In this issue I commend to your attention NPS’s entry in the USSOCOM’s CDTEMS national research program, led by Distinguished Professor Dave Netzer.

— Leonard Ferrari, Associate Provost and Dean of Research

The USSOCOM-NPS Cooperative Field Experimentation Program
BGEN Steven Hashem, USA, director of the Center for Knowledge and Futures, United States Special Operations Command (USSOCOM) describes the USSOCOM-NPS Cooperative Field Experimentation Program as “leveraging experiments that focus on identifying key gaps and deficiencies resulting from applications of advanced technology, unmanned systems, and net-centric applications.”

Under this cooperative program (unique in its college setting), a range of technologies addressing short- and longterm US SOCOM needs are evaluated each quarter. The program also evaluates dual-use capabilities for homeland security, stabilization, reconstruction, and disaster relief/humanitarian assistance.

The NPS program was initiated in FY02 by Professor Netzer, then dean of research, to provide faculty and students a chance to field test their science, technology, and concepts of utilization with congressional funding support (CDTEMS). The initial effort was conducted by LT Joseph Butner, a Navy SEAL and DA student, who used modeling and simulation and field experiments to assess unmanned aerial vehicles (now known as unmanned aerial systems, or UASs) for their potential in downed-pilot rescue.

Meanwhile, in Afghanistan, professors Gordon McCormick and Hy Rothstein of DA were apprised by CW02 Chris Manuel, USA Special Forces, of an urgent communications need. CW02 Manuel had used ROVER technology to receive direct video from a Predator UAV to ground forces. Because the 34-pound, man-toted equipment could not be used with other intelligence, surveillance, and reconnaissance (ISR) assets, Manuel conceived of a small, light package compatible with all ISR assets likely to be encountered. McCormick and Rothstein invited Manuel to NPS to avail himself of faculty expertise, and the dean suggested the ROVER study be the major initial focus of the new field-experimentation program.

The combined program was called STAN, the Surveillance and Target Acquisition Network. With the enthusiasm of Manuel, this program burgeoned into a cooperative quarterly effort between NPS and USSOCOM, with help from other DoD and government organizations and contractors. The seventh field experiment, STAN 7, was completed in August 2004, yielding the initial versions of several products now in use by operational forces and providing the basis for a new program of record at USSOCOM. For this reason, in FY05 the name TNT, Tactical Network Topology, was adopted.

TNT capitalizes on the unique NPS students, many with recent operational experience, who represent interdisciplinary education focused on the military requirements of the armed services as a whole. The program also leverages the large NPS research program, augmenting those that appear valuable to USSOCOM and are ready for evaluation in a field environment. In FY05, thirty-four thesis students and thirty-one faculty from eight departments, two institutes, and three research centers participated in the program. Classes in information sciences, operations research, and computer science also utilized the field experiments for course projects. Currently seventeen corporations and twenty DoD/government organizations participate in the field experiments, and several DoD technology-development
programs use the collaborative environment to help evaluate their technological progress.

In FY06 the program is supported by congressional funding (NPS CDTEMs, USSOCOM FEPSO) and USSOCOM, and several other NPS research efforts utilize the field experiments as part of their test and evaluation program, adding value to USSOCOM-NPS program objectives. Three of these associated programs are in the Center for Network Innovation and Experimentation (CENETIX), directed by Professor Alex Bordetsky; the OSD/Office of Force Transformation WolfPac-Stiletto program; the OSD/OFT Humanitarian Assistance/Disaster Relief Project; and the New Jersey Health and Emergency Medical Response Network Project. Another program augmenting the field experiments is the OSD/Homeland Defense Maritime Security Program in the Meyer Institute of Systems Engineering, under Frank Shoup.

NPS’s Center for Autonomous Underwater Vehicle Research, headed by Prof. Anthony Healey, has funded programs with the Office of Naval Research and Virginia Tech. The latter explores technologies for the collaborative behavior of heterogeneous mixes of unmanned/autonomous vehicles.

The NPS centers and academic departments lend significant assets to the field experiments. In addition, Navy Reserve Unit ONR S&T 113 is energetically involved, manning tethered balloons, monitoring networks, collecting and analyzing data, and writing after-action reports.

Quarterly field experiments are conducted at the NPS/CIR-PAS flight facility at Camp Roberts, the Ft. Ord MOUT facility, San Francisco and Monterey bays, and Camp Park, FL. A set of experiments lasts about two weeks, its content determined by the USSOCOM-NPS working group, consisting of NPS, USSOCOM J9, USSOCOM SOAL-T, and all USSOCOM component commands. Meetings are held frequently via conference calls, VTC, and onsite rendezvous.

Technologies under investigation include agile, adaptive, tactical networks (ground, airborne, ship, and underwater) with long-haul reach-back; integration with GIG-EF via DREN, GIG-BE, and Abilene; combat-medic networking; collaboration; shared-situational awareness; unmanned/autonomous vehicles; network-controlled UASs; networked sensors; IED detection and jamming; smart antennas; precision tracking and targeting with UASs; network-vulnerability assessment; biometrics; airspace management and deconfliction; and data analysis and mining. These are complemented by modeling and simulation, human-systems integration, and development of concepts for utilization.

The collaboration that takes place among a wide range of disciplines yields novel capabilities. Professors Kevin Jones, Isaac Kaminer, and Vladimir Dobrokhodov in the MAE department are conducting a major UAS effort directed at vision-based tracking and network control of multiple UAVs in cooperative behavior. Together with Prof. Wolfgang Baer of IS, they provide precision targeting with low-cost UASs. When these capabilities were combined with SA-agent technology (by Bordetsky, Eugene Bourakov, and Mike Clement), the ability to control multiple UASs by simple drag-and-click on a laptop SA display was created. Collaborative behavior of multiple network controlled UASs which autonomously conduct “feature following” (roads, rivers, ridge lines) is a current effort. Jones and Prof. Ravi Vaidyanathan also collaborate on micro-UAV efforts.

LtCol(sel) Carl Oros, USMC, examines network vulnerabilities while Prof. Lonnie Wilson (ECE) is conducting field experiments of smart detectors and jammers for IEDs that can be incorporated onto small UASs. Professors Ken Davidson and Peter Guest (MET) provide real-time prediction of radar-
detection range and visual range as effected by measured local meteorological conditions. Prof. Nancy Haegel (physics) will continue her efforts in developing individual identity, friend-or-foe technology by conducting ground and airborne tests during Camp Roberts TNT experiments this year.

A TNT plug-and-play sensor, unmanned-vehicle, decision-maker, networking testbed with global reachback continues under development and maintenance by CENETIX students and staff. This network includes 24/7 operation of a 802.16 backbone between the NPS network operations center (CE-NETIX) and the tactical operations center at Camp Roberts, ~100 miles south of Monterey. Via VPN, it extends to the Lawrence Livermore National Laboratory, then stretches to San Francisco Bay via the USCG, Alameda Island where it supports experimentation in maritime interdiction operations. The network will expand in FY06 to Austria and Sweden, and plans are underway to include Australia and Singapore.

Current efforts are also directed at extending the network testbed to Fort Hunter Liggett/Combat Support Training Facility, USAR. Through collaborative technology, all organizations connected to the backbone can participate live in experimental scenarios. Currently connected and participating are USSOCOM (Tampa, Fort Bragg), OFT, NSWC Coronado, Avon Park, FL, USCG Alameda, DTRA, Biometrics Fusion Center, and the U.S. Forest Service in Missoula, MT.

Human-systems integration is an important component of the field-experimentation program. Technology performance is of course measured, but it is also important to measure the performance of the soldier-operators using these technologies. Thus Special Operations Forces are used in nearly all scenarios. Prof. Nita Miller and Col Lawrence Shattuck, USA (OR) utilize their Applied Warfighter Ergonomics Laboratory, as well as the field experiments, to obtain data.

An team of OR professors (Moshe Kress, Johannes Royset, Roberto Szechtman, and Kyle Lin) is developing models that tactical-operations centers and air-operations commanders can use to deploy assets such as UASs and ground vehicles in search of red forces in mixed terrain. CENETIX network modeling will be linked with the asset-utilization model to include network-degradation effects on asset distribution.

A singular aspect of this program is the model that has evolved: a highly collaborative and cooperative environment that employs the special capabilities and assets of government, academia, and industry to address the short- and long-term needs and requirements of USSOCOM. The testbed permits rapid assessment of new concepts and technologies and, when required, rapid transition to the warfighter.

New technologies and concepts of utilization are examined each quarter, as well as several major scenarios that are more operationally focused and attempt to integrate various technologies, evaluating their combined utilization. As new technologies become more developed and reliable, they are moved into the critical path of the scenario timeline. While the focus and technologies investigated change according to USSOCOM needs, the major areas of tactical networks, unmanned/autonomous vehicles, human-systems integration, and concepts for utilization will remain the focus.

Students and faculty interested in participating are encouraged to contact Prof. Netzer (dnetzer@nps.edu, 831-656-2980) or any faculty participant.

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