regulated to class I hospitals even nearer their homes when these hospitals had beds available and the professional capability of treating their injuries.

As the entire Republic of Vietnam had been designated a combat zone, fixed hospitals that give long-term care to patients and are normally found in a communications zone were not present. If all the injured or sick who could not be returned to duty in Vietnam within the established 15- to 30-day evacuation policy had been evacuated to the continental United States, it would have created a great drain of experienced manpower from the combat zone. To give this fixed-bed capability, the equivalent of about 3½ general hospitals were established in Japan to receive and care for patients who could be expected to return to duty within 60 days.

Evacuation

In-Country

Highly mobile and widely deployed forces must have a highly mobile and flexible medical evacuation system immediately responsive to their needs. The helicopter ambulance provided this flexibility and responsiveness in Vietnam. At the peak of combat operations in 1968, aeromedical support was provided by 116 air ambulances. These helicopters could transport six to nine patients at a time, depending upon the number of litter cases. Medical evacuation flights averaged only about 35 minutes each, a feat which often meant the difference between life and death for hundreds of patients. The more seriously wounded usually reached a hospital within 1 to 2 hours after they were injured. Of the wounded who reached medical facilities, about 97.5 percent survived.

The helicopter brought modern medical capabilities closer to the frontline than ever before. Furthermore, combined with a medical radio network, the helicopter provided greater flexibility in regulating patients. Preliminary evaluation of the injury and the condition of the patient was made while in flight, and the use of the radio network permitted redirecting the patient to the nearest hospital suited to his needs. If a hospital developed a surgical backlog, the combination of helicopter and radio facilitated regulating patients according to available operating facilities, rather than available beds. This combination was the core of the Army medical management system in Vietnam.

The buildup of air ambulance units. The buildup of air ambulance units paralleled the commitment of U.S. combat forces to Vietnam. The first air ambulance unit sent to Vietnam, the 57th Medical Detachment (Helicopter Ambulance), later nicknamed "The Originals," arrived in 1962 to support the 8th Field Hospital at Nha Trang. The unit was authorized five HU–1A aircraft, which were replaced by an improved model, the "B" version, in March 1963. Initially, two aircraft were

stationed at Qui Nhon and three in Nha Trang. As fighting increased around Saigon and in the Delta, the helicopters were shifted from place to place in response. The 82d Medical Detachment (Helicopter Ambulance) became operational in IV CTZ (the Delta), in November 1964.

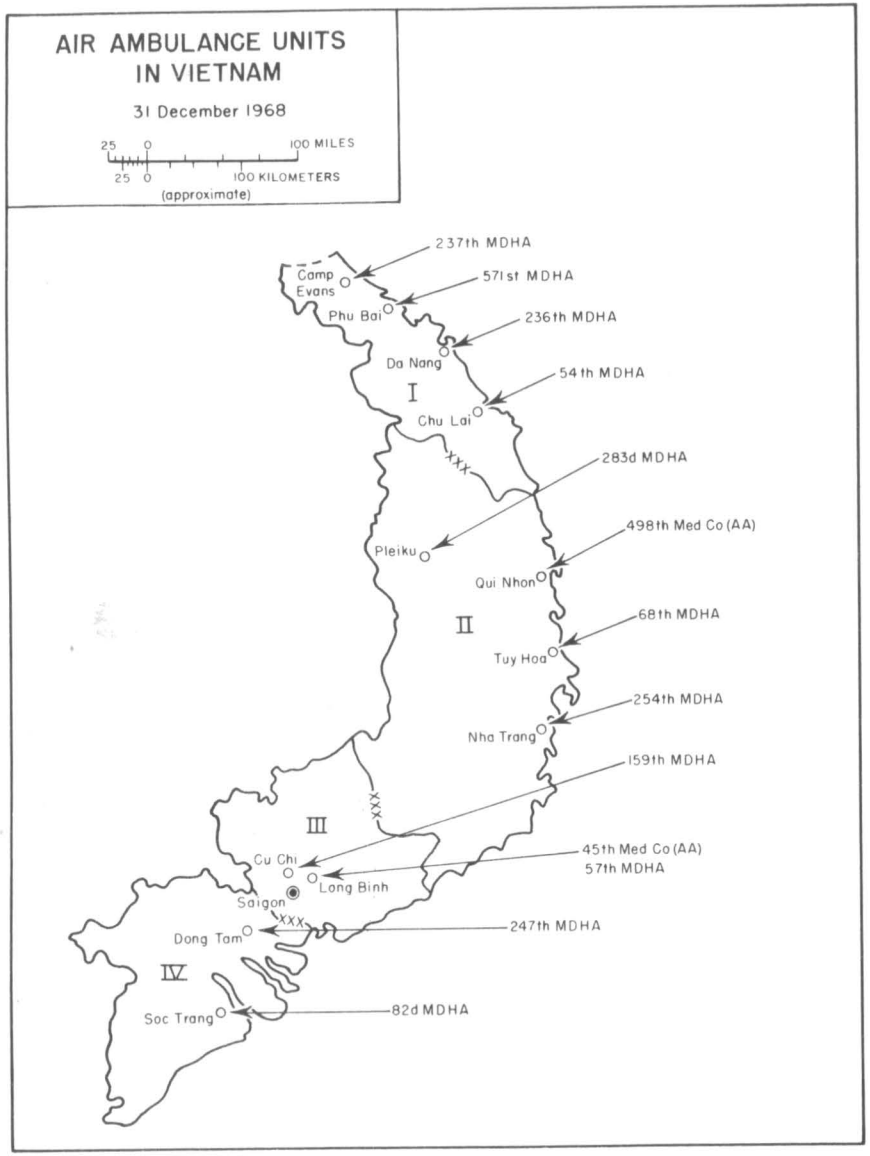
The buildup of units continued at an accelerated pace in 1965. The 283d Medical Detachment (Air Ambulance) arrived in August 1965, followed by the 498th Medical Company (Air Ambulance) in September. The 254th Medical Detachment (Air Ambulance) arrived in Vietnam before the end of the year but did not become operational until February 1966 because a backlog at the port delayed the arrival of the unit's equipment. The four detachments, each authorized six helicopters under a new table of organization and equipment, supported III and IV CTZ's. The 498th Medical Company, which was authorized 25 aircraft, supported II CTZ.

During 1967, the 45th Medical Company (Air Ambulance) and four additional air ambulance detachments arrived in Vietnam. The units were shifted from location to location to provide the most effective area coverage in response to tactical operations. In 1968, four additional detachments were sent to Vietnam, completing the buildup of aeromedical evacuation units. One unit, the 50th Medical Detachment, which was assigned to the 101st Airborne Division in mid-1968, became the nucleus of the division's air ambulance platoon. By 1969, there were 116 field-army-level helicopter ambulances in Vietnam. These were assigned to two companies and 11 separate detachments. (*Map 3*)

Air Force aeromedical evacuation support. The Army and the U.S. Air Force evacuation systems complemented each other, each carefully continuing the movement of wounded or sick until they reached a final-destination medical facility.

Based on experience gained in World War II and the Korean War, the U.S. Air Force initially used returning assault or cargo aircraft for casualty evacuation. The system worked well during the early stages of the Vietnam War, because the number of sick and wounded was relatively low. As troop strength increased and combat operations became more intense, the system grew progressively less satisfactory. The requirements for evacuation often coincided with the most urgent needs for resupply, although not always at the same location.

The old system was therefore abandoned in favor of a new one in which aircraft were regularly used specifically for evacuation purposes. The 903d Aeromedical Evacuation Squadron scheduled the first regular in-country evacuation flights in 1967. By late 1969, the number of regular scheduled flights had increased to 188. The assault aircraft initially used for aeromedical evacuation were supplemented, in early 1968, by C–118 cargo aircraft specifically modified for evacuation missions. The average



Map 3

number of patients moved increased from 5,813 per month between July 1967 and January 1968, to 9,098 from March to June 1968. During the Tet Offensive in February 1968, more than 10,000 patients were evacuated by the Air Force.

"Dust-off." Those Army medical evacuation helicopter units not organic to divisions came to be called Dust-off, after the radio call sign of

the most famous of the early pilots, Major Charles L. Kelly, MSC, who was killed in action on 1 July 1964. Several scores of these flying "medics" flew their unarmed helicopters into hostile areas, risking their own lives to save those of others. In a 2-year period, 39 crew members were killed and 210 wounded in aeromedical evacuation missions.

The combination of the helicopter ambulance and a medical radio network was the basis of the effective medical regulating system that evolved in Vietnam. During the first phase of U.S. troop commitment to Vietnam in early 1965, there was only one hospital in support of each CTZ and therefore no alternative to the destination of a casualty. As the number of hospitals and the number of casualties increased, however, the need for a regulating system became imperative. The first system in the III and IV CTZ's was set up with Air Force Radar Tan Son Nhut, Paris control. Dust-off helicopters inbound called Paris control which had a direct-line field telephone "hot line" to the MRO (medical regulating office) and the 3d Field Hospital. The three major treatment facilities available were the 3d Field Hospital, the 93d Evacuation Hospital, and the 3d Surgical Hospital, the last named then located at Bien Hoa. The MRO confirmed or changed the destination chosen by the pilot as the medical situation indicated.

After Headquarters, 44th Medical Brigade, arrived in Vietnam in 1966, the brigade MRO became responsible for all in-country regulating of patients. Medical groups controlled the movement of patients from tactical areas to hospitals within their own group areas. Further movement of patients from one group area to another was co-ordinated by medical group MRO's with the brigade MRO, who maintained over-all control to insure proper usage of all medical facilities.

Telephone communications were abysmally poor and radio communications not much better during this period. When heavy fighting produced a large number of casualties and medical regulating was most urgently needed, operational radio traffic was also heaviest. Moreover, since short-range radios were used, requests for evacuation had to be routed from divisional medical battalions to backup hospitals by way of the Dust-off radio network or through the supporting field army medical group. This cumbersome method caused delays and sometimes resulted in garbled transmissions.

On an experimental basis, the 55th Medical Group at Qui Nhon borrowed single-sideband long-range radios from the 498th Medical Company (Air Ambulance). Originally placed in the air ambulance company for long-range transmissions to its aircraft on evacuation missions, these radios had been little used because of the relatively short distance of most flights and the extensive maintenance they required. Their use for medical regulating proved highly successful, and an additional 54

sets were ultimately acquired to expand the communications network throughout the medical brigade.

Medical regulating started on the battlefield. Medical groups placed regulators (senior noncommissioned officers) in areas of troop concentration or at the site of a combat operation. In co-operation with the local medical unit, the regulator radioed requests for evacuation to the supporting Dust-off unit. The transmission was monitored by the MRO at his medical group headquarters.

In the absence of a field medical regulator, a request for air evacuation was normally made by the medical aidman at the site of the casualty. The request, which included such information as the number of patients by type, the exact location by map grid co-ordinates, data on enemy movements, and the radio frequency of the requesting unit, was transmitted over the Dust-off radio network to the supporting air ambulance unit. Frequently the call was received by an air ambulance already in flight which could be diverted from a less urgent mission. If not, a standby crew at a field site or at the unit headquarters scrambled to make the pickup.

After proper identification of the ground force with the casualty, the Dust-off helicopter generally made a high-speed or tight-circle approach into the area. Time spent on the ground in a normal operation was usually between 30 seconds and 1 minute, depending on the number of casualties. The casualty was given emergency treatment by the medical aidman on board as soon as the aircraft was out of the combat area.

The patient was flown directly to the medical treatment facility best able to give the care required. This might or might not be the one nearest the site of injury. The decision as to the proper destination hospital was based on several factors. Distance was less important than time; the objective was to reduce the time between injury and definitive treatment to the minimum. Information based on the preliminary in-flight evaluation of the injury and the condition of the patient, knowledge of existing surgical backlogs, and the over-all casualty situation were other considerations. If the aircraft commander questioned the destination selected by the medical regulator because of his knowledge of the patient's condition, a physician was consulted by radio while the patient was still in transit before the decision became final. The inbound medical aircraft commander informed the receiving hospital by radio of his estimated time of arrival, the nature of the casualties on board, and any special reception arrangements that might be required. Thus, the receiving hospital was able to have everything in order to receive casualties and begin definitive surgical care.

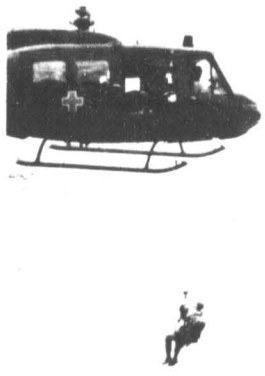
Helicopter evacuation techniques and requirements varied by geographic area, type of combat operation, and type of equipment available, and changed from year to year as experience modified and refined procedures. Since the air ambulance was unarmed, gunship support was requested if the ground reported contact with the enemy in the vicinity of the pickup site, or if the rescue was a hoist operation.

In "hot" areas, the crew of the evacuation aircraft consisted of a pilot, copilot, crew chief, medical aidman, and a man armed with an automatic rifle. In quieter areas, the rifleman was left behind in favor of increased patient capacity. On hoist operations in mountainous and jungle terrain, before the more powerful "H" model aircraft was introduced, the crew consisted only of a pilot, copilot, and hoist operator. On these missions, fuel load was also generally reduced in favor of greater lift capability. Night missions were quite common, often comprising 15 to 20 percent of the total missions in some areas.

Helicopter rescue operations were aided by new equipment designed especially for use in jungle terrain or in combat areas where it was too dangerous for a helicopter to land. The hoist consisted of a winch and cable on a boom which was moved out from the aircraft when it arrived over the rescue site. At the end of the cable was a ring and hook to which a Stokes litter, rigid litter, or forest penetrator could be attached. The cable could be lowered at the rate of 150 feet per minute and retracted at the rate of 120 feet per minute. The forest penetrator, a spring-loaded device which could penetrate dense foliage, opened to provide seats on which a casualty could be strapped. It was preferred over the litter by the crews for hoist rescues because it was less likely to become entangled in the trees.

Hoist operations significantly increased the danger for Dust-off crews. Hovering above the jungle or a mountain side as it lowered its cable, the helicopter became a "sitting duck" for enemy troops in the area. In 1968, 35 aircraft were hit by hostile fire while on hoist missions. The number increased to 39 in 1969. Nonetheless, the hoist was used extensively and to great advantage in Vietnam. Its use permitted the rescue of 1,735 casualties in 1968 and 2,516 casualties in 1969, who otherwise could not have been retrieved.

The primary mission of the Army helicopter ambulance was the in-country aeromedical evacuation of patients. The number of patients evacuated by aeromedical evacuation helicopters rose from 13,004 in 1965, to 67,910 in 1966, to 85,804 in 1967, and peaked at 206,229 in 1969. These figures included members of the ARVN, Vietnamese civilians, and Free World forces as well as U.S. patients. Each time a patient was moved by helicopter, the move was entered in the tally. Thus, if a patient was taken to a surgical hospital by helicopter and later transported from there to an evacuation hospital by helicopter, this would count as two patients evacuated. Army air ambulances completed more



USE OF HOIST IN VIETNAM, 1968

than 104,112 aeromedical evacuation missions while flying approximately 78,652 combat hours in 1969.

In addition to this primary mission, Army helicopters were also used to transport professional personnel, medical supplies, and blood to medical facilities. Supplemented by scheduled Air Force flights, and from time to time by larger helicopters, they were also used to transport patients between hospitals for consultations or to free beds in areas where increased casualties were anticipated.

Out-of-Country

The Air Force provided all out-of-country aeromedical evacuation. Initially, out-of-country medical regulating was controlled at the FEJMRO (Far East Medical Regulating Office) at Camp Zama, Japan, through a representative functioning at the Office of the Surgeon, USMACV. To handle the increased volume of traffic, a branch of the FEJMRO was established in Vietnam and Major (later Lieutenant Colonel) Robert M. Latham, MSC, reported as Chief, FEJMRO (USMACV), in July 1966. FEJMRO allotted bed space in hospitals in the Pacific area for FEJMRO (USMACV) use, and issued "bed credits" on a 24-hour basis. This information was relayed to Vietnam via Clark Air Force Base in the Philippines because communications between Japan and Vietnam were chronically poor. Late in 1966, a direct system for transmitting information between the two offices was adopted.

The procedures for regulating out-of-country evacuations were further improved in November 1967. Under these new procedures, medical group regulating officers submitted consolidated requests for evacuation to the medical brigade MRO who then sent a single request to FEJMRO (USMACV). In turn, information concerning destination hospitals was sent back down the line. The new system enabled hospitals in Vietnam to follow up on patients and permitted medical facilities to close out clinical records. It also provided information more promptly on the total number of evacuees to casualty staging facilities, the Military Airlift Command, and offshore hospitals. Routine calls were handled within a 36-hour period, and urgent evacuation requests were processed within an hour if an aircraft was available.

Since substantial U.S. forces were committed to Vietnam in 1965, the relative continuity of combat was as much a factor in building up

patient loads as was the severity of fighting. Under such conditions, patient evacuation was therefore accelerated to provide for contingencies. The 9th Aeromedical Evacuation Squadron, for example, increased its flight schedule from two weekly departures from Tan Son Nhut to daily flights with additional sites for departure at Da Nang and Qui Nhon. The number of evacuations out-of-country increased from 10,164 in 1965 to 35,916 in 1969. (*Table 8*)

TABLE 8.—TOTAL NUMBER OF PATIENTS EVACUATED FROM VIETNAM, U.S. ARMY, BY MONTH, 1965–69

Month	1965	1966	1967	1968	1969
January	164	832	1,469	2,417	3,224
February	227	1,330	1,851	3,576	3,099
March	226	1,062	2,178	2,471	4,166
April	252	853	1,780	2,782	3,210
May	300	1,298	2,367	3,952	4,334
June	480	1,256	2,072	2,701	3,951
July	471	766	1,595	2,569	2,879
August	821	957	1,521	2,700	3,308
September	999	942	1,431	3,401	2,187
October	1,978	983	1,851	2,856	1,890
November	2,361	1,331	2,435	2,790	1,789
December	1,885	996	2,152	3,176	1,879
Total	10,164	12,606	22,702	35,391	35,916

Source: Army Medical Service Activities Report, MACV, 1965; Army Medical Service Activities Reports, 44th Medical Brigade, 1966, 1967, 1968, 1969.

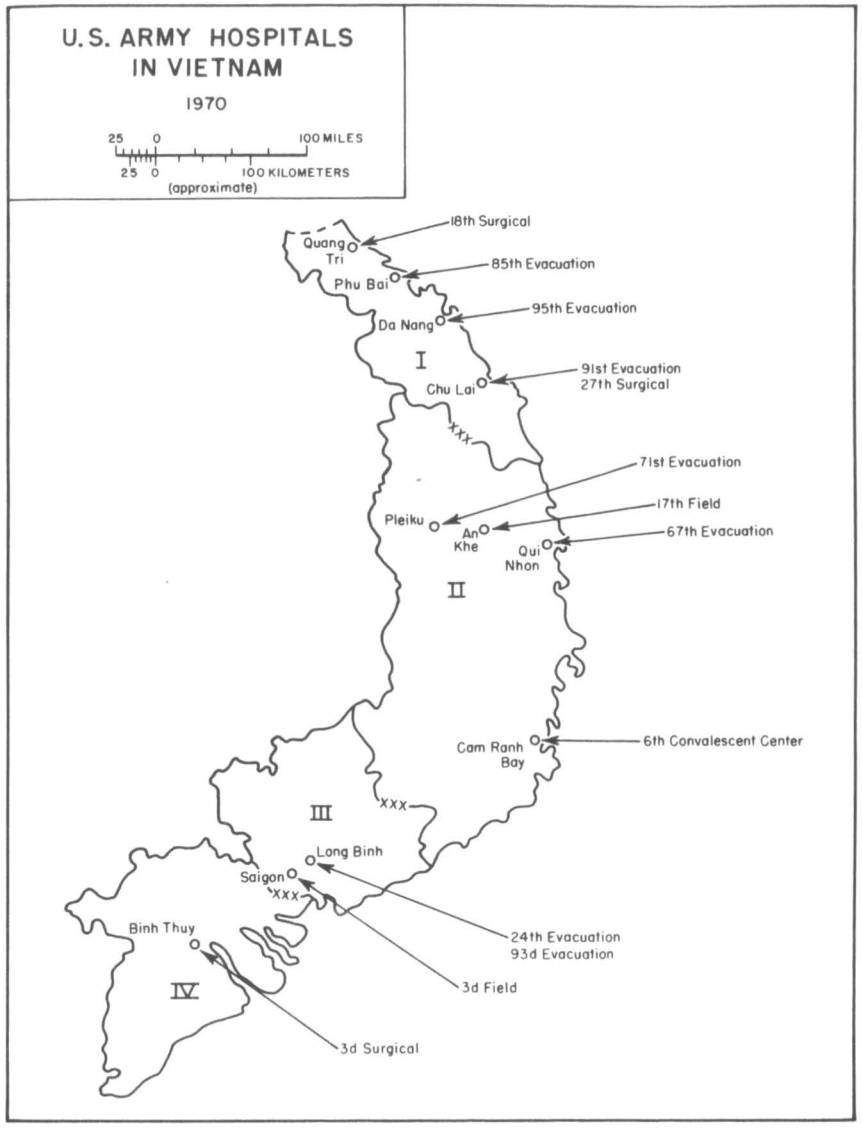
Initially, out-of-country evacuation was by aircraft to Clark Air Force Base; from there evacuees were routed either to the continental United States; to Tripler General Hospital in Hawaii, to the U.S. Army Hospital, Ryukyu Islands, or to Japan. In the summer of 1966, to reduce the drain of experienced manpower from the combat zone, the equivalent of about 3½ general hospitals was established in Japan to receive and care for patients who could be returned to duty within a 60-day period. C–141 Starlifter jets, which were used to transport troops to Vietnam, were quickly reconfigured to evacuate patients to Japan. The C–141 could carry 80 litter, 121 ambulatory, or a combination of 36 litter and 54 ambulatory patients. After a 6-hour flight to Japan where those patients to be retained disembarked, patients bound for the continental United States boarded and the aircraft continued either to Andrews Air Force Base, Washington, D.C. (18 hours via Elmendorf Air Force Base, Alaska) or to Travis Air Force Base, Calif., by a direct 10-hour flight.

Throughout the chain of evacuation, the well-being of the patient was of overriding concern. At all points along the chain, a qualified flight surgeon was on hand to determine if the evacuation should be continued. If necessary, a physician accompanied a severely wounded or critically ill patient. At all times, the finest medical care was given to the wounded or sick soldier as he progressed through the aeromedical evacuation system.

Reduction and Reorganization

The de-escalation of combat activities in Vietnam during 1969 and 1970 was paralleled by a reduction in the number of hospitals and air ambulance units. During 1969, three Reserve hospitals returned to the continental United States. The 7th and 22d Surgical Hospitals and the 29th and 36th Evacuation Hospitals were inactivated. The number of beds in operation decreased from 5,189 to 3,473 by the end of the year. During 1970, the 8th Field, the 2d Surgical, the 45th Surgical, and the 12th Evacuation Hospitals were redeployed or inactivated. (*Map 4*) The 254th Medical Detachment (Helicopter Ambulance) was inactivated in November.

A new structure for administering the medical units still in-country was authorized. Early in 1970, outlying dispensaries and clinics were placed under the command and control of the hospital in the closest geographic proximity. This change resulted in the inactivation of the headquarters elements of two medical battalions. The two medical battalions in-country were reorganized and given command and control of all medical evacuation helicopter, field ambulance, and bus ambulance resources. One medical evacuation battalion was assigned to each of the two medical groups that remained in Vietnam.



Map 4