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HELICOPTER EMERGENCY MEDICAL SERVICE IN THE REPUBLIC OF CROATIA

ABSTRACT

Current situation of emergency medical assistance indicates the need to organize faster and more efficient system of linking all the parts of the Republic of Croatia. The solution can be found in the implementation of aviation as the fastest and therefore the best method of transporting the injured, diseased and other persons who need urgent transport. The use of military helicopters for the purposes of emergency aviation does not satisfy the needs of the Republic of Croatia from the organizational and legal aspect. There were 597 fatalities on the Croatian roads in 2005 and with the establishment of emergency helicopter medical service, the number of fatalities may be reduced by one third.

KEY WORDS

helicopter, heliport, emergency, emergency aviation, operative centre

1. INTRODUCTION

The efficiency of fast transport of patients in the Republic of Croatia by ambulance is not at a satisfactory level. If an ill or injured person is transported to hospital within the first hour from the time when the accident has occurred, the chances that the patient will survive are very high. It is not always possible to get fast to the accident site and to perform high-quality first aid there and then to get to the clinic by road ambulance vehicles. The biggest problems that occur in administering emergency medical assistance are the congestions on the roads, isolation of the population on the islands, poor population density, inaccessibility of some regions, and special requirements related to tourism. The results of the current organization are inadequate times of arrivals to the accident site, delayed first aid, and delayed specialist treatment resulting often in losing lives and health.

Emergency medical aviation, primarily helicopters, increase the efficiency of the response to emergency medical cases and allow faster access to big medical centres that provide specialist and sub-specialist medical treatment. The experiences of countries (Germany, Austria, Switzerland, USA and United Kingdom) that have a developed system of air emergency medical assistance indicate that almost immediate accessibility of medical staff and fast transport after the injury reduce mortality by 35% to 52%. [1]

2. DEFINING OF THE HEMS OPERATIVE SYSTEM

Successful functioning of the HEMS operative requires highly equipped helicopter, flight crew capable of flying in adverse weather conditions at any time of day and night, and capable of landing on almost any surface, organized and simple communication system, and even simpler procedure of flight clearance.

The term of emergency aviation means operative by air traffic means with the purpose of urgent action in all cases of risk i. e. threat to human lives and natural and material assets. Emergency aviation is the operative segment and logistic support in the system of government care for protection and security of citizens and assets in case of danger. [2]

According to primary intention, emergency aviation can be classified into sub-groups for search and rescue (SAR), fire-fighting and emergency medical service (EMS).

JAR-OPS 3 defines SAR operations as: [3]
(1) Search & Rescue (SAR) – "A flight the purpose of which is to give immediate assistance to persons threatened by grave and imminent danger or hostile environment".

JAR-OPS 3 defines HEMS operations from a much narrower aspect that have the primary mission of providing immediate medical assistance by the medical staff at the accident site:
(2) Helicopter Emergency Medical Service (HEMS) – "A flight by a helicopter operating under a HEMS ap-

proval, the purpose of which is to facilitate emergency medical assistance, where immediate and rapid transportation is essential, by carrying:

- medical staff; or
- medical stocks (equipment, blood, organs, medicine); or
- ill or injured persons".

The additional service of inter-hospital transport is defined by JAR-OPS 3 as secondary mission:

(3) Helicopter Air Ambulance Flight – "A flight usually planned in advance, the purpose of which is to facilitate medical assistance, where immediate and rapid transportation is not essential".

Providing urgent medical assistance using emergency aviation means includes mainly:

- fast transport of physicians and assisting staff to the event site in order to undertake measures for rescuing lives of the ill or injured persons and preparing them for transport,
- transport of the ill or injured persons to the hospital in order to prevent further deterioration of their condition,
- transport of persons who received primary medical assistance from one hospital to another for final treatment,
- transport of medicines, blood, transplantation organs, medical instruments and equipment.

According to JAR-OPS 3 regulations the following operational requirements are set for establishing the HEMS service: [3]

(1) Helicopter. Performance Class 3 will not be implemented in out-of-airport conditions. Class 3 understands the operations such as for example the possibility of supply system failure during flight. In that case, emergency landing may be required of the multi-engine helicopter, but landing has to be performed in case of single-engine helicopter.

(2) Required performances.

(i) Take-off and landing – helicopters with Maximum Take-off Mass - MTOM of 5700kg or less.

Helicopters that take off or land in out-of-airport conditions have to satisfy Class 1. Class 1 understands operations such as e. g. failure of the supply system during flight, and the helicopter has the capability of landing on the first adequate terrain or even safely continue the flight to the first heliport. Class 1 includes helicopters of Category A which have to have several engines and are designed so that in case of engine failure they can continue to fly. Category B includes helicopters with a single or several engines which do not fully satisfy Category A, i. e. there is no guarantee that they will stay in the air in case of engine failure and are forced to land. The area accommodating operations has to be sufficiently large to ensure undisturbed performance of rescue actions. The area has to be lighted from the ground or from helicopter reflectors.

(ii) Takeoff and landing – helicopters with MTOM over 5700kg.

Helicopters have to meet Class 1.

(3) Staff

(i) Selection. For the selection of the flight crew used in HEMS operations, previous flight experience in other services is required.

(ii) Experience. Minimal experience of the flight crew participating in HEMS operations should not be shorter than:

- 1000 hours as aircraft captain out of which 500 hours as helicopter captain.
- 1000 hours as co-pilot in HEMS operations out of which 500 hours spent as helicopter captain under surveillance and 100 hours as independent captain.
- 500 hours of flight experience spent in operations performed in similar conditions to those in HEMS operations.
- pilots engaged in night operations have to have at least 20 hours of night flights in Visual Meteorological Conditions – VMC, as captains.

(iii) Recency. All pilots who participate in HEMS operations have to have at least 30 minutes flight by sole reference using instruments onboard helicopter or on simulator (Synthetic Training Device - STD) within the last 6 months.

(iv) Crew composition.

- Day flight. Minimum crew during day has to include one pilot and one crew member. In exceptional situations crew member is not necessary.
- Night flight. In night conditions minimal crew consists of two pilots. However, there are situations when one pilot can be engaged, but another crew member has to be present.

(4) HEMS operative minima.

(i) Performance Class 1 and 2. Minimal weather conditions required for HEMS operations of this Class are presented in Table 1. In case there is sudden change in weather conditions during flight, helicopters not equipped with IFR[1] have to leave the area and return to base, whereas IFR-equipped helicopters can continue the rescue operation (pilot's decision).

(ii) Performance Class 3. Minimal weather conditions which have to be ensured for this class operation are determined by cloud base at 183m and visibility of 1 500m. Visibility can be reduced to

Table 1 - HEMS operative minima [3]

2 PILOTS		1 PILOT	
DAY			
Ceiling	Visibility	Ceiling	Visibility
152.4 m &more	5,000 m ***	152.4 m and more	5,000 m
152.1-122 m	1,000 m *	152.1-122 m	2,000 m
121.6-91.5 m	2,000 m	121.6-91.5 m	3,000 m
NIGHT			
Cloud base	Visibility	Cloud base	Visibility
365.8 m**	2,500 m	365.8 m	3,000 m

* Visibility may be reduced to 800m for short periods of time when the landing site is visible and if the helicopter is flying at a speed which allows safe manoeuvring.

** Cloud base can be reduced to 304.8m for short time periods.

*** Helicopters can fly at the visibility of 1500m if the landing site is constantly visible.

800m for short periods only if the flight speed is such that it allows the pilot safe manoeuvring.

Helicopters participating in HEMS operations have to be equipped with communication equipment which provides two-way communication with the operative centre, and if possible, communication with the emergency medical staff on ground at the accident site and the hospital staff in order to provide timely information of the time of landing at the heliport of the medical institution. At this moment, only KBC (clinical-hospital centre) Zagreb and KBC Split have heliports in their hospital complexes, while in case of Rijeka the helicopters land at the Krk airport, in case of Osijek helicopters land at Čepin airport (the hospital is located near the military base in which helicopters may land), in case of Dubrovnik helicopters land at Ćilipi airport (about 2 kilometers from the hospital a city stadium is located where helicopters may land), in case of Zadar the helicopters land at Zemunik airport.

In the transport of patients and injured persons by helicopters and in all the other operations that require the use of helicopters there are three types of locations from which the landing and takeoff operations may be performed. These locations are organized and certified airports and heliports, adequately selected and designated places for landing and take-off, and ad hoc selected places of landing in the vicinity of the accident site. Heliport is an airport or a particular area on ground, building or vessel intended completely for landing, takeoff and movement of helicopters equipped with all the communication and signalization equipment and qualified staff for safe helicopter traffic. The emergency heliport is a defined area on ground equipped with minimal helicopter landing and takeoff facilities during day and night in visual meteorological conditions, suitable for the boarding and disembarking of people or loading and unloading of cargo from the helicopter in order to rescue and protect people and assets. Emergency heliport should not be used for the purpose of commercial helicopter traffic. [4]

Recently, in the Republic of Croatia, certain positive shifts have been made in the construction and equipping of heliports, especially in the areas in which transport means of road traffic to the medical institution requires too much time or the position of the accident site requires combination of several traffic modes. This refers first of all to the traffic-isolated islands, usually with no medical institution where complicated medical procedures could be performed, which results in the need for a maximally fast transport of the victims to the first major hospital centre. On every bigger island there is usually a place that is used for helicopter landing in emergency cases. These locations are usually meadows, sport fields or parking lots. The heliport location should be near the inhabited areas using the helicopter transport or at a comparable distance from several places in the immediate vicinity of a clinic or a community health centre with pre-met condition of adequate road accessibility for the ambulances.

The dimensions of the helicopter landing pad have to be at least 50% bigger than the length and width of the helicopter. The landing and takeoff pad and the airspace of the pads for landing and takeoff should be free of obstacles. The pad may be made of natural or artificial materials. The condition for the pad is to ensure smooth takeoff and landing of helicopters, i. e. to be strong enough not to collapse under the helicopter and not to adhere to the landing gear during takeoff. The emergency heliport on ground should provide free and prepared area of 60 x 60 metres with the landing and takeoff pad covering an area of 15 x 15 metres in the centre.

3. ARGUMENTS FOR IMPLEMENTING HEMS OPERATIVE IN CROATIA

Arguments in favour of the implementation of HEMS operative: [1, 5]

- according to the European measures the Republic of Croatia is at the very top of the traffic accident balance,
- a large number of the injured die on their way from the accident site to the hospital,
- the tourist most attractive Adriatic coast and island region are poorly connected by conventional transport means, thus being in a way isolated regarding traffic,

- mountainous regions of the Republic of Croatia during winter, due to adverse weather conditions are to a great extent isolated regarding traffic,
- HEMS operative status in the Republic of Croatia is not at a satisfactory level from the organizational or legal aspect,
- at 60 locations there are currently dangerous spots regarding safety, and half of them are the so-called "black spots",
- losses from traffic incidents and accidents are estimated at 1.5% to 2% of the total gross national revenue, out of which 60% are related to the injured, and 40% account for material damage,
- in accordance with the strategic interest of the Republic of Croatia to participate in the European integrations, a necessary precondition is also the harmonization of the system of urgent medical assistance by using helicopters from the aspect of regulations, infrastructure, and management in operative, by applying international standards, especially the references given by the European Union and the "best practice" model.

The probability of survival for the persons in mortal danger increases by the decrease in time necessary for such persons to reach the hospital. In about 65% fatal accidents, death occurs within the first 25 minutes. If first aid is administered to the seriously injured within a period of 14 minutes from the accident, the number of further complications that may cause death occurs in only 20% of the totally treated victims. In case of delayed first aid, i. e. medical treatment after 28 minutes after the accident, the consequences and complications, including death, occur in 80% of the cases. [2]

At the moment, in the Republic of Croatia military helicopters are used as assistance in the emergency medical system. However, from the safety aspect and regarding equipment these helicopters do not satisfy the needs of the Republic of Croatia. The drawbacks of using helicopters for the urgent assistance purposes in the Republic of Croatia can be reduced to the fact that there is no one organization controlling the entire system, the procedure of sending helicopters is unacceptably time-consuming, medical staff accompanying the patient/injured does not have any specialist training, helicopter is not meant exclusively for emergency, there is no standard of indications for summoning the helicopter, the reception of the patient/injured is usually limited to pre-known landing locations, the model of the helicopter used does not correspond to the purpose. [1, 5]

At the beginning of 2004 the first Croatian commercial operator was established in the Republic of Croatia - Heli company (HIKO). HIKO has a certificate for commercial flying (Air Operator Certificate - AOC) and HEMS operation in the Republic of Croatia and abroad. The fleet consists of two fully equipped helicopters for such missions, of type Eurocopter BK117 C1 and Eurocopter BK 117 C2 (EC 145). In the Split-Dalmatia County, on 10 August 2006 the pilot project HEMS was started on the initiative of the Hrvatski autoklub (HAK – Croatian Automobile Club), Hrvatska gorska služba spašavanja (HGSS – Croatian Mountain Rescue Service) and the Heli Company, with the support of the Split-Dalmatia County and approval of the Ministry of Health and Social Welfare. The project lasted for a month and one fourth of the transported were foreign citizens. The costs of their transport will be covered by their health insurances. The foreign citizens can pay the insurance also from the membership fees in their automobile clubs. The sources of the means for the Croatian citizens covered by social insurance will be collected from additional insurance at insurance companies. The Croatian motorists can pay the insurance from their HAK membership fee. Every year the Ministry of Health and Social Welfare allocates the means for additional emergency medical teams on the roads. A part of these funds can be re-allocated for HEMS. The annual cost of one helicopter base amounts to about €1,200,000 which includes about 400 hours of flying, which is about one hour a day. In the Split-Dalmatia County, a helicopter flew 30-40 minutes per day. When one takes into consideration the fact that at the same time also a military helicopter answered 112 calls, then already one hour of flying was realized daily. [6] One should not forget the fact that the Republic of Croatia is obliged to provide helicopter rescue in case of aircraft accidents.

The majority of the European countries in the medical teams in helicopters have doctors specialists or registrars in specialties such as anaesthesia, surgery, internal and urgent medicine. Apart from the doctor there is also a technician coming from the emergency medical service. The teams are not permanently employed at the helicopter base but rather arrive there on duty (several times a month). This is the best model since the doctors and the technicians maintain the routine and skills, and at their primary institution, where the injured are usually transported to, have the possibility of following the results of their work in the field.

4. ORGANIZATION MODEL OF HEMS OPERATIVE IN CROATIA

4.1 Selection of optimal helicopters

Today, the helicopter represents an irreplaceable means in search and rescue operations, fire fighting and emergency medical assistance due to its charac-

teristics which allow safe flying at low altitudes and low speeds, small landing and take-off areas, hovering possibilities, equipping with latest communication and navigation instruments, usage of additional fuel tanks, etc. Apart from facilitating work to rescue services and emergency medical assistance, a helicopter is a means that increases to a great extent the chances for survival of the victims or reduces the negative consequences that may result from long transport to the medical institution. The rescue operation using a helicopter at the same time represents the most complex and difficult rescue operation which very often requires action in adverse weather and night conditions and in the areas which are often far from the stipulated safe landing areas.

Helicopter MIL MI-8 MTV 1 from the Croatian Air Force fleet, apart from advantages such as high loading capacity, stability, possibility of transporting a big number of rescuers and equipment because of the spacious cabin, also features significant drawbacks when used for the purposes of administering emergency medical transport since it does not comply with the European civil flight regulations JAR-OPS 3, i. e., it has not been civil registered, it is not equipped with necessary medical equipment for administering medical help, air-conditioning system, emergency transmitter, pontoons for emergency landing on water, communication instruments for direct communication with the police, fire brigade, vessels, ambulance, search reflector, it does not have adequate winch designed for two persons, it has a large diameter of the main rotor, the cabin noise level is very high, and there is no intercom connection between the flight and the medical crew. Helicopter Bell 212 owned by MUP (Ministry of the Interior) complies partially with the technical requirements; however, the equipment is not adequate nor is the level of noise adequate for civil requirements, which are the reasons, among others, why it was withdrawn from production. Three helicopters Bell 206 are not to participate in medical operations since they are single-engine ones, and JAA regulations require twin-engine helicopters to be used for these purposes. The average age of the MUP helicopters is 25 years.

The plan to buy, i. e. purchase adequate helicopters has to be made in detail, analysing the needs of the system and economic efficiency of the entire investment. However, in purchase planning, there are several conditions that have to be met regardless of the higher investment costs if an efficient system is to be established. The requirements to be fulfilled, that are set as obligatory, are for the helicopter to have two engines with sufficient spare power to operate in conditions of high ambient temperatures, sufficient space to transport two victims/injured, systems for flying in all meteorological conditions, it has to be fitted with instrumental flying instruments, day and night, have sufficient flying speed (not less than 200km/h) so that it covers its area in such a way that the flight to the boarding place and the transport of the victim to the hospital do not take more than 1 hour, high-positioned main and tail rotors (preferably with a tail rotor in an isolated housing), it has to have pilot space separated from the area for transporting patients, it has to have safety belts for the crew, medical staff, and patients, it has to have life vests, possibility of fast start-up, communication instrument for direct communication between the pilot, emergency doctor, auxiliary staff with the doctor at the accident site. Boarding and disembarking of patients on stretchers have to flow smoothly and should not disturb the patient's comfort. External dimensions of helicopters have to be as small as possible in order to enable landing on as many places as possible. This refers especially to landing in urban areas which are space-limited and on the buildings of minor hospitals which have no heliports. It is important to limit the helicopter weight in order to improve the performance and to reduce the impact of rotor operation. This may be special obstacle in the vicinity of the accident site and in urban areas where there are usually many passive observers. It is necessary to reduce the impact of vibrations and noise to the minimal level.

It is important to make the selection of fleet whose performances need to satisfy the specific requirements of single operative areas. In the function of configuration characteristics, the operative areas of greater heights above sea level, require the selection of specific-purpose means of higher climbing speeds and flight peaks and in the function of climatic characteristics, the operative areas of higher mean air temperatures require the means of greater propulsion power. Although the best solution is to use the helicopter precisely for the defined purpose, the current economic situation in the Republic of Croatia and the obvious shortage of helicopters used for emergency aviation indicate the need to use helicopters as multi-purpose operative.

For the HEMS operative purposes, in the world today, the following models are mostly used: Eurocopter EC 145, Eurocopter EC 135, BK 117 B2, BO 105 CBS, MD 900 Explorer, Bell 222 B, Bell 412 HP and Agusta A 109. Each of these models showed its quality during several years of their implementation in rescue activities. If it were assumed that helicopters are of European production or later models, optimal helicopters would be Agusta A 109 and Eurocopter helicopters EC 135 or EC 145, or combination of these two models. Regardless of the number of ordered helicopters and of the manufacturers, it is essential that all the helicopters are manufactured by the same manufacturer in order to ensure fleet standardization which eventually results in substantial reduction in the costs of pur-

Table 2 – Technical characteristics of most frequently used helicopters in HEMS operations

	EC 145	EC 135	BK 117 B2	BO 105 CBS	MD 900 Explorer	Bell 222 B	Bell 412 HP	Agusta A 109
Number of engines	2	2	2	2	2	2	1	2
Max. power per engine	550 kW	463 kW 472 kW	527 kW 560 kW	313 kW	485 kW	505 kW	765 kW	320 kW
Cruising speed	254 km/h	262 km/h	248 km/h	240 km/h	250 km/h	240 km/h	240 km/h	250 km/h
Max. operative altitude	6,000 m	6,000 m	3,000 m	3,000 m	6,000 m	6,000 m	6,000 m	4,570 m
Range	700 km	670 km	540 km	550 km	550 km	700 km	700 km	600 km
MTOM	3,585 kg	2,720 kg	3,350 kg	2,500 kg	2,835 kg	3,750 kg	5,400 kg	2,600 kg

chase, maintenance, and training of the flight and auxiliary crew. For the Republic of Croatia, the best solution for a long-term period would be combined purchase of 6 to 10 Eurocopter models EC 145 and EC 135. EC 145, namely, is bigger (it has the biggest cabin in the class), which provides transport and treatment of several persons if necessary, whereas EC 135 could be used for the transport operations of fewer injured / patients. The fleet should consist of 60% models EC 145 and 40% EC 135 models.

4.2 Locations of operative centres

HEMS is usually organized in such a manner that the state territory is covered by a distribution of helicopter bases which cover the entire state, so that the operation radius allows arrival of helicopters to the accident site within 20 to 30 minutes, and the transport of the injured to the hospital within one hour. The plan of EMS service was projected by dr. William Cowley who invented the phrase "golden hour"– if the ill or injured person is transported to hospital inside first hour from the time when the accident has occurred, the chance of surviving is very high. The delay within the first hour after the accident not only reduces the chances for survival but results also in other harmful consequences – the costs of treatment and medical rehabilitation increase, as well as the losses due to unnecessary invalidity and similar. The efficiency of emergency operations can be increased by overlapping of the operative areas, thus increasing the effective operative coverage of the area, i. e. reducing the time necessary for intervention.

Recommendations indicate the importance of connecting medical helicopters with the clinical-hospital centres at the expense of helicopter operation radius. The solution would be to divide the Republic of Croatia into four Operative centres with their areas of responsibility regarding the existing four clinical-hospital centres. Regarding also the existing infrastructure for helicopter handling, the division system of the Republic of Croatia into Operative centres would include the Main Operative Centre Zagreb with helicopters accommodated at Lučko airport, Operative centre Rijeka with helicopters located at Krk airport, Operative centre Osijek with helicopters at Čepin airport and the Operative Centre Split with helicopters at Resnik airport. An even better solution would be the addition of a fifth operative centre, Operative Centre Dubrovnik with helicopters at Ćilipi airport, which, apart from the four proposed operative centres, would fully meet the requirements of covering the Croatian territory. For an even better coverage of the area, especially during the tourist season, one helicopter with three crews could be accommodated in the alternative operative centre Zadar with the headquarters at Zemunik Airport. The helicopter for this alternative operative centre can be provided from the operative centre Zagreb or from the operative centre Split in case the model with five operative centres is applied.

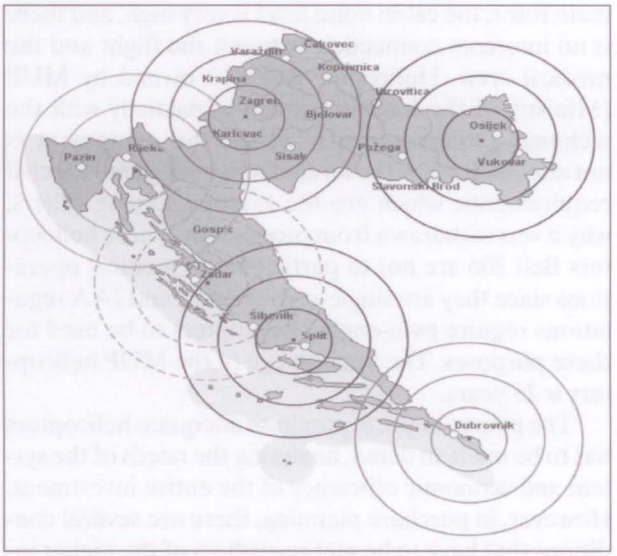

Figure 1 – Proposal of the locations of operative centres [5]

4.3 Organization of the system

A barrier to a more successful functioning of HEMS and SAR operations in the Republic of

Croatia consists in a very complicated and bureaucratized system of issuing helicopter take-off clearances. In order to dispatch a helicopter to a rescue operation, many factors to justify the dispatch to perform the task have to be satisfied. Since this is an expensive operation, it is necessary to determine that the helicopter is the only transport means which can perform the rescue operation on time. Through good organization of transport which results in good connection of local and regional centres of medical points which provide emergency interventions, a responsible and correct decision can be made within a short period of time about who requires the helicopter transport. National Protection and Rescue Directorate (Državna uprava za zaštitu i spašavanje) has been established which should manage and coordinate all the activities in case of catastrophes and major accidents. The Agency was developed by the reorganization of the previous Centre for Monitoring and Alerting and the free telephone number 112 for reporting catastrophes and accidents has been introduced by the Republic of Croatia in compliance with EU, but the existing emergency services (police, fire brigade, and ambulance) still have different phone numbers (92, 93, and 94 respectively). The National Protection and Rescue Directorate has the task to perform interventions of various purposes – search and rescue, medical care, fire fighting, reconnaissance, coordinating the national plan

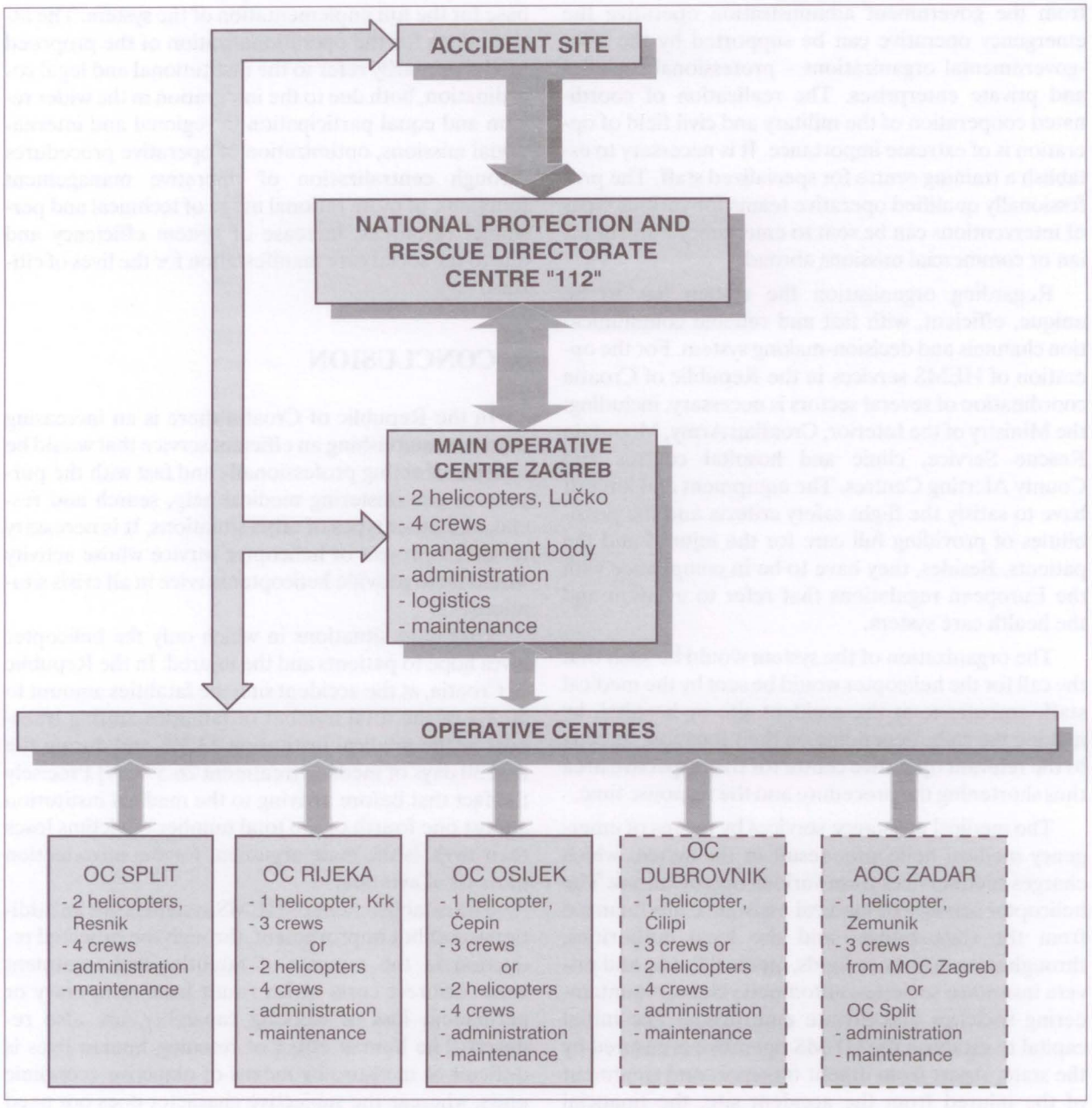

Figure 2 – Simplified scheme of the HEMS system organization [6]

with relevant ministries, organization of the main coordination centre which combines different emergency services. As part of the main coordination centre the communication and information centre is also organized with a single phone number for the needs of all types of interventions. The main coordination centre manages further coordination of intervention tasks, depending on the location and type of accident, the task is assigned to local coordination centres. The main operative centre would take care of the organization and coordination as well as system management. The helicopters and the crew would be available 24 hours at their central airports. The important task of the agency is the choice of optimal specified-purpose transport means, equipment and logistics. Apart from the government administration operative the emergency operative can be supported by the non-governmental organizations – professional societies and private enterprises. The realization of coordinated cooperation of the military and civil field of operation is of extreme importance. It is necessary to establish a training centre for specialized staff. The professionally qualified operative teams for various types of interventions can be sent to emergency humanitarian or commercial missions abroad.

Regarding organization the system has to be unique, efficient, with fast and reliable communication channels and decision-making system. For the operation of HEMS services in the Republic of Croatia coordination of several sectors is necessary, including: the Ministry of the Interior, Croatian Army, Mountain Rescue Service, clinic and hospital centres and County Alerting Centres. The equipment and aircraft have to satisfy the flight safety criteria and the possibilities of providing full care for the injured and the patients. Besides, they have to be in compliance with the European regulations that refer to aviation and the health care system.

The organization of the system would be such that the call for the helicopter would be sent by the medical staff, ambulance at the accident site or hospital, by making the calls, depending on their location, directly to the relevant operative centre for the respective area thus shortening the procedure and the response time.

The medical assistance services by means of emergency medical helicopter result in the system which charges such services from various organizations. The helicopter services of medical assistance are financed from the state budget and the local authorities, through state insurance funds, medical funds, and private insurance societies, automobile clubs, mountaineering societies and private enterprises. The initial capital to establish the HEMS operative is ensured by the state. Apart from urgent transport and treatment of the injured from the accident site, the financial profit of HEMS service can be realized through additional services such as the transport and treatment of the diseased/injured between the hospital centres, transport of organs, blood and blood plasma and drugs, by urgent transport of physicians if necessary and by transporting the victims of foreign nationality to their central hospitals. Besides, because of the helicopter distribution the service could provide their services also beyond the borders of the Republic of Croatia.

The past research of the problems regarding the use of helicopters for medical transport/treatment services and the proposals of concretized models for the establishment of the system in the Republic of Croatia, either as an autonomous system or as a segment of the system of wider civil protection, are sufficient base for the full implementation of the system. The assumptions for the operationalization of the proposed model primarily refer to the institutional and legal coordination, both due to the integration in the wider region and equal participation in regional and international missions, optimization of operative procedures through centralization of operative management functions, of more rational usage of technical and personnel resources, increase of system efficiency and due to the social care manifestation for the lives of citizens.

5. CONCLUSION

In the Republic of Croatia there is an increasing need for establishing an efficient service that would be capable of acting professionally and fast with the purpose of administering medical help, search and rescue, and other types of crisis situations. It is necessary to start a project of helicopter service whose activity would be to provide helicopter service in all crisis situations.

There are situations in which only the helicopter gives hope to patients and the injured. In the Republic of Croatia, at the accident site, the fatalities amount to 60.2% of the total number of fatalities, during transport to the medical institution 13.3% and during the first 30 days of medical treatment 26.5%. [7] Precisely the fact that before arriving to the medical institution almost one fourth of the total number of victims loses their lives, is the main argument for the introduction of medical aviation.

The establishment of HEMS system is not an additional cost but improvement, through the expected reduction in the number of fatalities and treatment costs. Indirect costs which result from temporary or permanent loss of working capability, are also reduced. The human effect of rescuing human lives is difficult to measure by means of objective economic units, whereas the subjective character does not need to be specially emphasised.

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SAŽETAK

HITNA HELIKOPTERSKA MEDICINSKA POMOĆ U REPUBLICI HRVATSKOJ

Trenutno stanje hitne medicinske pomoći ukazuje na potrebu organiziranja bržeg i efikasnijeg sustava povezivanja svih dijelova Republike Hrvatske. Kao rješenje se nameće primjena zrakoplovstva kao najbržeg, a time i najboljeg načina transporta ozlijeđenih, bolesnih i drugih osoba s potrebama hitnog transporta. Uporaba vojnih helikoptera u svrhu interventnog zrakoplovstva ne zadovoljava potrebe Republike Hrvatske sa organizacijskog i pravnog stajališta. Na hrvatskim cestama je 2005. godine poginulo 597 osoba, a uspostavom hitne helikopterske medicinske službe, kako pokazuju iskustva drugih zemalja, broj slučajeva s fatalnim ishodom se smanjuje za jednu trećinu.

KLJUČNE RIJEČI

helikopter, helidrom, hitna pomoć, interventno zrakoplovstvo, operativni centar

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1. IFR – Instrument Flight Rules.; instrumental flying, pilot relies on instruments on board. Another flying method is VFR (Visual Flight Rules) – visual flying, when the pilot relies on the landmarks using ground and space.

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