ASSESSING THE POSSIBILITY OF IMPROVING RESCUE OPERATIONS WITH THE USE OF UAVS. CASE STUDIES FROM WIELKOPOLSKIE PROVINCE

Piotr Gładysz[1]*, Rafał Parczewski[2], Anna Borucka[3]
[1] Provincial Headquarters of the State Fire Service in Poznań
[2] Military Training College, Military University of Technology, Warsaw
[3] Faculty of Security, Logistics and Management, Military University of Technology in Warsaw
* Correspondence: phddron@gmail.com

Abstract

The growing intensity of fire hazards is increasing the need for incorporating aerial vehicles — including unmanned aerial vehicles, which are now becoming a valuable tool in the hands of various state bodies and institutions, including the State Fire Service (SFS) in Poland, in supporting activities aimed at saving human life, health or property. The article presents the characteristics and purpose of the SFS and the range of tasks performed by it, as well as key problems in this area. Examples of the use of unmanned aerial vehicles (UAVs) in firefighting activities were also presented. It was pointed out that improving the ability of SFS to carry out tasks should be a priority, especially in an era of cyclical threats arising from human activity or environmental forces, and the continued growth of technology means that unmanned aerial vehicles can provide increasing support. The purpose of the article was to present the scale and level of a fire threat and to indicate the potential of UAVs in combating it. The research was conducted on the example of a selected region. The article uses the case study method: 3 examples are presented to support rescue operations using unmanned aerial vehicles. Descriptions of cases are supplemented by operational conclusions and recommendations. It was assumed (research hypothesis) that the large-scale use of unmanned systems for search and rescue operations in the SFS would not only affect the speed and effectiveness of the response, but also enhance the level of safety of the officers involved. The authors also emphasise the need of creating a new unit in the structures of the State Fire Service, which would deal exclusively with the implementation of tasks related to the processing, management, analysis and placement on the map of the necessary data on the hazards. This would make preventive measures more effective.

Keywords: unmanned aerial vehicle, fire protection, unmanned aircraft, fire safety, rescue operation, State Fire Service

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1. Introduction

1.1. Structure and tasks of the Provincial Headquarters of the State Fire Service (VH SFS)

The State Fire Service (SFS) is a service responsible inter alia for recognising fire hazards and organizing and carrying out rescue operations during fires, natural disasters or elimination of local hazards, i.e., those that result from direct human activity or forces of nature (e.g., various types of natural disasters) (Ciekanowski, Żurawski, 2022; Piwowarski et al., 2020). The scope of activities of the SFS keeps constantly expanding. Today, it is not only a typical rescue service, but also a formation designed to provide much broader aid activities such as evacuation, fire protection, search and rescues, etc. (Janik et al. 2021; Fellner et al. 2021). At present, SFS units boast excellent training and modern technical equipment (Rabajczyk et al., 2021; Kopa, Imielski 2015). The reason for this is that fire safety is an important aspect in ensuring the public safety of a country (Piwowarski et al. 2020; Gwardyński, Kogut, 2021). It is mainly this formation that is entrusted with the organization and conduct of rescue operations during a fire, the elimination of fire hazards, the effects of natural disasters or the undertaking of specialized rescue operations (Rabajczyk et al. 2021; Janik et al. 2021). Analyzing the tasks of the SFS, it can be concluded that they constitute the priority direction of action. The State Fire Service serves the state internal security and is the leading service in the implementation of tasks related to critical infrastructure. It organizes and conducts rescue operations as well as control and reconnaissance activities intended to identify fire hazards, also to control compliance with fire regulations. Establishing any irregularities and identifying other local hazards is also within the competence of the SFS and imposes a wide range of powers that its officers have. In Poland, the State Fire Service carries out operations in areas assigned to the relevant units. One such organizational unit of the SFS is the Provincial Headquarters of the SFS in Poznań, which is the subject of this study and which carries out its statutory tasks in the Wielkopolskie Province. The indicated province is located in the western part of Poland. It covers an area of 29,826 square kilometers and is the second largest province in Poland with a population of 34939.69 k (Wydział Kontrolno-Rozpoznawczy KW PSP Poznań 2018).

In Poland, tasks related to combating fire hazards carried out by professional firefighters are supported by volunteer fire departments (Act on volunteer fire departments 2021). These are formations that perform an analogous function in the state rescue system, but operate on an association basis. There are 1,811 volunteer fire units in the Wielkopolskie Province.

The purpose of the article was to present the scale and level of the fire threat and to indicate the potential of UAVs in combating it.

1.2. Subject of combating fire hazards supported by UAV

In the time of occurrence of a threat to life, health, property or the environment caused by fire, natural disaster or localized hazard, i.e., an event that arises from the development of civilization or the natural laws of nature, rescue operations are commanded by an SFS officer, who becomes, for the duration of the operations, an independent managerial public administration body, called the Commander of Rescue Operations (CRO). This unique status grants the SFS officer the right to issuing enforceable decisions, which can be given immediate enforceability. As an effect, the CRO becomes a one-person enforcement agency and enforcer. The effectiveness of rescue operations will depend on their decisions, knowledge and experience. Undertaking activities in question requires the CRO to carry out reconnaissance, which should be defined as organized, active and uninterrupted activities to identify and monitor threats, as well as continuously assess the situation. Standard reconnaissance does not give the CRO a complete picture of the situation (Chou et al. 2019; Martinovich et al. 2020). Its main limitations are its line of sight, its dislocation and basing an image of impending threat on information obtained by radio from another firefighter (Maher et al. 2020; Bayat et al. 2020; Wonjoo, Kwang-Min, 2021).

Therefore, of key importance in this area are modern technological solutions, such as unmanned aerial vehicles (UAVs), which enable remote information gathering in the form of video transmission from an aerial platform (Viegas 2022; Al Jaber 2021; Zadeh 2021). This allows providing CROs with a full picture in a very short time (Parczewski 2021; Zharikova 2019).

Evidence of this assessment is an analysis of selected events taking place in the Wielkopolskie Province that involved officers of the VH SFS in Poznań, during which, at the request of the commander of the rescue operation, an unmanned aerial vehicle was used.

The functioning of unmanned aviation in the structures of the State Fire Service is regulated only as of 2021, when the operational manual was adopted (Operational Instruction 2021). The most significant provision allows the UAV to be dispatched in coordination with and at the request of the rescue manager, and allows the UAV to be dispatched to operations by the SFS officer on duty, without the necessity of consulting the CRO upon receipt of a report of an incident whose threat is large in its magnitude. This shows the importance of using UAVs to combat fire hazards.

Performing an unmanned aerial vehicle mission during rescue operations of the State Fire Service often involves an air operation of high risk. In order to reduce it to an acceptable level, pilots of the State Fire Service assess the risk of every new mission, every new flight location and every environment change – each time taking into account the human factor. The method of performing the risk assessment is documented in the Operations Manual as part of the risk management process. The Operations Manual is an internal document of the State Fire Service that contains

operational procedures describing ways of organizing and performing UAV flights. Risk management comprises hazard identification, probability and severity assessments and of risk mitigation, if applicable. The Operations Manual specifies the risk management method by introducing probability and severity matrices; it also contains a risk tolerance matrix that helps deciding if any mitigation action is necessary. Due to the specific nature of missions of the State Fire Service, it is possible to document risk analysis only after the completion of flight, but not later than within 7 days. In addition, due to significance of the service, flights can be performed even when the risk is assessed as unacceptable (high, very high): the final decision rests with the UAV Operator, which is also described in the Operations Manual.

2. Materials and Methods

2.1. Selected cases of rescue operation support using UAVs

In order to demonstrate the potential of UAVs in rescue operations, some examples were chosen of their use during rescue operations executed in the Wielkopolskie Province in which UAVs played a key role. A case study of three actions of the State Fire Department of the Wielkopolska Province was used as a research method, supplemented by a literature review, inductive and educational inference. Selected cases were as follows:

- long-term landfill fire,
- search for a missing person at night,
- wind turbine blade fire.

2.2. Long-term landfill fire

The first case, demonstrating the wide range of capabilities of UAVs during rescue operations, was a long-term landfill fire. The fire broke out on 10 September 2019 and its extinguishing took more than 13 days. Rescue efforts mainly included identification of the hazard, setting up a water buffer and finding areas with elevated temperatures. Originally uncomplicated from the point of view of conducting operations, the fire was proving increasingly difficult as the days progressed, requiring the use of additional equipment and the development of effective tactics. The difficulty in carrying out rescue operations was due to the area comprised by the fire. For this reason, heavy military equipment was brought into action, and then also unmanned aerial vehicles, which are at the disposal of the VH SFS in Poznań. The unmanned aerial vehicles were first used to carry out preliminary hazard reconnaissance, including collecting information on the size of the area covered by the fire, the effectiveness of the application of fire extinguishing agents, the type of combustible material, the surface structure and elevations of the stored

waste and the number and location of fire outbreaks. As regards directing water streams, the UAV system made it possible to adjust their direction so that they hit the fire outbreak points directly. In addition, the UAV system was used to take images with a visible light camera to analyse the adopted firefighting tactics, as well as to create orthophotomaps with the use of a professional photogrammetry software. The developed orthophotomaps were further enhanced inter alia with information such as compass rose, cartographic grid, elevations and other fire databefore being printed and made available to the commander. The map prepared in such a way allowed the managed SFS units to clearly indicate places where action was necessary. The example of the above-described ways of using the UAV during ongoing operations shows that the possibilities of using UAVs are not only to monitor and picture the fire using a daylight or thermal imaging camera, but also to conduct continuous threat reconnaissance, analyse the effectiveness of ongoing operations, collect data to make orthophotomaps, calculate the area and volume of burning material, as well as document the entirety of ongoing operations. The view from the drone's camera is shown in the image below:

Figure 1. Landfill fire – image from RGB camera of Yuneec H520

Source: own resources of the Provincial Headquarters of the State Fire Service in Poznań

Performing flight operations during the fire described above provided new knowledge to the pilots as well as experience to draw further conclusions. One of the key conclusions concerned the time and correct hour for planning control flights aimed at locating areas with higher temperatures. The experience showed that in order to gain meaningful readings from the thermal imaging camera, flights

had to be planned and executed before sunrise. The thermal radiation emitted by the rising sun directly affected the stored glass and plastic materials, which were initially misinterpreted by the pilots as a potential fire spot. Further important experience involved responding to threats from birds circling over landfills. More than once there were situations where birds attacked the unmanned aerial vehicle. Due to the aforementioned danger, the UAV observer constantly kept the drone in sight, even during automatic flights, and in dangerous situations used short, repeated acoustic sounds emitted from a traditional whistle or compressed air fanfare.

2.3. Search for a missing person at night – implementation of the "lighthouse method"

The second example of rescue operations during which UAVs were used, worth analysing, was the search for a person reportedly lost in the woods (July 2021). The time of search operations, i.e. the moment the services were alerted until the moment the lost person was found, was close to 7 hours. The operations were conducted at night from 10 pm, and the area to be searched covered more than 4 square kilometres. The operation involved forces and resources such as: the Police, the State Fire Service, i.e., a search and rescue team with a dog, a drone team and the Volunteer Fire Department. The drone team included two UAV pilots with unmanned aerial vehicles type Yuneec H520 and DJI Mavic Dual Enterprise. Those UAVs were equipped with a dual daylight camera and a thermal imaging camera. As the result of the operations, the drone team used a UAV equipped with a halogen lamp, which it used to perform a novel method of establishing the direction of the search, called "the lighthouse". The method involved raising the drone to a height of about 50 meters at designated locations and performing a 360-degree rotation of the drone around its axis with the halogen lamp attached. During the rotation, in coordination with the CRO, a member of the drone team contacted the lost person by telephone to obtain information on whether they could see the rotating light. The method was designed not only to determine the direction to be taken by rescuers, but also to confirm whether the person reporting is in fact a lost person. After relocating the drone team several times to perform rotations, the use of the UAVs had the desired effect. Rescuers made voice contact with the lost person and eventually pinpointed their location. The non-standard use of a UAVs equipped with a halogen lamp, which is widely advertised as a tool for illuminating the area of operations, was applied during the search. In the case of this incident, the halogen lamp integrated into the drone has proven to be more useful than the thermal imaging camera that is recommended during any search operation. The view of the "lighthouse" in the fog seen by the lost person is shown in the image below:

Figure 2. Reflection of lights from UAV during landing phase in heavy fog – view from ground observer

Source: own resources of the Provincial Headquarters of the State Fire Service in Poznań

In the above-described example of using the UAV during search operations, attention should be paid not only to the tactics of using a drone with relevant equipment but also to the danger of a meteorological phenomenon such as fog. Suspension of very small droplets of water in the ground layer of the air, was practically unnoticeable in the first phase of flights. Nevertheless, with each hour of the search, the fog intensified, directly affecting the safety of the flight. Considering the purpose of performing flight operations - saving endangered human lives and the availability of a drone suitable for flying in the rain, the UAV pilot decided to continue performing flights although water droplets were visible on the propellers during the battery change. In order to reduce the risk, the drone did not come closer than 10 meters to third parties at any time during the flight. This experience proves that when performing a risk analysis it is necessary to predict the evolution of the existing threat, and that precipitation and temperatures below 0 degrees Celsius are not the only threats from meteorological phenomena. It is worth bearing in mind that fog is a threat to the electronic components of which the drone is built and affects the propagation of radio waves, the disruption of which will directly influence the controllability of the UAV.

2.3. Wind turbine blade fire

Another example of an incident in which UAVs were used, in terms of its individual capabilities, was an unusual fire that occurred at an altitude of 187 m above sea level. It was a burning wind turbine blade. The fire was most likely caused by lightning. The activities of the SFS officers began past 6 p.m., and ended the next day after 7 a.m. The use of UAVs made it possible to quickly identify the fire, i.e., to detect the temperature of the burning wind turbine blade and monitor the overall spread of the fire. As a result of the reconnaissance, a decision was made to apply directly an extinguishing agent to the site of the fire. The only way to provide water at that altitude at that point was to send a helicopter to drop water from a suspended tank. Due to the need of undertaking firefighting operations as soon as possible, a private helicopter equipped with a suspended firefighting tank, the so-called *Bambi Bucket*, was used for the incident. The use of the drone in the analysed fire involved taking continuous measurements of the fire temperature and controlling its development by using a thermal imaging camera, as mentioned, at the altitude of 187 meters. As of today, this height is a limitation even for the highest ladders and hydraulic lifts available to the Fire Department. This fact proves the capacity of combining a thermal imaging camera with an unmanned flying platform. An example of reading a thermal imaging camera is shown in the image below:

Figure 3. Screen form Ground Control Station of the DJI Mavic 2 Enterprise Dual: thermal view of buildings in abandoned factory complex

Source: own resources of the Provincial Headquarters of the State Fire Service in Poznań

An analogous situation involving the use of a UAV equipped with a thermal imaging camera to take measurements in hard-to-reach areas took place during another cited incident. The fire in question developed in one of the buildings of an abandoned factory complex in the centre of the city of Poznań. As SFS officers arrived on the scene, the fire has already covered the entire building. After the fire has been extinguished, it was necessary to take measurements with a thermal imaging camera to confirm the effectiveness of the firefighting efforts. It was not advisable for firefighters to enter the burned-down abandoned building due to the condition of the compromised structure. Therefore, a drone team was used. A team arriving on the scene with a drone equipped with a thermal imaging camera quickly and efficiently measured the extinguished building, i.e., its roof, exterior and interior walls. In addition, the UAV pilot took measurements of neighbouring buildings affected by the high temperature caused by the fire. As a result of thermal imaging surveys, the UAV pilot confirmed that there were no fire pockets. The use of a drone with a thermal imaging camera in the above-described example of a fire in an abandoned building not only allowed to reassure the CRO that the fire has been fully extinguished, but, above all, allowed replacing the human potential that could have had to risk life and health entering buildings at risk of collapse with a handheld thermal imaging camera. An example of reading a thermal imaging camera is shown in the image below.

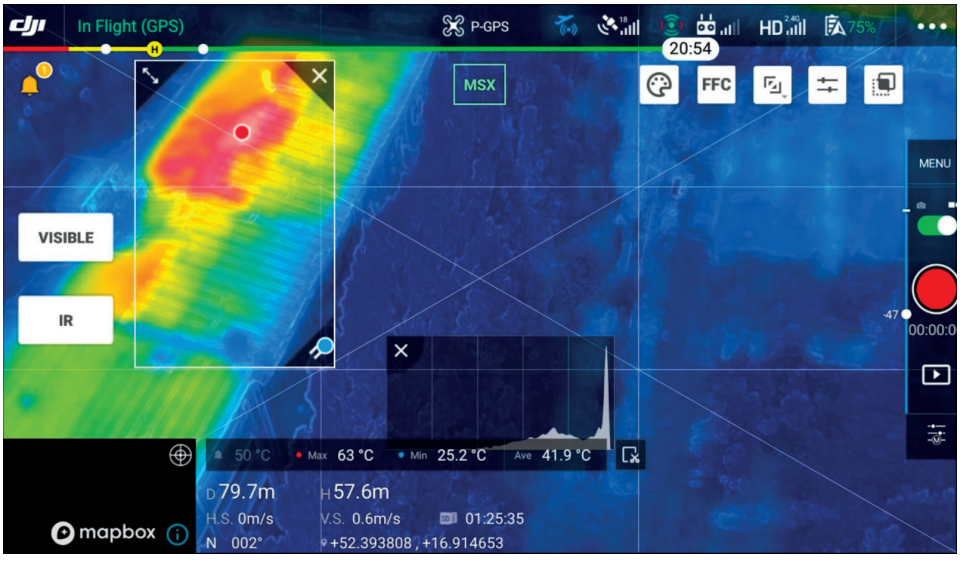

Figure 4. Screen form Ground Control Station of the DJI Mavic 2 Enterprise Dual: thermal view of buildings in abandoned factory complex

Source: own resources of the Provincial Headquarters of the State Fire Service in Poznań

Using a drone equipped with a thermal imaging camera during firefighting operations executed on a wind turbine blade is an example of the implementation of new technology in the operations of the State Fire Department, in order to eliminate

height restrictions, and an example of the experience for the pilot, during which he encountered new threats. One of the main threats at the flight spot were wind gusts and turbulence created by operational wind turbine units located close by. Their influence on the unmanned aerial vehicle from the ground was practically unnoticeable, but the slowed movement of the drone on departure in the selected direction, the clear vibration of the camera view and the accelerated consumption of energy in the batteries were evidence of their real impact. This shows that a pilot performing a flight in a wind farm environment should carefully plan safety systems in case of a possible loss of control of the drone, and take special care in case the drone loses its GPS signal and switches to ATTI mode.

3. Conclusions

The above-described uses of UAVs demonstrate the possibility of optimizing the management of rescue operations with the use of UAVs. As a result of the first described incident, the UAV system effectively assisted the rescue leader in recognizing the hazard, and namely a fire, and organizing the necessary firefighting operations. Viewing the fire from "above" in terms of thermal imaging effectively allowed the detection of sources of thermal radiation constituting points of fire outbreaks. Viewing the fire from "above" using a visible light camera allowed optimizing the directing of firefighting streams, compiling images used to generate orthophotomaps and calculate the magnitude of the fire, as well as documenting the overall rescue effort. In the second case, thanks to the rapid response of UAVs, it was possible to pinpoint the direction and sector where the lost person was present. These actions were a key moment in the search and rescue operation and directly contributed to reducing the search time. In the last two cases described, UAVs were used to take thermal measurements in hard-to-reach areas. The described example of the use of UAVs with thermal imaging cameras to confirm the extinguishment of a fire inside an abandoned building is particularly important, as it illustrates how the equipment replaces human potential, which could be at risk of loss of life and health in this type of rescue operations.

The above-described examples of the use of unmanned aerial vehicles by SFS officers testify to the possibility of optimizing rescue operations using this equipment given the great variety of hazards. The growing demand for the use of drones during rescue operations underpins the establishment of a new specialization in the structure of the State Fire Service. It should include carrying out the tasks of processing, managing, analysing and mapping the necessary data concerning hazards. The work of developing rules for the organization of the new specialty should take into account interdepartmental cooperation, with the aim of excluding the obligation to apply civil aviation regulations by fire protection units and creating regulations dedicated to emergency services instead. The current legal situation governing the operation of unmanned aviation is based on European

regulations, which do not distinguish between civil aviation and state aviation, which includes state aircraft owned by the SFS. In addition to legal regulations, the rules in question should specify the requirements and technological standards of the flying platforms, as well as the scope and subject matter of specialized training courses that assure not only piloting privileges, but also skills and an idea of the applicability of UAV systems.

In the era of current threats, UAV systems should be used for search and rescue operations to ssure their success. Analysing the development of unmanned aviation both technologically by manufacturers and operationally and organizationally within the structures of the State Fire Service, it can be assumed that in the coming years UAV systems will undergo development and continuous modifications.

References

1. Act on volunteer fire departments of 17 December 2021, Polish Journal of Laws 2021, item 2490.
2. Act on State Fire Service of 24 August 1991, Polish Journal of Laws of 1991, No. 88, item 400.
3. Al Jaber, R., Sikder, M.S., Hossain, R.A., Malia, K.F.N. and Rahman, M.A., (2021). Unmanned aerial vehicle for cleaning and firefighting purposes. In: *2021 2nd International conference on robotics, electrical and signal processing techniques (ICREST)* (pp. 673–677). IEEE.
4. Bayat, H., Delavar, M.R., Barghi, W., EslamiNezhad, S.A., Hanachi, P. and Zlatanova, S., (2020). Modeling of emergency evacuation in building fire. *International Archives of the Photogrammetry, Remote Sensing & Spatial Information Sciences*, 43.
5. Chou, J.S., Cheng, M.Y., Hsieh, Y.M., Yang, I.T. and Hsu, H.T., (2019). Optimal path planning in real time for dynamic building fire rescue operations using wireless sensors and visual guidance. *Automation in construction*, 99, pp. 1–17.
6. Ciekanowski, Z., Żurawski, S., (2022). Państwowa Straż Pożarna jako grupa dyspozycyjna w systemie zarządzania kryzysowego. *Aviation And Security*, issues no. 1(1/2022). DOI: 10.55676/asi.v1i1.4
7. Decision No. 20/2022 of the Voivodeship Commander of the State Fire Service in Poznań 2 on the organizational regulations of the Provincial Headquarters of the State Fire Service in Poznań dated 20 May 202.
8. Fellner, R., Zawistowski, M. and Sadowski, P., (2021). Reliability of UAVs in Fire Services Operations. Tests and Measurements of Selected Parameters. In: *International Scientific Conference on Air Traffic Engineering*, pp. 34–45. Springer, Cham.
9. Gwardyński R., Kogut B., (2021). Znaczenie państwowej straży pożarnej w systemie bezpieczeństwa wewnętrznego państwa. *Bulletin of Lviv State University of Life Safety*, 24, pp. 74-82. DOI: 10.32447/20784643.24.2021.09
10. Janik P., Zawistowski, M., Fellner, R. and Zawistowski, G., (2021). Unmanned Aircraft Systems Risk Assessment Based on SORA for First Responders and Disaster Management. *Applied Sciences*, 11(12), p. 5364.

11. Wydział Kontrolno-Rozpoznawczy KW PSP Poznań, (2018) *Analiza zagrożeń województwa Wielkopolskiego*, Poznań 2018.
12. Kopa D., Imielski, T., (2015). Zadania Państwowej Straży Pożarnej wobec zagrożenia terroryzmem w Polsce. *Acta Universitatis Wratislaviensis*, No. 3693 Studia nad Autorytaryzmem i Totalitaryzmem 37, No. 4 (3693).
13. Maher, K., Bateman, N. and Randall, R., (2020). Fire and rescue operational effectiveness: the effect of alternative crewing patterns. *Production Planning & Control*, 31(14), pp. 1195–1206.
14. Martinovich, N.V., Mel'nik, A.A., Kalach, A.V. and Akulov, A.Y., (2020). Functional model of activity of the fire and rescue unit. *Journal of Physics: Conference Series*, Vol. 1479, No. 1, p. 012007.
15. Operational Instruction on the use of UAV in the activities of the organizational units of the State Fire Service, August 2021 Warsaw.
16. Order of the Chief Commander of the State Fire Service No. 15 on the approval of the organizational regulations of the Provincial Headquarters of the State Fire Service in Poznań dated 25 May 2022.
17. Parczewski, R. and Kicia, T., (2021). Use of FlyEye Unmanned Aerial Vehicles for the Purposes of the Military Fire Protection – Research Results. *De Securitate et Defensione. O Bezpieczeństwie i Obronności*, 2 (7), pp. 164–174.
18. Piwowarski, J., Piwowarska, B. and Piwowarski, J.A., (2020). Państwowa Straż Pożarna w Krajowym Systemie Ratowniczo-Gaśniczym. *Kultura Bezpieczeństwa. Nauka–Praktyka–Refleksje*, 37, pp. 47–66.
19. Rabajczyk, A., Zboina, J., Zielecka, M., Fellner, R. (2020). Monitoring of Selected CBRN Threats in the Air in Industrial Areas with the Use of Unmanned Aerial Vehicles. *Atmosphere*, 11, 1373. https://doi.org/10.3390/atmos11121373
20. Viegas, C., Chehreh, B., Andrade, J. and Lourenço, J., (2022). Tethered UAV with combined multi-rotor and water jet propulsion for forest fire fighting. *Journal of Intelligent & Robotic Systems*, 104(2), pp. 1–13.
21. Warmiński, A., (2009). Zadania i organizacja Państwowej Straży Pożarnej w zakresie ochrony przeciwpożarowej. *DOCTRINA Studia Społeczno-Polityczne*, No. 6.
22. Wonjoo, L., Kwang-Min, M., (2021). A Study of the Relationship between Volunteer Fire Brigade Management and the Efficiency of the Fire Administrations of Metropolitan Governments. *Fire Sci. Eng.*, 35(3):82–98. DOI: https://doi.org/10.7731/KIFSE.2a61f202
23. Zadeh, N.R.N., Abdulwakil, A.H., Amar, M.J.R., Durante, B. and Santos, C.V.N.R., (2021). Fire-fighting UAV with shooting mechanism of fire extinguishing ball for smart city. *Indones. J. Electr. Eng. Comput. Sci*, 22, pp. 1320–1326.
24. Zharikova, M. and Sherstjuk, V., (2019). Forest firefighting monitoring system based on uav team and remote sensing. In: *Automated Systems in the Aviation and Aerospace Industries* (pp. 220–241). IGI Global.

OCENA MOŻLIWOŚCI USPRAWNIENIA DZIAŁAŃ RATOWNICZYCH Z WYKORZYSTANIEM BSP. STUDIUM PRZYPADKÓW Z WOJEWÓDZTWA WIELKOPOLSKIEGO.

Abstrakt

Rosnące natężenie zagrożeń pożarowych zwiększa potrzebę włączania do działań statki powietrzne, w tym bezzałogowe statki powietrzne, które stają się obecnie cennym narzędziem w rękach różnych organów i instytucji państwowych, w tym Państwowej Straży Pożarnej (PSP) w Polsce, we wspieraniu działań mających na celu ratowanie życia, zdrowia lub mienia. W artykule przedstawiono charakterystykę i cel PSP oraz zakres realizowanych przez nią zadań, a także kluczowe problemy w tym obszarze. Zaprezentowano również przykłady wykorzystania bezzałogowych statków powietrznych (BSP) w działaniach gaśniczych. Wskazano, że doskonalenie zdolności PSP do realizacji zadań powinno być priorytetem szczególnie w dobie cyklicznych zagrożeń wynikających z działalności człowieka lub sił natury, a ciągły rozwój technologii sprawia, że bezzałogowe statki powietrzne mogą stanowić coraz większe wsparcie. Celem artykułu było przedstawienie skali i poziomu zagrożenia pożarowego oraz wskazanie potencjału bezzałogowych statków powietrznych w jego zwalczaniu. Badania przeprowadzono na przykładzie wybranego regionu. W artykule wykorzystano metodę studium przypadku: przedstawiono trzy przykłady wsparcia działań ratowniczych z wykorzystaniem bezzałogowych statków powietrznych. Opisy przypadków uzupełniono wnioskami i rekomendacjami operacyjnymi. Założono (hipoteza badawcza), że wykorzystanie na szeroką skalę systemów bezzałogowych do działań poszukiwawczo-ratowniczych w PSP wpłynie nie tylko na szybkość i skuteczność reagowania, ale także podniesie poziom bezpieczeństwa zaangażowanych funkcjonariuszy. Autorzy podkreślają również potrzebę utworzenia w strukturach Państwowej Straży Pożarnej nowej komórki, która zajmowałaby się wyłącznie realizacją zadań związanych z przetwarzaniem, zarządzaniem, analizą i umieszczaniem na mapie niezbędnych danych o zagrożeniach. Dzięki temu działania prewencyjne byłyby bardziej skuteczne.

Słowa kluczowe: bezzałogowy statek powietrzny, ochrona przeciwpożarowa, bezzałogowy statek powietrzny, bezpieczeństwo pożarowe, działania ratownicze, Państwowa Straż Pożarna