UPDATE NPS
Naval Postgraduate School Monterey, California

January 2009

Mini-Satellite Launcher Catapults NPS into Space Race

By Barbara Honegger

Like the Sputnik launch that triggered the Cold War space race, Russian miniature spacecraft launches have catalyzed the Naval Postgraduate School to design and build a revolutionary new mini-satellite launcher to quickly bring the U.S. into the competition.

Space Systems Academic Group (SSAG) Profs. Jim Newman and Rudy Panholzer and Research Associate Dan Sakoda came up with the idea for the NPS CubeSat Launcher (NPSCuL) that attaches to an Atlas or Delta rocket via a secondary payload adapter and deploys a large number of miniature satellites into a tumbling, low-earth orbit. Command signals trigger a sequence of spring releases in the "Jack-in-the-Box" device that catapult the tiny cube-shaped spacecraft carried inside the launcher into orbit. Once freed, the small CubeSats conduct a wide range of missions, from earth observations to testing cutting-edge technologies for spaceflight such as new solar cells, to studying the effects of microgravity on biological samples.

CubeSat Launcher design team, from right: current student program manager Lt. Christina Hicks, with a CubeSat frame; Lt. j.g. Anthony Harris, with a CubeSat Poly Pico-Satellite Orbital Deployer; the project's first student program manager Lt. Matthew Crook, with a scale model of the launcher; and Lt. Cmdr. Adam Dejesus, with the payload adapter ring that attaches to a rocket.

Through the integrated thesis research of a team of NPS master's students, the CubeSat Launcher vision is being rapidly brought to life under SSAG's Small Satellite Design Program.

"Our goal is to create a new 'coach class to orbit' so we can regularly, quickly and affordably launch the increased number of very small spacecraft on orbit needed to keep the U.S. government, military and academic space community on the cutting edge," said the project's new student program manager Lt. Christina Hicks. "Current U.S. launch opportunities for individual CubeSats are limited and expensive, and most are launched by other countries – predominantly on Russian rockets – with the sole U.S. exception being NASA's GENESAT, so there's a real need for quick and affordable domestic access to space for experimentation and education. When NPSCuL goes up in late 2010 or 2011, it will be both the world's first high-capacity CubeSat launch and the first U.S. non-NASA CubeSat launch," she noted.

"The wave of the future is spacecraft miniaturization, just as miniaturization was a major turning point for computers," said Newman, the project's lead principal investigator. "This project is a unique hands-on opportunity for Space Systems officer students to build a real piece of space hardware that's a major enabling technology for access to orbit and that will actually be launched, all within a two-year curriculum. Though each is doing an individual thesis, they also work as a team and coordinate at the group level."

Three NPS students in addition to Hicks – Lt. Matt Crook, Lt. Cmdr. Adam "Tito" Dejesus and Lt. j.g. Anthony "Tony" Harris – are currently working on NPSCuL-Lite, a variation of the original launcher design with eight instead of ten CubeSat containers.

For his thesis, Crook, the project's first student program manager, built a half-scale model and wrote the process by which non-government CubeSats can be added to launch manifests on a space-available basis.

"By capitalizing on excess capacity on space-available flights aboard U.S. launch vehicles, NPSCuL-Lite will catalyze CubeSat development by government, industry and educational institutions who want to avoid the challenges and potential issues associated with foreign launch providers," Crook said.

Dejesus is building a full-scale NPSCuL model and doing the integration, assembly and laboratory testing with vibrations more severe than those that would be encountered in space. "The greatest challenge is understanding the launch environment because the stresses at launch are literally not of this earth," he said.

Harris is adapting an existing microcontroller for the command-signal-initiated launch sequencer. "Coming from a B.A. in economics, everything about this project has been a challenge, but we've more than met it as a team," he said.

"A significant NPS role is outreach to other players in the CubeSat development community - which already consists of over 100 universities, half of them in the U.S., industry, DoD and other government agencies - to foster DoD-relevant science and technology, as well as coordinate with launch providers," said Newman. "The Naval Postgraduate School functions in a dual-hatted academic and military environment, which puts us in a unique position to contribute to this kind of technological innovation."

"If interest in CubeSat development continues, NPSCuL-Lite may well establish itself as a standard payload aboard compatible launch vehicles, paving the way for relatively inexpensive demonstration of DoD-relevant technologies and educational opportunities for future space professionals," Hicks concluded.

Students interested in carrying the work of the CubeSat team further for their thesis research are encouraged to contact Newman at jhnewman@nps.edu, (831) 656-2487.

CSRS' Efforts to Prevent Conflict in Arctic Region

By MC2 Kellie Arakawa

To unite stakeholders who hold varied interests in the Arctic region, the Naval Postgraduate School Center for Stabilization and Reconstruction Studies (CSRS) co-hosted a two-day conference that addressed the economic, cultural, scientific, security and political implications of the region's dramatic change in climate.

"On Thin Ice" gave 170 participants - who represented industry, environmental, indigenous, government civilian and military groups - an opportunity to work toward preventing conflicts that may arise as global warming transforms the Arctic landscape.

"When those of us in the conflict management field look at this region, we see it is rife for political, human confrontation," said Matthew Vaccaro, the CSRS Program Director. "We don't expect violent conflict, but it certainly seems to us there is a high risk for much disagreement and political confrontation between stakeholders."

CSRS, a conflict prevention and conflict recovery program that provides educational opportunities for practitioners of peace and stability operations, drew guidance for the event from the U.S. military's new maritime strategy. The strategy emphasizes the need to prevent future wars through relationship building and cooperative approaches.

Dr. Tatsushi Arai, Assistant Professor of Conflict Transformation for the School for International Training in Brattleboro, Vt., opened the conference by urging participants to establish a responsibilities-based approach to solving potential conflicts. "None of us in this room can solve our own sector's problems without reaching out to other sectors … that is the challenge," he said. "When things are interconnected, it gives us an opportunity to activate peace and deactivate destructive potential."

Throughout the event, researchers and representatives from each stakeholder group shared their knowledge of the Arctic's current environment and led focused discussions on the region's future.

Dr. Wieslaw Maslowski, a research professor for the NPS Oceanography Department, outlined the Arctic's current and future physical state, offering research that shows the ice is melting at a much faster rate than most models indicate. Maslowski called many of the current prediction models "too conservative of the current realities," and warned that if the warming trend continues, the Arctic may experience an ice-free summer as soon as 2013. The implications of an ice-free Arctic include the establishment of new shipping routes, international interests in natural resource development, and defense issues posed by limited capabilities for search and rescue missions.

Chief Joe Linklater, Chair of the Gwich'in Council, discussed cultural perspectives of the Gwich'in community, an indigenous nation in the Arctic region. Because global warming has affected the region's natural resources, traditional Gwich'in knowledge is becoming less reliable and transforming the mindsets of younger generations, Linklater said. He emphasized the need to include the indigenous perspective in decision-making processes, and said that all groups, whether they're environmental, political or a part of industry, need to consider how their decisions will affect the lives of the indigenous communities.

NPS President Dan Oliver also addressed the participants and said it was fitting for an institution like NPS to co-host an event aimed at preventing conflict. "U.S. national security policy clearly recognizes the effects of globalization, and NPS is an international institution that understands the importance of preventing wars in addition to winning them," Oliver said.

The conference was notable for its involvement of so many different representatives of the NPS community. In addition to numerous graduate students and faculty participants from across campus, nine NPS faculty and staff served as speakers, and many NPS staff members supported the large event.

For Vaccaro, the conference reaffirmed the need to unite various communities, in spite of their competing interests, to work collectively toward a solution. "The changes that are happening in the Arctic region and the potential for confrontation is so complex that you really have to involve a large group of stakeholders to come up with innovative solutions," he said. "We know that we've built new relations and new understandings, but what the participants do with that, is up to them."

IN BRIEF

- On Dec. 1, 2008, Dr. David S. Chu, Under Secretary of Defense (Personnel and Readiness) issued a memorandum instituting a three-year Joint Foreign Area Officer (FAO) Skill Sustainment Pilot Program to be conducted at NPS. The goal of the program is to find innovative ways to provide language and regional sustainment training and education that enables seasoned FAOs to meet joint mission requirements. NPS was selected as the "ideal institution to conduct this pilot program, due to its unique combination of extensive regional studies expertise and access to, and partnership with, advanced language resources in Monterey."

- Chairman of the NPS Computer Science Department, Chair and Director of the Cebrowski Institute, Dr. Peter Denning, with the support of an NSF grant, is organizing "Rebooting Computing: The Magic and Beauty of Computer Science," an Appreciative Inquiry Summit on Jan. 12 – 14, 2009 which will be held at the Computer History Museum in Mountain View, Calif. Over 200 visionary leaders from all sectors touched by computing, including science, engineering, business, education, journalism, policy-making and government, will address the decline in computer science and other science and technology disciplines that are critical to our nation's well-being and strength. For more information visit www.rebootingcomputing.org.

- Based on the Coast Guard's Autonomous Information System network, a team from GSEAS is heading an interdisciplinary project to utilize real-time vessel tracking data along the West Coast of the U.S. This effort includes oceanography, electrical engineering, meteorology, homeland security and other disciplines.

WASC Update

- The Capacity and Preparatory Review Report was submitted in time for the Dec. 17 deadline. The WASC visit team has been selected. The team will be chaired by Dr. Mary Lyons, President of the University of San Diego and includes faculty and administrators from Stanford, UCSC, San Francisco State University and the University of Maryland. The team visit is slated for March 11 - 13, 2009. At the same time, an Educational Effectiveness Task Force has been formed to begin addressing the second part of the self study which is due in 2009. Dr. Doug Moses, Vice Provost for Academic Affairs, will chair the Task Force.

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Message From

GSEAS Dean Sivaguru Sritharan

The defense establishments in the U.S. and elsewhere are confronted with costly failures of defense acquisitions. Escalating technological complexities involved in the design and assembly of advanced weapons along with the political, economic and management components of defense acquisition processes have made the challenge of dealing with cost overruns a critical component of engineering education and practice. Scientific discoveries and engineering innovations help advance the frontiers of technology while deepening the sophistication and specialization of research and education. Engineering failures such as the Titanic, Tacoma Bridge, Hindenburg, Comet aircraft accidents, Space Shuttle Challenger, Chernobyl and satellite-in-orbit and launch failures, etc., on the other hand, have historically provided the main impetus for the evolution of a highly interdisciplinary technological underpinning of engineering and applied sciences called systems engineering. Although not as transparent as these well-known engineering counterparts, failures in defense weapons acquisition necessitated the broadening of the scope of this new area of engineering to incorporate financial and risk management aspects, thus expanding beyond traditional boundaries of engineering and sciences.

The National Academy of Engineering (NAE) summarizes its vision for Engineer of 2020 as having the following attributes:

- Strong analytical skills
- Practical ingenuity
- Creativity
- Communication
- Business and management skills
- Leadership skills
- High ethical standards and professionalism
- Dynamism
- Agility
- Resilience and flexibility
- Global awareness
- And, lifelong learners.

How can the Graduate School of Engineering and Applied Sciences (GSEAS) create such prolific engineers and scientists so that they can lead tomorrow's military in strategic decision making and be an integral part of the DoD workforce for the effective building and acquisition of advanced defense systems? This is the kind of mindset that drives the research and educational programs of GSEAS, in particular, our aspirations for the future of systems engineering at NPS. Most systems engineers of today began their career with traditional training in engineering or physics and attained professional maturity in their fields through problem-solving experiences in the industry and defense sectors. This is a lengthy process in one's professional career growth. Our challenge however, is to create a revolutionary M.S. and Ph.D. program in system engineering to produce those *renaissance engineers with the attributes of NAE 2020*, who will have adequate depth in traditional engineering disciplines, along with very strong training in acquisition and management.

The renewed emphasis on Ph.D. degrees for all programs offered by GSEAS will enrich the classes and laboratory

projects with advanced students and stimulate faculty research productivity. We are committed to maintaining accreditation by ABET and WASC to ensure institutional effectiveness as measured by student learning, program quality and faculty scholarship. Our distinguished lecture series features Nobel Laureates to provide the students and faculty an intellectual climate of the highest caliber. GSEAS will seek ways to share the quality of education and research enjoyed by the resident students with the distance learning students and embedded educational facilities across the defense establishment. This requires a flexible view point that is non-traditional and a level of institutional commitment that has no counterpart in the civilian university system. I wish to invite the GSEAS faculty in building such a unique school to produce the renaissance engineers and scientists who are critically needed for national security and defense.

Announcements

After a national search led by Prof. Phil Durkee, on Jan. 5, 2009, Dr. Karl Van Bibber will become the NPS Vice President and Dean of Research. The search committee had a number of strong candidates to consider, a testament to the Naval Postgraduate School's growing national reputation as a research university.

Van Bibber is currently Chief Scientist of the Physical Sciences Directorate and Lawrence Livermore National Laboratory (LLNL) with experience in strategic planning.

He earned his baccalaureate degree in Physics, his master's degree in Mathematics, and his Ph.D. in Physics - all from MIT. Van Bibber has published extensively in the axions, dark-matter and cosmology area as well as accelerator science and technology and high energy and nuclear physics. He has an impressive academic and research background, as well as a nationally recognized record of executive management of scientific programs and resources.

As Vice President and Dean of Research, Van Bibber will have responsibility for sponsored research and administration, oversight of the four research institutes, and facilitation of the growth in the NPS research program.

The NPS community extends its sincere thanks to Dr. Dan Boger for his superb service as interim Dean of Research. Boger selflessly stepped in to fill the position vacated by Provost Leonard Ferrari in September 2006, while simultaneously serving as the Chair of the Information Sciences (IS) department. He has provided outstanding oversight and overall programmatic management of NPS research and sponsored programs, set strategic direction for the institutes, and developed lasting relationships with sponsors. He has agreed to take on the additional responsibilities as the Executive Director of the National Security Institute while continuing as the Chair of the IS department. The campus congratulates Boger for a job "Well Done" and wishes him well in his new responsibilities.

After a national search by a review committee, Alan Richmond has been appointed to the position of Director of Marketing and Community Relations for the Naval Postgraduate School. Richmond has served as a contractor in the Office of Institutional Advancement for the past four years, and has been the president of his own public relations and marketing firm since 1993.

Richmond's prior extensive broadcasting and marketing career includes local positions as the Director of Community Relations both for KION TV (CBS) and KWAV 97 FM radio, where Richmond also served as the top-rated television anchorman, and as an on-air radio personality, respectively. Richmond was also the Public Affairs Officer and Vice President of Communications and Marketing for Yosemite National Park at NBC Universal in Hollywood.

Faculty Notes

Associate Prof. Christopher M. Brophy of the Department of Mechanical and Astronautical Engineering received the 2008 NPS Menneken Award for Excellence in Scientific Research.

Prof. Dorothy Denning received the Outstanding Innovation Award from the ACM Special Interest Group on Security, Audit and Control.

Distinguished Prof. Brij Agrawal of the MAE department became a fellow of the American Institute of Aeronautics & Astronautics.

Prof. Wieslaw Maslowski of Oceanography received a personal call from former vice-president Al Gore who invited Maslowski to attend The 14th Conference of the Parties to the United Nations Framework Convention on Climate Change. The meeting marks the halfway point in negotiations for an ambitious and effective international climate change agreement to be clinched in Copenhagen in 2009.

Prof. Glenn Robinson, Defense Analysis, has authored *The Battle for the Story: Jhadi Information Strategy*, which will be published by Stanford University Press in 2009.

Because of his contributions to COMET training modules on Coastal Meteorology and other publications, ***Prof. Wendell Nuss*** was invited by the Peru Weather Service, Servicio Nacional de Meteorologia e Hidrologia (SENAMHI), to teach a course on Coastal Meteorology to their forecasters and other researchers in the region.

Calendar

January 13
Marine Corps Maj. Gen. Thomas A. Benes
Director, Operational Warfare
Secretary of the Navy Guest Lecture
POC Protocol Ext. 2466

January 15
Prof. Charles Townes, Nobel Laureate
GSEAS Distinguished Lecture
King Hall; 3:00 – 4:00 p.m.
POC Nancy Weigle Ext. 7859

January 16
Naval Command College
Naval War College Site Visit
POC Protocol Ext. 2466

January 19
Martin Luther King, Jr. Day Observed

January 22
NPS Foundation
Members' Happy Hour
Trident Room
POC Anna Blackmon Ext. 2981

January 28
Stories from the Front Line,
and the Way Ahead in Afghanistan
NPS Foundation Quarterly Event
POC Anna Blackmon Ext. 2981

February 17-19
Senator Fernando Flores, Chile
Cebrowski Institute/Dr. Peter Denning
POC Sue Higgins Ext. 3596

Historical Highlights

The Del Monte Pre-Flight School – the Navy's first command at the Hotel Del Monte – was decommissioned in January 1944. Nearly 4,000 aviation cadets passed through the wartime command during the Pre-Flight School's brief 11-month existence. Instructors included Cornelius Warmerdam, a world champion pole-vaulter, and several football players who became legendary pro players after the war.

Del Monte Properties Company (forerunner of today's Pebble Beach Company) President Sam Morse wrote, "The fine, clean-cut young Americans that are graduating every two weeks from the Del Monte Pre-Flight School are establishing a tradition that will write a big page in the history of Del Monte and the Monterey Peninsula." The Navy's emergency wartime use of Hotel Del Monte set the stage for the government's subsequent purchase of the property and a cross-country move of the Naval Postgraduate School from Annapolis.

Cornelius Warmerdam

Historical Highlights are provided by the Dudley Knox Library.