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TITLE
TO WHAT EXTENT CAN HELICOPTERS BE EMPLOYED TO EVACUATE CASUALTIES FROM FRONT LINE UNITS UNDER COMBAT CONDITIONS

Capt Phelps R. Womble
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PREFACE

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The point of view expressed in this paper is that of the author - not necessarily that of The Infantry School or the Department of the Army.

Phelps R. Womble, Capt, Inf

INTRODUCTION

All too frequently many military men, reacting like laymen, marvel at the dramatic evacuation of a wounded soldier from an isolated place, as though it were a miracle. Helicopter evacuation is not and never should be thought of solely as an emergency operation, but should be thought of as a part of the normal evacuation system. (11:51) This monograph is a discussion of the extent of employment of the helicopter in its role as a transportation vehicle in the evacuation of casualties from front line units under combat conditions.

During the Korean conflict, thousands of soldiers were saved by this means of evacuation and returned to duty in a relatively short time. This success was due to the speed and efficiency of the rotary-wing aircraft in transporting the casualty to a medical installation capable of administering the necessary definitive medical treatment. Thus the author accepts as fact the necessity, validity and feasibility of helicopter evacuation of casualties. (4:153)

In order to limit the scope of this monograph, the author must define a portion of the title so that the reader and author will proceed with a mutual understanding. COMBAT CONDITIONS, EXTENT, and FRONT LINE UNITS will be limited in meaning.

Combat conditions for the discussion is defined as those conditions which exist when a unit is subject to receiving or is actually receiving effective fire from enemy direct fire weapons and/or observed or unobserved fire from indirect fire support weapons.

Extent has been defined in part by Webster as being of a given dimension or degree, i.e., the limit to which anything reaches in size within given bounds. Therefore, this paper will be confined to the potential of helicopter evacuation of casualties, in respect to extent,

and will not delve into the mechanics of rotary-wing evacuation except as is necessary to illustrate a point in question and where the mechanics of evacuation have an inherent limiting affect. Also the technique of evacuation will be incorporated to outline procedures that can be taken to minimize some of the inherent limitations of this relatively new transportation vehicle available to the Army.

Next we must establish a common denominator in limiting what is meant by front line units. For our purpose, front line units will be those infantry troop units positioned in the forward battle position that are (1) actually in contact with the enemy, (2) positioned in order to support by fire the units actually in contact, and (3) capable of swift movement to counterattack the enemy that has penetrated the position of a unit that is considered in contact.

DISCUSSION

Among other specific missions of medical company of the infantry regiment is the establishment and operation of a collecting station for receiving, sorting, and temporary care of casualties and removing casualties by litter and/or ambulances to battalion aid stations and collecting stations with continuous medical care incident to further evacuation to the rear. (9:1) Herein lies the basic responsibility for introducing the helicopter, as an ambulance, into the evacuation organization.

Sorting of casualties consist primarily of establishing a priority of treatment and ascertaining which case is an emergency case. Emergency cases are those that are diagnosed as needing immediate surgery as the necessary definitive medical treatment. (5:NA) Since major surgery is not normally performed on this level, thereby necessitating helicopter evacuation, the medical doctor in attendance will initiate the request for helicopter through medical channels (5:NA) Upon this doctor rests the responsibility for establishing a priority of evacuation and taking the necessary action to secure the helicopter, if he so deems this type transportation advisable. (12:51)

Evacuation and supply are wedded together like a commander and his staff, since neither can be effective without the integration of both functions. Therefore, in referring to supply and resupply as it pertains to the rotary-wing aircraft, the same advantages, disadvantages, limitations, and examples noted in reference to supply will apply also to evacuation.

With the recent staggering increase in fire power, especially in the form of nuclear weapons, our doctrine, tactics, and techniques are being studied and modified. Our current concepts visualize widely dispersed armies made up of self-contained units that must be moved and supplied in sustained combat operations without land

communications. (1:32) Therefore a reinforced battalion can be located five to ten miles forward of the collecting station. By the very nature of this wide distance between units, we must accept as truth that enemy infiltration will not only be a threat but in most instances a reality. This front line battalion, in planning the evacuation of its wounded, must either dispatch an armed escort with its casualties or it must devise a system whereby this threat of infiltration can be circumvented. The helicopter is the tool, readily at hand, highly suitable to fill this requirement.

However, efficient utilization of rotary-wing aircraft can be obtained only when its most favorable characteristics are exploited and the effects of its inherent limitations are minimized. This necessitates dynamic and imaginative planning by all commanders. Familiarization with the advantages and disadvantages of rotary-wing aviation is necessary to correctly evaluate the extent of use of the helicopter.

Under normal conditions, when not overloaded, rotary-wing aircraft are able to perform limited vertical flight, taking off and landing without horizontal movement on the ground. Present rotary-wing aircraft may accomplish forward flight at airspeeds varying from zero to approximately one hundred and forty miles per hour. At minimum ground speed (zero) the helicopter is hovering. Rotary-wing aircraft in horizontal flight may be decelerated rapidly from any speed and brought to a hovering position. This type aircraft may achieve horizontal flight in any direction, forward, backward, sideward or obliquely. (7:34)

If engine failure or other emergencies in flight necessitate a forced landing, the rotor blade continues to rotate through a force-wheeling unit. This process, termed autoration, produces lift. In autoration, the aircraft operator has complete flight control and the helicopter can be safely landed without power. The large windshield of the helicopter and the absence of fixed wing surfaces provide substantially unrestricted visibility. (7:34)

In comparison with surface methods of transportation, the helicopter

possesses great speed and flexibility since it does not depend on fixed routes, such as highways, railways and waterways. The ability to move in a straight line from one point to another also greatly increases the relative speed. (7:34)

Equipped with flotation-type landing gear, the helicopter is considered amphibious and may operate from water or ground surfaces. The ability to operate with floats from hard surfaces is, of course, dependent upon the ability to attain vertical flight. (7:35)

Because rotary-wing aircraft can ascend and descend vertically, they can operate from confined and unimproved areas, provided that sufficient space to meet operating requirements of the particular aircraft is available.

The ability of the helicopter to execute a rapid deceleration of airspeed and stop in flight, combined with its capacity for slow forward speed and vertical landing, adapts the aircraft for operation in marginal weather. By regulating his speed to conform with the limits of visibility, the operator may stop and land when weather conditions become critical. The special flight characteristics of rotary-wing aircraft make them well suited for operating in difficult terrain, particularly in areas where landing fields for fixed-wing aircraft are not available or cannot be constructed. (7:35)

Tactical night missions may be accomplished by rotary-wing aircraft with minimum ground lighting facilities for take off and landing. The helicopter operator can operate successfully at night when his landing spot is marked by a single flashlight or flare upon a prearranged signal from the operator. Night operation, however, requires well trained and experienced operators and there is a need for improvement and other technical devices. (7:35)

This type aircraft is capable of performing any mission within their weight lifting capabilities and operating radius normally assigned fixed-wing aircraft. External loading, which utilizes the built-in hoist systems, provide many advantages. Casualties preloaded on pallets, in cargo nets, or in slings can be picked up by hovering helicopters. The external load method is of importance in short haul operations,

as the ratio of time required for loading and unloading when compared with travel time is reduced. Also the time that the helicopter is exposed to enemy fire is reduced. (7:35)

As the commander exploits to the utmost the advantages of rotary-wing aircraft, so must he also recognize its limitations and acts to minimize the effects of such.

Since the main rotor blades are vulnerable to enemy fire throughout the plane of rotation, damage to the blades may establish destructive vibration. Because of limited experience, the flight vulnerability of rotary-wing aircraft has not been accurately established. Their peculiar flight renders their attack by high speed fighter aircraft questionable, but their relatively slow flight makes them more subject to ground fire in tactical operations than other aircraft. Their primary means of protection is landing, which can be accomplished faster than by fixed-wing aircraft. (7:36)

In comparison with fixed-wing aircraft, the maintenance requirements of rotary-wing aircraft are high with respect to personnel, tools, equipment and maintenance man-hours. (7:36)

The amount of load and its proper distribution are critical factors affecting the control of rotary-wing aircraft. Proper distribution of load is necessary to keep the center of gravity within allowable limits. Fatigue is a greater element in the operation of helicopters than of fixed-wing aircraft. Additional control that must be manipulated, greater attention to instruments, and constant vibration are the principle contributing factors to operator fatigue. (7:35)

The ability of rotary-wing aircraft to hover, ascend, and descend vertically under normal conditions has been classed as an advantage. Restriction on hovering and vertical flight imposed by abnormal weather conditions must, therefore, be considered limitations. Rotary-wing aircraft operating at high elevation or in extreme heat may not be able to produce enough lift for hovering or for vertical flight, inasmuch as lift is directly proportional to air density. Under such conditions

the helicopter must enploy a running takeoff and landing, which necessitates a large operating area of reasonably smooth surface and therefore, considerably limits the utility of the aircraft. (7:36)

Although the wide speed range of rotary-wing aircraft is a definite advantage, it is the lower speeds that are most important in establishing the utility of the helicopter. At present, design problems restrict the maximum speed to approximately one hundred and forty miles per hour, which is a definite limitation when compared to fixed-wing aircraft speeds. Likewise, this aircraft range is restricted due to the extremely limited amount of fuel that can be carried. The weight carrying capabilities of current designs present a definite limitation for the majority of military uses, and this limitation increases as the elevation and temperature increases. (7:37)

In amphibious operations, the size of the aircraft carrier elevators impose some restriction on the operation of the helicopter. Rotary-wing aircraft operation from other ships is dependent on the availability of landing platforms or other suitable operating space. (7:36)

The helicopter offers great logistical advantages in all type of operations and its proper exploitation can greatly enhance the speed and flexibility of casualty evacuation from front line units under all conditions, by circumventing fixed defenses, natural obstacles, land at otherwise inaccessable areas and on unimproved landing sites, rise and descend vertically (to a limited degree), and move rapidly at varying altitudes and speeds (to a limited degree). (11:50) These characteristics admirably qualify the helicopter as either a supplement to, or a substitute for, slower surface transportation.

Physical limitations to the effective employment of helicopters are imposed by darkness, extremely bad weather, enemy air action in the area high altitude and extreme heat. These limitations are essentially the same encountered in the early stages of development of other modes of transportation and are mainly technical in nature. (2:10) The two primary limitations that will affect the use of rotary-wing aircraft in evacuation

are the load carrying capacity and the range of the aircraft. With the expected gradual development these latter two factors and the extensive maintenance requirements will be overcome. (7:31)

Employment of the helicopter in an evacuation role must further be analyzed according to the types of operation, whether it be a special operation or a normal operation.

During normal operations, we can expect troop units to be disposed linearly or in a series of widely separated strong points and under average weather and terrain conditions. (1:32) The normal operation may be further complicated by the threat of, or the introduction of, mass-destruction weapons. The problem created by the widely separated units demands that a method of evacuation be developed that will permit swift and reliable evacuation to more elaborate medical installations rearward. This system or procedure must be able to circumvent barriers either by going around the barriers or over the barriers. Thus the rotary-wing aircraft becomes an invaluable means of transporting casualties away from the area of damage to medical installations capable of further evacuation or of administering definitive treatment. (6:13)

Under special operation, for discussion purposes, I have grouped operations that do not fall within normal operations, i.e., amphibious operation, mountain operation, airborne operation, desert operation, arctic operation and jungle operation. The nature of weather and terrain of special operations place certain limitations on the rotary-wing aircraft in its employment as another means of evacuation from front line units, but does not, by any means, prohibit the effective employment of helicopter aircraft. (8:120)

The limitations encountered in an amphibious operation are inherent with the ship used to transport the helicopter to a point within its operating range and the weather conditions incidental thereto. A large amount of deck space is required for landing to take on a load internally, thus in most cases, since deck space is

a premium and critical factor on the great majority of our ships, the aircraft must be loaded externally and thereby reducing the efficiency of the helicopter. Water, especially salt water, necessitates extensive precautions be taken to prevent rust and corrosion. Frequently in this type operation floats will be required. Floats reduce the load carrying capacity of the helicopter and prevents running take-offs and thus again the effectiveness of the aircraft is reduced. (7:23)

The density of the air is in inverse proportion to altitude and accordingly limits the use of helicopters. The higher the altitude the lower the payload of the aircraft since the helicopter depends upon air density for lift capability. In mountain operation the air density and the lack of adequate landing sites preclude the realization of full payload flights. (7:23)

In the initial stage of an airborne operation, the distance between the air head and medical installation prohibit the use of helicopters. This distance factor, as well as the normal depth of airborne operation in relation to the general trace of front line friendly units, forces the use of other aircraft to transport rotary-wing aircraft to the airhead. (7:23) Here again we find the inherent range limitations a prohibiting factor in the evacuation potential of the helicopter.

During desert operations, sand and extreme heat are the principal factors to be considered in determining the employment of helicopters. The intense heat decreases the air density and thus makes it almost impossible for the helicopter to hover or make a vertical takeoff. The heat then makes it practically impossible to carry external loads. (7:24) The rotor downwash (air forced earthward), a characteristic of rotary-wing aircraft, causes the helicopter to be engulfed with sand and thereby causes extensive damage, as well as blinding the pilot. This can be overcome by spreading oil over the landing site. Normally, a front line unit, under enemy fire, will not have sufficient oil available to adequately soak the landing site. Needless to say, the

sand factor will greatly increase the maintenance requirements.

Successful casualty evacuation for arctic operations is contingent upon speed. (3:5) Here the helicopter can play a paramount role but not without weighty restrictions. Extensive extra equipment, such as skid-type landing gear, winterization kits, external engines for preheating the engine, and external power sources for starting the helicopter, are necessary to get the aircraft aloft. During hovering and vertical takeoff, the rotor downwash causes powder-snow to be blown in such a manner that the pilot's vision is restricted at critical times. The pilot's depth perception is also restricted when flying over broken snow or ice surfaces. Strong winds and blowing snow, conditions which frequently exist in arctic zones, will either interfere with or prevent the use of helicopters. Unstable atmospheric conditions will frequently disrupt all radio contact with the aircraft. (7:24) Where speed is of paramount importance, the rotary-wing aircraft and the operator must surmount these obstacles in order to accomplish the mission. Frigid temperatures not only increase the maintenance requirements but greatly hamper maintenance activities.

Jungle operations are characterized by dense vegetation, high humidity and extensive swampland. These characteristics create a problem in finding suitable landing sites, which are few in number. Too frequently, landing sites must be literally cut out on the jungle. (9:23) The clearing of a minimum landing site requires four to six hours work by a supporting engineer platoon. (5:NA) High humidity fosters rapid formation of fungus growth on all parts of the helicopter and causes metal parts to rust abnormally fast. Again the already extensive maintenance requirement increases. (7:23)

From the foregoing discussion it is determined that the helicopter can be brought to any front line, even though at times it may present seemingly insurmountable problems, if properly directed. This direction requires a properly marked landing site, trained personnel at the landing site and communications, both radio and visual. (5:NA)

Radio communication facilities that are presently authorized for medical installations at infantry battalion level is limited to one radio set AN/PRC-10. (9:7) This radio has an operating range of three to five miles. With the increased dispersion between units, the dependability of this radio set is doubtful. As a Rifle Company Commander, Regimental Headquarters Company Commander and Battalion S-3 with the U.S. Seventh Army in Europe, this doubtful dependability was all too frequently observed by the author. Since helicopters are requested through medical channels, the built-in range limitations of this radio set limits the helicopter evacuation by virtue of the inability to communicate the request. (12:51) In a moving situation, radio and messenger are the primary means of communication.

The helicopter is not invulnerable to enemy aircraft fire, but on the other hand is very susceptible to this fire as long as the enemy has air superiority. Under such a condition, the helicopter will be highly restricted in the missions that can be flown. (8:120)

Helicopter operators must be well informed of artillery fire and air strike to avoid such areas during pick-up. This necessitates extensive coordination between infantry, artillery and the surgeon of the command echelon concerned with the employment of evacuation aircraft. (5:NA) The lack of this required coordination of fires and helicopter flight pattern sometimes necessitates long delays between pick-up request and actual pick-up.

CONCLUSION

Helicopters are capable of routine and emergency evacuation of casualties from front line units under combat conditions.

The extent of employment of helicopters to evacuate casualties from front line units under combat conditions is limited, not denied, by the following restrictions:

a. Extensive maintenance requirements.

b. Abnormal weather and temperature

c. High altitudes

d. Terrain

e. Communications

f. Friendly fires

g. Enemy air superiority

h. Training and skill of operator

i. Training and skill of personnel at pick-up site

j. Commander's imagination

k. Limited range capability

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