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У збірнику тез конференції, яка відбулась 23–25 жовтня 2013 року, представлені головні питання виступів учасників, у яких висвітлений ряд проблем, пов'язаних з актуальними проблемами глобалізаційних процесів, стратегії політики безпеки у 21 столітті, і гарантування національної безпеки стратегії що визнає стратегічне значення прикладу й важливості первинної роботи всередині країни.

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ЕКОНОМІЧНА БЕЗПЕКА ВИЩИХ НАВЧАЛЬНИХ ЗАКЛАДІВ 3

Assoc.prof. Ing. Ľubica Černá, PhD.

The Catholic University in Ružomberok

Faculty of Education

SOCIAL DIALOGUE AS A KEY ELEMENT OF DECENT WORK, SOCIAL PROTECTION AND SOCIAL SECURITY 5

PhDr. Martin Jakubec,

Bratislava, Slovakia,

Ing. Miloslav Hosček, PhD.

INTERNET2, 5G NETWORKS, MEDIA AND SOCIETY BEYOND Y2030 15

Ing. Miloslav Hosček, PhD

ICOCRIM Lieutenant Colonel,

ICOCRIM Slovakia

YEARS 2030 – 2050 GLOBAL STRATEGIES, MEGATRENDS, FIGHTS AGAINST CRIMINAL AND TERRORIST NETWORKS 19

Prof. Ing. Juraj Hraško DrSc.,

akademik SAV.

PRIORITA 21. STOROČIA – DOSTATOK POTRAVÍN 22

László Komjáthy, PhD

Ágoston Restás, PhD

Attila Kozák PhD Student

National University of Public Service,

Budapest, Hungary

DEVELOPING A TECHNOLOGY FOR MAKING AERIAL FIREFIGHTING MORE EFFECTIVE IN HUNGARY 27

doc. Ing. Miroslav Lisoň, PhD.,

JUDr. Jaroslav Rapčan,

Akadémia Policajného zboru v Bratislave

ORGANIZÁCIA A RIADENIE PROCESOV KRIMINÁLNO-POLICAJNÉHO POZNANIA 32

JUDr. Michal Marko

Akadémia Policajného zboru v Bratislave

DROGOVÁ KRIMINALITA, JEJ VÝVOJ A STAV V SLOVENSKEJ REPUBLIKE 54

László Komjáthy, PhD⁵
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DEVELOPING A TECHNOLOGY FOR MAKING AERIAL FIREFIGHTING MORE EFFECTIVE IN HUNGARY

Each forest fire requires different technique and tools. The extent of the catastrophe determines the size and type of units that take part in containing and extinguishing the fire. In many cases the involvement of volunteers and the army is necessary along with the regular Fire Department Response Units.

However it is very important to have knowledgeable and well-trained personnel in command. It is also imperative to provide the firefighters with carrier vehicles appropriate logistics and equipments. During extinguishing, the nature of the terrain determines whether or not the fire trucks can be deployed.

Keywords: *forest fire, firefighter, danger, aerial firefighting, safety equipment, inside tank, KA-26 helicopter.*

Introduction

We can clearly establish the fact that each fire – such as forest fire – has different characteristics. Depending on the nature of the fire, there has to be a broad range of method in place to battle the elements. It is the responsibility of the Fire Department – being the first unit to respond – to quickly decide on the extent of personnel and technical requirements to extinguish different type of fires. The local professional firefighter units with the help of volunteers can easily handle smaller forest fires. In the case of medium fires however, there might be a need for help from the neighboring communities or even from the general population.

The commanders of the Fire Department may request the help of the local residents, however in the event of more severe cases, the involvement of the Disaster Response Unit is absolutely necessary. At significant forest fires where it could take several days to extinguish the fire, the importance of thoughtful and

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careful organizing is obvious. There are major logistical issues to deal with while providing sufficient and effective environment such as financial and technical support, and well-rested units at any given time.

Units and Equipments

An important aspect of receiving help from residents is the fact that they do not always have proper qualification and experience. To fully utilize their presence and willingness to help, they need guidance from well-trained firefighters. In case of devastating forest fires, residential areas are clearly in danger, therefore organizing and executing of the evacuation phase are the most important priorities.

Here is the summary of deployable groups and organizations in fighting enormous forest fires:

- volunteer firefighters;
- civic defense forces;
- members of professional regional firefighters;
- commanders of the Emergency Response Unit;
- volunteer helpers of residents;
- forestry engineers and workers.

Technical Support:

The resources of the ground units are the hand tools, various vehicles, fire trucks, their team and individual equipments.

Team Equipments:

- carrier vehicle;
- walkie-talkie radio;
- first aid package;
- various tools such as hacks, picks shovels, axes, motorized chain-saws, fuel.

Individual Equipments:

- personal safety equipment;
- shovel;
- 2-3 liters of water.

These specifications contain the basic individual and team equipment only.

Vehicles

The fire trucks have multiple purposes. They are designed to carry the response units, their equipments, maintenance and service tools. It is quite difficult to get water into the forest from any kind of vehicle. During the deployment of fire trucks firefighters encounter challenging terrains therefore proper positioning of the vehicles is close to impossible.

Water cannons and special chemical powders that are being used from fire trucks to extinguish house fires are difficult to deploy on mountainous terrains. Flat terrain could also pose danger as the vehicles can easily sink into sandy soil, where even walking could be a challenge. To fight forest fires, water cannons can only be used at the very edge of the forest, or along roads where equipments can be safely operated [1].

It is obvious, that due to the special firefighting environment in the face of the modern requirements aerial support is necessary even in Hungary. Aerial firefighting is the use of aircraft and other aerial resources to combat wildfires. The types of aircraft used include fixed-wing aircraft and helicopters. Because of the present, integrated disaster management system and the rising probability of other environmental disasters besides fires, it is not logical and not possible to operate these aerial vehicles only for firefighting purposes.

Taking the characteristics and frequencies of domestic accidents into consideration helicopters has better features in exploitation and effectiveness in comparison with fixed-wing aircrafts due to their multi-purpose applicability [2]. A well-equipped helicopter in readiness with a well-trained crew besides the extinction of the vegetation can be capable for:

- aerial reconnaissance;
- fire extinction of hall-type buildings;
- relief in case of industrial and environmental disasters;
- SAR (search&rescue) missions;
- MEDEVAC (medical evacuation) missions;
- engineering rescue in distant or hardly accessible places;
- aerial rescue;
- supporting flood protection activities.

The term Helitack refers to "helicopter-delivered fire resources", and is the system of managing and using helicopters and their crews to perform aerial firefighting and other firefighting duties, primarily initial attack on wildfires. Helitack crews are used to attack a wildfire and gain early control of it, especially when inaccessibility would make it difficult or impossible for ground crews to respond in the same amount of time.

Helitack exercise

The effective aerial firefighting depends on many factors, such as weather conditions, fuel load, fire intensity, etc. Extinguish depends also on the quality and quantity of the extinguishing material we put on the vegetation surface. The quality can mean the kind of the material we use for the suppression, like water, foam, gel and retardant. These have different effectiveness of suppression; for the measurement firefighters use a simply classification. Based on the classification,

where the effectiveness of the water is “1”, the foam means ‘3’, retardant means “9”. That is, why water enhancer usually used in aerial firefighting. Unfortunately using water enhancer has a simply disadvantageous, that is very expensive.

Using inside tank can help to avoid water losing during the transportation as it happens usually in case of bucket use. In Hungary helicopters (Mi-8, Mi-17) usually used the bucket method (Bumby Bucket), even if we can find also some efforts for using inside tank (Mi-2) [3]. The bucket solution can lose even up to 50% water of the bucket capacity depending on the speed of transportation and the distance (flight time) between the water resource and fire front. Thus, inside tank seems much better solution than the bucket version.

There is on other solution making aerial firefighting more effective. Using pure water but releasing it with technical assistant can help to spray water with higher effectiveness. Water has heat capacity, which is objectively limits its ability for extinguish. If the fire intensity is very high, we need more water for the unit area (m^2) to be able to extinguish the fire. Even if the heat capacity of released water is enough for balancing the fire intensity, that is not equal for the successful

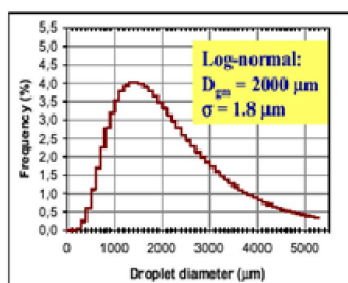


Fig. 1. Distribution of the water droplet size

suppression. If the sizes of water drops are too small, it means that, the airflow (wind, turbulence of rotors) can take away from the fire zone without physical interaction. Other side, if the sizes of water drops are too large, it means that, drops will roll down from the leaf to the ground and there is also no chance for physical interaction. Water drop size distribution presented by Tomé (2002) can be seen at *figure 1*. [4] For the effective extinguish we need a drop size in such scale, that remains on leafs (surface of the vegetation). For this reason the named project aimed to create a special

sheet made of steel to optimize the drop size. For reducing the price and for other practical reason project team choose a small helicopter (Ka-26) for the test.

In August, 2013 team carried out the first helicopter fire extinguishing exercise, using a helicopter servicing in agriculture (type: Kamov Ka-26) with a modified filling system of its inside tank (volume 600-800 liters). There was fitted a pressure stud with a rapid connector to the tank and made the escape valve capable of hydraulic opening and closing.

There was made four runs and the following observations were noticed: to complete our mission four people were necessary. The first was the commander, who controls the filling-up, the second operates the compressor, and the other two connect the hoses between the compressor and the tank on the helicopter. The time

needed for filling-up was approximately 15-20 seconds. Landing and refilling near the fire meant 5 minutes per run. So the main consequence is, that 10-12 turns an hour means capable support of the conventional (ground) firefighting [5].

Conclusion

Quite often water cannons can only be used from the edge of the forest or along the road. In such cases when vehicles are unable to approach the site due to inaccessible terrains, firefighters are forced to get to the fire on foot.

The difficult terrains pose dangerous and challenging conditions, especially when firefighters have to wear the same protective heavy gear as they do in conventional circumstances. For all these reasons it is clear that using helicopters in firefighting in Hungary could provide invaluable help for our men.

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Fig. 2. Ka-26 helicopter

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