers from the 1972d Communications Squadron provided expert handling for a scheduled refueling stop on its return trip to Cape Canaveral.

personnel and support contingency landing locations, and (2) planning and activating additional Automatic Voice Network service between military and NASA agencies for every mission.

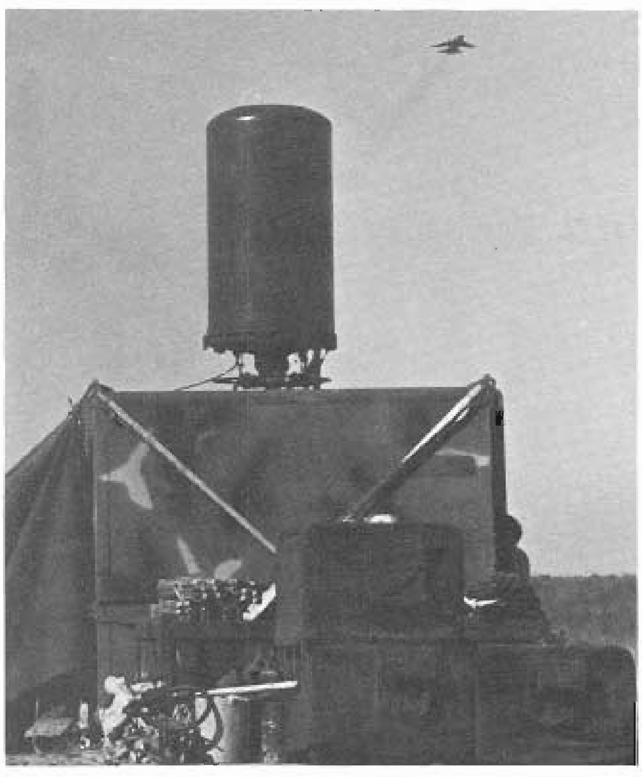
During reentry, the shuttle's friction with the outer atmosphere attenuated all radio and radar transmissions. After this lapse in communications, part of AFCC's responsibility was to assist the crew in locating Edwards AFB quickly and correcting any inertial guidance system errors. This assured a successful landing by providing the space shuttle a reliable navigational aid to update the onboard computer guidance system during the critical reentry phase. The control system then guided the spacecraft through the critical last 15 minutes prior to touchdown. Personnel from AFCC's 2179th Communications Group, 1925th Communications Squadron, 1877th Communications Squadron, and the 3d Combat Communications Group furnished this key support at Patrick AFB, Florida; Edwards AFB, California; and the White Sands Space Harbor, an alternate landing site in New Mexico. Aircrews and ground technicians from the 1866th Facility Checking Squadron at Scott AFB, Illinois, verified critical mobile tactical air navigation (TACAN) equipment parameters at all three locations.

In addition, several AFCC units provided a wide range of other support functions. For example, the 2d Combat Communications Group supplied jeeps equipped with mobile communications units to provide connectivity between rescue helicopters on ground alert posture and the force commander at Cape Canaveral. The 2179th Communications Group at Patrick AFB maintained telephone circuits as well as teletype support, monitored TACAN equipment, and recorded the orbital vehicle's broadcasts. The unit also furnished telephone, teletype, and facsimile support after the landings at Edwards AFB. Members of the 2080th Communications Squadron in Los Angeles supplied secure and ordinary telephone connections, and, in conjunction with the Air Force Frequency Management Office in Washington, D.C., provided radio frequencies for the space shuttle. Overseas, the 1957th and 1962d Communications Groups in Hawaii and Japan furnished communications while the 1st Combat Communications Group provided a mobile TACAN at Senegal's Dakar-Yoff Airfield. This facility, one of the most modern in West Africa, was a transatlantic abort landing site where the space shuttle could make emergency landings immediately after launch.

AFCC's support continued after the space shuttle became operational in November 1982. On 28 January 1986, however, Space Transportation Shuttle 51-L, known as "Challenger," exploded 1 minute and 12 seconds into its flight. Because of this disaster and the investigations growing out of it, there were no further space shuttle missions for over two and one-half years. When the missions resumed with the flight of "Discovery" on 29 September 1988, AFCC picked up its former mission support. Although communications and air traffic control support remained vital to each flight's overall success, AFCC's involvement was so efficient that it was considered to be routine.

During space shuttle flights, AFCC communicators provide the shuttle with a reliable navigational aid to update the onboard computer guidance systems during the critical reentry phase, and to guide the spacecraft through its last 15 minutes prior to landing.

AN/TRAN-26 TACAN



A portable AN/TRN-26B tactical TACAN is used to provide radio navigation to aircraft during a NATO exercise. The TACAN can provide bearing, identification, and distance information to as many as 100 aircraft simultaneously.

SSgt Tim Godwin (on top of van), SSgt Curt Tostie (foreground) and Amn Chris Winters attach the base of a satellite antenna to the AN/TSC-88 van.

This Solar Observing Optical Network facility was maintained by Operating Location G, 1957th Communications Group, at Learmonth, Australia.

The 8-foot dish of the Search and Rescue Satellite-Aided Tracking System antenna at Scott AFB, Illinois, homes on a low angle satellite.

The Rescue Coordination Center of the Search and Rescue Satellite-Aided Tracking System at Scott AFB, Illinois, is staffed continuously. This system and its Soviet counterpart use satellites in low, near-polar orbits to search for aircraft and vessels in distress. AFCC's Airlift Communications Division's Automation Support Branch supports the effort at Scott by monitoring the communications lines and ensuring that data flows properly between the tracking system centers.

DATA AUTOMATION SYSTEMS

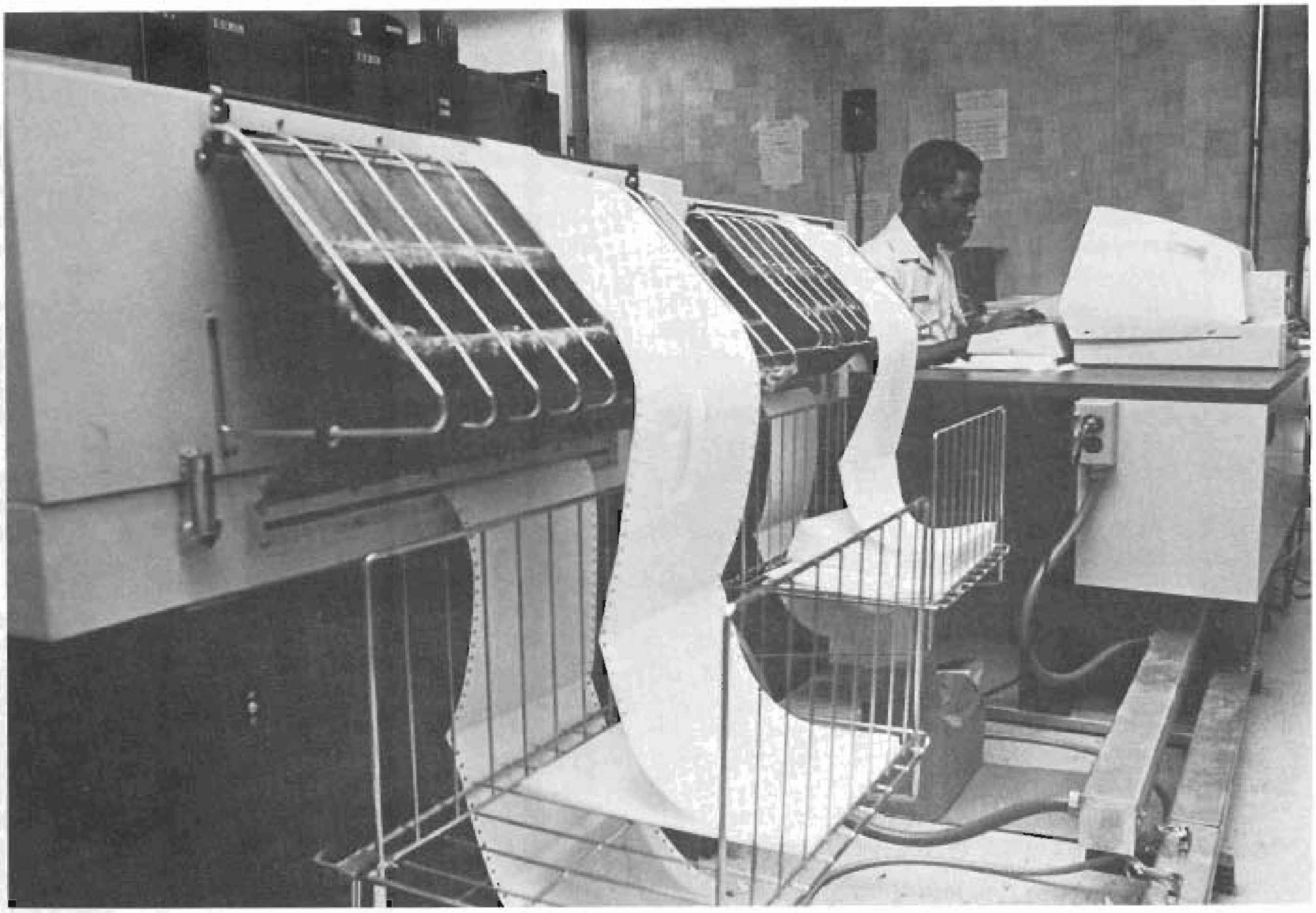
By the early 1980s, prompted by a general Air Force need and expanding on its role in communications, AFCC was heavily involved with the Air Force's data automation efforts. In 1984, for example, the data automation component of Air Force information systems was integrated with communications to form a combined teleprocessing mission. AFCC also performed modeling and automatic data processing sizing studies for all federal agencies, and served as the Air Force automatic data processing systems manager for developing and maintaining standard data systems for both automatic data processing and telecommunications. Additionally, the command performed Air Force-wide automatic data processing acquisition evaluations for automatic data processing systems, and managed data centers supporting the Office of the Secretary of Defense, Air Staff, Secretary of the Air Force, and many other government users.

In order to demonstrate the possibilities of data automation, AFCC created an office information system for the command's headquarters. On 22 September 1981, AFCC embarked upon this long-range project that eventually would revolutionize the way in which the command conducted its day-to-day business by automating many routine office functions, such as word processing and records management. On 22 April 1982, General McCarthy directed that a pilot office information system project be started in one portion of the headquarters, the Operations, Plans and Readiness directorate. The planners envisioned that this project would be expanded to include the entire headquarters, and finally all of AFCC. The purpose of the system was to increase overall staff productivity by processing information more rapidly and improving information resource sharing throughout the staff.

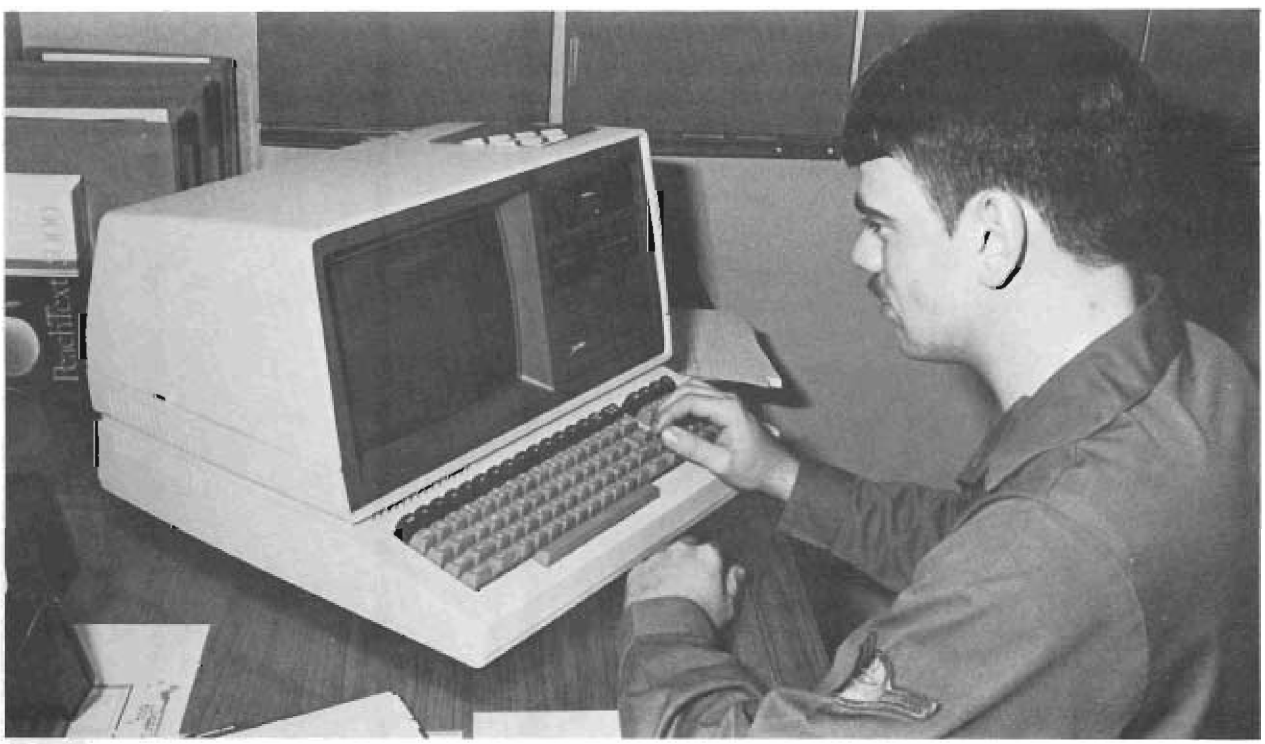
In October 1983, after successful implementation and operation of the pilot project, General McCarthy directed the expansion of the system to the entire headquarters. The productivity improvements which the full-scale office information system would provide were needed immediately to compensate for increased workload and reduced manning at Headquarters AFCC. In addition, the office information system would create a showcase for other commands on the possibilities of office information systems.

On 4 December 1984, the office information system was implemented officially throughout the headquarters. Over 600 personal computers were linked together via an electronic network, allowing the headquarters' staff to exchange information and data rapidly, send and receive electronic mail over the Defense Data Network, and utilize automated office aids such as calendars and suspenses. As the system matured, the AFCC staff continued to develop new applications and procedures while ensuring the system met all legal, security, and regulatory requirements necessary to conduct official business in an electronic environment.

SSgt John H. Price, Detachment 2, 2006th Communications Group traffic analysis NCO, operates the detachment's new Standard Remote Terminal line control unit.



Console operator SSgt Clifford R. Liggins gives instructions to the Automated Message Processing Exchange equipment, in background, to direct the flow of messages through the 600-line-per-minute printer.



Airman Brian Turbide, operations administration clerk, 2192d Communications Squadron, prepares to take a communications security test on the new Z-100 microcomputer. These microcomputers were part of the office information system created by AFCC to change the way in which day-to-day business was conducted by automating many functions, such as word processing and records' management.

Another aspect of the command's data automation effort included a modernization program to replace antiquated and logistically unsupportable punch card and paper tape devices with newer technologies, such as floppy disks. Ultimately, the means to this end was SARAH, the acronym for Standard Automated Remote to AUTODIN Host, a user friendly software package that allowed messages to be prepared and stored on computer floppy disks rather than paper. The Defense Communications Agency gave Category III certification to this personal computer-based system, which allowed it to be used as an Automatic Digital Network terminal.

The Command and Control Systems Office at Tinker AFB, Oklahoma, began developing SARAH in 1985. Ada programming language was selected because of its ability to support modern software engineering principles which improved a product's transportability and maintainability. To control hardware costs, SARAH was developed for standard expanded memory microcomputers which could be acquired under the existing Air Force Standard Small Computer Requirements Contract.

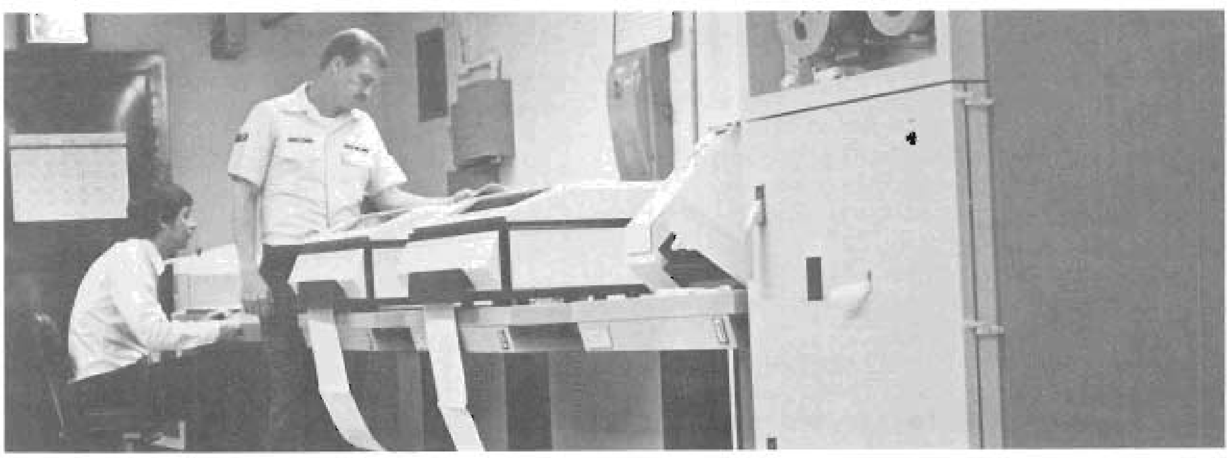
There were actually two versions of the system: one for administration, the other for communications. The former, used with Z-248 computers with expanded memory, allowed users to create messages for storage on a disk or for printing on paper, such as a message form; the latter, used on TEMPEST versions of the Z-248, provided message preparers on-line access to the Automatic Digital Network system.

Initially, SARAH was installed at Langley and Tinker AFBs in 1988. It was expanded to other communications centers as funding became available. By the end of the decade, the conversion had been completed.

The Automatic Digital Network (AUTODIN) was the primary high-speed computer data service supporting the Air Force, Department of Defense, and selected independent agencies. Under the operational control of the Defense Communications Agency, this network was a secure, switched network that provided a single, integrated, computer controlled, record communications service. Becoming fully operational in 1963, AUTODIN was completely saturated by the 1970s, despite periodic upgrade efforts. As early as 1972 the Assistant Secretary of Defense for Telecommunications began looking for an expanded or replacement network. The Defense Communications Agency in 1976 responded with AUTODIN II, a proposed high-speed data communications support network. Because of insoluable technical problems and high costs this program was cancelled in early 1982, and the crucial problem of the fully saturated AUTODIN network remained unresolved.

The alternative solution proposed by the Defense Communications Agency was the Defense Data Network. Because of the great need, the Defense Communications Agency acted quickly on this proposal, publishing the initial plan in January 1982 and establishing the unclassified segment of the network in April 1983. By the end of 1985 over 100 nodes were already operating, and others came on line as soon as equipment, funding, and manpower allowed.

Under Air Staff guidance, AFCC played a crucial role in the Defense Data Network. The command was responsible for such things as preparing a program management plan for the Air Force portion of the network, and supplying the necessary technical and program guidance for the Air Force. It was also responsible for the operations and maintenance of the Defense Data Network at Air Force locations, and maintaining communications security equipment where AFCC had maintenance responsibilities. Moreover, AFCC would provide technical assistance and evaluation of existing and planned automated data processing communications networks for the Defense Data Network service.



Detachment 2, 2006th Communications Group's telecommunications center's new Standard Remote Terminal equipment is part of an AFCC initiative to upgrade telecommunications centers by replacing non-automated terminals with automated equipment using a Standard Remote Terminal.

AFCC also played a vital role in the development of Local Area Networks, one of the most promising communications technologies developed in the early 1980s. In general terms, a Local Area Network was a base-wide communications network, such as the one for the Air Force Academy, designed to interconnect numerous data processing and communications equipment with a high degree of connectivity and/or interoperability. These networks appeared to be the answer to some of the Air Force's communications requirements and problems, as properly implemented networks were operationally flexible enough to allow easy addition or deletion of user equipment and even reconfiguration of equipment. While Local Area Network technology was promising, the proliferation and control of systems were rapidly becoming problems in themselves. These networks were a prime example of burgeoning technology where the role of centralized management was crucial; someone had to control their formation.

As the Air Force single manager of data automation, AFCC was especially concerned about these problems and took the first step in trying to correct them. During 1984 AFCC established the Implementation of Local Area Networks Office at the command's Engineering Installation Division. The objectives of this office were the consolidation of all Air Force Local Area Network implementation efforts, the standardization of hardware and software, and the inclusion of Local Area Network requirements in all new Air Force military construction programs. With the creation of the Base Information Digital Distribution System in 1986, the Implementation Office and the entire Local Area Network program became part of this broader base information transfer system and was no longer regarded as a separate entity.

Along this same line, AFCC also was actively involved in developing the Core Automated Maintenance System which was an on-line, base-level management information system for aircraft, engines, trainers, test equipment, and communications-electronics maintenance. The overall objective of this system was to improve Air Force readiness. Using data automation, the command increased the flow of logistics information, enhanced management procedures, and improved the utilization of resources by using data automation to track maintenance items. This system was especially important in tracking the diverse inventory associated with the new B-1B bomber, and was first used at Dyess AFB, Texas, on 10 March 1985.

AFCC was also responsible for the operation and maintenance of approximately 170 telecommunications centers worldwide. As part of continuing Air Force efforts to provide the most economically efficient and technologically sound facilities possible, these base telecommunications centers were the focal point of several significant programs in the early 1980s. As the primary user and developer of base telecommunications centers, AFCC directed many of these efforts.

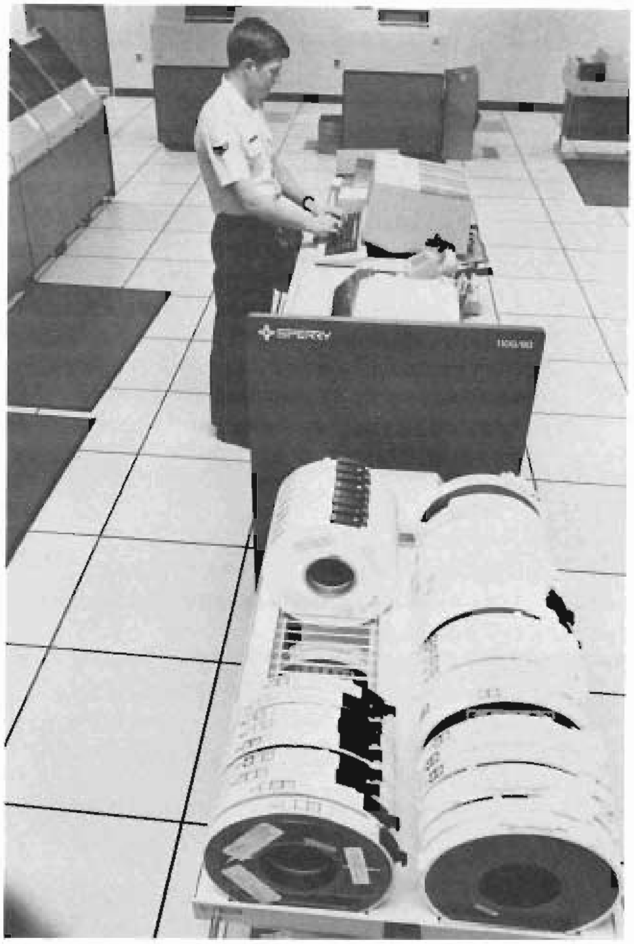
To help satisfy the growing demand for automation, AFCC developed its own program to modernize smaller communications terminals on a worldwide front. The Telecommunications Center Terminal Equipment Upgrade program was initiated by the command to replace nonautomated telecommunications center terminals with automated equipment using a standard remote terminal. By the end of 1987, all such sites had been converted.

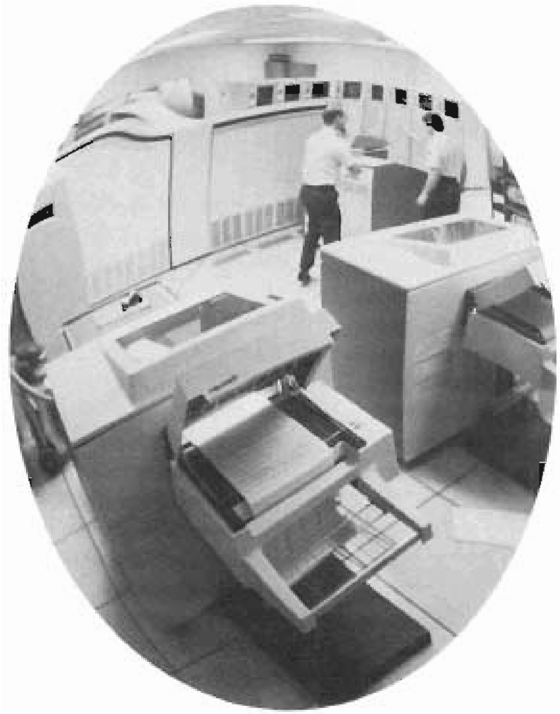
Another part of this telecommunications center modernization effort was the Air Force Automated Message Processing Exchange program. The impetus behind this program was the Air Force's desire to use computer technology to automate its large telecommunications centers, thus streamlining message traffic processing while saving manpower. It was a highly successful program. By the end of 1985, all eight locations had been brought on line on schedule.

Air Force efforts to automate its message processing exchanges paralleled efforts by the US Army and Navy. Eventually all three efforts were combined into a composite, multiservice project known as the Inter-Service/Agency Automated Message Processing Exchange (I-S/A AMPE). This program was designed to provide the capability for secure, reliable, and responsive services necessary to support essential command, control, communications, and intelligence management of widely dispersed Department of Defense elements during both peacetime and wartime.

The original plans called for fielding approximately 100 systems worldwide, with the Air Force responsible for 37 of them at 29 locations. The Air Force was also responsible for funding the program development, with each service/agency then responsible for funding its own I-S/A AMPEs and facilities. The Air Force appointed AFCC as the executive agent for this program, and AFCC, in turn, appointed its Automated Systems Program Office as the program manager.

On 7 June 1984, the request for proposal was formally released, and the I-S/A AMPE design period contract was awarded on 13 August 1985. However, the program was beset with serious problems from its inception. The problems plaguing the program were the result of a number of factors, such as the size and complexity of the system; the necessity of obtaining the proper system certification; the fact that one, single system was supposed to replace all the automated message processing exchanges of the various Department of Defense agencies; and the cost of the overall system. Each of these problems, taken individually, was serious enough, but the combination and interactions of all of them made it almost impossible to develop a usable and affordable system. Finally, on 28 December 1987, the Defense Review Board cancelled the I-S/A AMPE program because of funding constraints.





A1C Brian Dorgan of the 2036th Communications Squadron's Data Automation Branch tries out the new Sperry 1100/60 computer, a segment of the Phase IV program. This program was designed to replace the old supply and base computers with a single system, composed of state-of-the-art data processing equipment. Under Phase IV, AFCC provided centralized management of standard base computer systems at all Air Force installations.

The 1905th Communications Squadron at McChord AFB, Washington, installed the first segment of Phase IV, a Sperry 1100/60 computer system to replace the aging Univac 1050 II system used by base supply.

SSgt Jim Steinrugge operates the standard base supply system's new Sperry 1100/60 computer, the first segment of Phase IV, at the 1905th Communications Squadron's data automation facility at McChord AFB, Washington.

Another of AFCC's telecommunications center modernization programs pushed in the early 1980s was the effort to collocate the base level data processing installation and the telecommunications center. This effort was a direct result of the merging of computer and communications technologies. These two work centers were originally located in separate work areas because of differences in functions and equipment. However, in the early 1980s, the telecommunications centers were automated with computer driven equipment that operationally and functionally complemented the data processing installation work centers. Thus, the objective of this program was to test and evaluate the concept that collocating data processing installations and the telecommunications centers would save the Air Force resources while maintaining or improving service to users.

In 1983, AFCC identified two test locations: Peterson AFB, Colorado, and Malmstrom AFB, Montana. The collocated facility became operational at Peterson on 22 August and at Malmstrom on 3 November, 1983. The test was scheduled to run for one year, but was concluded at both locations on 15 February 1984 because of the early favorable results. After 1984, the data processing installation-telecommunications center collocation effort became simply one aspect of the broader communications and automated data processing integration effort.

SrA Larry Psenick, 1956th Communications Group, Yokota AB, Japan, sets address switches on a disk controller while TSgt Charles Ross, 1982d Communications Squadron, Kunsan AB, Korea, stands by with a boot floppy disk. The two were testing part of the data processing Tactical Shelter System, a transportable base data processing system designed to provide automated base level information systems support under wartime or contingency operations.

In terms of data automation, one of the command's major modernization efforts was known as Phase IV. Phase IV was a program established in 1976 to replace the old supply and base-level computers with a single system, composed of state-of-the-art, data processing equipment. Under Phase IV, AFCC provided centralized management of standard base computer systems at all Air Force installations. This centralized system supported such base functions as operations, supply, maintenance, personnel, and accounting and finance. Functional policies, operating procedures, and computer systems were integrated into a total systems approach ensuring that each functional transaction was processed the same way regardless of mission location.

In January 1983, the Air Force announced that Sperry-Univac had been selected as the contractor to replace the base level computers worldwide. As the Air Force manager for data automation, AFCC worked

Airman Lazaro Agular, 1982d Communications Squadron, loads magnetic tape for data input to test a program run. Airman Agular was making the run after Kunsan AB, Korea, had installed the new data processing Tactical Shelter System.

closely with Sperry over the next few years perfecting the design and implementation of the system. The Phase IV program was actually divided into three segments: X1 which replaced the old Univac base level on-line systems, X2 which replaced the old Burroughs base level on-line systems, and X3 which combined the X1 and X2 workloads into an integrated system using the new Sperry-Univac equipment.

The initial focus of the program was Langley AFB, Virginia. Conversion activities started there in May 1983, with Randolph AFB, Texas, following the next year. As with any new system, there were a number of hardware and software problems to be resolved, but on 30 May 1986, AFCC completed what had become the largest data automation acquisition effort in Air Force history with the implementation/conversion of the last Phase IV computer system at Wright-Patterson AFB, Ohio. The new system had been implemented at 121 bases and regional centers around the world.

An MB-Teen series mobile generator is used to power information systems equipment during deployments or contingencies.

TELEPHONE SYSTEMS MODERNIZATION

As the single manager of Air Force communications, AFCC, by the early 1980s, was responsible for the operation and maintenance of approximately 200 telephone systems at nearly every Air Force installation in the world. However, most of the telephone equipment employed was technologically outdated and logistically unsupportable. This situation, combined with the lack of a standardized telephone switch throughout the Air Force, caused unacceptably high costs for training, technical data, and supply support. Consequently, the majority of Air Force telephone offices could not meet present needs, let alone future requirements. New equipment, using current technology, was desperately needed.

To meet this demand, AFCC developed several programs. One of these was Scope Dial which eliminated the practice of contracting separately for each Air Force base's requirements. Instead the program addressed in one package the base telephone requirements for government-owned switches worldwide. At each base, AFCC and the Sacramento Air Logistics

Center were responsible for the acquisition, installation, and testing of the new telephone equipment. Rather than spending money on research and development costs, the Air Force decided to use commercially available equipment. On 13 March 1981, Northern Telecom, Inc., was awarded a five-year contract to use its digital multiplex switching system in the new dial central offices.

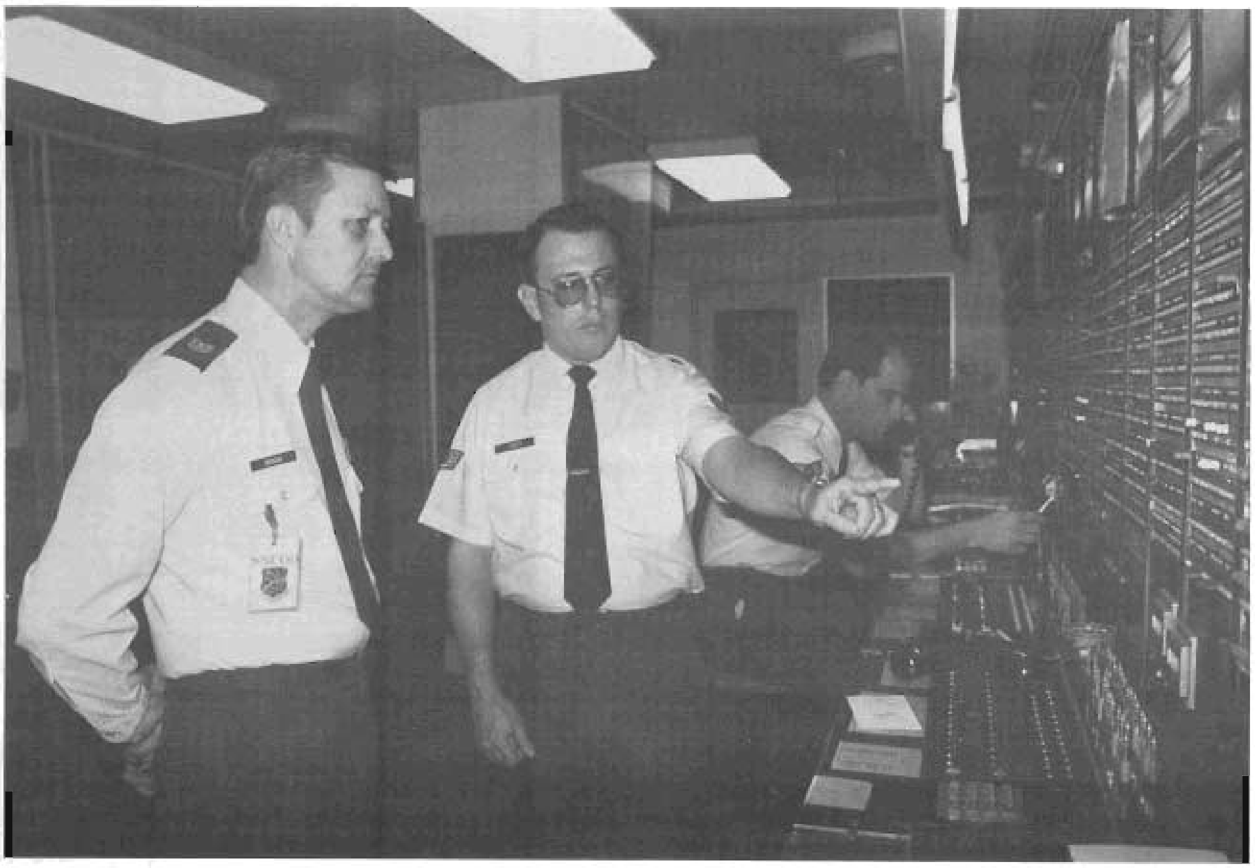
As with the installation of any new system, there were numerous equipment, funding, and manpower problems. Diligent efforts from AFCC, Sacramento Air Logistics Center, and contractor personnel, however, resolved the major ones. On 4 July 1982, at Vandenberg AFB, California, the first Scope Dial installation became operational. Osan AB, Korea, followed on 12 October and the Dayton Defense Metropolitan Area Telephone System became operational on 12 December.

By the end of the five-year, $171 million contract, a total of 40 digital telephone systems, totaling more than 138,000 lines had been installed throughout the United States, Europe, and the Pacific. The last Scope Dial installation completed was at RAF Bentwaters/ Woodbridge, England.

Original plans called for a follow-on effort, Scope Dial II; however, this program was cancelled and consolidated into the Base Information Digital Distribution System. As part of this new program, AFCC personnel would continue to replace government-owned electromechanical telephone switches with digital electronic telecommunications switching systems.

An important part of the Scope Dial program was the European Telephone System which would satisfy command and control, logistics, and administrative voice communications requirements in Europe. Since this was a Department of Defense-wide effort, AFCC was responsible only for the 83 Air Force sites in five different countries. By the end of 1985 the first three installations had been completed. The others followed as funding and manpower permitted, with all sites fully operational by the end of the decade.

Initially, a second important part of the Scope Dial telephone system upgrade program was the Defense Metropolitan Area Telephone System (DMATS), a program designed to provide, under a single manager, consolidated, unsecure telephone service to Department of Defense agencies on a regional basis. The Department of Defense originally considered 19 metropolitan areas as possible locations for DMATS switches, six of which were the responsibility of the Air Force. The DMATS concept theoretically seemed sound, but the actual operation of the DMATS program was plagued with problems from the very beginning.



Washington D.C. tactical switchboard

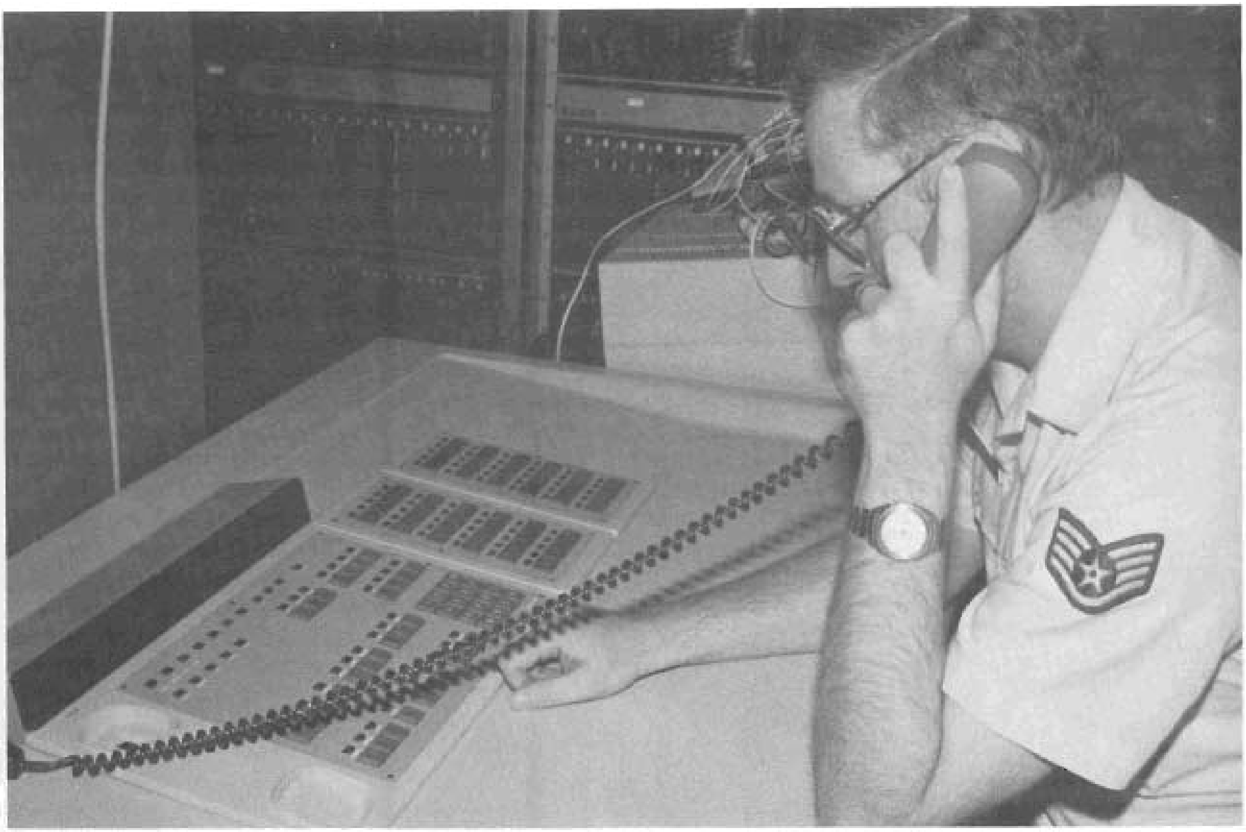
Only two systems were ever completed: the one at Boston, Massachusetts, by the Army and the one at Dayton, Ohio, by the Air Force. Extensive analysis of these programs revealed that DMATS yielded "no significant savings" in either costs or manpower over normal decentralized telephone modernization efforts. Accordingly Mr. Donald C. Latham, Deputy Under Secretary of Defense for Command, Control, Communications, and Intelligence, announced on 17 April 1984 that no more DMATS would be created. However, those already in existence would remain as DMATS areas, serving as one method to signal any changes in the economic climate in the post-divestiture environment.

Closely allied to the Scope Dial telephone upgrade program was Scope Exchange, an AFCC-planned initiative for the continental United States only. The purpose of Scope Exchange was to acquire, by competitive contracting, state-of-the-art telephone systems for Air Force locations that leased services from private companies. Under this arrangement, contractors, rather than the Air Force, provided total on-site telephone service, including engineering, design, installation, cutover, system management, operations, maintenance, and logistics support. The command saw Scope Exchange as a way of procuring new base telephone systems for bases not covered by any other program.

On 15 March 1982, the command selected Plattsburgh AFB, New York, as a test base and on 23 November 1982, awarded the contract to Northern Telecom, Inc. In April 1983, however, the Air Force Audit Agency questioned the whole Scope Exchange approach, bringing that program's acquisition process

Kelly AFB, Texas, telephone operators operate the old switchboard for the last time. The next day the telephone switching system was replaced by a state-of-the-art digital switching system. This replacement was part of an AFCC program known as Scope Dial, a project to modernize base telephone systems around the world.

CMSgt Burt Skinner, right, the superintendent of operations for the 1923d Communications Group, is shown some of the new computerized telephone operator consoles that replaced the old patch cord type switchboard at Kelly AFB, Texas. The new equipment was approximately one-tenth the size of the old equipment, but had many more capabilities, such as call transfer and three-way calling.

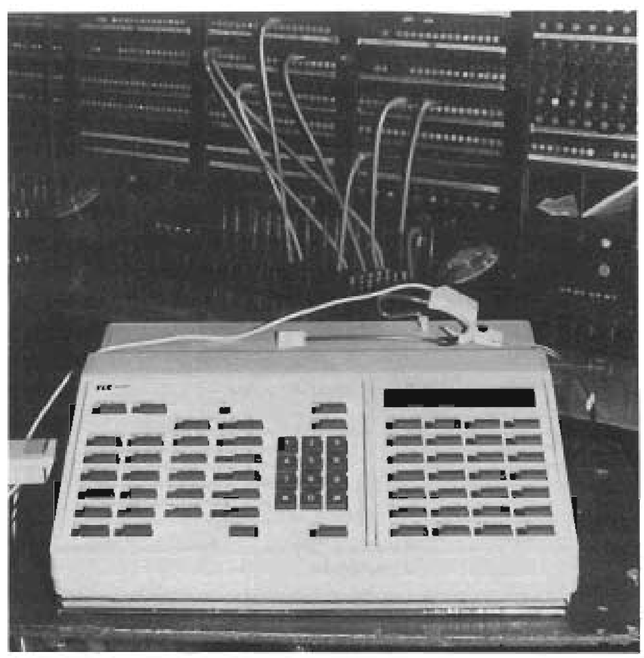


SSgt William C. Mehrhoff, 2134th Communications Squadron, NCOIC of telephone operations at Sembach AB, Germany, checks out one of the new terminals that will be installed to program the European Telephone System. This system was the European component of AFCC's Scope Dial program, a world-wide project to modernize the telephone systems at Air Force bases by using state-of-the-art equipment. The system at Sembach was only the second of its kind to be installed at a US Air Force location in Europe.

systems that utilized either of these technologies, but not both. Besides requiring the industry to develop new business methods and relationships, deregulation also caused unprecedented cost growth for service.

Before deregulation, the government had enjoyed a favorable rate structure under the TELPAK tariff which was generally unavailable to the public as a whole. This was abolished in May 1981 and followed one month later by a 34 percent rate increase. In 1981 and 1982 other rates were raised to level out the costs to American Telephone and Telegraph (AT&T) long distance communications that previously had been shared among its other subdivisions. This leveling of costs and the attendant cost increases borne by the user was unparalleled in the telecommunications industry and was financially disastrous for the Air Force. The Air Force projected that from 1980 to 1984 it would have to pay 80 percent more for the same service. Specifically, the net result of this price increase was a funding shortfall for AFCC of $26 million for leased communications in fiscal year 1982 alone. This deficit caused serious problems for AFCC that were solved only with the help of the Air Staff.

The problem in 1983 was even worse. The command's initial funding for the common user telephone



The cumbersome 1938 vintage R-7D switchboard, in the background, one of the oldest in the US Air Forces in Europe command, and the new switchboard console of the DMS-100/200 illustrate the conversion from the old to the new in voice communications at the 2186th Communications Squadron at Torrejon AB, Spain.

program for 1983 was $168.6 million which the Air Staff in January 1983 increased to $176.8 million. Even with this increase, however, there was still a projected deficit of $11.8 million. To correct this problem, Headquarters AFCC took immediate action. Throughout the fall of 1982, it sought economies and worked with the Air Staff trying to obtain additional funding. Only in the spring of 1983, when General McCarthy took the extraordinary step of threatening to reduce service to the major commands, did the Air Staff and the major commands perceive the severity of the problem. After several months of threats and negotiations, the Air Staff on 15 August 1983 finally notified AFCC that Congress would approve a reprogramming request which would include money to cover the command's deficit.

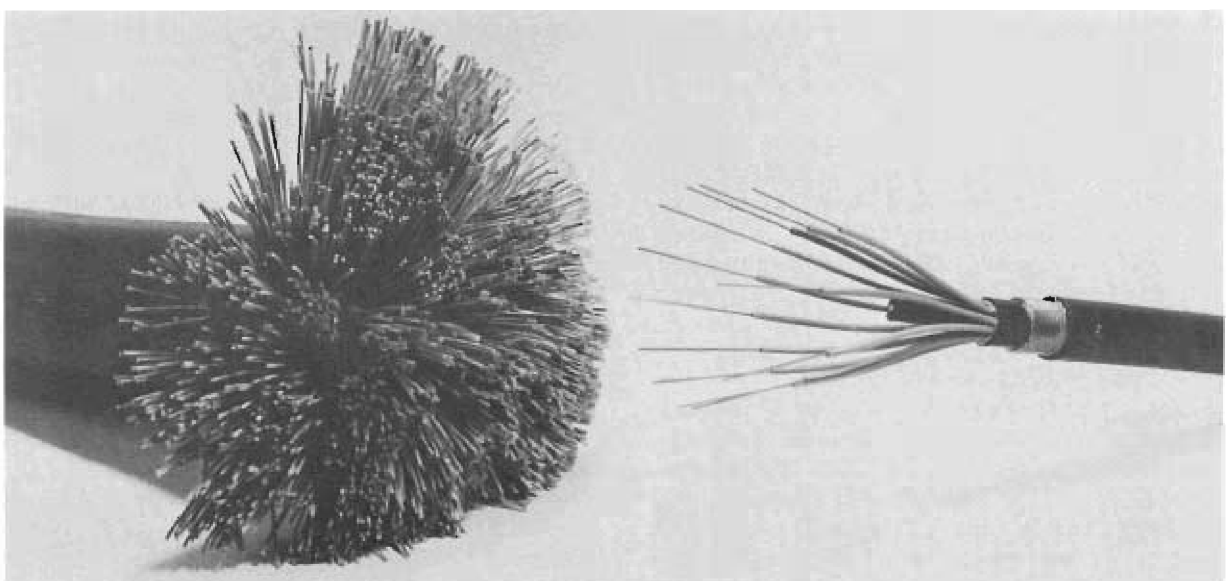
While the majority of the large rate increases resulting from deregulation were projected by 1982, the same could not be said about divestiture and its effects on local/base communications costs. Historically, AT&T had been viewed as a legal and benevolent monopoly. However, during the 1960s, the question as to whether AT&T should be permitted to retain its domination of the industry was raised with increasing frequency and intensity. The Department of Justice finally entered an antitrust suit against AT&T in November 1974. After years of legal maneuverings, on 24 August 1982, the Department of Justice and AT&T reached an agreement. This decree, commonly referred to as the Modified Final Judgment, established the procedures by which the 22 Bell operating companies became independent from the AT&T organization and its previously provided subsidies.

In the past, in the interest of providing universal service, the Bell System had maintained local telephone costs at an artificially low level by providing subsidies from its more profitable long distance business. In 1981, this subsidy totaled over $7 billion; or 37 cents out of every dollar spent on long distance calls had gone to subsidize the local telephone companies. This loss of revenue, beginning 1 January 1984, could only be made up by increased costs to the consumers, one of whom was the Air Force.

Base communications bore the full brunt of the new rates. While increases for similar services in different states varied from 20 to 186 percent, AFCC's Teleprocessing deputate estimated that the new access charges would cost the Air Force approximately $5.3 million. In addition, costs for tariff increases would also be high. Between July 1982 and July 1983, the various Bell companies had requested and received from individual state Public Utilities Commissions $704.7 million in rate increases in states where Air Force installations were located. More than $6.177 billion in additional increases were pending in 27 other states.

AFCC met the challenge of divestiture, in part, by establishing a special Tariff Regulatory Law Office within the Staff Judge Advocate. This office, created on 1 July 1983, acted as the command's legal counsel and liaison with other federal agencies contesting rate increases. It used its legal expertise to protect the Air Force against disproportionate or discriminatory rates requested or implemented by a telephone company. In 1987 alone, this office helped convince commissions in eight states to lower telephone company rates, saving consumers approximately $211 million.

In another major effort to provide the Air Force with the best possible telephone service at the least cost, AFCC developed a program called Scope Cold which took advantage of increased competition in the long



Existing communications wire, left, compared to replacement lightguide fiber optic cable. Fiber optic transmissions move along at a speed of 186,000 miles per second. The messages are transmitted by tiny lasers that flash on and off 400 million times per second.

distance arena. On 13 September 1982, the Air Staff commissioned AFCC to study and test the feasibility of obtaining telecommunications services through competitive procurement. AFCC, in turn, tasked its Continental Communications Division to investigate this issue. Tinker AFB, Oklahoma, and Kelly AFB, Texas, were selected as test locations to begin using special common carrier services. Savings proved to be substantial—16.4 percent at Kelly and 14 percent at Tinker. Based on this experience, Headquarters Continental Communications Division simplified the procedures used and expanded the process to other Air Force bases.

Installers from the 1835th Engineering Installation Squadron hoist a 10-foot microwave reflector into place at Hill AFB, Utah. This reflector was part of the radio microwave link between Hill AFB and Wendover Field, Utah. This equipment will relay radar data and telephone transmissions from the 299th Range Control Squadron's facility at Wendover Field to the controllers at the 299th's location at Hill AFB. Normally an installation that involves mountain sites is accomplished during good weather, but the 1835th had to contend with low temperatures and snow accumulations.

WEATHER COMMUNICATIONS SERVICE

A long-standing AFCC mission was providing weather communications service. In addition to maintaining and modernizing meteorological equipment for the Air Weather Service, AFCC personnel also participated in defining and fielding new weather equipment. In the late 1970s and early 1980s, AFCC was involved in several simultaneous efforts to improve the transmission and distribution of weather information.

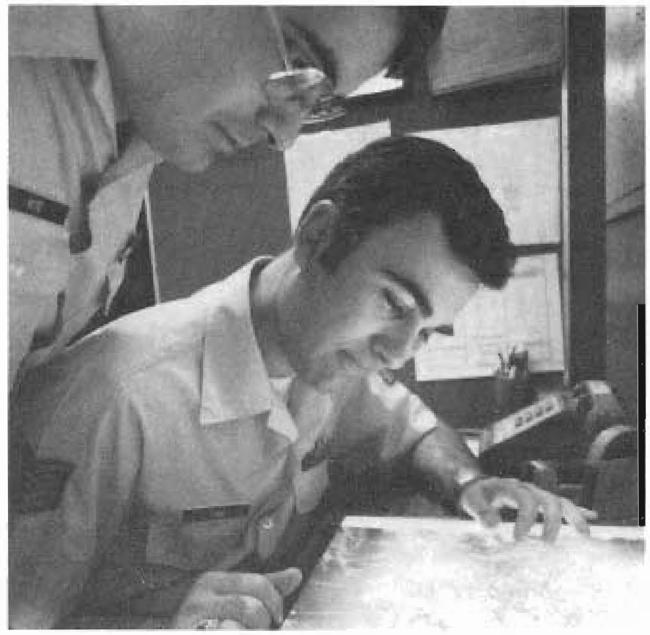
The Automated Weather Network, composed of Automatic Digital Weather Switches in the continental United States, Hawaii, and the United Kingdom, was a system for the efficient, reliable, and timely collection and rapid delivery of worldwide weather and Notice to Airmen data to the Air Force Global Weather Central and other Air Force, Army, and Navy facilities. This network satisfied existing traffic levels but had no capacity for growth. Moreover, by the early 80s the computer systems comprising these switches were technologically antiquated, unreliable, and increasingly difficult and expensive to maintain.

One of AFCC's responsibilities was to modernize these Automatic Digital Weather Switch computer systems, starting with the system hub at Carswell AFB, Texas. In 1986, UNISYS Corporation was awarded a contract to install two Sperry 1100/70 computers at Carswell to replace the old switch equipment. Following several months of development and testing, the government formally accepted this switch on 30 March 1989. Approximately six months later, the government awarded a $13.7 million, five-year contract to UNISYS to modernize the two overseas switches. Working quickly because of the critical nature of the mission and the age of the old equipment, UNISYS had the RAF Croughton, United Kingdom, upgrade completed in October 1989, and Hickam AFB, Hawaii, in early 1990.

A closely allied program was the Communications Front End Processor which was a message switching system providing several functions, such as communications support for the Automated Weather Distribution System; connection between that system and the Satellite Data Handling System; and in-transit, backup, and archival storage of information for retransmission. Thus, in essence, the Communications Front End Processor was an AFCC-initiated automated data processing project that would replace, through consolidation, several current functions for which AFCC had responsibility at the Air Force Global Weather Central. The developmental test and evaluation of this processor started on 5 January 1988, and achieved initial operational capability on 14 December 1989.

Another weather program requiring modernization was the Global Weather Intercept Program whose facilities intercepted environmental data from foreign sources worldwide, and then transmitted that data to users and the Air Force Global Weather Central. To upgrade this program, AFCC undertook two new projects: the Weather Intercept Control Unit and the Weather Intercept Search Position.

An Air Weather Service officer demonstrates the capabilities of the Mark IV Defense Meteorological Satellite Program van through the computer interface panel. This van and its equipment can be delivered to almost any part of the world and operating within a matter of hours after arrival.



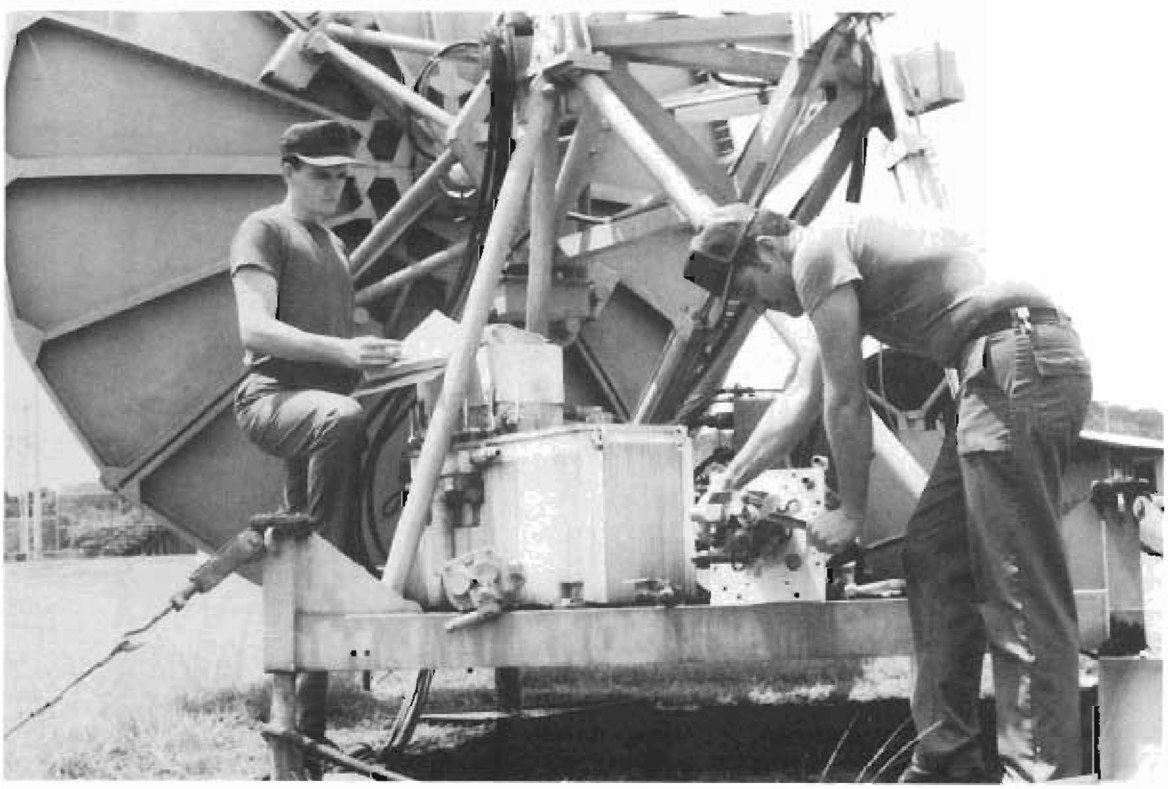
SSgt Dennis Rote and TSgt James T. Finn, digital facsimile maintenance section, 2044th Communications Group, check the quality of a weather map.

SrA Timothy Morris, 1923d Centralized Repair Activity, repairs a weather radar set.

These projects were needed to insure the uninterrupted flow of this environmental data. Weather data was collected at intercept sites and passed over low-speed lines, often thousands of miles long, to an automated digital weather switch where the data entered the air weather network. However, there was no provision for storing this intercepted data. Thus, in the event of circuit failure, all data were lost until the circuit was restored. The Weather Intercept Control Unit eliminated these deficiencies by providing a store and forward facility which combined the information emanating from the various weather intercept sites and forwarded it to the digital weather switch. By the end of 1987, AFCC personnel had installed these units at three locations: Clark AB, Philippines; RAF Croughton, United Kingdom; and Torrejon AB, Spain.

These weather intercept sites monitored weather broadcasts from approximately 120 stations worldwide. Frequently, these stations deviated from their scheduled broadcast times and frequencies, or even their mode of operation. The monitoring station then lost the broadcast and was unable to support properly the priority customers requiring worldwide weather data. To surmount this problem, AFCC began developing the Weather Intercept Search Position which would allow an operator to search the entire high frequency band visually for radio frequency energy and cause that data to be entered on a monitor. Because there was no commercially available system, AFCC personnel needed to create their own. Once operational, this capability would be added to the equipment at existing weather intercept sites at RAF Croughton, United Kingdom; Incirlik AB, Turkey; Torrejon AB, Spain; Clark AB, Philippines; Owada, Japan; and two new sites at Elmendorf AFB, Alaska and Ascension Island.

The Automated Weather Distribution System was Air Weather Service's primary capital investment program for modernizing the base weather stations. It was a major research and development program for the modernization of all present Air Force weather dissemination capabilities at base level. It would collect, store, distribute, and display automatically local and worldwide weather conditions to base weather personnel, air traffic control facilities, and operational units. The major goal of the program was to improve Air Force meteorological support by increasing the timeliness, quality, and reliability of the weather data provided to base customers. In specific terms, this system would enable weather forecasters to display forecasts and maps at computerized work stations, replacing the cumbersome, grainy maps currently used to illustrate changing weather conditions. The system would also streamline weather operations by allowing people to plot weather conditions automatically in 5 to 10 minutes, instead of the hour needed with the current manual system. Once completed, there would be 166 fixed and 20 transportable units.



MSgt Larry Flohaug, left, puts filters on a new hydraulic system pump for the Mark IV transportable weather terminal, as Sgt Ron J. McNally, space systems equipment technician, reads off the technical order checklist.

Under the initial December 1980 Air Staff taskings, AFCC was assigned the broad spectrum of development and test responsibilities for the project. On 3 October 1988, contracts were awarded for the initial phase of the production program to three contractors: CONTEL Federal Systems, ITT's Federal Electric Corporation, and UNISYS Corporation. Under the terms of the contract, each company would produce two complete systems, then at the end of the test and evaluation period, one company would be awarded the remaining production contract options.

During this same period of time, AFCC personnel were also involved in developing the High Frequency Regional Broadcast System which was designed to transmit weather data to users beyond the reach of fixed weather communications. These transmissions would be sent by placing high-powered, high-frequency transmitters at eight regional broadcast facilities around the world.

On 17 April 1987, Harris Corporation was awarded the contract for the radios and necessary peripherals. The first location, Elkhorn, Nebraska, reached limited operational capability on 26 September 1988. The second site, Elmendorf AFB, Alaska, was operational by the end of 1989. The other locations would come on line in the 1990s as the radios, antennas, modems, encryption devices, and maintenance training became available.

In the 1980s, AFCC was also involved in the efforts to upgrade a separate component of the Automated Weather Network, the meteorological data systems for Alaska, Europe, the Pacific, and the Atlantic region. In each area, old, low-speed weather teletype networks were modernized with higher speed circuits and equipment, thus improving the timeliness, responsiveness, and quality of the US weather support essential to flight safety and military operations. AFCC had most of the installation and maintenance responsibilities for these systems.

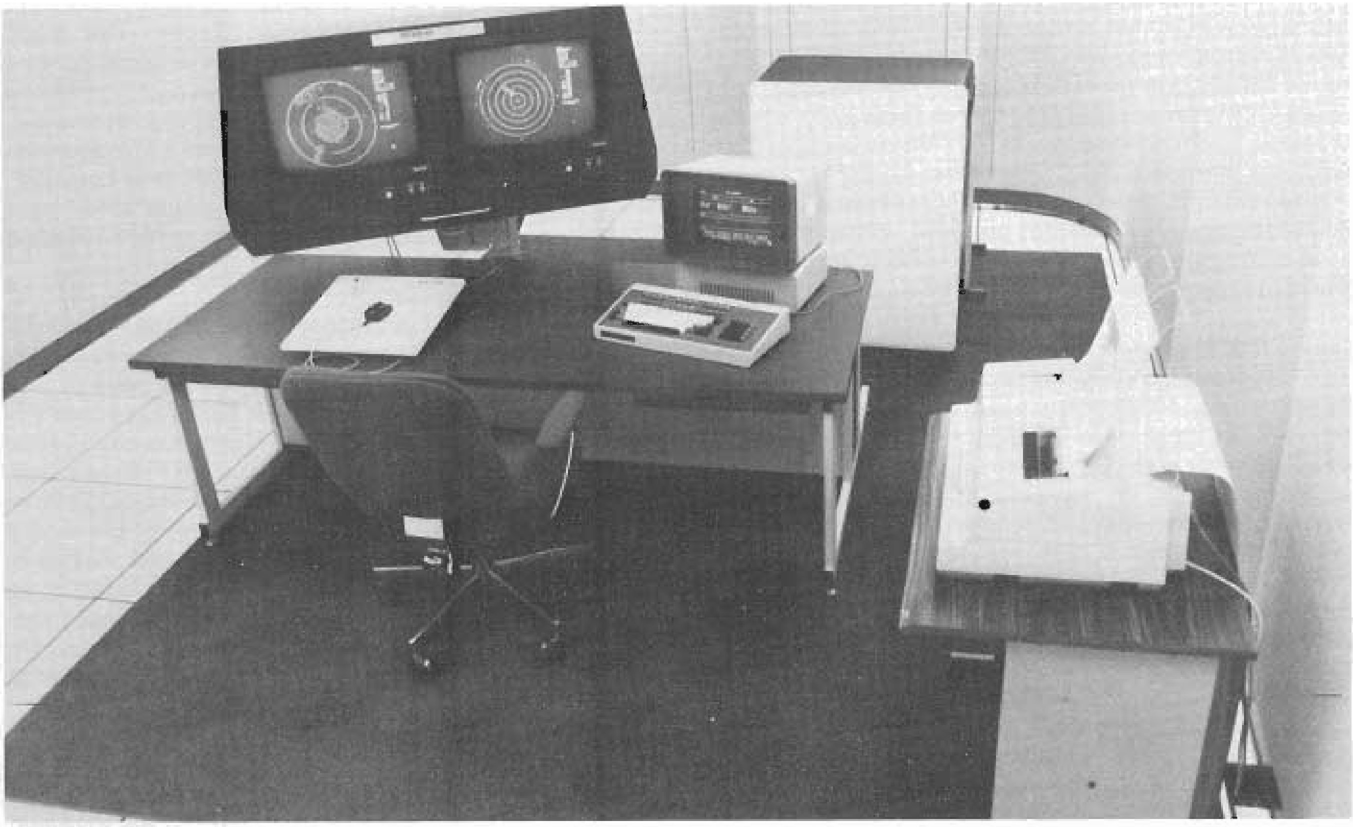
By the mid-80s, the Air Staff had approved this modernization program for all the geographical areas. In Europe, 70 locations would be affected by the network, 16 in Alaska, 41 in the Pacific, and 11 in the Atlantic region. In January 1981, the contract for the equipment to support the system was awarded, but production problems with it delayed the whole program about a year. The first of the new teletypes was delivered in 1984, and except for a few minor problems, all systems were completed by the end of 1990.

AFCC also played a major role in the development of the Next Generation Weather Radar. The basic weather radar system for the continental United States needed to be replaced because of equipment obsolescence and performance limitations. By the early 1980s, managers from three government agencies (Departments of Defense, Commerce, and Transportation) were working together to shape a joint-use weather radar replacement program, which took the name Next Generation Weather Radar.

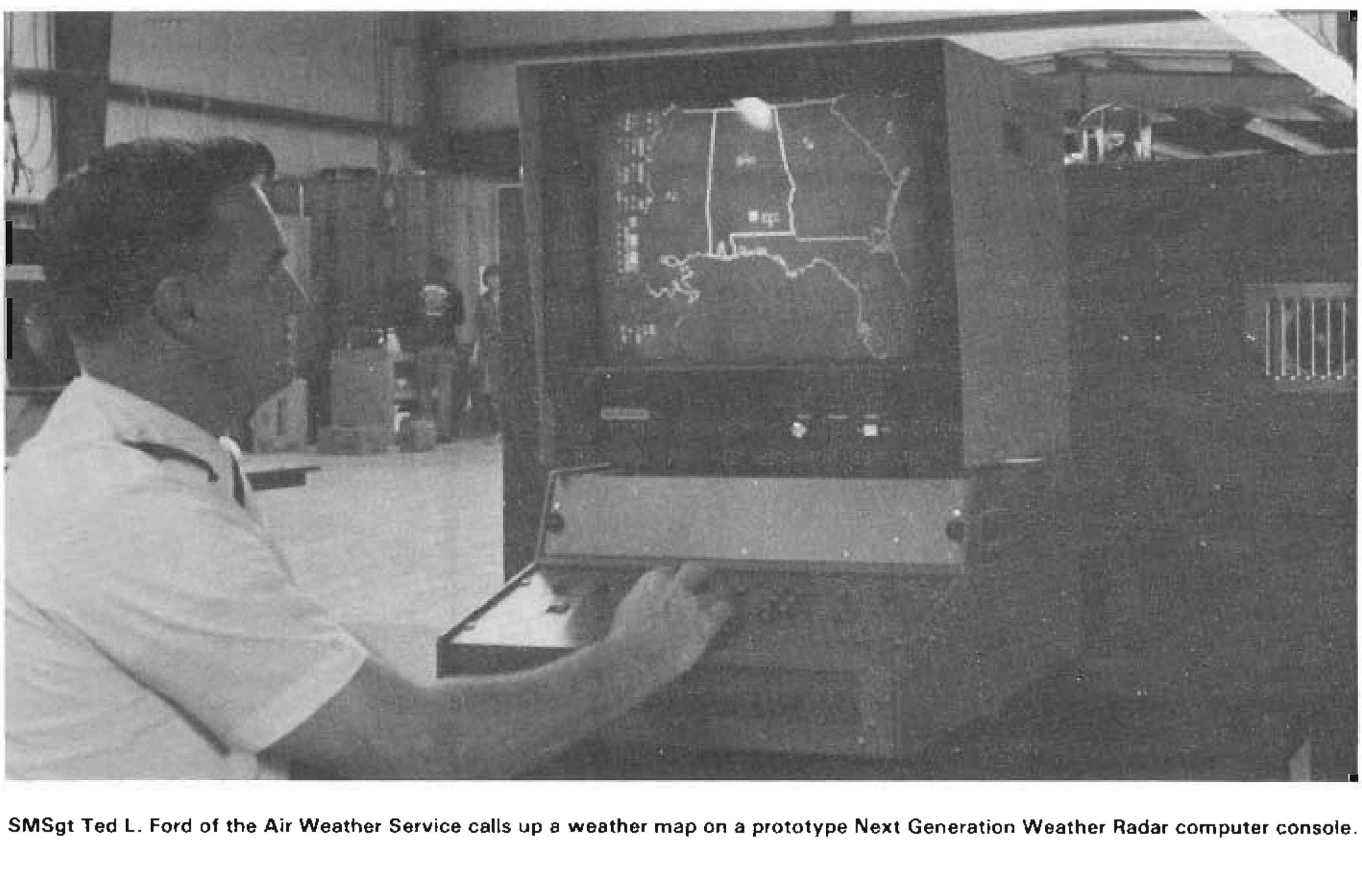
This new radar would provide significantly improved capability to detect, acquire, process, and distribute weather data to aid in reducing injuries, loss of life, and damage to property. The Air Force expected the new system to give an average tornado warning time of at least 20 minutes (from the current 1-2 minutes); to improve thunderstorm descriptions, including location and severity; to improve detection of damaging winds and hail; to improve detection and measurement of wind shear and thunderstorm turbulence; to give rainfall estimates for flash flood warnings; to reduce the size of warning areas through more precise weather determinations; and to lower the number of false hazardous weather warnings.

A Joint System Program Office was established to manage this multiyear program and resolve any differences in systems' requirements among the involved government agencies. As directed by the Air Staff, AFCC representatives served on this Joint System Program Office board and were concerned primarily with installation, communications support, logistics, and maintenance. Because the command ultimately would have the responsibility for maintaining this new equipment, it had a particular interest in the reliability, performance, and maintainability of the proposed equipment.

Under this joint program, the Air Force would receive 44 systems: 17 for overseas, 23 for the continental United States, and 4 for training and depot level repair. As originally designed, this new system would be implemented in four phases: system definition, validation, limited production, then full production. Two contractors, Raytheon and UNISYS, were selected for the validation phase. The testing of their prototype systems began in August 1986, and on 1 December 1987 UNISYS was selected as the contractor for a limited production run of ten units, three of which would go to the Air Force.



Next Generation Weather Radar was the name given to a joint agency program to acquire and deploy a new weather radar system. This new system would use doppler radars and computer technology, such as the prototype console pictured here, to allow better detection and measurement of storm severity, to improve warning accuracy, and to permit the automated exchange of weather radar data among federal agencies.



SMSgt Ted L. Ford of the Air Weather Service calls up a weather map on a prototype Next Generation Weather Radar computer console.

In the 1960s there was a gradual move away from high frequency radio as alternative high capacity, reliable transmission systems were developed. Later, however, the ability of signal processing technology to mitigate nuclear and electronic jamming effects stirred new interest in the military application of high frequency radio. By the 1980s there were several new high frequency radio acquisition and modernization programs in operation, and AFCC played a major role in each as a natural extension of its other missions.

One such modernization program was Scope Signal, the five-phase Air Force program to consolidate, collocate, and upgrade Air Force high frequency radio facilities around the world. Since many of the existing stations had been built and equipped in the 1960s and could not be supported logistically much after 1990, AFCC personnel initially planned to have all of the phases completed by that date. Phase I of the Scope Signal program was completed in 1976 and integrated the Tactical Air Command's command and control functions with the aeronautical stations, which, on 1 October 1983, were redesignated the Global Command Control System.

Planning for Phases II, IV, and V, begun in 1979, would consolidate, collocate, and modernize facilities in the Pacific, Europe, and the Western Hemisphere respectively. Although these three programs were originally an initiative to replace and standardize high frequency equipment, the Air Staff issued a new Scope Signal program management directive in April 1983 which called for the regionalization and consolidation of high frequency single sideband sites. The Air Staff designated AFCC as the implementing command for this effort and charged it with the overall management of the program. On 25 October 1983, AFCC designated its Engineering Installation Center as the program manager for all three phases.

In August 1985, however, after several funding cuts had rendered the programs unexecutable, the Scope Signal II, IV, and V programs were abandoned. To replace these Scope Signal efforts, a new program, Scope Command, was created. It retained all the consolidation and collocation facets of the early Scope Signal projects and incorporated several new initiatives as well. AFCC planners anticipated that funding for this new program would become available in the 1990s.

Scope Signal III was slightly different from the other Scope Signal projects. It provided upgraded high frequency single sideband equipment, with automatic switching, for the Strategic Air Command's (SAC's) Giant Talk system. By consolidating SAC's high

A 1931st Communications Wing technician at the USAF Global Command Control System relays information to a pilot at Elmendorf AFB, Alaska. In 1976, the old Tactical Air Command's command and control functions were integrated with the aeronautical stations under a program known as Scope Signal I. In October 1983 this system was redesignated the Global Command Control System.

A1C Sharnee Riley, radio team member, 1837th Engineering Installation Squadron, uses an Amphanol "Amp-Champ" crimper to terminate a connector on one of the multitude of 25-pair cables installed at the control site as part of the Scope Signal III installation at Clark AB, Philippines. Scope Signal III is the program to modernize Giant Talk, the Strategic Air Command's world-wide command and control network. The station at Clark was the first Air Force-installed station to come on line.

frequency radio stations and the Air Force's aeronautical stations, Scope Signal III provided improvements in the Giant Talk system while simultaneously reducing the number of locations utilizing high frequency single sideband radios. As designed by AFCC and SAC, this program fielded state-of-the-art equipment utilizing the latest technology. Once completed, all stations would be interconnected and provide a simultaneous worldwide broadcast capability.

After several years of development effort, on 15 January 1982, AFCC issued the programming plan and implementation schedule for the Scope Signal III system. On 7 March 1983, SAC declared its acceptance of the operational capability of the United States portion of the system, and thus entered a new era in the command and control of its operational forces. By the end of 1985, five of the six overseas Scope Signal III stations were finished, only the installation at Incirlik AB, Turkey, remained to be completed. AFCC planners believed that the entire Scope Signal III system would be fully operational by the early 1990s.

As with Scope Signal I, most of the Scope Signal III stations were collocated with AFCC's Global Command Control System (GCCS) stations. There were 14 GCCS stations located strategically around the world. The stations' mission was to provide reliable, rapid, two-way command and control, and operational communications between Department of Defense aircraft on transoceanic flights, and military ground agencies, regardless of the geographic location or type of aircraft. The GCCS air-to-ground communications complex, through its high frequency voice and data circuits, ensured that the major commands could maintain continuous, real-time communications with their aircraft. If needed, the GCCS stations could also support special purpose and contingency air-to-ground-to-air missions.

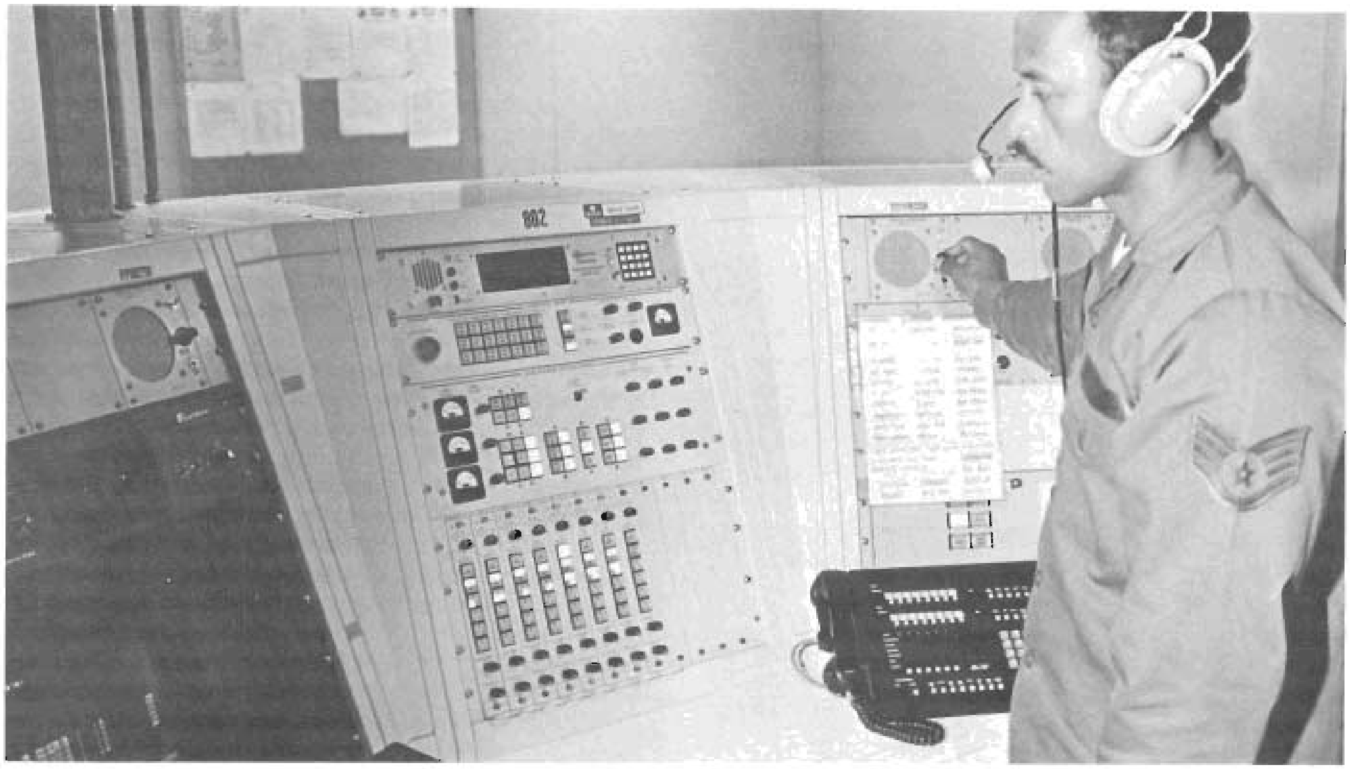
In addition to the Scope Signal efforts, AFCC was working concurrently to replace all low-powered high frequency equipment. Under this program, known as Pacer Bounce, the numerous models of 1960 vintage radios were replaced with a new, standard model manufactured by Harris Corporation and featuring solid state electronics and remote digital tuning. This replacement effort was a continuation of the Air Force policy of standardization and commonality.

As single manager for Air Force communications, in the 1980s, AFCC became increasingly involved in joint service programs such as MYSTIC STAR. MYSTIC STAR was the name given to a worldwide, joint service, high frequency communications network that supported the President, Vice President, members of Congress, foreign heads of state, and other senior government and military officials by providing rapid, high-quality, two-way, air-ground-air voice and data communications while aboard Special Air Mission aircraft anywhere in the world.

By the late 1980s, the system had three parts: the primary network consisted of seven Air Force high frequency ground radio stations collocated with Global Command Control System stations, plus one station operated by the US Navy; the secondary network was additional support from other GCCS high frequency radio ground stations; and the third part was four ultra high frequency satellite communications ground entry points.

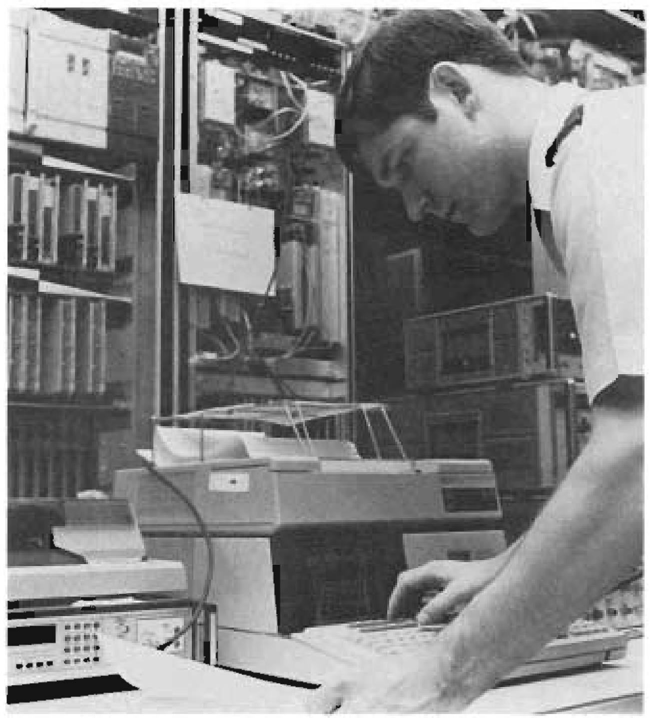
Initially established in 1967, by the early 80s the existing MYSTIC STAR equipment could no longer adequately support its mission tasking. Consequently, HQ USAF directed the modernization of both the Special Air Mission aircraft communications equipment and the ground communications network. The latter was AFCC's responsibility.

The MYSTIC STAR modernization effort began in 1985 as a program to update the quality and speed of data and voice communications provided to Special Air Mission aircraft. To handle the other end of this increased communications requirement, AFCC acquired the upgraded Network Control Station at Andrews



The new Scope Signal III Giant Talk station at the 1956th Communications Group at Yokota AB, Japan is one of six overseas stations. When completed, all stations will be interconnected and provide a simultaneous world-wide broadcast capability.

SrA Sid Trekel and A1C Mike Trevizo of the 485th Engineering Installation Group complete the boom section of a heavyweight rotable log antenna on North Mountain, near Thule AB, Greenland.



2LT Norman Howard, 1842d Electronics Engineering Group, verifies automated procedures on the prototype digital microwave radio system. This installation supports the Japan Reconfiguration and Digitization program. These radios are now being installed at various sites in Japan and the automated tests are used to verify system performance and accomplish test and acceptance in the field.

AFB, Maryland. This new system dramatically expanded the old system, going from a 100-line crossbar switch to a digital switch that can handle up to 5,000 lines. In the old station at Andrews AFB, there were only three operator positions that could provide five data circuits to its customers. The new station, in contrast, has 12 consoles that can handle 72 of the same type circuits.

In addition, the new system includes four new satellite stations covering the globe. While the old network had only six manually controlled satellite terminals, the new system has 18 terminals worldwide that can be remotely controlled by the operators at Andrews AFB. New cryptographic equipment was also added to the system. Together these facilities offered a dramatic improvement in Very Important Person (VIP) airborne communications. There were a host of technical problems associated with this modernization effort, but on 1 March 1989, the government accepted the MYSTIC STAR Net Control Station at Andrews AFB.

In a similar manner, AFCC became responsible for providing communications support to important people such as the Secretary of Defense, the Chairman of the Joint Chiefs of Staff, the Chief of Staff of the Air Force, and presidential candidates. On 22 August 1983, the Air Staff appropriated over half a million dollars to purchase the equipment necessary to provide secure voice and secure facsimile at trip locations and secure voice only while airborne. Connectivity was provided by a combination of media: landlines, ultra high frequency satellite communications, and, eventually, high frequency on selected Special Air Mission aircraft. On 3 September, AFCC announced that communicators from the 2044th Communications Group, traveling with whatever equipment was necessary, would provide the required support.

AFCC communicators provided communications support to President Ronald Reagan and other candidates during the 1984 presidential campaign.

Air Force One was only one of several special mission aircraft supported by MYSTIC STAR, a world-wide, joint-service, high frequency communications network. MYSTIC STAR supported the President and other high level government officials by providing rapid, high quality, two-way, air-ground-air, voice and data communications.

Sgt Keith Trawick, left, and Sgt Rick Chaples, both Quick Reaction Package technicians, manually change the settings of the high frequency radio in preparation for a data test with the Quick Reaction Vehicle.

Under the direction of AFCC, the Military Affiliate Radio System (MARS) continued its long-standing service into the 1980s. When high frequency radio was "rediscovered" in the 1980s, there was an accompanying renewed interest in MARS. As Maj Gen James S. Cassity, Jr., the AFCC Commander stated: "It has been proven, time and time again, that MARS, despite all the new, technologically advanced communications systems that we come up with, gets us through when everything else fails."

Given these circumstances, by the late 80s AFCC personnel began to push strenuously for the modernization of the MARS system and its full use for the purpose for which it had been established originally. In 1988, the MARS network itself was given a boost. On 12 September, the MARS station at Travis AFB, California, became the fourth "key" MARS station, open 24 hours a day, 7 days a week. (The other three were Scott, Andrews, Rhein-Main.) This meant that the Travis station now fulfilled the function as the "Gateway station" to the Pacific. By 1989, the new Pacer Bounce radios had been delivered to all MARS Class A stations, and two critical HQ AFCC personnel vacancies were filled: the long-vacant USAF MARS's director's position was filled in May by MSgt Jeffrey Trimmer, and the Assistant Director's position was filled in September by TSgt Michael Lyles.

One potential problem faced by the MARS network in the mid-80s was the decreasing number of MARS volunteers. At its peak during the Vietnam era, the MARS network had nearly 20,000 members. By 1987, the services had scaled back to approximately 12,000, of which 3,300 were Air Force members. Significantly, by 1987, the average age of the current MARS members was the mid-fifties. Consequently, the Air Force and Department of Defense placed increasing emphasis on recruiting youthful, quality MARS members. By the end of the decade, this recruitment effort was beginning to pay dividends. In 1989, for example, over 350 new applications for Air Force MARS memberships had been received.

As always, the MARS program stood ready to provide backup communications in cases of emergency. Perhaps the most spectacular example of the decade was when Hurricane Hugo, the most destructive hurricane of this century, swept through the Caribbean then hit the southeastern United States on 22 September 1989, coming ashore at Charleston, South Carolina. Hugo passed almost directly over the Charleston AFB

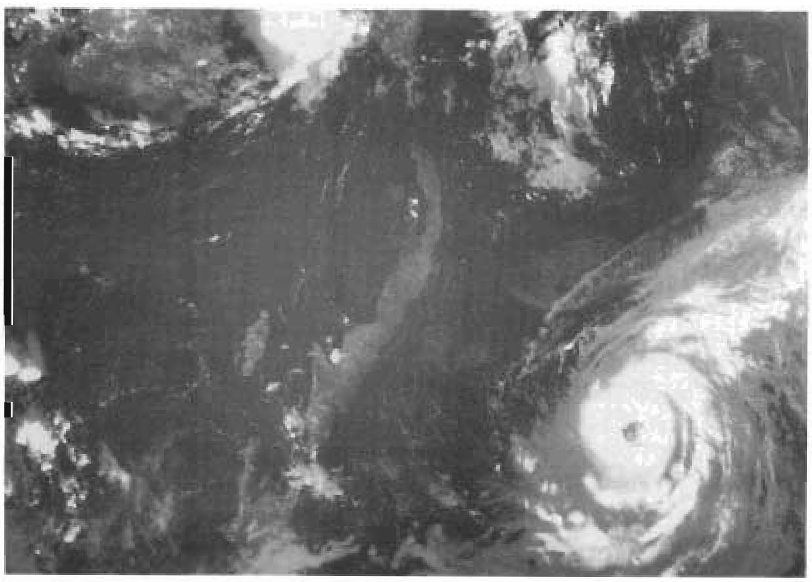
The Military Affiliate Radio System joins military personnel and civilian volunteers under AFCC direction to provide emergency communications and morale-lifting communications support such as this phone patch to Santa. Amber Stevens, a student at the Anchorage Rigel Special Education School, gets close to the mike to make sure Santa hears what she wants for Christmas. A1C Ron Smith, a Military Affiliate Radio System radio operator with the 1931st Communications Wing, Elmendorf AFB, Alaska, helps out.

MARS station. Throughout the whole ordeal, however, the MARS station stayed on the air, providing information on the hurricane's path, reports on damage and casualties, and requests for aid. This MARS station remained on the air for eight days without interruption, supporting the entire Charleston area.

During this same emergency, on St. Croix, one of the US Virgin Islands, local government officials specifically requested a MARS team to come in and set up reliable high frequency communications. The MARS network also provided emergency communications when an earthquake rocked northern California on 17 October 1989. During the first 48 hours after the quake, the MARS station of the 1901st Communications Group at Travis AFB, handled over 500 emergency messages.

In the 1980s AFCC also was given responsibility for a small portion of the Ground Wave Emergency Network (GWEN) program. This network was part of the Minimum Essential Emergency Communications Network which was designed to provide high-confidence connectivity throughout the continental United States for critical command, control, and communications before, during, and after a nuclear attack. This connectivity would be achieved by using a highly redundant network of unmanned, electromagnetic pulse hardened communications nodes connected by low frequency radio groundwave signals.

The first part of this network, deployed in 1984, validated the concept through an Initial Connectivity Capability which provided connectivity between Headquarters, Strategic Air Command, the North American Defense Command, and Buckley ANGB Colorado, while simultaneously providing a receive only capability at 11 SAC bases. The second phase



Satellite picture of Hurricane Hugo just before it hit South Carolina 22 Sep 89, causing more than a billion dollars in damage. The picture was taken by the Mark IV transportable weather terminal of the 1978th Communications Group's Defense Meteorological Satellite.

A1C Charles Atwood, with shovel, SrA Floyd Homer, and Sgt Christopher Fowler, 1827th Electronics Installation Squadron, prepare the survivable low frequency communications systems antenna.

TSgt Gordon Smith, land mobile radio manager for Langley AFB, Virginia, programs one of the new portable radios with software loaded on a Z-248 computer. The unit acquired all the hardware and software needed to change frequencies in minutes rather than the months required to order crystals.

of the network demonstrated the full-scale development of the system by testing a Thin Line Connectivity Capability across the United States. This Thin Line connected 8 input-output terminals, 30 receive-only terminals, and 56 tower relay nodes, the minimum number of relay nodes needed to make the GWEN system operational. Even though there were some problems still pending, the government accepted this Thin Line Connectivity Capability system on 23 December 1987.

In developing the GWEN system, AFCC was responsible for performing quality assurance and evaluation of the relay nodes, operating and maintaining the receive only and input/output terminals, and providing qualified personnel to support the contract maintenance effort.

In a similar vein, AFCC was involved with the development of Land Mobile Radio policy. Land Mobile Radio equipment was used to provide the local transfer of information, usually in the very high frequency radio bands, through the use of hand-held, portable, mobile, base station transmit and receive radios. With the publication of AFR 700-3 in November 1984, HQ AFCC was designated the standard information systems manager for Land Mobile Radios. Where possible, AFCC tried to standardize policies, management procedures, and, to some extent, equipment.

AIR TRAFFIC SERVICES

In 1988, AFCC marked the 50th anniversary of its involvement with air traffic control and airways communications. The command continued to operate the free world's largest military air traffic control system with nearly 290 navigational aids and more than 170 radar facilities and 120 control towers. Headquarters AFCC, through its Deputy Chief of Staff for Air Traffic Services, was the single manager for the Air Force's air traffic control services. It established Air Force traffic control and landing systems policies, objectives, plans, and proposals in cooperation with the Federal Aviation Administration (FAA) and the major air commands, subject to Headquarters USAF approval. The command exercised full program management of the traffic control and landing systems' ground facilities and equipment, including site engineering, installation, operation and maintenance.

The command's controllers handled over 21 million tower operations and over 5 million radar operations in 1988. Despite these large numbers of air operations, AFCC has been a major contributor to the Air Force flying safety program. The aircraft "save" program exemplified AFCC's attention to safety. The Air Force defined an aircraft save as the safe recovery of an aircraft by air traffic controllers when there was reasonable doubt that the aircraft could have landed without assistance. Between July 1961 and December 1988, AFCC's controllers saved 2,063 military and civilian aircraft carrying nearly 7,700 people. The value of the saved aircraft was nearly $3.8 billion.

The 2069th Communications Squadron's air traffic control facility's state-of-the-art computerized radar equipment at Nellis AFB, Nevada, added a new safety measure to southern Nevada. In 1986, Nellis AFB was probably the biggest and busiest air force base in the free world with all the flying accomplished for readiness training missions and for Red Flag exercises throughout the year.

In 1988, AFCC renamed its "Aircraft Save Award" the "Lt Gen Gordon A. Blake Aircraft Save Award" in honor of General Blake's career achievements. When Japanese aircraft attacked Pearl Harbor on 7 December 1941, Major Blake was in the control tower at Hickam Field, Hawaii, and successfully guided 12 unarmed B-17 Flying Fortresses to safe landings between the attacks. In October 1988, at a ceremony during the Airways and Air Communications Service Alumni Association annual meeting, Maj Gen James S. Cassity, Jr., the AFCC Commander, presented the first Lt Gen Gordon A. Blake Aircraft Save Award to its namesake, retired Lt Gen Gordon A. Blake.

Proud of its past record and ever sensitive to its responsibilities for providing safe and effective air traffic services, AFCC worked continually to update its services and equipment. For example, AFCC continued to improve a variety of pilot information systems such as the Notice to Airmen (NOTAM) System and instrument procedures for airport terminals. The Air Force Central NOTAM Facility at Carswell AFB, Texas, an AFCC direct reporting unit, was the single military source for issuing NOTAMs. It collected, processed, and sent out information about air traffic control facilities, services, and potential flight hazards to the Department of Defense and selected users. The facility daily exchanged data with more than 300 Department of Defense collection facilities, as well as 125 international NOTAM offices and 15 foreign military NOTAM offices.

By the early 1980s, the manual processing method for NOTAMs was slow and needed updating, but attempts to automate the system met unexpected problems with the contractor in 1982 and 1983. After studying various alternatives, AFCC concluded that it was cheaper to combine the military and the Federal Aviation Administration's NOTAM systems into one than to continue the Air Force's automation efforts. On 17 December 1985, the Department of Defense and the FAA agreed to integrate the two systems. On 1 October 1987, the operational control of the Department of Defense NOTAM system formally passed from HQ AFCC to the USAF Instrument Flight Center, corresponding with the transfer of the AFCC flight check mission to HQ MAC.* On 21 June 1989, the Defense Department finally transferred NOTAM responsibility to the FAA, and on 1 July HQ AFCC inactivated the Air Force Central NOTAM Facility and its two operating locations at Rhein Main AB, Germany, and Yokota AB, Japan.

The transfer of the NOTAM system took advantage of the improvements in FAA data automation capabilities, and resulted in a more timely delivery of critical flight safety information to aircrews. The transfer improved the efficiency and safety of the system and resulted in an annual savings of $1 million with an additional one-time savings for the Air Force of $900,000 because a planned system hardware modernization could be eliminated.

A second automation effort focused on terminal instrument procedures (TERPS) at airfields. In 1976 the FAA and the Air Force initiated a joint program to automate instrument procedures in the airport terminal area and thereby provide more timely and accurate information. After 1978, however, the combined efforts began to diverge. By late 1984, AFCC was developing over 1,000 procedures a year, and had collected a substantial automated data base on navigational aids, obstacles, and elevation figures for several airfields. This automation effort eliminated the need to draw instrument procedures manually for those airfields in the data base, and reduced the designing of instrument approach procedures from weeks to minutes.

In order to expand this automation effort, in 1984 HQ AFCC's air traffic services personnel developed a decentralized approach to the efforts to automate the TERPS system. Under this concept, each AFCC division would develop its own TERPS products, with HQ AFCC responsible for developing the TERPS automation program. Each division would get computer equipment to tie into the headquarter's Honeywell 6060 computer, and would then develop TERPS products for their respective units, using the TERPS automation programs.

In 1985, the Airlift, Air Training, and Strategic Communications Divisions had come on line with the main TERPS computer at HQ AFCC. The next year, the European and Tactical Communications Divisions were also connected. In addition, by the late 1980s, the US Army and Navy, the Federal Aviation Administration, and West German, British, and Canadian governments had all expressed interest in the TERPS automation program. Because of this interest, in December 1989, AFCC released the first operational MICRO TERPS program for evaluation outside the Air Force.

A vital part of AFCC's air traffic control mission involved the management of traffic control and landing

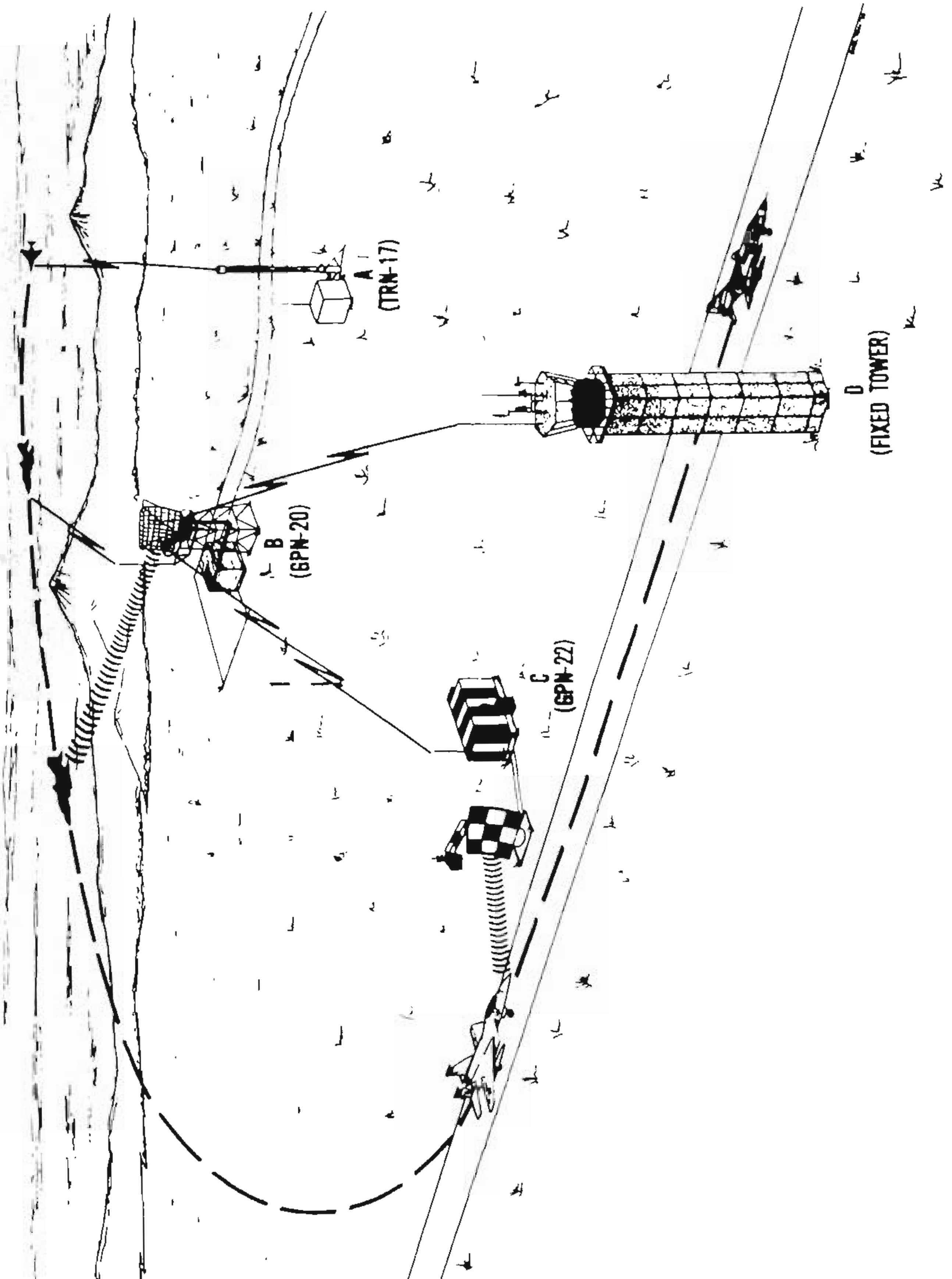
Automation of the terminal instrument procedures reduced the time necessary to prepare procedures from 60-70 hours to 30 minutes. Here TSgt Gene Newton plots departure and arrival routes.

systems, commonly known by its acronym TRACALS. The USAF TRACALS provided for the safe, orderly, and expeditious movement of air traffic in support of USAF air operations, and required modern, highly reliable equipment. These systems included fixed and mobile systems such as radars, tactical navigation systems, instrument landing systems and control towers and supported bases in the continental United States as well as Air Force-operated locations overseas.

One of the many challenges faced by the Air Force was the need to keep pace with the new technology. Modernizing TRACALS included providing the support for new aircraft, developing radar facilities that provided a range of services to the operational Air Force including long-range radar as well as terminal radar inputs, and providing passive and accurate guidance information through the incorporation of space based surveillance capabilities with military air traffic facilities.

*See page 238 for transfer of AFCC's flight check mission.

AN/GPN-24 SYSTEM

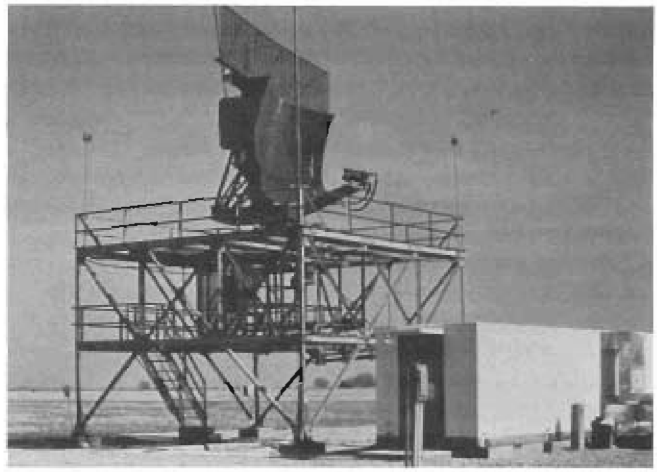


During the early 1980s, AFCC had several programs underway to upgrade its TRACALS. These projects included replacement of the long-range radars that provided air traffic services support along three access corridors into Berlin as well as within the Berlin control zone. Another program involved replacing older vacuum tube technology with solid state tactical air navigation systems that enabled a pilot to determine the aircraft's geographic position accurately.

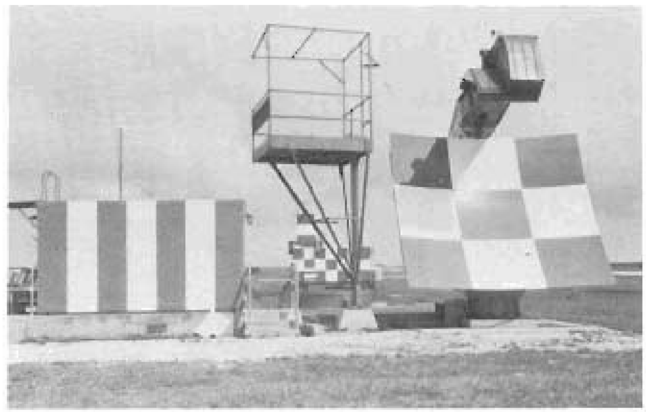
In November 1988, the TRACALS acronym was changed to ATCALS which stands for Air Traffic Control and Landing Systems. This change not only standardized the acronym among the services, but also more accurately reflected the specific mission of the Air Traffic Control and Landing Systems as opposed to the more generic term TRACALS.

One of AFCC's most significant modernization projects was the AN/GPN-24 program which replaced aging air traffic control radar systems with a relocatable facility that also functioned as a fixed-base system. This program filled the gap between the extremes of the highly mobile AN/TPN-19 system and heavy fixed base radars that could not be moved easily. The AN/GPN-24 consisted of three segments: the AN/GPN-20 airport surveillance radar, the AN/GSN-12 operations center, and either the AN/GPN-22 high performance precision approach radar or the AN/FPN-62 normal precision approach radar. The AN/GPN-24 systems could be installed with a minimum of construction and manpower and withdrawn from hostile areas quickly. The new radars offered not only significant improvements in flight safety, operations, reliability, and maintainability, but also aided AFCC's readiness posture in Europe and the Pacific. The first system was installed at Nellis AFB, Nevada, in 1979, and by the end of the 1980s all locations but one had been completed.

In early 1985, the new AN/GPN-22 precision approach radar, part of the AN/GPN-24 program, stands ready for flight checks on the primary runway at Andersen AFB, Guam. The new radar gave more reliable service because it was simpler to operate and provided more accuracy, greater precision, and more detailed display.



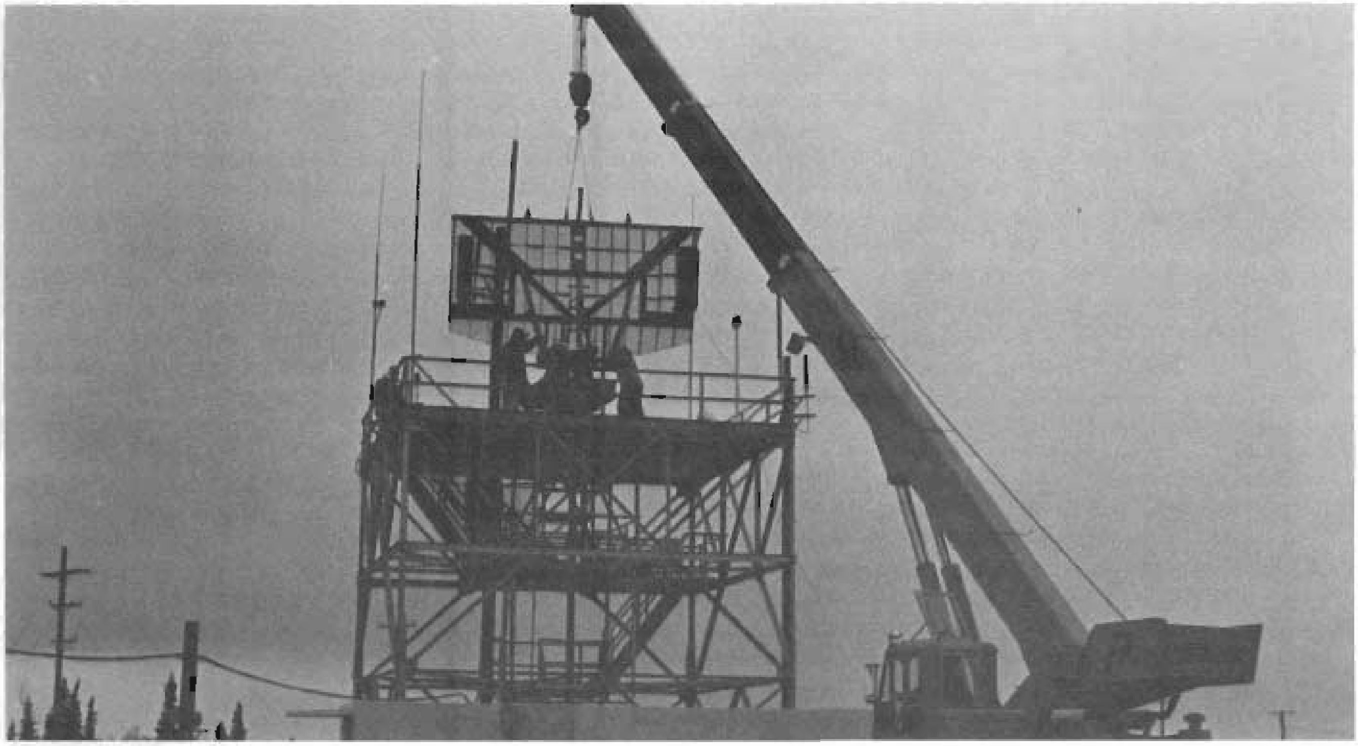
An AN/GPN-20 radar surveillance antenna with the fixed site/false target antenna mounted on top of the radar antenna.



This is an OD-130G radar surveillance indicator associated with the AN/GPN-20 surveillance radar. The indicator is housed in an AN/GSN-12 operations van.

Eventually, AFCC hoped to eliminate most of the precision approach radar systems and replace them with microwave landing systems which have several advantages. A microwave landing system is relatively immune to siting problems, requires preventive maintenance much less frequently, has remote maintenance monitoring capability so system status can be monitored from a centralized location, has 200 channels compared to 40 channels for the current systems thus has less frequency congestion, and provides excellent signal quality and guidance for the pilot.

In January 1983, the Secretary of Defense designated the Air Force as the lead service for all Department of Defense microwave landing system activities. AFCC would have a leading role in this development and would assume responsibility from the Army for developing joint tactical, transportable ground equipment. Moreover, the transition to microwave landing systems was to be accomplished in concert with the



Members of the 1835th Electronics Installation Squadron from Norton AFB, California, lower the antenna dish into position on the base of the new AN/GPN-20 surveillance radar stand. The radar installation at Zweibrucken AB, West Germany, part of the AN/GPN-24 upgrade program, brought state-of-the-art air traffic control equipment to the 2143d Communications Squadron.

AN/TPN-19 mobile radar facility interior civilian sector's microwave program. The Air Force planned to install a minimum of 256 microwave landing systems, and hoped to have the complete conversion done by the year 2000.

Technical demonstration contracts were awarded to five contractors in June 1987 for the military avionics portion of the microwave landing system program. By October 1988, all these contractors had successfully completed the initial, high reliability, technical demonstrations, and the contract was awarded to Hazeltine Corporation. However, by mid-1989 problems with the vendor delayed the fixed microwave landing system project by at least three years, and was seriously jeopardizing the fate of the program.

Meanwhile, in August 1987 a Request for Proposal for a mobile microwave landing system had been released. A year later, the contract for the system was awarded to Bell Aerospace. This system development proceeded on schedule, with the critical design review of both the software and hardware conducted in June 1989. The initial operational test and evaluation of the system was scheduled for the early 1990s.

A contractor-related program not connected to the general microwave landing system development effort was the system at Shemya AFB, Alaska. This system was originally authorized because it was less costly to install and more capable than current instrument landing systems. After reviewing several funding alternatives, the Air Staff accepted AFCC's recommendation to award the installation contract to private industry. The Bendix microwave landing system at Shemya was commissioned on 3 March 1984, less than a year from the signing of the contract.

This 2-degree azimuth facility on its 30-foot tower was part of the microwave landing approach system at Shemya AFB, Alaska.

The microwave landing system at Shemya AFB, Alaska, would provide more accurate information than other landing systems.

In obvious ways, control towers were the most visible and most easily recognizable features of AFCC's air traffic control and landing systems. Most of these towers had been built in the 1960s or before. New construction after 1975 had been sporadic, largely because there had been no single agency responsible for advocating control tower replacement. Consequently, by the late 1970s, several towers were in need of extensive remodeling or replacement altogether. In June 1981, to rectify this situation, Headquarters USAF made AFCC responsible for validating and programming Air Force control tower requirements. The benefits of a centrally managed program included standardized tower design, improved work space for operators and maintenance personnel, and a prioritized schedule for tower replacement.

In 1987, the Air Force had 111 active duty Air Force and 16 contracted or classified location control towers. Of those 127, 74 had been constructed before 1960; of those 74, 64 were candidates for replacement. By the end of 1988, ten complete control tower and four other control tower cab replacements had been completed. Other replacement projects were under construction or in various stages of design. Cuts in military construction program and/or tower replacement program funds would effect the speed of these replacement efforts.

To insure that AFCC's navigation aids were calibrated correctly, the command, for years, had three facility checking squadrons to inspect procedures, equipment, and ground-air communications. While the Federal Aviation Administration had flight check responsibilities, its obligation to support the Department of Defense requirements in wartime was limited. Under existing agreements, the FAA could determine its own level of flight check support by considering the need, risk, timing, and its ability to accomplish the mission. Moreover, FAA flight crews would serve on a voluntary basis, and the military would provide support including air cover and rescue. Since these caveats severely limited the Air Force's ability to plan for contingencies, the operating commands believed that an Air Force flight inspection function was critical. For example, the flight checking

Part of AFCC's control tower modernization program included remodeling the tower cab. Members of the 1883d Communications Squadron at Beale AFB, California, gained more floor space with the new wraparound-type console.

On 20 September 1985, the Army Corps of Engineers transferred the new control tower at Mather AFB, California, shown here under construction, to the base civil engineers.

mission had been especially critical during the Southeast Asia conflict when the command's aircraft had received battle damage on at least 25 different occasions. If the Air Force was going to have the capability to operate during times of political tension and war, it was imperative that it have the capacity to restore failed or damaged navigational aids immediately.

To perform this flight check mission, AFCC's fleet, by the 1970s, totaled just four C-140A JetStar and two Rockwell T-39A Saberliner aircraft. By the 1980s, these 20 year old aircraft were becoming increasingly inefficient, logistically unsupportable, and limited in their ability to respond to an increasing number of worldwide missions. Since the C-140As had long been out of production, new parts were costly and difficult to obtain. When the Military Airlift Command inactivated its T-39 fleet in 1985, AFCC's T-39s faced the same logistical problems since they were among the last ones remaining in the Air Force's inventory.

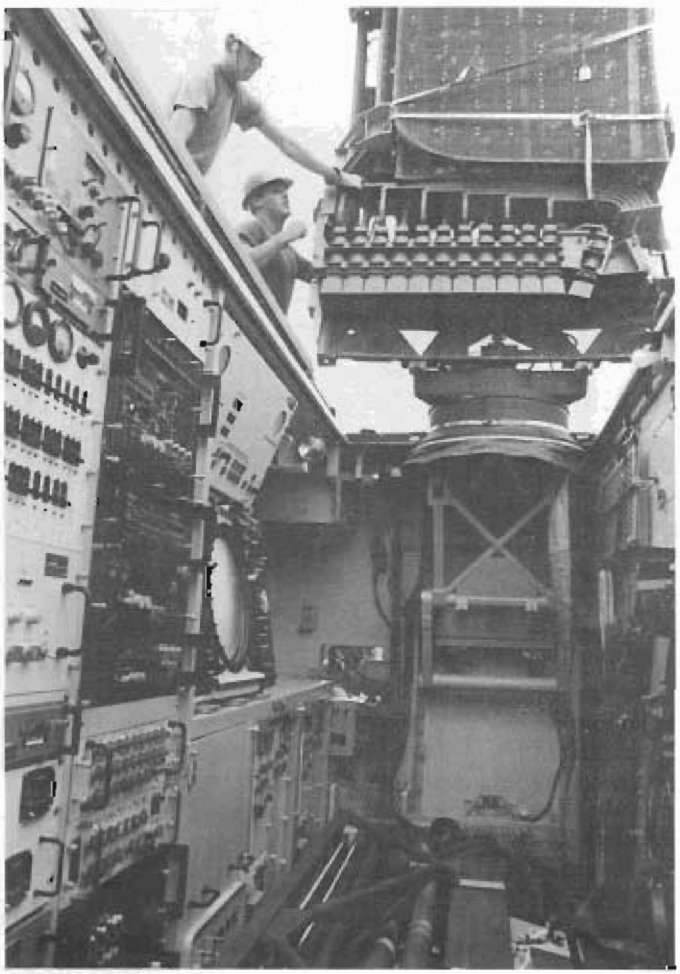
Planners at Headquarters AFCC identified the characteristics for a replacement aircraft, reviewed the suitability of several commercial planes, and sought throughout the early 1980s to acquire aircraft that would satisfy this vital mission. Although the Air Staff validated the need for seven replacement aircraft in 1982, austere funding prevented acquiring them. During 1985, the Air Staff reconsidered AFCC's proposal and approved a request for six smaller aircraft with less capability than originally requested. Funding for one aircraft was available for fiscal year 1987, and AFCC hoped to award a contract by 1 October 1986.

The whole issue of replacement aircraft, however, soon took a back seat to the question of the future of AFCC's flight check mission itself. The flight checking of navigational aids and procedures was one of AFCC's oldest missions. It dated back to October 1942 when an executive decree assigned the responsibility for supervision and control of all stations of the Civil Aeronautics Administration, including its flight check responsibilities, to the Army Airways Communications Service, the forerunner of AFCC. Even though the scope of the flight check mission declined after World War II, the function remained important to the command, even after achieving major command status in 1961.

During 1985 and 1986, the AFCC Commander, Maj Gen Gerald L. Prather, reviewed the structure of the command's flight checking organization in order to give HQ AFCC more operational control of the units. His initial proposal recommended changing the two overseas squadrons to in-theater detachments under the 1866th Facility Checking Squadron at Scott AFB, Illinois. Both overseas division commanders voiced strong opposition to losing operational control, and warned of possible mission degradation.

An AFCC C-140A aircraft makes a flight check of a final approach control radar. While logging more than 145,000 flying hours, AFCC's six specially equipped planes have had no major mishaps. In 1985 alone they flew 4,000 hours in support of their mission and played a major role in the Air Force flight safety record set in that year.

The OD-69 airport surveillance radar indicator with the AN/FPN-47 system at Scott AFB, Illinois. Scott AFB also has an AN/FPN-62 precision approach radar system.



SSgts David Bloomingdale and Floyd Bundrant, of the 21st Combat Communications Squadron, prepare a radar unit for operation.

While this discussion was going on within AFCC, personnel from HQ USAF's DCS for Plans and Operations made the whole question moot when they initiated independent actions to transfer AFCC's flight inspection mission to the Military Airlift Command (MAC). Headquarters AFCC personnel maintained that flight inspection was an integral part of the air traffic control mission, and that there was no operational advantage in separating it from the rest of the air traffic control mission.

The Air Staff position, however, was that a transfer would place an operational mission under an operational command which possessed similar aircraft. The proponents of the transfer stressed that MAC was already responsible for the logistics support of the flight inspection aircraft, and combining the operational and administrative functions with maintenance would consolidate responsibility for the aircraft. Moreover, MAC routinely operated throughout the world and had an established command, control, and communications network which was capable of supporting the facility checking squadrons' worldwide routes. On 29 April 1987, General Larry D. Welch, the Air Force Chief of Staff, agreed to the transfer of AFCC's six aircraft and their associated flight inspection mission.

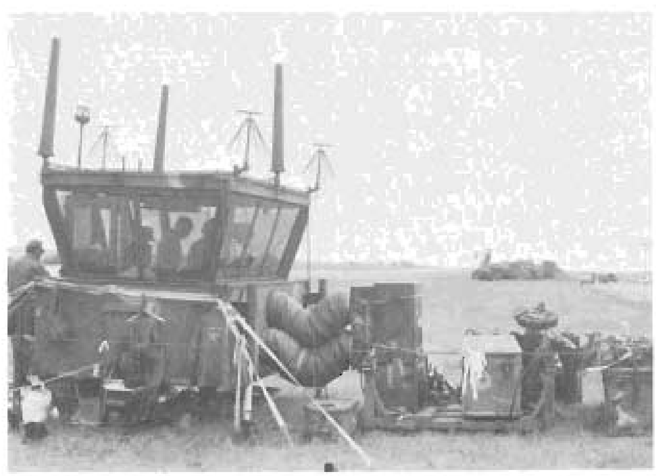
The actual transfer took place on 1 October 1987. Manpower and funding for the flight checking squadrons also transferred to MAC. AFCC retained responsibility for air traffic services, traffic control and landing systems evaluation, European terminal instrument procedures, the European Central Altitude Reservation Facility, and Department of Defense-Federal Aviation Administration notice-to-airman integration plan management. Furthermore, the HQ AFCC Air Traffic Services Evaluations (ATTE) Deputate continued as the office of primary responsibility for the development of policy and procedures to be used by local AFCC units to request and coordinate flight inspections and to conduct the ground portion of inspections. The local chief air traffic control officer retained authority to initiate requests for special flight inspections and to take appropriate action concerning periodic flight inspections.

At the time of the mission transfer, the 1866th Facility Checking Squadron at Scott AFB, Illinois, the 1867th Facility Checking Squadron at Yokota AB, Japan, and the 1868th Facility Checking Squadron at Rhein-Main AB, Germany, were consolidated and redesignated the 1467th Facility Checking Squadron. Because of the illustrious wartime accomplishments of the 1867th, AFCC personnel made sure that its lineage and honors transferred to the new 1467th Facility Checking Squadron. The new MAC unit became part of the 375th Aeromedical Airlift Wing at Scott AFB. The units in Europe and the Pacific became detachments of the 1467th.

In losing the flight inspection mission, AFCC lost three squadrons (1866th, 1867th, 1868th), 76 manpower authorizations, and the capability of insuring the accuracy of the navigational aids without going outside the command. After 1988, AFCC had to schedule flight inspection missions with MAC and the FAA, both of whom had their own list of priority missions.

The future of military flight inspection itself was called into question in August 1989 when HQ MAC submitted a request to the Air Staff to turn over this mission to the FAA. This transfer of mission concerned HQ AFCC which feared that the flight inspection mission would have an even lower priority with the FAA than it had with MAC. Specifically, HQ AFCC personnel feared there would be a decrease in the effectiveness of military air traffic control and landing systems due to equipment, procedural, and priority differences between the FAA and the military.

According to the MAC proposal, MAC would transfer the entire flight inspection mission, aircraft, and aircrews to the FAA by 1 October 1990. In return, the FAA would provide all overhead management and assume all aircraft operating costs. The total savings to the Air Force would be $31.1 million, including 31 manpower positions deleted. Based on their previous experience, HQ AFCC personnel raised several questions about this mission transfer. With the flight inspection mission under the control of the FAA, would the command and control, crew recall, aircraft positioning and readiness reaction policies be responsive during wartime situations? Would it be possible to respond to wartime situations rapidly and to sustain operations using civilians when Air Force crews were not available? Would a civilian program be responsive to the military air traffic control and landing systems evaluations requirements? In December 1989, HQ AFCC accepted the responsibility for developing a Memorandum of Agreement between the FAA, HQ MAC, and HQ AFCC that, hopefully, would address these questions. It would be the early 1990s, however, before the final approval of such a memorandum could be worked out.



During emergencies, AFCC used mobile equipment such as the AN/TSW-7 tactical air traffic control tower, shown here in the foreground, and the AN/TPN-19, seen in the distance. This equipment would insure continuing air traffic control services during wartime.

After more than a year of wiring work, the old Seimens consoles, right, were replaced in 1985 by the new OJ-314 consoles, left, at the Berlin Air Route Traffic Control Center, Tempelhof Central Airport. The new console would be used by American, British, and French controllers in accordance with an Allied agreement signed at the end of World War II.

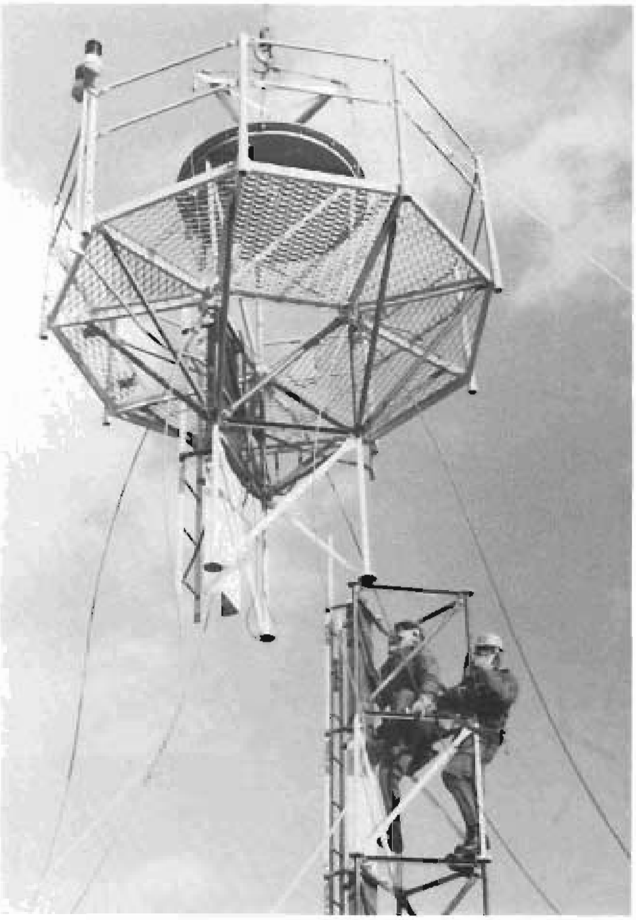
Air Vice Marshall Huxley, standing left, is briefed on the Berlin Air Route Traffic Control Center. This center is a part of the 1946th Communications Squadron, Tempelhof Central Airport, and is responsible for air traffic control operations conducted in the three corridors leading to and from the control zone surrounding Berlin.

Nearly all the air traffic service improvement projects that the Air Force and Department of Defense were developing had a parallel effort underway in the civilian sector. Eventually, these efforts would be tied together in the National Airspace System Plan.

In December 1981 the Federal Aviation Administration released the National Airspace System Plan which detailed specific improvements that needed to be made to air traffic control facilities and equipment. These improvements were needed in order to meet the projected demands on the nation's air transportation system for the last 20 years of the 20th century. This plan had two facets: modernization of equipment from control towers to radar approach systems, and management consolidation of air traffic control services and facilities nationwide. The plan would consolidate more than 200 FAA control facilities into less than 30 and would incorporate high levels of automation to improve safety, fuel efficiency, and air traffic control capacity.

The Department of Defense was initially omitted from the National Airspace System Plan but several of the plan's projects would impact the DOD. Clearly, without DOD participation the FAA's modernization program could not achieve its goals of efficiency and safety. Responsible for a large percentage of all air traffic handled by the National Airspace System, the Department of Defense and the US Air Force were both major providers of air traffic control services and users of national airspace with special use requirements. AFCC, for example, was responsible for the operation of 137 (15%) of the 909 air traffic facilities in the country. Another 163 (18%) were operated by the Army and Navy. Thus, by 1986, detailed DOD inputs were called for to assure timely development and installation of DOD air traffic control equipment and aircraft avionics. As part of this plan, the Departments of Defense and Transportation began negotiating a reorganization of air control responsibilities through the consolidation and transfer of radar approach controls nationwide to achieve greater efficiency and a need for fewer personnel.

As part of this effort, in August 1986, AFCC personnel started attending and working with a National Airspace System Plan working group. In September 1989, AFCC formally announced the formation of the AFCC National Airspace System Plan Office. Consisting of a civilian director, three officers and two senior NCOs, this AFCC planning office was set up as a task force that reported directly to the Assistant Deputy Chief of Staff for Air Traffic Services to develop, manage, and implement DOD participation in the National Airspace System Plan.



SrA James Fink and SrA Andrew Hyde prepare to mount the crow's nest for the TACAN antenna at Grand Forks AFB, North Dakota.

In March 1985, AFCC installed a prototype of a TACAN antenna (AN/GRA-121) with a heated radome at Shemya AFB, Alaska. The heat made the antenna, used for enroute and terminal service, invulnerable to blowing snow and ice buildup.

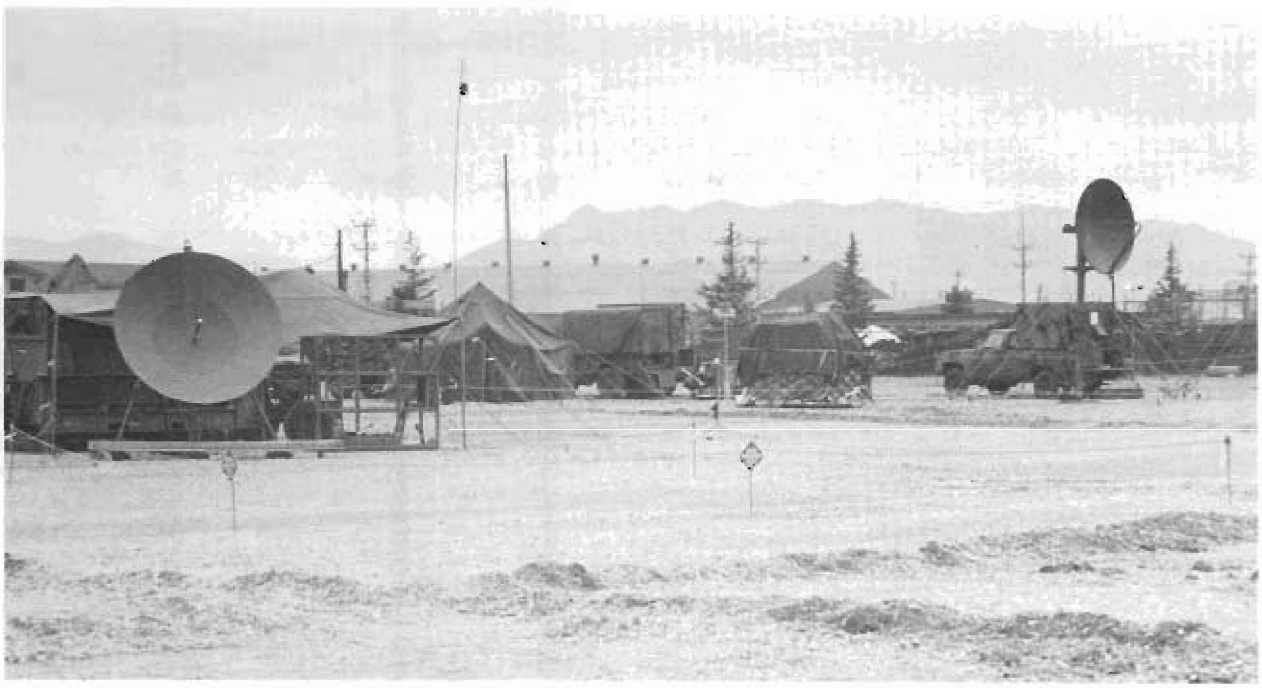
COMBAT COMMUNICATIONS AND DEPLOYMENTS

A key theme of AFCC in the early 1980s was combat readiness, the ability to meet Air Force requirements for wartime communications, air traffic control, weather communications, engineering and installation, and data automation. Each of the AFCC commanders in the late 1970s and early 1980s initiated efforts to improve the readiness posture of the command. In 1978, for example, Maj Gen Robert E. Sadler initiated a readiness program that established procedures for identifying, analyzing, monitoring, and completing readiness projects. Combat communications received special attention in February 1981 when Maj Gen Robert T. Herres created a Deputy Commander for Combat Communications and Reserve Force Matters on his staff. On 1 October 1983, Maj Gen Robert F. McCarthy went further by creating the Deputy Chief of Staff for Combat Communications. All readiness efforts were then consolidated under this new deputate until new equipment could be integrated into the command and policies established for transferring authority for employing combat communications assets to using commands during contingencies. On 1 December 1985, AFCC having achieved these goals, Maj Gen Gerald L. Prather abolished the deputate during a general headquarters restructuring and transferred its functions to other deputates.

In 1986, the Air Staff directed the combat communications groups to go from combat limited to combat ready status, effective January 1990. In order to meet this directive, some of the combat communications groups increased their authorizations and reorganized into squadrons. On 20 July 1988, HQ AFCC activated the 21st, 22d, and 23rd Combat Communications Squadrons and assigned them to the 2d Combat Communications Group, headquartered at Patrick AFB, Florida. Two days later HQ AFCC activated the 31st, 32d, and 33rd Combat Communications Squadrons for the 3rd Combat Communications Group, Tinker AFB, Oklahoma; and the 51st, 52d, and 53rd Combat Communications Squadrons for the 5th Combat Communications Group, Robins AFB, Georgia.

Increasingly, combat communications emphasis focused on survivability, connectivity, and interoperability. The command also continued to emphasize

CMSgt Floyd Burlock, right, relays flight information to a departing C-130 aircraft while SSgt Mike Rothschiller listens, during the 4th Combat Communications Squadron's participation in Exercise HEALTHY STAR 88.



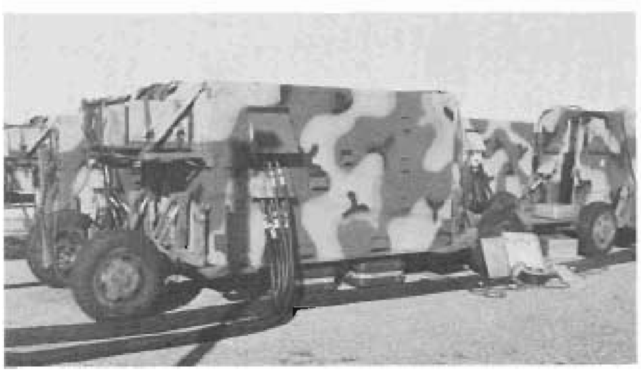
Communications site for 4th Combat Communications Squadron at Kimhae Air Base, Republic of Korea.

protective measures, as well as countermeasures, against electronic jamming and chemical warfare which threatened the Air Force's ability to communicate. Communications realism was stressed in exercises, and damage to equipment was simulated so that both communicators and using command personnel could train under realistic wartime conditions. At AFCC's request, the Air Training Command also established courses in Morse Code for radio operators. Morse Code was difficult to jam which made it a reliable, though slower, alternative to voice communications. AFCC also obtained special encryption devices to improve secure voice communications systems.

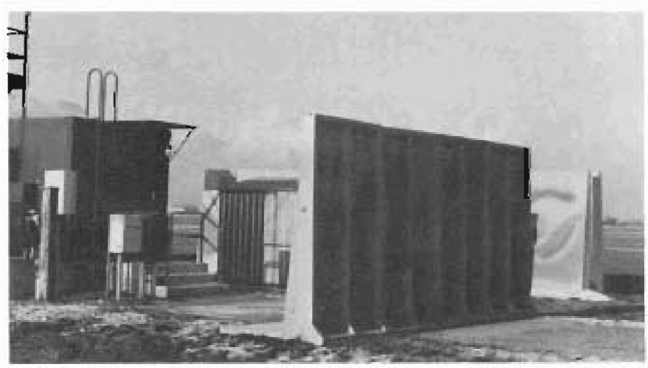
One of AFCC's major efforts was to improve the ability of Air Force commands to communicate among themselves as well as with the other services. For example, the Joint Tactical Communications Program, popularly called TRI-TAC, sought to reduce Air Force, Army, and Navy development efforts as well as improve secure, tactical systems which could communicate among themselves. The program's ultimate goal was to provide worldwide deployable communications systems which afforded functional and operational interoperability with end-to-end security.

SrA Duane Smith, a member of the 5th Combat Communications Group, Robins AFB, Georgia, makes line checks on the new TRI-TAC TTC-39 automatic switchboard.

The AN/TRC-170 TRI-TAC radio tested by Detachment 1, 1815th Operational Test and Evaluation Squadron, could be set up and taken down quickly. This totally digital mobile radio was designed to provide cheaper and more accurate communications than the AN/TRC-97 radios. Since the AN/TRC-170 transmitter operated in the super high frequency range, the radio could be used in a line-of-sight mode or a tropospheric scatter mode.



Two shelters make one complete AN/TTC-39 system. On the left is the switching shelter. The control shelter, where the operator works, is on the right. The AN/TTC-39 is a 600-line TRI-TAC automatic telephone switching central. Features never before seen in tactical communications included call forwarding, speed calling, conferencing, and precedence and preemption capabilities, all without operator assistance.



Revetments have been added to protect this airport surveillance radar.

Revetments, such as these at Aviano AB, Italy, were designed to give AFCC sites added protection from attack.

AN/TSC-102 communications van

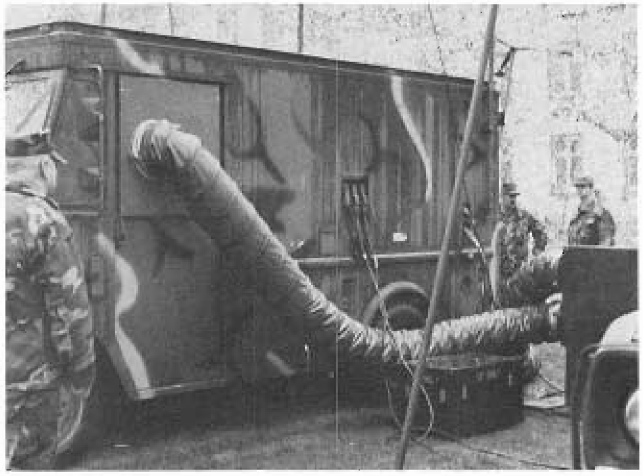
AFCC's role in the TRI-TAC program was mutifaceted, ranging from establishing validations to assisting the Army in the final test and evaluation procedures. Under the initial taskings, the command also had the overall responsibility for operating and maintaining all TRI-TAC equipment assigned to the combat communications units.

During 1983, the first TRI-TAC equipment, automatic telephone switches, was delivered to three AFCC combat communications groups. This equipment became operational in early 1984. Automatic message switches were delivered in 1984 and became operational in 1985. In addition, contractors delivered two types of TRI-TAC transportable radios to the command in late 1985. Other TRI-TAC systems were still under development and would be brought into the Air Force inventory in the future.

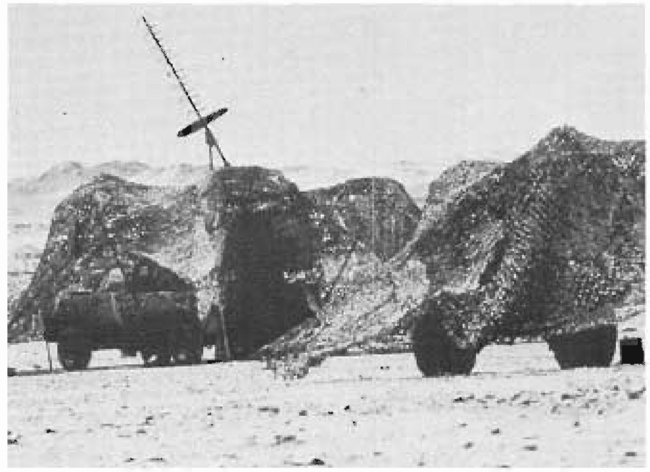
The command also took measures to protect bases and communications sites. The Base and Installation Security Program, for instance, aimed at providing perimeter and area protection against unauthorized entry at more than 1,000 sites around the world. Another program designed to decrease the vulnerability of AFCC's assets toned down paint on equipment from stark white or bright reds to colors that reduced the object's visibility.

The pile of dirt in the foreground is really a demonstration of camouflage netting that would be used in a desert environment.

AFCC used camouflage nets to help its units avoid detection and make its equipment less visible targets. This photo illustrates the camouflage netting used in areas with snow.



Inside the camouflage netting, AFCC personnel continue to provide communicatins using an AN/TSC-107 quick reaction package.



Camouflage netting helps conceal this mobile satellite terminal and helixical antenna.

Conforming with the Air Force trend, HQ AFCC also established its own Air Base Operability Division within the Operations Deputate. Its mission was to develop and promulgate command policy for communications-related air base operability issues, including communications survivability, wartime communications restoral, disaster preparedness, chemical defense, and electronic combat defense. Specific AFCC initiatives to improve air base operations included such things as prepositioning communications restoral kits in the base war reserve materiel, establishing defensive fighting position communications, and ensuring the integration and interoperability capability of communications and computer systems tasked with supporting the base.

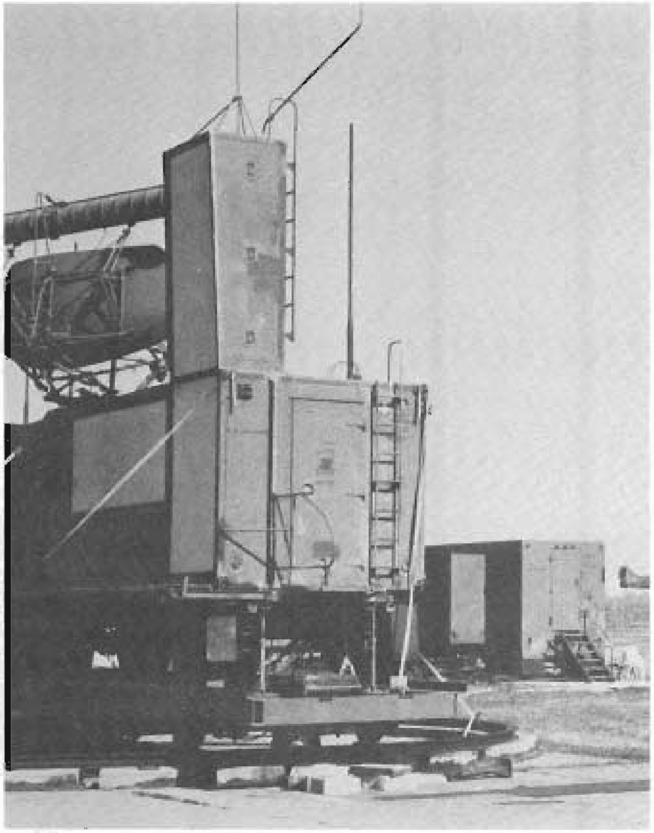
Throughout Europe and the Pacific, AFCC examined its communications systems and sought ways not only to protect them, but to maintain connectivity by either bypassing damaged sections or quickly restoring them. For example, AFCC developed quick reaction packages that enabled the combat communications units to deploy special equipment quickly to areas damaged by nature, warfare, or terrorists and provide minimum essential communications services to tactical users.

In a related effort, AFCC undertook a series of initiatives to assure continuing air traffic control services during wartime. Planners agreed that navigational aids would probably sustain damage or loss of power because of their proximity to runways. Among other initiatives under development in the mid-1980s were measures to protect surveillance radars against jamming and to acquire portable towers and radars which could replace battle-damaged equipment.

Another important AFCC readiness project involved the rapid launch and recovery of aircraft. Despite recent advances in aircraft avionics and air traffic control

AFCC had a tone-down program to repaint some of its equipment, such as this AN/FPS-77 weather radar, to make it less visible.

equipment, many of the same problems existing 30 years ago in the terminal area airspace continued to confront flight crews and air traffic controllers. Employing FAA procedures designed for commercial



In the fall of 1985, a 1st Combat Communications Group AN/MPN-14 mobile air traffic control radar unit and crew supported Canadian forces at Baden Soeltingen, West Germany. The radar set is a complete ground control approach facility used as an air traffic control center.

aircraft during peacetime, military controllers became saturated with recovery rates above 35 aircraft per hour when using radar, and 15 aircraft per hour without radar support. Requirements for wartime or contingencies, however, could be as high as 75-90 aircraft per hour. In response, in 1978, Headquarters USAF initiated the Aircraft Surge, Launch, and Recovery program and made AFCC chairman of the task force that studied the problem.

Between 1979 and 1982, AFCC developed new procedures for rapidly launching and recovering aircraft. The command used computer models to evaluate new procedures and in 26 actual tests in the Pacific and Europe achieved rates as high as 85 aircraft per hour using radar and 27 aircraft without radar.

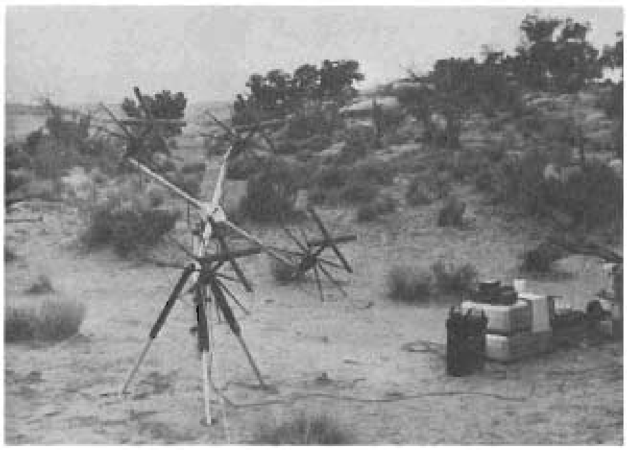
In early 1983, following Air Staff approval, the Tactical Air Command, the Pacific Air Forces, and the United States Air Forces in Europe began implementing the new procedures. In April 1983, the Federal Aviation Administration agreed to support AFCC in its efforts to establish the program throughout the United States. By mid-1985, the Aircraft Surge, Launch, and Recovery program was operational through much of the Air Force. Since the program was primarily a Tactical Air Forces requirement and not an air traffic control requirement, AFCC transferred executive management of the program to the Tactical Air Command on 1 October 1985.

The Aircraft Surge, Launch, and Recovery program was only one of AFCC's measures to make the command more responsive to Air Force needs. Several incidents, especially the nuclear weapons accident exercise conducted in April 1979 and an explosion at an Arkansas Titan missile site in September 1980, revealed that one of the deficiencies in Department of Defense plans for dealing with nuclear weapon accidents was the lack of timely and secure communications. To correct the communications shortcomings, the AFCC Commander, Maj Gen Robert T. Herres, began organizing a small, elite, and highly flexible unit called Hammer Ace to provide secure voice communications between response teams and command posts during emergencies, contingencies, and special operations.

Hammer Ace consisted of 19 of the command's highly skilled officers, noncommissioned officers, and airmen. A team could deploy within three hours of notification and provide long-range communications from virtually any place on earth. Although primarily organized for rapid response, Hammer Ace also evaluated new ultra high frequency satellite and associated equipment for possible use throughout the Air Force.

Hammer Ace teams, usually consisting of three to five people, were equipped with lightweight, battery-powered communications systems carried in aluminum suitcases.

Within one hour of arriving, the Hammer Ace team could supply the on-site commander a private, encrypted network for local communications and a secure satellite system for voice communications through government or commercial telephone lines.



Hammer Ace teams often used a phased array antenna to provide secure satellite communications.

A Hammer Ace team deployed for the first time during a Strategic Air Command exercise on 16 July 1982. Since then the team's value has been proven on numerous occasions. Between 1982 and 1989, Hammer Ace teams deployed to numerous aircraft accident sites, provided secure communications for high level Air Force conferences, and participated in several actual contingencies. For example, Hammer Ace teams had two critical contingency deployments in 1983. One was to Grenada during operation URGENT FURY, the rescue of Americans trapped on the island. The second was to the Sudan as part of operation ARID FARMER, the United States' reaction to Libyan aggression in Chad.

The whole concept of Hammer Ace came to exemplify AFCC's determination to provide responsive, resourceful support to the emergency needs of the Air Force. By 1985, Hammer Ace deployments had become largely routine. Its personnel had gained both the expertise and the equipment to provide specialized communications to the Air Force wherever and whenever needed. Hammer Ace personnel were especially active in 1986, deploying 23 times for a total of 367 man-days in support of numerous aircraft accident investigation and/or recovery efforts, exercises, and demonstrations. Such support continued throughout the decade. For example, among the most important deployments in 1989 were those supporting the Military Airlift Command's mission at Howard AFB, Panama, during operation JUST CAUSE; aiding the Exxon Valdez oil spill recovery efforts in Alaska in April; and the Hurricane Hugo relief efforts in September and October in the Caribbean and southeastern United States.

Hammer Ace was so successful that in May 1986 HQ AFCC developed the AFCC Forward Information Systems Team, or Hammer FIST as it was nicknamed. Hammer FIST was a comprehensive program which formally established Hammer Ace's wartime responsibilities. Besides prescribing the unit's communications assets necessary to accomplish assigned taskings, Hammer FIST also required that Hammer Ace personnel receive small arms training to enhance their combat survivability. As with Hammer Ace itself, the Hammer FIST mission remained under the operational control of the AFCC commander who would provide support to any major command requesting it.

The Air Force needed AFCC's responsiveness and resourcefulness several times in the decade of the 80s. During this period, the command deployed its people and equipment into Central America, the Caribbean, the Mid-East, and Africa to support national objectives. In December 1982, for example, the 1st Combat Communications Group deployed a four-man team to Beirut, Lebanon, to supply secure voice communications for the European Command Liaison Team, part of the peacekeeping forces in war-torn Lebanon. Following the 18 April 1983 bombing of the American Embassy in Beirut when 17 Americans lost their lives, the team members were recognized for their heroism. Ambassador Robert Dillon said these men were "the real heroes of the bombing. Never leaving their equipment, they supplied communications for a myriad of organizations, sleeping in chairs next to their radios." One of the team members, A1C Rodney Hamman, received a Purple Heart for injuries sustained during the bombing and the Joint Services Commendation Medal for rescuing the ambassador's secretary. Following the suicide terrorist bombing at the Beirut Airport on 23 October 1983 that killed 241 United States marines and sailors, AFCC's communicators were moved aboard Navy ships off the coast of Lebanon where they continued to provide vital communications.

During this same period and in the same area, AFCC personnel were also involved with a long-running deployment known as ELF ONE. Beginning in 1980, European Liaison Forces (ELF) ONE, a nine-year Air Force program, provided assistance to the government

Maintaining equipment

Operating switchboards

Operating RAPCONS

AFCC sought to protect its personnel during chemical warfare attacks by equipping them with special gloves, garments, and masks which also allowed them the manual dexterity to operate sophisticated equipment.

Splicing cable

Defending sites

of Saudi Arabia. With the onset of hostilities between Iran and Iraq in 1980, the stability of the Persian Gulf region was in question. Because of the strategic significance of the Persian Gulf, the United States had a vested interest in ensuring that the conflagration did not spread to neighboring states. Assistance came in the form of airborne, air surveillance, and early warning for Saudi Arabian military and oil production facilities.

AFCC provided a variety of communications and computer support services throughout the nine-year program. The command deployed wideband, electrical component switching, electrical communications and cryptographic, and telecommunications and data circuitry specialists as well as communications/computer systems officers, operators, and programmers. The command also provided power production and refrigeration specialists and maintenance personnel. Between October 1980 and April 1989, nearly 2,000 AFCC personnel deployed to Saudi Arabia on limited duty tours averaging 90 days duration. The command contributed approximately 231 specialists annually, drawn as individual augmentees from the 2d, 3rd, and 5th Combat Communications Groups and Air National Guard forces.

This long-term exercise provided incalculable experience in preparing the command for its involvement in Operation DESERT SHIELD, the United States' defense of Saudi Arabia and other middle eastern states after Iraq's invasion of Kuwait in August 1990, and Operation DESERT STORM, the United Nations-sponsored, multi-national war effort to force Iraq out of Kuwait. Hundreds of AFCC technicians, controllers, and operators were deployed to the Persian Gulf region as part of these operations. AFCC communicators were responsible for providing communications packages, including telephone and data networks, transmissions systems and air traffic control systems to deployed decision makers at both established and bare-base locations. At the same time, at HQ AFCC the Air Force Telecommunications Certification Office was working to coordinate the communications efforts for the operation. It handled the requirements for long-haul communications connectivity, both commercially leased and government-owned. The Air Force Telecommunications Certification Office also helped facilitate command and control of forces in the Persian Gulf by establishing satellite communications links between users in the Middle East and various other organizations worldwide.

Across the world, in the Caribbean, when, in the early 80s, the Marxist government of Grenada, with the assistance of Cubans and Russians, began to build an international airport at Point Salines, the United States became concerned that the airport would be used as a strategic staging base to spread Soviet and Cuban inspired unrest throughout Central America and the Caribbean. The situation deteriorated further after 18 October 1983 when the more radical General Hudson Austin overthrew and killed Maurice Bishop and his supporters in a bloody coup. On 25 October, at the direction of President Ronald Reagan, US Marines, Army Rangers, and military personnel from some Caribbean nations invaded Grenada to protect over 1,000 Americans whose safety on the island was jeopardized by the coup. Code named URGENT FURY, the invasion met strong Cuban and Grenadian resistance, but eventually rescued the Americans assembled at St. George's Medical College and captured some 600 Cubans along with large quantities of Soviet-made weapons and ammunition.

The Point Salines airport on the island of Grenada might have become a Soviet "stepping stone" to the Caribbean and Central America.

After securing the runway at Point Salines airport, C-141 aircraft unloaded more supplies and equipment. The 2d Combat Communications Group deployed an AN/TSW-7 mobile control tower for air traffic control support.

The 3d Combat Communications Group provided satellite communications to the Airlift Control Center during the Grenada rescue operation.

Sgt Mark Derryberry, left, and Sgt David Bevis of the 1978th Communications Group, handle message traffic for the humanitarian portion of KINDLE LIBERTY 85, one of a continuing series of regularly scheduled Panama Canal defense exercises held since the treaty went into effect in 1979.

On 3 October, elements of the Panamanian military staged an unsuccessful coup against General Noriega. Without direct US participation, the coup failed and the leader of the attempt was executed. By now, however, the Panamanian government of General Noriega had begun to feel some effects from internal dissent and economic pressures applied from abroad. With the degradation of public services came an accelerated breakdown in law and order. The increasing social unrest and the accompanying instability of the government of Panama heightened US concerns over the security of Latin America as a whole and the Panama Canal in particular.

Exacerbating a bad situation, General Noriega took a series of actions in December 1989 that finally forced the hand of President Bush. On 15 December, General Noriega unilaterally declared war on the United States. The United States essentially ignored this declaration until the next day when Panamanian Defense Force troops murdered a US Marine lieutenant and intimidated other Americans held captive.

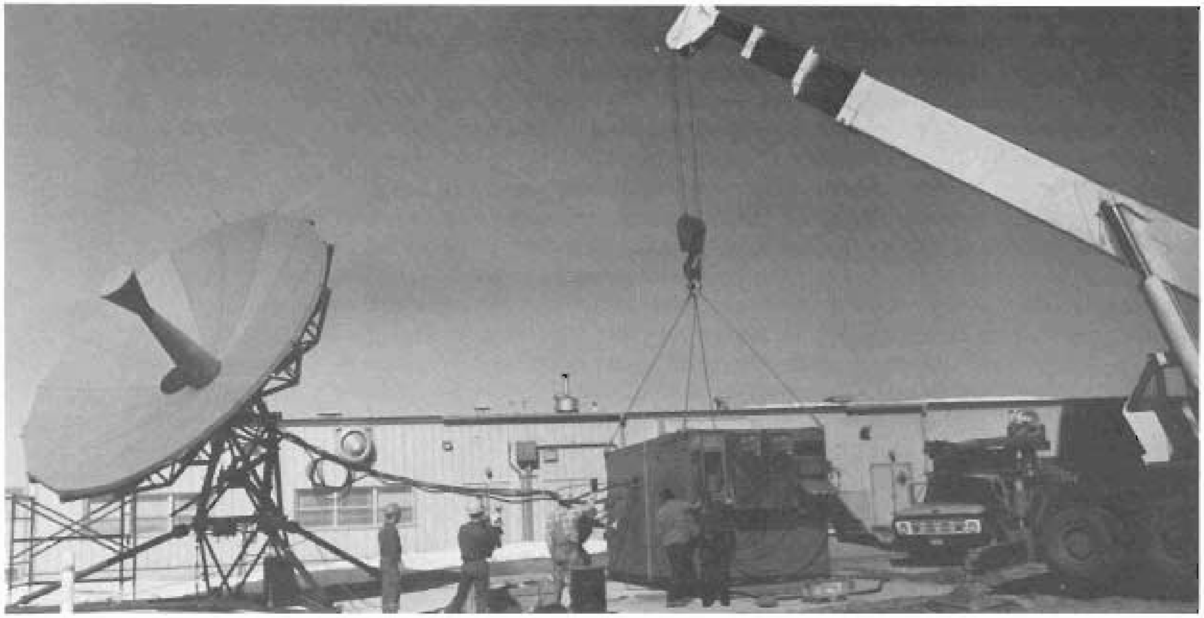
On 17 December, President Bush ordered the United States military to take actions to restore the legitimate government of Panama, bring peace to the streets of the country, and protect American lives and property, as well as the remaining US interests in the canal. A concomitant mission was to capture General Noriega and bring him to the United States for trial, where he was wanted on a number of long-standing indictments for trafficking in illegal drugs. Over the next several weeks, the armed forces of the United States successfully executed these Presidential orders.

For its part of operation JUST CAUSE, AFCC provided combat communications, fixed communications support, and air traffic control for the entire operation. Between 20 and 23 December, for example, AFCC air traffic controllers at Howard AFB, Panama, handled more than 1,200 takeoffs and landings per day. Throughout the operation, communications went smoothly and provided the requisite command and control of Air Force assets.

One of the biggest potential dangers to AFCC personnel and assets during the 1980s stemmed from acts of terrorism. During that period, terrorist attacks became an ever increasing threat to the security of Air Force personnel, sites, and equipment. AFCC, with its worldwide commitment, was especially vulnerable to this shadow enemy and took measures to protect its people and assets. These measures included security training for personnel and improvements in site security such as tone-down painting, better lighting, fencing, sensors, locks, alarms, and the burial of fuel and water tanks. Personnel at some remote sites were given weapons and combat training. The security of each site, especially those in Europe, was carefully evaluated based on intelligence assessments. These efforts paid substantial dividends. Few attacks were directed specifically against AFCC, and what little damage the command did suffer was more in the category of vandalism than terrorism.

Although AFCC was rarely specifically targeted by terrorists, the command's personnel were sometimes collateral victims of attacks. For example, the 18 April 1983 bombing of the American Embassy in Beirut, Lebanon, injured one of the four AFCC communicators stationed at the embassy. In 1985, another AFCC airman was on a commercial aircraft hijacked by terrorists and was held hostage for several weeks along with fellow passengers in Beirut. Fortunately, these were the only serious incidents involving AFCC personnel.

In addition to participating in military contingencies, AFCC also assisted the civilian community during emergencies. To cite but a few examples, during 1982 AFCC's people helped recovery and cleanup operations following Tropical Storm Faye on the Philippine island of Luzon and a tornado that devastated New Baden, Illinois, a town near Scott AFB. Members of AFCC units also assisted in cleanup activities in Hawaii following Hurricane Iwa and participated as part of the US State Department disaster relief team sent to the Fiji island of Viti Leve following Cyclone Oscar. In 1985, AFCC communicators were very active when a severe earthquake struck Mexico City and other Mexican towns. The Kelly AFB, Texas, Military Affiliate Radio System station went into around-the-clock operations to relay information between the US Embassy in Mexico City and the State Department Task Force in Washington, D.C. Within hours of the first shock waves, people from AFCC's 5th Combat Communications Group, Robins AFB, Georgia, deployed to the Benito Juarez Airport to provide communications between the airport and the US Embassy.



Members of the 1849th Engineering Installation Squadron installed the AN/GSC-49 jam-resistant secure communications terminal at the 2162d Communications Squadron, Buckley ANGB, Colorado, in May 1984. The AN/GSC-49 greatly improved the unit's communications capability in the post-attack environment.

SSgt Kevin Green, a member of the 1923d Communications Group, relays information between the US Embassy in Mexico City and officials in the United States. He was the person on duty who was notified that there had been a disastrous quake in Mexico City.

Upon the release of the American hostages from the hijacked TWA flight 847, the 1st Combat Communications Group provided communications support at the USAF Regional Medical Center at Wiesbaden, West Germany, where the former hostages underwent medical examinations. The 2063d Communications Squadron at Lindsey AS and the 1964th Communications Group at Ramstein AB supplied communications support for the news media and Vice President George Bush.

Controllers from the 2021st Communications Squadron, Tyndall AFB, Florida, approach control stayed on the air during the entire Hurricane Elena threat in September 1985. When the hurricane took a course that threatened the entire Gulf coast, the air traffic situation became complex as many residents took to the air to go to safer areas.

This pattern was repeated over and over. In 1985, AFCC personnel and equipment were there after Hurricane Elena hit the US Gulf Coast; in 1986 after Hurricane Angela touched the Florida panhandle; in 1988 when Hurricane Gilbert devastated Jamaica; and in 1989 when Hurrican Hugo swept through the Caribbean and hit the southeastern US, and an earthquake hit northern California.

The emergency that drew the greatest public recognition for AFCC, however, stemmed from the strike by members of the Professional Air Traffic Controllers Organization (PATCO). The early summer of 1981 proved to be a tense time for the air traffic community, both civilian and military. Negotiations between the Federal Aviation Administration and PATCO reached an impasse, and the danger of a strike that would cripple the nation's air transportation system became eminent. On 2 June, expecting PATCO to strike on 22 June, the FAA asked the Department of Defense about the possibility of deploying 520 military controllers to augment 20 FAA facilities. The Air Force and the FAA had been planning for such a contingency since August 1980, but the 2 June request was the first time that an actual deployment had been officially mentioned. With the Air Force General Counsel's assurances that it was legal for military controllers to operate in FAA facilities during a strike, HQ AFCC personnel reacted quickly and incorporated a possible deployment into their planning efforts.

Although the strike on 22 June did not materialize, the crisis was avoided only briefly. On 27 July, PATCO's members overwhelmingly rejected the negotiated contract and threatened to strike on 3 August if their demands were not met. On 1 August Secretary of Defense Caspar Weinberger ordered the immediate deployment of 100 military controllers to FAA facilities as a show of force to convince PATCO not to strike. Responding quickly, General McCarthy deployed 90 controllers to New York City, Atlanta, and Chicago during the night of 2 August and the early morning hours of 3 August. The Army supplied another ten controllers to Atlanta. Undaunted, nearly 13,000 of the nation's 17,000 civilian controllers walked off the job at 0700 on 3 August 1981. The ensuing deployment proved to be one of the most important events in military air traffic control history.

Until 5 August, when President Reagan fired 11,438 striking controllers who continued the walkout, everyone assumed the deployment of military controllers would be of short duration. Initially AFCC issued orders for only a ten-day deployment, but it soon became apparent that the deployment would be far longer. Amidst an international controversy over the qualification of military controllers and the safety of the nation's airways, the Department of Defense continued to deploy additional controllers. From 3 August to 1 November 1981, AFCC deployed 612 controllers to 107 FAA facilities. The Army and the Navy assisted by deploying 248 and 164 controllers respectively. Although the military controllers began returning to their home bases as early as October 1981, it was not until 30 June 1983 that the FAA released the last of AFCC's controllers.

Col Derrel L. Dempsey, Headquarters AFCC Deputy Chief of Staff for Air Traffic Services, briefs Maj Gen Robert F. McCarthy in the AFCC Strike Task Force Operations Center on the deployment of AFCC air traffic controllers following the PATCO strike.

MSgt Charlie Byrd assists an FAA controller at one of the control positions in the San Francisco control tower.

TSgt Frederick Crum works closely with an FAA controller at the BRITE IV radar display in the San Francisco control tower.

An AFCC controller operates the flight data clearance delivery position at Chicago's O'Hare International Airport.

The prolonged support to FAA required AFCC to make numerous administrative and procedural changes to sustain its Air Force mission. Many units adopted a 48-hour work week, cancelled or postponed annual leaves, delayed attendance at professional military education schools, and used management personnel in facility operating positions. Many flying commands voluntarily reduced flying schedules without losing flying hours and AFCC developed new routes, schedules and procedures to accommodate other commands' operations. The effectiveness of these changes allowed the Air Force to operate at 90-95 percent of its prestrike sortie rate by 11 August 1981. AFCC acted very aggressively at the strike's outset to initiate programs to ease some of the hardships encountered by deployed controllers and their families. Attesting to the professionalism of the Air Force's air traffic controller force, retention rates remained high even though employment possibilities with the FAA were very attractive.

Throughout the long PATCO deployment, and despite minor harassment, the deployed controllers exhibited a high degree of resiliency and expertise that allowed the FAA to maintain a high safety record. This efficiency and dedication to duty brought recognition and high praise from several quarters, both military and civilian. More importantly, the close and unprecedented military/civilian collaboration demonstrated to the FAA and the flying public the skill and professionalism of military controllers. Above all, the contingency showed Americans that AFCC was ready and able to perform its air traffic control mission and contribute to the nation's well-being during peacetime.

All military personnel who deployed to FAA facilities because of the PATCO strike were awarded the Humanitarian Service Medal.

CONCLUSION

THE CHALLENGE OF THE NINETIES: THE END OF AN ERA AND THE CREATION OF NEW RELATIONSHIPS

During the 1980s, AFCC was the most widely dispersed command in the Air Force. In December 1989, for example, the command had more than 54,000 officers, airmen, and civilians assigned to 752 active units at 430 locations in the United States and 27 foreign countries. The mission of AFCC in 1989 was to provide communications, computer, and air traffic services to the Air Force operational and support commanders and units. The command also provided designated command and control systems for the specified, unified, and component commands. In addition, AFCC was one of the three acquisition commands within the Air Force and was responsible for acquiring commercially available communications and computer systems.

The merger of Air Force communications and data automation in 1986 marked the culmination of fifty years of development towards the centralized management of communications within the Air Force. Headquarters AFCC applied the same type of central control to communications that other commands, such as the Strategic Air Command and the Military Airlift Command, applied to their areas of responsibility. Headquarters AFCC provided the central management necessary to acquire, install, operate, and maintain communications and services which were used across the Air Force, the Department of Defense, and other government agencies. Headquarters AFCC established the standards, policies, and procedures by which all Air Force standard communications were operated and maintained, thereby insuring continuity of operations across the Air Force. AFCC also assisted in developing the standards, policies, and procedures for major command-unique systems to guarantee their interoperability with other systems.

In addition, budgeting for all common user communications, such as telephone exchanges and data processing equipment, was done through HQ AFCC. Central management of this activity allowed the Air Force to take advantage of economies of scale, and insured that the most cost-efficient approach to acquisition was used. Headquarters AFCC was also the central manager for Air Force air traffic services. It was the Air Force single point of contact with the Federal Aviation Administration and insured that Air Force air traffic control operations met the standards of the Federal Aviation Administration and the International Civil Aviation Organization. Moreover, HQ AFCC managed all engineering and installation resources worldwide, including prepositioned assets.

In all areas, the role of HQ AFCC in the 1980s was to provide strong, central, efficient management of the Air Force's varied and increasingly complex communications. In essence, the centralized management from AFCC ensured standard operations practices, interoperable equipment, and the cost-effective procurement of that equipment.

By 1989, however, the conditions and assumptions that AFCC had been operating under began to change drastically. As the most obvious example, the late 80s saw the end of the Cold War, the guiding principle of American foreign policy for over forty years. During the last half of 1989, the Warsaw Pact alliance of the Soviet Union and its Eastern European satellites, which had endured since the late 1940s, collapsed. Furthermore, most of these Eastern European countries overthrew their Communist governments without interference from Moscow and usually without bloodshed. If anything, Moscow gave tacit approval of the changes and began negotiations to withdraw Soviet troops from Warsaw Pact countries. The Soviet Union itself was increasingly beset by economic problems, internal ethnic unrest, and agitation for democratic reforms.

Signs of the end of the Cold War were everywhere apparent: the Berlin Wall was dismantled and pieces of it were sold as souvenirs; the Red Army choir sang "The Star Spangled Banner" at the Kennedy Center; Marshall Sergei Akhromeyev, military advisor to Soviet President Mikhail Gorbachev, testified before the United States House Armed Services Committee; Soviet military leaders were given tours of NATO facilities and the underground command post at Headquarters, Strategic Air Command; East and West Germany reunited in 1990; and the Soviet Union supported the United States in its call for a United Nation's embargo against Iraq, later reaffirming its consonance when the actual war with Iraq started.

Partly as a consequence of these changing conditions, and partly due to frustration over new disclosures that the Department of Defense was paying outrageous sums of money for some procurement items, Secretary of Defense Richard B. Cheney, in July 1989, directed the military services to review their operations and focus on improving the acquisition process by finding more efficient, cost-effective management methods. Eventually, this review was expanded to include all aspects of the military and how it did business. Secretary Cheney set a target of $39 billion in savings during fiscal years 1991-1995. These savings would be achieved by cutting management layers, streamlining procurement and logistics, eliminating less essential functions, and consolidating related jobs.

Following this directive, on 2 August 1989, HQ USAF tasked all the major commands to conduct reviews of Air Force operations with the focus on streamlining, consolidation, and reducing duplication. To coincide with this initiative, Secretary of the Air Force Donald Rice directed a top-down review of issues along functional lines developed by the staff and senior leadership.

After a careful review of the command and its functions, the HQ AFCC staff proposed eight general areas where changes could be made. Six of these, which would eliminate 2,350 manpower spaces throughout the command, were accepted by the Air Staff. Some of these spaces could be eliminated by taking advantage of gains in technology; others by streamlining the command's integration and interoperability functions, certain AFCC units, and the headquarters' staff itself.

Concurrent with these initiatives, the whole functional review process got caught up in the broader question of the future of AFCC and Air Force communications. Indeed, one of the perennial questions that AFCC faced was why HQ AFCC was needed as a central manager for communications within the Air Force. This was not a new issue. The challenge to the concept of a single manager who controlled Air Force communications had stalked the command from its beginning. The need for some kind of central management of airways communications had not been recognized until 1934, and then it took another four years to achieve. Between 1937 and 1988, the reason for AFCC's existence was examined formally at least 18 times. In most cases, the reviews stemmed either from a theater commander who wanted total control of assets in his theater, or a major command commander who simply wanted a portion of AFCC's mission, such as engineering and installation or combat communications.

A late 1980's struggle over control of communications assets in the Pacific was simply part of this continuing struggle. On 19 June 1989, General Merrill A. McPeak, Commander-in-Chief, Pacific Air Forces, had sent a formal program change request to HQ USAF asking that all AFCC units assigned to the Pacific Communications Division be transferred to PACAF. General McPeak told HQ USAF that he saw no advantage in maintaining the existing "stovepipe" arrangement and the associated dual-hatting. He proposed that administrative oversight and day-to-day management of communications resources in PACAF become a theater responsibility. Under his proposal, AFCC would continue to be responsible for doctrine, standardization, and equipage.

Going one step further, General McPeak resurrected the question of the need for AFCC by stating that "it is PACAF's view that the proposed command arrangement (comm/ADP under mission rather than functional command) could be extended to other theaters and CONUS commands." He offered PACAF as a test case to determine the pros and cons.

Once again the age-old question of unity of command confronted AFCC. This Air Force doctrine had been at the heart of the disputes over AFCC's existence since the early days of World War II. Maj Gen Robert H. Ludwig, AFCC Commander since 16 May 1989, had a ready response to this point of view. Acknowledging the conflict between the doctrine of unity of command and the ever-increasing need for integration and interoperation of systems serving the Air Force, General Ludwig pointed out that the "overriding need for Air Force-wide integration and interoperation has in each case justified an accommodation to the very important doctrine of unity of command. That accommodation is the dual-hat concept."

The dual-hat concept, long used in the Air Force, simply meant that below the HQ AFCC level, AFCC commanders filled two positions. Nine of the eleven AFCC divisions were collocated with the headquarters of other major commands, and AFCC's division commanders also served on the host major command staff as the Deputy Chief of Staff for Communications-Computer Systems. Each division subordinate unit commander served in the same capacity on the host major command's subordinate unit commander's staff. This dual-hat arrangement gave the host major command operational control over its air traffic services and communications while administrative control of these same assets resided with AFCC. In this way AFCC was able to supply the integration and interoperability which unified the various major commands of the Air Force into a single service.

These disparate issues — the Defense Management Review of all Air Force functions, the question of AFCC's structure and mission, and the debate over unity of command — were all tied together on 30 August 1989 when General Larry D. Welch, the USAF Chief of Staff, decided to create a separate Defense Management Review panel to examine alternative structures for AFCC. The options evaluated ranged from keeping the status quo; to stripping AFCC of its major missions such as operations and maintenance responsibilities or combat communications; to merging AFCC with other commands, such as the Electronics Security Command, thus creating an even larger technical command.

This panel completed its review of AFCC in September. It concluded that AFCC's own six Defense Management Review initiatives were a good first step in steamlining AFCC and no other restructuring was needed. These conclusions were briefed to the Defense Management Review Executive Review Panel and the Air Staff Board. Both appeared satisfied with these conclusions and AFCC's streamlining initiatives, and no further action was taken to restructure AFCC in 1989. The basic issue, however, shortly resurfaced again.

After further consideration, on 18 June 1990, General Welch announced, as part of the second round of Defense Management Review initiatives, a "complete restructure of Air Force communications and computers," effective 1 October 1990. In his announcement, General Welch said that "The Air Force needs a coherent communications structure with strong functional leadership. To meet this need and bring communications and computer activities into the mainline of the Air Force, we are restructuring communications and computer responsibilities." He went on to outline seven specific objectives of the restructure: strengthen the unity of command for the operational commanders; enhance the integration of Air Force communications and computer systems so they can work together without duplicating efforts; ensure strong functional area support of communications and computers that service Air Force and Department of Defense-wide activities; ensure that a responsive, enforceable structure existed for the development of standards relating to operations, maintenance, and interoperability of communications and computer systems; establish clear Air Staff and Secretariat relationships for policy, management, and acquisition; ensure the growth of Air Force civilian and military communications and computer professionals by providing visible opportunities for senior leadership positions; and save manpower by combining similar functions and structures.

In addition to the intense reexamination of the size and organization of the Air Force brought about by the Defense Management Review initiatives, General Ludwig, the AFCC Commander, saw another crucial reason behind the reorganization of the command. As he stated: "There was in the eyes of Air Force leadership an opportunity to recognize just how critical communications, computer and air traffic services have become, and to put the responsibility for that service clearly in the hands of senior leadership: meaning four-star operational commanders."

In concrete terms, the restructure of Air Force communications meant that AFCC transferred operation and maintenance units from the command to the host units they served. In other words, each host base gained command responsibility for the local communications unit formerly commanded by AFCC. At the same time, AFCC moved to other major commands nine of its divisions as well as eight other direct reporting units. In addition, the combat communications units were transferred to the tactical air forces, but these units retained their wartime taskings and worldwide support responsibilities. Similarly, AFCC responsibility for the contingency communications elements transferred to the Military Airlift Command and the Strategic Air Command. Total manpower assigned to AFCC fell to slightly under 8,000.

AFCC retained the responsibility for engineering, installing, removing, and relocating Air Force communications, computer, and air traffic control systems. Furthermore, the command would continue to develop, integrate, and manage Air Force standard computer systems hardware and software. AFCC also remained responsible for Air Force command, control, communications, and computer systems standards, integration, and interoperability. The command also continued to play a critical role in air traffic services. AFCC was responsible for formulating policy, guidance, and standardization for Air Force air traffic services; for providing the requirements and architecture needed to integrate Air Force air traffic control facilities into the Federal Aviation Administration's National Airspace System Plan; and for serving as the Air Force focal point for the operational and technical evaluation of Air Force air traffic control and landing systems facilities and services.

Under the restructure, AFCC kept two of its old organizational divisions, the Computer Systems Division at Gunter AFB, Alabama, and the Engineering Installation Division at Tinker AFB, Oklahoma. In addition, the command organized a new unit, the Technology Integration Center, collocated with the AFCC headquarters at Scott AFB.

Created 1 October 1990, the Technology Integration Center combined into one comprehensive, focused resource the existing resources of the Air Force Communications-Computer Systems Integration Office, the AFCC Operational Test and Evaluation Center, the 1842d Electronic Engineering Group, the Air Force Communications-Computer Systems Doctrine Office, and several HQ AFCC staff elements. This center was created to provide responsive, results-oriented support to Air Force communications and computer systems integration needs. It consolidated systems engineering, standards, integration, test and evaluation, and systems management expertise into a single technical support team for the Air Force to employ. With the breakup of AFCC and the resultant decentralization of Air Force communications, there was a continuing need for a unifying influence to ensure a common, interoperable communications and computer infrastructure to support Air Force operations worldwide. The purpose of the Technology Integration Center was to define, design, and evaluate the effectiveness of this infrastructure to ensure it supported the Air Force mission. The Technology Integration Center provided a comprehensive source for life cycle management policy, systems engineering, integration, and test support for Air Force communications and computer systems.

After further study, in early 1991, in an attempt to further streamline the management structure, the Air Staff announced another change in the way Air Force communications and computers would be handled. Under this new functional restructure, the Air Force Communications Command, on 1 July 1991, would become one of a number of Air Force organizations to be designated as "field operating agencies." Under this arrangement, the Air Force Communications Command would cease to be a major command, but would report directly to the Air Force Headquarters Deputy Chief of Staff for Command, Control, Communications, and Computers. As a field operating agency, AFCC would retain the same mission but take on more of an operational flavor while policy making would be focused at Air Force Headquarters.

In subfreezing temperatures, a member of the 1839th Engineering Installation Group fastens a 100-pair bridge to a 400-pair cable during a cable expansion project at Incirlik AB, Turkey.

In 1984, the AACS Alumni Association presented a plaque to the Air Force Academy commemorating AACS and its early commanders. The plaque is on permanent display at the Academy's stadium.

The Berlin Airlift Memorial at Rhein-Main Air Base, West Germany, towers over guests and spectators during ceremonies marking the beginning of the 40th anniversary of the Berlin Airlift.

EPILOGUE

Air Force Communications Command can take pride in a long history of achievement and involvement. Over the years, AFCC has evolved from a simple system operating 33 stations in the continental United States to a major organization whose myriad responsibilities spanned the globe. In the early days of the command, its workforce was largely comprised of amateur radio operators and older professional men who were considered too old for combat duties, but too well educated not to be used in some capacity. Today, highly skilled and highly trained personnel are responsible for engineering, installing, removing, and relocating Air Force communications, computer, and air traffic control systems. Other command members develop, integrate, and manage highly complex Air Force standard computer systems.

In January 1945, Gen "Hap" Arnold addressed his staff on trends in the Army Air Forces and in so doing accurately predicted the future importance of communications to the Air Force:

> The Air Force in the future must not be built solely around pilots.... This policy must change if we are to keep the United States free from attack.... The United States must be so far ahead of the other nations in the future that they will not dare attack us. I refer particularly to those devices which are being developed. Radar and similar devices have enormous possibilities and their development is still in its infancy. I maintain that any Air Force which does not include the most technically able personnel to form the nucleus, around which to build the Air Force of the future, such an Air Force is doomed to failure.

Over the past 50 years, communications have more than lived up to General Arnold's expectations, and AFCC played a dominant role in those developments. From a simple system providing airways communications and weather information dissemination, AFCC grew to a conglomerate organization responsible for central management of nearly all of the Air Force's information systems. The command's growth was a slow, evolutionary development, responding to the needs of the Air Force and the nation. As part of that same evolutionary process, AFCC, in 1990, changed again. It was time to move away from a centralized to a decentralized approach for managing Air Force communications. In one way this move showed the increasing importance of communications and computers as the Air Staff took a decentralized approach to bring both those functions more into the mainline of the Air Force's operations.

As AFCC reaches its thirtieth anniversary as a major air command, it can look back on 52 years of accomplishments. Its people participated in most of the major battles of World War II, often being the first in and the last out of an area. It was the men of AACS, for example, that preceded the occupation forces of MacArthur into Japan. The expertise of AACS air traffic controllers insured the success of the Berlin Airlift of 1948-1949. AACS units were some of the first units sent into Korea in 1950, and AFCS units were among the first into and the last out of Southeast Asia. AFCC has also participated in numerous other contingencies such as the Cuban missile crisis in 1962, the Zaire airlift in 1979, the rescue effort in Grenada in 1983, the operations in Panama in 1989, in Saudi Arabia in 1990, and in Kuwait and Iraq in 1991. Not all of the contingencies have been military in nature. AFCC has long provided communications support to the space program and has assisted during many rescue and relief operations following natural disasters such as the Alaskan earthquake in 1964, the Mexican earthquake in 1985, and the devastations brought about by hurricanes, typhoons, and tornadoes over the years.

In its 52-year history, AFCC has been a vibrant, constantly changing command, endowed by its people with an unflinching dedication. From the control tower at Hickam AFB, during the attack on Pearl Harbor to the control towers of Southeast Asia; from the early AACS radio men in Alaska, Labrador, Greenland, and Africa to the AFCC men and women supporting the Federal Aviation Administration following the PATCO strike; from serving isolated tours on the mountain tops of Europe to supporting the American forces in the Persian Gulf region, the people of this command have established a tradition of dedicated support and a high degree of readiness to serve whenever and wherever needed.

The restructure of Air Force communications changed none of that. Maj Gen John S. Fairfield, AFCC Commander at the time of the announced changes, pointed out that AFCC personnel still had a critical role to play in the Air Force. He stated clearly: "We will continue to develop communications, computer, and air traffic control standards — critical support the Air Force needs to fly, fight, and win." It was a mission that all past communicators could identify with.

APPENDIX 1
LINEAGE

Action	Authority
The Army Airways Communications System established in the Communications Section of the Division of Training and Operations, Office of the Chief of the Air Corps, effective 15 November 1938.	Ltr, Adjutant General's Office, War Dept, to Commanding Generals of all Corps Areas, et al, subj: "Establishment of the Army Airways Communications System and Constitution of 1st, 2d, and 3d Communications Squadrons," 3 Nov 38; Army Regulation 95-200 "Organization, Operations, Control and Maintenance of AACS," 1938.
The Army Airways Communications System placed under the Operations Division, the Directorate of Communications, HQ Army Air Forces, effective 23 April 1942.	Army Air Force Regulation 100-3.
Field Branch of the Directorate of Communications proposed to be known as the Office of the Army Airways Communications System. It was to be located in Philadelphia, Pa. In preparation for the move, a headquarters was established at Bolling Field, D.C., effective 27 March 1943. This was the first separate HQ of the Army Airways Communications System. However, General H. H. Arnold decided on 26 March 1943, to place the Army Airways Communications System under the new Flight Control Command rather than establish a field branch.	Memo, Maj Gen George E. Stratemeyer, Chief of Air Force, to Director of Technical Services, subj: "Office of the Army Airways Communications System," 17 Feb 43; Memo, Maj Gen George E. Stratemeyer, Chief of Air Force, to Gen H. H. Arnold, subj: "Creation of the Army Air Forces Flight Control Command," 26 Mar 43; Hist of AACS, 1938-1945, pp. 932-33; Memo, Director of Technical Services, Army Air Forces, subj: "Office of the Army Airways Communications System," 6 Mar 43.
The Army Airways Communications System Wing was constituted and assigned to the Flight Control Command on 13 April 1943, and was activated effective 26 April 1943. The history of AFCS as a unit begins with this action. Before this, it was merely a function/staff office, not a unit.	Ltr, Adjutant General's Office, War Dept, to Commanding Generals of the Army Air Forces, subj: "Activation of the AACS Wing, Flight Control Command," 13 Apr 43.
The Army Airways Communications System closed its office at Bolling Field, Washington, D.C., at 0814, 3 May 1943, and reopened in Asheville, N.C., under the name of HQ Army Airways Communications System Wing, Flight Control Command, effective 0815, 3 May 1943.	Ltr, Adjutant General, HQ Army Air Forces, to Commanding Generals of all Air Forces, et al, subj: "Address of Army Airways Communications System Wing, AAF," 30 Apr 43.
The Army Airways Communications System Wing reassigned from the Flight Control Command to HQ, Army Air Forces "under the immediate supervision and jurisdiction" of the Assistant Chief of Air Staff, Operations, Commitments and Requirements, effective 14 July 1943.	Ltr, Adjutant General, HQ Army Air Forces, to Commanding Generals of all Air Forces, et al, subj: "Reassignment of Certain Army Air Forces Units," 14 Jul 43.

Appendix 1 con't.

Action	Authority
The Army Airways Communications System Wing reassignment to HQ Army Air Forces was amended by eliminating the phrase "under the immediate supervision" of the Assistant Chief of Air Staff, effective 13 October 1943. It was now running its own organization.	Ltr, Adjutant General, HQ Army Air Forces, to Commanding Generals of all Air Forces, et al, subj: "Reassignment of Certain Army Air Forces Units," 13 Oct 43.
The Army Airways Communications System Wing dropped the "Wing" designation and was given separate command status, effective 26 April 1944. The command underwent a complete reorganization, effective 15 May 1944.	Ltr, Adjutant General, HQ Army Air Forces, to Commanding Generals of all Air Forces, et al, subj: "Redesignation and Disbandment of Certain Units, and, Allotment of Personnel to Army Airways Communications System, Army Air Forces," 25 Apr 44.
The Army Airways Communications System was redesignated Air Communications Service and reassigned as a subcommand to Air Transport Command, effective 13 March 1946.	Ltr, Adjutant General's Office, War Dept, to Commanding Generals, et al, subj: "Redesignation and Assignment of the Army Air Forces Weather Service and the Army Airways Communications System, Establishment of Certain Army Air Forces Activities," 13 Mar 46.
Air Communications Service was redesignated Airways and Air Communications Service, effective 11 September 1946. Change made to retain the AACS symbol.	Hist of AACS, 3 Sep 1945-Jun 1946, Foreword.
The Airways and Air Communications Service reassigned to Military Air Transport Service, effective 1 June 1948.	Air Transport Command Special Order #26, 14 May 43; Military Air Transport Service General Order #2, 1 Jun 48.
The Airways and Air Communications Service was relieved from assignment to Military Air Transport Service, redesignated Air Force Communications Service, and designated a major command, effective 1 July 1961.	Ltr, HQ USAF Directorate of Manpower and Organization to Joint Chiefs of Staff, et al, subj: "Designation of the Air Force Communications Service as a Major Air Command," 10 May 61.
The Air Force Communications Service was redesignated Air Force Communications Command effective 15 November 1979.	AFCC SO G-252, 15 November 1979; DAF/MPM Ltr 283g, 15 Nov 1979.

APPENDIX 2

AACS/AFCS/AFCC HEADQUARTERS LOCATIONS

DATE	LOCATION
27 March 1943*	Bolling Field, Washington, D.C.
3 May 1943	Municipal Building, Asheville, North Carolina
17 December 1945	Langley AFB, Virginia
12 December 1946	Gravelly Point, Virginia (Adjacent to Washington National Airport)
19 November 1948	Andrews AFB, Maryland
15 January 1958	Scott AFB, Illinois
16 July 1970	Richards-Gebaur AFB, Missouri
1 November 1977	Scott AFB, Illinois

*Original HQ AACS established on 27 March 1943. Since its activation on 15 November 1938, AACS had been operated as a field command by the Directorate of Communications, HQ USAAF.

APPENDIX 3

AACS COMMANDERS

Colonel Lloyd H. Watnee
27 Mar 1943 - 11 Nov 1943

Brigadier General Ivan L. Farman
12 Nov 1943 - 12 Mar 1946

Major General Harold M. McClelland
13 Mar 1946 - 9 Sep 1948

Brigadier General Wallace G. Smith
10 Sep 1948 - 31 Aug 1951

Major General E. Blair Garland
1 Sep 1951 - 31 Aug 1954

Major General Francis L. Ankenbrandt
1 Sep 1954 - 28 Jul 1955

Major General Dudley D. Hale
29 Jul 1955 - 14 Jan 1958

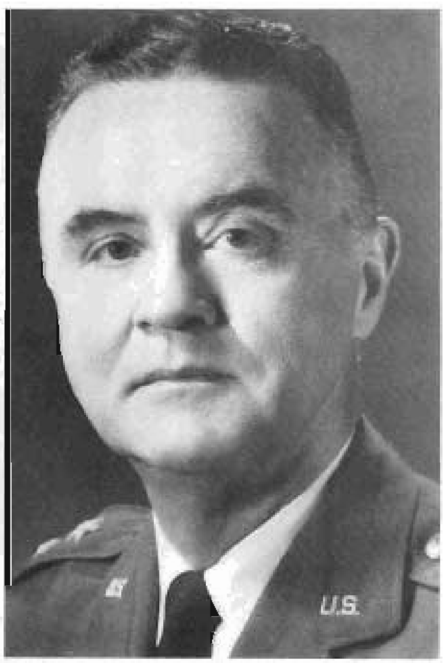
Major General Daniel C. Doubleday
15 Jan 1958 - 30 Jun 1961

APPENDIX 4

AFCS/AFCC COMMANDERS

Major General Harold W. Grant
1 Jul 1961 - 15 Feb 1962

Major General Kenneth P. Bergquist
16 Feb 1962 - 30 Jun 1965



Major General J. Francis Taylor, Jr.
1 Jul 1965 - 18 Oct 1965

Major General Richard P. Klocko
19 Oct 1965 - 2 Jul 1967

Appendix 4 con't.

Major General Robert W. Paulson
15 Jul 1967 - 31 Jul 1969

Major General Paul R. Stoney
31 Jul 1969 - 31 Oct 1973

Major General Donald L. Werbeck
1 Nov 1973 - 22 Aug 1975

Major General Rupert H. Burris
22 Aug 1975 - 31 Oct 1977

Appendix 4 con't.

Major General Robert E. Sadler
1 Nov 1977 - 21 Jun 1979

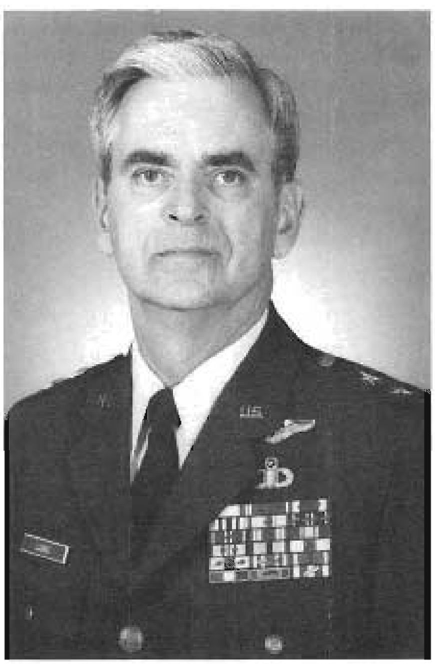
Major General Robert T. Herres
22 Jun 1979 - 27 Jul 1981

Major General Robert F. McCarthy
27 Jul 1981 - 31 May 1984

Major General Gerald L. Prather
1 Jun 1984 - 28 Aug 86

Major General John T. Stihl
28 Aug 86 - 29 Mar 88

Major General James S. Cassity, Jr.
29 Mar 88 - 16 May 89



Major General Robert H. Ludwig
16 May 89 - 9 Nov 90

Major General John S. Fairfield
9 Nov 90 -

APPENDIX 5

AFCC PERSONNEL TOTALS
1938-1986

As Of	Authorized	Assigned
Dec 1938	303*	199*
Apr 1939	533*	278*
Jan 1940	N/A**	428*
Dec 1941	N/A	2,049*
Dec 1942	N/A	8,803*
May 1943	N/A	11,087*
Oct 1943	N/A	15,676*
Dec 1943	N/A	19,176*
Jul 1944	40,817*	27,681*
Dec 1944	48,801*	37,197
Aug 1945	52,550*	49,400*
Jun 1946	13,691*	8,635*
Dec 1946	17,290*	12,426*
Jun 1947	15,320	13,263
Dec 1947	15,361	14,618
Jun 1948	16,403	17,110
Dec 1948	16,075	14,661
Dec 1949	15,023	14,556
Jun 1950	14,983	14,681
Dec 1950	16,667	19,148
Jun 1951	20,331	20,382
Dec 1951	23,225	22,831
Jun 1952	25,692	25,102
Dec 1952	25,490	24,548
Jun 1953	25,728	27,741
Dec 1953	26,089	29,191
Jun 1954	27,975	28,820
Dec 1954	29,554	29,015
Jun 1955	28,935	28,692
Dec 1955	30,587	27,473
Jun 1956	32,486	29,225
Dec 1956	32,865	33,279
Jun 1957	33,214	36,158
Dec 1957	32,100	35,505
Jun 1958	31,220	36,975
Dec 1958	29,723	33,792
Jun 1959	27,330	30,365
Dec 1959	30,015	30,790
Jun 1960	30,270	28,734
Dec 1960	30,761	28,990
Jun 1961	30,432	30,058
Dec 1961	32,903	32,013
Jun 1962	41,370	36,480
Dec 1962	47,075	45,267
Jun 1963	46,674	47,336
Dec 1963	45,399	50,149
Jun 1964	46,430	48,328
Dec 1964	48,687	46,807
Jun 1965	49,594	47,377
Dec 1965	50,664	49,368
Jun 1966	52,403	52,171
Dec 1966	53,969	53,705
Jun 1967	54,359	53,996
Dec 1967	52,873	54,422

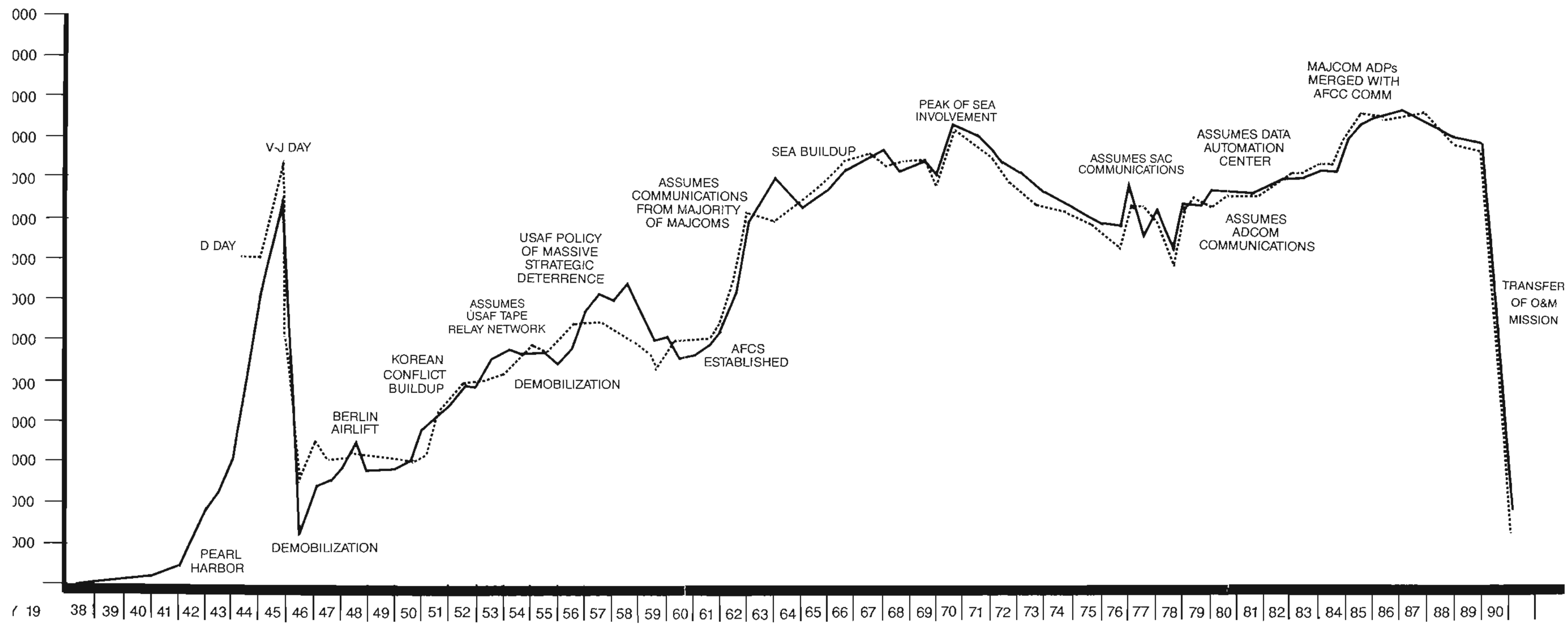
Appendix 5 con't.

As Of	Authorized	Assigned	As Of	Authorized	Assigned
Jun 1968	53,151	51,675	Dec 1979	49,090	47,580
Dec 1968	N/A	N/A	Jun 1980	49,025	48,731
Jun 1969	52,010	52,327	Dec 1980	49,363	48,066
Dec 1969	50,264	51,522	Jun 1981	48,713	48,488
Jun 1970	57,385	58,825	Dec 1981	49,420	48,825
Dec 1970	N/A	N/A	Jun 1982	50,112	50,500
Jun 1971	54,524	55,870	Dec 1982	50,643	50,917
Dec 1971	53,086	54,855	Jun 1983	51,185	52,321
Jun 1972	50,129	52,248	Dec 1983	51,456	52,902
Dec 1972	48,913	50,501	Jun 1984	51,391	53,173
Jun 1973	47,028	49,549	Dec 1984	55,532	56,967
Dec 1973	47,174	49,519	Jun 1985	57,211	58,457
Jun 1974	45,898	47,576	Dec 1985	57,724	57,695
Dec 1974	44,825	47,201	Jun 1986	60,500	58,771
Jun 1975	44,243	45,960	Dec 1986	58,911	58,781
Dec 1975	43,385	45,061	Jun 1987	58,791	58,661
Jun 1976	41,480	44,748	Dec 1987	57,361	57,971
Dec 1976	47,471	51,154	Jun 1988	56,430	55,208
Jun 1977	47,501	50,053	Dec 1988	55,659	54,855
Dec 1977	45,365	47,722	Jun 1989	55,120	55,066
Jun 1978	39,840	42,689	Dec 1989	54,731	54,264
Dec 1978	46,981	48,034	Jun 1990	55,659	52,717
Jun 1979	47,438	48,338	Dec 1990	9,003	7,707

* Does not include civilians.
* * Not available.

SOURCE: AFCC Annual Histories.

AFCC PERSONNEL TOTALS



APPENDIX 6

AFCC PERSONNEL
(PERCENTAGE OF TOTAL AIR FORCE MANNING)

Year	Air Force Strength	AACS/AFCS/AFCC Assigned Strength	Percentage
1938*	21,089**	199**	.9%***
1939	23,455**	278**	1.2%***
1940	51,165**	428**	.8%***
1941	152,125**	2,049**	1.3%***
1942	764,415**	8,803**	1.2%***
1943	2,197,114**	11,087**	.5%***
1944	2,372,292**	27,681**	1.2%***
1945	2,282,259**	49,400**	2.2%***
1946	455,515**	8,635**	1.9%***
1947	305,827**	13,263	4.3%
1948	387,730**	17,110	4.4%
1949	588,305	14,556	2.5%
1950	565,730	14,681	2.6%
1951	1,049,109	20,382	1.9%
1952	1,283,137	25,102	1.9%
1953	1,279,900	27,741	2.2%
1954	1,243,515	28,820	2.3%
1955	1,272,022	28,692	2.3%
1956	1,258,188	29,225	2.3%
1957	1,260,161	36,158	2.9%
1958	1,186,962	36,975	3.1%
1959	1,153,901	30,365	2.6%
1960	1,122,201	28,734	2.6%
1961	1,124,527	30,058	2.7%
1962	1,190,206	36,480	3.1%
1963	1,166,413	47,336	4.1%

Appendix 6 con't.

Year	Air Force Strength	AACS/AFCS/AFCC Assigned Strength	Percentage
1964	1,145,624	48,328	4.2%
1965	1,112,965	47,377	4.3%
1966	886,350**	46,245**	5.2%***
1967	1,226,205	53,996	4.4%
1968	1,227,511	51,675	4.2%
1969	862,352**	46,723**	5.4%***
1970	791,349**	49,629**	6.3%***
1971	753,896**	48,402**	6.4%***
1972	724,333**	45,137**	6.2%***
1973	691,194**	42,911**	6.2%***
1974	643,792**	40,774**	6.3%***
1975	895,277	45,960	5.1%
1976	847,007	44,748	5.3%
1977	828,791	50,053	6.0%
1978	823,740	42,689	5.2%
1979	806,713	48,338	5.9%
1980	804,505	48,731	6.1%
1981	816,505****	48,488	5.9%
1982	830,145****	50,500	6.1%
1983	835,100****	52,321	6.3%
1984	849,900****	53,173	6.3%
1985	858,500****	58,457	6.8%
1986	867,000****	58,782	6.8%
1987	872,000****	58,012	6.6%
1988	863,000****	55,659	6.4%
1989	825,000****	54,264	6.6%
1990	827,000****	7,707	.01%

* 1977-Present Data for Air Force Assigned Strength A/O 30 September; AFCC Assigned Strength A/O 30 June.
** Does Not Include Civilians.
*** Percentage Based on Air Force Military Strength; Does Not Include Civilians.
**** Rounded.

SOURCE: Air Force Statistical Digest, 1938-1990.

APPENDIX 7

AFCC AIRCRAFT INVENTORY
(As Of 30 June)

	1961	1962	1963	1964	1965	1966	1967	1968	1969
AC-47A	2	2							
AC-47D	21	21							
AC-54D	6	6							
AT-29C	10	10							
B-47B	1	1							
C-47A		3	2						
C-47D	9+	4	3				1		
*VC-47A		1							
C-54G	1	1	1						
C-135A									
C-140A			4	4	4	4	4	4	4
EC-47D			17	3	3	3	3	3	3
EC-54D			5					1	1
ET-29C			6					2	3
RC-130A									
T-33A	9	9	9	9	9	10	11	10	10
T-39A									
*VC-118A									
*VT-29B									
*VT-39A									
	59	58	47	16	16	17	19	20	21

Appendix 7 con't.

	1970	1971	1972	1973	1974	1975-1987
AC-47A						
AC-47D						
AC-54D						
AT-29C						
B-47B						
C-47A						
C-47D						
*VC-47A						
C-54G						
C-135A					1	
C-140A	4	4	4	4	4	4
EC-47D	3	3	1			
EC-54D						
ET-29C	5	5	3	3		
RC-130A		4	4	4	4	
T-33A	4					
T-39A	1	2	2	2	2	2
*VC-118A		1	1	1	1	
*VT-29B		3	2	2	2	
*VT-39A		1	1	1	1	
	17	23	18	17	15	6**

*Support Aircraft.
+Combined Total of C-47A, C-47D, VC-47A.
**These six aircraft and the flight inspection mission were transferred to the Military Airlift Command on 1 October 1987.

SOURCE: AFCC Histories 1961-1987.

GLOSSARY OF TERMS AND ABBREVIATIONS

AAC	Alaskan Air Command
AACS	Army Airways Communications System
	Airways and Air Communications Service
AB	Air Base
ACAN	Army Command and Administrative Network
ACIC	Aeronautical Chart and Information Center
ACD	Airlift Communications Division
ACR	Alaska Communications Region
ACS	Alaskan Communications System
ADC	Aerospace Defense Command
	Air Defense Command
ADWS	Automatic Digital Weather Switch
AFAFC	Air Force Accounting and Finance Center
AFAMPE	Air Force Automated Message Processing Exchange
AFB	Air Force Base
AFCC	Air Force Communications Command
AFCS	Air Force Communications Service
AFDAA	Air Force Data Automation Agency
AF DATACOM	Air Force Data Communications
AFGWC	Air Force Global Weather Central
AFLC	Air Force Logistics Command
AFS	Air Force Station
AFSC	Air Force Systems Command
AFSATCOM	Air Force Satellite Communications
AIRCOM	Air Force Communications Complex
AIRCOMNET	Air Force Communications Network
AIROPNET	Air Force Operations Network
ALMEDS	Alaskan Meteorological Data Systems
AMPE	Automated Message Processing Exchange
ANG	Air National Guard
ATC	Air Training Command
	Air Traffic Control
	Air Transport Command
ATCALS	Air Traffic Control and Landing Systems
ATCP	Automated Technical Control Program
ATP	Automated Telecommunications Program
ATRC	Air Traffic Regulation Center
AT&T	American Telephone and Telegraph
AUTODIN	Automatic Digital Network
AWDS	Automated Weather Distribution System
AUTOSEVOCOM	Automatic Secure Voice Communication Network
AUTOVON	Automatic Voice Network
AWN	Automated Weather Network
AWS	Air Weather Service
BADGE	Base Air Defense Ground Environment System
BIDDS	Base Information Digital Distribution System
BISS	Base and Installation Security System
BMEWS	Ballistic Missile Early Warning System
CAA	Civil Aeronautics Administration
CAC	Caribbean Air Command
	Continental Air Command
CAMS	Core Automated Maintenance System
CESO	Communication-Electronics Support Office
CO	Commanding Officer
COMEDS	Continental United States Meteorological Data System

COMLOGNET	Combat Logistics Network
DCA	Defense Communications Agency
DCO	Dial Central Office
DDN	Defense Data Network
DEB	Digital European Backbone
DECCO	Defense Commercial Communications Organization
DEW Line	Distant Early Warning Line
DMATS	Defense Metropolitan Area Telephone System
DMSP	Defense Meteorological Satellite Program
DOD	Department of Defense
DPI	Data Processing Installation
DSCS	Defense Satellite Communications System
DSTE	Digital Subscriber Terminal Equipment
EAME Area	European, Africa, and Mid East Area
ECA	European Communications Area
ESC	Electronics Security Command
ESD	Electronics System Division
ETS	European Telephone System
EURMEDS	European Meteorological Data Systems
FAA	Federal Aviation Agency/Administration
FDEP	Flight Data Entry Printout
GCA	Ground Control Approach
GCCS	Global Command Control System
GEEIA	Ground Electronics Engineering and Installation Agency
GI	Government Issue
GLOBECOM	Global Communications System
GWEN	Ground Wave Emergency Network
HF	High Frequency
IDCSP	Initial Defense Communications Satellite Program
ILS	Instrument Landing System
I-S/A AMPE	Inter-Service/Agency Automated Message Processing Exchange
ISDN	Integrated Services Digital Network
JACSPAC	Joint Airways Communications System Pacific Ocean Areas
JCS	Joint Chiefs of Staff
LAN	Local Area Network
LORAN	Long-Range Navigation
MAC	Military Airlift Command
MARS	Military Affiliate Radio System/Amateur Radio System
MATCon	Military Air Transport Command Communications Center
MATS	Military Air Transport Service
MEDS	Meteorological Data Systems
MTCIP	Manual Technical Control Improvement Program
NABS	NATO Air Base Satellite
NASA	National Aeronautics and Space Administration
NATO	North Atlantic Treaty Organization
NCA	Northern Communications Area
NEXRAD	Next Generation Weather Radar
NORAD	North American Air Defense Command
NOTAM	Notice to Airmen
OCCM	Office of Commercial Communications Management
OIS	Office Information System
PACAF	Pacific Air Forces
PACMEDS	Pacific Meteorological Data Systems
PATCO	Professional Air Traffic Controllers Organization
PCA	Pacific Communications Area
RAF	Royal Air Force
RCA	Radio Corporation of America
ROAMA	Rome Air Material Area

SAC	Strategic Air Command
SACCA	Strategic Communications Area
SAGE	Semi-Automatic Ground Environment
SAMSO	Space and Missile System Organization
SARAH	Standard Automated Remote to AUTODIN Host
SCA	Southern Communications Area
SEACR	Southeast Asia Communications Region
SEAMARF	Southeast Asia Military Altitude Reservation Facility
SESS	Space Environment Support System
SHORAN	Short Range Aid to Navigation
SRT	Standard Remote Terminal
STRATCOM	Strategic Communications System
TAC	Tactical Air Command
TACAN	Tactical Air Navigation
TACCA	Tactical Communications Area
TCC	Telecommunications Center
TERPS	Terminal Instrument Procedures
TRACALS	Traffic Control and Landing Systems
TRI-TAC	Joint Tactical Communications Program
UHF	Ultra High Frequency
US	United States
USAF	United States Air Force
USAFE	United States Air Forces in Europe
USAFSS	United States Air Force Security Service
VHF	Very High Frequency
VOR	VHF Omnidirectional Range
VORTAC	VHF Omnidirectional Range/Tactical Air Navigation
WACS	White Alice Communications System
WATS	Wide Area Telephone Service
WICU	Weather Intercept Control Unit
WISP	Weather Intercept Search Position

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