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### AEROMEDEVAC HELICOPTERS

Dr. Wilson de Oliveira Freitas, Lieutenant Colonel, MC, Air Force

\*Study presented to the 1st Military Medical Congress, Sao Paulo, 1954.

This study contains data on the importance of helicopters in aeromedevac, the standards adopted by the US Army and the USAF in the light of the Korean Conflict. It will be divided into four sections, as follows:

1. Definition and Historical Background of Aeromedevac;
2. Aeromedevac According to Modern USAF Doctrine;
3. The First Echelon in Aeromedevac; and
4. Helicopters in Aeromedevac.

#### 1. Definition and Historical Background of Aeromedevac

**Definition:** Aeromedevac or medical evacuation by air can be defined as the air transport of casualties from regions in which there is limited medical assistance to places where this assistance can be more adequate. The importance of aeromedevac is a living reality. In this respect, the director of the United States Health Service, in his report The Health Service in World War II, said: "In terms of saving lives, aeromedevac is on the same level as plasma and penicillin."

#### History

(a) Prior to 1792, casualty evacuation was rather precarious and improvised; Baron Larrey, Napoleon's surgeon, introduced the use of light, two-wheeled ambulances, for the fastest possible and least painful evacuation of wounded; this, combined with his surgical skill, saved a number of lives in the battles of Abukir and Borodino.

(b) During the siege of Paris in 1870, 160 patients were evacuated over the Prussian lines in observation balloons.

(c) In 1890, De Mooy, a Dutchman, pointed up the importance of air transport of wounded and at the Scheveningen Exhibit in 1892 he demonstrated how this could be done with balloons.

(d) In 1895, Ch. Richet tried to stir up public opinion in support of aeromedevac but was attacked for his views.

(e) In 1910, De Mooy took up the subject again and in the Dutch magazine La Sirena he published blueprints of medical evacuation aircraft; during that same year, G. Gosman, a Captain in the Medical Corps of the US Army made an ambulance aircraft at Fort Barrancas in Florida.

(f) In 1912 we had the works of Dr. Reymond, Duchaussoy, Perret, Eybert, and Julliot, of France; the officers of the Medical Corps of the British Army pointed up the possibility of medical assistance by air; Reymond simulated an aeromedevac mission during that year.

(g) In 1913, the aviatrix Marvingt put a duraluminum stretcher on her Duperdussin monoplain for patients to be used in airevac.

(h) World War I.

(1) During the withdrawal from Serbia in 1915, Dangelzer and Paulhan evacuated 12 seriously injured in warplanes which had been precariously adapted for this purpose; it was French aviation which evacuated a wounded Serbian aviator across Albania.

(2) In 1916, the Royal Flying Club of England evacuated a soldier by air from Palestine.

(3) In 1917, Dr. Chassaing built an ambulance aircraft of the Dorand type which carried two litters, with mattresses and protection against the wind. The aircraft was used in the French frontlines; Marshal Lyautey ordered the transformation of 60 Breguet aircraft into ambulance aircraft and in 1918 four Dorand-Dalsace aircraft were identically converted for this purpose; all of these aircraft were used in operations in Morocco.

(4) In 1918, the RAF transported wounded in aircraft in the Morocco theater of operations.

During that year, Major N. Driver and Captain W. Ocker of the United States converted a Jn-4 into an ambulance aircraft (in Louisiana, USA).

(1) In 1919, the French General Poeymirau, wounded in the Moroccan Sahara, was transported by air.

Between 1919 and 1937, the RAF employed planes and hydroplanes to carry 3,000 casualties by air in the course of operations in Somalia, Iraq, Palestine, and Waziristan.

(j) In 1920, Count Densin, not having any ambulance aircraft, evacuated 80 casualties by air in combat aircraft from Sicily and Syria to the medical-surgical centers of the Levant.

(k) In 1921, France transported 700 wounded by air in Morocco.

(l) In 1929, Major Robert Simpson, an American, pointed up the advantages of aeromedevac: comfort, saving lives, and speed.

(m) In 1935, Beaver proposed the subdivision of aeromedevac: smaller aircraft for places with short runways and larger aircraft to operate out of airfields.

(n) In 1935, during the war between Paraguay and Bolivia, Bolivia conducted aeromedevac over a distance of 250 km between the front and the surgical center at Tarija.

(o) During the 1936-1938 [sic] Spanish Civil War, Kowalssig cited the trips made by the Junkers aircraft from Spain to Germany in one leg, covering a distance of 2,200-2,600 km and carrying five wounded on each trip; the aircraft used were Ju-52's which carried oxygen and surgeons on board.

(p) During World War II, aeromedevac was conducted by the Germans in 1939 during the Polish campaign; 2,500 wounded were evacuated by air to German hospitals; only four died, with the first of them carrying a bullet wound in the lumbar vertebra, the second and third having wounds in the lungs, and the fourth having peritonitis.

(1) In 1940, Lieutenant General Hippke, chief of the German Air Force Medical Service, reported that the aeromedevac problem was solved by equipping conventional transport aircraft with brackets to which stretchers could be attached; he preferred the rapid adaptation of transport aircraft to the use of ambulance aircraft; he listed the decline in the sick rate and the death rate as advantages of air evacuation.

(2) During the Russian Campaign (1939-1940), the Germans evacuated 280,000 casualties by air.

(3) In 1942, the United States organized aeromedevac squadrons.

(4) Between 1939 and 1945 the RAF transported 500,000 casualties by air.

(5) Between 1942 and 1949, the USAF carried a total of 1,410,927 casualties.

(6) During 8 months of operations, 327 sick and wounded of Brazil's FEB [Brazilian Expeditionary Force] were evacuated by air.

(q) During the Korean Conflict, aeromedevac plus antibiotics and plasma saved lives.

With the large-scale use of helicopters, air evacuation reached the climax of its mission. Between June 1950 and 30 September 1951, the USAF evacuated 176,936 casualties by air (Colonel Allen Smith).

(r) Aeromedevac proved its effectiveness during the Indochina Campaign.

## 2. Aeromedevac According to Modern USAF Doctrine

The USAF has adopted the following standards pertaining to evacuation as we can see in paragraphs a (airevac echelons), b (airevac phases within the TO [theater of operations]), and c (medical units implementing airevac).

### (a) Aeromedevac Echelons

There are three echelons in air evacuation: the 1st, 2nd, and 3rd.

(1) 1st Echelon. It is handled by liaison aircraft, gliders, and helicopters -- advanced aeromedevac.

The distance covered by this echelon is between 10 and 100 miles (a), the hourly speed is between 100 and 125 mph (b), the aircraft are single-engine (c); they require runways with a length of 700 ft for landing and takeoff, while helicopters only need a clearing or sufficient room to perform their maneuvers (d).

In general they carry two to four patients or more; the crew consists of one pilot and one male nurse or perhaps even a flight surgeon (f). It operates within the TO and can evacuate casualties from the 1st echelon of the Army -- PSB [Battalion Aid Station] and PEVD [Divisional Clearing Station] (g).

(2) 2nd Echelon. It is equipped with Douglas C-47 aircraft; this is tactical aeromedevac.

The distance covered in general is between 100 and 1,000 miles (a); the speed of the aircraft is between 125 and 300 mph (b).

Here we mostly have twin-engine aircraft (c); in general they require a runway of 2,500 ft; these must be grass or surfaced runways (d); they carry an average of 15-30 casualties (e); the crew consists generally of two pilots, one engineer, one radio operator, one flight nurse, one or two male flight medical attendants, and if necessary one flight surgeon (f).

It is on the 3rd or 4th echelon of the army (Army Medical Corps, ZA [Com Z] and ZI (g).

The modern transient aeromedical groups, which operate the transient hospitals, have regular landing fields.

(3) 3rd Echelon. It is provided with Douglas C-54 aircraft and this is called strategic aeromedevac.

The distance covered varies between 1,000 and 10,000 miles (a); the aircraft fly at speeds between 185 and 500 mph (b).

These are at least four-engine aircraft (c); in general they require a surfaced runway of 7,000 ft (d); they can carry from 30 to more than 300

casualties (e); the crew consists of an average of two to four pilots, one or two navigators, one or two engineers, one or two radio operators, one to three flight surgeons, one to ten flight nurses, and one to ten flight attendants (f).

They perform evacuation missions from ComZ to the ZI (g).

At the takeoff points they require the modern aeromedical transit groups which operate the transient hospitals and they bring the casualties to be evacuated to the aircraft and they receive the casualties that come from the TO.

(b) Aeromedevac Phases

During all years of warfare, more than 1 million patients were carried and more than 1 million miles were logged by air.

In 1949, the Secretary of Defense made a study of the report submitted by the Chief of the Medical Service of MATS, listing the advantages and disadvantages of aeromedevac; it was established that the standards of the department would call for the transport of wounded and patients -- in peace or war -- where ever possible by air.

Airevac is accomplished in two distinct phases within the TO. In the first phase, advanced or front line aeromedevac, the casualties are transported by helicopter, liaison and assault aircraft. The mission is performed by the advanced or front line aeromedevac squadron (EA) (TOLE 1-4101T). This squadron consists of a HQ, a supply section (both of them with a total of one officer and three EM) and three evacuation teams (each with one officer and seven MC EM) as we can see below.

The unit is responsible for the loading and unloading of all casualties in aircraft, including the 1st, 2nd, and 3rd echelons of the Medical Service. It evacuates casualties from the infantry, armored, and airborne divisions who require immediate and specific medical-surgical assistance. It also provides 1st, 2nd, or 3rd-echelon routine evacuation when evacuation by land is not practicable.

These units are distributed to the numbered tactical air forces and they are subordinated, by the chief of the Medical Service of the TAC, to the transport brigades when these are equipped with helicopters, liaison aircraft, or attack aircraft and when their missions include direct aeromedevac support for ground forces or when, attached to the air transport brigades, they remain subordinated to them. Their subordination may depend on the particular requirement as determined by the chief of the Medical Service.

During the second phase, the unit which provides medical-surgical assistance on board conventional aircraft is the aeromedevac squadron (TOLE 1-447). The squadron organization includes a HQ and four flights; each flight is commanded by a flight surgeon.

Each flight has six evacuation teams giving us a total of 24 evacuation teams in each squadron. Each evacuation team consists of one flight nurse and one MC EM or technician. Below we will see how they are organized.

Each team is trained to take care of the number of casualties carried in the particular aircraft, on the average. This team can be reinforced with a flight surgeon or even flight nurses and technicians, depending upon the number or nature of casualties carried.

Within the TO, this unit is employed in conjunction with the transport units.

(c) Aeromedical Transit Groups

The aeromedical transit groups are advanced casualty receiving units in the aeromedevac pipeline. These groups are stationed where it is necessary to establish central casualty collecting and transportation points. This procedure is advisable before we conduct any other aeromedevac missions to hospitals or rear-area embarkation units. They are organized along three different types: TOLE 1-4001-T (heavy), 1-4002-T (medical), and 1-4003-T (light) and they operate the transient hospitals.

Their evacuation capacity is between 400 and 1,200 patients per day; depending upon the requirements, they may be organized according to the directives issued by the chief of the Medical Service of the TO. Their assignments can be seen below.



TOLE	UNIT	PERSONNEL officers EM Total	DISTRIBUTION	MISSION, CAPACITY, OBSERVATIONS
1-4001 T	Aero- medical transit group (Heavy, capacity 1,500 ev evacuees	180 769 949	Major air commands and TO and over- seas	Receives and evacuates 1,200 casualties every 24 hours; furnishes temporary medical assistance and treatment to evacuees; conducts triage [sorting], classifies and gives priority to casualties awaiting aeromedivac to the ZI and redistributes casualties retained in the TO to adequate treatment facilities likewise within the TO; conducts disinfection, delousing of uniforms and equipment of casualties to be evacuated; prepares an inventory and recovers clothing and equipment of evacuees; makes a count of personal property, government equipment and uniforms as well as enemy equipment; receives, stores, distributes, and records medical equipment and supplies. Furnishes the equipment and supplies accompanying casualties to be evacuated by air; distributes all kinds of rations to its personnel, to attached personnel, to aircraft crew members, casualties, as well as in-flight rations; trains personnel of the Air Force Medical Service and provides medical assistance for subordinate or attached personnel.
1-4002 T	Aerome- dical transit group (medium, capacity 1,000 evacuees)	129 562 691	Major air commands and TO and over- seas	Same mission as Heavy [group], with the difference that it receives and evacuates 800 casualties every 24 hours.
1-4003 T	Aeromedical transit group (light), capacity 500 evacuees)	89 332 421	same	Same mission as Heavy [group], with the difference that it receives and evacuates 400 casualties every 24 hours.

TOLE	UNIT	PERSONNEL		EQUIPMENT		DISTRIBUTION	OBSERVATIONS, MISSION, CAPACITY
		Officers	EM Total	Heavy lbs	Volume Cu ft		
1	TOLE Aeromedi-	31	56	87	97888	8391	<p>Furnishes Medical Service Personnel to the COMTA [TAC?] and air transport units responsible for the air evacuation of patients and wounded. The squadron renders medical assistance, nursing service, and on-board treatment; out of its personnel, 25 are flight nurses (commissioned officers); during flight, the flight nurses fill out the aeromedevac card below.</p> <p>Provides 1st, 2nd, and 3rd echelon evacuation by air for infantry and armored casualties requiring immediate and specific treatment; performs 1st, 2nd, and 3rd echelon routine evacuation missions when land evacuation is not practicable.</p>
1	cal eva-						
1	cuation						
447	group						
19	July						
44							
	Advanced	4	24			28	<p>Normally sub-ordinated to the numbered tactical air force or one in support of each army corps</p>
	or front						
	line aero-						
	medevac						
	flight						

**AEROMEDEVAC CARD**  
or  
**AIR-TRANSPORTED CASUALTY REPORT**

Name.....Duty Station.....Sex.....Age.....

Date.....From:.....To:.....

**Diagnosis**

Ambulatory..... Stretcher.....

Surgical: preoperative..... Postoperative.....

**IN-FLIGHT SYMPTOMS**

- |  |                            |                 |
|--|----------------------------|-----------------|
| 1. none                                | 8. vomiting                | 17. weak, tired |
| 2. pallor                              | 9. difficulty in breathing | 18. cooperative |
| 3. perspiration                        | 10. dyspnea                | 19. calm        |
| 4. cyanosis                            | 11. headache               | 20. morose      |
| 5. vertigo                             | 12. earache                | 21. disturbed   |
| 6. gastrointes-<br>tinal dis-<br>order | 13. intestinal gas         | 22. aggressive  |
| 7. nausea                              | 14. pains                  |                 |
|  | 15. chills                 |                 |
|  | 16. trembling              |                 |

**The Symptoms Occur:**

1. absence of symptoms
2. prior to takeoff
3. during takeoff
4. in flight
5. during descent
6. after landing

**Flight Conditions:**

- Altitude**
1. less than 5,000 ft
  2. 5,000-10,000 ft
  3. 10,000 ft and more

- Weather**
1. good, calm
  2. slight turbulence
  3. moderate turbulence
  4. severe turbulence

**TREATMENT OF SYMPTOMS**

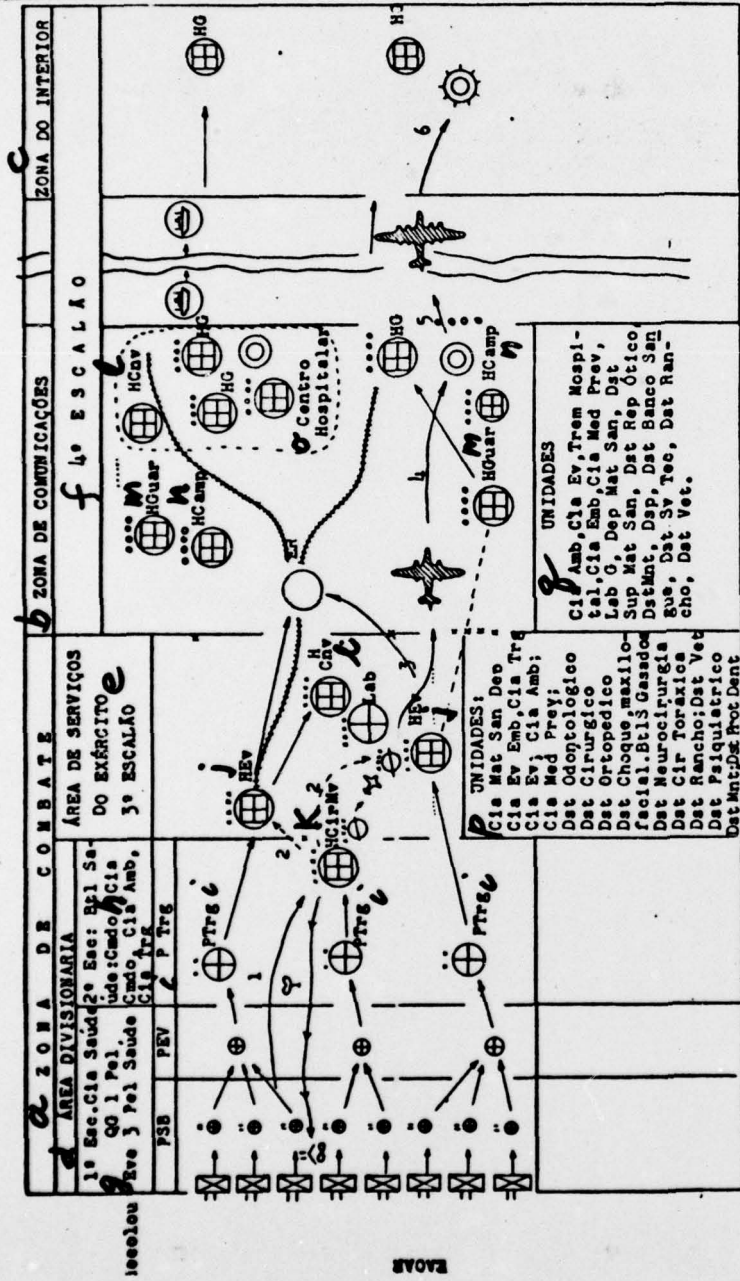
- |           |                         |               |
|-----------|-------------------------|---------------|
| 1. none   | 2. rest on stretcher    | 3. medication |
| 4. oxygen | 5. other (specify)..... |               |

**RESULT OF TREATMENT**

- |  |                     |                   |
|--|---------------------|-------------------|
| 1. no treatment                          | 3. cure             | 5. no improvement |
| 2. improvement<br>without treat-<br>ment | 4. some improvement | 6. unknown        |

**COMMENTS**

**Signature**



16 Esc Ev Ao  
1.0.2

28 Esc Ev  
3.3.4

35 Esc Ev Ao  
2.3.4

Legend: a--combat zone; b--communications zone; c--ZI; d--division area; e--army service area, 3rd echelon; f--4th echelon; g--1st echelon, medical corps company, HQ, one platoon, three medical corps platoons; h--2nd echelon: medical battalion, HQ, HQ company, ambulance company, sorting [triage] company; i--triage point; j--evacuation hospital; k--surgical hospital; l--convalescent hospital; m--base hospital; n--field hospital; o--hospital center; p--units: medical equipment depot company, evacuation embarkation company, triage company, evacuation company; ambulance company; medical supply company; dental detachment, surgical detachment, orthopedic detachment, shock and maxillo-facial detachment, medical battalion for the treatment of gas casualties; neurosurgical detachment, chest surgery detachment, mess hall detachment; veterinary detachment; psychiatric detachment, assembly detachment, dental prosthesis detachment; q--units: ambulance company, evacuation company, hospital train, embarkation company, medical supply company, laboratory, medical equipment depot, medical equipment supply detachment, hearing aid detachment, assembly detachment, veterinary detachment, blood bank detachment, technical service detachment, mess hall detachment, veterinary detachment; i--1st aeromedevac echelon, 1 and 2; s--2nd evacuation echelon, 3 and 4; t--3rd aeromedevac echelon; l--formal route of helicopter detachment; 2--formal route of helicopter company; EAOAR [unknown]; HG--General Hospital; HGuar--Base Hospital;

### 3. Aeromedevac: 1st or Front Line Echelon

(a) Initial considerations. The medical aircraft many years ago yielded to transport aircraft; these aircraft, which move troops and supplies, all of them to the TO, upon their return carry wounded from the front to medical facilities which provide more comfort.

Medical aircraft used in the past, such as Aerochir (1921), Hanriot H 14 (1925), Guillemin IG 40, Le O 21, Potez 29 (1933), Beach Craft, Monospar (1936), Junkers F-13, Junkers G 31, Junkers 33-34, Fokker F-14, have now yielded to our present day C-47's, C-54's, and C-124's.

Along with gliders and liaison aircraft, we now have, on the first echelon, helicopters which the Americans have nicknamed "flying angels."

(b) Characteristics of aircraft employed on the 1st echelon. Colonel Kenneth E. Pletcher provides us with the main data of aircraft used on the airevac echelons. Here are those on the 1st echelon:

(1) Types of aircraft: liaison-type aircraft, gliders, and helicopters.

(2) Speed and distance: aircraft speed between 100 and 125 mph, with an average of 100 mph; the 1st echelon requires more than 5 minutes to fly 10 miles and 55 minutes for 100 miles; the distance covered by the 1st echelon is between 10 and 100 miles.

(3) Casualty capacity: between two and four wounded can be carried in the 1st echelon; it is true that present-day helicopters can carry more than 30 patients.

(4) Crew: the 1st echelon carries one pilot and one EM; the latter can be replaced by a nurse or surgeon depending upon circumstances.

(5) Facilities: the 1st echelon does not require evacuation and embarkation points since it picks up the casualty at the place where he was wounded, as determined by the HQ of the TO, or at the front line or at the PSB or at the mobile surgical hospital.

(6) Death rate: as far as we know, the 1st echelon has not yet reported any deaths during evacuation.

(7) Flying altitude: the 1st echelon operates between 500 and 2,000 feet.

(8) Landing strip: the helicopter requires only a small open space for landing; the liaison aircraft needs a gravel or grass strip with an approximate length of 700 feet.

(9) Medical equipment on board: in general rather restricted and consisting of emergency rations, a small first-aid box with morphine, codeine, aspirin, etc.

(c) Types of aircraft used in 1st echelon

(1) Gliders. Gliders in general must be used only in an emergency; Colonel Pletcher declares that, since the glider is not motorized, it must be used only when there are no other means of evacuation.

They were used during World War II in Burma and at the Remagen bridge-head on the Rhine; they were used as an emergency measure when landing strips were being built for aircraft.

The gliders were picked up by the C-47's during low-level runs over the place where they were parked. The most frequently used glider was the Waco CG-4A which is equipped with six stretchers (in an emergency) plus six walking wounded. The French are presently using the "Emouchet" glider equipped with four "Escopette" pulse-jato; but it has not yet been used in air evacuation.

(2) Liaison type aircraft. These aircraft in general are equipped with one litter or they can carry one to three walking wounded. During World War II, in the Burma-India theater and in the Philippines, they were used in transporting casualties from the regiments and divisions to the evacuation and field hospitals. These are light and sturdy aircraft and we might mention the following types:

(a) The LIC with floats and skis for landing on the water and in the snow; it carries a pilot and one litter or one walking wounded.

(b) The Vultee Vigilant L-1, the Texas Ag-1, and Piper PA-18, the Vultee Sentinel L-1, the Consolidated Vultee L-13, the Convair L-13, the Aeronca Champion L-16, the Paulistinha, and the HL, all of them with one pilot and one litter or one ambulatory patient.

(c) The Beech Bonanza C-35, Tenco Swift GC-1B, Piper PA-20, Cessna 195, Ryan Navion L-17, Cessna 170, Piper PA-22 -- all of them with one pilot, one assistant, and one litter or two ambulatory patients.

These aircraft are very important in our study because they are available in large numbers at the aviation clubs in Brazil; they are relatively easy to maintain and in an emergency situation they must be considered for employment in aeromedevac.

(3) Helicopters:

The helicopter, which we studied in greater detail before, was employed by various rescue services and during World War II the R-4's, R-5's, and R-6's were used in aeromedevac. Patients can be carried in litters placed outside the craft or inside. They have been used for the evacuation of wounded, picking them up at the very place where they were hit when the situation so permits. In addition to the pilot they can carry between two and 12 or even more litters.

(d) 1st echelon service employed in modern war. According to Allen Smith, aeromedevac during operations in Korea was governed by the following principles:

(1) Inside Korea, patients whose recovery was expected to take 30 days remained in Korea and were transported in C-47-type aircraft.

(2) Outside Korea, patients requiring treatment in excess of 30 days were sent to hospitals in Japan and were carried in C-54-type aircraft.

(3) In Japan, some patients were sent from the hospitals in Southern Japan to the big hospitals in Osaka and Tokyo and they were transported in C-47-type aircraft.

In most cases the helicopters were used in 1st echelon airevac during operations in Korea; in August 1950, an aid station was isolated at a point at an elevation of 3,000 feet; communications were cut and a helicopter was used to carry out airevac; since then, these craft have been perfected for troop transport and aeromedevac purposes.

Helicopters generally pick up the casualty at the front and take the casualty to the mobile surgical hospital or to the hospital ships "Consolation" or "Haven"; helicopter detachments were always available to the mobile surgical hospital for aeromedevac purposes (Kater).

#### 4. Helicopters in Air Evacuation

##### (a) Historical Background

(1) The idea of vertical flight comes to us from Leonardo da Vinci, during the 16th century (1500), who visualized a spiral of light material with appropriate construction that could rise in space.

(2) In 1923, Juan de La Cierva invented the autogiro and in 1937, Focke-Engel, a German company, built a craft which flew from Bremen to Berlin (capacity: 6 seats).

(3) Igor Sikorsky had been dreaming of building a helicopter since 1908 and finally built one in Russia which however did not fly.

(4) In 1939, Sikorsky built the VS-300 in the United States. Since then, this craft has accomplished various missions both in peace and war, almost always with the utmost success; it is designed for troop and supply transport and its noble purpose is to save lives.

(b) Various rescue missions have been carried out in the Arctic, on the ocean, during floods, in the desert and in the mountains; we might mention some of them here:

(1) During floods in California in 1950, a helicopter with a crew of one pilot and one crew member saved 39 lives, working 22 hours without rest.

(2) Certain lighthouses are supplied by small helicopters (Kellett eggbeaters).

(3) Helicopters (Bell helicopter) are used in the Forest Service, in spreading DDT on areas infested with insects, and during scientific expeditions going to high mountain peaks.

(4) In January 1950, it took mountain climbers 3 days in Yukon, United States, to reach the icy peaks of a mountain on which an aircraft had crashed. In just 2 hours, the helicopter carried all of the injured to the nearest hospital.

(5) During the floods in Holland, most of the rescue work was done by helicopters.

(6) On 12 March 1953, a telegram from Rome announced that the little town of Castelluccio, near Perugia [Perugia], in Central Italy, was half buried under 8 meters of snow and was being supplied by helicopters; the 1,600 inhabitants were linked to the rest of the world only by telegraph wires; normal contact with the neighboring towns was not restored until May.

(7) Forest fires have also been fought with the help of helicopters.

(8) Civilian uses for helicopters. Although the helicopter is presently being used on a rather small scale in the civilian sector we can expect without doubt that hundreds will in the very near future be used for specific missions. In addition to the above-mentioned missions we might mention the following:

- (a) Postal service,
- (b) Police patrols,
- (c) Epidemic prevention,
- (d) Inspection of power lines and oil pipelines,
- (e) Miscellaneous reporting,
- (f) Prospecting for petroleum deposits,
- (g) Transport of patients from hard-to-reach places,
- (h) Tourist aviation,
- (i) Air transport between the downtown areas of cities or from airports to downtown areas.

And we can image many others.

(c) The Helicopter in Brazil

Brazil's first Air Force helicopter made its experimental flight at Galeao Airport on 31 March of this year. This is a Bell helicopter with 200 hp,



with a speed of 97 mph, piloted by Air Force majors Humberto Aguiar and Celso Macedo. Others will come later and can be useful in any emergency that might arise on our territory. The helicopter can perform any rescue operation, in the forest or on the high seas.

When equipped with a winch, this craft can, with the help of the medical attendant, pick up patients and injured even if no clearing has been made for it to land; the litter comes down on a cable and the patient is hoisted aboard with the help of the flight attendant. This method was used for pilots who crashed into the sea and whose aircraft were still afloat; the cable is lowered and the pilot ties it to his belt and he is then pulled up.

Just as liaison aircraft are very useful in our vast Brazilian territory, these helicopters will also be used extensively here. Sao Jose dos Campos is getting ready to produce them in numbers capable of meeting all needs.

#### (d) The Helicopter in Modern War

The facts which we report below are taken from contemporary bibliography (Lt. Comdr. A. L. Schoeni, USNR, and Comdr. M. T. Martin); they speak very highly of these craft in airvac in modern war; the difficulty of building long landing strips and the rough terrain make these "flying angels" even more valuable. Their importance is so great that the death rate, which was 80% during World War I, dropped to 45% during World War II; after launching helicopter operations in Korea, the death rate in UN hospitals dropped to 26%.

The process of transporting casualties was simple during operations in Korea: the soldier wounded at the front was evacuated and treated by the surgeon at the PSB; in case he was seriously wounded, a call was placed to the mobile surgical hospital and the helicopter came from there to take the casualty either to that hospital or to the hospital ship near the coast; in flight, the male nurse would administer whole blood, plasma, or the necessary medication; there were cases where the helicopter was able to pick up the soldier in the exact place where he had been hit.

The US Army states that 97.25% of its wounded survived and that 85% were returned to combat duty because of the effectiveness of the aeromedevac units (Schoeni). But here are some true stories which will corroborate our statement:

(1) Downed pilots were picked up and taken to the hospital ship "Consolation" under enemy fire.

(2) On 15 August 1951, 600 South Koreans were surrounded by Reds and had only one way out: to the beach; a helicopter spotted them and established contact with a ship in a naval squadron and that ship was able to rescue the surrounded unit.

(3) On 23 August 1950, a helicopter picked up a pilot 8 minutes after he had crashed on takeoff at a base in Southwestern Japan -- a record indeed; another pilot was rescued 40 minutes after he had parachuted from his

disabled aircraft southwest of Honshi; just 20 minutes after a B-29 had crashed on Okinawa, the survivors were brought to the hospital; 10 minutes after the accident, the helicopter landed on the spot and picked up those who were still alive; 10 minutes later the wounded were in the hospital.

(4) These helicopters rescued 16 Americans and 24 South Koreans in a desert area north of Seoul.

(5) US Navy helicopters rescued 118 men from the Corvette "H.M.S.T. Prassae"; this vessel had run aground along the coast of Korea controlled by the North Koreans during a storm.

(6) A HUP, during one of the exercises of the North American Squadron, picked up two pilots and deposited them on board the USS Midway just 90 seconds after the aircraft had fallen into the water.

(7) In June 1952, an American Army sergeant was evacuated from the front line to a base hospital by an H-5 Sikorsky of the 3rd airevac squadron; when he saw the craft, his first words were: "My angel of mercy has come."

(8) During operations in Korea until December 1951, more than 4,000 wounded were evacuated from the front lines and some of them were sent on to the air port of Seoul (Kater).

(9) From June 1950 until September 1952, helicopters carried out 4,779 evacuations [missions] in spite of the fact that the Marines only had half a dozen Sikorsky or Bell helicopters in squadron VMO-6; on just one day in May, 77 casualties were evacuated by air from Hwachon, a number which climbed to 222 during the 31 days of that month.

The other squadron, HMR-161, using bigger Sikorsky helicopters, the HO4S, although its primary mission was troop transport, managed to evacuate and rescue a total of 779 patients in one year.

(10) Modern stretchers provide more visibility for casualties since the covers are plastic; the old stretchers of the Bell H-13D employed in aeromedevac gave the casualties claustrophobia.

(11) The US Army has about 2,000 helicopter pilots and is training Army Medical Service Corps officers at Fort Sill, Okla., in a 19-week course so that they will be able to fly these craft; these officers are not doctors but do have training in medicine which enables them to administer first aid to casualties, to give plasma, etc.

(12) Helicopters played a most important role in the evacuation of patients and wounded during operations in Indochina.

(e) Here is a table of helicopters with some of their features and capacities.

1	2	3	4	5
DESIGNAÇÃO MILITAR	CAPACIDADE APROXIMADA	CARACTERES VELOCIDADE 1.ª Cruzeiro; 2.ª Máxima	FABRICANTE	EMPREGO
R-4 R-5	5 pessoas: 1 piloto 2 macas externas 2 macas internas 3 Passos: 1 piloto, 245 HP 2 macas externas	—	17 em uso desde 1945 — Sikorsky 17 EE. UU. Idem	Ev Ae, Transporte 20
R-6	1 enfermeiro 3 lugares ol 3 macas + piloto 8 10 lugares	—	Idem	Idem
H-5H H-12	3/4 ton 6 lugares + piloto 3 lugares: 1 piloto e 2 macas 42 lugares	64 Km/hr 140 Km/hr 170 Km/hr 64 Km/hr 120 Km/hr 145 Km/hr	Bell Aircraft Corp. EE. UU. Idem	Transporte; Ev Ae 20 21 Jeep voador; Ev Ae (Coréia)
H-12B H-13	3 ton 4 lugares: 1 piloto 1 enf. e 2 macas	170 Km/hr 210 Km/hr ráio de ação	Piasecki H. Corp. EE. UU. Sikorsky EE. UU.	Em experiência Jeep voador; Ev Ae (Coréia)
XH-16	3 ton 4 lugares: 1 piloto 1 enf. e 2 macas	550 Km. 145 Km/hr 175 Km/hr	Idem	Transporte arma- mentos, Ev Ae Caninhão voador Trem pouso onli- bio (terra, água, gelo); Ev Ae
H-19	12 lugares: 1 piloto 1 enf. 2 dentes e 8 pedrolas 16 lugares: 12 macas 1 piloto, 1 enfermeiro, 2 doentes	100 milhas horárias 155 milhas horárias	Piasecki EE. UU.	Idem
H-21A	16 lugares: 1 piloto e 2 macas	Idem	Idem	Idem
H-21B H-23B	22 lugares: 1 piloto 3 lugares: 1 piloto e 2 macas	120 Km/hr 145 Km/hr	Hiller H. Corp. EE. UU.	Jeep voador; Ev Ae (Coréia)

1	2	3	4	5
DESIGNAÇÃO MILITAR	CAPACIDADE APROXIMADA	CARACTERES VELOCIDADE 1.ª Cruzeiro; 2.ª Máxima	FABRICANTE	EMPREGO
H-26A ou HUP-3	6 lugares: 1 piloto, 1 enfermeiro, 1 doente, 3 macas 11 14 14	85 milhas horárias 12 105 milhas horárias 12	Plasecki H. Corp. EE. UU. 18	Army mule - Transporte de tropas - Ev Ae Idem
HUP-1	6 lugares 12	90 milhas horárias 14 105 milhas horárias 14	Idem	Idem
HUP-2	6 lugares 12	68 milhas horárias 14	Idem	Idem
HTE-2	3 lugares 12	180 Km/hv	Hillcr H. Corp. EE. UU. 31	Idem
Gyrodine 2C	6 lugares 12 1 piloto, 1 enf., 11 1 doente, 3 macas 14 6 lugares: 1 piloto, 8 enfermeiro e macas 14	82 milhas horárias 14	Gyrodine Co. - EE. UU.	Suprimento; Ev Ae 19
Donan LZ-5	4 lugares: 1 piloto, 8 1 enfermeiro, 2 macas 14 1 piloto, 1 enfermeiro e 11 doentes ambulatórios 27	—	Doman H. Inc. EE. UU. Inglês 97	Idem Transporte; Ev Ae 20
Sycamore Bristol-175	1 piloto, 15 8 6 15	168 Km/hv 16 233 Km/hv	Inglês 34 2 motores	Transporte, Carga; Ev Ae 22 19
XH-26	1 piloto e 2 padiolas	A JATO 2 motores a Jato; velocidade 133 Km/h; voo 1 h a 1 hora e meia sem reabastecer.	EE. UU. 18	Em experiência na US Air Force 23
Kaman 225	3 lugares inclusive o piloto	Turbo motor 175 HP 2 turbo jato	EE. UU. 18	Em experiência 23
XH-17				

Legend: 1--military designation; 2--approximate capacity; 3--speed, 1, cruising; 2, maximum; 4--manufacturer; 5--use; 6--and; 7--persons; 8--pilot; 9--external stretchers; 10--internal stretchers; 11--male attendant; 12--places [seats]; 13--or; 14--stretchers; 14a--patients; 15--litters; 15a--mph; 16--action radius; 17--in use since; 18--United States; 19--aeromedevac; 20--transport; 21--flying jeep; 22--Korea; 23--being tested; 24--weapons transport; 25--flying truck; 26--land, water, ice landing gear; 27--ambulatory patients; 28--three seats including pilot; 29--two jato motors, speed 133 km/hr, endurance 1-1.5 hr.; 30--troop transport; 31--supply; 32--cargo; 33--being tested by USAF; 34--British.

**(f) Present aeromedevac missions by helicopters:**

Here are the basic principles of helicopter aeromedevac used during the Long Horn maneuvers in Texas by the US Army:

(1) Aeromedevac missions for casualties requiring fast transport is worthwhile, practical, although very expensive.

(2) At this time, the Army is trying to see to it that seriously wounded, who require comfort and rapid evacuation to save their lives, will be transported by air.

(3) Where possible, this transport must be made available even to less seriously wounded.

(4) An ambulance helicopter detachment (T/O&E 8-500 A), supporting each division in the zone of operations, could meet the basic needs of that division.

(5) The inclusion of air evacuation in the missions of the Army Transport Helicopter Company will materially increase the air evacuation potential of the Army service area.

(6) The helicopter is extremely valuable in supporting ground evacuation and its qualities must be investigated at every opportunity.

(7) The helicopter so far does not eliminate the need for medical service facilities from the Army service area nor has the importance of that area declined in any way.

(8) The future improvements in this craft must be aimed primarily to facilitate greater comfort and safety and at the same time assistance during flight.

(9) In the Army service area, there must be ambulance helicopter detachments under the control of the divisional surgeon, in other words, they must operate with the medical battalion. Normally, each division must have one detachment and another one must be in reserve, in the Army area.

(10) The normal operations area of an ambulance helicopter detachment must be between the front line and the MASH which supports the divisional clearing station.

(11) Casualty evacuation from the front lines to the evacuation hospitals or evacuation and embarkation units located in the division rear area must be handled only by helicopters of the detachment under special circumstances.

(12) The success of aeromedevac for the Army depends on the perfection of communications, the improvement in operations management, and the teamwork between the various headquarters involved.

(13) Aeromedevac from the mobile surgical hospital to the evacuation and embarkation units or evacuation hospitals in the Army service area must be accomplished by the Army transport helicopter company, as a secondary mission, upon return, in addition to the mission of carrying supplies to the front on supply runs.

(14) Army transport helicopters must perform aeromedevac missions only under exceptional conditions forward of the mobile surgical hospital or beyond the Army rear area.

(15) Army Aviation, when completely developed on the basis of existing standards, will be capable of meeting all aeromedevac requirements for the movement of casualties within the Army area.

#### Summary

##### Initial Considerations

The author gathers modern data and standards adopted in air evacuation and divides the work into four sections:

1. Definition and History of Aeromedevac.
2. Aeromedevac According to the USAF Concept:
  - a -- The Three Echelons of Aeromedevac,
  - b -- Aeromedevac Phases,
  - c -- Aeromedical Groups, Aeromedivac Squadron and Flight.
3. The 1st Echelon of Aeromedevac and the Aircraft Employed are Gliders, Liaison Aircraft, and Helicopters.
4. The Mission of Helicopters in Aeromedevac and the Standards Adopted for the Helicopters of the Ambulance Helicopter Detachments All the Way to the MASH and Those of the Army Transport Helicopter Company From That Hospital to the Evacuation Hospital and Evacuation or Embarkation Units Is in Accordance With the Opinion of Linston and Giesecke.

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