DAY AND NIGHT MEDICAL AIR ASSISTANCE OPERATIONS, HANDLING THE LIMITS

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Abstract: The use of the unique capabilities of the helicopter come together in nowadays Helicopter Emergency Medical Service (HEMS) operations. In day and night HEMS operations the helicopter is often used at its limits, not only regarding human factors, environmental aspects and helicopter performance but also regarding helicopter design. For helicopter crews the aerodynamic characteristics and other limitations bound to the laws of nature are a fact of life they have to live with. But are low main and tail rotors, low exhaust pipes, narrow cabin entrance and limited and non ergonomic cabin space also laws of nature? Are there additional technical solutions possible to support the HEMS crew in aeronautical decision making ? Is there a possibility for an "inside-out" design approach? Funds for HEMS operations are limited and of course economical restrictions set their own limitations but one wonders whether operational demands and challenges find their way to the drawing tables. The challenges and demands identified in HEMS operations during day to day (and night) business are reviewed in respect to the helicopters used in HEMS operations today. Included in the review are: area of operation, environmental circumstances and HEMS specific needs.

1. INTRODUCTION

HEMS operations within the Netherlands started in 1995 and are still relatively new in comparison to other European countries. Starting as a project in Amsterdam with one BO-105 helicopter in 1995, today HEMS operations in the Netherlands have grown to an almost full coverage of the Netherlands with four EC135 helicopters stationed inside the Netherlands and occasional cross border assistance from Germany and Belgium.

The new performance requirements introduced by the Joint Aviation Authorities (JAA) in JAR-OPS 3[1] and implemented in the Netherlands as of January 1st 2005 forced ANWB Medical Air Assistance (MAA) to obtain new helicopters. To choose the right model for our task MAA made an analysis of the available helicopter make and models that could meet these performance requirements and the requirements of the day tot day HEMS operation.

2. AREA OF OPERATION

With the Netherlands, also known as 'the Lowlands', being rather flat, reduced helicopter performance, met at high altitudes and in the mountains, is almost never encountered with a normal operating altitude up to 1,500 feet and outside air temperatures below +40° Centigrade. Hoist and long-line operations are not considered necessary for HEMS in the Netherlands due to the flat terrain. Not all helicopters in the MAA analysis meet the JAR-OPS 3 performance requirements which means Performance Class 1 and Category A, some can with weight limitations in respect to their max take-off weight. This led to exclusion. Performance

Class 1 and Category A are required to be allowed to operate in congested areas and to land at elevated heliports at hospitals.

The bigger challenge is posed by the congested areas themselves, especially in the western part of the country. The scarce space makes it attractive to use the space available to the maximum extend possible leaving few usable open spaces and construct many high rise buildings. Most landings are within confined areas. This calls for a helicopter with small outside dimensions as the required size of an HEMS operating site is directly related to the rotor diameter (required FATO= 2D during daylight).

Congested areas also mean the possibility of the presence of a lot of people in the vicinity of the HEMS operating site during and after landing. Safety wise this excludes low turning main rotor blades and low turning tail rotors that impose more danger to the public, and crews, than necessary. Fenestron and NOTAR anti-torque systems are a real improvement for safety because they reduce the possibility of harming people. The ground clearance of the anti torque system is also important when landing at sloping areas.

The open spaces available in the larger cities are usually surrounded by buildings and other obstacles making unobstructed outside view from the cockpit and the cabin of paramount importance for the reconnaissance of the landing sites, since most of them are unprepared.

Load bearing of landing sites on clay, in moors and water saturated meadows favour helicopters with skid type landing gears rather than the ones with wheels.

The Netherlands can be very wet and moist so a good heating system must be installed in the helicopter to prevent fogged windows. It can be fairly warm on the other hand so a fresh air or cooling system (air conditioner) would be welcome to.

3. HEMS SPECIFIC NEEDS

Time pressure is always present when responding to a HEMS call. The doctors assistance is requested and the for the type of patients he or she has to treat every minute can count. Preparation time after the HEMS call is therefore limited to as few as two to three minutes. The pilot monitors the weather during the day and decides beforehand whether he will accept a flight, with the prevailing weather conditions, if a HEMS call is made, or not. When accepting the HEMS call the pilot will immediately go to the helicopter, start the engines and prepare for take-off. Simple and fast start-up procedures help reducing the response time. The HEMS crew member, a nurse additionally trained to navigate and support the pilot while in flight, will set up the basic navigation while the doctor confirms acceptance of the HEMS call to the dispatch centre. Good cockpit ergonomics and simple to use navigation systems contribute to safety by reducing en-route workload leaving both crew as much time as possible with their eyes outside. After landing shutdown should be easy and fast to accomplish.

Patient loading and transport demand an easily accessible, spacious and ergonomic cabin. Loading a 100kg patient should be possible with 3 persons, the height of the helicopter floor over ground should be high nor low. Side loading usually allows easier access to the cabin and connection to the medical equipment and is therefore preferable. The doctor should have as much access to the patient as possible in-flight and must be able to alter position in relation to the patients injuries. The helicopter needs a special medical interior to allow safe carriage of medical equipment and an oxygen installation. The cabin should be multi functional in that

it also allows carriage of incubator to transport neonates. All these requirements are laid down in EN 13718-1, operational and technical requirements and EN 13718-2, Medical device interface requirements.

4. HEMS AT NIGHT

Normally the helicopters are on call from 07.00 hours till 19.00 hours and only during the universal daylight period (UDP). Return from an HEMS operating site, usually the accident site, outside the UDP is allowed if night flying conditions prevail. These requires higher ceilings and visibility than during daylight period. As of November this year a pilot project will start to investigate the possibilities to use the helicopter for HEMS operations outside the UDP and the need for 24hr availability of a Mobile Medical Teams (MMT), which crew the helicopter but can also be transported by road ambulance. To reach an equivalent level of safety Night Vision Goggles (NVG) will be used by both crew members (pilot and hems crew member), in addition to raising weather limits and requirements for landing sites. Landing will only be made outside congested areas. Already existing crew concepts will be maintained and additional training is required for all crew members and the doctor. The use of NVG requires NVG friendly cockpit and exterior lighting. Therefore the cockpit has to be adapted or has to fitted with expensive and heavy EFIS (glass cockpit) systems.

5. CONCLUSION

Non of the reviewed helicopters met all the requirements to the extend that one could, without argument, say that there is an ideal HEMS helicopter. Some met so few of the requirements that they where no longer candidates at all. In the end economical factors, delivery terms, maintenance requirements and spare parts supply play there own role in the decision for a certain make and model.

The worldwide HEMS helicopter market is good for a total number in excess of 1,000 helicopters. For the HEMS operators it would be nice to have a choice between helicopters that meet all the requirements in stead of choosing the most suitable one available.

[1] Joint Aviation Requirements - Operations of Helicopters (JAR-OPS 3)