AN ANALYSIS OF VERTICAL LIFT PLATFORMS IN SUPPORT OF HUMANITARIAN ASSISTANCE AND DISASTER RELIEF OPERATIONS

NPS — PRAESTANTIA PER SCIENTIAM · 1909

Naval Postgraduate School

Abstract

- The purpose of this research was to examine how the capabilities of the various vertical lift platforms, coupled with their unit cost, can be modeled and optimized to inform future decisions when tasking theater assets to assist in humanitarian assistance and disaster relief (HA/DR) operations. A multi-criteria analysis was used to compare alternatives across key performance measures, such as search and rescue (SAR) capability, load capacity, range determination, and crew performance limitations. Additionally, we gave operational commanders a realistic assessment of daily capacity and cost, as well as the limitations thereof, through Monte Carlo risk simulation. Results from our models provided both an optimal vertical lift aircraft mix and scalable results in terms of daily pounds of goods delivered.

HADR Support Operations

Notional disaster scenario

Methods

- Quantify data related to vertical cost and our focused capabilities parameters such as load capacity, search and rescue capability and range limitations (relief radius).

- Performed mathematical modeling to determine an optimal product mix, given a preselected number and type of aircraft.

- Analyzed the risk associated with delivery of relief goods using Monte Carlo simulation.

Results

- The V-22 and the UH-1, based on our models were the preferred aircraft for our HADR simulation. This result seems to further support the argument that amphibious ships are optimally tailored to support HADR in the future.

- While a product mix was determined to both minimize cost and optimize capacity in terms of relief supplied, we found that amount of vertical lift aircraft needed to service an entire disaster was beyond the capability of the Navy and the DoD.

- Models produced scalable results for what the amount of relief that can be expected from a single aircraft.
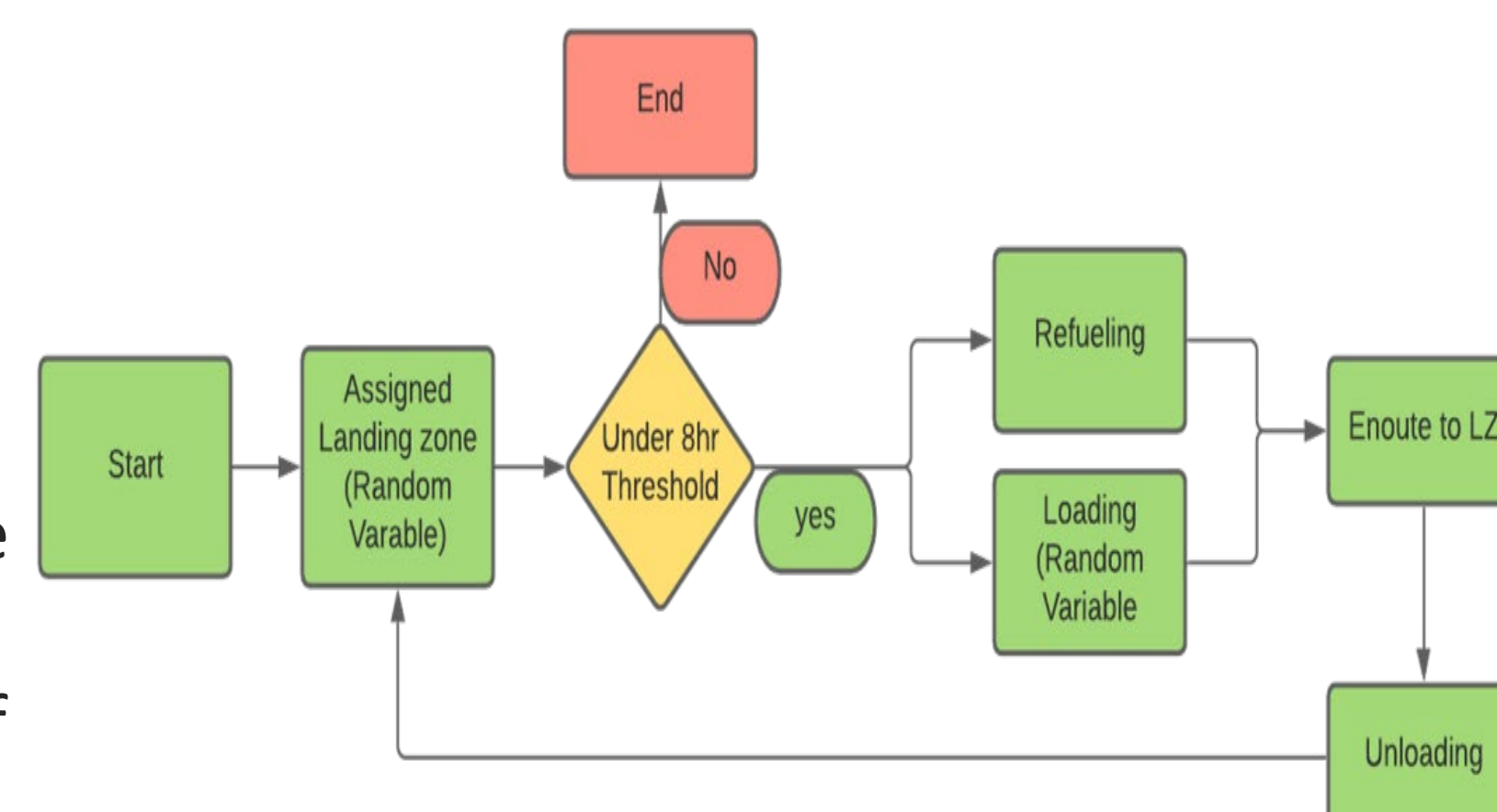
Relief process and decision matrix

Recommendations

- Commanders are not given the choice of what assets are available for employment to a disaster. Instead, disasters are serviced by what is available in the region. A follow-on research project would be to specifically adapt both our optimization and risk models to a real-world scenario modeled from a past disaster to capture a more realistic idea of aircraft mix and daily capacity delivered.

- Quantifying summative relief efforts across multiple agencies to understand total supply. In HADR, the US Navy is one of many different entities providing relief. Many other nation's navies (including in our scenario the Japanese Maritime Self Defense Force) significantly contributed to relief efforts. Resultantly, HADR consists of teamwork between all parties to communicate the location and number of displaced persons, asses the amount of demand for all types of relief cargo and track the completion of aid missions.

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