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2010-09-01

Research Naval Postgraduate School v. 2, no. 10, September 2010

Monterey, California, Research and Sponsored Programs, Office of the Vice President and Dean of Research, Naval Postgraduate School (U.S.)

RESEARCH AT NPS

FY2010 closed with a record $360M in sponsored funding receipts and over $200M executed. This is almost a one-third increase over the FY09 execution of $152M. Growth is good. It is a healthy indicator of the confidence sponsors have in NPS as a "go-to" place to solve research problems, provide education or service as an executive agent for programs of high relevance to the DoD.

The NPS Annual Report will be produced shortly as well as Annual Reports for the Graduate Schools of Engineering and Applied Sciences and Operational and Information Sciences. These publications provide a broad overview of NPS Sponsored Programs. Statistical information on sponsored projects is available upon request and can be tailored as necessary. Historical data on sponsored project funding received is available on line at http://www.nps.edu/Research/RSPO/Default.aspx.

Carryover accounts have been established and released to Principal Investigators/Program Managers that have completed the on-line accountability training required each year. If you have not already completed the training, you are urged to do as soon as possible. As a reminder there are three modules: 1) Accountability in Sponsored Programs; 2) Fiscal Law Review; and 3) Use of Human Subjects in Research. Modules are on line at https://www.nps.edu/Technology/WebBasedTraining/Auth/modules/Research/index.asp.

NPS CIRPAS TWIN OTTER AVAILABLE AS PART OF NATIONAL SCIENCE FOUNDATION RESEARCH AIRCRAFT DEPLOYMENT POOL

CIRPAS Twin Otter at Marina Airport

The Naval Postgraduate School recently entered into a memorandum of understanding (MOU) with the National Science Foundation (NSF) to allow the Twin Otter operated by NPS' Center for Remotely Piloted Aircraft Studies (CIRPAS) to be available as part of the National Science Foundation Research aircraft deployment pool.
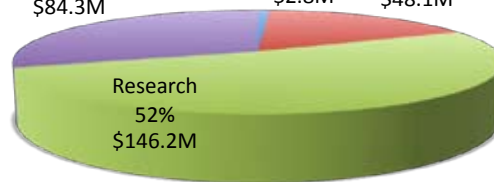
The CIRPAS Twin Otter (TO) has been involved in other agency airborne science campaigns for years. Recently the TO participated in the National Science Foundation-sponsored POST (physics of stratocumulus tops) airborne campaign and provided excellent support. Consequently, NSF and the NPS entered into this MOU whereby the CIRPAS Twin Otter research aircraft can be utilized by the NSF as part of the deployment pool to support National Research Facilities. The CIRPAS TO is a national facility under the Scientific Committee for Oceanographic Aircraft Research (SCOAR), part of University-National Oceanographic Laboratory System (UNOLS). Under this agreement, the CIRPAS TO would be requested to provide airborne science platform support when schedule and cost concerns determine it is the best platform to use. This would be similar to other national facilities that are supported by NSF's Atmospheric and Geospace Sciences Division (AGS), with the significant exception that no base funds are required by CIRPAS.

SPONSORED PROGRAMS STATUS, SEPTEMBER 2010

FUNDS AVAILABLE: $281.3M

By Type of Activity

Service 30% $84.3M
CRDA 1% $2.8M
Education 17% $48.1M
Research 52% $146.2M

By Sponsor

Other 1% $1.3M
Other-Fed 4% $10.6M
Air Force 3% $9.6M
Army 4% $10.1M
CRADA 1% $2.6M
NSF 4% $12.2M
Navy 26% $73.1M
Joint 5% $13.3M
DHS 10% $29.3M
DoD 42% $119.3M

By School

SIGS 13% $36.4M
GSBPP 5% $14.5M
Other 28% $79.2M
GSEAS 23% $65.5M
GSOIS 14% $39.8M
Institutes 17% $45.9M
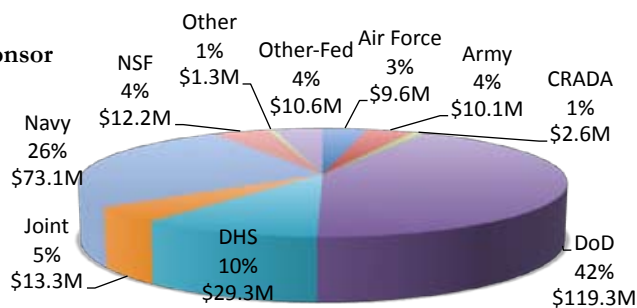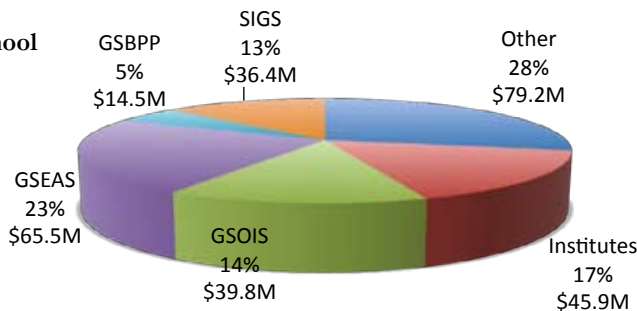
Graduate School of Engineering and Applied Sciences

Funds available to date: $65.5M

By Department

- Systems Engineering 12% $8.1M
- Space Systems 4% $2.3M
- GSEAS Dean 1% $791K
- Electrical/Computer Engineering 12%
- Applied Math 2% $1.1M
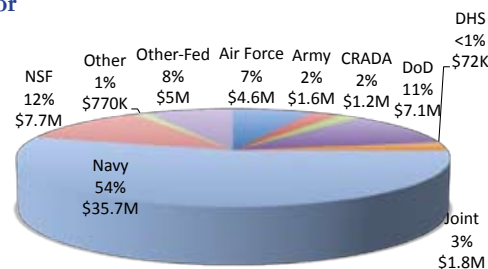- Mech/Aero Engineering 16% $10.6M
- Oceanography 24% $15.5M
- Physics 20% $13.1M
- Meteorology 9% $6M

By Sponsor

- DHS <1% $72K
- NSF 12% $7.7M
- Other 1% $770K
- Other-Fed 8% $5M
- Air Force 7% $4.6M
- Army 2% $1.6M
- CRADA 2% $1.2M
- DoD 11% $7.1M
- Navy 54% $35.7M
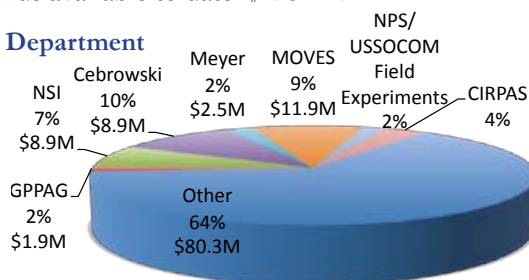- Joint 3% $1.8M
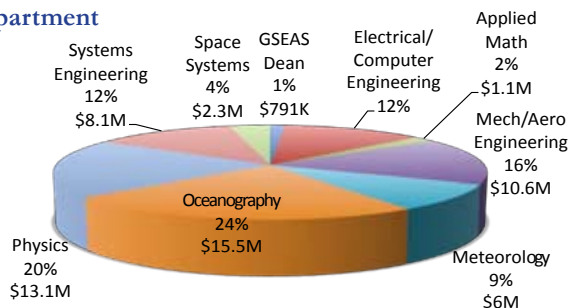
Projects funded in September:

- Support for Engineering Logistics, *Doug Fouts, ECE* (NELO) Multiscale Nonhydrostatic Models for Next-Generation Computers, *Francis Giraldo, MA* (ONR)
- Principal Tangent System Reduction, *Art Krener, MA* (NSF)
- Feasiblity of Using New Propellants, *Chris Brophy, MAE* (DoN)
- Terminal Navigation for Autonomous Reacquisition, *Doug Horner, MAE* (ONR)
- Herding and Active Force Protection Using Autonomous Agents, *Isaac Kaminer, MAE* (ONR)
- Enhancing Spacecraft Agility Flight Demonstration, *I.M. Ross, MAE* (SAF/FMBIB-AFOY)
- Sheer Effects on Convection for Stages of TC Development Observed in TCS08, *Chih-Pei Chang, MR* (ONR)
- State-Space Analysis of Model Error: Probabilistic Parameters with Spatial Analysis of Variance, *Phil Durkee, MAE* (ONR) Western N. Pacific Tropical Cyclone Formation, Structure Change TCS08 Experiment Support, *Patrick Harr, MR* (ONR)
- Tropical Cyclone Formation, Change, Predictability in the Western N. Pacific, TCS08 Experiment, *Mike Montgomery, MR* (ONR)
- Quantifying Sensible Weather Forecast Variability, *Wendall Nuss, MR* (ONR)

- Improving Mesoscale Models on Boundary Layer Simulations Using Ground-Based Observations, *Qing Wang, MR* (ONR)
- South-China Sea Signal Propagation and Ambient Noise Data Analyses, *CS Chiu, OC* (ONR)
- Analysis and Modeling of Ocean Acoustic Fluctuations and Moored Observations of Philippine Sea Sound-Speed Structure, *John Colosi, OC* (ONR)
- Introduction to Geographic Information Systems: A Short Course, *Arlene Guest, OC* (USCG)
- Development of a Real Time Signal-to-Noise Ratio Estimation Systems, *John Joseph, OC* (ONR)
- Observations and Predictions of Sand Grain Size Variability and Morphodynamics on Beaches, *James MacMahan, OC* (NSF)
- Arctic Extreme Temperature and Precipitation: Projection of Climatic Change and Causes, *Wieslaw Maslowski, OC* (NSF)
- Development of Miniature Directional MEMS Ultrasonic Sensor, *Gamani Karunasiri, PH* (NSA)
- Ursus-2 Sensor Selection, *Chris Olsen, PH* (USA Engineer R&D Center)
- Physics of Underwater Missile Launch, *Jose Sinibaldi,* PH (DoN Strategic Systems)
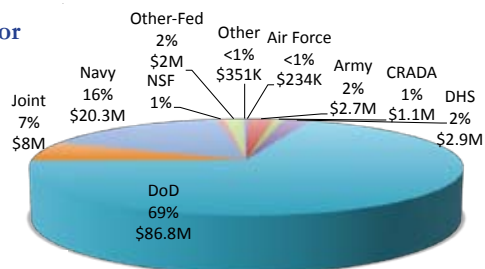- MSSO DL Program, *Mark Rhoades, SP* (DoD)

Research and Education Institutes, Centers, and Other

Funds available to date: $125.1M

By Department

- NSI 7% $8.9M
- Cebrowski 10% $8.9M
- Meyer 2% $2.5M
- MOVES 9% $11.9M
- NPS/USSOCOM Field Experiments 2%
- CIRPAS 4%
- GPPAG 2% $1.9M
- Other 64% $80.3M

By Sponsor

- Joint 7% $8M
- Navy 16% $20.3M
- NSF 1%
- Other-Fed 2% $2M
- Other <1% $351K
- Air Force <1% $234K
- Army 2% $2.7M
- CRADA 1% $1.1M
- DHS 2% $2.9M
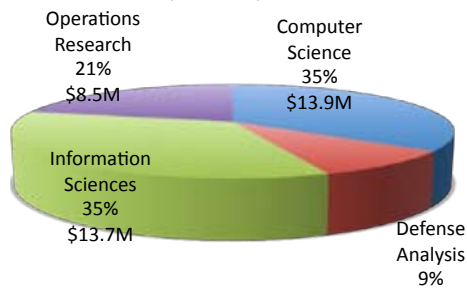- DoD 69% $86.8M

Projects funded in September:

- DoD Joint Strategic Communications Workshop, *Ronald Franklin, CEE* (U.S. European Command)
- USPTC and GPPAG FY10 Preparatory Work for Global Challenges Forum, *Alan Howard, USPTC* (OUSD)
- Earthquake Remote Sensing Technology, *Chris Olsen, NSI* (DHS)
- Hastily Formed Networks for Humanitarian Relief, Stability, Security, Reconstruction, *Brian Steckler, Cebrowski* (OSD)
- Bi-dimensional Empirical Mode Decomposition for Mine and Change Detection, *Peter Chu, Meyer* (NAVOCEANO)

- Chair, Undersea Warfare Program, *Jerry Ellis, Meyer* (NAVSEA)
- Landing Signal Officer Automated Pass and Recovery Tracking System Replacement, *Mike McCauley, MOVES* (ONR)
- Field Experimentation Program for Special Operations, *Raymond Buettner, NPS Field Experimentation Program* (USSOCOM)
- ScanEagle Operations, Camp Roberts, *Robert Bluth, CIRPAS* (NAWC)
- Sentry UAS Assessment and Flight Test, *Robert Bluth, CIRPAS* (Army Rapid Equipping Force)
- Wimax/WiFi Development, *Robert Bluth, CIRPAS* (Alcatel-Lucent)

Graduate School of Operational and Information Sciences
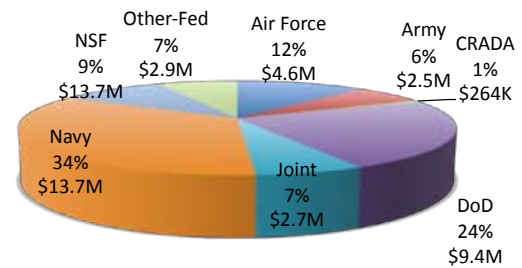
Funds available to date: $39.8M

By Department

Operations Research 21% $8.5M
Computer Science 35% $13.9M
Information Sciences 35% $13.7M
Defense Analysis 9%

By Sponsor

Other-Fed 7% $2.9M
NSF 9% $13.7M
Air Force 12% $4.6M
Army 6% $2.5M
CRADA 1% $264K
Navy 34% $13.7M
Joint 7% $2.7M
DoD 24% $9.4M

Projects funded in September:

- Game-Theoretic Approaches to Deterrence, *Gordon McCormick, DA* (AFOSR)
- Patuxent River Electronic Warfare, *Terry Smith, IS* (NAWC-Weapons)
- Next-Generation Network Science, *David Alderson, OR* (ONR)
- Development of Operational Planning Tools for the Maritime Operations Center, *Gerald Brown, OR* (ONR)
- Optimization-Based Models and Algorithms, *Matthew Carlyle, OR (*ONR)
- FDA Optimization Support, *Lee Ewing, OR* (Army Deputy Chief of Staff)
- Optimizing Threshold-Based Surveillance Systems, *Ron Fricker, OR* (ARO)
- Modeling Essential Services, Security, Economics and Employment Associated With Attitudes About Local Government and Extremist Groups, *Ron Fricker, OR* (Army Center for Analysis)
- Optimization of Sensor Operation for Search, Surveillance, and Rapid Accurate Decision Making in Maritime, Littoral, and Urban Environments, *Moshe Kress, OR* (ONR)
- Optimal Surveillance Patrol, *Kyle Lin, OR* (ONR)
- AERMIP/Corrosion Project, *John Schmidt,* OR (NAWC–Aircraft)
- Human Systems Integration DL Certificate Program, *Larry Shattuck, OR* (Various)
- Irregular Warfare Automated Wargame, *Roberto Szechtman, OR* (Army Center for Analysis)

Graduate School of Business and Public Policy
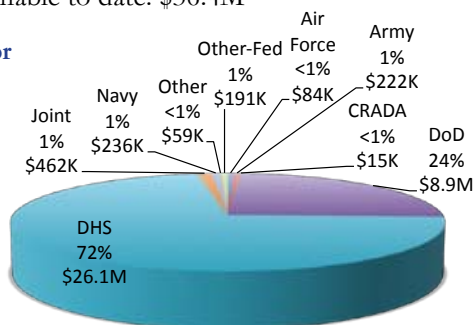
Funds available to date: $14.5M

By Sponsor

Navy 21% $3.1M
Other <1% $71K
Other-Fed 4% $554K
Army 21% $3M
DoD 49% $7M
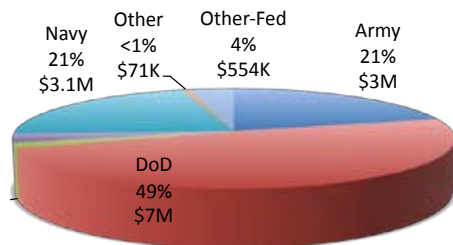
Projects funded in September:

- Advanced Acquisition Program, *John Dillard, GSBPP* (MARCORSYSCOM)
- Performance Measurement in Supply Chains, *Geraldo Ferrer, GSBPP,* (US TRANSCOM)
- Army Cost Management Certification Course, *CAPT Barbara Ford, USN, GSBPP* (OASA (FM&C)
- Applying Social Control Theory to Modeling and Assessments, *Deborah Gibbons, GSBPP* (Army Center for Analysis)
- Analysis of Budgetary, Financial Management, and Related Initiatives in NAVSOC, *Larry Jones, GSBPP* (NAVSPECWARCOM)
- DCAA Strategic Communication Assessment, *Cynthia King, GSBPP* (DCAA)

School of International Graduate Studies

Funds available to date: $36.4M

By Sponsor

Joint 1% $462K
Navy 1% $236K
Other <1% $59K
Other-Fed 1% $191K
Air Force <1% $84K
Army 1% $222K
CRADA <1% $15K
DoD 24% $8.9M
DHS 72% $26.1M

Projects funded in September:

- Long Range Threat Assessment: Student Research Support, *Sandra Leavitt, NS* (USMC Intelligence Agency)
- Global Trends and the Future Warfare 2025, *Daniel Moran, NS* (National Intelligence Council)
- Traumatic Brain Injury (TBI) Evaluation Instruments and Processes for Clinical Follow-Up, *Jomana Amara, DRMI* (VA–Boston Healthcare System)

DEVELOPMENT OF A RECEIVER PROCESSOR FOR UAV VIDEO SIGNAL ACQUSITION AND TRACKING USING DIGITAL ARRAY ANTENNA

Fevzi Aytac Kaya–1st Lieutenant, Turkish Air Force
M.S., Electronic Warfare Systems Engineering–September 2010
M.S., Electrical Engineering–September 2010
Advisor: David C. Jenn, Department of Electrical and Computer Engineering
**Second Reader: Lt. Col. Terry Smith, USAF, Department of Information Sciences**

Air dominance is a key factor concerning today's warfare. Obtaining air dominance requires having a high degree of situational awareness. Unmanned aerial vehicles (UAVs) have gained popularity for surveillance and reconnaissance missions and provide situational awareness to ground-based military units. During operations it is necessary to maintain an uninterrupted data and control link between the UAV and the ground control station (GCS). This requires GCS antennas with signal-tracking capability.

The work on this research was based on an ongoing project that originally started in 2002. The ultimate purpose is to design and build a digital phased-array antenna system that can automatically acquire, track, demodulate and decode video signals from a UAV using commercial-off-the-shelf (COTS) equipment. Previous work done includes integration of hardware components and development of software modules that allow the array system to auto-track signals from a UAV as well as decode the video signals in a standard format. The research in this thesis focused on allowing the system to demodulate the video signals acquired by the digital tracking array. The baseband demodulation technique implemented was previously tested with video signals. A new technique utilizing tangent-type demodulation of signals was also implemented and tested using a bench-top test setup. *LT Kaya received the NPS Outstanding Academic Achievement Award for International Students and the Kiwanis Club Outstanding International Student Award.*

UAV tracking beam formation according to range.
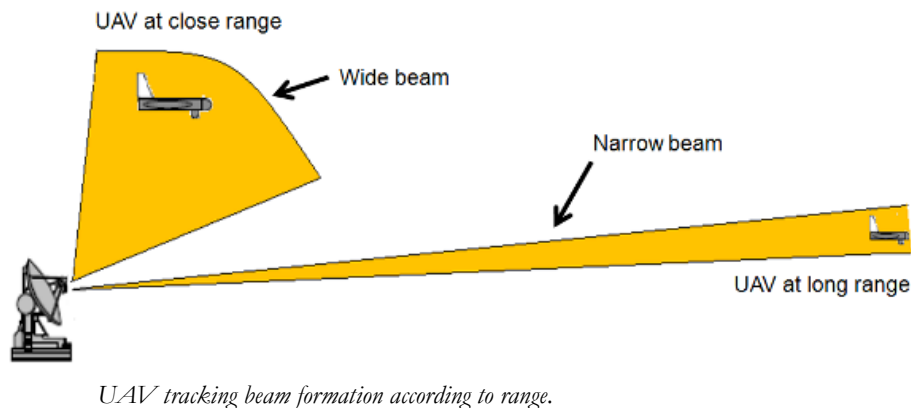
NPS TINYSCOPE PROGRAM MANAGEMENT

Christopher G. Turner–MAJ, USA
M.S., Space Systems Operations–September 2010
Advisor: Marcello Romano, Department of Mechanical and Aerospace Engineering
**Co-adviser: James Newman, Space Systems Academic Group**

This master's thesis introduces the program management and concept of operations of the TINYSCOPE Program. TINYSCOPE is a 6U CubeSat designed as a low-cost and easily replaceable imaging spacecraft that can produce tactically relevant imagery data. Tactical requirements in this context would emphasize "good enough" image resolution with a rapid-response tasking loop and high revisit rate. The TINYSCOPE project intends to demonstrate the utility of small, risk tolerant spacecraft for tactical imagery.

The program management section of the thesis discusses the relationships of cost, performance, risk, and schedule and the impact of each on the program. The program's successes and failures are examined to glean lessons for future program managers of university projects. The remainder of the thesis develops a comprehensive concept of operations for the prototype spacecraft. Areas of discussion include overviews of the ground, space and launch segments of the mission architecture, and proposed conduct of operations for those segments.

Finally, relevant program management and systems engineering documentation are presented as appendices. *MAJ Turner was the recipient of the Association of the U.S. Army, Gen Joseph W. STilwell Chapter, Award for Outstanding Army Student.*
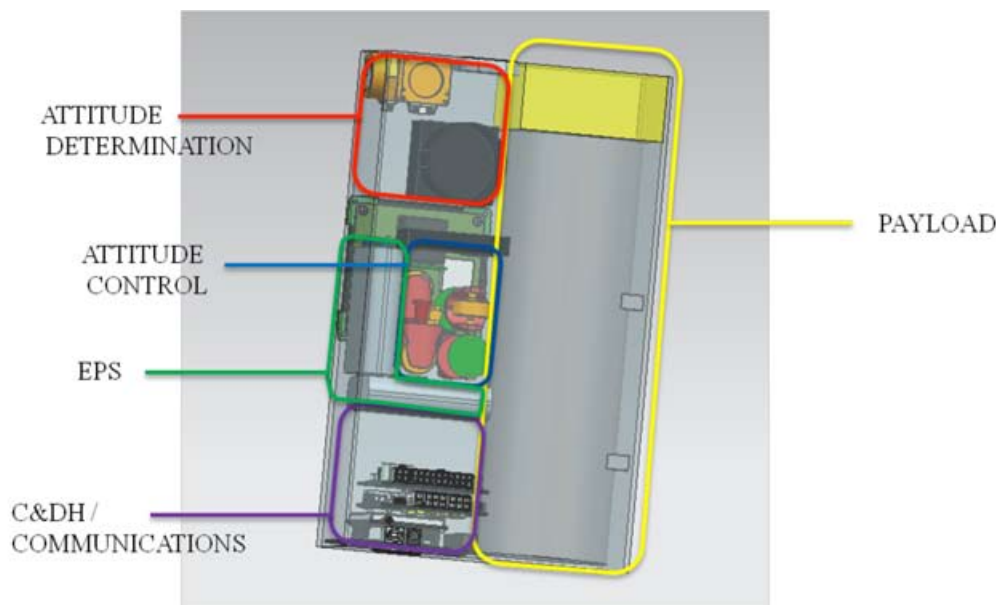
TINYSCOPE Volume Configuration

SUSTAINABLE CONSTRUCTION IN AFGHANISTAN
Lagena Malan–LCDR, USN
M.A., Security Studies–September 2010
Advisor: Robert McNab, Defense Resources Management Institute
Second Reader: Thomas Bruneau, Department of National Security Affairs

This thesis examines whether current reconstruction methods in Afghanistan are economically efficient and effective with respect to the counterinsurgency mission. My argument is that they are not, due to the absence of culturally correct, indigenous construction materials and techniques.

This research explores the impact of construction as a part of a counterinsurgency mission, drawing on local cultural factors and building techniques in constructing new facilities in Afghanistan. If current methods are not sustainable either culturally or economically, then the reconstruction efforts are likely to fail, incentivize corruption, and weaken the legitimacy of the Afghan government.

If, on the other hand, they are sustainable and sensitive to local cultural norms and economic capacity, the likelihood of these projects increasing the quality of life, building positive relationships, and decreasing violence, increases significantly.

If reconstruction fails to increase the ability of the Afghan government to develop the capacity at the local level, the International Security Assistance Force will not have anyone to which it can transfer responsibility for local government services. This would seriously inhibit the ability of nternational Security Assistance Force to transition to Afghan control and, given the current political environment in the United States, potentially lead to the failure of the Afghan campaign. *LCDR Malan won the Hans Jones Award for Excellence in Thesis Research in Special Operations and Irregular Warfare of Security, Stabilizaton, Transition, and Reconstruction.*

Jat cotton tents outside Kabul

APPLICATION OF LEAN SIX SIGMA IN SATELLITE MANUFACTURING
John G. Fernandez II–CDR, USN
M.S., Space Systems Operations–September 2010
Advisor: Al Scott, CAPT, USN, (Ret.), Space Systems Academic Group
Second Reader: Uday Apte, Graduate School of Business and Public Policy

Worldwide application of Lean Six Sigma tools to improve quality, increase production speed and reduce waste led this author to review their prevalence in the satellite manufacturing industry. Initial observations of cost plus contract manufacturers for national programs showed a glaring absence of continuous process improvement initiatives and a lack of Lean Six Sigma use in the workspace.

This paper offers a review of Lean Six Sigma principles to give the reader a basic understanding of the tools available to production leaders, a presentation of Lean Six Sigma currently in use at major satellite manufacturers, and a demonstration of Lean Six Sigma application in a service-oriented process.

This application highlights variance control for requirement verification reports and the use of a new mathematical formula that applies first pass yield variables to provide a more accurate labor prediction for report generation thus the ability to better allocate labor and meet target deadlines.

This author found few major satellite manufacturers capitalizing on Lean Six Sigma benefits to help focus on metrics that provide illumination of forthcoming obstacles in order to mitigate them prior to impact. The majority appears to be mired in the complications of satellite manufacturing driven from cost plus environment

pitfalls (and a craft industry mindset) who fail to capitalize on the full potential of Lean Six Sigma implementation. *CDR Fernandez was the recipient of the Admiral William Adger Moffett Space Systems Award and the NPS Superior Service Award.*

STRIKE PACKAGE-TARGET PAIRING: REAL-TIME OPTIMIZATION FOR AIRBORNE BATTLESPACE COMMAND AND CONTROL
Connor S. McLemore–CDR, USN
Kevin Moeller, LT, USN
M.S., Applied Science–September 2010
Advisor: Matthew Carlyle, Department of Operations Research
Second Reader: Gerald Brown, Department of Operations Research

When an air strike is requested against a target, the desired result is rapid arrival of a strike package of appropriately armed aircraft to destroy the target. However, the current manual system used by airborne battle managers is outdated, resulting in a slower strike package delivery time. This primitive system requires the operator to pair strike packages to targets manually in real time. A system that improves the efficiency of the airborne battle managers in a high-workload environment would result in faster strike package-target pairing and tasking, and might result in better parings.

We develop a model, RASP, that creates strike package-target pairings that best satisfy operational requirements as outlined in various joint publications and clarified by Naval Strike and Air Warfare Center subject matter experts. RASP minimizes data entry while replicating the decision processes that military operators use to decide strike package-target pairings. The starting point for this

thesis is the RAPT-OR model, developed by Zacherl in 2006, a weapon-target pairing tool we adapt for use in a real-time tactical decision aid for airborne battle managers. *CDR McLemore and LT Moeller were awarded the Military Operations Research Society Steven A. Tisdale Graduate Research Award.*

PRODUCT LIFECYCLE MANAGEMENT: A COLLABORATIVE TOOL FOR DEFENSE ACQUISITIONS

Christopher M. Schindler, LT, USN
M.S., Systems Engineering–September 2010
Advisor: Thomas Housel, Department of Information Sciences
Second Reader: William Solitario, Department of Systems Engineering

A 2010 review of 96 defense-acquisition programs showed average delivery rates are 22 months behind schedule and the cumulative cost growth exceeded $296 billion. With budget cuts looming, a small window of opportunity exists to enact reforms improving the health and solvency of the defense acquisition portfolio. First, we must leverage the technology investments made into collaborative software suites such as product lifecycle management (PLM) to align the requirements, design, engineering, logistics, maintenance, and operational data environments into one comprehensive activity. Implementing a product lifecycle management strategy will present cost-saving opportunities through faster information access, improved data reuse, social networking, and virtual collaboration and testing. Product lifecycle management systems have the ability to capture and organize vast amounts of data. Because through human interaction data becomes knowledge, lean product design is a philosophy that can change how we think, learn, use, and build up on that knowledge. By going beyond merely attacking waste by finding a balance between waste reduction and value addition, total ownership costs can be reduced drastically. These reforms have the ability to fundamentally change how we design, build, and maintain the fleet, making the defense portfolio solvent and thus continuing to fulfill the needs of the warfighter. *LT Schindler was awarded the American Society of Naval Engineers Award for Excellence in Naval Engineering.*

IMPLEMENTATION CHALLENGES FOR DOD LOGISTICS ENTERPRISE RESOURCE PLANNING IT SYSTEMS

Mark W. Jones, Marine Corps Civilian
M.S., Systems Engineering Management–September 2010
Advisor: Charles Pickar, DBA, Graduate School of Business and Public Policy
Second Reader: Mark M. Rhoades, Department of Systems Engineering

In the summer of 2008, the Global Combat Support System—Marine Corps (GCSS-MC) breached both cost and schedule in development of their ERP system. In addition, Navy ERP has had problems, GCSS-Army has been delayed, and the Air Force Expeditionary Combat Support System (ECSS) is currently rebaselining their program. Why are all of these DoD ERP system development efforts having difficulty and is there a better way to implement ERP systems in the DoD?This research focuses on DoD ERP implementation efforts ongoing in the Army, Navy, Air Force, and Marine Corps. A macro-level review of six DoD ERP implementations provides a historical perspective reflecting the difficulty all have had in developing their respective ERP systems. A micro-level review of the GCSS-MC program identifies systems engineering challenges the program has faced. The conclusion is that all Service Components have similar requirements and all struggle with development of their respective ERP solution. Much money has been and continues to be spent on ERP implementation and each implementation has taken much more time than was originally planned. It is important for the DoD to take a hard look at how the current ERP solutions have been developed and determine alternate ways to develop similar systems in the future. The DoD cannot afford the billions of dollars that have been spent on multiple system developments and needs to figure out a way to consolidate efforts between the Service Components. These consolidated efforts may provide not only an expedited system development effort but also a common system that can be centrally managed and used to breakdown the unique stove pipe processes within each Service and transform logistics chain management as it is known today. *Mark Jones received the Meyer Award for Outstanding Student in Systems Engineering (Distance Learning).*
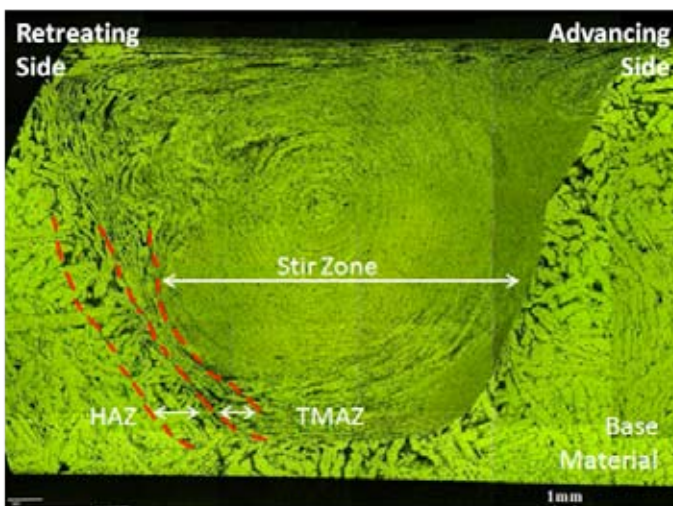
Friction-Stir Processing Zones Drawn on Optical Micrograph of Transverse View of Single-Pass Nickel–Aluminum Bronze.

ANALYSIS OF MICROSTRUCTURE REFINEMENT DURING SINGLE-PASS AND MULTI-PASS FRICTION STIR PROCESSING OF NIAL PROPELLER BRONZE

Carolyn J. England-LT, USN
Mechanical Engineer–September 2010
M.S., Mechanical Engineering-September 2010
Advisor: Terry McNelley, Department of Mechanical and Aerospace Engineering
Second Reader: Sarath Menon, Department of Mechanical and Aerospace Engineering

High strength, corrosion resistance, ductility, and toughness are material properties required for United States Navy (USN) Propellers. Propellers for both surface ships and submarines in the USN are currently made from cast Nickel Aluminum Bronze (NAB) Wrought NAB exhibits strength, corrosion resistance, high dampening capacity, low friction coefficients, and good fracture toughness for a wide range of temperatures [1]. Casting NAB into large structures lowers some of the qualities seen in wrought material and

sought after for the propellers. After casting, some of the structure exhibits high porosity and an undesirable grain structure. Friction Stir Processing (FSP) can be used to refine grain structures and remove pores created during casting. This would reduce or eliminate the need for heat treatment and fusion welding currently being used to prepare Navy propellers. Orientation imaging microscopy was used to aid understanding of friction stir process's effects on grain structure evolution and processes of recrystallization in Nickel Aluminum Bronze. Observations were made about the grain orientation, size, and texture within the stir zone, thermal-mechanically affected zone, and the heat-affected zone for both a single-pass and a multi pass processed pieces of bronze. *LT England was awarded the Naval SEa Systems Command Award in Naval/Mechanical Engineering.*

CLOUD COMPUTING IN SUPPORT OF SYNCHRONIZED DISASTER RESPONSE OPERATIONS

Shawn M. Kelly–Major, USMC
M.S., Information Technology Management-September 2010
M.S., Software Engineering-September 2010
Corey A. Mazyck-Major, USMC
**M.S., Computer Science–September 2010**
Advisor: Man-tak Shing, Department of Computer Science
Second Reader: Karl Pfeiffer, Department of Information Sciences

During disaster response, key resources are supplied from a variety of channels including: government agencies, volunteer organizations, commercial business, educational institutions and others. While many of the entities have efficient internal methods of communication and coordination, global collaboration has historically been hindered by political, social, and technological challenges. Following Hurricane Katrina this resulted in over-resourcing of some in-need areas with little or no resources reaching others. While there is little argument that a global approach to disaster response should be adopted, political and technical challenges surrounding the integration and ownership of such a system have prevented its emergence.

This thesis examines the current challenges to collaboration between responding entities and proposes self-synchronization using a distributed, highly scalable, web application based on cloud computing technologies to facilitate communication between a broad range of public and private entities without requiring them to compromise security or competitive advantage. The proposed design applies the unique benefits of cloud computing architectures such as automatic scaling, geographic distribution, and query performance to the disaster-response domain. *Maj Kelly won the Rear Admiral Grace Murray Hopper Information Technology Management Award.*
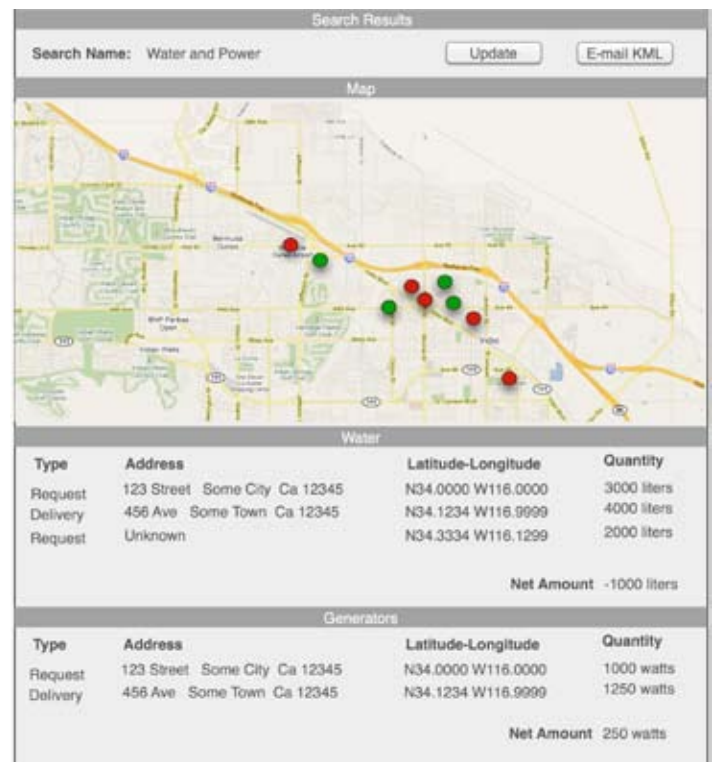
Example of Search Results Pinpointing Water and Power Assets

THE EVALUATION OF HOMER AS A USMC EXPEDITIONARY ENERGY PREDEPLOYMENT TOOL

Brandon H. Newell–Capt., USMC
M.S., Electrical Engineering–September 2010
Advisor: Sherif N. Michael, Department of Electrical and Computer Engineering
Co-Advisor: Daniel A. Nussbaum, Department of Operations Research

In this thesis, the author evaluated whether HOMER Micropower Optimization should be used by the Marine Corps as a predeployment tool for meeting expeditionary energy demands. The author created two unique experiments to facilitate the evaluation of HOMER's modeling capability. First, a grid-tied-photovoltaic (PV) system at the Naval Postgraduate School was monitored for a one-month period. During this experiment, a HOMER model of the system was created. The actual energy production from the system was compared to the model. Then, the model was calibrated to the particular system to ensure that the model's energy estimate matched that of the actual system. The second experiment involved the use of two different types of PV panels and a small wind turbine. Each system was monitored over a one-month period, and the results were compared to a HOMER model of the systems. The difficulty of modeling wind turbines and the related limitations of HOMER's modeling strategy is discussed in this thesis. The calibration method established in the grid-tied-PV experiment was used to ensure the HOMER models were accurate. Following the calibration, the concept of expeditionary energy density as it pertains to power production was defined and utilized to evaluate each of the systems. The final portion of this thesis shows the advantage of using HOMER as part of the Experimental Forward Operating Base (ExFOB). The ExFOB was conducted by the Marine Corps to evaluate alternative power solutions currently on the market for expeditionary energy purposes. Four distinct power production solutions were chosen by the Marine Corps following the ExFOB. These solutions were then field tested in Morocco and scheduled to be deployed to Afghanistan. This thesis details how the use of HOMER would have benefited the ExFOB process had it been utilized. *Capt. Newell won the Cebrowski Institute Award for Innovation.*

TECHNICAL SERVICE AGREEMENTS (TSAS)

Headwall HIS Payload Test
Partner: Regents of the University of California, UC Santa Cruz
NPS POC: Robert Bluth, CIRPAS
Summary: NPS/CIRPAS and/or through its prime contractor (TBD), will provide pre-flight coordination, flight coordination, range management, flight safety and facility management of UCSC Headwall HIS payload testing. CIRPAS will provide Pelican Aircraft, facility and personnel support.

MEMORANDA OF UNDERSTANDING/ AGREEMENT (MOUs/MOAs)

Partner: The Armed Forces Communications and Electronics Association (AFCEA) International
NPS POC: William Rodriguez, Meyer Institute
Summary: The purpose of this MOU is to outline the roles and responsibilities of NPS and AFCEA related to their co-sponsorship of the 2011 Complex Operations, Cultural and Organizational Awareness (COCOA) Conference.

Partner: Office of the Assistant Secretary of the Navy (Research, Development and Acquisition) Chief Systems Engineer and Director, Strategic Systems Programs
NPS POC: James Kays, Department of Systems Engineering
Summary: This agreement is to continue a relationship for the sponsorship of the Naval Chair of Systems Engineering.

PATENT APPLICATIONS

Hybrid Soft-Decision/Hard-Decision Reed–Solomon Decoding, Navy Case No. 20090006.
Inventor: Capt. James Caldwell, USAF, Department of Electrical and Computer Engineering

Method for Determining Hard Drive Contents Through Statistical Drive Sampling, Navy Case No. 2009008.

Inventors: Alexander Nelson and Simson Garfinkel (both Department of Computer Science)

Micro-coupling Active Release Mechanism, Navy Case No. 2009003.
Inventors: CDR William Crane, USN, Department of Mechanical and Aerospace Engineering; Paul Oppenheimer, Naval Research Laboratory; Marcello Romano, Department of Mechanical and Aerospace Engineering; James H. Newman, Space Systems Academic Group

Distinguished Professor Emeritus Terry McNelley

SYMPOSIUM HONORS NPS PROFESSOR

A symposium entitled "Advances in Recrystallization and Processing of Fine-Grained Materials" was organized and held in honor of Distinguished Professor Emeritus Terry R. McNelley of the Department of Mechanical and Aerospace Engineering on September 14, 2010 at Aranzazu (Onate-Guipuzcoa), Spain. The symposium was part of the XII National Congress on the Mechanical Properties of Solids 2010 (PMS2010), organized by INASMET – Tecnalia. This honor reflects his contributions to the research and engineering programs at the Centro Nacional de Investigaciones Metalurgicas (CENIM) in Madrid on sabbatical and other visits as well as joint supervision of graduate students at CENIM, two of whom visited NPS to conduct research. Professor McNelley's work in friction-stirred processing (FSP) is internationally recognized and of importance in a number of Navy and DoD applications.

TECHNICAL REPORTS PUBLISHED

NPS-CS-10-003	Residual Data Found Guardian Edge-Protected Removable Storage Media	S. Garfinkel
NPS-CS-10-004	Counter Intelligence Risks Posed by Information Stored in DoD 411 – The DISA Global Directory Service (DoD 411)	S. Garfinkel
NPS-OR-10-006	Human Systems Integration Domain Trade-Offs in Optimized Manning: The Task Effectiveness Scheduling Tool	A. Tvaryanas, N. Miller
NPS-OR-10-007	The Effect of Decoys in IED Warfare	K. Lin, A. Washburn
NPS-OC-10-003	High Frequency Automatic Recording Package Data Summary Report PS05, August 4, 2008 – January 6, 2009	T. Margolina
NPS-MV-10-002	Should S1000D be Required by the Department of Defense?	C. Blais, J. Falby, M. McCauley
NPS-IS-10-004	Joint Battlespace Awareness ISR Integration Capability (JBAIIC) Participation in the Joint Expeditionary Force Experiment 2010-3 (JEFX 10-3)	N. Irvine, W. Roeting, D. Crissman, *et al*
NPS-SE-10-004	A Systems Engineering Analysis of Energy Economy Options for the DDG-51 Class of U.S. Naval Ships	MSSE Cohort 311-912.

Technical reports may be obtained at http://www.nps.edu/Research/TechReports.html