Proceedings of the Annual General Donald R. Keith Memorial Conference
West Point, New York, USA
April 28, 2016
A Regional Conference of the Society for Industrial and Systems Engineering

Design of the Life-Ring Delivery Drone System for Rip Current Rescue

Andrew Hardy, Lahari Venuthurupalli, Mohammed Rajeh, and Gang Xiang

Systems Engineering
George Mason University
Fairfax, Virginia

Corresponding author's Email: gxiang@masonlive.gmu.edu

Author Note: The authors are all students at George Mason Universities Volgenau School of Engineering. This abstract was written as part of their senior capstone project. The authors would like to thank Brett Velicovich and Brian Yi from ExpertDrones, Captain Butch Arbin III from Ocean City Beach Patrol, Leigh Smith from Miami Beach Patrol, and Barry Kirschner from Virginia Beach, Dane Underwood. Professors Dr. Lance Sherry and Dr. George Donohue, as well as Bahram Yousefi for their guidance over the course of this project. Please contact Gang Xiang, the corresponding author, or Andrew Hardy (ahardy9@masonlive.gmu.edu) for any questions or requests.

Abstract: Between 2003 and 2012, U.S. lifeguards averaged 67,700 rescues per year. Rip currents account for 80% of rescues and fatalities. Once spotted, a drowning victim must be rescued before a mean of 102s, standard deviation of 30s. Faster delivery of a life ring has potential to save additional victims. A concept-of-operations for drone delivery of a life-ring was developed. A system dynamics model of rip current rescue was used to evaluate: (1) launch locations, (2) flight paths, (3) drone (size, weight, and battery), and (4) overall effectiveness for rescue. A utility versus cost analysis ranked the following as best: 10.2 kg octocopter with a 20000 mAh battery, launched near lifeguard towers. The system reduces time to reach a victim by a mean of 36%, reduces standard deviation by 63%, and reduces the chance of drowning by a factor of thirteen. Results are most sensitive to distance between lifeguard towers.

Keywords: Unmanned Aerial System, Drone, System Dynamics Model, Rip Current