Institute Report

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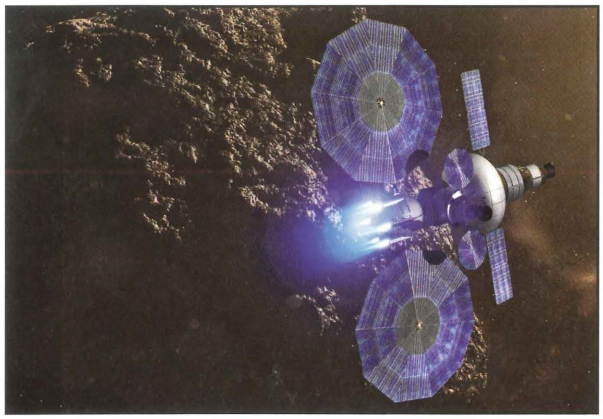
Sabbatical Project Assists NASA with Space Propulsion

By John Robertson IV

VMI-supported research is laying the groundwork for solar electric propulsion, a technology that is central to the future of space exploration.

Col. Joe Blandino, professor of mechanical engineering, spent fall semester on sabbatical working with Richard Pappa, the technical lead of the solar array structures project, and other researchers at the NASA Langley Research Center to develop a way of predicting how large solar array structures will perform in space.

Blandino's expertise in understanding thermal effects in the context of structural mechanics will allow designers of large solar arrays to identify potential issues before they cause trouble in space.



One design for solar electric propulsion employs circular deployable solar panels to power electric thrusters. This tug is passing an asteroid, one of many possible destinations for the spacecraft. – Drawing courtesy of NASA.

"Understanding all of the interactions is important because what you're doing is trying to mitigate risk," said Blandino. "We want to be able to say this will go out into space with a reasonable chance of success, which is very important when you're spending a couple hundred million dollars."

The arrays would be much larger than the largest solar panels currently deployed in space and, when coupled with electric thrusters to create solar electric propulsion (SEP) tugs, could eventually provide a platform for traveling from Earth's orbit to the Moon, Mars, and beyond.

"For missions to the outer planets NASA wants to develop a tug – essentially a utility spacecraft – to deliver cargo and supplies, and maybe one day people," said Blandino. "So we need to develop panels 10 times larger than those on the international space station."

NASA is planning to deploy smaller 30-50 kilowatt arrays in the next

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Chosen by Circumstance, They Embraced Opportunity

African-American Alumni Return to Post to Talk Recruitment

By Sherri Tombarge

In 1968 five African-Americans matriculated with the Class of 1972. Three of the five returned March 1 and 2 to share their stories and their ideas for recruiting with fellow African-American alumni, current African-American cadets and VMI staff.

From the start, the enthusiasm was palpable.

Friday afternoon briefings on recruiting, admissions, financial aid, alumni support, and the general state of VMI today, as well as a cadet panel Saturday morning, elicited questions and comments. Alumni spoke of their engagement, noting the need to be ambassadors and recruiters, and recognizing the opportunity VMI had offered them. Their own successful careers, they said, started at VMI.

That engagement is exactly what conference organizers were hoping for. They hope that eventually each VMI Alumni Association chapter will have an African-American contact who can follow up on VMI contacts with prospective cadets. They hope also to see alumni forming an advisory committee to help with strategizing for more effective recruitment.

More than 30 alumni attended, representing 16 classes and each of the four decades since 1972.

"It's amazing to me the broad cross-section that we got," said Adam

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VMI Band in Mardi Gras Parade

The VMI Regimental Band and Pipes march in the 7 ½–mile Endymion Parade, the largest of the Mardi Gras parades in New Orleans. The unit was awarded the Harry Mendelsohn Trophy as the best military unit out of seven other units, including the Citadel, Duquesne University, and several ROTC units. The cadets were seen by an estimated 400,000 people during the four-hour, 26-minute march, culminating at the Louisiana Superdome. – Photo courtesy of Col. John Brodie.

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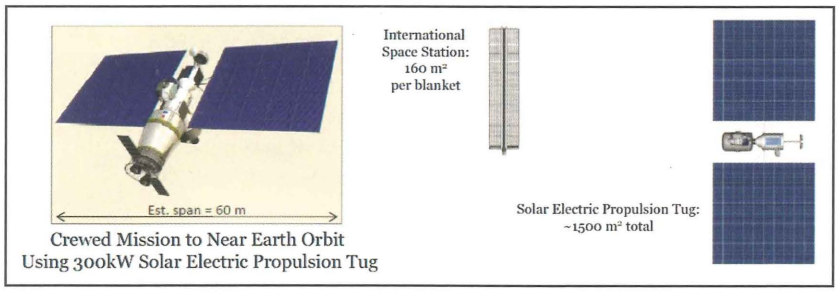
decade, which will pave the way for the larger arrays necessary to fulfill NASA's long-term exploration goals.

"Arrays with power output of 300 to 1,000 kilowatts are needed for far term – in 15 to 20 years – large-scale exploration missions. Solar arrays with such a high power output would be game changing," said Pappa. "Preliminary design of these huge structures is already under way for use on far-term NASA missions."



Col. Joe Blandino's research will support the development of solar panels much larger than the largest solar panels currently deployed in space. – Drawing of courtesy of NASA.

Before this vision becomes a reality, however, there are numerous engineering challenges to overcome. Because of the large surface area necessary to harness the requisite energy, NASA engineers must use flexible panels that can be tightly packaged into a rocket and unfurled in space.

Flexible structures in space have a tendency to behave unpredictably when exposed to sunlight due to the difference in temperature between the areas of the structure heated by the sun and the shadowed areas that remain cool.

This flexing can cause deformation of the solar collector surface, thermal fatigue, and control problems. This is why predicting the behavior of structures in space is vital to the SEP project's success.

"Any of these conditions on a large array such as those proposed for the SEP tug will have an undesirable effect on spacecraft performance and may result in the loss of the mission," said Pappa.

Blandino's model will allow NASA engineers to test current and future designs to minimize the risk of such a mission loss.

"What I gave them at the end of the day was a set of procedures and subroutines that would allow them to evaluate these large flexible solar arrays and understand how the temperature and structural mechanics are linked," said Blandino.

Blandino is looking forward to the next challenge, as his expertise can offer insight into predicting how SEP structures will perform during the deployment phase.

"I'm staying involved in the project," said Blandino. "The next question is what happens when you've packaged something up at 70 degrees and you're deploying it at minus 100 or minus 150 degrees when everything has contracted. That's the high-risk phase; if your spacecraft doesn't deploy properly, the mission's over."

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