

<b>Author:</b>	<b>Jerzy Fiuk</b>
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The motivation to take up the research topic regarding the functioning of the search and rescue system was the recognition of the need to assess solutions in the area of maritime safety in terms of the implementation of rescue activities carried out by SAR in Poland (Chapter 1). The literature on the subject shows that the research area concerning the functioning of aerial sea rescue has not been exhausted. Despite numerous reports on the optimization of system elements for the implementation of rescue tasks, presented in Chapter 2, few of them are implemented in the Polish SAR service. Based on the analysis of the research material, it was found that there is a knowledge gap about the strategic location of air bases. Therefore, a strategy is necessary that would allow for a well-thought-out location of base stations and the allocation of rescue resources, planning logistic and rescue activities, planning activities during large-scale disasters, assessing responsiveness, risk analysis, and search planning. Based on the conclusions drawn from the literature review, in Chapter 3, research hypotheses were formulated. In order to verify them, research goals were set, consisting of developing a mathematical model containing important elements influencing the functioning of the system. The model of the air search and rescue system is presented in Chapter 4. Chapter 5 presents the algorithm for assessing the functioning of the search and rescue system based on such evaluation functions as: coverage with the primary rescue potential, coverage with secondary (backup) rescue potential, the Gini index, the average availability time of the rescue service and the maximum availability time of the rescue service. more. The analysis of the obtained values allows for the assessment of various system configurations. It takes into account the impact of meteorological conditions, as well as the allocation of resources and the presence of additional base stations. Chapter 6 presents an assessment of the system based on a case study of the SAR Service in the Polish zone of responsibility. The data from the rescue flight reports carried out in the years 1995-2020 was analyzed and the evaluation model was implemented in the form of a computer simulation. The results of the analysis and calculations allowed for the drawing of research conclusions, which are presented in Chapter 7. The summary of the dissertation indicates the possibility of applying the results in the real search and rescue system and indicates further directions of research in the field of air rescue at sea.