MASTER OF SCIENCE IN SYSTEMS TECHNOLOGY

DESIGN CONSIDERATIONS FOR FUTURE DECISION SUPPORT SYSTEMS

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The Navy faces a future of increasingly complex warfare as it continues the shift in emphasis from the open-ocean to the littorals. This complexity arises from the larger number and more difficult nature of missions in littoral environments, plus the increasing sophistication of modern weapons. All of these factors combine to increase the pressure decision-makers will face in making engagement decisions.

By combining the techniques developed in the field of Naturalistic Decision-Making (NDM) with a decision-centered approach to the design of future decision support systems various aspects of the decision-making and execution process can be strengthened to enable decision-makers to react more quickly and confidently to the high tempo warfare they will face. A decision-centered approach to system design and training will support decision-makers in an environment characterized by high stress, ambiguity, and time pressure by enhancing situational awareness and strengthening the steps used to make quick and correct decisions.

The overall impact of a decision-centered approach to system design and training will be a vast increase in the speed of decision-making. This will enable a decision-maker to have the ability to react quickly to take advantage of changing circumstances, to consider a larger set of response options, to forestall enemy options, and to control the overall pace and direction of the conflict.

KEYWORDS: Decision Support Systems, Decision-Making, Tactical Decision-Making Under Stress (TADMUS), Naturalistic Decision-Making (NDM), Speed of Command, Speed of Decision-Making

DoD KEY TECHNOLOGY AREA: Command, Control, and Communications

CURRENT AND FUTURE EFFORTS TO VARY THE LEVEL OF DETAIL FOR THE COMMON OPERATIONAL PICTURE

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The Joint Staff developed the Command, Control, Communications, Computers, and Intelligence (C4I) for the Warrior Concept in 1992 which stated that the warrior needs a fused, real-time, true representation of the battlespace. To help accomplish this vision, the Global Command and Control System (GCCS) was created. It provides the common operational picture described above, but only down to the unified commander.

This thesis is a comprehensive report that gives a complete review of the current situational awareness systems available to the commander in addition to current and future efforts to bring a common operational picture to all levels of

command. The detailed discussions in the thesis of these systems will help students and researchers in the Joint C4I curriculum at the Naval Postgraduate School develop a better understanding of the difficulties in getting a true common operational picture to all services at all levels.

KEYWORDS: Global Command and Control System, Common Operational Picture, Situational Awareness, C4I, Command and Control, Battlespace Management

DoD KEY TECHNOLOGY AREA: Command, Control, and Communications

CONVERT SUBMARINE COMMUNICATIONS USING EXTRA HIGH FREQUENCY (EHF) TRANSMISSIONS (U)

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This thesis quantifies the detectability of a transmitting U.S. nuclear submarine that is using EHF communications. This is done using a communications link analysis that is performed by circular equivalent vulnerability radius (CEVR) computer algorithm that displays its results in polar graph format. CEVRs for two different communication suites under alternative scenarios are calculated. Furthermore, by performing such an analysis onboard a submarine in precarious waters, the necessary real-time information for evaluating the risk of using such EHF communication transmissions would be available instantaneously.

KEYWORDS: Submarine, EHF, Communication

DoD KEY TECHNOLOGY AREA: Command, Control, and Communications

RESIDENTIAL LIT FIREPLACE DETECTION AND DENSITY MEASUREMENT USING AIRBORNE MULTI-SPECTRAL SENSORS

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Both locally (San Francisco Bay Area) and nationally, evidence is mounting that particulate matter poses a serious health risk. Locally, concentrations of 10-micron particles are highest on cold nights, during the months of December and January. Analysis of the composition of these 10-micron particles suggests that a large percentage is wood smoke. Currently, there are no adequate ways to estimate the number of lit fireplaces on a given night. NASA Ames Research Center, the Naval Postgraduate School, and San Francisco Bay Area Air Quality Management District performed a joint research project to determine the feasibility of using thermal imagery to detect lit fireplaces.

This thesis addresses the use of an airborne multi-spectral remote sensing system to detect lit fireplaces. The focus is on the remote sensing equipment used for fireplace detection, the development of the test plan, airborne data collection, ground truthing and data analysis.

KEYWORDS: Remote Sensing, Multi-Spectral, Environmental Quality

DoD KEY TECHNOLOGY AREA: Environmental Quality, Sensors