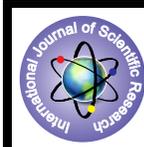


Hospital Helipads: Design and Operational Requirements



Medical Science

KEYWORDS : EMS, Helicopter Ambulance, Helipads, Hospital, Quality

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ABSTRACT

An overwhelming proportion of deaths occur before patients even reach the hospital. Two third (60.7%) of the accident victims belonged to the age range of 15 to 44 years. As a result, governments in developing nations have been attempting to establish and strengthen pre hospital emergency medical systems that can provide patients with pre hospital basic life support and transportation to higher care. Unfortunately, pre hospital trauma care is not available to most of the world's population and India is no exception. In India, Helicopter Ambulance services are still in the stage of infancy. With the advent of technology and increase in purchasing power of consumers, helicopter ambulances are likely to increase and extend their operations to meet the rising patient need and expectations, hence the need for hospitals to incorporate helipads in the initial hospital planning and designing stage. This document provides with the guidelines for various stakeholders in the hospital for designing helipad services.

INTRODUCTION

Class mates of Nitin Bhawarkar (23 yrs); a second year management student were shocked when their friend collapsed while giving a presentation in class at Lalwale Campus. He was later declared dead at the Aditya Birla Hospital as he has scummed to massive heart attack. However, the students feel that if the ambulance would have arrived on time, there friend would have lived. [1] He did not die alone, along with him died the health-care delivery system of this country, unofficially. The death of Nitin was not a routine death; His death symbolized the breakdown of the emergency medical services (EMS) in India, which encompasses a wider gamut of evacuation from mechanical ambulances to air ambulances. Hence a dire need for health care organizations to incorporate helipad services in the planning and designing stage.

An overwhelming proportion of deaths occur before patients even reach the hospital.[2] Two third (60.7%) of the accident victims belonged to the age range of 15 to 44 years.[3] This is the economically productive age group and major financial support for their families. Lack of timely medical attention attributed to 30 per cent of deaths at site and 80 per cent of the remaining patients died within an hour of injury (golden hour). [4]

As a result, governments in developing countries have been attempting to establish and strengthen pre hospital emergency medical systems that can provide patients with pre hospital basic life support (BLS) and transportation to higher care.[5],[6]. Unfortunately, pre hospital trauma care is not available to most of the world's population and India is no exception. If the facilities for Med Evac by Helicopter were available, precious life of a student might have been saved. Since the first helicopter ambulance was established in India helicopter ambulance services in India are still in a stage of infancy. Most of the med evac services in the country are carried out by Armed Forces or Coast Guard. With the advent of technology and increase in purchasing power of consumers, helicopter ambulances are likely to increase and extend their operations to meet the rising patient need and expectations.

There is a lack of awareness on the designing and operations of helipads among the various stakeholders in the hospital. This guidance will enable executives and staff to become informed about the design and regulatory requirements of a hospital helipad. This document will serve as a guiding document for designing of helipads for the health care organizations willing to support air evacuations.

HOSPITAL HELIPADS

Helicopter Ambulances deliver care to patients rapidly and transport them to hospital if felt appropriate. There usage is likely to increase with the rising patients' expectations and if becomes more necessary to transport patients based of clinical requirements more to from general to specialist hospitals.

Helicopters are, by design, able to use non-conventional operating sites. Helicopters offer significant advantage over the use of aero planes for passenger transport by being able to operate away from conventional aerodromes into and from ad hoc sites or specially designed helipad. Hospital helipads are likely to be used by helicopters which can be Ambulance Helicopters or Search and Rescue Helicopters. The list of some common Indian registered helicopters is given in Table 1.

Table 1: List of Registered Helicopters in India (DGCA)

TYPE	Over all		Under Carriage 'B'		
	Length 'A'(m)	Height (m)	Type	Length (m)	Width (m)
AS 355	12.99	3.15	Skid	2.91	2.10
Bell 206 B3	11.91	3.16	Skid	2.52	2.07
BELL 206 L3 & L4	12.95	3.13	Skid	3.01	2.34
BELL 212	17.47	3.84	Skid	3.68	2.68
BELL 230 HELICOPTER	15.30	3.65	Wheel/skid	3.71	2.37
BELL 407	12.74	3.32	Skid	3.01	2.28
BELL 412 EP	17.37	4.57	Skid	2.40	2.53
BELL 430	15.30	4.02	Wheel/skid	3.81	2.53
BELL 47	13.41	3.04	Skid	3.01	2.28
CHEETAH SA 315	12.94	3.35	Skid	3.29	2.37
ALLOUETTE III SA 316B	10.17	2.96	Wheel	3.50	2.59
DAUPIN AS 365N3	13.73	4.06	Wheel	3.64	1.89
EC135 T1	12.19	3.50	Skid	3.2	2.01
ECUREUIL AS350	12.93	3.34	Skid	1.13	2.28
EUROCOPTER EC130	12.64	3.60	Skid	3.2	2.40
SIKORSKY S76C	16	4.41	Wheel	5	2.44

HELIPAD SITE OPTIONS

Ground Level Helipads [Figure 1]: Ground level helipads are least expensive to construct and operate. However, they take up much more space than elevated or rooftop helipads. They require a clean level landing area free from all obstructions.



Figure 1: Ground Level Helipads

Roof top helipads[Figure 2]: Due to ever increasing space constraints, increase in high rise buildings and form both aviation and long term planning point of view roof top helipads are best position for helipads as far as hospital are concerned. Figure 3 shows some of the pros and cons of the ground and roof top helipads.



Figure 2: Roof Top Helipads

ROOF TOP		GROUND	
PROS	CONS	PROS	CONS
Security	Cost	Cost	Privacy
Privacy	Complexity	Simplicity	Obstruction
Safety	Safety	Safety	Safety
obstruction	Fuel	Fuel	Security

Figure 3: Pros & Cons of Roof Top and Ground Helipads

PLANNING CONSIDERATIONS

Access to Accident and Emergency: Since helicopter borne patients are likely to be in time critical condition, it is important that the time taken from the helipad to point of care is short (less than 2 min) [7]. The safest, fastest and most efficient transfer from helipad to the A & E Department should be resorted to.

Public Safety: All helicopters create a downward flow of air known as downwash. The severity depends upon the type of helicopter. While siting a helipad the most effective mitigation is to raise the helipad above public areas, hoardings and loose objects. Raised sites considerably reduce the downwash.

Licensing: Under the provisions of Rule 133A of the Indian Aircraft Rules, Helipad or helicopter sites are not required to be licensed unless they are to be used by a schedule transport service and/ or for public transportation involving series of landing and/ or hire and reward. [8]

The helipad consists of a touchdown and lift-off area (TLOF) surrounded by a final approach and takeoff area (FATO). A safety area is provided around the FATO

Site Requirements Touchdown and Lift off area (TLOF) [8]. :The minimum dimensions of the TLOF shall be 2 B X 2 B, where B equals the wheel base or the side base of the helicopter whichever is more, of the helicopter used (Figure 4). A TLOF shall be capable of supporting the weight of the helicopter intended to be used.

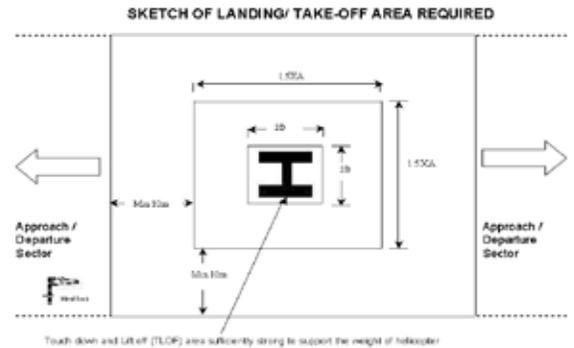


Figure 4: Sketch of Landing & Take off Area

Final Approach and Take-off area (FATO) [8]: TLOF shall be encompassed by a FATO. The minimum dimensions of the FATO shall be 1.5 A x 1.5 A, where A equals the maximum overall length of the helicopter used (Figure 4). This area shall be without obstructions. The surface shall be suitable for forced landings and free from loose objects, which may endanger the safe performance of the flight.

Marking [8]: A helicopter identification marking shall be provided within the TLOF area and shall consist of letter “H” white in colour. The legs of the ‘H’ should be 3 metres in length and 0.4 metres wide. The crossbar should be of the same width and separate the legs so that the overall width of the ‘H’ is 1.8 metres. The marking used shall be of such a nature and fixed in a way that it does not constitute a risk to the flight or to any third party. The marking shall be as shown in the figure 5.

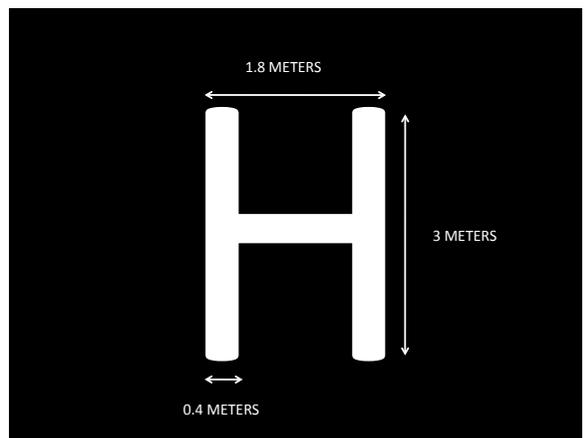


Figure 5: Markings of Helipad

Wind Direction Indicator [8]: A wind direction indicator may be a wind sleeve, flag or continuous smoke source. It should be so situated so as to be visible from a helicopter in flight, in a hover or on the movement area and should indicate the wind conditions over the FATO in such a way as to be free from the effects of airflow disturbances caused by nearby objects or rotor downwash.

Safety area [8]: The take-off and landing area should be surrounded by a safety area, the width of which should not be less than 10 m. Within the safety area no obstacle must be higher than 1 m. The surface shall be suitable for any forced landings, if required.

Approach and Take off climb surface [8]: An Approach and Take-off climb surface in an inclined plane sloping upwards (8%) from the end of the safety area and centered on a line passing through the centre of the FATO, should be available for a distance of at least 245 meters. The Approach and take-off climb surface should comprise: a) an inner edge horizontal and equal in length to the minimum specified width of the FATO plus the safety area, perpendicular to the centre line of the take-off climb surface and located at the outer edge of the safety area; and b) two side edges originating at the ends of the inner edge and diverging uniformly at a specified rate of 10% from the vertical plane containing the centre line of the FATO.

Protection of site [8]. : Before an area is used as take-off and landing area, operator shall take necessary measures to protect the site by cordoning, fencing with fragile material, etc. to ensure that no unauthorised persons, vehicles or stray animals enter into the perimeter of the safety area.

ENGINEERING REQUIREMENTS [7]

Space requirements for services and plant: Adequate space should be made available for critical engineering services such as fire fighting, helipad access and helipad lighting for night landings. These services are often duplex or with adjacent standby plant. Electrical equipment must be supported by an uninterrupted power supply (UPS).

Hot and cold water systems: For water to extinguish fires and to wash the helipad Internal drainage: The specific requirements for helipad drainage to remove potentially burning fuel and fire-fighting media, as well as rain and melted snow

Acoustics: Consideration should be given at the earliest opportunity to the impact of the noise of helicopters, which may otherwise affect the function of the healthcare facility.

Lighting : Helipad lighting has to provide reliable illumination in exposed conditions, including the strong winds caused by helicopter downwash; failure or disintegration could cause a fatal accident. Also, the lighting must meet the chromaticity and illumination levels specified. The lighting fittings should therefore be supplied by accredited aviation suppliers, not by domestic or normal industrial suppliers. All helipad guidance and obstacle lighting should be operated by a single switch in the vicinity of the helipad. On elevated or other pads with fire-fighting facilities, the switch should be located beside the position where the fire appliances are placed prior to a helicopter landing.

GENERAL SAFETY REQUIREMENTS [8]

1. The site to be used for temporary helicopter operations should be a level piece of well-drained ground, either good grass or solid surface free from loose stones, debris.
2. The Final Approach and Take off Area should be obstruction free. Before undertaking any such flight, the helicopter operator and/ or his pilot must satisfy himself by his physical inspection on ground/ air and/ or obtaining required information from District authorities that surroundings are free from obstacles and the site suitable for operations of type of helicopter being operated and there is sufficient open space to force land, if necessary.
3. If the temporary helicopter landing area is situated within aerodrome traffic zone or aerodrome control zone of a public

aerodrome, the flight shall be coordinated with the air traffic control at the aerodrome concerned.

4. Pilots operating to these sites must comply with the aerodrome procedures when operating within the Aerodrome Control Zone. The details of the site like name of site, and grid reference shall be given to the air traffic services of that aerodrome. Helicopter operator through their Accountable Manager shall be responsible for the safety of helicopter operations, passengers and people on ground.

5. It is the responsibility of the owner or the person having control of such place to ensure that the land is used as per the applicable local regulations.

RISK MANAGEMENT [7]

Aviation risk assessment: Hospitals should include specific risks created by helicopters using the hospital helipad in their overall site risk assessments. An independent consultant or the operator of the ambulance helicopter could provide analysis of general aviation and site-specific risks.

Overall, the acceptable quantitative probability of a safety occurrence for helicopters is less than 5×10^{-8} per flight hour (defined as "extremely remote"). [7] This is achieved by addressing safety at all stages including the design and airworthiness of the helicopter, its maintenance and operation, the training of all personnel involved, and internal and external auditing of safety processes.

The effect of a helicopter accident would be significant, the likelihood is extremely remote.

Hospital Risk management: A hospital with a helipad should manage the facility and its risks by means of a Helipad Operations Manual written specifically for the local conditions and criteria, and should audit the helipad routinely for compliance with the Manual. It should include sections covering the following matters:

1. Introduction: This should include the purpose, control and distribution of the Manual.

2. Technical administration: The following technical administration is recommended:

- Names, status, contact details and responsibilities of the Helipad Quality Managers and their deputies, and the helipad operating staff
- Safety Management Policy
- Location and status of architectural, mechanical and electrical drawings
- Procedures for the periodic maintenance (and auditing) of the structure and systems.

3. Helipad characteristics: This section should include the location, elevation, and description of the facility including illustrations showing the windsock, markings, obstacle-free corridors and all local obstacles to flight, with details.

4. Operational procedures: Relevant operational procedures include:

- Security from vandals, straying members of the public, and unauthorised landings
- Flight booking, authorisation and reception procedures

- Nature and frequency of pre-landing and routine helipad and equipment inspections and surface cleaning
- Removal of snow and ice
- Radio communications
- Night flying procedures if applicable.

5. Lighting :Lighting considerations include:

- Specification and method of operation of the systems
- Inspection and maintenance regime
- Stand-by power arrangements
- Locations and responsibilities for obstacle lighting on neighboring buildings and obstacles.

6. Rescue and Fire-Fighting Services: Rescue and fire-fighting considerations include:

- Safety accountabilities of chief and line fire officers and their procedures
- Details of the fire-fighting media (including replenishment and shelf-life procedures) and delivery systems
- Personnel manning, supervision and training (including records)
- Procedures for Emergency Response and Contingency Plans and their routine exercising.

7. Personnel safety: To help ensure the safety of personnel, the following should be covered:

- Safety of people in the vicinity during operations;
- Rules concerning restricted access to the helipad area, no smoking, the storage and use of protective clothing including ear defenders, the dangers of rotors and jet blast, how to approach and depart from a helicopter with rotors turning and stationary, and the danger of loose objects and clothing
- Training requirements for medical teams on specific aircraft types and on the procedures for receiving and dispatching patients safely.

8. Hospital procedures: The following procedures and information should be included:

- Procedures for receiving and reacting to warnings of incoming helicopters
- Responsibilities and individual actions of the switchboard, porters, medical and security teams;
- Patient assessment and handover procedures, including the routes from the helipad, the operation of dedicated lifts and key procedures;
- Contact details for hospital staff and departments and air ambulance, police, coastguard and military helicopters likely to use the helipad.

QUALITY ASSURANCE AUDITING [7]

If the hospital has a Quality Department, the helipad should be included in its responsibilities and audit programme, or external, independent specialist helipad auditors should be employed. Audits should be planned annually to assess compliance with the local Helipad Operations Manual, and should include observation of day and night operations. Any non conformances identified should be prioritized, and the Quality Manager or Helipad Manager should formulate a timely corrective-action plan to eradicate the root causes. The audit should remain open until agreed corrective actions have been completed and signed off by the Quality Manager or Helipad Manager, with a copy sent to the auditor if external auditing is used.

CONCLUSION

In near future, helipads will become an integral part of planning and designing of hospitals and health care organizations. This document harmonizes and interprets the relevant regulations, standards and best practices but cannot provide expert aviation advice. Hence the executives involved in planning and designing of hospitals are recommended to sought advice of independent aviation experts.

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