NPS FIELD EXPERIMENTATION PROGRAM PROVIDES UNIQUE OPPORTUNITY FOR STUDENTS AND FACULTY

In FY 2002 NPS initiated a field experimentation program to provide students and faculty the opportunity to utilize and evaluate their latest technologies in an operational environment while at the same time permitting operational forces the opportunity to experiment with these technologies. The program was initiated, and NPS' participation continues to be made possible, through utilization of Congressional support to our Center for Defense Technology and Education for the Military Services (CDTEMS). The initial program (Butner, *NPS Research*, February 2003 Special Edition, p. 27) was directed at utilization of unmanned aerial vehicles (UAVs) to enhance the ability of SEALs conducting downed pilot rescue. The program rapidly grew and increased in op tempo when it was coupled with the Surveillance and Target Acquisition Network (STAN) effort in January 2003 (Manuel, *NPS Research*, June 2003, p. 14). Three major experiments have been conducted with STAN (July, September, and October) and a fourth will be conducted at Camp Roberts, CA from 19-27 February 2004. The focus of these experiments has, to date, been on tactical operations; that is push and pull of data, voice, and video for improved situational awareness and warfighter effectiveness of the operator on the ground or in the water. Compatibility with theater and national capabilities is a consideration, but their utilization has not been a major focus.

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While NPS has a substantial research program with evolving technologies that are ready for field demonstration, we obviously do not have a corner on this market, nor do we have the ability to very rapidly build and deploy many of these technologies. Which technologies are ready for field demonstration depends not only upon the maturity of the S&T but also on the requirements of operational forces. For this reason, STAN currently involves a very interactive team consisting of a requirements sponsor (U.S. Special Operations Command (SOCOM)), defense contractors (Sierra Nevada Corporation, AKSI Solutions, Inter-4, and eTreppid), and students, staff, and faculty at the Naval Postgraduate School. The participation of the defense contractors is made possible through support from SOCOM. This combination of participants and funding sources provides our students and faculty the ability to experience the full range of activities associated with bringing a new technology to the point where it can be utilized by operational forces; from delineation of requirements through field experimentation and data analysis. It involves the interaction of modeling and simulation with experimentation, data collection and analysis, and the generation of quantitative measures of performance of both the technologies and the operators utilizing these technologies. We selected an op tempo of one experiment per quarter in order to facilitate both the needs of SOCOM and the quarterly academic schedule of NPS, thereby permitting the maximum participation of our students through thesis research and class projects. The high op tempo is not without some difficulties. By the time a typical final report is written the results are often obsolete; changes having been rapidly made to correct and improve on the results from the just-completed experiment for the next experiment.

The constitution of the team also provides another unique opportunity; effectively dealing with the somewhat different major objective of each component. SOCOM is primarily interested in delivering new and innovative products to the warfighter in the very near future, the defense contractors are primarily interested in getting their products to the point where they can be demonstrated to meet the specified requirements, and NPS has a primary focus of conducting experiments with new and emerging technologies in which the data support quantitative measures of performance. This is not to say that all three components of the team are not actively interested and involved in the major objectives of the other team members, they are. However, it does mean the regular planning meetings require compromises to be made between all three important major areas if an effective activity (experimentation and demonstration) is to be accomplished in the 7-9 days scheduled each quarter.

Significant progress has been made in a very short time. With the first STAN experiment being conducted in July 2003, there has already been operational use of one of the technologies utilized. Two more have promise for use in early 2004. The original goals for STAN have been significantly expanded. A maritime component has been added to provide

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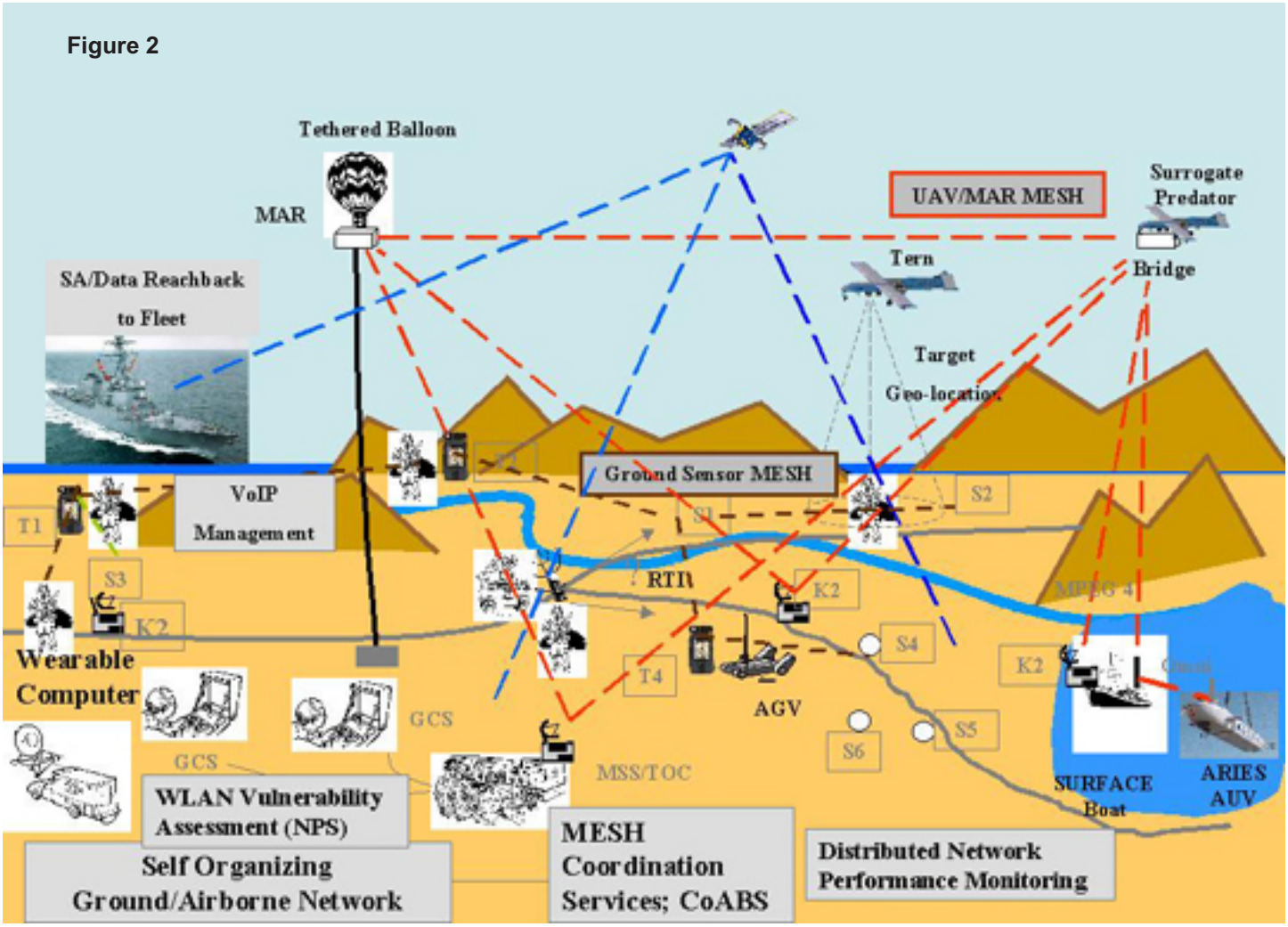
as the backbone for experimentation with emerging new technologies. For this reason it was decided to split the network into two components for this experiment; the "backbone" networks developed by SNC/AKSI and an experimental network being utilized by NPS. Each is involved with both networks and network integration will be attempted as new components become reliable and demonstrate their utility for the operator. The components of the Contractor Team (supported by NPS) network and experimentation for February 2004 are delineated in Figure 1 and have a major focus on network operational reliability and utilizing the networks with a large number of small, hand-held Tacticomps for text messaging, video receive and transmit, VoIP, HUD, and GPS. The components of the NPS (supported by the Contractor Team) network and experimentation for February 2004 are delineated in Figure 2, and have several new areas being investigated: self organizing ground/airborne network, utilization of autonomous underwater vehicles with UAVs, a tethered balloon with a mobile access router, VoIP management, wearable computers, various sensors operating over the network, and reach-back of situational awareness/data reach-back to the Fleet. The sensors being utilized on the network include seismic/acoustic, new EO and IR video camera technologies, cameras on a UGV, laser range finder with coupled camera, and muzzle flash detection.

The NPS field experimentation program continues to evolve with new technologies as we attempt to improve the entire process both for improved results and collaboration with other government and industry programs as well as for the educational experience of our students.

Figure 2



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a common operational picture for underwater, surface and air. In addition, new technologies for mobile networks (self-forming/self-healing, cooperative control/interaction of multiple unmanned vehicles, etc.), sensors controlled over the network, and unmanned ground vehicles have been added. Some of the latest capabilities developed by students and faculty are also being phased into the series of experiments: network vulnerability assessment using the Information Science Department NEMESIS van (*NPS Research*, February 2003 Special Edition, p.2), network performance monitoring, auto-landing of UAVs on ships, coupled electronic warfare and UAV avionics for target ID and direction finding, network security, precision target location, cognitive blending for prediction of "red team intent," detection of concealed weapons, human systems performance, and maritime domain awareness.

At the present time there are eleven thesis students, sixteen faculty, and four staff involved in the program from seven departments, two Research Centers, and two Research and Education Institutes. In addition, the departments of Defense Analysis, Operations Research, Information Science, and Systems Engineering are utilizing the program for class projects, providing benefit to the operational content of the classroom instruction and to the support required for the field experimentation.

Some of the components of the experiments (802.11b network, eTreppid compression, etc.) have been developed and demonstrated to the point that they will not be substantially changed in the February 2004 experiment. While some improvements are always being evaluated, they are being used

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Figure 1