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POSSIBILITIES OF MISUSE OF UNMANNED AERIAL VEHICLES (UAV) TO TERRORIST TARGETS

Abstract. This paper deals with description of current technological developments in the field of UAVs and analyzes the possibilities of abuse them with unlawful acts, in particular with regard to the potential application of CBRNE agents. Then describes the incidence of similar events in recent times and predicts its development trend of the future. It is also given the example of theoretical calculation of the effects of selected CBRNE agents in selected area.

Keywords: Unmanned Aerial Vehicle, improvised explosive device, CBRNE substances, terrorist groups.

MOŻLIWOŚCI WYKORZYSTANIA BEZZAŁOGOWYCH STATKÓW POWIETRZNYCH DO CELÓW TERRORYSTÓW

Streszczenie. W publikacji przedstawiono nowoczesne technologie w zakresie bezzałogowych statków powietrznych oraz dokonano analizy możliwości ich wykorzystania w działaniach nielegalnych, ze szczególnym uwzględnieniem zagrożeń CBRNE. Ponadto przedstawiono rzeczywiste przypadki takich działań oraz oszacowano możliwość ich wystąpienia w przyszłości. Zaprezentowano również teoretyczną analizę efektów wystąpienia zagrożeń CBRNE na wybranym obszarze.

Słowa kluczowe: Bezzałogowe statki powietrzne, improwizowane ładunki wybuchowe, czynniki CBRNE, grupy terrorystyczne.

Introduction

Unmanned Aerial Vehicle (UAV) is defined as an aircraft with no pilot on board. UAVs are usually remote controlled aircrafts (flown by a pilot at a ground control station) or can fly autonomously based on pre-programmed flight plans or more complex dynamic automation systems. Complex system, including ground stations and other elements besides the actual air vehicles, is called as the unmanned aerial system (UAS).

Unmanned aerial vehicles were invented initially for military purposes. UAVs came into first use after World War II when unmanned jets, such as the Ryan Firebee started its field operation.

Since then, the number of UAVs in military use increased extremely that the New York Time decided to refer to it as a new paradigm for warfare [1, 2].

The Pentagon now has some 7,000 UAVs, compared with fewer than 50 a decade ago. Within the next decade the Air Force anticipates a decrease in "multirole" UAV (the ones that spy as well as strike) to nearly quadruple, to 536 [1].

The rotor UAVs gradually become available to the general public. The civil and commercial market for unmanned aerial vehicles has grown significantly over the last five years. As approximately 200 000 civilian-use UAVs are being sold worldwide every month. Governments around the world are currently trying to keep up (in terms of legislation) with the speed with which new UAVs are being developed and put to new use [3].

Commercially available UAVs have the potential to be converted into flying attacker, carrying all kind of various explosives, biological, chemical and radiological weapons (CBRNE), capable of hitting targets such as nuclear power stations or other important objects.

Authors of this article consider possibilities which today's commercially available UAVs have and also consider cases of terrorist attacks using UAVs in the past.

UAVs in the hands of terrorist groups

With the increasing availability of UAVs and their technological development, the UAVs can become a dangerous weapon in the hands of terrorists. A range of terrorist and insurgent groups have already deployed UAVs for attacks and intelligence gathering.

Today's commercial UAVs are exploitable mainly in two ways:
− for placement improvised explosive devices (IEDs), CBRN substances, etc.
− for reconnaissance of area

Well known terrorist group Hezbollah allegedly has a small fleet of UAVs, including Iranian Ababil-3 and Shahed-129. The Ababil-3 is a small reconnaissance UAV with limited range and flight endurance. It's also been deployed by the Sudanese armed forces in the former Iranian ally's various civil conflicts. But the Shahed-129 is superficially similar in design to the US's Reaper and Predator platforms, and Iranian military officials claim that the UAV can carry as many as 8 Sadid missiles [4].

Some reports estimate that the fleet includes up 200 platforms for reconnaissance and combat missions. In November 2004, Hezbollah allegedly flew an Iranian UAV over parts of northern Israel before returning to Lebanese territory. In August 2006, Hezbollah launched three small Ababil UAV with explosive payloads, with the purpose of attacking Israeli military targets. The UAV were destroyed by Israeli F-16s. In October 2012, Hezbollah supposedly flew a small UAV 35 miles into Israeli airspace with the aim of undertaking reconnaissance on a nuclear reactor. An Israeli aircraft destroyed the UAV before it could return back to Lebanon. Attacks of Hezbollahs' UAVs supplied into Israel from Lebanon have occurred with increased frequency and sophistication since 2012. Although they are used only for purposes of reconnaissance, they have the potential for future attacks on military and civilian targets. Much depends on the political situations [3, 5, 6].

Hamas's military wing Al-Qassam Brigades in December 2014 launched a locally manufactured UAV at a Gaza City terror group's 27th anniversary march in honor of the founding of the group, prompting the Israel Air Force to raise its alertness level. The UAV activity led the air force to summon jets to the area, but no shots were fired at the unmanned aerial vehicle [7].

In January 2014 Hamas allegedly launched several unmanned aerial vehicles into the Israeli skies. In a statement the group said, that the planes, loaded with explosives, flew 60 kilometers deep in the Israeli skies. Al-Qassam said the planes were launched to carry out certain missions without giving details of what the missions would be [8].

On the seventh day of Operation Protective Edge in the summer of 2014, a Hamas UAV infiltrated southern Israel. It was intercepted by a Patriot missile near Ashdod.

More recently (in July 2015) al-Qassam Brigades revealed that a special unit took over an Israeli Skylark I UAV and was able to making it operational. The Skylark I UAV, developed by Elbit Systems, is used by the Artillery Corps. It has crashed in Palestinian areas in the Gaza Strip and the West Bank several times over the past few years [9].

The so-called Islamic State uses UAVs especially for reconnaissance purposes. In case of assault on the Baiji oil refinery complex (in April 2015), several scenes were shown by using of unmanned aerial vehicles.

The use of UAV allowed the Islamic State to gather information to be used by commanders for command and control purposes, as well as act as spotters for artillery pieces.

This was not the first time the Islamic State has used UAVs on the battlefield. In August 2014, the group released a video showing its forces using UAV in a similar fashion at the Syrian Army's Brigade 93 base in Raqqah province [10].

David Cameron, the Prime Minister of Great Britain, warned that terrorists of the Islamic State are planning to use UAVs to spray nuclear material over Western cities in a horrific "dirty bomb" attack. The risk is that jihadists want to buy basic UAV that are widely available online for transport radioactive material into the heart of major cities in a strike that could kill thousands. Cameron said that the danger of Islamic State getting hold of nuclear material was "only too real" [11].

Characteristics of selected UAVs

Most commercially available models are rotary multicopters UAVs (quadcopter - four propellers, hexacopter - six propellers, octocopter - eight propellers). UAVs are more operative in a small area in comparison with the UAV with fixed wings. In case of terrorists' attack at some location in Europe, it is much more probable, that these groups would use some multicopter unmanned aerial vehicle.

Below (Table 1) is given a list of some commercial UAVs and we show also important characteristics (payload, flight time, range, maximum speed) in terms of their potential exploitability of hostile groups.

Tab. 1 Important characteristics of UAVs

Model	Payload (kg)	Max. speed (m/s)	Flight time (min.)	Range (km)
DJI Phantom 3	cca 1.1[12]	20	28	3.5
Robodrone Kingfisher	5	14	60	2
UAVEX Octocopter	10	-	35	-
DJI Phantom 4	0.46[13]	20	28	5
DJI Inspire 1	0.63[13]	18	18	5
SkyJib-X4 XL Ti-QR	7.5	86.4[3]	15	3-25

We can consider from the above mentioned characteristics that commercially available UAVs have a relatively small payload, but payload is one of the most critical characteristics for prediction of damages. Maximum value of payload is only 7.5 kg. 7.5 kg of explosives likely do not cause so much damage compared to 7.5 kg of hazardous chemical weapons or another type of CBRN. Figure 1 shows a range of explosion of 7.5 kg TNT explosives on the street Sabinowska 62/64 in Częstochowa (Poland).
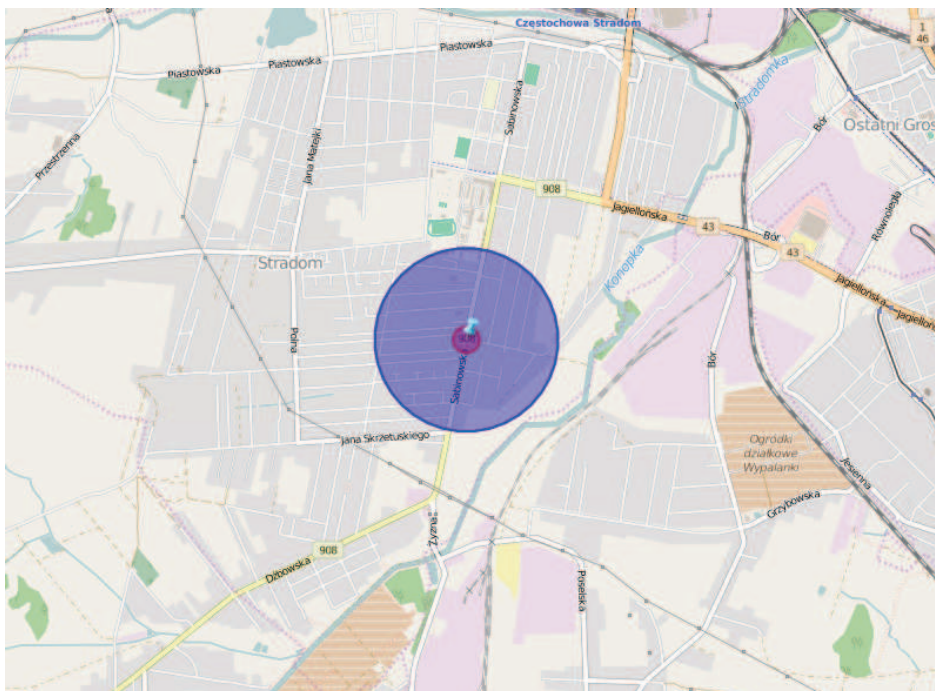

Fig. 1. Range of explosion of 7.5 kg TNT in Częstochowa. Terex was used for this assessment

Figure 2 shows the consequences of the explosion of 7.5 kg TNT.

Fig. 2. Consequences of the explosion of 7.5 kg TNT. Terex was used for this assessment

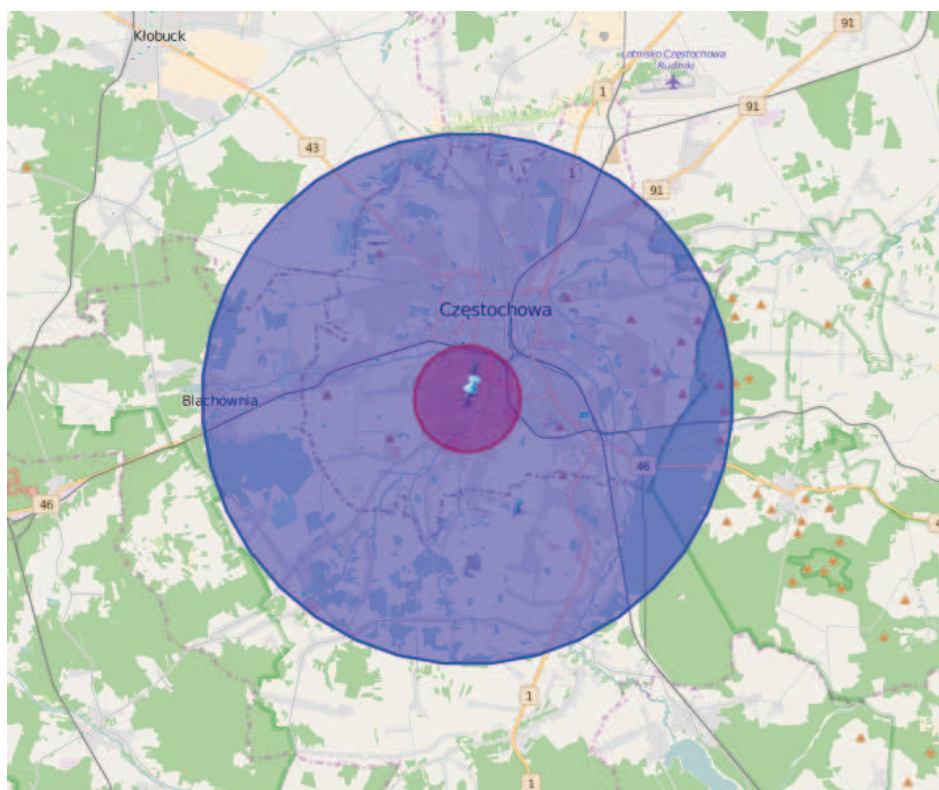Figures 3 and 4 show the consequences of 7.5 kg mustard gas attack.

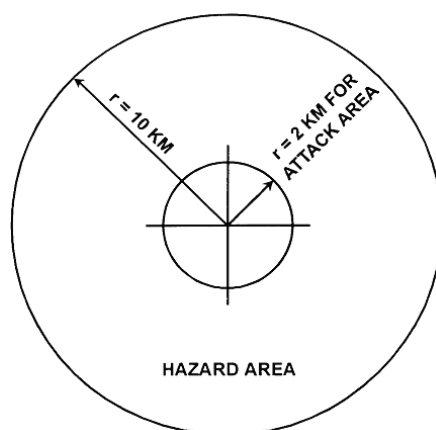Fig. 3 Result of 7.5 kg of mustard gas (Yperit) attack. Terex was used for this assessment

Fig. 4 Schematic representation of the effect of 7.5 kg mustard. Terex was used for this assessment

Initial conditions of attack are following:

Type of substance: N-yperit, surface air temperature: 20°C, downwind speed 10 km/h, Day-Summer, urban area.

From these result we can consider, that much more dangerous would be use some chemical, biological and radiological substance.

Conclusion

Unmanned aerial vehicle at this time presents the extreme risk because of their capabilities and widespread availability. Small rotor UAV are really available for a wide range of population, including terrorists. A range of terrorists groups have already demonstrated the ability to use civilian UAV for attacks and intelligence gathering. Certain restriction for using UAV is their small payload (for explosives).

Unmanned aerial vehicles can pose serious threat to society in case of sophisticated use of chemical, biological and radiological substances.

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