

Mission Of Rescue Helicopters In Disaster Medicine

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Abstract

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INTRODUCTION

Most disaster emergency plans do not include mission statements for helicopters. If rescue helicopters are included, they most likely play a role in patient transportation. However, much more can be performed with help of the helicopters during disaster relief. After receipt of a disaster or accident report, the actual site may not always be clearly defined. Especially in mountain areas difficulties may be encountered. A plane may crash anywhere, even in not easily accessible places as shown in the picture below. An American Dakota special flight crashes on Gauli glacier on November 1946. This event led to one of the first major air rescue missions in Switzerland (1).

Figure 1

Rescue mission on Gauli glacier in 1946



SEARCH FROM THE AIR

Trains, cars and busses are bound to rails or streets. Although bound to such fixed structures, it still might be very difficult to locate the site of an accident in mountainous regions with steep slopes (2). Ground-bounded search units need time to find and reach sites of disasters. Search from the air is - weather conditions permitting - fast and efficient. If disaster sites are wide spread, search from the air speeds and facilitates the location of injured victims. By night, special equipment such as search lights or night goggles enhance chances to find injured or lost persons (3). Night goggles are able to intensify remaining light by 40,000 times and make even dark areas visible as shown in the pictures below.

Figure 2

Search with special search lights



Figure 3

Night goggles



Figure 4

Vision through night goggles in completely dark night



SURVEILLANCE FROM THE AIR

After locating a disaster site, air rescue crews not only give geographical coordinates but information about accessibility, further imminent dangers, dimension of disaster sites, and topographical particularities. The search helicopter gives guidance to ground rescue teams and may remain stationary to mark the location of the disaster site for inbound rescue teams (4).

OVERVIEW FROM THE AIR

In the event of complex disasters such as earthquakes, flooding, or large fires tactical planning based on air-view is facilitated (5). Information concerning accessibility, evacuation routes, and transport of equipment can be relayed immediately. Also, the extension of the damage zone can be defined. Leaders of medical rescue teams, police and firefighters may be taken up for a short flight for better overview and better decision making.

Figure 5

Flooding of large areas in Switzerland in the early 90's



Furthermore, in case of extended fires spreading may be observed. Possible danger can be relayed immediately to fire fighters or other rescue teams.

Figure 6

Observation of spreading fire



TRANSPORTATION OF PERSONNEL AND RESCUE EQUIPMENT

Helicopters play an important and time saving role in disaster relief missions to places with difficult access. Additional teams and equipment can be flown to the scene within short time (6). During some rescue missions around Zuerich in the near past, helicopters were mainly used to bring additional trauma physicians to the spot (7). If needed, special medication or equipment can be supplied by air to the disaster area.

Figure 7

Transportation of "Search and Rescue Dog Teams" to the site of an avalanche



SALVAGE OPERATIONS

In some cases helicopter rescue may be the only remaining possibility for salvage of victims (mountain slopes, remote areas,...). Special cable winches allow to lower medical personnel to the victims and to evacuate them after stabilizing vital signs. Advantages of helicopter search and rescue are evident in cases of ship wreckage with imminent danger of drowning. Quick locating and salvation are vital for such victims. Evacuation from roof tops in case of fires or trapped cable cars in ski resorts are best performed through the air. Major accidents in non-accessible areas (land slides, avalanches, earthquakes,...) may necessitate the whole salvage operation from the air.

Figure 8

Evacuation of a victim with help of the cable winch



SUPPORT OF SPECIAL RESCUE TASK

FORCES

Firefighters in full protection gear can be put on roof tops in order to search burning building from the top. Trapped victims can be evacuated from the roof of high buildings. Rescue divers can be dropped in full scuba diving gear near drowning sites of victims. In case of avalanches, land slides or earthquakes search and rescue dog teams can be flown within short time to the site of accident. If helicopters are grounded because of bad weather conditions, helicopter crews can be brought to the scene by police in order to reinforce medical personnel.

Figure 9

Fire fighter with full protection gear is lowered to the roof of a high building



Figure 10

Assembling of personnel and equipment near the site of an avalanche



TECHNICAL ASSISTANCE FROM THE AIR

In large fires, extinguishing from the air supports ground-based fire fighters. Location of buried victims may be easier and quicker by flying over an avalanche with special monitoring devices. In early phases of rescue missions during the night rescue helicopters may provide necessary illumination by special search beams until ground teams have installed respective power equipment. In areas with difficult access such as deep valleys direct wireless communication often fails due to the special topographical situation. Helicopters flying above such locations may act as necessary link in order to provide contact with the headquarters of the rescue mission.

Figure 11

Fighting a fire from the air



LEADERSHIP AND RESPONSIBILITIES OF HELICOPTER CREWS

The pilot of the first helicopter reaching the site should be the designated controller for all air traffic. He has to define landing areas, holding patterns, inbound and outbound tracks, and safety on ground. He has to recognize obstructions and other imminent dangers such as trees, poles, power cables, danger of explosions and avalanches. He has to establish safe flight and landing zones. Thereafter, he is responsible for all inbound/outbound flight and overhead air traffic. He will be in charge until arrival of a professional air controller. Helicopter crews are often the first medical personnel on the site of remote disaster areas. They will have to take charge of the medical aspects of the rescue mission and will therefore not be available for air evacuation of victims until a trained trauma physician/paramedic is on place to take over such tasks (2). If rescue missions are already on the way, the arriving helicopter crews may have to help other medical personnel until the leader of the rescue mission decides to start airborne evacuation of the victims.

PRIMARY TRANSPORTATION

Helicopter represent an additional transportation option during the evacuation of victims. Similar to the rescue of single injured persons in smaller size accidents, one would favor evacuation of victims in disasters under the same terms (stabilizing vital signs and constant control of the victim by specially trained trauma physician/paramedic).

Unfortunately, the evacuation of a large amount of injured has its own special dynamics. Providing care for individual patients has inevitably to be limited in order to save as many as possible. Primarily the heavily injured and the ones demanding special hospital-bound treatment have to be transported by helicopters. It would be preferable to fly them - if vital signs and/or weather conditions allow - to farther away hospitals in order to avoid overwhelming nearby hospitals. This way, such nearby hospitals are not blocked completely in regard of admitting other ground-transported patients.

Figure 12

Helicopter used for primary transportation of specially injured patients. i.e. head trauma, spinal injury, burns



SECONDARY TRANSPORTATION

Helicopters are fast and efficient in transportation of patients from the admitting hospital to a specialized center or to hospitals with more admitting capacity. If hospitals near a disaster site are overflowed with patients such secondary transportation might represent an important way to further distribute patients (8). Whenever possible, repeated redistribution of patients should be avoided in first place by controlled evacuation from the disaster site. Secondary transportation can be avoided to a great extent by making proper patient and hospital selection right on site. Please [click here](#) to learn more about the organization of the “First Aid Station in Disaster Medicine”. However, secondary transportation may be inevitable after securing vital signs. Patients may have to be transported to specialized centers for treatment of head injury, spine fractures, burns, ...) (9). Sometimes, space in intensive care units is limited and patients have to be transferred to other centers postoperatively.

CONCLUSION

In daily routine, helicopters are used in salvage and rescue of individual patients. These patients are treated optimally at the accident site and then transported to the most suited hospital. In case of disasters this daily routine should not be the primary objective. The helicopter crew should - at least in the early phase of the operation - remain on site and fulfill other tasks:

- trauma physician/paramedic: triage, supervision of arriving medical personnel, treatment (securing airway and circulation on site, stabilizing

fractures,...)

- pilot: securing flight and landing zones, act as flight controller, transport more personnel or equipment, provide better overview of the disaster area to team leaders, make search flights, bring personnel and equipment to spots with difficult accessibility

After performing these tasks and only if sufficient personnel is available, transportation of patients to designated hospitals should start.

In summary, it might be concluded that helicopters are a fast, mobile and versatile tool in rescue missions. While used mainly for evacuation and transportation in daily occurring accidents, duly equipped rescue helicopters fulfill multifunctional purposes in large accidents or disaster relief missions.

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