

DAYTON

ENGINEER

UNIVERSITY OF DAYTON SCHOOL OF ENGINEERING • SUMMER 2007

A space odyssey

FISHBOWL EFFECT • SOLUTIONS FROM THE SUN

LAUNCH VEHICLE

Since Sputnik launched 50 years ago, the University of Dayton has sent some 100 engineers into service at NASA. We checked in on some of these grads, and current interns, to find out what they're doing in the most recent space races, including the new pushes toward Mars and the moon. *by Pam Frost Gorder*

Ryan Wittrup has been an intern for only 48 hours, so he can't yet decide on his favorite part of the job. At this point, all he knows is that he's going to spend his summer making nanotubes for NASA.

"I'm looking forward to the whole project because there are a lot of applications for this technology down the road," said the UD sophomore chemical engineering major. The ceramic tubes are light and strong and may one day insulate tiny wires or reinforce aerospace parts. Engineers at NASA Glenn Research Center in Cleveland are developing the technology.

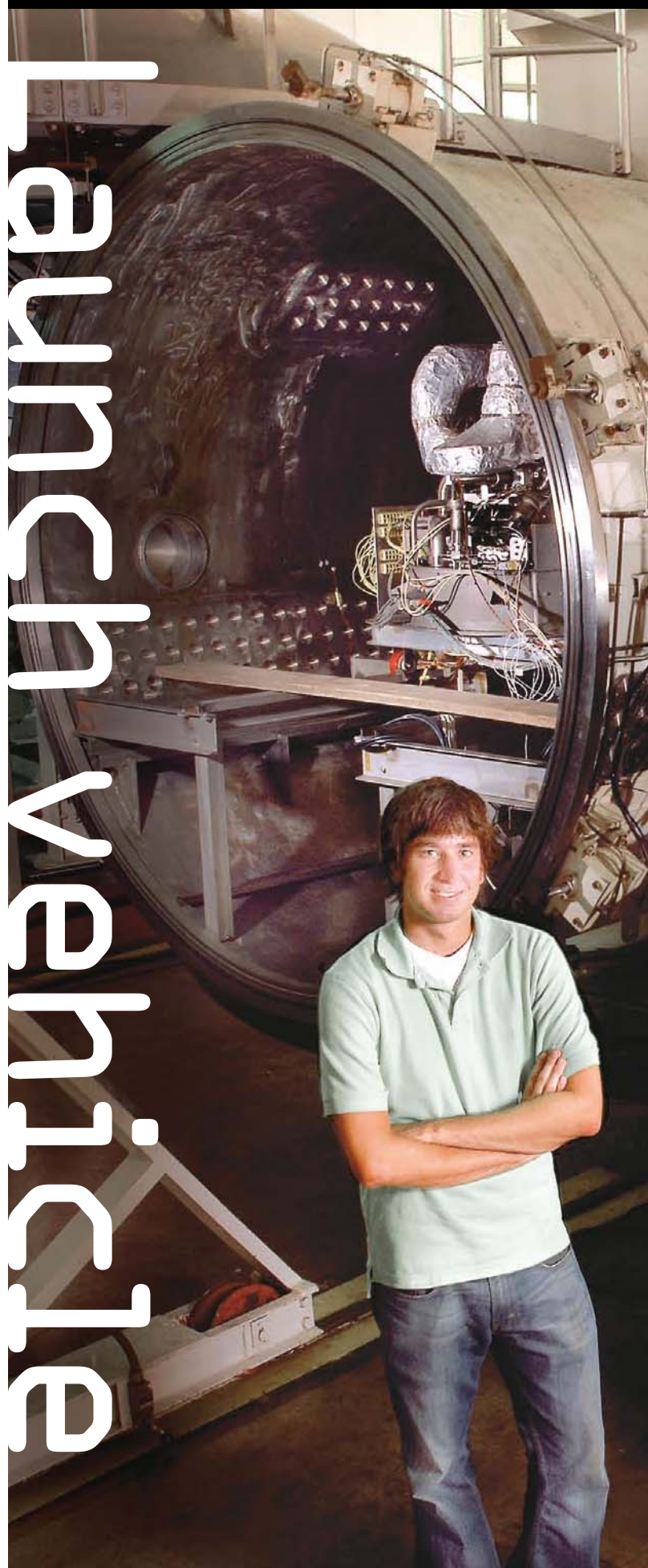
Wittrup is one of five UD students working at the research center this summer. To get there, he completed the most rigorous job application of his college career at the urging of his uncle, Lee Mason '87. Mason, now an aerospace engineer at Glenn, got his start at the agency through a similar internship and has worked there full time since he earned his mechanical engineering degree.

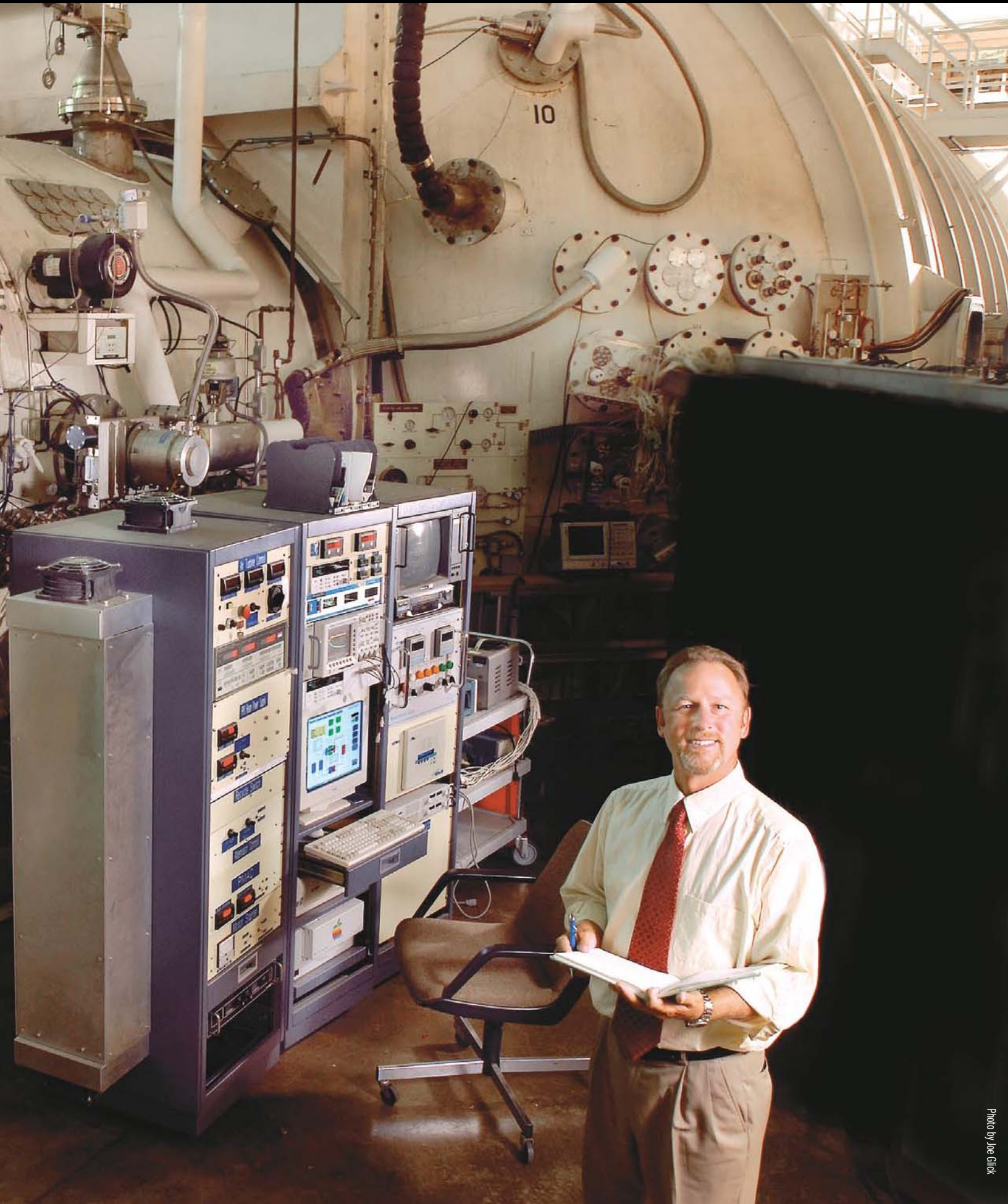
Mason said he learned how to apply the skills he learned at UD to a wide variety of projects as NASA's goals have changed over time. He's also learned how to cope when a mission he's worked on for years is canceled. (In the space game, most missions don't make it beyond the testing phase.)

"A big part of my job is validating the technologies, testing things on the ground to make sure they work before we launch them into space," Mason said, "so there's a degree of satisfaction in just getting to that point."

His expertise in energy conversion brought him to a project with UD electrical engineering grad James Soltis '70. They worked on the Jupiter Icy Moons Orbiter, a spacecraft that was to sport a high-tech ion propulsion drive powered by a fission reactor. ▶

Right: Intern Ryan Wittrup (left) and Lee Mason '87 stand before data collection racks at the large vacuum facility at NASA Glenn where they evaluate power and propulsion technologies before use in space. The facility can simulate the environmental conditions of space — vacuum, temperature -70 C and sunlight at 1.4 kW/m².





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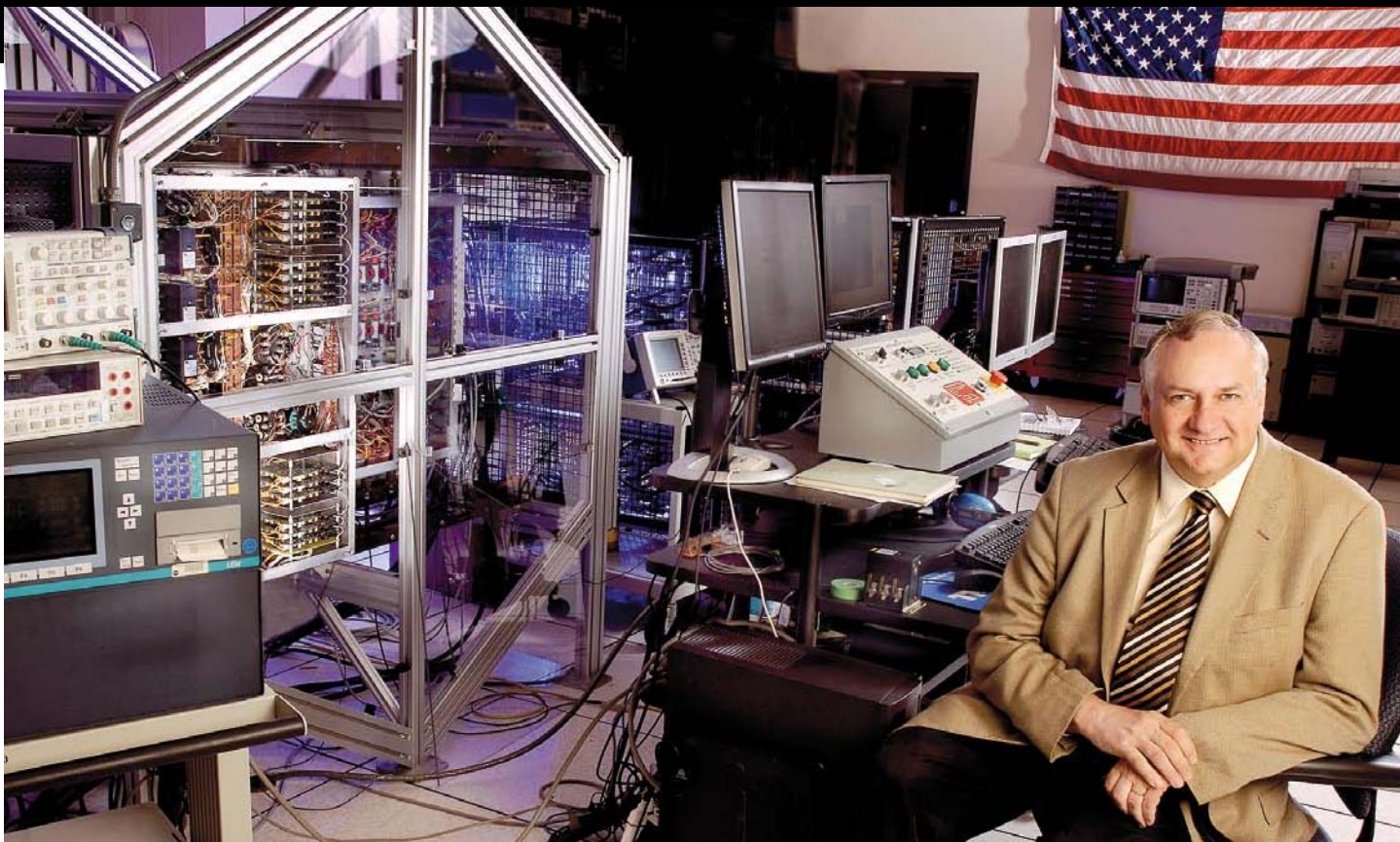


Photo by Joe Glick

James Soltis '70 sits near an electrical power system test bed for testing flight configurations. It was developed for the Jupiter Icy Moon Orbiter project on which he worked for two and a half years.

Mason and Soltis were a perfect match for the job. “I turned the heat from the power source into electricity,” Mason said, “and he made the electricity usable for the spacecraft.”

NASA canceled the project when it shifted its priorities back to manned space missions, but that just gave Mason another avenue for his work: he’s developing nuclear power systems for settlements on the moon.

Michael Zernic '85 can instantly name more than a dozen UD grads with whom he has worked at NASA, among them Mason and Soltis. At Glenn, Zernic helped design the electric power system for the International Space Station before moving to wireless communications. He managed experiment operations for the Advanced Communications Technology Satellite, which rivaled fiber optics in speed and performance. The job involved domestic and international relations and earned him inclusion in the Space Technology Hall of Fame as well as the UD School of Engineering Alumni Award of Excellence in 1998.

He’s currently working on the Constellation program, which in part is building Orion, the vehicle to replace the Space Shuttle. Orion will ferry crew and cargo to the International Space Station and eventually carry expeditions to the moon and Mars.

Zernic said that studying mechanical engineering at UD taught him “how to deal with a variety of people and viewpoints. I believe this to be invaluable, but something that needs to be experienced — it cannot be learned with textbooks and formulas.” He gives current students career advice through the UD Alumni Network and circulates their résumés if they’re looking for a job.

Paul Solano '86 was working on the aeronautics side of the agency — the side that develops aircraft technology — at Glenn until two years ago, when he began working on the engine directional control system for the Orion launch vehicle, Ares. The design engineer said that the transition wasn’t difficult. “The

only difference between space hardware and aero hardware is that space hardware is much more scrutinized,” he said. As a bonus, he worked with retired Apollo designers and astronauts on the design of the Orion Crew Module at Johnson Space Center in Houston.

Like other UD grads at NASA, Solano unabashedly expressed a passion for his job. “I like being here,” he said during a telephone interview. “It’s 6 p.m. on a sunny day, and my eight hours was up an hour ago, but I’m going right back into it after I hang up.”

Paul Rall '60 trained as an electrical engineer at UD and kept the same NASA job for 30 years. He supervised the ground communications network that delivered satellite data to three key NASA sites: Goddard Space Flight Center, the Jet Propulsion Laboratory and Johnson Space Center. “We were constantly expanding communications, achieving higher data rates,” he remembered. “We had rates akin to teletype speeds of 100 words a minute when I joined the agency, and we were using megabit rates when I retired in 1990.”

Not all UD grads at NASA started out as engineers. John Greco '74 earned his bachelor’s degree in marketing, then discovered a love for engineering while selling manufacturing parts. After earning an engineering degree elsewhere, he joined NASA Langley Research Center in Virginia in 1990. He became quality and safety manager for LITE, the first spaceborne lidar instrument — a kind of radar that studies Earth and the atmosphere with laser light. Lidar was launched on the Space Shuttle Discovery in 1994.

Years of careful preparation went into LITE. “But once we got to the launch pad at Kennedy Space Center and watched the LITE being placed in the cargo bay of the shuttle — that was amazing,” Greco recalled. The experiment sat on a 10-foot-wide cradle

that spanned the width of the cargo bay. "Seeing the shuttle on the pad in its launch configuration with the payload bay doors open and our payload bolted in there, about 50 feet in the air, made me feel like I was part of the space program ... a small part of a larger program that I had been in awe of since I was in first grade." He watched the launch from inside Mission Control — a place most people get to see only on TV. It was a real "goose-bump moment."

Now he manages NASA resources for scientists doing atmospheric research and helps evaluate program proposals — two jobs that draw on his UD degree.

Gary DuBro '69 knows about those goose-bump moments. He joined the agency in 1990 after working as an aeronautics expert for the Pentagon and the Office of Naval Technology. At NASA, he took the lead on policy issues for the International Space Station and the Space Shuttle, then became lead of strategic planning for the office of spaceflight. In that time, he witnessed five Shuttle launches from the grounds at Kennedy Space Center. "You're two-and-a-half miles a way, you see the engine light up, and some seconds later you feel the shock wave," he said. "Feeling that against your chest is a pretty awesome experience as you watch it take off."

He felt a moment of particular pride when he escorted a Japanese space agency official high atop the scaffolding that surrounded a Shuttle on the launch pad. "He said, 'Now I understand why the United States is a leader in space,'" DuBro remembered.

He went on to become NASA's senior representative to the Air Force Research Laboratory in New Mexico, where he helped the two agencies find common ground for sharing technology. He retired from NASA in 1998 — and was hired by AFRL the next day to do the same job as a contractor.

One of the experiences that shaped DuBro's career was working with Carol Shaw, the UD engineering management professor who founded the University's Center for Competitive Change. Her program gave him a new way of thinking about the strategic management of research and development, he said.

A newer addition to NASA's ranks is Amy Mielke '98, a research engineer at Glenn. She studies air flows in jet engines, including hypersonic engines that fly craft faster than Mach 5, five times the speed of sound.

Like sophomore Ryan Wittrup, Mielke was once a NASA intern. During that time, she worked on the first project ever to examine how fire spreads across liquid pools in low gravity. She helped develop the flow visualization technique for the experiment, which launched on a sounding rocket in 1996. Scientists

'It's been nice to see the different things that I can do with my education — to see where I can go.'

gained information that is now critical for fire safety on both the Shuttle and Space Station.

"It was very exciting for me to know that I was a contributor to the success of the launch, even if I couldn't be there while it was happening," she said. "With experiments like these where you get one shot to get your data, it is critical that everything goes perfectly as planned. The pride and joy that a researcher feels when that happens is overwhelming."

Now Mielke recruits students for Glenn's co-op program. At the moment, that program does not actively recruit at UD, but she is working to change that. She encourages any engineering students in their sophomore year or above to apply, and would like to refer them to <http://www.grc.nasa.gov/WWW/OHR/coop>. "Once the co-op program managers see what good luck they have with UD students, they will most definitely add UD to the recruitment list in the future," she said.

Students from any UD engineering background could put



Amy Mielke '98, who studies air flows in hypersonic jet engines, recruits students for the Glenn Research Center's co-op program.

their skills to use at NASA, said Leo A. Burkardt '67, a project manager at Glenn. The mechanical engineer has overseen projects ranging from general aviation to hypersonics. His son, Leo J. Burkardt, is set to graduate from UD in December 2007 with a major in mechanical engineering and a minor in aerospace engineering.

"Actually, it's not a bad idea to work for a semester in an area that's outside your major," said the senior Burkardt. Having broad job experience is good for engineering as well as any other line of work.

Wittrup admitted that before his current internship, he wouldn't have thought that chemical engineers worked at NASA. "It's been nice to get a different perspective," he said, "and see the different things that I can do with my education — to see where I can go."

Until Pam Frost Gorder can file her freelance stories from an exotic lunar outpost, she will content herself to cover science and engineering from Columbus, Ohio.