

COOPERATION OF RESCUE COORDINATION CENTERS IN THE EVENT OF AN AIRCRAFT ACCIDENT

Milić, K.¹

¹Ministry of the Interior, Republic of Croatia

ABSTRACT: *In the case of an aircraft accident, the impeccable coordination of rescue efforts among various entities is paramount to minimize loss of life and mitigate damages. The main point of this coordination is between in land Rescue Coordination Centre and Maritime Rescue Coordination Centre, which plays critical roles in managing emergencies both on land and at sea. Working together helps in developing and implementing standardized procedures, ensuring that all teams operate under the same operating procedures, which is crucial during multi-agency responses. Collaboration fosters joint training exercises, which improves readiness and interoperability of various agencies involved in search and rescue operations. This paper gets deeper into the functions of these coordination centers and the collaboration required between them to ensure effective response and rescue operations.*

KEYWORDS: *search and rescue, collaboration, coordination, RCC, MRCC*

E-mail: kmilic3@mup.hr

1. Introduction

The Republic of Croatia, as a signatory of the International Convention on Civil Aviation (Chicago Convention), is obliged to integrate Annex 12 “Search and Rescue” into national regulation as well as the SOLAS Convention which focuses on the maritime safety but also includes provision of SAR operations. This involves establishing and maintaining a search and rescue (SAR) system that meets international standards and practices. To simplify the implementation of Annex 12 into the national legislation of the signatory states of the International Civil Aviation Organization (ICAO), the International Aeronautical and Maritime Search and Rescue Manual (IAMSAR) was developed. This Manual, published by ICAO and International Maritime Organization (IMO), serves as a guide for organizing and conducting maritime and aeronautical search and rescue operations.

The IAMSAR Manual provides a standardized framework and operational procedures, facilitating the coordination and efficiency of SAR services across different countries. It aims to ensure that search and rescue operations are conducted effectively, enhancing cooperation and interoperability among various national and international SAR entities.

In the Republic of Croatia, aircraft SAR system is organized between two Ministries. Ministry of the Interior, Civil Protection Directorate have the role of the Rescue Coordination Center in land (RCC) and Ministry of Sea, Transport and Infrastructure, with the organizational unit of

National Coordination Center in Rijeka, the role of the Maritime Rescue Coordination Center (MRCC).

RCC serve as coordination hub for managing emergency response activities following an aircraft accident. This center typically involves a various of stakeholders, including national, regional and local level authorities, emergency services, medical teams and aviation authorities. RCC primary functions is to facilitate emergency response coordination in the aircraft search and rescue operations, ensuring that various agencies work together seamlessly to address the search and rescue operation. MRCC is specifically tasked with managing maritime aspects of rescue operations, particularly in cases where the aircraft accident occurs over sea or in close proximity to coastlines. This center plays a crucial role in coordinating search and rescue efforts at sea, deploying vessels, aircraft and specialized teams to locate and assist survivors.

This paper will provide insight into collaboration between RCC and MRCC, which is essential for maximizing the effectiveness of search and rescue operations in aircraft accidents. This collaboration implies information sharing as the key aspect to ensure to both centers to have access to relevant and up - to - date information about the accident. This includes details such as the location of the accident, the number of survivors and any specific resource needs that may arise during the rescue operation.

Continuous communication is essential to maintain effective coordination between centers throughout the duration of the rescue operation. This involves establishing and maintaining communication channels that enable real-time updates, information sharing and coordination of efforts as well as with other relevant stakeholders involved in the rescue operation.

Main hypotheses: RCC and MRCC are focal points for coordination of SAR services and to conduct SAR operations in Republic of Croatia.

Methodology: literature review, data collection, data analysis and sintesis.

2. Regulation of SAR Systems in the Republic of Croatia

Search and rescue system, especially in the area of the security of the air traffic is one of the main requirements, which defines each state as a high rate safe country. In the Republic of Croatia, aircraft search and rescue is carried out in the manner regulated by the Decree on the conditions and manner of conduction search and rescue of aircraft (Official Gazette 129/11) and special legislative which regulates search and rescue at sea, in the area of responsibility for search and rescue of the Republic of Croatia (Search and Rescue Region - SRR RH), in the area of flight information (FIR Zagreb) with established lateral boundaries in accordance with ICAO doc. 7755 (Air Navigation Plan) and the Air Traffic Act (Official Gazette (69/09, 84/11, 54/13, 127/13, 92/14).

The aircraft search and rescue system in the Republic of Croatia (hereinafter: the System) is based on international standards and regulations established by the International Civil Aviation Organization (ICAO), the European Air Safety Agency (Eurocontrol) and the International Maritime Organization (IMO). These organizations define guidelines for the implementation of search and rescue to ensure effective action in the event of an aircraft accident.

The main responsibility for the air traffic security system is on the Ministry of Transport, Sea and Infrastructure, which is obligated to achieve communication with international organizations and represent the area of search and rescue in relation with the international standards. Search and rescue system is divided into two Rescue Coordination Centers – Rescue Coordination Centre in land with the responsibility of Ministry of the Interior, Civil Protection Directorate and Maritime Rescue Coordination Centre – Rijeka for the seaside with the responsibility of Ministry of Transport, Sea and Infrastructure. (Air Traffic Law, 2014.)

Before entering into force of the Air Traffic Law in 2009, responsibility for the implementation of aircraft search and rescue, activities in land were in the Ministry of the Interior. In 2009 these obligations have been transferred to the National Protection and Rescue Directorate and on 2011, Government Decree of the Republic of Croatia on the conditions and methods of aircraft search and rescue has entered into force. Regulation refers to standards and recommended practices contained in Annex 11 “Air traffic services” and Annex 12 “Search and rescue” of the Convention on International Civil Aviation and Doc. 7333 – AN/859 International Aeronautical and Maritime Search and Rescue Manual.

2019 National Protection and Rescue Directorate has integrated into the Ministry of the Interior and Civil Protection Directorate was established as the responsible unit for the providing and developing aircraft search and rescue service in land and internal waters in the Republic of Croatia. Within the Civil Protection Directorate, the Civil Protection Operational Center, in case of aircraft accident, has been established with the key role of the Rescue Coordination Center in Land (RCC) in the search and rescue operation and the responsibility for the coordination and establishment of effective communication of all participants in the aircraft search and rescue system.

Regarding the maritime search and rescue, it is important to highlight year 1998 when National Plan of Search and Rescue of human life at sea has been brought and was established MRCC. Within the National Plan there is an Official Manual in which the procedures for performing search and rescue operations are written. (MMPI, 2024.) With the growth of the tourism, the number of vessels along the entire Adriatic coast increased during the year, which requires efficient and well-organized tracking system and rescue at sea. The role of the MRCC is not only providing search and rescue at sea but also the supervision of maritime

traffic, allocation of places of shelter and coordinating actions in case of sudden sea pollution. Jurisdiction includes internal seawaters, Croatian territorial sea and international waters that are determined by the agreement with neighboring countries. In 2024, Decree on new National plan has been brought. Being at disposal 24/7, MRCC is the focal maritime point for all the sailors and citizens in case of an accident or for providing nautical advice.(Decree,2024.)

MRCC is the primary function of search and rescue operations in maritime environments, coordinating the deployment of resources and personnel to conduct search efforts efficiently and effectively. This may involve collaborating with other maritime agencies, such as coast guards and naval forces, to leverage their capabilities and assets for the rescue operation. They also provide navigational support to vessels and aircraft involved in the rescue operation. This includes monitoring maritime traffic, providing guidance on safe navigation in the vicinity of the accident site and coordinating with relevant authorities to ensure the safety and security of rescue assets operating at sea. (Decree, 2024)

Civil Protection Directorate has the role of the Rescue Coordination Centre in Land (RCC) and Maritime Rescue Coordination Centre (MRCC) have the jurisdiction for providing search and rescue activities at sea. Their primary role is to coordinate all the resources and institutions from the search and rescue area, each from their responsibility point. Joint planning and decision-making enable both centers to develop coordinated response strategies and make critical decisions regarding resource allocation, operational priorities and overall coordination of rescue efforts. This involves holding joint planning sessions, conducting regular briefings and maintaining open lines of communication between the two centers.

3. Organizational structure of RCC and MRCC

In the Republic of Croatia, each Rescue Coordination Center (RCC/MRCC), whether it is in land or maritime, has its structure that is differently constructed within the separate Ministries. Rescue Coordination Center in land is the part of the Ministry of the Interior, Civil Protection Directorate and Maritime Rescue Coordination Center is within Ministry of the Sea, Transport and Infrastructure.

Both Rescue Coordination Centers (RCC/MRCC) independently manage and coordinate search and rescue operations within their respective jurisdictions. Their autonomous efforts are aimed at ensuring the efficient and successful execution of aircraft search and rescue missions. (Decree, 2011)

3.1 Rescue Coordination Centre in land - RCC

Civil Protection Operational Centre as an organizational unit within Ministry of the Interior, Civil Protection Directorate is performing the role of Rescue Coordination Centre in land

(RCC). The basic role of the RCC is to receive and evaluate information in the event of an aircraft accident, make and implement decisions on initiating search and rescue activities.

Within the Rescue Coordination Centers, the Rescue Sub – centers (RSC) manages aircraft accidents on land and inland waters, operating through Regional Civil protection offices and their respective units. The Maritime Rescue Sub – centers (MRSC) oversees aircraft accidents at sea, functioning through maritime sub – centers and their units (land, air or maritime).

The main responsibility of the Rescue Coordination Centre and the Rescue Sub- centers is to receive and evaluate information regarding aircraft accidents, make and execute decisions to initiate search and rescue operations, and direct and coordinate these operations within their areas of responsibility.

RCC activates in the moment when it is triggered by Air Traffic Control, 112 county center or by getting the information from the eye witness. In accordance to international standards, there are three different stages that categorize emergency situation. The first phase is the „Uncertainty Phase“ which is usually declared when radio contact is lost with an aircraft in distress and cannot be re-established or when the aircraft fails to arrive at its destination. During this phase, the Rescue Coordination Centre in land (RCC) is activated, which is in charge in accordance with his territorial jurisdiction. The reports are being collect, evaluated and data relating to aircraft in distress. Depending on the situation, the uncertainty phase can develop into the „Alert Phase“, in which Rescue Coordination Centre in land alerts search and rescue units and initiates further actions. „Danger phase“ is declared when it is almost certain that the aircraft is in distress. At this stage, Rescue Coordination Centre is responsible for taking action in order to determine location of an aircraft in distress as quickly as possible.(IAMSAR, 2022)

3.2 Maritime Rescue Coordination Centre – MRCC

MRCC in Rijeka is the part of the Ministry of the Sea, Transport and Infrastructure is 24/7 service available via the emergency number 195. The maritime search and rescue service in the Republic of Croatia consists of the National Coordination Center in Rijeka, regional sub-centers, coastal observation units and search and rescue units. (MMPI, 2024)

Maritime search and rescue units include maritime, aviation and land-based teams. Before being deployed, the National Coordination Centre in Rijeka or regional sub-center assess the expertise and training of the personnel, as well as the equipment and technical specifications of the units. If a search and rescue unit receives an emergency alert and can provide assistance, it immediately initiates search and rescue operation and promptly informs the National Coordination Center to facilitate coordination.

Upon receiving information about a potential emergency requiring a maritime search and rescue operation, the search and rescue coordinator will declare one of three danger levels: uncertainty, alert or distress. To ensure coordinated action by the maritime search and rescue service members at each danger level, the Official Manual provides a specific checklist for

each level. This checklist is completed by the National Coordination Center in Rijeka or the jurisdictional regional sub-center. (Decree, 2024)

These units operate in accordance to the established search and rescue plan and continuously update the Search Mission Coordinator or On-Site coordinator. They report on various factors such as the areas searched, possible limitations, weather and other conditions, search outcomes, detection and loss of signals from persons in distress, actions taken, the status of the search and rescue units, their remaining operational time and any other pertinent details.

New Regulation from March 2024. specifies the procedures and detailed conditions for conducting maritime search and rescue operations. It includes the operational procedures and official records, the professional training and qualifications required for search and rescue personnel, the organization of search and rescue units and coastal observation units, as well as the rights and responsibilities of volunteers, and the terms for establishing and terminating voluntary search and rescue agreements at sea.

National Coordination Center in Rijeka, during the maritime search and rescue operations actively involves maritime search and rescue units in sea operations, providing prior and subsequent notification to responsible personnel. It also notifies relevant ministries and government bodies, seeking assistance from rescue units and other services under their authority. When the incidents are complex and the air force assistance is needed, the assistance of the Aircraft Coordinator (ACO), will be appointed in cooperation of the Rescue Coordination Centre in land (RCC) and the air operations will be conducted in accordance with the special regulations, which includes reservation of the airspace and establishment of the Temporary Segregated Area (TSA) for the purposes of the search and rescue operations. National Center in Rijeka approves the entry of foreign maritime search and rescue units into designated search and rescue zones as defined by international agreements between Croatia and neighboring countries and coordinates maritime search and rescue efforts with National Coordination Centers of these countries. (Decree, 2024)

Regional sub-centers are set up at the port authorities of Pula, Rijeka, Senj, Zadar, Šibenik, Split, Ploče and Dubrovnik. They are responsible for search and rescue operations within their respective areas, covering the internal waters and territorial sea of the Republic of Croatia. If one of the regional sub-centers is not operational 24/7 for any reason, the National Coordination Centre in Rijeka will take over its responsibilities during the non-operational hours. (MMPI, 2024)

4. Importance of cooperation between RCC and MRCC

Good cooperation has been developed between Ministry of the Interior, Civil Protection Directorate and Ministry of Sea, Transport and Infrastructure in cases of marine pollution. Civil Protection Directorate through their representatives in Headquarters for the implementation of the Intervention plan participates in managing different kind of sea pollutions. Events which occurred due to ships collision, potentially causing significant

marine pollution or endangering the marine ecosystem, fires and explosions that may release hazardous substances into the sea, accidents due to structural problems on ship operation that result in maritime accidents. In accordance to Intervention plan for sudden sea pollution, types of risks and threats from sea, pollution also considers pollution management from sunken vessels and aircraft and responses to aircraft and helicopter crashes into the sea. (Plan, 2008)

Fortunately, there haven't been aircraft accidents that required cooperation and coordination between rescue coordination centers so far. However, it is crucial to ensure the readiness of the system in case if such event occurs.

Based on International Aeronautical and Maritime Search and Rescue Manual (IAMSAR), there are few key aspects of cooperation between RCC and MRCC:

Communication lies at the heart of coordination centers, acting as a vital conduit between different response teams and agencies involved in the rescue operation. With the established and maintained communication channels to enable the exchange of crucial information, coordinate efforts, and disseminate updates to all relevant parties involved in the rescue operation. Most of these channels are used by satellite phones, radio channels.

Logistical support is another key responsibility of coordination center. By overseeing the deployment of personnel, equipment, and resources to the accident site it is ensured that the necessary assistance reaches the affected area promptly and efficiently. This involves managing transportation logistics, coordinating with external organizations for additional support, and addressing any logistical challenges that may arise during the rescue operation.

Information management is also a critical aspect of coordination centers function. Gathering, processing and disseminating accurate information about the accident to various stakeholders, including families of the victims, media outlets and relevant authorities are crucial elements. This ensures that everyone involved has access to timely and reliable information, helping to coordinate efforts effectively and manage crisis communication regarding the incident.

Mobilization of the resources is facilitated through the jurisdiction of each coordination center. By pooling their resources and coordinating their efforts, they can ensure that the necessary personnel, equipment and assets are deployed to the accident site in a timely and efficient manner.

Joint Exercises of the coordination centers should be carried out periodically in order to develop efficient cooperation between their services. Exercises does not have to be complex but should engage facilities, which are likely to operate together.

Communication and coordinated activities of RCC and MRCC On-site Coordinator (OSC). In case of aircraft event which connects both land and sea parts, it is crucial to establish coordinated activities of On-site Coordinators to achieve effective emergency response and ensure that all resources are up-to –date with the information and for making coordinated decisions. Clear delineation of roles and responsibilities ensures efficient use of available assets.

In order to test effective cooperation between Rescue Coordination Centers it is crucial to organize and implement exercises and go through evaluation after each one, which would result with lessons learned, and identification of areas of improvement.

5. Joint Exercises

In order to test the readiness of the aircraft search and rescue system, the best way is to conduct joint search and rescue exercises. To achieve a high level of proficiency, all resources of aeronautical search and rescue system should regularly participate in coordinated search and rescue operations. There are three types of Exercises:

Communication Exercises: These are straightforward drills that ensure all communication channels between search and rescue entities are operational. They confirm the ability to communicate effectively during actual emergencies.

Coordination Exercises: Involve simulated responses to various emergency scenarios where search and rescue services participate without physically deploying. These exercises require substantial planning, especially when multiple units or organizations are involved. Typically lasts for one to three days. Simulation exercises conducted within Rescue Coordination Centers allow personnel to practice responses and refine their skills, techniques, procedures and processes as part of ongoing training.

Full-Scale or Field Exercises: These comprehensive exercises entail the actual deployment of search and rescue resources. They thoroughly test the entire search and rescue system, including realistic challenges such as response times, transit and on-site operations of search and rescue facilities. (IAMSAR, 2022)

It is necessary to organize joint exercises between RCC and MRCC in case of an aircraft accident with the main goal of mutual coordination of the activities and making decisions, not only from the side of Search Mission Coordinators but also from the On-site Coordinators.

Preparation of the exercise is the crucial element and includes planning of how the exercise will be conducted, development of scenarios, evaluation, lessons learned, recommendations

for future improvements. Second crucial element is the evaluation process from the side of the expertise in the areas, which are evaluated during the preparation and implementation of the exercise. Exercises are critical for testing and enhancing operational plans, improving communication and coordination skills, providing valuable learning experiences and ensuring preparedness to respond effectively to actual aircraft search and rescue incidents.

6. Conclusion

The cooperation between the RCC and MRCC is crucial for effective search and rescue (SAR) operations. Their collaboration ensures a coordinated and efficient response to emergencies, using the strengths and resources of both centers. Through impeccable communication and coordination, with defined communicational and operational procedures, the crucial information's in case of an aircraft accident are of most importance to be timely and effectively provided for the activation of search and rescue operations. By working together and if needed, sharing the personnel, equipment and expertise, they enhance the overall capability to respond to emergencies in both maritime and in land contexts. Joint training and exercises helps build mutual understanding and trust when the real-life emergency occurs. The collaboration ensures that international conventions and standards are fulfilled by the signatory state which not only improves operational effectiveness but also enhances international cooperation and support. Cooperation is indispensable in order to achieve swift, efficient and unified response to aircraft accident, ultimately saving lives and reducing the impact of an event.

Main hypothesis has been confirmed.

Literature

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