HELIPORTS: SITUATION ANALYSIS AND THE EXISTING LEGISLATION. PROJECT OF A HELIPORT IN LOURES

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ABSTRACT AND KEYWORDS

The 20th century was characterized by the increasing development of Portuguese Aeronautic System, namely through the construction of heliports. Despite the benefits of the construction of those infrastructures sometimes they are not efficient enough. Mainly, the heliport's inefficiency reflects in terms of lack of security conditions for the helicopters operation or in the closing of the heliport as a result of the bad planning of the infrastructure.

This article presents the standards and recommendations, usually followed, for the planning of heliports. It also presents, and in accordance with the standards and recommendation, the principal components that a heliport construction must demand.

Nowadays, the traffic of helicopters tendency is to continue to increase, not only in terms of commercial flights but also in cases of emergency. This work presents the main indications for the planning of a heliport in Loures to be used in cases of emergency.

Key-words: helicopters; heliport; standards and recommendations; planning; Portuguese Aeronautic System.

1. INTRODUCTION

The work of Portuguese Engineering in the conception and construction of infrastructures for civil aviation and the air transportation only started to be excellent in the end of 30's of twenty century. (Tavares and Esteves, 2000)

Nowadays, the aeronautic infrastructures, that are developed in domestic territory are: airports; airfields; heliports and military airfields.

A heliport is an adequate infrastructure only for use by helicopters, being able to have one or more helipads as well as some structures of support.

The heliports may have a lot of functions. In Portugal the heliports have specific functions, such as, civil protection, medical emergency, aerial work or sporting and educational aviation, on the responsibility of regional entities, municipals and/or privates.

The national heliports must be certified and must have an efficient system of management of security. For such the planning of heliports must obey to a set of rules that serve of orientation. These rules are established in some existing standards and recommendations in the scope of

infrastructures of heliports. However, those standards and recommendations are not well fit in Portuguese laws.

Thus, one of the main objectives of this work consists in the summarized presentation of the standards and recommendations adjusted for the efficient planning of heliports.

With this analysis is intended to prevent that the heliports are closed due to conditions of security for the operation of helicopters in these infrastructures, as already happened, for instance, the heliport of Hospital de Santo António in Porto. (Oliveira, 2006)

After the analysis of the situation related with heliports and comparing the actual standards and selecting the necessary information, a design with his technical component has been elaborated.

2. PORTUGUESE AERONAUTIC SYSTEM

In the last few decades, a competitive aerial market of transport, the significant search in air traffic, the growth of passengers and load, the deregulation promoted by European Commission of air traffic between intra-communitarian space and the liberalization of certain aeronautic activities has contributed to a great development of the Aeronautic System.

From the Portuguese Aeronautic Sector we can refer the following infrastructures (MOPTC, 2006): 5 Main Airports: Lisboa, Francisco Sá Carneiro, Faro, Madeira and Ponta Delgada; 10 Complementary Infrastructures in the islands: Airports – Porto Santo, Horta, Santa Maria and Flores; Airfields - Graciosa, Corvo, Pico, Lajes and S. Jorge; 1 approved heliport; 84 Complementary Infrastructures in the continent: 24 certified airfields, 2 approved airfields, 9 certified heliports, 49 approved heliports;11 Military airfields: Ovar, Monte Real, Tancos, Santa Margarida, Alverca, Sintra, Alcochete, Montijo, Beja, Porto Santo e Lajes (some of them also have use of civil flights – Alverca, Lajes e Porto Santo).

The amount of infrastructures in the national territory is good when it is compared with other European countries. (Figures 1 and 2)

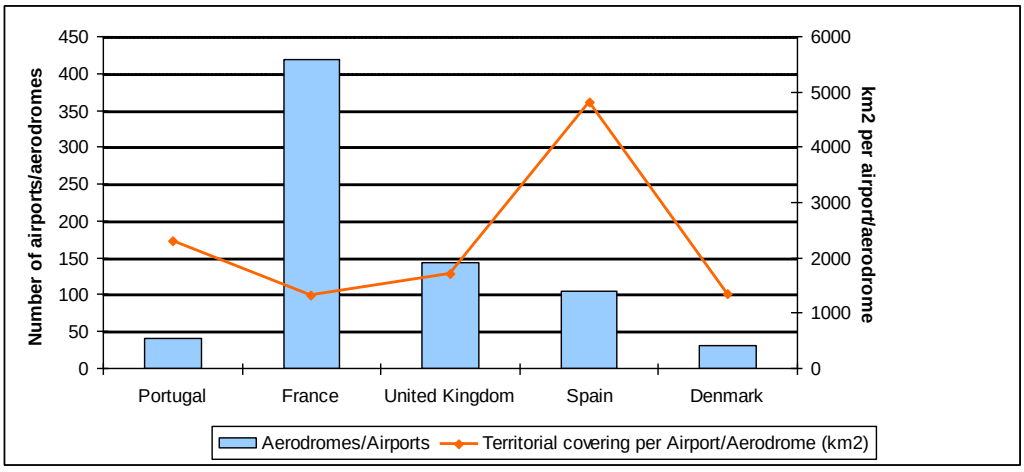

Figure 1 – Airports/Aerodromes in european countries (MOPTC, 2006)

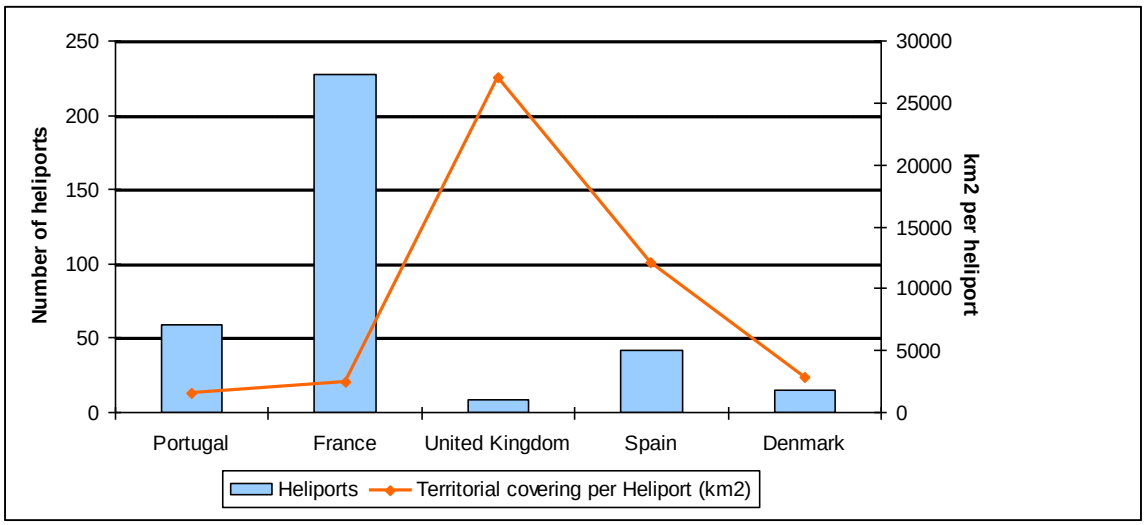

Figure 2 – Heliports in european countries (MOPTC, 2006)

3. HELIPORTS

Characteristics

A heliport is a small airport use by helicopters. Heliports typically contain one or more helipads and may have facilities such as fuel, lighting, a windsock, or even hangars. (Wikipédia, 2007)

Services in Heliports

In addition to their service in the transportation of people, helicopters have already proven to be useful to their communities in the following ways: Disaster Relief, Air Ambulance Services, Police Services and Moving High-Values-Assets. (Advisory Circular, 2004).

It is on the basis of this type of services that sometimes the installation of heliports in some places is justified.

Establishment of Heliports

According to the standards and recommendations related with heliports there are some main components that must constitute a heliport: touchdown and lift-off area (TLOF); final approach and take-off area (FATO); safety area; approach and departure surfaces; helicopter ground taxiways; aprons – helicopter stands; markings and markers; lighting; windsock; rescue and fire fighting services; other services.

4. LEGISLATION AND STANDARDS

General Considerations

The Instituto Nacional da Aviação Civil is a collective person of Public Right endowed of administrative and financial autonomy and of own inheritance who takes as a finality the supervision, the regulation and inspection of the sector of the civil aviation.

To the Instituto Nacional da Aviação Civil also compete the definition of the requisites and technical presuppositions on which there depends the concession of licenses, certifications and authorizations in the context of the civil aviation.

On the other side the Instituto Nacional da Aviação Civil has to define the necessary rules for application of standards and recommendations of technical normalization, created by international organisms of the sector of civil aviation.

However, inside the competences of the Instituto Nacional da Aviação Civil, above enumerated, the standards connected with heliports are not very abundant or clear. The most used standards are those of the International Civil Aviation Organization. In Annex 14, volume II, are included the arrangements related to heliports that cover all the aspects of the planning, project and operations of heliports, and it is divided in six different chapters.

In terms of directives of the Instituto Nacional da Aviação Civil there is one straightly connected with heliports – CIA 08/90 "*Critérios básicos para a aprovação e certificação de heliportos. Aprovação do projecto*" and another one that is also important – CIA 25/05 "*Aeródromos: Actualização dos dados constantes do Manual do Piloto Civil*".

Still in the Portuguese Standards there is a law who refers some aspects related with heliports – DL nº. 186/2007.

Outside the Portuguese Standards is important to refer the following ones: "*Advisory Circular – No. 150/5390-2B"* of United States of America; "Normas Para La Solicitud De Establecimiento De Helipuertos Privados" of Spain;" *Instruções para a Operação de Helicópteros para Construção e Utilização de Helipontos ou Heliportosl*" of Brasil.

Situation of the Legislation in Portugal

Actually in Portugal the situation related with the Annexes of the Convention is the next one: the Annexes of the Convention of International Civil Aviation Organization are not in application as such in the Portuguese internal right, despite of everyone act that they are.

5. CASE STUDY – HELIPORT IN LOURES

The use of the heliport is restricted to operations of sanitary transport or emergency. The heliport to develop is of simple configuration, including only the track of contact and taking off and the minimum installations necessary to carry out the operations. The heliport will have the adjacent constructions strict necessary for its good utilization.

The project of the heliport have the following characteristics: surface heliport; operations by helicopters with performance of class 1; operations in conditions of visual flight; system of helps for operation in meteorological adverse conditions and at night; the heliport will have adjacent constructions of support, prefabricated.

The elements considered in the planning were: Surrounding air space analysis; meteorological characteristics of the heliport localization; physical characteristics and heliport dimensions; characteristics and performances of the operation helicopters and definition of the critical helicopter; protection areas and obstacle limitation surfaces; rescue and fire fighting.

The elements of co-ordination and sanitary functions developed with the planning were: Influence areas of the heliport; principal routes of injured people transport; origin and destiny of the injured people; co-ordination with the others emergency services; access and needs of the emergency services.

The terrain suggested for the heliport installation is situated in Loures, more concretely in Planalto da Caldeira. This location is a southwest of the city (Figure 3)

UTM Coordinates:

X – 485530

Y – 429445

UTM zone - 29

Geographical Coordinates:

Latitude – 38º 49’16.92’’ N

Longitude – 9º 10’ 28.77’’ W

Figure 3 - Heliport localization

The most important characteristic for the project of a heliport is the analysis of the prevailing winds. The Annex 14, vol.II, suggests that the definition of the approximation route should be done without crossed winds. In Loures it wasn’t detected such problem.

From the analysis of the prevailing winds, during the months between March and September is the Northwest direction. In the other months the prevailing wind direction is Northeast.

The routes should permit pilots to avoid downwind conditions and minimize crosswind operations. From the analysis of the downwind conditions it is visible that the direction of northwest is the most important. So Loures Heliport must have an approach and departure path with a route of 320º in relation to the north.

However, it is important that a heliport have two approach and departure paths. Then as the northeast is the second direction of the prevailing wind the Loures Heliport must have an approach and departure path with a route of 50º in relation to the north.

It is also important too, as it is referred in Annex 14, that it is necessary to exist two approach and departure paths distanced from 150 degrees. So it was defined the following paths: 50º, 140º and 320º.

In practise the principal routes for the helicopters are: SE-NW; NW-SE and SW-NE (See Figure 4).

Figure 4 – Routes of Loures Heliport

In alternative it is possible to define an approach and departure path with 180º of route since the crossed winds respect the values in the acceptable interval and as it is referred in Annex 14.

The approach and departure paths aren't situated on urban zones. The local environment is essentially an agricultural zone and so it is free and it is no predictable that could happen problems with the operations of helicopters in the heliport.

The heliport isn't situated in a dangerous, restricted or forbidden zone. However his localization in Lisbon's TMR is very important because this is very restricted due to the fact of the intense aeronautic movemet.

The operations to carry out in the heliport are the one's related with de transport of injured people in emergency situations and help aid to the population in catastrophe cases. Some exceptional operations, for example institutional type, could carry out in the heliport if the previous authorization was done. The utilization of the heliport is only private.

The Augusta Westland EH-101 Merlin is the helicopter in operation in Portugal that has the bigger dimensions so this helicopter must have to be the reference helicopter for the project of Loures Heliport.

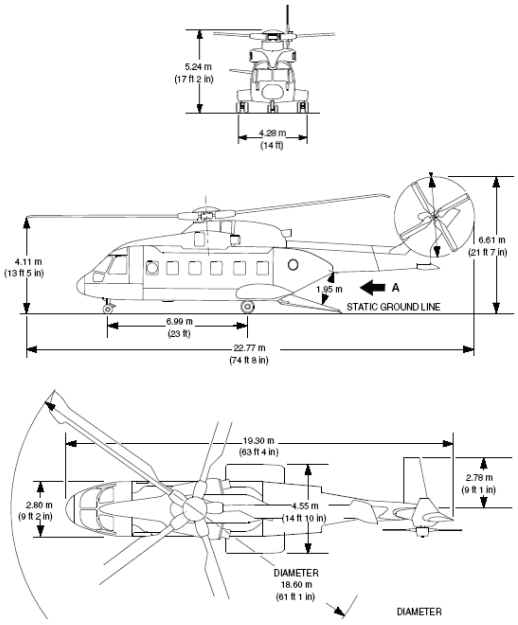

Figure 5 – Agusta-Westland EH-101 Merlin

Table 1 - Critical helicopter characteristics

Characteristics of Agusta Westland EH-101 Merlin	
Description	
Manufacturer	Agusta-Westland
Mission	Busca e Salvamento/Fiscalização
Crew	4
Dimensions	
Length	22,77 m
Rotor diameter	18,59 m
Height	6,61 m
Area (wings)	271 m2
Weight	
Empty	10.500 kg
Total	5.100 kg
Maximum Take-off Weight	15.600 kg
Propulsão	
Engines	3 x Rolls-Royce/Turbomeca RTM322-01 turboshofts, 2312 shp (1.725 quilowatts) each
Performance	
Cruise Speed	309 km/h
Reach	1220 km
Maximum Range	4572 m
Rate of climb	216 m/min

Heliport Configuration

Considering the standards and recommendations about the planning of heliports, Loures Heliport must have some characteristics. The heliport is provided with a quadrangular Touchdown and Lift-off Area (TLOF) with 14 meters; with a quadrangular Final Approach and Take-off Area (FATO) with 46 meters; with a safety area with 8 meters from the periphery of FATO.

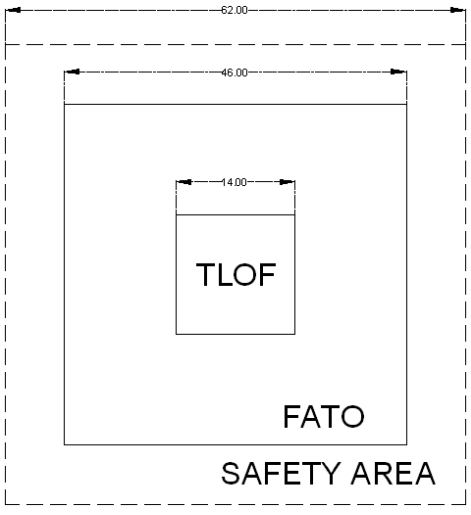

Figure 6 – Physical characteristics of Loures Heliport

The airspace around Loures Heliport should be maintained free from obstacles so as to permit the intended helicopter operations at the heliport to be conducted safely and to prevent the heliport becoming unusable by the growth of obstacles around him.

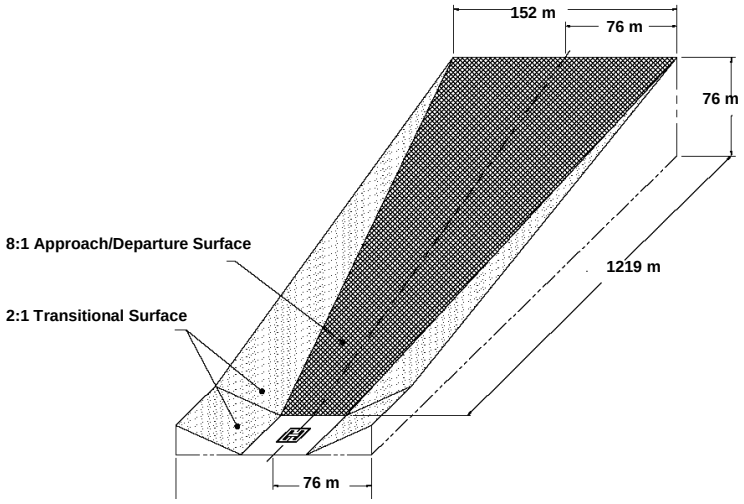

Figure 7 – Heliport Approach/Departure and Transitional Surface

So Loures Heliport should be provided with approach and departure paths that starts at the edge of the FATO and slopes upward at 8:1 (h:v) for a distance of 1219 meters where the width is 152 meters at a height of 152 meters above the elevation of TLOF surface; with a transitional surfaces that starts from the edges of the FATO parallel to the flight path centreline, and from the outer edges of the approach and departure surface, and extended outwards of a slope of 2:1 (h:v) for a distance of 76 meters from the centreline (See Figure 7).

In Figures 8 and 9 are represented the approach and departure routes of Loures Heliport.

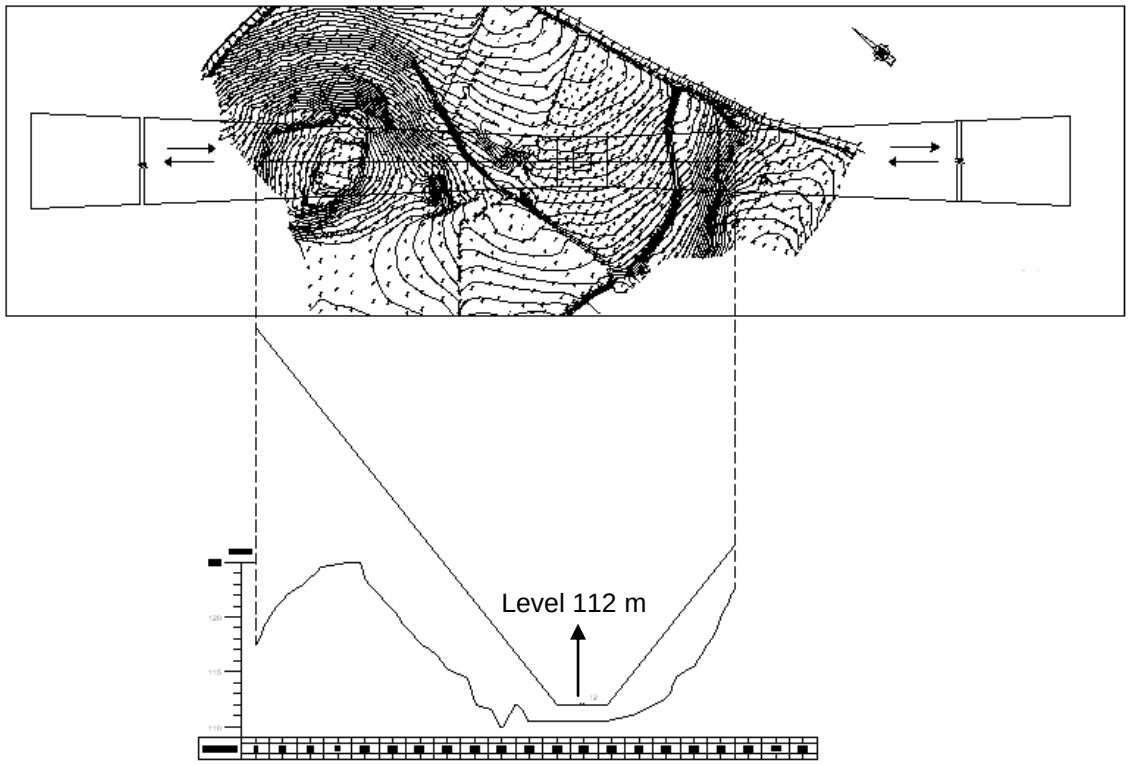

Figure 8 – Approach and departure paths with a route of 140º and 320º

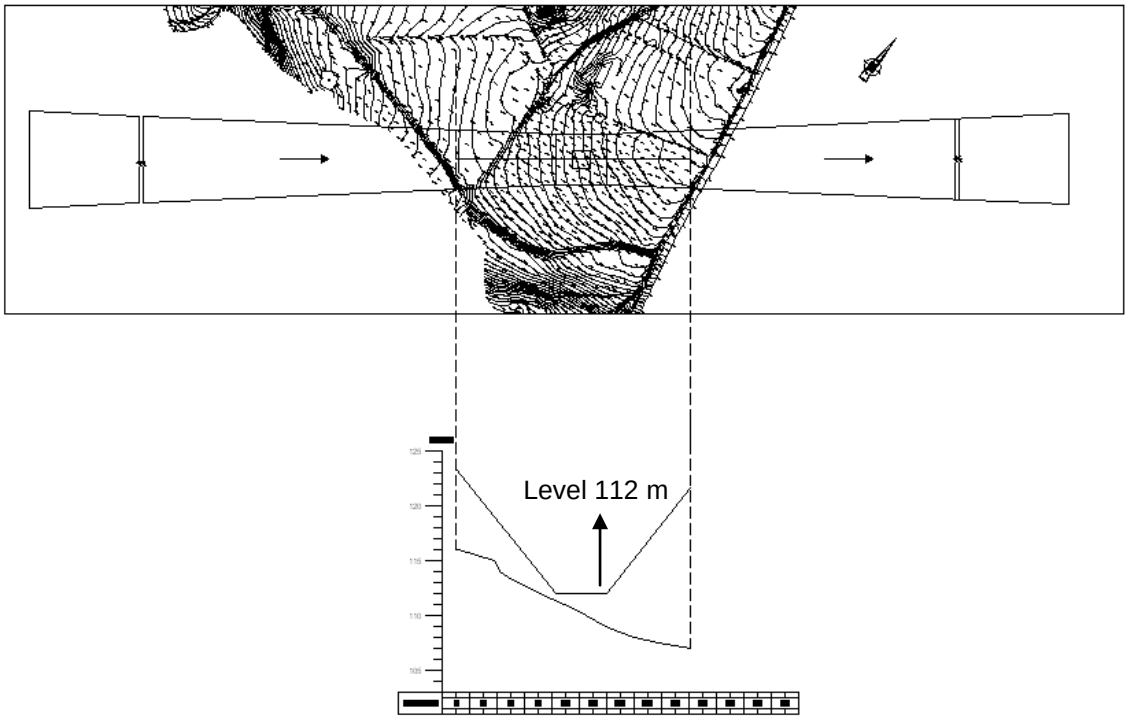

Figure 9 – Approach and departure path with a route of 50º

There are some information items which the helicopter pilot must obtain outside the cockpit during an approach or departure. Visual aids provide that item. So first of all, to indicate the wind conditions over the final approach and take-off area, Loures Heliport must have a windsock visible from a helicopter in a flight, in a hover or on the movement area, with a length of 2,4 meters and a diameter on the larger and smaller end of 0,6 meters and 0,3 meters respectively.

The following markings are recommended to identify the heliport and the limits of some areas: a heliport identification marking (H) oriented with the cross arm of the H at right angles to the preferred final approach direction; the final approach and take-off area marking located on the boundary of the final approach and take-off area consists of a rectangular stripe with a length of 9 meters and a width of 1 meter; the touchdown and lift-off area marking located along the perimeter of the touchdown and lift-off area consists of a continuous white line with a width of 30 cm.

For night operations a minimum lighting system should be included. So Loures Heliport have these lights: a touchdown and lift-off area lighting system which includes 4 lights uniformly spaced at intervals of 5 meters on each side of the touchdown and lift-off area; final approach and take-off area lights which consists of 4 lights on each side of the final approach and take-off area; an approach lighting system which consists of a row of 3 lights spaced uniformly at 30 meters intervals and of a crossbar 18 meters in length at a distance of 90 meters from the perimeter of the final approach and take-off area; visual approach slope indicators should be provided to serve the approach to a the Loures Heliport (HAPI).

In Figure 10 are represented the visual aids of Loures Heliport.

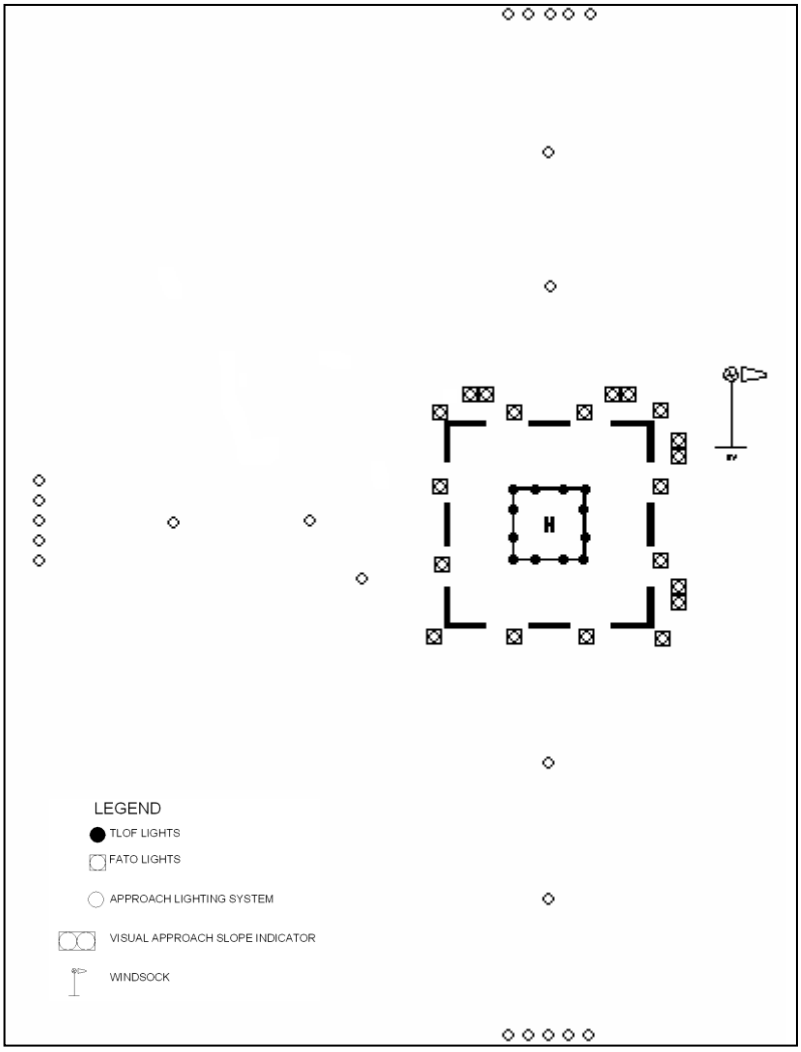

Figure 10 – Visual aids in Loures Heliport

Rescue and fire fighting services are provided to save lives in cases of helicopter accidents or incidents. For this reason, and knowing that the fire fighting category admitted was H2, Loures Heliport have the following services: 4 extinguisher cars of 50 kg with chemical dust ABC and a pistol of intent discharge; 4 portable extinguishers of 6 kg the CO2 extinguish agents.

Loures Heliport also have rescue equipment which includes: adjustable wrench; axe, rescue, non-wedge or aircraft type; cutters, bolt, 60 cm; crowbar, 105 cm; hook, grab or salving; hacksaw, heavy duty complete with 6 spare blades; blanket, fire resistant; ladder, length appropriate to helicopters in use; lifeline, 5 cm, 15 m in length; pliers, side cutting; set of assorted screwdrivers; harness knife complete with sheath; gloves, fire resistant; power cutting tool.

In addition to the characteristics referred it is important to provide the following installations in Loures Heliport: a prefabricated structure annex to the operation area of the heliport to serve as an auxiliary infrastructure; a fence around the heliport installations; a system of vigilance cameras.

6. CONCLUSIONS

In the last few decades the progressive growth of the aerial traffic has demanded a big development of the Portuguese Aeronautic System. Actually the existing infrastructures present a good covering in Portugal.

The heliports are one type of the infrastructures that constitute the aeronautic system. Allied to the development of these infrastructures a preoccupation with the most appropriate and safety planning should be taken into account.

So with this document is intended to contribute for the divulgation of the standards and recommendations associated with the planning of heliport and the form how the planning of these infrastructures should be structured.

The legislation in Portugal is a little bit confuse in spite of the Instituto Nacional da Aviação Civil make an effort to define the necessary rules for application of these standards and recommendation created by the international organisms for civil aviation

The problem of the legislation could be simple resolved if the standards and recommendations are integral transpose into a law.

In this work it was also an intention the elaboration of a heliport planning to practise the application of the standards and recommendations about heliports.

The heliport planning, in a non-urban environment, has become as a challenge to demonstrate the potentialities and the importance of this kind of infrastructures for situations of emergency and rescue.

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