Chapter 7
Assessing the Performance of a SAR Boat Location–Allocation Plan via Simulation

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ABSTRACT

Maritime search and rescue (SAR) operation is a critical process that aims to minimize the loss of life, injury, and material damage by rendering aid to persons in distress or imminent danger at sea. Optimal allocation of SAR vessels is a strategic level process that is to be carried out with a plan to react rapidly. This chapter seeks to evaluate the performance of a SAR boat location plan using simulation. The proposed methodology in this chapter works in two stages: First, an optimal allocation scheme of SAR resources is determined via a multi-objective mathematical model. Next, simulation is used to test the performance of the analytical solution under stochastic demand. With the heaviest traffic and maritime risk, the methodology is applied to a case study in the Aegean Sea.

INTRODUCTION

Each year the Turkish Coast Guard (TurCG) receives hundreds of calls and distress signals from the vessels in danger. As the time difference between life and death can sometimes be measured in minutes, quick response to these signals plays a vital role in reducing fatalities and physical damage (Razi and Karatas, 2016). However, an average SAR operation requires substantial amounts of time, effort and money as well. Hence, emergency response operations should be planned with care and foresight. SAR operations planning can be counted as an emergency system planning. As discussed by Green and Colesar (2004), despite many challenges, operations research and management science applications play an important role in decreasing the negative outcomes of emergencies. This argument is particularly applicable to SAR operations conducted by the TurCG.

TurCG conducts SAR operations in the Turkish Maritime SAR Zone, which is divided into four sub-responsibility areas as follows: the Black Sea, the Sea of Marmara and Adjacent Straits, the Aegean Sea and the Mediterranean Sea. Of all those sub-areas, the Aegean Sea has the heaviest marine traffic due to maritime transportation from and to the Black Sea, shipping, cruise tours, yachting, windsurfing and enormous illegal-border crossing activities.

As a consequence of the heavy maritime traffic, the Aegean Sea has an increased level of risk in maritime safety, which is as much high as the maritime incident rate. Together with (UNHCR Global Appeal, 2015) and (Giuliani, 2015)'s works, Razi and Karatas (2016)'s study show that the number of incidents tend to increase in the Aegean Sea responsibility area each year due to a number of reasons such as:

- Presence of narrow waters and dangerous routes among 3000 islands of various sizes
- Increased vessel traffic passing through the region as an outcome of the turmoil in Syria and Iraq
- Being the main route for immigrants to illegally cross EU borders
- Increased number of vessels carrying hazardous cargo
- Lack of designated shipping lanes

In 2014 alone, TurCG conducted 842 SAR operations, and 716 of them (85% of all operations) were in the Aegean Sea. The data provided by TurCG reveals that during those operations, 12,901 victims were saved, 190 boats were recovered undamaged and 154 lives were lost, while 62% of all operations were related to illegal-border crossing activities.

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