

DESIGN OF HELIPAD AND HELICOPTER UNIT AREA FOR THE CZECH ARMED FORCES IN FOREIGN OPERATIONS

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ABSTRACT

The article deals with space arrangement of the Helicopter troop at the Military Base in Foreign Operations. It describes individual objects of the Helicopter troop. The Helicopter troop consists of two Helipads, a Hangar for the Helicopter service, Technical Facilities, an Operation centre and Stores. The article is an output of the project at the Department of Engineers Technologies "Development of Expertise Department focused on the area of verification of material models for protective structures".

Keywords:

Helicopter unit, heliport, hangar for the helicopter service.

ABSTRACT

L'article traite aménagement de l'espace de la troupe de l'hélicoptère à la base militaire dans les opérations étrangères. Il décrit les objets individuels de la troupe de l'hélicoptère. La troupe de l'hélicoptère se compose de deux héliports, un hangar pour le service d'hélicoptères, installations techniques, un centre d'exploitation et de magasins. L'article est une sortie du projet au Département de Ingénieurs Technologies "Développement du Département d'expertise concentré sur le domaine de la vérification des modèles de matériaux pour les structures de protection".

Keywords:

Unité d'hélicoptères, héliport, hangar pour le service de l'hélicoptère.

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1 INTRODUCTION

One way how to carry people and material in inaccessible terrain and dangerous environment is by the means of helicopters. Helicopter troop consists of human and materials resources, technical support, and logistic. All these parts are important for the tactical operation of the helicopter troop and safe operation and maintenance of helicopters.



Figure 1 Aerial view of heliports (KOSOVO), separation of the helipads from the vehicle fleet

2 SITE INVESTIGATION, SURFACE DRAINAGE, SUBSOIL

2.1 SITE INVESTIGATION

The first and the most important step for designing and constructing the base are reconnaissance, ground survey and initial geologic survey. These surveys should provide the answer for the basic question: is it possible and safe to use this piece of land for the helicopter troop location [1]. The following are requirements for the helicopters troop structure [4]. They consist of these parts:

- Helipads,
- Access road,
- Handling space,
- Technical facilities, etc.

Moreover all of these helicopter troop parts need enough space and grade level. The ground survey focuses of:

- appropriate size of the space + back up space for possible expansion,
- configuration of ground and gradient of the slope orientation (relief),
- geological conditions of the area (foundation soil bearing capacity and possibility of ground improvements),
- hydrological conditions (level of groundwater and aggressiveness of groundwater, surface moisture presence),

- vegetation presence and their influence on taking off and landing of helicopters,
- climatic effects (precipitation, temperature, wind, dustiness, humidity),
- prevailing wind,
- elevation above the sea-level,
- possibilities of the existing infrastructure usage (access road for vehicles and supplement, water resources, waste management, electricity, etc.).

2.2 SURFACE DRAINAGE

During the designing process of the helicopter troop, it is necessary to consider measures against precipitation and running water. One of these measures can be sloping surfaces it can be combined with the creation of an uncovered or covered drainage system. The uncovered system can consist of drain ditch, gutter, sideslip, cascade or drain pit. The covered system can consist of drains or dewatering pipelines. Functional drainage is important not only for the area designated for a helipad, but also for the area used for storing and dispensing fuel

Good drainage should be set in by natural cross slope of plain approximately 3.0% towards drainage trenches. Drainage trenches should be placed on longitudinal slope for good water outlet. Minimal depth of the drainage trenches is 0,30m. If the cross slope of drainage trenches is less than 0,5% or greater than 3% his bottom had to be reinforced.

2.3 SUBSOIL

Subsoil for helipad has to have adequate bearing capacity. If the subsoil doesn't have the adequate bearing capacity, it is necessary to perform its improvement. Decisive criteria are given in standard called EUROCODE 7 – Geotechnical design. Here is one of possible alternatives:

- Removal of top (humus) layer of 150 -200 mm according to the local conditions, if the area is load-bearing enough, it is possible to omit this item.
- Compaction and flattening of the layer with vibratory roller.
- Placement of separate layer (the layer separates two other layers from different materials and prevents them from mixing and degrading).
- Placement of gravel layer, 32/63 grading, compaction by rolling.
- Placement of aluminium plates of 500 x 2000 mm for the top layer of the heliport (at Šajkovac base, Kosovo, plates of UK production were used); other options: I-TRACK, concrete slabs, paving asphalt.
- Perimeter fence from defence-wall of 1000 mm high.
- Possible vertical obstacles close to the heliport are to be removed or marked visibly
- Efficient drainage, especially during possible spring floods.
- Heliport should not be situated close to the perimeter of the military base; minimum distance from the first obstacle is 100 m.

3 BASIC ELEMENTS OF THE HELICOPTER TROOP

The basic elements of the Helicopter troop are:

- Helipad.
- Mobile repair work place.
- Deployable Squadron Operation Centre.
- Handling and parking road.

3.1 HELIPAD

When designing heliport it is essential to know the number and kind of helicopters, which will utilise it. If it is not known is it necessary to count with the biggest one. The biggest kind of the helicopter in the Czech Armed Forces is Mi – 171Š [2]. Its diameter of rotors is 21,29 m. Table 1 shows helicopter proportions important for heliport design.

Table 1 Helicopters dimension [2]

Helicopters	Rotors diameter [m]	Fuselage length [m]	Helicopters length with rotors on the move [m]
W - 3ASokol	15,2	14,21	
Mil Mi 8	14,5	11,4	25,24
Mil Mi - 24	17,3	17,51	19,79
Mil Mi - 17	21,29	18,22	25,35
CH 47 Chinook	18,29	15,54	30,1

Example – design of helipad space for two helicopters CH 47 Chinook: safe separation distance between two helicopters is equal to the diameter of rotors of the helicopter.(for measures, see Table 1). Width of the helipad space W:

$$W = a + b + a \text{ [m]}, \text{ where} \tag{1}$$

a is the diameter of rotors of the particular helicopter [m],

b is the length of the helicopter with rotors on the move [m].

$$\text{then } W = a + b + a = 18 + 30,1 + 18 = 66,1 \text{ m}$$

Minimum width of the helipad is 66 m. Beyond this distance could be place constructions, but height hazards are restricted.Length of the helipad space L:

$$L = a + b + a + b + a \text{ [m]} \tag{2}$$

$$\text{then } L = a + b + a + b + a = 18 + 30,1 + 18 + 30,1 + 18 = 114,2 \text{ m}$$

Minimum length of the helipad is 114 m. Minimum space for two helicopters CH-47 Chinook is 66 x 114 m.

Space necessary for technical facilities, hangars, and offices has to be located in safe distance from the helipads. This space has to be separated from the rest of the base parts. This separation can be done by small defence wall or other small obstacles. The requirement of the separation construction has to be met in order to ensure safe landing and taking off.

3.2 MOBILE REPAIR WORK PLACE

The portable hangar (see Figure 4) is designated for servicing and maintenance of helicopters. This hangar is essential for the deployed units. Most of the helicopter servicing and maintenance cannot be done in the open air [3]. For this reason the Czech Army have purchased portable hangar for deployed helicopters troop in Afghanistan, see Figure 6. It is possible to provide relatively clean and dust-free environment inside this hangar, as well as adequate temperature during servicing and maintenance work despite unfavourably conditions outside. Proportions of the portable hangar are as following:

- Overall length is 37 m, length of the interior is 35,5 m,
- Overall width is 25,0 m, width of the interior is 23,2 m,
- Overall high is 10,2 m, high of the interior is 9,3 m.
- Range of temperature in which it can be used -20 to 45 °C.
- Wind speed $40 \text{ m}\cdot\text{s}^{-1}$.
- Snow loads $150 \text{ kg}\cdot\text{m}^{-2}$.
- Numbers of shipping containers are 17 pcs.

The hangar has to be located near the runway not creating the vertical obstacle. The road connecting heliports and hangar is load-bearing and paved. The hangar itself already contains all equipment for technical support and maintenance of an aircraft. In case of parachute landing, it is necessary to add air-conditioned container for parachute storage with internal temperature of $14 - 25$ °C and humidity from 35 to 73 %.

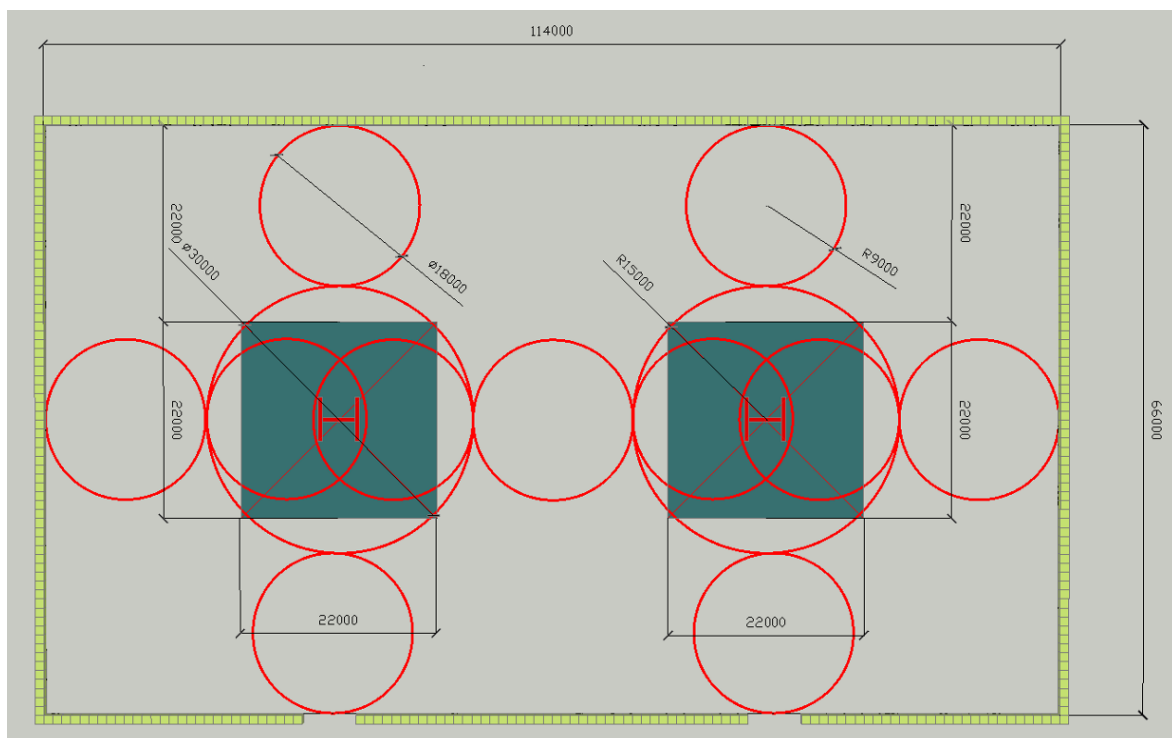


Figure 2 Helipad ground plans for two helicopters CH-47 Chinook, for dimensioning are used millimetres, delimitation of defence-wall is marked in yellow (size $1 \times 1 \times 1$ m), red circles delimitate rotor diameter and minimum safety distances

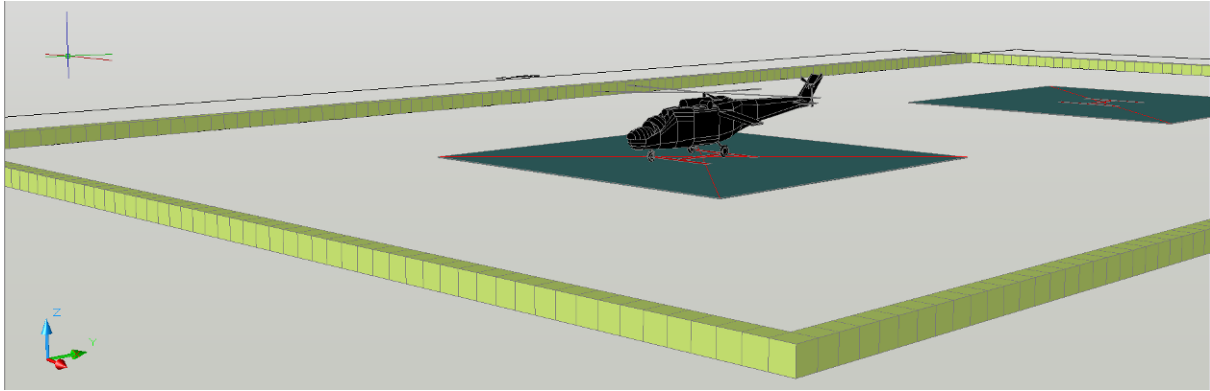


Figure3 View 3D on helipads for two helicopters CH-47 Chinook

Additional storage area could store the following items: cannons, machine guns, ammunition, starting power-supply unit or air heater. Extra space is needed for fuel and lubricant store to supply helicopters.



Figure 4 Hall designed for helicopter repair [2]

3.3 DEPLOYABLE SQUADRON OPERATION CENTRE

Deployable Squadron Operation Centre (DSQOC/M) can be used in foreign missions (see Figure5). The mobile Operation Centre [4] is transported in ISO containers 1C [5]. The Operating Centre is equipped with:

- Four special workstations located in the ISO 1C containers.
- Four shipping containers with equipment, operational equipment and ballistic protection BO DSQOC/M.
- Transition Module S2K 480 used for connecting containers DSQOC/M.
- SU711 large tents with air conditioning to ensure preparation and planning of flight operations.
- Floor Supa-Trac system for outdoor and indoor use.



Figure 5 Mobile Operations Centre D SQOC/M

3.4 HANDLING AND PARKING ROAD

There are service roads designed for moving of the helicopters, handling and operating wheeled vehicles in the Helicopter troop's area. The service road has to be good bearing. It is designed for the biggest vehicles, by which this road will be used. The biggest helicopter in Czech Armed Forces is Mil Mi - 17 and the biggest vehicle is AD-20.2 – Mobile crane. Handling and operating wheeled vehicles, which ensure operation of helicopter units:

- T-815 PR2NK – Truck for container transport.
- ASKDK-K – Automotive workshop.
- CAPL_16M – Road tanker.
- AD-20.2 – Autocrane.
- Land Rover Defender 110.
- Wheeled tractor Zetor Z 7211.
- SUEZ 3-M.
- DVHM_3522 – Forklift.

3.5 THE EXAMPLE OF THE TAKE-OFF AND LANDING AREA

There are two examples of the take-off and landing area for two Mil Mi - 17 helicopters shown in Figure 6 and Figure 7 [6]. The picture shows two helipads, a mobile repair workstation, a mobile and operational control centre, roads and parking areas. Obstacle limitation surfaces are marked in yellow.

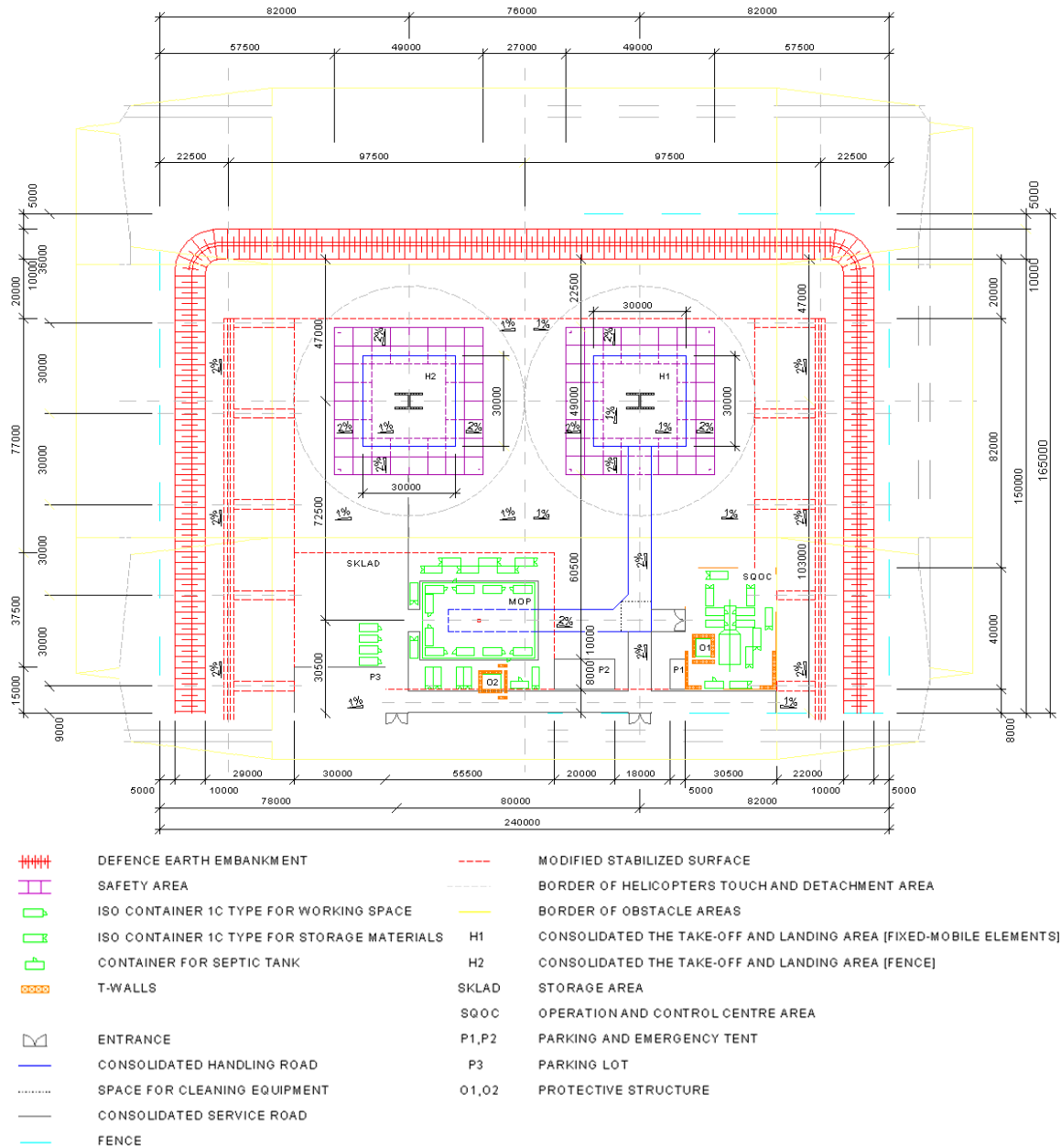


Figure 6 The example of the take-off and landing area for two helicopters Mi-17

- [6] POV – RUCH – Technical support of design, building, maintenance and removal of the Czech military bases in missions abroad, using the Reach Back. Brno : University of Defence, 2012.

Článek recenzovali dvaja nezávislí recenzenti.