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**Mission Scenario Generation and
Characterization to Support Acquisition
Decisions for Long Range Precision
Fires-Maritime (LRPF-M)**

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Monterey, California: Naval Postgraduate School

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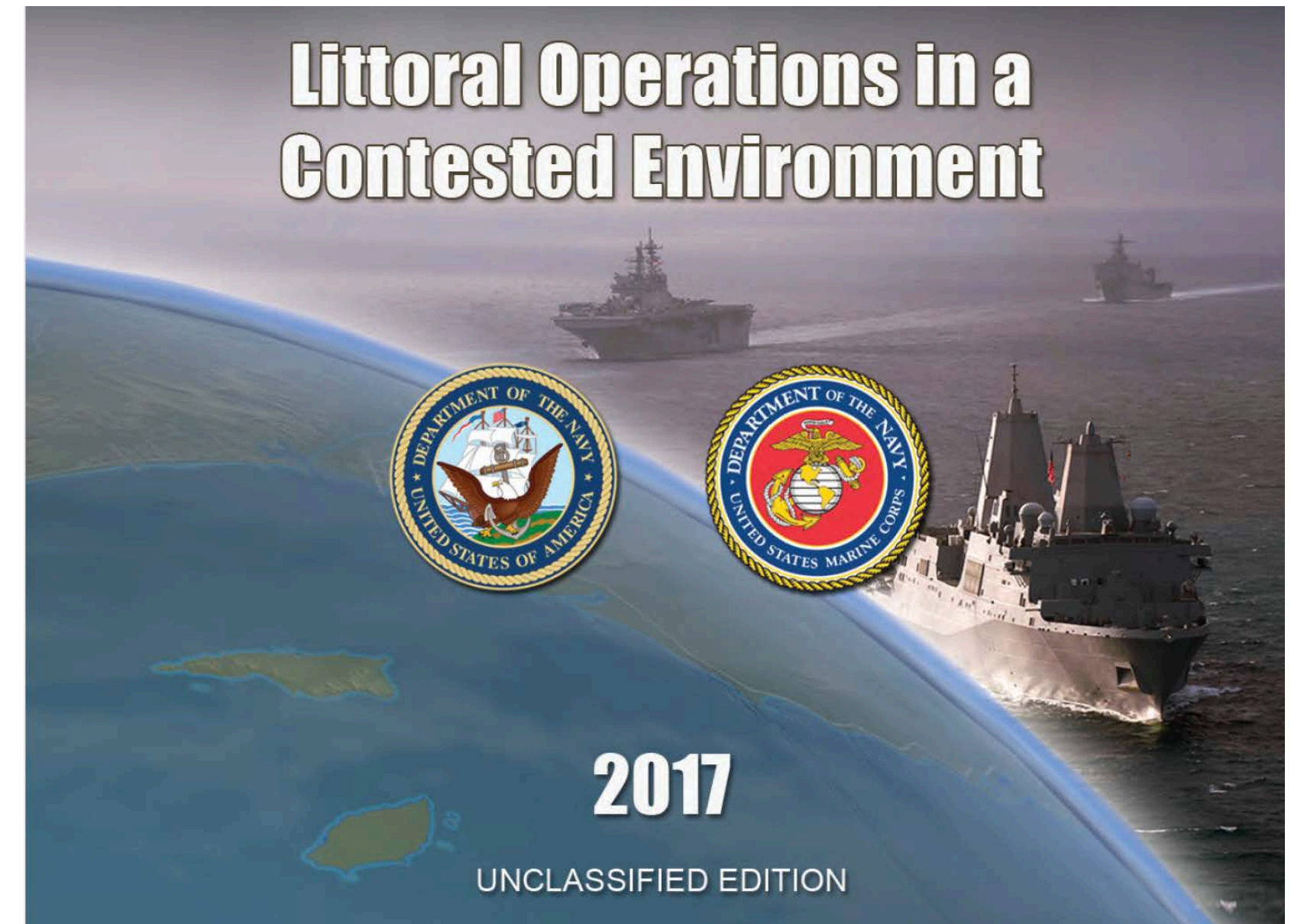
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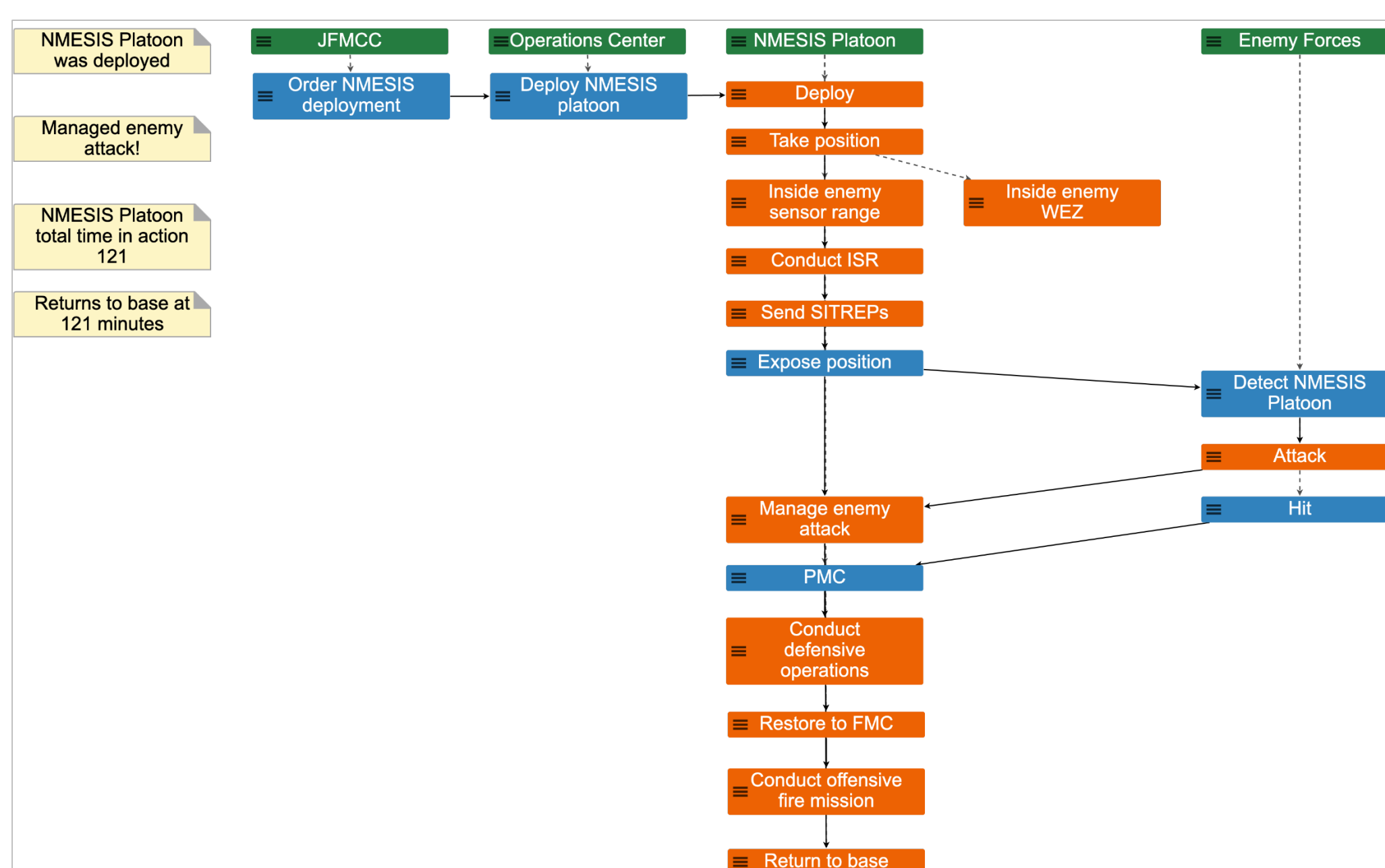
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Research Questions

- What are the alternative possible flows for a baseline mission, given events that can occur in the system's environment?
- Can the mission scenarios be characterized with durations, probabilities and/or costs to support acquisition decisions?



A behavior model formally captured communication and decision flows among operations and control entities of a Navy/Marine Expeditionary Ship Interdiction System (NMESIS) Platoon operating in a littoral environment.



Example Flow (Trace 6)

1 Mission, 105 Alternative Flows

- A Monterey Phoenix (MP) behavior model exhaustively generated all possible combinations of alternative flows, e.g., how platoon:
 - deploys or fails to deploy
 - position remains concealed or exposed
 - is fully mission capable or partially mission capable

From 105 to 22 Alternative Flows, and Characterization

- Logical and simplifying constraints reduced the number of valid scenarios while keeping a formal record of important assumptions
- Implicit assumptions can be made explicit for all to understand
- Constraints can be toggled on or off to admit or reject different combinations of events during validation of the scenarios
- Assigned notional durations and probabilities to key events to estimate whole scenario characteristics
 - MP-Firebird calculations exclude zero-probability scenarios rejected by constraints (Quartuccio 2019)
 - Notional values were used to test the approach instead of experiential or historical data

Report for scope 1

Total 22 traces

Probability for NMEMSIS Platoon to be detected was 0.0802544

Probability for NMEMSIS Platoon to be killed was 0.00535029

A "Global View" computes resulting model statistics.

Conclusions & Further Research

- MP modeling supports requirements discovery and analysis by providing scenario combinations that are unavailable in such numbers in a manual scenario generation process.
- Quantify the value/savings (e.g., in time or dollars) of having exposed the assumptions, constraints and/or requirement needs for a system or program office.

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Dissertation:
Quartuccio, J. (2019.) Identification of behavior patterns in system of systems architectures (Doctoral dissertation).