

# Smooth Sailing

Industry weathers economic trend



PURDUE **AERONAUTICS & ASTRONAUTICS**

# ENGINEERING **IMPACT**

FALL 2009

## **Rocket Girls**

An all-female team gets fired up about propulsion

## **Here Comes the Sun**

Faculty member's contributions shine brightly in the classroom and the lab



John Underwood



## On My Mind

Welcome to the Fall 2009 edition of *AAE Impact* magazine. The theme of this issue is something that appears in headlines everyday and has affected nearly every constituent of our school—the economy.

The pages which follow offer a glimpse of the effects the worldwide economic downturn has had on our industry and our students. What you will also read of,

however, is an industry which is responding, in innovative ways, to the issues brought about by economic weaknesses.

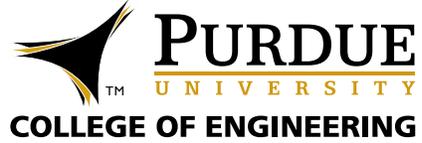
The school is rightfully proud of its alumni and industry partners who have not wavered in the face of economic difficulties, and who are playing a significant role in our national recovery.

**Thomas N. Farris**  
Head, School of Aeronautics & Astronautics

As we go to press, Thomas Farris, professor and head of AAE, announced that he has accepted the position of dean of engineering at Rutgers University. We thank Dr. Farris for all he has done for aeronautical and astronautical engineering at Purdue, and wish him the best in his new position.

## Don't be a stranger. We want to hear from you!

Tell us what you think by sharing your Purdue memories or reacting to a story in this issue. We invite you to write to us via the contact information above. In doing so, you grant us permission to publish your letter in part or in whole in an upcoming issue. We also reserve the right to edit letters for length and/or clarity.



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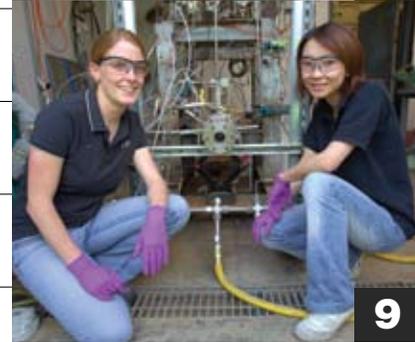
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Michael H. Campbell

## Alumnus honored as distinguished engineer

The school is proud to honor **Michael H. Campbell** (BSAAE '83) as a 2009 distinguished engineering alumnus. Campbell, executive vice president and chief operating officer at Fair Isaac Corporation, is considered a pioneer in the application of mathematical optimization to complex management tasks. Campbell is widely recognized for his ability to solve almost any problem while conserving resources. Campbell was nominated "for his skills as a determined and accomplished entrepreneur, leader and pioneer within software development, and technological innovator."



## Welcome to new faculty

- **Karen Marais**

The School of Aeronautics and Astronautics welcomes new faculty member Karen Marais. She joined the school as assistant professor in the aerospace systems group in the spring of 2009. Marais received her PhD. from the Department of Aeronautics and Astronautics at MIT in 2005. She also holds a master's degree in space-based radar from MIT. Prior to graduate school, she worked in South Africa as an electronic engineer. She holds a B.Eng. in electrical and electronic engineering from the University of Stellenbosch and a B.Sc. in mathematics from the University of South Africa.

- **Timothée Pourpoint**

Timothée Pourpoint joins the school as a research assistant professor. Pourpoint received his M.S. in mechanical and aerospace engineering from the University of Alabama in Huntsville in December 2000 and an Engineer's Degree from ESTACA University in Paris, France, in July 2000. He received his PhD. from the School of Aeronautics and Astronautics at Purdue University.

## Astronauts' archives coming to Purdue

Astronaut **Eugene A. Cernan**, the most recent person to walk on the moon, will soon leave another footprint alongside fellow space explorer Neil Armstrong, this time in Purdue University Libraries' Archives and Special Collections.

Cernan's papers will join a growing list of historically significant collections in Purdue Libraries' flight archives. Armstrong, a 1955 Purdue graduate and the first person to walk on the Moon, donated his personal papers in November 2008. Cernan announced his gift in January.

Purdue Space Day



## Alumni Astronauts in Space

Astronaut **Mark Polansky** (BS and MSAE '78) interacts with elementary and middle school students during Purdue's Space Day 2008. Polansky was commander of Shuttle Mission STS-127, which launched in July. Read more about Polansky and fellow Boilermaker and astronaut **David Wolf** (BSEE '78), who joined him on the crew of the mission, in this issue of Purdue Engineering Impact, (p. 26).

## Professor aids space shuttle experiment

Purdue professor and aerospace researcher, **Steven Schneider**, played a part in space shuttle Discovery's recent 13-day mission, which launched in March. Schneider helped shape plans to install a new experiment to collect data for controlling deadly friction and heating in the design of future spacecraft. According to Schneider, data from the experiment will also help engineers design "hypersonic" aircraft that travel faster than Mach 5, nearly 4,000 mph.



## Here Comes the Sun

Faculty member's contributions shine brightly in the classroom and the lab

The research and teaching accomplishments of C.T. Sun, Neil A. Armstrong Distinguished Professor of Aeronautical and Astronautical Engineering, could fill an encyclopedia.

During his more than 40 years at the university, Sun has authored or co-authored nearly 300 journal papers and countless conference proceedings. He's also served as a thesis advisor to more than 80 PhD students, many whom now serve on the faculties of top engineering schools around the world. Given such prolific output, even Sun's colleagues find it challenging to highlight one achievement over another.

For example, when the American Institute of Aeronautics and Astronautics (AIAA) and the American Society for Composites (ASC) recognized Sun earlier this year as one of the two inaugural winners of the AIAA-ASC James H. Starnes Jr. Award, it was not for a singular achievement in his field, but for "four decades of unparalleled contributions."

Sun, whose current research focuses on composite materials, fracture mechanics, structural dynamics, and nanomaterials, is characteristically humble about the distinction. "It's nice to be recognized, of course, but the respect from peers who are doing similar work is more gratifying than any award," he says.

Still, the accolades are too numerous to overlook.

In addition to his recent honor, Sun has received the ASC Distinguished Research Award, the AIAA Structural Dynamics and Materials Award, and

the American Society of Mechanical Engineers (ASME) Warner T. Koiter Medal. He's also been awarded a Fellow of the ASME, ASC, and AIAA and earned several teaching and research awards from Purdue and the College of Engineering.

Sun attributes his success to a strong tradition of scholarly excellence within the School of Aeronautics and Astronautics, which encourages its faculty members to balance their time between the classroom and the laboratory. "Teaching and research are interdependent," he says. "You really can't separate one from the other."

Sun's role as director of the school's Composite Materials Laboratory reflects that philosophy. While used primarily for research, the facility is also open to undergraduates enrolled in Sun's yearly composite materials course. "It gives students hands-on experience with the technology we discuss in the classroom," Sun says. "They can see the mechanics of composite materials in action."

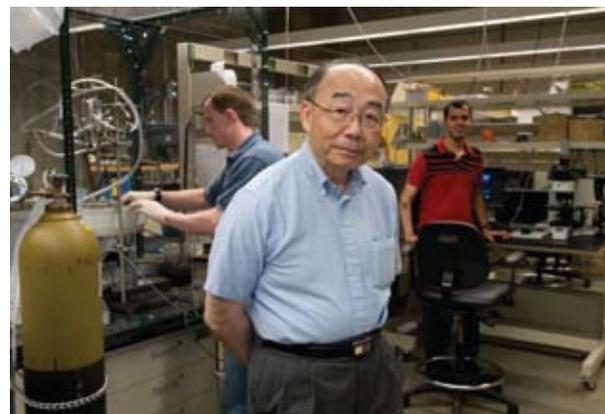
For graduate students like Marriner Merrill, who received his PhD at Purdue's May commencement, Sun's laboratory is a classroom. With Sun's guidance and support, Merrill is conducting leading-edge research in nanostructured materials that may someday lead to viable commercial applications.

"The standard advice given to graduate students is that you should choose your thesis advisor more carefully than your spouse," Merrill says. "From that perspective, I feel very fortunate to be able to work with Dr. Sun.

He's helped me to achieve things that otherwise wouldn't have been possible."

Sun believes the possibilities offered by his and Merrill's continued research efforts are equally achievable. "The technology is still in its infancy and there are numerous challenges, but I think nanomaterials could have the same impact as microelectronics," he says.

Mark Simons



C.T. Sun (center), Neil A. Armstrong Distinguished Professor of Aeronautical and Astronautical Engineering, supervises the research of PhD students Marriner Merrill (left) and Bhawesh Kumar (right) in Purdue's Composite Materials Laboratory. Sun established the facility in 1973 and continues to serve as its director.

Sun is also confident that support for such research will continue to grow despite the current financial crisis. "We expect additional funding to become available as a result of the new stimulus package," he says. "I think everyone realizes that the research done at institutions like Purdue is crucial to the future of economy and to maintaining the United States' competitive edge in the world." ■ **Eric Nelson**

## Wisdom of Experience

Alumnus Bud Mitchell offers insights on the past, present, and future

**G**ary “Bud” Mitchell (BS '60), retired vice president of Boeing Integrated Defense Systems, is a seasoned veteran of the aeronautical field with close to 50 years of industry experience. Here he offers priceless insights on the aerospace industry during these tough economic times.

**Q: How did you become interested in aeronautical engineering and what inspired you to pursue a career in the field?**

**A:** I was fortunate to have a father who recognized the importance of education and his dream was to have me go to Purdue and become a chemical engineer. I knew this from five years of age. I almost got the dream right, but I had a psyche that was driven by the aviation of WWII. My little boy collection of models that I either bought or made reflected everything that flew: hellcat, mustang, and of course the Mitchell bomber. While in school, Sputnik flew and changed the vision of our country and added stimulus for me. I changed my major at Purdue to aeronautical engineering and never regretted the move.

**Q: How has the industry changed since you first entered the field? Do you see these as positives or negatives?**

**A:** Change came to every corner of the business from the computational capability, computer aided design, new materials, new electronics, etc., to management concepts and organizational attributes. I remember when the Monroe salesman in the early '60s loaned me a four-function calculator.



Bud Mitchell

I had a good friend come over and we both marveled at what it could do. Can you imagine designing heat shields or doing re-entry trajectories for Mercury and Gemini with that primitive capability? It was done. The entire new tech had positive dramatic influence on the business and industry. The people in the ranks still have the same drive for the best solution that they have always had. Having lived abroad and viewed the work force from a distance constantly assured me that we are the best in the whole world.

When I started my career, I was inspired almost daily by the founder and visionary of the McDonnell Aircraft Company, J. S. McDonnell. People like this are not very abundant and the focus on the bottom line has been a

breeding ground for compromise of loyalty, integrity, ethics, and the best solutions. J.S. McDonnell boasted that his salary was the average of 10 floor sweepers. That is probably a good benchmark for today as well but the boards have allowed executive salaries to go out of control. The seeds of this became rooted in the early '90s and accelerated with pay for performance being very shortsighted.

**Q: As a veteran of nearly a half century in the industry, what is your assessment of the current economic climate?**

**A:** It's very unhealthy for all industries because of the wide swath misfortune has encompassed. When poor judgment is used in a vital economic business like housing, the ripple effect we



have witnessed is a sure thing. My end of the business, military, will not be impacted to a great degree. The military buys based upon requirement, and as long as our government recognizes its primary role, to defend the people, the necessary purchases will be made. When times are tough however, weak programs with overruns and immature technology are likely to get the axe. This is probably just. What worries me is that tough times also focus on the procurement mechanisms and with severe criticism of cost plus contracts. Let me be very clear on this. Cost plus has a place when the requirement exists for a capability, but the technology is risk laden. The media usually gets the story wrong and the industry for many good reasons elects not to fight the battles. Who can forget the \$20,000 toilet seat?

For any company, to bet the store with shareholders' money would be inexcusable. The general public does not appreciate how dedicated and hard our engineers and scientists work at pay rates that are dwarfed by Wall Streeters. My view is that if you need it, then you should be prepared to get it. The commercial side of the story is quite different. They are directly affected by the general health of the airline business and the impact the economy has on their purchases. They are also need driven, but theirs can often tolerate a slip in time, and we witness the delays and/or cancellations of orders. These, of course, are painful because production delays usually drive layoffs, and layoffs drive learning curves that hurt production costs. The same effects impact recovery and parts availability that since day one have been a problem for the aircraft industry.

**Q: What types of innovations do you predict will help keep the aeronautical engineering industry afloat during such economic downturns?**

**A:** I don't think it's a case of innovation, but more a case of application of sound business principles and best practices. Number one, stay close to your customers, understand their difficulties, know how you can be of the most help, and recognize margins may have to slip for a better tomorrow. Anyone can lay off people to live to budget. The exceptional manager will exhaust all avenues before letting go of the most valuable assets, people. The companies that emerge from a downturn with little damage are those that anticipated the economic turn and put the appropriate measures in place. Too many companies go through the motions of planning looking at economic forecasts in executive filled rooms where probing questions are scant and the group leaves without making any changes to their activity.

I'm a strong advocate for the Malcolm Baldrige concept of data gathering on the basis that if a data set doesn't promote an action than it is probably information and not data. Often the time slot is filled with information where eyes glaze over and meaningful actionable data is absent. The executives are not excused, but rather at fault because they should provide the challenging demands on seeing data that drives action even if the action is to decide based upon data to hold the course. We have all sat through briefings that were once called "death by view graph," but when we ask leaving the meeting, "what did we learn?," it's too late. That question should be aired during the meeting. It's not the first economic downturn and it won't be the last. Robust companies will seek opportunity in both swings.

**Q: What have been the key motivating factors for you as a leader in the industry, in other words, what kept you going to work every day?**

**A:** Apart from the luxury of working with very talented people my entire career, and having wide diverse exposure to the international scene, I was blessed to work for a great, small company that was growing fast. The leadership associated with the dynamics of that growth was always very inspiring. Leadership has a way of roping you in and keeping you going. It is responsible for the positive general attitude of the work groups and the harmony of relationships. Certain things about leadership can be taught, but I am convinced that it is a gift that is nurtured from early childhood. The tyrants can get a job done in the short haul, but you will usually find that they fall by the wayside as the leaders pass them by.

My entire career was a constant exposure to talent with a passion and a leadership that recognized they could not get there alone. Unfortunately, in recent years we have seen egos and greed become a trait of some of our leaders; integrity has suffered. I'm not sure why, but I know it must be addressed in very visible ways. I look to Purdue to clearly see this need and take the subject from the depths of a strategic plan to a visible worldwide leadership role, a center of excellence where the subject is studied and taught. What better place to take worldwide leadership than with the foundation of values from the Midwest. Finally and foremost, I have a wife and two children who have, in many different and individual ways, been a constant inspiration each day of my life.

# Smooth Sailing

Despite today's turbulence, the industry is on course, report Purdue alumni at Boeing, Northrop Grumman and Lockheed Martin

By **Kathy Mayer**



**A** struggling economy, new U.S. presidential administration, and potential changes in defense priorities may be creating some drag for the country's top aerospace and defense firms, but that's not slowing their focus on innovations or determination to thrive.

That's the assessment of three Purdue University aeronautics and astronautics engineering alumni who bring a combined 70 years' experience in the field to their insights and represent three industry leaders: Chicago-based Boeing Co.; Bethesda, Md.-headquartered Lockheed Martin Corp., and Los Angeles-based Northrop Grumman Corp.

With an order backlog of more than 3,500 airplanes and global demand that "remains strong for new, more efficient commercial airplanes in response to high fuel prices, aging fleets and environmental concerns," there's optimism at Boeing, says Erika Pearson (BS AAE '93). She's the business director/deputy vice president of Leasing & Asset Management for Boeing Commercial Airplanes in Renton, Wash.

Yes, there have been layoffs at Boeing as commercial airlines face tough economic storms.

"While we are paying close attention to the uncertain economic environment, and airlines are making significant changes to their operations, market fundamentals and our strong backlog will help us work through this period," she says. Even though "further deterioration in the financial system may create a funding shortfall," the company would address that through its capital liquidity and portfolio management infrastructure.

At Lockheed Martin Aeronautics Co. in California, Chief Engineer Paul Bevilaqua (M.S. Engineering Science '69, PhD '73), reports, "We're not depressed, not anything like the auto or general aviation industries. We're in defense, and the defense budget is about the same as last year. There are no cancellations in Lockheed Martin's military area other than those that were already planned."

One challenge comes from having to "make up losses in pension plans due to the market crash," he says. "And the company is buying back stock, so those two things have reduced money for research and raises. I think that's occurred across the board in all aerospace companies."

Northrop Grumman, largely dedicated to government defense and technology, is "not driven by the consumer economy," says Jerry Lockenour (BS AE '67), director of technology development in El Segundo, Calif., where satellite, space and aircraft systems were recently combined in one operating unit. "We're impacted in some of our programs, so we won't go forward as strongly as we had hoped, but, overall, we're in a strong growth position."

In the meantime, all three businesses are continuing with new developments.

At Boeing, product enhancements are ongoing for the 737 and 777, and the latest version of the 747, the 747-8, is progressing, Pearson says. "Delivery of the first 747-8 freighter is planned for the third quarter of 2010. The first delivery of a 747-8 intercontinental passenger jet is set for the fourth quarter of 2011."

In the leasing area, she says, "We expect there will be some consolidation, but we also expect to see about the same number of lessors we have today, as new players from China, the Middle East and other regions enter this lucrative business."

Development of Boeing's 787, dubbed next-generation because of lightweight composite parts and fuel efficiency, also continues, despite delays.

"Throughout the history of commercial aviation, there have been peaks and valleys," she says. "That said, we firmly believe that long term, the aviation industry will continue to grow."

That could mean a \$3.2 trillion airline investment for some 29,400 new commercial planes in the next 20 years, she suggests. What will fuel that? "Passenger preference for more frequent, nonstop flights with shorter trips times," she says.



courtesy of Boeing

Boeing all-new 787 Dreamliner

> continued on next page



**Erika Pearson**  
(BS AAE '93)

Lockheed Martin's focus on the future is centered on the F-35 Joint Strike Fighter. "That will be the biggest airplane program in dollars in history, and it looks pretty good for the next 30 to 40 years," Bevilaqua says.

Two are now flying, one is on a test stand, and four more nearly finished, with 16 in various stages of assembly. "We have 3,000 or so orders identified, and the potential for who-knows-how-many more."

Also in Lockheed Martin's mix are reconnaissance aircraft and airships, he says. "Rather than a few big airplane programs, there will be lots of little programs, with new kinds of engineers needed."

Important to note is the export market. "Most people aren't aware that about the only things we sell overseas are aircraft," Bevilaqua says. "We buy televisions, shoes, clothes, everything from other countries. The only thing to balance that is airplanes."

At Northrop Grumman, several projects are planned, Lockenour says. "We are developing unpiloted autonomous aircraft for surveillance and combat, with mission management from the ground. And more sensors are being integrated into our platforms, which together give a single integrated picture of the environment."

Another area is precision strike, to minimize collateral damage. "We're moving into lasers, high-powered microwave, cyber operations, going for computer and electronic systems instead of destroying buildings."

On the manufacturing side, yesterday's large production lines and numbers that drove low unit cost are being replaced by a new paradigm, Lockenour says. "We're doing more rapid prototyping and reconfigurable operations so we can build smaller numbers cost effectively and more easily upgrade the product."

Technology continues to evolve, he notes. "The challenges are the many different aspects, the many dimensions, all rapidly changing. It's hard to forecast where technology is going to go. When you think long-term, it really is eye-watering."

He's positive about the future. "The outlook is very strong. We've been challenged by conflicts our country is involved in, the ups and downs in the industry, insurgency conflicts that challenge us to transform to products that are more effective in that environment than the cold war environment," Lockenour says.

"We're taking advantage of science and technology, and changes will occur. It's never been a static industry."

courtesy of Lockheed Martin

courtesy of Northrop Grumman



The F-35 Joint Strike Fighter during a test flight



Broad Area Maritime Surveillance Unmanned Aircraft System (BAMS UAS)



**Paul Bevilaqua**  
(M.S. Engineering Science '69, PhD '73)



**Jerry Lockenour**  
(BSAE '67)

**“ We’re not depressed, not anything like the auto or general aviation industries. ”**

**—Paul Bevilaqua**  
Chief Engineer, Lockheed Martin



## Rocket Girls

An all-female team gets fired up about propulsion

**Y**en Yu's childhood fascination with fireworks sparked an interest in rocket propulsion. Loral O'Hara's love of flying propelled her into aeronautical engineering. For the past two years, they have served as the first all-female team in the rocket propulsion facilities at Purdue's Maurice Zucrow Laboratory.

In fact, the "Rocket Girls," as Yu and O'Hara are called, are likely one of the few all-women rocket propulsion teams in the entire country.

"It's a male-dominated field," explains Yu. "Not many girls think about getting their hands dirty, plus they may have wondered since most of the engineers are guys, they might not be welcome. But that's not the case, and we can do as good as any guys out there."

Born and raised in Taiwan, Yu became captivated with rockets while observing annual Chinese New Year fireworks displays. "It was fascinating to see something that was originally stationary and sitting on the ground to suddenly be lit and shot off into the sky," she says.

After attending high school in Singapore, Yu enrolled in Purdue's College of Engineering. During her senior year, she tested rockets in a laboratory. "In the undergraduate program, you don't have a lot of hands-on experience related to propulsion," she says. "But I got the opportunity to design hardware, see it built, and then test it."

Two years ago, O'Hara joined her group. A native of Houston, Texas,

home of Johnson Space Center, O'Hara knew from a young age she wanted to be an astronaut. "I grew up in a space culture, and when I was in elementary school, we flew tomato plants on the space shuttle. That probably played into my whole obsession with space," she says.

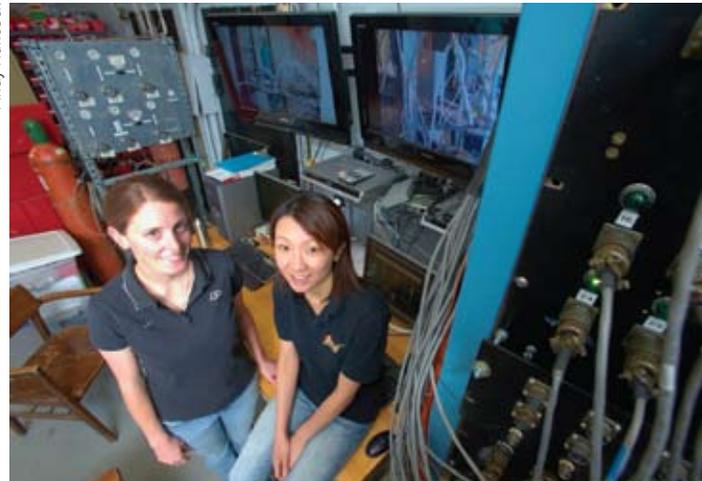
O'Hara began flying planes as a teenager, then, as an undergraduate at the University of Kansas, took propulsion classes and joined the rocket club. After graduation, she headed to Purdue for a master's degree in aeronautics and astronautics.

Together, the women have conducted subscale rocket engine experiments for NASA's Marshall Space Flight Center in Huntsville, Alabama. "The model rocket that I'm building has a diameter of two inches, but it's able to produce the sound of a jet engine 100 meters away. From this little thing, it's pretty impressive," Yu says.

For each test, the duo measures temperature and pressure under different configurations—injector sizes, combustor sizes, operating chamber pressure, and propellant combinations. "We want to establish predictive capability," Yu says. "Hopefully from this experiment, we can gain fundamental understanding towards rocket engine combustion instability that can be applied to the next-generation rocket engine."

For O'Hara, the hands-on experi-

Andy Hancock



Loral O'Hara, left, and Yen Yu at Maurice J. Zucrow Laboratory

ences in the laboratory have been invaluable. "Anywhere else you go, the technicians turn the wrenches," she says. "Out at Zucrow, the students get to do it. It's experience you don't get anywhere else," she says.

O'Hara will complete her master's degree in August. Possibly after more studies, she'll pursue NASA's astronaut program.

Yu graduated in May with her PhD in aerospace engineering. She's now working as a postdoctoral fellow, continuing her work with NASA on combustion instability. Someday, she may become a faculty member and do research.

But neither one seems ready to leave the rocket lab yet—probably because they're having so much fun. "It's cool putting together the hardware and lighting it," O'Hara says. "It's always exciting to see some fire."

■ **Angie Roberts**



## Outside the Box

Scholarship support follows an exceptional career both in and outside industry



Wayne Willich, BSAE '60

Whether marketing a Boeing 737, developing medical equipment, or leading a small Idaho community, Wayne Willich attributes the diversity of his career experiences to one source—Purdue University.

Willich, a graduate in the class of 1960 with a degree in aeronautical engineering, said a strong work ethic and a high morale will always set Purdue graduates apart.

“You don’t really think about it when you go through the process, but what I took from lectures made me want to go after every possible opportunity,” Willich says. “You have to want to find what you’re looking for. Forty years down the line I’ve gotten all of that and my education at Purdue was a big part in achieving that.”

Willich says that he was always destined to be a Boilermaker.

He grew up on the south side of Chicago, and followed his uncle to Purdue, who attended for one semester on the GI bill after serving in World War II. After attending Purdue Calumet for his first two years, Willich came to West Lafayette in 1958 where he completed his degree.

Soon after graduating, he took a job with Boeing where he worked on Boeing’s SST projects, NASA research programs, and eventually became marketing director for the

737, a job he describes as the easiest in the world because of the plane’s popularity.

By 1970 he sought a new direction and left Boeing to enter the medical research field, working on equipment to remove fluid from the lungs, a development, he says was ahead of its time.

Willich soon returned to Boeing, though, due to greater financial rewards on offer, but cites his capability and willingness to step outside of the box, something he learnt from his Purdue years, as a career defining move.

“I had accomplished all of my wildest dreams four years out of college, but by then I was in a little bit of difficulty,” he says. “I used the time to test the waters and take some dif-

ferent advice—it was a little mind-sapping—but a year later I did the medical research project. When it was time to go back to Boeing I did so with a different outlook, one that worked for me on the corporate side of the company.”

Retiring from Boeing in 1996 at age 57, Willich says that many people might be content to play golf and enjoy the quiet life. Not him.

While still involved with medical research, Willich sought political office and in 2007 was elected mayor of Sun Valley, Idaho, a ski resort town of 1,500 people.

Willich says he likes to visit West Lafayette at least once a year to attend a football game and is a regular and enthusiastic supporter of the university.

He recently agreed to donate \$25,000 to the Trustees and Presidential scholarships being awarded to AAE students. He says that, unlike some donors looking for publicity, he believes in helping talented students follow their dreams.

“It’s not necessarily the dollar amount, but having someone there wanting you to do well,” Willich says. “If I can help in any small way to help someone get an education, I will be happy with that.”

With the opportunities available for today’s engineering students to make a difference in the world, he has one wish: to be 40 years younger with the chance to follow his dreams once again. ■ **Kevin Smith**



## Launching the Next Generation

Scholarship aims to grow top talent for aerospace industry

As deputy undersecretary for the Air Force Space Program in the Pentagon, Gary Payton (MSAE '72) oversees the military's space launch program and its satellite and aerospace engineering. He's got a heady responsibility and a lot on his mind, including where the next generation of Gary Paytons will come from.

As a member of the Sputnik generation, Payton saw the effect that the Russian space program had on the world. He was a child in Rock Island, Ill., at the time, and describes himself as an average little boy who liked airplanes and fire trucks.

"It was like the entire U.S. culture shuddered when Sputnik launched," he recalls. "Even in the public school system in the heartland of America, where John Deere tractors are in everyone's mind more than satellites, the school system did an overnight turnaround to put more emphasis on mathematics and science education. I got wrapped up in all that. I took the philosophy that airplanes are great, but jets go higher and faster, and rockets go even higher and faster than jets." In elementary school, when John Glenn launched, he recalls being more impressed with the Atlas vehicle than the capsule.

Payton followed his love of jets and rockets to the Air Force Academy, where he learned to fly and nurtured a fascination with rockets and missiles by earning a degree in astronautical engineering in 1971. He furthered his studies with a master's degree at Purdue.

Payton started his Air Force flying in Air Training command T-37s

and 38s. From 1976 to 1980, he worked at Cape Canaveral, launching satellites. In 1980, flight and space connected for him once again when he was selected for the USAF Manned Space Flight Engineer Program. In January 1985, he served as

a payload specialist on the space shuttle Discovery, becoming the first Department of Defense astronaut. Since retiring from the Air Force in 1995, Payton has held a variety of positions related to space: NASA's deputy associate administrator for space launch technology (1995-2000), senior vice president for Engineering and Operations, ORBIMAGE (2000-2002); and deputy for advanced systems, Missile Defense Agency (2002-2005). He has held his current post at the Pentagon since 2005.

Payton speaks about the different generations that make up the nation's aero and astro workforce. His "Sputnik generation" is nearing the age of retirement. It is followed by a sector of workers who emerged in the late 1980s during the military build-up of the Reagan administration. And then there are the newcomers.

"I learned how to do engineering on a slide rule and French curves. We've gone far beyond that now," he says. "At the Air Force Academy, my senior-



Gary and Sue Payton in front of a T-37 during a recent air show at Dover Air Force Base

year design project was to design a better version of a rocket engine. Now, cadets are building FalconSat satellites that they then fly in orbit. At Purdue, you have the high-speed wind tunnel. Each brand new graduate is far more capable than his or her predecessor."

Payton and his wife, Sue, are doing their part to help ensure the continued growth of the aerospace industry. They have endowed a merit-based scholarship at Purdue for out-of-state undergraduates studying aeronautics and astronautics.

"Purdue has such a worldwide reputation in engineering and such an attractive curriculum that my wife and I wanted to make it easier for top-talent, out-of-state kids to stay at Purdue," he says. "Throughout the entire aerospace industry, whether in government or industry, there's a real concern about the workforce. This scholarship is part of encouraging people to get into the aero and astro side of engineering so that we can build that workforce." ■ **Linda Thomas Terhune**



Researchers have uncovered evidence suggesting that factors other than genes could cause obesity. A team led by researcher Ji-Xin Cheng, assistant professor in the Weldon School of Biomedical Engineering and Department of Chemistry, found that genetically identical cells store widely differing amounts of fat depending on subtle variations in how cells process insulin. In this image, insulin (green) is present in cells with no fat storage and absent in cells with fat storage at two days after insulin addition. This observation indicates faster insulin processing rates in cells with fat storage. Fluorophore-labeled insulin (green) is visualized with fluorescence imaging, and fat is visualized with coherent anti-Stokes Raman scattering—or CARS—imaging (red/white).

