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## PODPORA VRTUĽNÍKA V MAĎARSKU HELICOPTER SUPPORTED FIRE-FIGHTING IN HUNGARY

Attila Kozák, László Komjáthy

### Abstract

One of the tools of air-supported fire-fighting are rotor-planes, applied for exploration and extinction of vegetation and forest fires. Exploration, extinguishing of vegetation fires, deceleration of their escalation, maintenance of environmental security became emphasized tasks in the planning, management and organizational operating system of disaster recovery services. Furthermore, parallelly with remediation, it is important to protect the environment; in order to achieve these objectives with this possible tool of fire-fighting, not only the first-line intervention force (helicopter) may be supported, but, with proper exploration, informations may be supplied to support the decisions of ground crew, to slow down fire escalation an effective way, or may stop it in such areas, that would may be very hard to reach for ground units. Helicopters are the main intervention forces for forest fires of great magnitude, and, in line with exploring fire devastations, they may mean a hindrance for escalations of fires.

**Keywords:** KA-26 helicopter, MI-2 helicopter, forest fires, vegetation fires, air (supported) fire-fighting

### INTRODUCTION

One of the expectable effects of global climate change is, that the risk of forest and vegetation fires may heighten, the occuring fires become more intensive, they may cause more serious damages.[1] Through media, we experience day after day, that defence / protection against destructive effects of fire is a serious problem to be solved, not only in Hungary, but at international level, mainly in mediterranean regions. The importance of fighting against vegetation fires, especially against forest fires force science and technology to



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capitalize their present opportunities as good as possible, and improve effectiveness of protection.[2] Also we, fire-fighter professionals need to find new solutions.[3]

## **1. AIR SUPPORTED EXTINGUISHING OF FOREST AND VEGETATION FIRES**

Forest fires are well-known even by laymen, but, only a few have heard about vegetation fires. What is vegetation at all? Vegetation is the summary of plant communities of a given area. In accordance with this, the basic unit of vegetation are not species or any other plant systematical units, but a plant community (association), respectively, (as a general description) a plant formation. Damages caused by vegetation fires may reach even the order of magnitude of more ten millions HUF in Hungary in a year, and the further amounts of damage interventions – even more millions HUF – enhance this amount more. Fighting of vegetation fires is such a complex task, that presume a proper knowledge of the intervention crew, as it is not enough to complete a succesful intervention in the nature, but, a great attention shall be paid to harmful effects of the fire, that affect fauna, flora and soil.[4]

Air (supported) fighting of forest fires demand almost always the parallel use of more airplanes. In such cases, logistics is an indispensable condition, namely, the control of air tools and coordination of their activities shall be done a professional way towards effective way of fire-fighting. The possibility to realize this in practice, is, when a patrol airplane or helicopter in a given, usually greater height is observing the given area, fire continuously.[5]

Air (supported) fire-fighting is fire-fighting by means of airplanes or other aircrafts. During this procedure, fixed-wing and rotor machines are used as well.[6] With helicopter (supported) fire extinction we mean fire-fighting by means of tools directly from and/or transported by a helicopter. Helicopters mean the primary intervention forces of forest fires with great order of magnitude, especially in case of places, that are hard to approach by ground units.[7] One of the most effective tools to fight forest fires are helicopters. [10]8[4]9 Helicopters are able to transport bigger quantities of fire extinguishing agents, mainly water to impassable places. Helicopters may not be applied only for air (supported) fire-fighting in a narrower sense, but for air reconnaissance, logistics and air control, air / aviation support of forest fire-fighting, that is.

In July 2015, in the Kiskunsági Nemzeti Park (*Kiskunság National Park, Hungary*) fires were fought by helicopters as well, the deployment of aircrafts was successful, as it has managed to extinct the fire, that affected more than 50 hectares; it was mainly a juniper area, but pinewood and leafy forests were affected as well.[8]



**Picture 1.** Helicopters were needed to fight fires in Kiskunsági Nemzeti Park (*Kiskunság National Park, Hungary*)

## 2. APPLICATION OF MI-2 HELICOPTERS FOR FIGHTING VEGETATION AND FOREST FIRES

The method of fire-fighting with helicopters was applied first in Hungary by the company Forgószárny kft. (*Ltd.*) placed in Budakeszi. The nature of the new fire-fighting method developed by them is, that a specially designed container is placed inside the helicopter, that is filled by means of a hose from a simple car-carried syringe / injector directly. A great advantage of this method is the independence from open water surfaces, quick (re) deployment, and the momentous firewater capacity, that may be used in 100 %,



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without any losses, thanks to the closed system. Because the water for fire extinguishing is placed inside the aircraft, the maneuverability of the helicopter, so, the exact use / targeting of extinguishing water and the speed / quickness of the turning circles became momentarily quicker, that enhances effectiveness as well.

This developed helicopter is suitable to extinguish fires in high buildings, skyscrapers, furthermore, to implement technical rescue there as well. Further areas of use may be hall-like buildings, respectively, extinguishing of industrial and/or extremely dangerous plant fires. By fire-fighting of hall-like buildings, the main problem is the lack of transparency / visibility; the air approach eliminates this. In case of dangerous plants / factories, air-supported fire-fighting is reasonable first of all from the aspect of security. The helicopter equipped with this new technology may be applied in such areas as well, where, from the reason of the ambient facilities and/or the kind, seriousness of the disaster other technologies can may not be used.

Effectiveness indicators of the developed MI-2 helicopter with inside container (1000 liter) during deployment:

flight time per circle / round:	2-3 minutes
container load time:	ca. 20-30 seconds
take-offs per hour:	12-15
loss of fire extinguishing agent:	0%
targeting of extinguishing agent:	100%
fuel consumption per hour:	320 liter

The new method has another additional advantage: the equipped rotor aircraft is suitable for rescue as well. This system of tools may be applied for air (supported) research / rescue tasks, completed with a tool enabling infrared range day and night, that is reasonable also for quick exploration of fires.[9]





**Picture 2.** An MI2 helicopter owned by Forgószárny Kft. at work

In the article published by Dernei Róbert on the website [langlovagok.hu](http://langlovagok.hu) on 26. October 2006. connected to this topic is written: „For fighting fires of great order of magnitude, or at hardly approachable locations, up to now, the bambi bucket method was the most spreaded method for air (supported) fire-fighting. For fire-fighting, helicopters with lower capacity (MI-2, with 700 liter container), or helicopters with greater capacity (MI-8 or MI-17-military aircrafts, with 2000 liter containers) were applied. It is true, that helicopters with greater useful loads may carry more extinguishing agent, but, from the reason of their „sluggishness”, their water quantity supplied per hour is momentarily smaller than the capacity of MI-2 aircraft.

In practice this means, that during fire-fighting or dam building / dam strengthening works, whilst greater aircrafts perform 3-4 rounds per hour, for MI-2 helicopters 4-5 minutes are enough to perform a round, that is, they may perform 12-15 rounds per hour. If we consider, that greater helicopters have 3-4 times higher operation costs, then, in optimum



case, the smaller ones may be applied for disaster-fighting tasks 6-7 times more economically. Thanks to the new technology, now this indicator of effectiveness may be duplicated.[10]

### 3. FIRE-FIGHTING WITH KAMOV KA-26 HELICOPTERS

#### 3.1. GENERAL CHARACTERISTICS

In accordance with the informations to be found on the website Wikipedia, KA-26 (NATO-code: Hoodlum) is a light-weight, multipurpose helicopter with coaxial rotors, piston engine, developed in the 1960s in the Sowiet Union, in the Kamov planning office (OKB-938). The serial production of this helicopter was done in the airplane factories Ulan-Ude and Kumertau, from the year 1969. The production / manufacturing was quit in the middle of the 1980s; up then, altogether 816 units were made. These were applied first of all for agricultural purposes, but were used for passenger transport and for military, courier tasks as well. Nowadays in Hungary, this helicopter is used for agricultural works (e. g. /fertilizer/ spraying).



**Picture 3.** KA-26 helicopter of Tréner Kft.

This type of aircraft was applied by 15 countries, and more of them (also Hungary) is still using these, mainly in the agriculture. From the onetime member states of the Warsaw



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Pact, only Hungary has adapted these for military tasks at the beginning of the 1970s. The production of KA-26 helicopters was quit already at the beginning of the 1980s.[11]

### 3.2. GENERAL CHARACTERISTICS / TECHNICAL DATA OF KA-26 HELICOPTER

length:	7,75 m
height:	4,05 m
rotor diameter:	13 m
empty weight:	2200 kg
maximum take-off weight:	3250 kg
chemical container capacity:	800 liter (usually loaded with 600 liter)
width of boom / <i>spraying frame</i> :	12,4 m
spraying width:	25 m
engine type:	2 units of Vedeneyev M-14V-26 nine cylinders air cooled radial engines
engine capacity:	265 kW (360 HP) per engine
fuel consumption:	180–220 liter/hour
fuel type:	B-100 aviation fuel
lube type:	SAE 50, SAE 60 degree of viscosity

### 3.3. FIRE-FIGHTING EXPERIENCES WITH THE HELICOPTER TYPE KA-26

TRÉNER KFT (*Ltd., that operates the airport of the city of Nyíregyháza in Hungary*) was founded in the year 1992, during the privatization procedure of the Aviation Service Company (*Repülőgépes Szolgálat*) by four aviation / pilot instructors. Since the establishment, this company does – as successor of Aviation Service Company – the practical training of the aircraft pilot students of the University of Nyíregyháza, for today, in accordance with JAR FCL1 requirements. Including the trainings of the predecessor, since 1968 about 500 professional aircraft pilots were succesfully trained in Nyíregyháza, who's professional skills are appreciated in Hungary and in the whole world as well. At the beginning, the starting



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aircraft stocks / machinery of the association were 5 units of Zlin Z-142 airplanes. For today, more than a dozen aircrafts with airworthiness certificate are available. Among others, the following aircrafts are to find in the machinery: Z-142, Z-326M Tréner, An-2, Pa-28 Cherokee, Pa-23 Aztec, C-152, R-26 S Góbé.[12] Tréner Kft. has at the moment more Kamov Ka-26 helicopters; one of these was transformed for special air (supported) fire-fighting tasks.

The helicopter flies in a speed range of 40-150 km/h. Meanwhile, depending on the load, it is able to float as well. An advantage of helicopters during fire-fighting tasks is, that they are able to land at the exact place of intervention, and have minimal landing place demands. As the landing place is near, short, approx. 5 minutes flight-turn time is enough to implement a task. Thus, such an aircraft is able to perform even 12 take-offs per hour. The loading time (of water) may be reduced to 20-30 seconds, if a pump with proper capacity is available. Only helicopter pilots with great experience in low-height freight flights (agricultural flying licence) are allowed to perform air (supported) fire-fighting.

Time of availability for fire-fighting may change depending on the tasks of the helicopter. In case the helicopter and the staff may perform only a fire-fighting duty at any assigned area, the time of availability / start is short, approx 15 minutes; but, the area of intervention is generally not near to the airport, thus, flight time to there must be considered as well, before starting any air (supported) fire-fighting. In other cases, when the helicopter performs any tasks other than duty, considering the readjusting / resetting of the extinguishing equipment and the flight time, availability may take 1 to 6 hours. A KA-26 helicopter is able to transport 600 extinguishing agent, meanwhile, a great advantage is, that after a smaller modification, it can transport even 800 liter. There are two ways to discharge the extinguishing agent: it can be discharged in 2-3 seconds by opening trap-doors, or, if requested, it can be fine-sprayed through the nozzles placed on the boom.

#### **3.4. ADVANTAGES OF KA-26 HELICOPTER**

The helicopter may be involved to the damage control only, if, in accordance with the incoming reports, alarms, it becomes necessary to explore the fire nest and hazardous, endangered areas. A helicopter is able to maintain continuous control, to coordinate rescue operations. There are tasks, that may be implemented from a helicopter floating in the air. A

staff member, who performs rescue, can descend to the ground with the help of a winch, and with the help of the lowered rope, persons or objects may be pulled aboard. Bie means of an infrared camera fixed onto the helicopter, fire nests may be indentified succesfully and exactly.



**Picture 3.** loading a KA-26 helicopter with vehicle hose



**Picture 4.** KA-26 helicopter at an airshow in Nyíregyháza





**Picture 5.** Fire extinguishing with water at an airshow in Nyíregyháza



**Picture 6.** Loading a KA-26-os helicopter with vehicle hose





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#### 4. PRACTICAL EXPERIENCES

Fire-fighting / extinguishing with KA-26 helicopters was different from other ways / methods from that point of view, that an agricultural helicopter was transformed for firefighting purposes. The preparation started absolutely with the basics, without any experience. The starting point was the external tank / container of the helicopter. For fire extinguishing, the loading system of the container must have been transformed, so, a discharge port with quick connector was mounted to the container, and, the quick-release container valve was equipped with hydraulic open / close functions. We had chances for three trial-extinguishes, that were also great to collect fire-fighting experiences. The helicopter was driven by one person, the ground service was performed by a professional unit of Nyíregyháza fire-fighters. For the service tasks, are a half squad, 1+3 persons, enough.[13] The commander controls the loading, one person operates the vehicle hosepipe, another man rolls the hose, and the last one rolls hose and connects it to the helicopter. Loading time takes 15-20 seconds; during that time, 600-800 liters of extinguishing agent can be loaded to the container of the helicopter. Extinguishing agent was water; as an experiment, we tried it with 1 % water softener (foaming agent) as well.

Air (supported) fire-fighting does not request much more skills, that a pilot normally uses during an agricultural spraying. We think, that **40 hours basic training** is enough for pilots, to become aware with fire-fighting professional tools / equipments, and professional units must be submitted a serious OSH education, as the rotors of the helicopter are in rotation (prepared for takeoff) during the procedure. The commander must learn to use different manual communication signs with the helicopter pilot, who is totally depending on the ground units. The practice time to harmonize the (*works of the*) pilot and ground units (practice + theory) take altogether 60 hours.

#### 5. CONCLUSION

The members of Professional Fire Headquarters of Nyíregyháza had no experiences regarding air (supported) fire-fighting / extinguishing up to now. We could collect experiences only based onto the implemented practices. These are as follows:

- the quantity of extinguishing agent may be changed from 200 to 800 liter.



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- maximum loading time takes 15-20 seconds.
- use / capitalization of fire extinguishing agent is 100 %.
- aircraft can maneuver quickly, because the container / tank is fixed to it.
- the transformation (*of the aircraft*) has not really high costs, the aircraft may be used for agricultural purposes, too.
- the effectiveness of fire extinguishing was enhanced by 1-2 % water softening, that means, the surface tension of water has been reduced, and, during the emission, the container opening security valve could be regulated, so, the fire extinguishing agent could be mixed properly.

Thus, the fire extinguishing agent did not only reduce flaming temperature on the burning surface, but ensured a covering effect as well, through that, oxygene was closed out from the burning space, so, a combined way of extinguishing could be achieved.

The release / spraying of the fire extinguishing agent can be performed by the transformed helicopter three different ways at this time: full release; slow, continuous opening of the container, furthermore, spraying through the nozzles of the spraying wings (right-left), respectively, separated, only at one side.[14] In our point of view, in case of a real event, the optimum way of preparation and deployment is, when by first load the aircraft takes 600 liter extinguishing agent with two pilots. Through this, the air exploration (*recon*) and the first extinguishing may be implemented. After this, through a continuous EDR-connection, the ground service staff shall be ready for a second load and service. Based onto the practice and onto the experiences collected during the airshow performance, we consider as probably, that fire extinguishing with helicopters / helicopter supported fire-fighting may not be used only by fighting of forest fires, fires of fallen, dry leaves, but – shall never happen – also for the extinguishing of fires arosen in industrial (rubber industry, wood industry, paper industry, etc.) establishments as well.

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