New challenges for Mine Action posed by illegal migrations

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Topics

• Illegal immigrants, HSA, border regions
• Case region 42,6 km² HSA
• Experience from UAS survey operations development in 2017-2018
• Assessment the initial status of HSA in case region
• Establishing the resource for Non-Technical Surveillance on demand
• Conclusion
Illegal immigrants and state’s border

• Illegal migration of persons towards Europe produces new challenges in many domains in EU countries, but only in Croatia, this phenomenon is linked with mine action.

• The Croatian borders are 2374 km long, and the one with Bosnia and Herzegovina, 1011,4 km long, is the most vulnerable, [1], [2].

• Hazardous Suspected Areas (HSAs) in Croatia are marked with warning tables made and maintained by Croatian Mine Action Centre (CROMAC), which maintains on Internet the selectable scale maps of existing HSA, [3].

• In a normal situation, without an increased number of illegal crossings the border, this satisfies all standards and practice of mine action.

• The MAC of Bosnia and Herzegovina has on the Internet the map of HSA at the fixed 1:400.000 scale, [4].

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Maps on Internet of hazardous suspected areas in Croatia and in Bosnia and Herzegovina

CROMAC, example HSA maps

BHMAC

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Conclusion
Z. Ničeno, Head MOI Borders Department, 25.03.2019:

- 1470 illegal crossing in three months 2019, in 2018 same period ~800 immigrants & 620 smugglers
- Immigrants change routes on daily basis when they detect police activity
- MOI is equipping with mobile and manual thermovision cameras, with sets of unmanned aerial systems (UAS)
- Two MOI helicopters are supported by Frontex helicopter on daily basis
- Key tasks: border protection, counter people trafficking; 6500 border policists


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HSA in border regions is a new challenge for Mine Action

• The illegal migrants cross the border outside the traffic routes, making the permanent space-time surveillance of the region near the border extremely demanding as regards the human and other resources of the border police.

• The additional problem is the increase of safety risk due to HSA, for illegal migrants and also for Croatian border police, if and when they enter and cross the HSA.

• Croatian border protecting forces are exposed to very high risk while they have to repeat search while protecting the regions near the border.

• A sustainable solution for permanent space-time control of HSA in this region of EU land border is the Non-Technical Survey, made by combined dual sensors onboard of unmanned aircraft systems (UAS), long wave infrared (thermovision) and very high spatial resolution color.
Case study region with HSA 42,6 km² in Croatia where the illegal crossings had maximum in 2018.

The majority of illegal immigrants in Bosnia and Herzegovina have been concentrated in 2018 in Bihać, Cazin and Velika Kladuša, and from these locations, they permanently attended to cross the Croatian border.
Problem definition

• The trespassers’ favorite paths change in time, mainly due to weather conditions and the availability of temporary stay (Bihać was one the largest in 2018). If the favorite paths are assessed they are not public. Therefore we will suppose that illegal immigrants can cross any of HSA, and that the probability of this event can be uniform.

• The nearly permanent space-time surveillance of the long border with HSA can be realized by a number of systems, each consisting of the dual sensor onboard of UAS. To evaluate this solution shall be done several analyses of HSA. The objectives of the preliminary analysis of HSA in the case study region shall be done using GIS data of HSA.

• The operational experience from 2014 in the project [5], shows that simple in office planning capacity of UAS survey is usually too optimistic (instead to provide 31 km² only 6,02 km² color imagery was achieved by two independent UAS teams).
Approaches to decrease a risk

• The total HSA in Croatia is 355,6 km², the perimeters are marked with 12280 warning tables. The simplest initial decrease of risk due to illegal crossing the HSA can be done by increased density of the warning tables on the perimeters of each HSA.

• Surveillance of the large HSA regions with UAS was initiated by HCR-CTRO Scientific Council in 2017. Due to organizational changes of Croatian Mine Action Center (CROMAC), this activity stopped in 2018, again we activate this idea. The goals of our paper are:

  • to analyse the idea on a representative case of combined borders and the HSA,
  • to test and evaluate foreseen technology, derive and verify standard operation procedures, establish resource in CTRO (unit which can be activated on demand) for day and night surveillance of the mentioned HSA, and for education and training,
  • to verify and estimate the optimal quantity of UAS surveillance sets for complete HSA in Croatia.
UAS survey operations development in 2017-2018

HSA 23.7 km² Dabar – Glibodol: HSA, safe roads, waring tables

Safe roads, vertical take-off and landing points, polygons for UAS survey

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Preliminary analysis of 42,6 km² HSA

1. Analyze the selected HSA, assess their rank of importance
2. Assess the safe access road, paths to the HSA
3. Assess the accessible locations for vertical take-off and landing the UAS, which enable dual sensor surveillance; determine the differences in flight height over HSA
4. Derive the polygons in HSA which enable dual sensor surveillance with UAS which have limited autonomy
5. Estimate a time needed for video and digital photography surveys, for color and for longwave infrared (thermal) sensors.
Establishment of the initial status of HSA

6 The initial estimation of needed time can be the final capacity achieved with two UAS systems in the project [5]. In this project the daily capacity for color images was 0.25 km\(^2\). For 42.6 km\(^2\) HSA needed acquisition time is at least 171 h. A travel time to VTOL locations is not included in this estimate. While thermal sensors have a smaller number of pixels, the time for this kind of acquisition will be larger.

7 Make survey with color sensor onboard simple UAS available in HCR-CTRO in a photogrammetry mode and derive digital ortho mosaics for selected HSAs. Orto rectify obtained mosaics on digital ortho maps, while they will present the current state of HSA.

8 Identify the potential indicators of illegal crossing in HAS.

9 Estimate capacity km\(^2\)/day and time needed to acquire color and thermal images and video for each considered part of the HSA.
Establishing the resource for day and night Non-Technical Surveillance on demand

The first objective of this work is to establish resource (structure, unit) in HCR-CTRO, which will be able to provide day and night surveillance of the HSA on demand (in the case of emergency in HSA), with approved technology (sensors, UAS, SOP, deminers – surveyors).

With members of the HCR-CTRO Scientific Council, this unit will be also a key resource for education and training for the Non-Technical Survey with UAS based surveillance systems.

The second objective of this work is to operationally test, evaluate and validate a considered technology for Non-Technical Survey of HSA in border regions and to support its deployment in other regions with HSA in Croatia.

The developed technology is suitable for other similar application in HSA and we invite to cooperation.
Conclusions

Assess the initial status of HSA in case study region and evaluate operational solutions in 6 months, needed funding.

We do invite and encourage donors and invite to cooperation in the implementation and deployment of UAS based day and night surveillance of HSA near the border, on illegal migration routes.

Scientific Council of HCR Centre for testing, development and training can realise proposed activity.
February 2002, Drenov bok - Dubica.

„Spatial information and applications of sensors for counter-terrorism”.