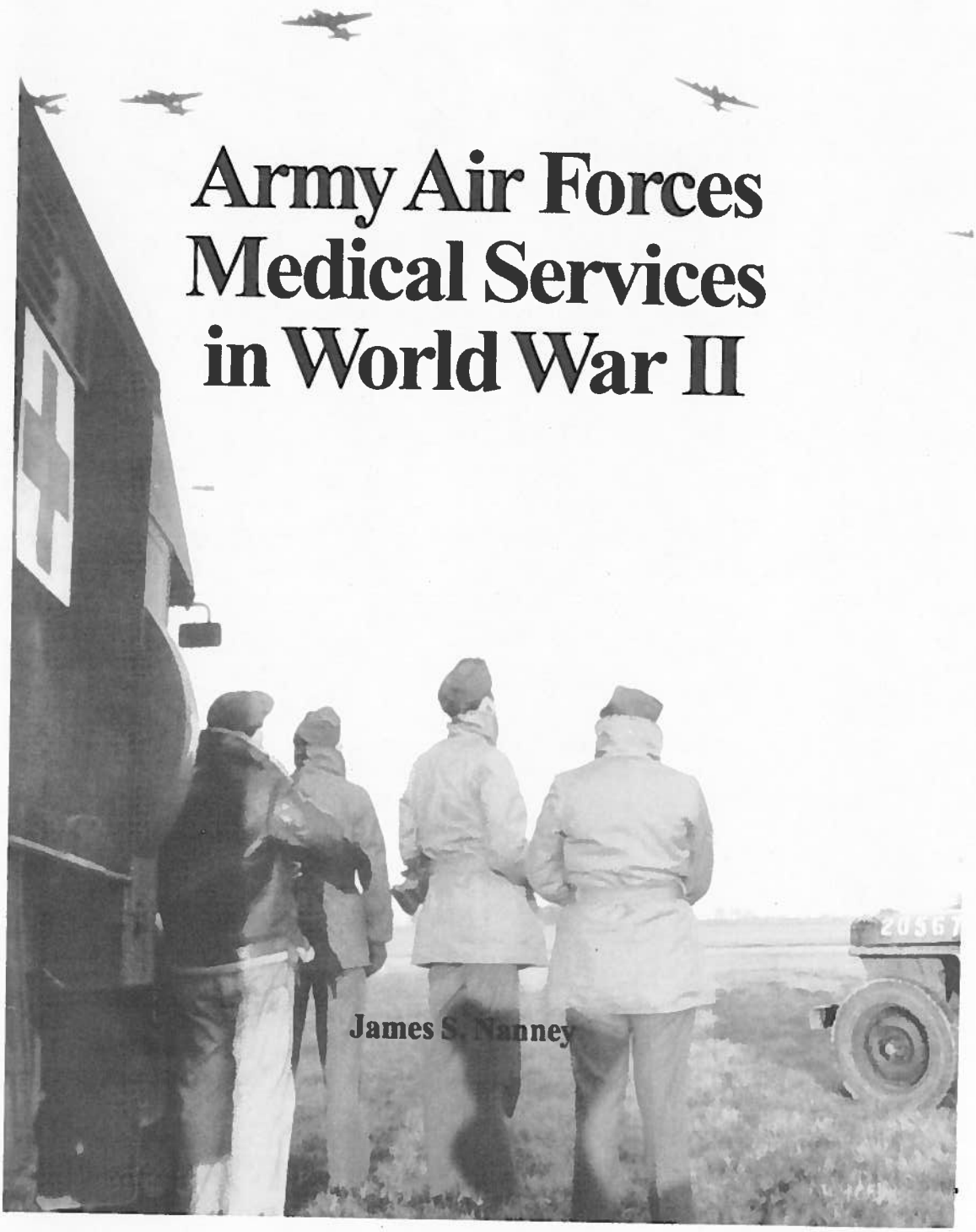
The U.S. Army Air Forces in World War II

Army Air Forces Medical Services in World War II



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Army Air Forces Medical Services in World War II

This history summarizes the Army Air Forces (AAF) medical achievements that led to the creation of the Air Force Medical Service in July 1949. When the United States entered World War II, our nation's small aviation force belonged to the U.S. Army and relied on the Army medical system for support. The rapid expansion of the AAF and the medical challenges of improved aircraft performance soon placed great strain on the ground-oriented Army medical system. By the end of the war, the AAF had successfully acquired its own medical system oriented to the special needs of air warfare. This accomplishment reflected the determined leadership of AAF medical leaders and the dedication of thousands of medical practitioners who volunteered for aviation medical responsibilities that were often undefined or unfamiliar to them. In the face of new challenges, many American medics responded with hard work and intelligence that contributed greatly to Allied air superiority.

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U.S. Air Force Surgeon General (September 1994–November 1996)

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INTRODUCTION

The Army Air Forces (AAF) relied on many types of medical support in World War II. One of the greatest medical contributions was research and development of personal survival gear and equipment for fighter and bomber crews. AAF doctors, for example, helped design the first flying suits that countered the physiological effects of the excess gravity forces (*g*-forces) in high-speed maneuvers. Aided by the U.S. Navy and organizations in Allied countries, the AAF Aeromedical Laboratory at Wright Field, Ohio, developed the first clothing designed successfully to counteract the negative effects of *g*-forces. Early in 1944, U.S. crewmen began to use the G-suits in Europe. G-suits were tactically valuable because they helped fighter pilots maintain consciousness under high gravitational forces. One P–51 pilot, who was credited with shooting down five enemy planes on one sortie, wrote:

> I found myself all alone in the middle of a bunch of Jerrys. Having no one to keep Jerry off my tail I had to keep full throttle and keep my air speed sufficient so that I could break away from anyone coming up on my tail. This maneuver would normally black me out but my G-suit kept me fully conscious of what was going on. I followed Jerry down to the deck, picking up an air speed of 600 mph. The Jerry went straight in without pulling out, and I would have, too, if I had not been wearing my G-suit.

The G-suit worn by this AAF fighter pilot helped him remain conscious under the stresses of extreme gravitational forces.

AAF Air Surgeon Maj. Gen. David N. W. Grant

Because of the special needs of such pilots and crewmen, the AAF during World War II often required and obtained its own support services, separate from those of the ground forces of the U.S. Army. Early in the war, the commander of the AAF, Gen. Henry H. "Hap" Arnold, decided to try to obtain his own system of AAF medical support. By war's end, AAF Air Surgeon Maj. Gen. David N. W. Grant had forged a medical service that was largely autonomous, although still subject to the authority of the Army Medical Department.

Two other notable AAF medical leaders were Malcolm Grow and Harry Armstrong, who directed the AAF medical program that helped aircrews cope with many new challenges in Europe. Grant, Grow, and Armstrong were the best of a highly educated group of AAF medical professionals, many of whom volunteered to leave private practice to cope with new aeromedical challenges in distant theaters of war. On the home front, the AAF also administered a large network of hospitals and convalescent centers, and its programs in medical research, development, and training prevented many deaths, wounds, and illnesses in combat theaters. By the end of the war, the AAF had laid a foundation for the independent Air Force Medical Service created in July 1949.

AAF Medical Independence

Throughout the war, Air Surgeon Grant disagreed with the Army Surgeon General over the amount of independence the AAF medical system needed to fulfill its mission. Grant agreed with AAF leaders that the special matériel features of air warfare required a separate air force supply

and logistics system, and he urged his military superiors to recognize the special needs of aerial combat and to give the AAF medical service the same degree of independence from the Army that most other portions of the AAF already had been given.

General Grant had developed his ideas on medical independence before World War II. In 1938, he graduated from the Air Corps Tactical School, the home of air power theory, which held that air power was a separate arm deserving a separate commander and support structure. The Tactical School produced many leaders who promoted an independent Air Force during World War II. Grant was the first and only medical corps officer to graduate from the school before Pearl Harbor. He was influenced by air power theory and by his readings on Dr. Theodore C. Lyster, the air surgeon in World War I who achieved a small measure of independence. After graduation from the Tactical School, Grant was assigned to England as an AAF medical observer—an assignment that allowed him to study the aeromedical problems of the Royal Air Force (RAF) in the Battle of Britain. In October 1941, Grant became Chief Air Surgeon of the Army Air Corps.

At the start of World War II, military airplanes were flying much faster and higher than ever before, creating new medical problems for aircrews. This technological revolution in aviation was yet another argument for a medical service specialized in aeromedical support. In fact, the AAF achieved some medical independence in March 1942 when a reorganization made the AAF equal with the Army Ground Forces (AGF) and Services of Supply (SOS). General Arnold, the AAF commander, was granted authority over some medical facilities, their patients, and the medical staff who cared for them. Air bases soon received surgeons and a medical reporting system was established. But official control of major logistical functions, including medical support, was delegated to the SOS, which evolved into the Army Service Forces command. The Army Surgeon General, who was subordinate to the SOS command, continued to claim ultimate jurisdiction over AAF medical services, a claim that crossed organizational boundaries. This boundary crossing caused problems. First, it prevented the highly mobile AAF, which sometimes created bases far from Army bases, from setting its own sanitary standards and procedures to prevent infection. Second, in combat theaters the AAF lacked its own station and general hospitals. Without them, it had to transfer many patients to Army theater hospitals where those patients often became administratively lost to the AAF. Because patients' medical reports were routed through long administrative channels, the AAF theater commander found it difficult or impossible to get reliable information on the health of the command.

Grant argued that there were other problems. Early in the war, there were not enough Army specialists trained in aviation medicine to adequately staff both combat units and Army hospitals abroad and in the

Having been flown in from a war zone, this Eighth Air Force airman, seriously wounded by enemy flak, is transferred from the evacuation airplane that brought him in from the fighting to an ambulance that will take him to a station hospital for more extensive treatment and surgery.

United States. To AAF leaders, it seemed that the theater SOS handled the medical logistics and facilities of AGF units much more rapidly and effectively than it handled those of AAF units, thereby forcing AAF medics to devise their own makeshift supply lines and facilities. In sum, the Air Surgeon thought that the Army Medical Department was not committed to giving the AAF fair and adequate medical support.

Although Grant failed to win medical independence abroad during World War II and was denied permission to set up AAF general hospitals in the United States, he obtained a considerable level of independence in 1943 for AAF station hospitals in the United States. He issued to the station hospitals equipment normally found only in general hospitals, and he used those hospitals to receive AAF patients directly from abroad.

The Army Surgeon General opposed Grant's independent actions. In November 1943, citing a shortage of surgical specialists, the Army Surgeon General proposed a virtual prohibition on elective surgery in AAF

hospitals in the United States—an action that would effectively reduce them to dispensaries. In February 1944, Grant and Arnold countered with a request for a separate, integrated AAF hospital system, both at home and abroad, to furnish continuous care for AAF patients in venues from combat theaters to highly specialized stateside AAF treatment centers. Grant noted that the AAF had already created their own repair and maintenance depots in Great Britain, separate from the Army theater SOS. But the Army Surgeon General was convinced that the AAF did not need its own hospital system.

To deal with this crisis and with complaints about the medical care given AAF combat crews in Great Britain, President Franklin D. Roosevelt sent a special team to Europe in March 1944. The team chief, Dr. Edward A. Strecker, then consultant in psychiatry to the secretary of war, was accompanied by Grant and Army Surgeon General Maj. Gen. Norman T. Kirk. Strecker and Kirk reported that the alleged problems in Europe were exaggerated. Grant was reluctant to make major changes on the eve of the Normandy invasion and he accepted the majority opinion, even though surveys showed that many workdays were being lost because of the lack of a separate AAF hospital system.

The same issue arose in the Pacific theater. Starting in August 1944, special medical problems of the Very-Long-Range Bomber Program against Japan prompted the Air Surgeon to ask for a separate AAF hospital system for the XX Bomber Command in the Pacific. This request also was rejected.

Despite setbacks, Grant had almost realized his ambition by 1945: the AAF medical service was basically independent in fact, if not in name. In January 1945, the AAF controlled almost 70,000 beds. Most of the beds were in the United States in 200 station hospitals, thirty regional hospitals, and seven convalescent centers. Abroad, the Air Transport Command (ATC) operated its authorized dispensaries basically as station hospitals, and many other AAF dispensaries overseas operated in the same mode.

The Medical War at Home

Medical support for American fliers abroad depended on several aeromedical functions in the United States. The medical service was responsible for selecting those young volunteers who were most qualified physically and mentally to fly combat aircraft. Newly recruited AAF doctors, nurses, and medical technicians needed training in military and aviation medicine. Researchers had to use the nation's most advanced laboratories to solve new aeromedical problems. And seriously ill or injured airmen had to receive specialized treatment, rehabilitation, and convalescent care. The medical service at home went to work on all of these tasks.

Aeromedical research, like that shown above, was a major component of the AAF medical system's work in the United States during World War II.

Advances in aeromedical research and development ranged from basic research on the physiology of flight to the design of flight instrumentation and aircrew support systems. Improved oxygen equipment and pressurized cabins for bombers received high priority. The first successful G-suits were produced, safer bailout methods were explored, and a night vision training program was started.

Aeromedical research was truly a national program. Advances like the G-suit were developed with the assistance of researchers in Allied countries, civilian contract researchers, and specialists of the U.S. Navy. The Naval Medical Research Institute supplemented the AAF work done by the School of Aviation Medicine and the Aeromedical Research Laboratory at Wright Field. In several areas, however, the AAF led the other services. In the field of patient convalescence, for example, the AAF inaugurated treatment that stressed early patient involvement in work-related training programs. AAF patients returned to duty much faster than patients who were less active when recuperating.

Recruitment and Training of Medical Personnel

Apart from research and development, the main business of the AAF medical system in the United States was recruitment and training. The AAF medical recruiting campaign, designed by Assistant Air Surgeon Col. Wilford H. Hall, acquired about 8,300 doctors and 3,700 nurses before the

Normandy invasion in June 1944. Another 4,980 nurses came from the Army and other agencies. Enlisted medics came from the Army's draft pool and often had no medical training when they were assigned to the AAF. Training those new medics was the responsibility of the AAF Training Command Surgeon, Brig. Gen. Charles R. Glenn.

From 1941 to 1943, most volunteer doctors in the AAF worked as aviation medical examiners, giving physical and mental examinations to candidates for skilled flying jobs as pilots, navigators, bombardiers, and aerial gunners. At the AAF aviation cadet centers, the cadets were tested physically for general health, motor skills, eyesight, hearing acuity, and other physical traits that predicted success in flying school. Applicants also received a battery of twenty psychological tests dealing with mental and physical alertness, intelligence, learning ability, memory, attention, and emotional stability. These psychological tests predicted a cadet's success in training and operations, although more accurately for pilots and navigators than for bombardiers.

Administering a standard test soon became tedious and boring to most volunteer doctors, so the AAF gave each of them an opportunity to learn the more advanced skills of a flight surgeon. The didactic classes were administered by the School of Aviation Medicine (SAM) at Randolph Field, Texas. The subjects were general aviation medicine and AAF medicine, including nutrition, physical fitness, and convalescence. To show some of the physical and mental stresses of flying, the program after July 1944 included an introduction to flight, including some hours in

Testing flight training candidates was another AAF medical system task on the homefront. Here, a doctor assesses a potential airman's eye muscle balance using a green refractor.

BT–13 trainers with a flight instructor. SAM graduates preparing to deploy to combat theaters learned about field aviation operations from the Tactical Unit Surgeon's Course at the AAF School of Applied Tactics in Orlando, Florida. From August 1940 to V–J Day, about 4,600 doctors passed the basic aviation medical examiner program. Approximately 50 percent of those doctors satisfied further learning and experience requirements and were rated as full-fledged flight surgeons.

The stateside medical instructional cadre also helped train two other critical specialists in combat units: the unit oxygen officer (from May 1942 to May 1943) and the personal equipment officer (from May 1943 to September 1945). Combat units quickly saw the need to make one officer totally responsible for their oxygen equipment, and a May 1943 regulation expanded this responsibility to include protective (armor) and emergency equipment.

Starting in March 1942, the High-Altitude Training Program was another responsibility of AAF medics. At several AAF bases, a team of aviation physiologists, directed by the base surgeon, used a large, low-pressure chamber to introduce fliers to the effects of high altitude. Within a year, the AAF had sixty-five high-altitude chambers. By November 1944, this program had given introductory high-altitude flights to 623,000 airmen, usually in groups of twenty. The original purpose of the training program was to identify those servicemen who could handle the stresses of

World War II produced the first flight nurses and established such nursing as a specialty of medical education.

At the AAF Tactical Center in Florida, a sergeant and a flight nurse train for duty on an aeromedical evacuation team, where giving blood plasma infusions and pain-easing hypodermic injections will be routine.

low pressure; but in the summer of 1943 the emphasis changed to teaching airmen how to survive at high altitude and especially how to prevent illness or death from lack of oxygen (anoxia). The anoxia prevention program contributed to a fourfold drop in the accident rate and a threefold drop in the fatality rate in the Eighth Air Force. The altitude chambers also proved valuable as diagnostic aids, sometimes revealing unusual problems. One combat pilot who complained of severe headaches at high altitude was given three chamber flights without access to an altimeter. His medical examiner wrote:

> Although actually far below, he developed a headache when told that he was above 20,000 feet. When he was told he was going down, but was actually taken up 5,000 feet, his headache improved but he complained of "clogged" ears. One hour and fifteen minutes at 30,000 feet produced no headache when he thought he was at 15,000 feet. On the way down he was told he was going up to 30,000 feet; at 15,000 feet he developed a headache. This man's symptoms were not organic.

In the United States, AAF medics trained at several bases. AAF enlisted medical technicians trained mostly at Warner Robins Field, Georgia, as members of the various types of small medical units authorized by the AAF. Specialized nurses' training consisted mainly of flight nurse training at Bowman Field, Kentucky, starting in November 1942. On June 23, 1943, the aeromedical training program at Bowman Field—which also

trained medical officers and enlisted men in aeromedical evacuation—was named the AAF School of Air Evacuation, the first of its kind in the world. Just as World War I produced the first flight surgeons, World War II produced the first flight nurses, a specialty that had been promoted since 1932 by civilian Lauretta M. Schimmoler, founder of the Aerial Nurse Corps of America. Early in the war, General Grant personally encouraged creation of the flight nurse specialty and the aeromedical school.

Aeromedical Evacuation

The U.S. armed forces had their first large-scale experience with aeromedical evacuation during World War II, in which 672,000 Americans were wounded—almost four times the number in World War I. Because incapacitating wounds or illnesses frequently occurred in areas remote from modern medical facilities, providing care to soldiers and airmen often required aeromedical evacuation. Even in western Europe, aeromedical evacuation offered both medical and logistical advantages. More than one million patients were successfully moved by air during World War II. Although most patients in the war still traveled by ground and water transport, aeromedical evacuation clearly showed a potential for expansion in future wars.

Early informal aeromedical operations began in the Pacific theater and in Asia. In 1942, U.S. and other Allied forces clashed with Japanese invaders in China, Burma, and the southwest Pacific region. If they existed at all, most sea and land routes from the fighting in those remote areas inhibited rapid medical evacuation. Cargo and troop carrier planes returning from the front were the only swift means of medical evacuation. The famous C–47 Skytrains often functioned as medical evacuation craft. Air evacuation routes that crossed mountain barriers and submarine-infested waters ended at general hospitals in New Caledonia, New Hebrides, and Australia.

Despite the successful inauguration of aeromedical evacuation in the southwest Pacific in 1942, in-theater aeromedical evacuation needed many improvements in organization, equipment, and training. In November 1942 at Bowman Field, training began for medics who would form AAF aeromedical squadrons consisting of several flight crews, each with a surgeon, nurses, and technicians. The squadron had no aircraft of its own, but its members boarded ATC aircraft when these were loaded with wounded returning from another mission. The first squadrons deployed in early 1943. Some went to the Pacific theater and some to North Africa, where the U.S. and Allied troops soon needed aeromedical evacuation.

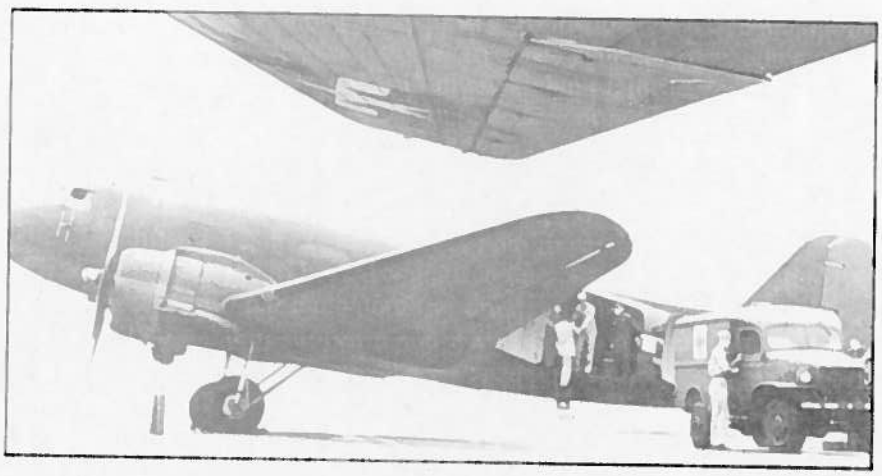
Air evacuation became critical in mid-January 1943, when U.S. forces pushed eastward into southern Tunisia, where there were few hospitals,

An AAF medic checks a wounded soldier's identification tag during an evacuation flight.

roads, or railways. Motor ambulances took twelve to fifteen hours to reach the nearest medical facility in Constantine, Algeria, and hospital trains took twenty to twenty-four hours; air evacuation took only one hour. Larger hospitals in Algiers and Oran were only ninety minutes away. In the last attack on Tripoli, almost all patients were evacuated by air. Patients seriously ill or injured departed on air ambulances, and patients with minor injuries left on transport planes. Although still new and imperfect in some respects,aeromedical evacuation quickly proved its worth.

As it had in the Pacific, the C–47 soon became the aeromedical workhorse in Tunisia. Most C–47 transports carried an evacuation kit containing blood plasma, oxygen, morphine, portable heaters, first aid medicine, and various bandages to control hemorrhaging. Flight surgeons selected patients for air evacuation but usually accompanied only flights with many serious or critical patients. The standard evacuation flight crew consisted of medical technicians and flight nurses, many of whom had been airline stewardesses before the war. The C–47 usually carried eighteen litter patients. Although many nonmedical personnel, especially transport and ground crews, were involved in aeromedical evacuation, the patients received excellent care. By May 29, 1943, the Twelfth Air Force had airlifted 15,000 patients from Tunisia, with only one death in flight.

Operation Husky, the invasion of Sicily, started on July 10, 1943, and air evacuation began four days later. Two-hour flights to North Africa continued nonstop until the operation ended with the capture of Messina on



The C–47 was the aeromedical workhorse in the Pacific theater and in North Africa.

August 17. The total number of patients evacuated by air from the U.S. sector was 4,755. About one-half were litter patients. Ships also evacuated many casualties because a number of commanders and doctors still had concerns about the safety of aeromedical evacuation.

U.S. landings at Salerno on September 9, 1943, began Operation Avalanche, the invasion of the Italian mainland. The 802d Aeromedical Evacuation Transport Squadron began operations seven days later. U.S. aeromedical squadrons supported both U.S. forces fighting up the western coast of Italy and British forces moving up the eastern coast.

The Tunisian and southern Italian campaigns, supported by aeromedical evacuation squadrons of the U.S. Twelfth and Ninth Air Forces, conclusively demonstrated the safety of aeromedical evacuation. The method proved suitable for every type of patient except those in shock who could tolerate no movement at all. It was suitable day and night, barring those rare occasions when the Allies did not have air superiority in the combat region. Air Surgeon Grant wrote that

> Many seriously wounded soldiers, while still under surgical anesthesia, were evacuated by air from the Anzio beachhead in Italy, but, thanks to expert nursing care, there were no deaths or ill effects in flight. In 1943, cargo and troop carrier planes stationed in the Mediterranean evacuated about 61,000 patients. Although about one-half of the evacuees were litter patients, only one patient died in flight.

The aeromedical evacuation flights, however, put many nurses and other medical personnel at great risk of death or injury. In November

1943, for example, a group of thirteen flight nurses and seventeen medical technicians in a transport plane went down in bad weather in German-held Albania and had to trek several weeks over snow-covered mountains before they were rescued on the coast of the Adriatic Sea.

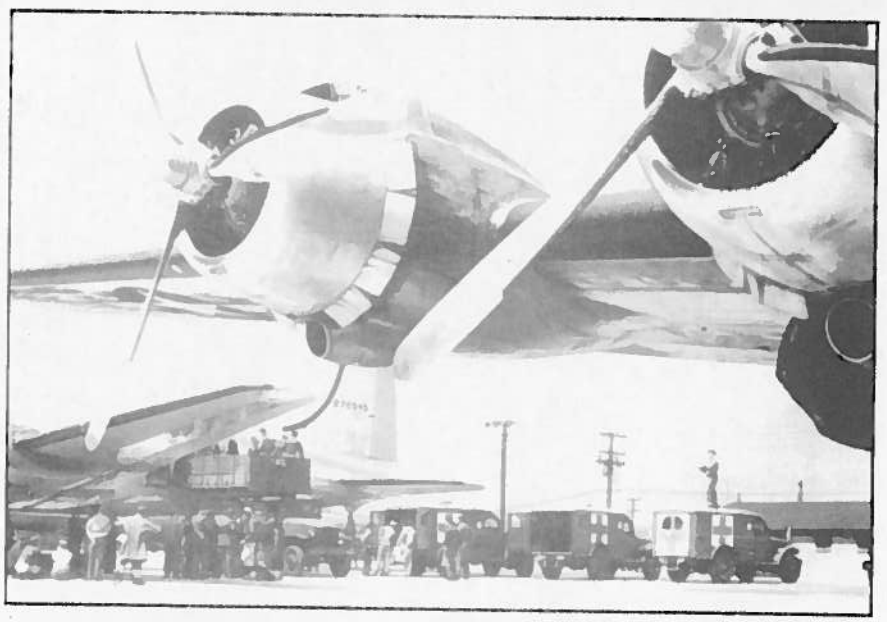
When aeromedical evacuation was in its infancy during 1942, a shortage of long-range transport planes limited air evacuation to the United States. Air Surgeon Grant nevertheless made plans and arrangements for a transoceanic system. In June 1942, the War Department established the ATC to move equipment, cargo, and high-priority personnel between theaters. In September of that year, the command began to assign high priority to sick and wounded patients returning to the United States. The January 1943 participation of Army nurse Elise Ott in a pathbreaking trip with five patients from Karachi in India (now in Pakistan) to Bolling Field, Washington, D.C., proved the feasibility of global aeromedical evacuation.

New, more powerful C–54 Skymasters soon became available, making possible the first scheduled medical evacuations from the United Kingdom to the United States in the summer of 1943. By the end of the year, preparations were under way to set up a similar route from North Africa. The transoceanic system, however, was still experimental, and most of the relatively few patients evacuated by air from Europe or Africa in 1943 were mainly ambulatory cases needing little medical attention.

This was also true in the Pacific theater. The ATC moved a monthly average of twenty-one patients from Pacific regions to the United States starting in March 1943. Large-scale evacuation from the Pacific did not begin until late November and December of that year, when five C–54s evacuated casualties from the invasion of Tarawa in the central Pacific. ATC moved 3,260 patients to the United States and another 5,400 patients

Nurse Katye Swope, a member of the 802d Medical Air Evacuation Transport Squadron, checks the litter patients aboard a plane evacuating wounded troops from Agrigento, Sicily, to Africa in July 1943.

A wounded airman is lifted into a Douglas C–39 air ambulance for transport to a hospital.



C–54 Skymasters like those shown here evacuated thousands of combat casualties from Great Britain.

between theaters during 1943. The stage was set, however, for much larger transoceanic operations in 1944 and 1945. By September 1945, ATC evacuations to the United States accounted for about 5 percent of the total 1.34 million air evacuations made during the war.

U.S. operations in 1942 and 1943, both in the Pacific and in Europe, presented several challenges for aeromedical evacuation. Poor communications hampered aeromedical planning and patient regulating. Medical crews had trouble returning litters, blankets, and medical equipment to the front. Because litters were not standardized among the Allies, fixed litter mounts were inconvenient or unusable. Many airfields had no medical holding facilities. Heating, air conditioning, and food service were inadequate or unavailable on most cargo and troop carrier planes. Stationing and rotation of aeromedical evacuation crews was difficult to streamline. Fortunately, these problems were not insurmountable.

By the end of 1943, the AAF aeromedical evacuation system was ready to assume larger responsibilities in Operation Overlord. Medical planners were especially busy. The Normandy invasion and the concluding attack on Germany produced the largest, most intense aeromedical evacuation operations of the war. Total AAF aeromedical evacuations more than doubled during the assault on western and central Europe from June 1944 to May 1945. When European hospitals filled to capacity during the Battle of the Bulge in the winter of 1944–45, patients flew directly to Mitchel Field, New York, just three days after they were wounded.

When the war ended in September 1945, it was clear that air evacuation, despite its early problems, was at least as safe as ground and sea evacuation. The improvement in patient comfort and medical care was evident, and notable reductions in medical and logistical costs had been achieved. Airplanes saved sick or wounded patients many painful, uncomfortable hours en route to a hospital, and more rapid arrival at definitive medical care reduced deaths and speeded recovery. Ground transportation for nonmedical items and troops also became more efficient when patients traveled by air. Gen. Dwight D. Eisenhower, commander of the European Theater of Operations, thought that air evacuation was as important as other World War II medical innovations—sulfa drugs, penicillin, blood plasma, and whole blood—in reducing the fatality rate of battle casualties. He told the press, "We evacuated almost everyone from our forward hospitals by air, and it has unquestionably saved hundreds of lives, thousands of lives."

After the war, the many advantages of aeromedical evacuation became apparent to the Army Medical Department and other defense officials. Secretary of Defense Louis B. Johnson recognized this lesson of the war in September 1949 when he announced that aeromedical evacuation was now the preferred means of transporting the sick and wounded, both in peacetime and in war.

Aeromedical evacuation personnel brought casualties from the invasion of Normandy in June 1944.

Aeromedical Operations in North Africa and the Mediterranean

The AAF faced its most difficult aeromedical challenge when the Allies attacked Adolf Hitler's "Fortress Europe," first from North Africa and then from Great Britain. Many AAF medical personnel joined the fighting abroad with little or no specialized training in wartime or aviation medicine. The early AAF medical problems vindicated General Grant's insistence on AAF medical autonomy. The size of the Mediterranean theater often forced Army and AAF units to deploy to different places, making it impossible for AAF medics to depend on regular Army supply facilities and hospitals. Although the theater commander quickly saw the need to hand over some Army medical facilities to the AAF, AAF combat units had no hospitals close to the front until March 1943. No Army hospitals were located east of Algiers, and that created a critical hospital shortage for AAF units advancing into Tunisia. After March 1943, the Army finally assigned the AAF one evacuation hospital in Constantine, Algeria. But the first Army hospital truly attached to an AAF unit was the 34th Station Hospital, established in June 1943.

As the Allies forged ahead to southern Italy and the islands of Sardinia and Corsica, the Surgeon of the North African theater agreed that Army fixed hospitals should be attached to AAF units. This allowed the AAF commander-in-theater to move the hospitals as needed without coordinating the moves with the overall theater headquarters. Between 1943 and March 1945, more than ten Army hospitals were attached to the AAF in the Mediterranean region. This remedied many AAF medical administration problems. Starting in March 1944, Army medics in the attached

hospitals could no longer reclassify airmen patients for limited duty only; all such patients and their records returned to the AAF unit commander.

Serving the Twelfth and Fifteenth Air Forces, the attached hospitals operated under the AAF Service Command, which in July 1944 was authorized to deal directly with supply authorities in the United States rather than go through the Army SOS in theater to obtain medical supplies. In effect, the AAF soon set up its own medical service distinct from that of the Army but acting in harmony with it.

These reorganizations, however, failed to prevent many medical difficulties at the remote air bases in theater. No AAF medical dispensaries were available in 1942, and much time and effort were needed to improvise satisfactory medical support at each air base. In the summer of 1943, laboratory equipment for examinations finally arrived in theater, and refrigerators, heating units, and beds were fashioned from scrap metal.

Flight surgeons started to fly a few missions to get a feel for aerial combat, and the diagnosis "flying fatigue" emerged for aircrews whose efficiency declined after a long or intense period of combat. Nervous disorders accounted for most of the flying casualties in the Twelfth Air Force from November 1943 to May 1944. These problems continued among overworked and overstressed AAF fliers throughout the war, in all combat theaters. The problem was not new or unique to the AAF. It had been identified in World War I among ground troops as "shell shock" and "war neurosis." But the problem had some unique features, AAF medics found, when it appeared among a group of specially selected, well-trained, highly intelligent aerial warriors. AAF psychiatrists had to devise some new procedures to diagnose the problem, distinguishing it from true cowardice, and then treat it effectively. Prevention depended on proper leave policies, and treatment later involved leave at special AAF rest homes.

In North Africa, young AAF crewmen gradually learned the value of preventive measures for their mental and physical health. One bomber tail gunner who had never worn his protective helmet on forty-three previous missions was on a combat run near Rome when he finally decided to put his "steel pot" on his head. No sooner had he put on the helmet than a burst of flak destroyed his right window, knocking his helmet spinning from his head. He received multiple slight lacerations on the back of his neck from the Plexiglas. His helmet showed three distinct, large, deep dents in the right-posterior quadrant. One large fragment of flak was recovered from the floor. It was believed that the steel helmet saved the gunner from a penetrating wound of the head that would have been fatal. The helmet was placed on display on the squadron operations board to stimulate use of the steel helmet by other combat servicemen.

Air operations in North Africa also involved the successful use of air transport to move medical assets to the front. In July 1943, during the invasion of Sicily, the AAF flew in a 50-bed hospital from North Africa. The hospital was set up and receiving patients just two-and-a-half hours after

troops unpacked it from the cargo planes. Air transport began to show promise as the quickest way to deliver a medical facility to forward troops. Despite difficulties, AAF medics and crew members were learning to cope.

Aeromedical Challenges in Mounting an Attack from Great Britain

The medical lessons of the North African and Italian campaigns proved especially valuable after D–Day, June 6, 1944. The northern theater, however, already had a unique set of aeromedical challenges arising from the AAF buildup in Great Britain that started early in the summer of 1942 and the ensuing high-altitude Combined Bomber Offensive against Germany. Bombing Germany was eventually the greatest challenge, but merely getting established in Great Britain in 1942 and 1943 required extraordinary efforts, because many AAF units were out of reach of Army hospitals. The small AAF units needed at least two doctors, a dentist, and about fifteen enlisted medics. Because not enough Army medics were available at first to organize effective medical support for U.S. troops, the theater surgeon had to send about 30 percent of Army and AAF patients to British hospitals. The problem abated but was not solved in 1943 when more medics arrived in theater.

Construction of U.S. Army hospitals was generally slow, and British hospitals were understaffed and too distant from AAF bases. There were 5,600 AAF troops living near Burtonwood, England, but the nearest American hospital was seventy-five miles away. Although the AAF population at Burtonwood grew to 20,000, only one American dispensary became available for its medical service. London also had no American hospital, even though the city housed a large contingent of Eighth Air Force troops. The theater-stationing plan seemed to ignore medical considerations. Until early 1944, most AAF units were in northeast England, but the Army theater SOS installations were in the south. Almost half of Eighth Air Force troops in 1942 and 1943 were isolated from all medical facilities.

Eighth Air Force surgeon Colonel Grow had two ideas to reduce the damage caused by a shortage of AAF doctors. First, he suggested creating a "casual" pool of medical officers from which to assign personnel to isolated air groups. Although this idea was rejected, he was allowed to create small Medical Dispensary Detachments, Aviation, one for every 5,000 troops. The dispensaries were only partially motorized, but they were easily air transportable.

Although first-echelon support for the AAF was at last available, its value was limited. The European theater surgeon, Col. (later Maj. Gen.) Paul Hawley of the U.S. Army, prohibited the AAF from operating a medical facility intended to hold a patient more than four days. More advanced treatment would require evacuation to an Army facility. The AAF

A crew member of the 379th Bomb Group, wounded during a mission over enemy territory, is removed from the plane by an ambulance crew at an Eighth Air Force base in England in May 1944.

resisted this policy, in keeping with Air Surgeon Grant's views. General Grant wrote that medical care of AAF personnel "does not end with the squadron Flight Surgeon, but that to assure the maintenance of the striking force of the air command, medical service must include hospital, sanitary, and daily hygiene inspection facilities." In August 1942, Colonel Grow got permission to operate AAF rest homes for patients with flying fatigue. When the air surgeon later tried to convert them into de facto AAF hospitals, the Army's theater command denied the request.

Facilities were not the only problem. Medical supplies and equipment were also scarce in 1942 and 1943, and inexperienced personnel often handled them improperly. Until early 1944, the theater surgeon seldom filled Eighth Air Force medical supply requisitions. As a result, the Eighth Air Force set up its own Air Service Command, allowing medical and other supplies to flow to Great Britain through a depot at Newark, New Jersey, without passing through SOS channels. The AAF in Great Britain soon had its own medical supply distribution points at a few advanced depots.

Concern for his aircrews was Grow's chief motivation. He created a "Care of the Flyer" section on his staff and established a facility in Great Britain for AAF medical research, development, and training. In August 1942, when the air war over Germany began, the Provisional Medical Field Service School officially opened at High Wycombe, England, a small town northwest of London. The school's first task was to expand AAF understanding of the medical and psychiatric problems of combat aviators, and give aviation medical training to new arrivals in Europe. In 1942, about two-thirds of the Eighth Air Force medical staff had no aeromedical training, and only 10 percent of medics in tactical units had any training. Several bombers and their crews already had been lost because of the lack of trained medical officers.

To make sure the training at High Wycombe was suitable, Colonel Grow added a medical board, altitude training unit, psychiatric unit, and research and development unit. He appointed as its first director Col. Harry G. Armstrong, Medical Corps (MC), a prewar pioneer in aviation medicine, who renamed the whole facility the First Central Medical Establishment. A second such facility was created in the Pacific, and a third was created in March 1944 for the Ninth Air Force, which moved from North Africa to Great Britain in October 1943 to support the ground forces invading France.

Colonel Malcolm Grow

The medical research program at High Wycombe concentrated on high-altitude bombing and airplane ditching. Flying a series of bomb runs on Germany was one of the most dangerous and physically demanding tasks of the entire air war. Sortie rates were high because of AAF pressure to win an early aerial victory, and fighter escorts were not made available for the early missions. About one-fourth of the returning bombers had sustained some form of battle damage. The normal maximum tour of twenty-five (later thirty-five) missions in a heavy bomber (the most dangerous) left a crew member with less than a 50 percent chance of escaping death or physical harm. Only one-fourth of the crew members could expect to complete all twenty-five missions.

Colonel Harry G. Armstrong

Starting in 1942, preventing and reducing these casualties became the focus of medical research at High Wycombe. Some form of personal armor soon looked promising against the German flak and 20-mm cannon shells that began to ravage high-altitude bomber crews in 1943. A British firm, the Wilkinson Sword Company, produced a light armored suit of thin manganese plates to protect the chest and pelvic area. An improved helmet was soon added, and by January 1944 enough suits were available

to equip every crewman in heavy-bomber groups. The program worked. Armored crewmen had 75 percent fewer injuries and death from flak and cannon fire. There were many reports of the body armor's effectiveness, including the following:

> A 20-mm cannon shell exploded in the radio compartment of a B–17. A fragment of casing approximately 2 cm by 1 cm by 4 mm in thickness, struck the radio gunner in the left side of the abdomen. It spun him around but, being deflected by the armor, caused no wounds. The armor plate was bent but not penetrated. The gunner, slightly stunned by the impact, continued firing his machine gun throughout the action.

Medics at High Wycombe also helped prevent anoxia deaths at high altitudes. These deaths were caused both by inadequate training with oxygen equipment and by the faulty design of the first AAF oxygen masks, which often froze up at high altitudes (above 25,000 feet) and shut down the oxygen flow. Most anoxia deaths occurred among recently arrived crew members, whose lack of experience at high altitudes sometimes caused their oxygen masks to disconnect from the hoses. Training in the proper use of oxygen equipment began in March 1943 at the school unit at High Wycombe. High-altitude flights in training chambers were made available to almost everyone in the Eighth Air Force, including the medical staff, and training exposure to the first stages of hypoxia (shortage of

A crewman, wounded by flak during an Eighth Air Force bombing attack over a heavily defended German industrial target, strains against the escape hatch of the B–17 Flying Fortress "That's All Jack" as medical personnel transfer him to a waiting ambulance.

An air crewman gets help putting on a lightly armored but lifesaving flak suit.

oxygen) was especially valuable because it emphasized this silent danger that could kill quickly and unexpectedly. By September 1944, oxygen training was completely adequate. Meanwhile, designers improved the standard AAF oxygen mask by substituting a demand flow for a continuous flow system. And new pressurized oxygen systems succeeded in sustaining operations above 43,000 feet. From November 1943 to November 1944, oxygen programs reduced the anoxia accident rate by 80 percent and the anoxia fatality rate by 68 percent.

Cold injury was another worry. Frostbite casualties were caused by the extreme cold and wind blast in AAF bombers flying at high altitudes. Unheated sections of bombers were sometimes –60°F, and the open waist gunner windows were especially dangerous. Yet less than one-fourth of the aircrews arriving in Great Britain knew how to prevent frostbite at high altitudes. Extreme cold often hampered first aid efforts. A ball-turret gunner described one such instance:

> At 26,000 feet the tail gunner had both cheeks of his buttocks torn by a 20-mm shell. We had him lie face down and put a dressing on as well as possible. Bleeding continued so we put a 140-pound ammunition box directly over the wound. The pressure seemed to stop the bleeding. He rested comfortably but was almost frozen because his heated suit was torn and we had no blankets available.

In March 1943, in response to these problems with oxygen and cold temperatures, the Eighth Air Force designated one member of each unit the

"personal equipment officer." His principal duties were to maintain cold-weather clothing, protective gear, and oxygen equipment in perfect condition, and to train crews in their proper use. Personal equipment officers were ground officers because pilots, navigators, and bombardiers were usually too busy with their standard duties to perform equipment work properly. New personal equipment officers were trained at High Wycombe. Laboratories in the United States helped the technicians in Great Britain devise better electrical heating for flying suits, gloves, boots, and casualty bags. Engineers reduced wind blast by structurally altering the aircraft. By March 1944, for example, they closed the waist windows. Most of the training problems were solved by June 1944, and equipment improvements reduced the rate of cold injury during late 1944 and 1945.

Another problem in 1942 and early 1943 was the lack of an effective AAF air–sea rescue program for crews who ditched in the North Sea or the English Channel. There was an urgent need for smarter ditching procedures and faster rescue responses to support an expanded AAF role in the war. Fortunately, the RAF's Air–Sea Rescue Service was already able to save about one-third of the British crews who landed in the water. The British, therefore, helped the U.S. personnel at High Wycombe work out better ditching procedures and demonstrate them to Eighth Air Force crews and air–sea rescue units. New ditching and rescue procedures were established by Lt. Col. (Dr.) James J. Smith of the First Central Medical

Aeromedical pre-evacuation rescue efforts at crash sites helped save lives.

Establishment. In 1943 alone, these improvements saved the lives of about 650 Eighth Air Force men, about 43 percent of those who ditched.

Eighth Air Force medical researchers also had to tackle a special aviator's disease known as aerotitis media, an inflammation of the middle ear caused by the ear's inability to adjust between its internal pressure and that of the surrounding atmosphere. Aerotitis media was prevalent in all theaters because the cabins of most AAF planes had no pressure systems. It was especially troublesome among heavy-bomber crews in Europe, and there was no agreement in the first two years of the war on how to treat the problem.

A research program on aerotitis media was started in May 1944, concentrating on heavy-bombardment crews in the Eighth Air Force. It soon became clear that the principal cause was multiple descents after long flights at high altitudes. Respiratory disease could also contribute to the ear inflammation. Some improvement was available through radium treatment of the lymphoid tissue around the eustachian tube opening, but no single prevention or cure was discovered. The noneffective rate resulting from aerotitis media fell during the war, partly because of a fall in the rate of respiratory disease. There were no meaningful changes in protective equipment, preventive measures, or indoctrination to cope with the problem.

In January 1944, preparations for the invasion of Normandy affected medical assignments and organizations. The Eighth and Ninth Air Forces in Great Britain combined to form the United States Strategic Air Forces in Europe (USSTAF), with Gen. Carl A. Spaatz as commanding general and Brigadier General Grow as USSTAF surgeon. Colonel Armstrong became the new Eighth Air Force surgeon and continued to work with the incumbent Ninth Air Force surgeon, Col. Edward J. Kendricks, MC.

The U.S. air forces in northern Europe, unlike those in the Mediterranean, never acquired long-term control over fixed Army medical facilities. The medical service of the Ninth Air Force was limited to the flight line and dispensary level, except for some clearing stations in the aeromedical evacuation chain. Grant was not happy with this situation, but could do nothing about it; Grow and Kendricks thought it best not to press the issue, although they agreed that AAF control of fixed facilities would probably simplify the aeromedical evacuation of patients to AAF installations in the United States.

By 1944, AAF patients were receiving adequate care in Great Britain. The Army had set up several fixed hospitals, and AAF flight surgeons attached to them were effective in handling the disposition of AAF patients referred to Army facilities. Both the Eighth and Ninth Air Forces had adequate numbers of flight surgeons and other medics. The challenge was to preserve this medical care in future operations.

In March 1944, forty aviation medical dispensaries were activated to support the Normandy invasion. Because of their limited resources, these

Lt. Col. (Dr.) James J. Smith, *left*, established improved ditching and rescue procedures for aeromedical teams.

dispensaries could hold patients no longer than seven days. In AAF clearing stations that were formed from the 39th and 40th U.S. Army field hospitals and assigned to the Ninth Air Force, patients could remain no longer than fifteen days. The clearing stations, however, could function independently, unlike the aviation medical dispensaries. Some of the forty such dispensaries assigned to the Ninth Air Force joined the first waves of troops landing in Normandy; others stayed in England to care for returning AAF patients.

The range as well as depth of activity grew for AAF medics after D–Day. As the ground troops advanced toward Germany, most AAF medical units became more independent from their British medical counterparts and gave less support to British troops because USSTAF's goal in Operation Overlord was to preserve the autonomy of its combat and support forces—a goal that had not been possible in North Africa.

AAF medical units also began to evacuate Army and AAF patients to England. Responsibility for air evacuation belonged to commanders of the U.S. First Army, the theater SOS, and the Ninth Air Force. Invasion plans directed the Ninth Air Force to equip all transport aircraft with suitable litter racks, give medical care and treatment to all casualties in flight, give emergency medical care at airdromes, deliver casualties to airfields in Great Britain convenient to fixed hospitals, and try to use all aircraft returning from forward areas for patient evacuation. Air evacuation, however, would only supplement evacuation by road, rail, and sea, and would depend on the degree of air superiority, the tactical situation, and the weather. De-

tailed plans and operations for air evacuation were the responsibility of the commanding general of the Ninth Air Force troop carrier command and his air evacuation officer.

Successful aeromedical evacuation operations began informally and ahead of schedule after D–Day. By July 23, AAF medics helped fly to Great Britain 18,415, or 33 percent, of the total 55,674 American casualties. (The others went by sea.) The medical units of the Ninth Air Force offered first-echelon patient care in the aeromedical evacuation chain. Although air evacuation in July and August was unreliable, it proved valuable nonetheless. C–47 crews often found themselves assigned to ad hoc medical evacuation missions. One crew member recalled these flights:

> Often, after unloading supplies in some part of France or Belgium, we would be ordered to a different airfield on the Continent, where we might find a nurse, medical crew, and a group of wounded (either walking or litter cases) waiting for us to take them to a hospital base in Britain.

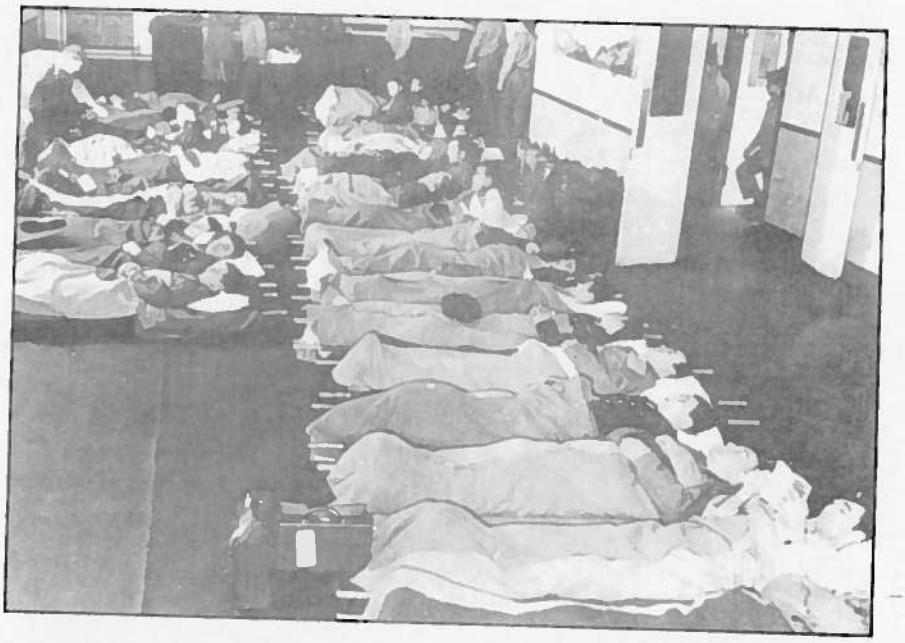
Lt. Margaret Murphy, U.S. Army flight nurse, and another member of the crew adjust traveling litters aboard an ATC C–54 Skymaster cargo plane. On return trips to the United States, the cargo craft operated exclusively as an air ambulance. Special litter supports made quartering wounded passengers swift and easy.

After D–Day, the ATC, European Division, evacuated more than 10,000 patients from Great Britain to the United States. The trip usually took twenty-four hours and included one stopover to change crew, refuel, and feed the patients.

One pilot flew a lot of missions supplying Gen. George Patton's tanks with fuel. According to the pilot's estimate,

> Maybe 50 percent of these flights finished by evacuating wounded men back to England. After off-loading the diesel there was always a scramble to install the litters and get the plane ready to receive the wounded soldiers.

On August 30, General Hawley, the chief surgeon in Europe, won approval for an expansion of air evacuation operations. He made air evacuation a separate mission not entirely dependent on cargo flights to the front, ordered airfields in France to function as patient destinations when weather did not allow landing in England, and established a formal method to inform the AAF commander about air evacuation needs. Hawley could not get approval, however, to dispatch empty cargo aircraft to the Continent simply to pick up patients. Grow's September 2 proposal to set aside fifty C–47s as dedicated air evacuation planes, under medical control, also met with disapproval.



In the "ready-room" at an air base in Great Britain, wounded Americans wait to be transferred to the C–54 Skymaster that will take them to Army hospitals close to home.

The limited air evacuation expansion was inadequate to meet all medical needs. By late September, a backlog of almost 7,000 patients on the Continent prompted the theater surgeon to resubmit the proposals for a dedicated air evacuation force. But the chief of staff in Europe, Lt. Gen. Walter B. Smith, again rejected the idea and directed the surgeons to consider air evacuation "a bonus to be available from time to time as conditions permit." When Lt. Gen. Omar N. Bradley, the commander of the Twelfth Army Group, asked for dedicated air evacuation, Smith again rejected the idea and wrote that "any evacuation system based on air transport will break down."

There was no question that transport and ground crews with little or no medical training sometimes had emotional problems in handling severely wounded patients. One mechanic wrote:

> Whenever they brought in the wounded, some of us would go up on the flight line and help unload those fellows. A few of us, I remember, couldn't handle that; they couldn't stand being near wounded people. Some of these had arms gone, legs gone, the sides of their faces shot away, holes in their bellies and more of that sort of thing. But somehow I was able to cope with this; I helped unload many of those poor fellows into ambulances.

Lower-level commanders, however, found ways to make the necessary cargo aircraft available. Some medical supplies were stored at airfields for opportune shipment forward, coinciding with requests for emergency air evacuation. Newly arrived C–47s from the United States were dedicated to air evacuation before they were reported to theater headquarters. Grow also got a squadron of twenty small UC–64 bush planes and dedicated them to medical missions. Based at Le Bourget Airdrome in France, they resupplied forward areas with blood and critical medical items. Equipped with three litters each, they evacuated 1,168 patients between September 23 and December 29, 1944.

Although Europe used air evacuation more than other theaters, especially from forward areas, many patients still traveled by ship—especially for evacuations from Europe to the United States; only 15 percent of such patients traveled by air. There were not enough transport planes or suitable patients to justify a more significant use of aeromedical evacuation to the United States.

Aeromedical Challenges in the Offensive Against Japan

AAF medics in the Pacific theater of operations confronted many medical challenges: sanitation, malaria control, and medical resupply, as

Men wounded in Pacific-theater combat are placed aboard a medical transport plane for evacuation in December 1943.

well as prevention and treatment of aircrew ailments such as aerotitis media and flying fatigue. Medical administration was also a challenge. Despite the importance of future air operations against Japan, the Army did not assign fixed hospitals to the AAF during the Pacific war, not even for the Very-Long-Range Bomber Program whose aircrews flew high-altitude B–29 missions. Medical support of U.S. fliers depended on Army medical facilities, which AAF medical leaders generally considered inadequate in many ways. The AAF medical response to these challenges, however, was flexible and appropriate, and the aerial fighting force was not seriously hampered by medical problems.

AAF medics were much more active in Asia and the Pacific than in Europe during the first year of the war. The Japanese had dealt the AAF heavy blows in Hawaii and the Philippines, and U.S. military leaders were eager to strike back and halt the Japanese advance southward toward Australia. In 1942, aiding the British in the China-Burma-India theater, AAF medics helped improvise aeromedical evacuations from Burma. They also helped sustain Claire Chennault's Flying Tiger volunteers who were helping Chiang Kai-shek's Nationalist Chinese forces resist the Japanese in southern China. AAF medics also supported the first efforts to create an aerial supply route from India to southern China.

The most severe medical challenges in the war against Japan occurred in the southwest Pacific. After the surprise Japanese attack at Pearl Harbor in December 1941, many U.S. airmen had evacuated from the Philippines to the mainland of Australia with Gen. Douglas MacArthur and his ground forces. In March 1942, the general took command of the Southwest Pacific Area (SWPA) theater. He intended to retaliate by seizing Papua, New Guinea, before Japanese forces could establish a hold there, and air power was one of his key weapons. Although the Japanese succeeded in occupying the northern Papuan coast, the advanced echelon of the Fifth Air Force set up at Port Moresby on the southern coast on September 15.

While MacArthur established a strong base of operations in New Guinea, more air forces joined the Pacific campaign. In mid-January 1943, the headquarters of the Thirteenth Air Force was established at Espiritu Santo in the New Hebrides islands. In June 1944, the Fifth and Thirteenth Air Forces combined to form the Far East Air Forces (FEAF), commanded by Lt. Gen. George C. Kenney, former commander of the Fifth Air Force. In the summer of 1945, the Seventh Air Force joined FEAF.

The first medical challenge was to get more qualified physicians for the Pacific units. Although this challenge was usually met, many units still lacked the uninterrupted support of a qualified flight surgeon. Early in the war, AAF units often activated without medical officers at all, and when these units arrived in the southwest Pacific, many received a medical officer who had no training in aviation medicine because not enough flight surgeons were available. This shortage was partially remedied by

denying many flight surgeons relief from combat duty. Some unanticipated needs for medical officer staffing in rest and recreation centers, convalescent training programs, and the FEAF combat replacement and training center were solved with much difficulty or were remedied inefficiently.

The staffing problem was made worse by fixed Tables of Organization (TO) that authorized the job specialties, including medical, for each AAF unit. Although some Pacific bases needed more medical officers than others, TO changes were not allowed. As a result, both Air Surgeon Grant and FEAF surgeon Col. Robert K. Simpson hoped to form a pool of flight surgeons for flexible assignments. When not assigned to operational units, these flight surgeons would be sent to general hospitals to attend refresher courses and work as consultants. But the AAF request to form a flight surgeon pool was not approved.

Early in the war, AAF medical leaders argued that Army hospital facilities in the Pacific were meager and situated too far away from AAF units to be of value. Because the AAF units needed ready access to at least some medical specialties and advanced services, expedients were required. In 1942, most units began to use their small medical section to organize a dispensary for the whole group, and many units of group or similar size expanded their dispensaries into infirmaries with forty beds. Infirmaries in the Thirteenth Air Force were almost as well equipped as were station hospitals.

The improvised AAF medical facilities saved workdays by keeping patients close to their unit rather than transferring them to a distant theater SOS facility. Unit doctors could better determine if a patient was fit to fly, whether to remove him from combat duty, and when to order a replacement. The patient's morale was better in his own unit facility. Furthermore, for planning purposes the unit could expand medical statistics and the patient's records.

A disadvantage, however, was that resupply for these units was slow, especially thirty to 120 days after a unit moved to a new forward area. Additionally, Army regulations prohibited almost all types of bedcare that could be given in such infirmaries. When mission needs were paramount, however, the Air Surgeon allowed some infirmaries to receive improved equipment designed for group aid stations and resume their hospital operations.

The air forces' requests for small, mobile hospitals were partly satisfied starting in 1943 when the Army theater SOS agreed to attach several of its "portable surgical hospitals" to the operational control of the Fifth Air Force. These 25-bed facilities were staffed by four medical officers, one internist, three surgeons, and thirty-three enlisted men. The Thirteenth Air Force began to use such facilities in late 1944 when it had to close some of its group infirmaries temporarily. Both numbered air forces usually expanded the portable surgical hospitals into small station hospitals with fifty to one hundred beds when circumstances warranted. The

hospitals sometimes functioned as holding stations for air evacuation. The AAF even tested various ways of transporting the hospitals by C–47s and small L–5 observation planes. The Army portable surgical hospital proved more useful to AAF tactical units in the Pacific than did the aviation medical dispensary created for the Mediterranean and European theaters.

Another Army concession was to earmark two Army general hospitals as reception points for most AAF patients entering the theater SOS medical system. In August 1944, the 51st General Hospital in Hollandia, New Guinea, was set aside for AAF patients. In July 1945, this hospital moved to Fort McKinley in Manila, the Philippines, FEAF headquarters. The hospital was near an AAF replacement depot, the Second Central Medical Establishment, and a convalescent training program. In January 1945, the 126th General Hospital at Leyte, the Philippines, was also earmarked for AAF patients. The theater SOS continued to administer and control both of these 2,000-bed facilities. Although valuable to the air forces, these two hospitals could not have handled all AAF inpatients in the Pacific theater, if it had been possible to transport them there. The Army also assisted in several experiments for tracking AAF patients through the theater SOS hospital system, but none of the experiments worked well.

The B–29 bombing campaign against Japan also produced a minor Army concession to AAF needs. Starting in November 1944, the AAF began to use the central Pacific Mariana Islands as a base for striking Japan with the high-altitude, long-range B–29 bombers of the Twentieth Air Force. In early 1945, on the island of Saipan, home of the XXI Bomber Command, the Army allowed the AAF to pool some wing dispensaries into a 100-bed hospital. The overcrowded hospital run by the AGF nearby was able to handle only critical AAF patients. The hospital's surgeon and even the Army Surgeon General agreed to permit a pooled AAF facility at West Field. About the same time, the Army agreed to a similar arrangement for a 150-bed hospital in Hawaii.

Despite these administrative problems, the war in the Pacific taught the AAF much about medical practice in the tropics. Casualties from disease were much higher than in Europe. Mosquito-borne diseases, particularly malaria, were the greatest single cause of workdays lost to the air forces. In this case, as in many others, commonsense prevention tactics were critical. General Kenney, commander of the Fifth Air Force in the Southwest Pacific, wrote that

> When the Americans first came to New Guinea and saw the Aussies wearing shorts and shirtsleeves cut off above the elbow, it appealed to them as a smart idea for that hot, humid, jungle service. Just as an experiment, I put long trousers and long-sleeved shirts on one squadron of a fighter group and shorts and short-sleeved shirts on another squadron for a month. At the end of the trial period, I had two cases of malaria in the long-trousered, long-sleeved squadron and sixty-two cases in the squadron wearing shorts.

> The evidence was good enough for the kids as well as me, so I issued the order [to wear long trousers and long sleeves].

Spraying insecticides from airplanes was first tried in February 1944 in New Guinea, using a compound known as Paris Green. The greatest chemical weapon against mosquito-borne diseases, however, was a new insecticide called DDT. Beginning in April 1944, DDT was sprayed from airplanes. It was especially effective in open and cleared areas and in cities, eliminating the flies and mosquitoes that carried malaria. But not enough ever became available to fill all sanitation needs. Starting in 1943, more conventional methods had also been used by malaria control and survey units. With the aid of DDT and other preventive measures, these units reduced the malaria rate to the point that it was no longer a serious handicap to operations by the end of 1944.

Another medical problem—maintaining aircrew fitness and morale—was less tractable. AAF crews had to fly until they were killed, wounded, or sidelined by some physical illness or mental problem caused by stress. The U.S. Army command in the Pacific—unlike the Navy, the Marines, and the Army command in Europe—did not create a rotation policy for their aircrews. Battle casualties were actually low compared with those in Europe. Pacific theater airmen survived far more time in combat than did their counterparts in Europe, only to be grounded by psychological problems, particularly low morale and fatigue. More than 30 percent of nonbattle casualties were psychological. After eighteen months in theater, more than 20 percent of the AAF personnel experienced some form of psychiatric problem. Often in such cases, the AAF medical role had to end with a proper diagnosis and treatment of symptoms, followed by grounding or reassignment for medical reasons; essential preventive measures were the responsibility of line commanders.

Autonomy for the Air Force Medical Service

The true measure of any military aeromedical service in wartime is effective combat support: the medical service must keep the air and ground crews healthy and fit enough to defeat the enemy. Judged by this standard, the AAF medical service undeniably improved after 1942 and ultimately succeeded. Disease and nonbattle injury rates declined in all theaters. Furthermore, commanders did not complain that high rates of sickness prevented the execution of their assigned missions. American aircrews in all theaters became inefficient mainly because they had to work too long and hard, not because they were chronically ill. Patient satisfaction among combat veterans was high. In the spring of 1945, an AAF doctor surveyed 2,600 AAF combat veterans, both officers and enlisted men, who were returning from all overseas theaters. Seventy-two percent were favorably im-

pressed by their squadron flight surgeon and only 18 percent were dissatisfied. Within the sphere it could directly influence—the physical well-being of the fighting force—the AAF medical service responded superbly to the challenges of the aviation arm fighting a global war.

To the end of the war, however, the Army Medical Department thought the AAF had overstated its argument for medical independence and a separate AAF hospital system. Army medical leaders argued that most AAF medical problems in the war were not so unusual that they could not be solved within the Army's medical system. In the face of such arguments, AAF medical leaders maintained that they had to obtain command and control of their own medical system.

The issue resurfaced when AAF combat elements gained total independence from the Army, becoming the United States Air Force on September 18, 1947. In a compromise leading to Air Force independence, the Air Force's medical service remained subordinate to the Army Surgeon General. In 1948, General Grow, who had succeeded Grant as the Air Surgeon in 1946, began a campaign for medical independence, reasserting many arguments from World War II. In this effort, Grow won support from the Air Force Association, the American Medical Association, and the Hoover commission on the organization of the executive branch. With their help, the Air Force Medical Service was established on July 1, 1949.

SUGGESTED READING

Like this pamphlet as a whole, the following publications are suggested for the general military reader. For readers with a scholarly purpose, many additional historical details, as well as reference citations of World War II documents and reports, are available in Mae Mills Link and Hubert A. Coleman, *Medical Support of the Army Air Forces in World War II,* Washington, D.C.: Office of the Surgeon General, USAF, 1955 (1992 reprint). A useful guide to the technical aeromedical journals for the period may be found in Ebbe C. Hoff and John F. Fulton, *A Bibliography of Aviation Medicine,* Springfield, Ill., and Baltimore: Charles C. Thomas, 1942, with its 1944 *Supplement.*

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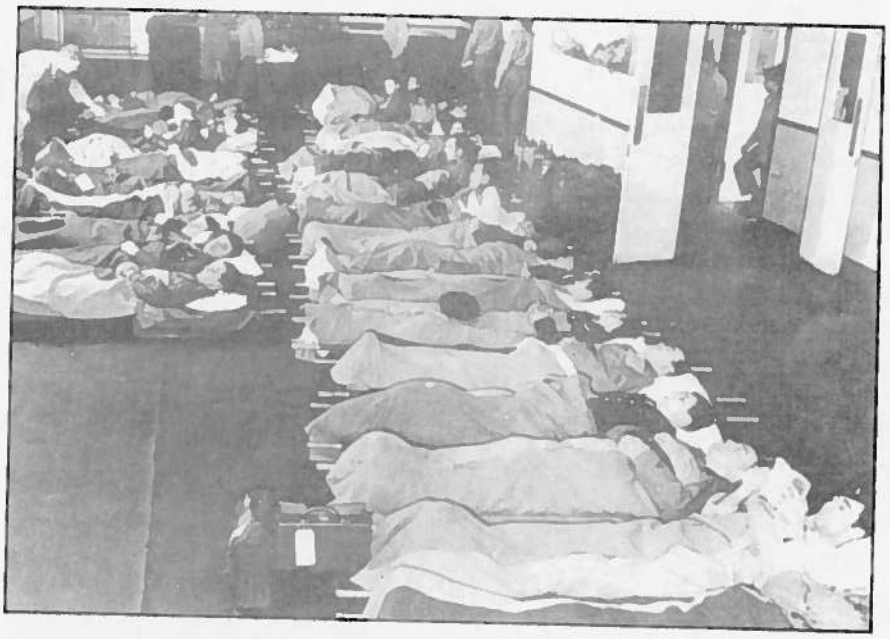

In the "ready-room" at an air base in Great Britain, wounded Americans wait to be transferred to the C–54 Skymaster that will take them to Army hospitals close to home.

The limited air evacuation expansion was inadequate to meet all medical needs. By late September, a backlog of almost 7,000 patients on the Continent prompted the theater surgeon to resubmit the proposals for a dedicated air evacuation force. But the chief of staff in Europe, Lt. Gen. Walter B. Smith, again rejected the idea and directed the surgeons to consider air evacuation "a bonus to be available from time to time as conditions permit." When Lt. Gen. Omar N. Bradley, the commander of the Twelfth Army Group, asked for dedicated air evacuation, Smith again rejected the idea and wrote that "any evacuation system based on air transport will break down."

There was no question that transport and ground crews with little or no medical training sometimes had emotional problems in handling severely wounded patients. One mechanic wrote:

> Whenever they brought in the wounded, some of us would go up on the flight line and help unload those fellows. A few of us, I remember, couldn't handle that; they couldn't stand being near wounded people. Some of these had arms gone, legs gone, the sides of their faces shot away, holes in their bellies and more of that sort of thing. But somehow I was able to cope with this; I helped unload many of those poor fellows into ambulances.

Lower-level commanders, however, found ways to make the necessary cargo aircraft available. Some medical supplies were stored at airfields for opportune shipment forward, coinciding with requests for emergency air evacuation. Newly arrived C–47s from the United States were dedicated to air evacuation before they were reported to theater headquarters. Grow also got a squadron of twenty small UC–64 bush planes and dedicated them to medical missions. Based at Le Bourget Airdrome in France, they resupplied forward areas with blood and critical medical items. Equipped with three litters each, they evacuated 1,168 patients between September 23 and December 29, 1944.

Although Europe used air evacuation more than other theaters, especially from forward areas, many patients still traveled by ship—especially for evacuations from Europe to the United States; only 15 percent of such patients traveled by air. There were not enough transport planes or suitable patients to justify a more significant use of aeromedical evacuation to the United States.

Aeromedical Challenges in the Offensive Against Japan

AAF medics in the Pacific theater of operations confronted many medical challenges: sanitation, malaria control, and medical resupply, as

Men wounded in Pacific-theater combat are placed aboard a medical transport plane for evacuation in December 1943.

well as prevention and treatment of aircrew ailments such as aerotitis media and flying fatigue. Medical administration was also a challenge. Despite the importance of future air operations against Japan, the Army did not assign fixed hospitals to the AAF during the Pacific war, not even for the Very-Long-Range Bomber Program whose aircrews flew high-altitude B–29 missions. Medical support of U.S. fliers depended on Army medical facilities, which AAF medical leaders generally considered inadequate in many ways. The AAF medical response to these challenges, however, was flexible and appropriate, and the aerial fighting force was not seriously hampered by medical problems.

AAF medics were much more active in Asia and the Pacific than in Europe during the first year of the war. The Japanese had dealt the AAF heavy blows in Hawaii and the Philippines, and U.S. military leaders were eager to strike back and halt the Japanese advance southward toward Australia. In 1942, aiding the British in the China-Burma-India theater, AAF medics helped improvise aeromedical evacuations from Burma. They also helped sustain Claire Chennault's Flying Tiger volunteers who were helping Chiang Kai-shek's Nationalist Chinese forces resist the Japanese in southern China. AAF medics also supported the first efforts to create an aerial supply route from India to southern China.

The most severe medical challenges in the war against Japan occurred in the southwest Pacific. After the surprise Japanese attack at Pearl Harbor in December 1941, many U.S. airmen had evacuated from the Philippines to the mainland of Australia with Gen. Douglas MacArthur and his ground forces. In March 1942, the general took command of the Southwest Pacific Area (SWPA) theater. He intended to retaliate by seizing Papua, New Guinea, before Japanese forces could establish a hold there, and air power was one of his key weapons. Although the Japanese succeeded in occupying the northern Papuan coast, the advanced echelon of the Fifth Air Force set up at Port Moresby on the southern coast on September 15.

While MacArthur established a strong base of operations in New Guinea, more air forces joined the Pacific campaign. In mid-January 1943, the headquarters of the Thirteenth Air Force was established at Espiritu Santo in the New Hebrides islands. In June 1944, the Fifth and Thirteenth Air Forces combined to form the Far East Air Forces (FEAF), commanded by Lt. Gen. George C. Kenney, former commander of the Fifth Air Force. In the summer of 1945, the Seventh Air Force joined FEAF.

The first medical challenge was to get more qualified physicians for the Pacific units. Although this challenge was usually met, many units still lacked the uninterrupted support of a qualified flight surgeon. Early in the war, AAF units often activated without medical officers at all, and when these units arrived in the southwest Pacific, many received a medical officer who had no training in aviation medicine because not enough flight surgeons were available. This shortage was partially remedied by

denying many flight surgeons relief from combat duty. Some unanticipated needs for medical officer staffing in rest and recreation centers, convalescent training programs, and the FEAF combat replacement and training center were solved with much difficulty or were remedied inefficiently.

The staffing problem was made worse by fixed Tables of Organization (TO) that authorized the job specialties, including medical, for each AAF unit. Although some Pacific bases needed more medical officers than others, TO changes were not allowed. As a result, both Air Surgeon Grant and FEAF surgeon Col. Robert K. Simpson hoped to form a pool of flight surgeons for flexible assignments. When not assigned to operational units, these flight surgeons would be sent to general hospitals to attend refresher courses and work as consultants. But the AAF request to form a flight surgeon pool was not approved.

Early in the war, AAF medical leaders argued that Army hospital facilities in the Pacific were meager and situated too far away from AAF units to be of value. Because the AAF units needed ready access to at least some medical specialties and advanced services, expedients were required. In 1942, most units began to use their small medical section to organize a dispensary for the whole group, and many units of group or similar size expanded their dispensaries into infirmaries with forty beds. Infirmaries in the Thirteenth Air Force were almost as well equipped as were station hospitals.

The improvised AAF medical facilities saved workdays by keeping patients close to their unit rather than transferring them to a distant theater SOS facility. Unit doctors could better determine if a patient was fit to fly, whether to remove him from combat duty, and when to order a replacement. The patient's morale was better in his own unit facility. Furthermore, for planning purposes the unit could expand medical statistics and the patient's records.

A disadvantage, however, was that resupply for these units was slow, especially thirty to 120 days after a unit moved to a new forward area. Additionally, Army regulations prohibited almost all types of bedcare that could be given in such infirmaries. When mission needs were paramount, however, the Air Surgeon allowed some infirmaries to receive improved equipment designed for group aid stations and resume their hospital operations.

The air forces' requests for small, mobile hospitals were partly satisfied starting in 1943 when the Army theater SOS agreed to attach several of its "portable surgical hospitals" to the operational control of the Fifth Air Force. These 25-bed facilities were staffed by four medical officers, one internist, three surgeons, and thirty-three enlisted men. The Thirteenth Air Force began to use such facilities in late 1944 when it had to close some of its group infirmaries temporarily. Both numbered air forces usually expanded the portable surgical hospitals into small station hospitals with fifty to one hundred beds when circumstances warranted. The

hospitals sometimes functioned as holding stations for air evacuation. The AAF even tested various ways of transporting the hospitals by C–47s and small L–5 observation planes. The Army portable surgical hospital proved more useful to AAF tactical units in the Pacific than did the aviation medical dispensary created for the Mediterranean and European theaters.

Another Army concession was to earmark two Army general hospitals as reception points for most AAF patients entering the theater SOS medical system. In August 1944, the 51st General Hospital in Hollandia, New Guinea, was set aside for AAF patients. In July 1945, this hospital moved to Fort McKinley in Manila, the Philippines, FEAF headquarters. The hospital was near an AAF replacement depot, the Second Central Medical Establishment, and a convalescent training program. In January 1945, the 126th General Hospital at Leyte, the Philippines, was also earmarked for AAF patients. The theater SOS continued to administer and control both of these 2,000-bed facilities. Although valuable to the air forces, these two hospitals could not have handled all AAF inpatients in the Pacific theater, if it had been possible to transport them there. The Army also assisted in several experiments for tracking AAF patients through the theater SOS hospital system, but none of the experiments worked well.

The B–29 bombing campaign against Japan also produced a minor Army concession to AAF needs. Starting in November 1944, the AAF began to use the central Pacific Mariana Islands as a base for striking Japan with the high-altitude, long-range B–29 bombers of the Twentieth Air Force. In early 1945, on the island of Saipan, home of the XXI Bomber Command, the Army allowed the AAF to pool some wing dispensaries into a 100-bed hospital. The overcrowded hospital run by the AGF nearby was able to handle only critical AAF patients. The hospital's surgeon and even the Army Surgeon General agreed to permit a pooled AAF facility at West Field. About the same time, the Army agreed to a similar arrangement for a 150-bed hospital in Hawaii.

Despite these administrative problems, the war in the Pacific taught the AAF much about medical practice in the tropics. Casualties from disease were much higher than in Europe. Mosquito-borne diseases, particularly malaria, were the greatest single cause of workdays lost to the air forces. In this case, as in many others, commonsense prevention tactics were critical. General Kenney, commander of the Fifth Air Force in the Southwest Pacific, wrote that

> When the Americans first came to New Guinea and saw the Aussies wearing shorts and shirtsleeves cut off above the elbow, it appealed to them as a smart idea for that hot, humid, jungle service. Just as an experiment, I put long trousers and long-sleeved shirts on one squadron of a fighter group and shorts and short-sleeved shirts on another squadron for a month. At the end of the trial period, I had two cases of malaria in the long-trousered, long-sleeved squadron and sixty-two cases in the squadron wearing shorts.

> The evidence was good enough for the kids as well as me, so I issued the order [to wear long trousers and long sleeves].

Spraying insecticides from airplanes was first tried in February 1944 in New Guinea, using a compound known as Paris Green. The greatest chemical weapon against mosquito-borne diseases, however, was a new insecticide called DDT. Beginning in April 1944, DDT was sprayed from airplanes. It was especially effective in open and cleared areas and in cities, eliminating the flies and mosquitoes that carried malaria. But not enough ever became available to fill all sanitation needs. Starting in 1943, more conventional methods had also been used by malaria control and survey units. With the aid of DDT and other preventive measures, these units reduced the malaria rate to the point that it was no longer a serious handicap to operations by the end of 1944.

Another medical problem—maintaining aircrew fitness and morale—was less tractable. AAF crews had to fly until they were killed, wounded, or sidelined by some physical illness or mental problem caused by stress. The U.S. Army command in the Pacific—unlike the Navy, the Marines, and the Army command in Europe—did not create a rotation policy for their aircrews. Battle casualties were actually low compared with those in Europe. Pacific theater airmen survived far more time in combat than did their counterparts in Europe, only to be grounded by psychological problems, particularly low morale and fatigue. More than 30 percent of nonbattle casualties were psychological. After eighteen months in theater, more than 20 percent of the AAF personnel experienced some form of psychiatric problem. Often in such cases, the AAF medical role had to end with a proper diagnosis and treatment of symptoms, followed by grounding or reassignment for medical reasons; essential preventive measures were the responsibility of line commanders.

Autonomy for the Air Force Medical Service

The true measure of any military aeromedical service in wartime is effective combat support: the medical service must keep the air and ground crews healthy and fit enough to defeat the enemy. Judged by this standard, the AAF medical service undeniably improved after 1942 and ultimately succeeded. Disease and nonbattle injury rates declined in all theaters. Furthermore, commanders did not complain that high rates of sickness prevented the execution of their assigned missions. American aircrews in all theaters became inefficient mainly because they had to work too long and hard, not because they were chronically ill. Patient satisfaction among combat veterans was high. In the spring of 1945, an AAF doctor surveyed 2,600 AAF combat veterans, both officers and enlisted men, who were returning from all overseas theaters. Seventy-two percent were favorably im-

pressed by their squadron flight surgeon and only 18 percent were dissatisfied. Within the sphere it could directly influence—the physical well-being of the fighting force—the AAF medical service responded superbly to the challenges of the aviation arm fighting a global war.

To the end of the war, however, the Army Medical Department thought the AAF had overstated its argument for medical independence and a separate AAF hospital system. Army medical leaders argued that most AAF medical problems in the war were not so unusual that they could not be solved within the Army's medical system. In the face of such arguments, AAF medical leaders maintained that they had to obtain command and control of their own medical system.

The issue resurfaced when AAF combat elements gained total independence from the Army, becoming the United States Air Force on September 18, 1947. In a compromise leading to Air Force independence, the Air Force's medical service remained subordinate to the Army Surgeon General. In 1948, General Grow, who had succeeded Grant as the Air Surgeon in 1946, began a campaign for medical independence, reasserting many arguments from World War II. In this effort, Grow won support from the Air Force Association, the American Medical Association, and the Hoover commission on the organization of the executive branch. With their help, the Air Force Medical Service was established on July 1, 1949.

SUGGESTED READING

Like this pamphlet as a whole, the following publications are suggested for the general military reader. For readers with a scholarly purpose, many additional historical details, as well as reference citations of World War II documents and reports, are available in Mae Mills Link and Hubert A. Coleman, *Medical Support of the Army Air Forces in World War II,* Washington, D.C.: Office of the Surgeon General, USAF, 1955 (1992 reprint). A useful guide to the technical aeromedical journals for the period may be found in Ebbe C. Hoff and John F. Fulton, *A Bibliography of Aviation Medicine,* Springfield, Ill., and Baltimore: Charles C. Thomas, 1942, with its 1944 *Supplement.*

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