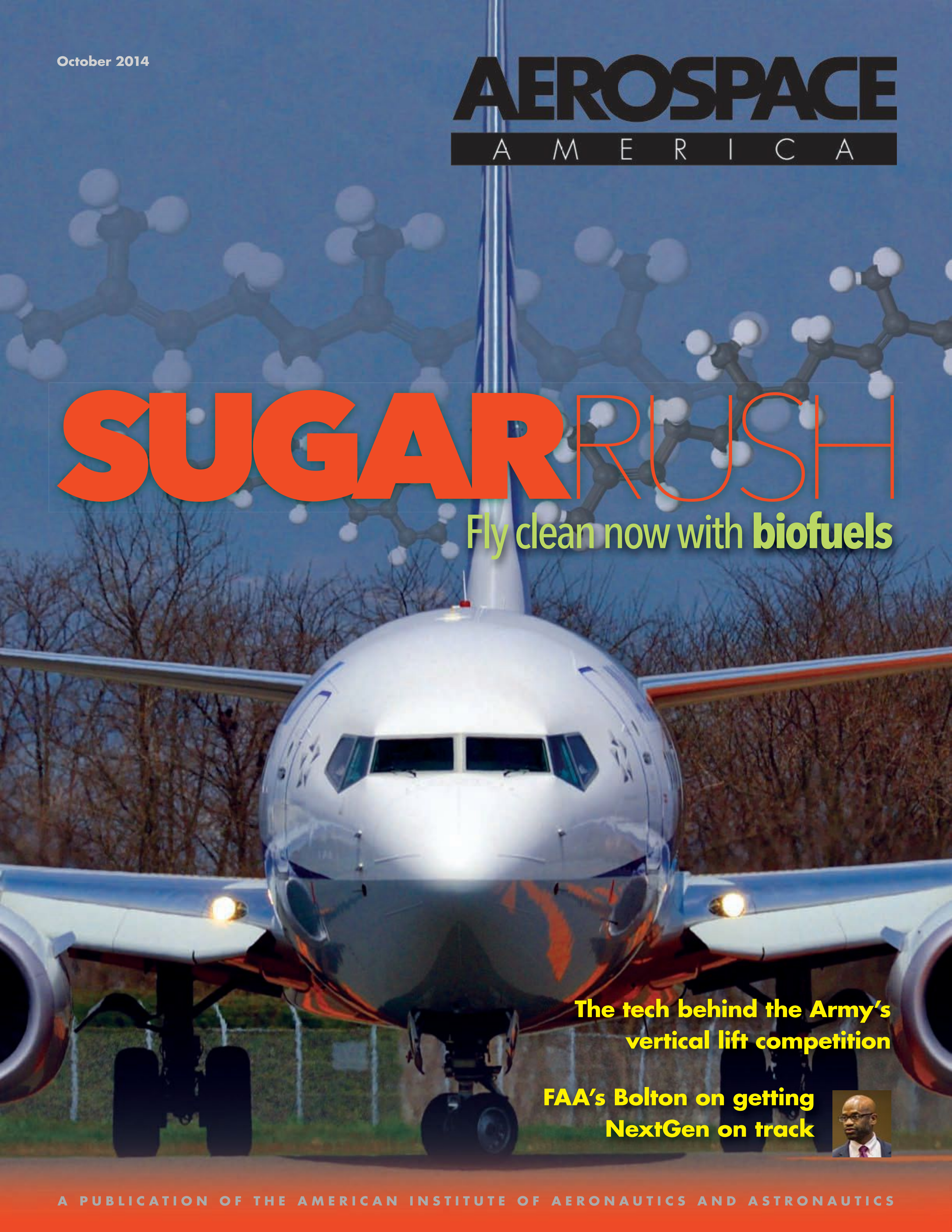
October 2014

AEROSPACE AMERICA



SUGAR RUSH

Fly clean now with **biofuels**

The tech behind the Army's vertical lift competition

FAA's Bolton on getting NextGen on track

A PUBLICATION OF THE AMERICAN INSTITUTE OF AERONAUTICS AND ASTRONAUTICS

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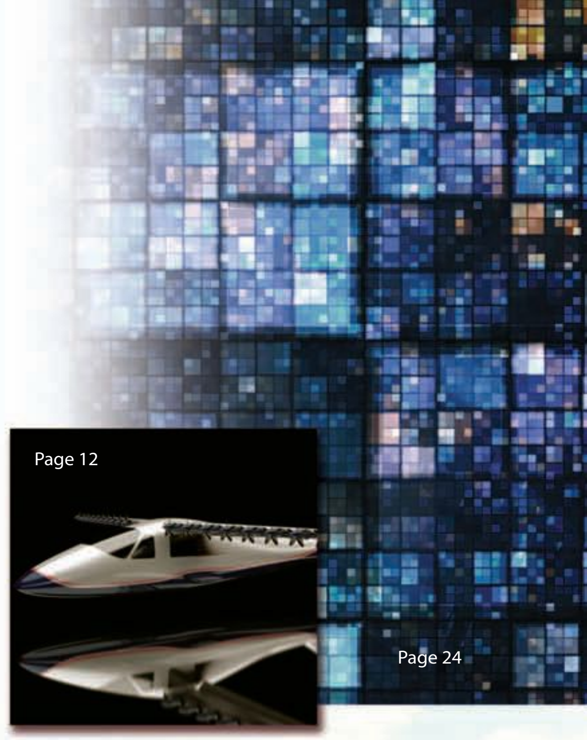
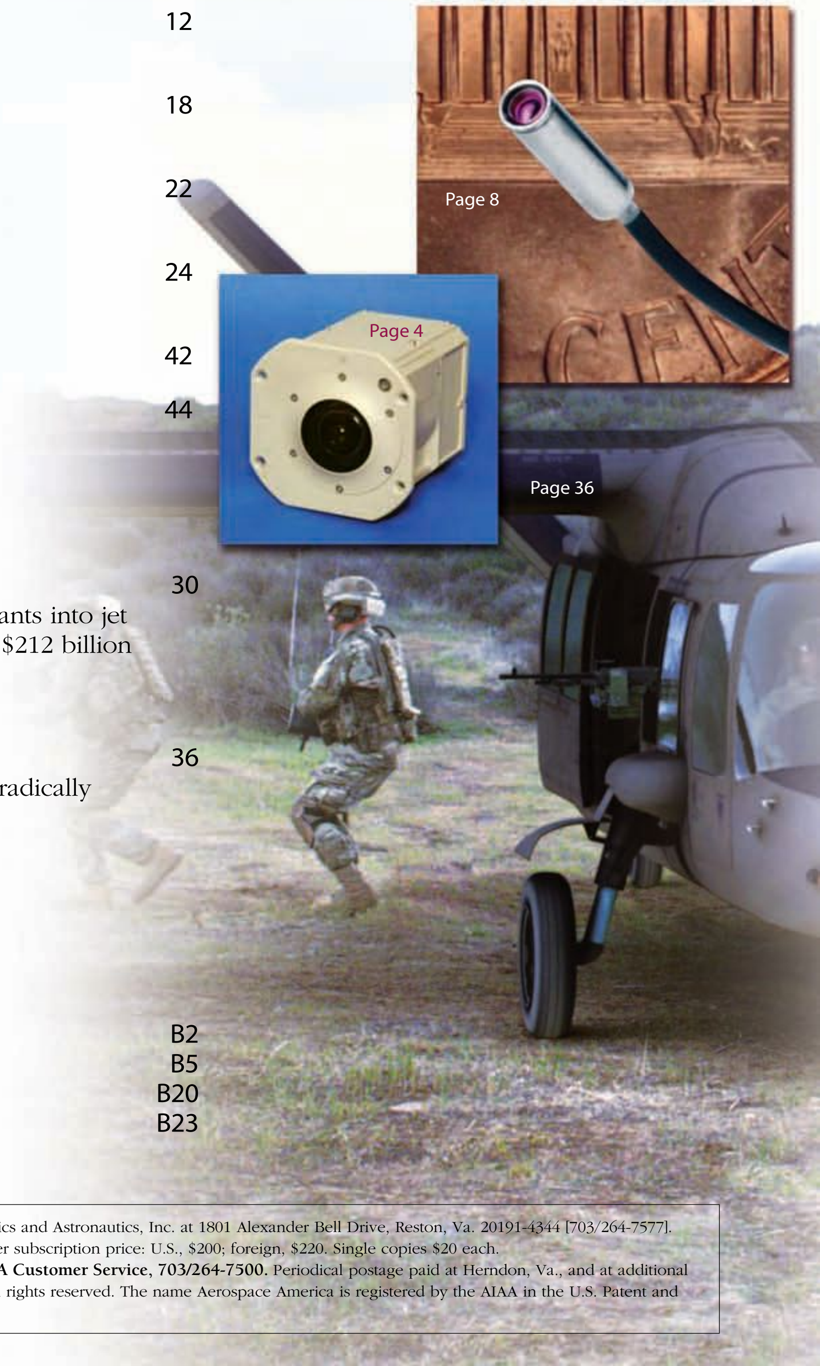
DEPARTMENTS





FEATURES

BULLETIN

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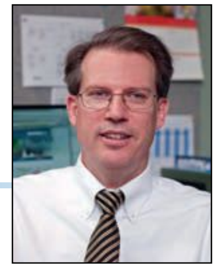
Editor's Notebook



A pivotal era for human spaceflight

When I was a reporter for Space News in the mid-1990s, then-NASA Administrator Dan Goldin turned the tables on me during an interview when the topic turned to human spaceflight. Goldin asked whether I expected the airliners I ride to be owned and operated by the U.S. government. The conversation stuck with me over the years, because I never imagined there might be another way to get astronauts into space.

Here we are two decades later and what seemed like a radical notion — astronauts flying on privately engineered spacecraft — might be just around the corner. NASA has picked SpaceX and its Crew Dragon capsule and Boeing with its CST-100 capsule to tackle that goal, possibly as soon as 2017. In what's either a compromise or truce, deep space exploration will be left to astronauts riding in the forthcoming Orion modules that will be owned and flown by NASA.

One has to wonder whether someday deep exploration could follow the same path as the Commercial Crew program, which would mark a complete transformation for crew services.

If that happens – it's unlikely any time soon — that shouldn't be an argument against a strong role for government in aerospace. It would be another feather in the cap of a private sector that is doing great things, in part, because of decades of government-funded research and development, operational experience and workforce development. The privatization and commercialization we're witnessing are evidence of the highest form of progress, and it's a form that not every spacefaring nation can claim. It's a progress that could be stymied in other areas if we fail to make adequate investments in science and technology.

This trend of parallel government and civil programs is playing out in modified form in areas beyond human spaceflight. It will be interesting to see what happens given the exploding private-sector production of unmanned aircraft and Earth observing satellites. For those Earth observations, it could be harder to envision privately operated satellites meeting the need for a continual, scientific view of our whole planet. The European Union, for example, has its Copernicus Earth monitoring program, which includes a planned constellation of Sentinel satellites to monitor key environmental indicators and aid in disaster relief missions.

All told, I think a few words from the FAA's Ed Bolton about engineers-turned-managers might apply more broadly to human spaceflight. "Engineers have a tendency to want to own the problem," Bolton says in the Conversation feature on page 10. "Managers have to give problems away."

And so, NASA is handing low Earth orbit services to the private sector. 2017 will be a turning point year.

Ben Iannotta
Editor-in-Chief

Aerial refueling for airliners

More sims planned

National Aerospace Laboratory

Simulations with existing planes could be a step toward a futuristic concept in which a giant passenger plane, called a cruiser, would pick up fuel and passengers from a smaller plane, called a feeder. Europe calls the project RECREATE, for Research on a Cruiser-Enabled Air Transport Environment.

Researchers who conducted a detailed simulation of aerial refueling for commercial airliners plan to go back into the simulators in October to demonstrate tweaks to the computer interfaces and procedures for future flight crews.

Experts from the National Aerospace Laboratory in Amsterdam and the German Aerospace Center in Braunschweig are buoyed by preliminary findings from their August 2013 simulation suggesting a potential reduction in fuel costs of 11 percent to 23 percent by refueling planes in midair on long flights instead of stopping to take on fuel. During the study, a flight crew at the Generic Research Aircraft Cockpit Environment research simulator in Amsterdam pretended to fly a current generation airliner while counterparts at the Generic Experimental Cockpit research flight simulator in Germany pretended to fly a current generation tanker. The sites were connected by an Internet link.

Researchers have coined the term "cruiser-feeder" to describe a concept in which initially a smaller feeder plane would deliver fuel from a hub airport to a long-range cruiser aircraft. Researchers are looking at the longer-term challenges of delivering cargo and passengers using the same method.

"All pilots who participated are convinced that the presented cruiser-feeder concept can be implemented and will provide the required level of safety," said Stephan Zajac, an engineer at the National Aerospace Laboratory, which is leading the work. He said the pilots rated the workload to be "comparable with present-day operations" and that improvements to the "human-machine interface and the involved procedures" would be evaluated in a second series of experiments in October.

The simulations are part of the €3.7 million Research on a Cruiser-Enabled Air Transport Environment, or RECREATE, study, which began in 2011. The goal is to see how much fuel might be saved by replacing airport fueling operations with midair refueling. The initial expectation of researchers was that up to 31 percent in fuel use could be saved on flights of 6,000 nautical miles. The European Commission is providing €2.9 million in funding for the project and nine European research organizations are involved in the work. The research has three main objectives: to substantiate that viable and acceptable concepts exist for cruiser-feeder operations; to identify the necessary procedures and facilities to assure airworthiness of these operations; and to confirm that the reported benefits of midair refueling operations are consistent with the refined analysis and high-fidelity simulation.

Commercial airline pilots steered a tanker aircraft and wide-body passenger aircraft in flight simulators to investigate aerial refueling of airliners.

According to Zajac, a conservative estimate of fuel savings possible by refueling an airliner in the air rather than on the ground is more than 21 percent Taking into account the fuel used by the tanker the overall savings possible from the entire operation would drop by 5 percent to 6 percent for a very fuel-efficient tanker to 10 percent or 12 percent using today's aircraft — but that would still leave a minimum 11 percent improvement over current operations with a potential 23 percent improvement possible.

"Traffic simulations are used to assess the benefits on carrier fleet and network level," said Zajac. "Based on these analyses and for a specific historic mix of aircraft and traffic, obtaining a reduction of a total operating cost of 14 percent was found possible. This result shows that an economical benefit can be achieved for the carrier through not only a reduction of fuel cost but also an overall beneficial way of operation, in spite of very high investment costs. This result was not anticipated at the start of the RECREATE project."

The calculations are based on a 250-passenger aircraft with a nominal range of 2,500 nautical miles to 3,000 nautical miles, which can be extended substantially with aerial refueling. The corresponding tanker aircraft has to be capable of delivering 35,000 pounds of fuel and to loiter for four hours.

RECREATE researchers are also looking at the possibility of delivering more than just fuel to future generations of airliners. One strand of work involves researching how passengers and cargo might be delivered to a nuclear-powered ultra-long-range airliner.

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Comet landing to test European tech

Space watchers are expecting high drama when a European Space Agency lander, called Philae, separates from the Rosetta orbiter in November and attempts to become the first spacecraft to make a controlled landing on a comet. The 100-kilogram lander was designed to operate autonomously — the only intervention from Earth will be the command to detach Philae from the orbiter. If all goes according to plan, it will land softly, settle into a stable position and transmit scientific data, possibly for years.

"The main challenge for the Rosetta lander is that we have had to design it without having any good information about the target body," says Stephan Ulamec of the German Aerospace Center, who is project manager for the lander.

"Mass, shape, even the day/night cycle were unclear in the design phase of the lander," he says. "The properties of the surface are still unknown, since one cannot easily derive surface strength from orbiter data. The strategy to cope with this situation was to define an engineering model containing wide ranges of parameters — including some educated guesses — and tests were then performed against these model parameters."

The target is comet 67P/Churyumov-Gerasimenko, which was attractive because it passes through the inner solar system between the orbits of Earth and Jupiter on its 6.5-year orbit around the sun. The Rosetta spacecraft has been closing in on the comet since its launch in 2004.

Philae will extend its three landing legs and touch down on the surface at the speed of a meter per second. The self-adjusting landing gear is designed to ensure that the lander can operate from a level or sloping surface. On touchdown the lander will fire two harpoons into the surface to anchor the lander in place and a cold gas thruster on top of the craft will push Philae gently down on to the surface. Gravitational forces on the comet are so weak there is a danger the lander will tip over or bounce off the surface immediately after landing. Landing legs are equipped with screws under the footpad to fix them in place.

Philae carries nine scientific instruments, including a drill that will reach about 20 centimeters beneath the surface to extract material for examination by the lander's onboard lab. An antenna will transmit data to Earth via the orbiter and it will take 30 minutes for messages to be received.

Analyzing what lies below the surface could help scientists determine whether comets aided development of life on Earth by delivering water and organic compounds.

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The Philae lander, shown in an artist's rendering, is expected to transmit a wealth of data to researchers after it lands on comet 67P/Churyumov-Gerasimenko next month.

European Space Agency

Happening in October:

ICAO preliminary report due on intel sharing

An international task force that's been looking into how governments gather and share intelligence about threats to civilian airliners plans to publish its preliminary report this month to an industry that's eager for change following the downing of a Malaysia Airlines 777-200 over Ukraine in July.

Airlines currently rely on information supplied by their national governments' intelligence agencies to assess the risks involved in flying over conflict zones. The quality and quantity of this information can vary greatly among countries, which has led to calls for a single, reliable source of threat assessment on which all airlines and governments can rely.

"We need an international body to produce industry-wide information," said Nico Voorbach, president of the European Cockpit Association, which represents airline pilots when new aviation regulations are being planned by European Union institutions. Voorbach said "intelligence agencies have been very reluctant to share information but working through ICAO would allow the sources of intelligence to be made anonymous."

Today, ICAO has a threat and risk working group that advises countries about how to develop risk-based threat assessments and national policies around these, but the group's role is not to facilitate sharing of information among members.

Options under discussion for improving sharing would be to develop an intelligence collating and dissemination group within ICAO, perhaps based on the threat and risk working group; set up a new international body at ICAO to do the work; or rely on more regular and formal intelligence sharing mechanisms among national and regional governmental aviation safety bodies, with support from ICAO.

In the wake of the shootdown of a Malaysia Airlines jet over Ukraine, researchers are considering how missile defense systems developed primarily for military aircraft, such as Northrop Grumman's Guardian, can be adapted for civil aircraft.

Northrop Grumman

Because ICAO operates on the basis of consensus, it would take time to vote through substantial changes to ICAO's security work. Therefore, some see the third option, in which ICAO would perform a support role, as one that can best meet the need for an urgent solution.

"In my opinion it is more likely that risk assessments — rather than direct intelligence — will be shared between regional aviation agencies, with ICAO providing the forum for these information exchanges," said Ian Lowden, director of Infrata aviation consultants based in London.

Until a global framework for risk analysis and dissemination can be established, the world's airlines will continue to rely on their own country's security assessments delivered through national Notice to Airmen bulletins. There is also growing political pressure in some countries to actively protect airliners from attack. At the end of July 2014, U.S. Sen. Charles Schumer, D-New York, and Rep. Steve Israel, D-New York, wrote to the Department of Homeland Security, Department of Defense and FAA to ask for a new study to examine whether U.S.-registered aircraft should be equipped with anti-missile devices, such as on-board lasers, warning systems, flares, or infrared countermeasure systems, to protect against both shoulder-fired man-portable air defense systems and surface-to-air missiles. According to the text of the letter: "The Department of State estimates that as many as several thousand MANPADs exist outside state control, including in the hands of al Qaeda."

Directional infrared countermeasures against MANPADs have been tested for civil use and are widely reported to be operating onboard Israeli airliners. But the equipment is expensive to buy and maintain. According to a March 2010 report from the Science and Technology Directorate of the U.S. Department of Homeland Security the cost of The U.S. calculates that equipping and supporting the U.S.-based fleet of 3,636 airliners with anti-MANPAD systems would cost $43.3 billion. Infrared countermeasures are also ineffective against missiles that rely on radar rather than heat emissions for targeting, such as the BUK or SA-11 missile reported to have shot down the Malaysian airliner. These infrared countermeasures also reduce the aerodynamic efficiency of the aircraft, and there are complexities in regulating the safety of essentially military systems on board civil aircraft and problems associated with civil organizations maintaining the equipment.

SAAB

Saab's Civil Aircraft Missile Protection System autonomously detects incoming shoulder-launched anti-aircraft missiles and dispenses pyrophoric decoys to distract the threats.

Even so, companies are improving infared countermeasures with a new generation of lasers that do a better job of jamming a heat-seeking missile's guidance head, plus better trackers and approach warning systems.

Seven years ago, infrared countermeasures were demonstrated as "highly effective and reliable," said Ed Zablocki, technical director for threat management solutions at BAE Systems. "Since then we have advanced their reliability and effectiveness; reliability, for example, has doubled or tripled and the weight and mass has been reduced by a factor of two. There are some substantial reductions in acquisition costs but these are completely dependent on the volume of build."

While most research into cost and effectiveness has focused on adapting current military systems — such as the C-MUSIC system from Elbit; Northrop Grumman's Guardian and Diehl Defence's DIRCM, short for defense infrared countermeasures — there are also new systems designed and developed specifically for civil users. For example, Saab has developed its Civil Aircraft Missile Protection System, or CAMPS, to use the same passive ultra violet-based missile approach warning system as the company's military system, but instead of using military pyrotechnical flares, the system dispenses pyrophoric decoys specifically developed for the civil market.

"CAMPS is also installed flush with the aircraft skin and has a negligible effect on performance," said Peter Liander, marketing communication manager with Saab Electronic Defence Systems.

Even with the improved performance of these systems, many in the industry say that the global response to the downing of MH17 will result in new formal agreements of risk-assessment sharing between governments and the complete avoidance by airlines of airspace where there is any risk of missile attack. For airlines having to operate in these areas, it will be up to individual governments to decide whether or not to equip their national airlines with this new generation of more capable civil anti-missile systems.

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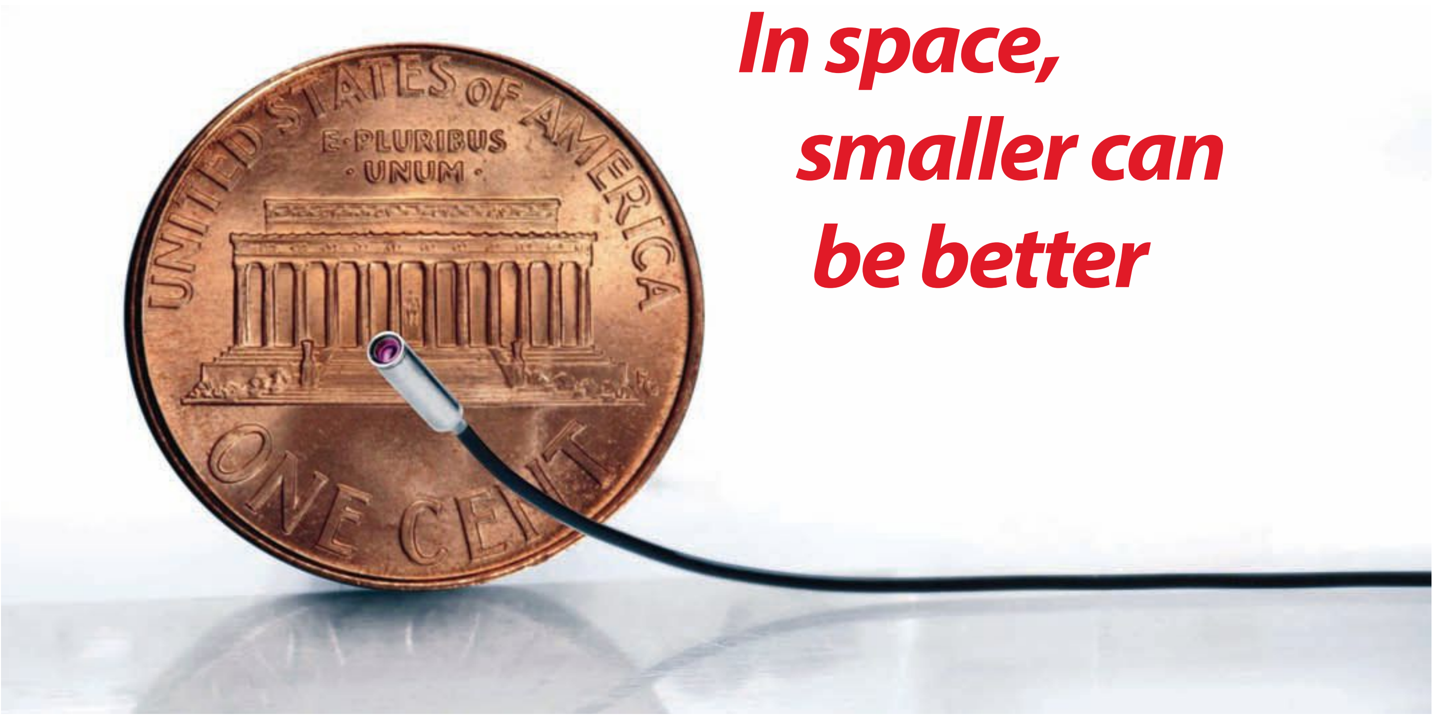
In space, smaller can be better



NASA will incorporate the micro ScoutCam 1.2 into its Visual Inspection Poseable Invertebrate Robot tool for use on the International Space Station.

Medigus

[illegible] a tiny video camera for an experiment aboard the International Space Station, it turned to an unexpected source: the medical device industry.

The micro ScoutCam 1.2, which is thinner than a dime, was originally designed to allow doctors to peer inside the tight confines of a human stomach. Officials at Medigus, the Israeli company that built the device, said they never envisioned their product would play a role in space.

But Medigus packed plenty of picture power into a small package. A key innovation is that some calculations typically done inside a camera's sensor are instead done in a video processor, a separate device. This allowed "our engineers…to reduce the dimensions of the sensor and thus of the entire camera," says Yaron Silberman, the company's vice president of sales and marketing. In addition, the camera's sensor is made in a semiconductor fabrication plant, where small products are the norm. Other components come from suppliers with expertise in miniaturization.

NASA approached Medigus after concluding that the color camera would be well-suited to probing the nooks and crannies of a mock satellite. The micro ScoutCam, which is 1.2 mm in diameter, is attached to a cable and can be rotated up to 90 degrees in four opposing directions. NASA says that while the camera's 0.05 megapixel resolution is not as fine as "today's commercially available digital cameras, which have resolutions on the order of 20 megapixels, this capability is perfect for close-range inspection jobs when the camera is only 1 to 2 inches away from its intended target." The tip of the camera has five differently shaped glass lenses mounted on top of each other, turning "the narrow keyhole view of the camera to a broad 100 degrees field of view," Silberman says.

The micro ScoutCam is one of three cameras on NASA's Visual Inspection Poseable Invertebrate Robot, or VIPIR, delivered to the station earlier this year. VIPIR will inspect the mock satellite as part of a series of tests that could pave the way for NASA to robotically service a real satellite.

While Medigus retained the camera's basic design for VIPIR, it made some modifications to prepare the device for space. For example, it added tiny LED lights to the camera's exterior to ensure the camera's operators on the ground can see what they are doing.

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Buoyed by the Double Bubble

[illegible] over results of the latest wind tunnel tests on a subscale model of NASA's proposed D8 airliner design, and one official expressed growing confidence that the plane's unusual engine placement, tail design and fuselage shape — nicknamed the double bubble — will add up to significantly better fuel efficiency.

To reduce energy consumption, twin engines would be flush mounted in the fuselage's upper aft section, below a tail resembling the mathematical pi symbol. The wide, flat fuselage would reduce drag and provide lift.

Five weeks of tests ended Sept. 8 in a 14-by-22-foot subsonic wind tunnel at NASA's Langley Research Center in Hampton, Va. The exercise confirmed what was learned from a similar round of tests in 2013, but it did so with a more precise set of measurement tools.

Based on an initial analysis of those tests, the flush-mounted configuration used 6 to 7 percent less power to produce the same amount of thrust in a simulated cruise mode than a traditional configuration, such as engines mounted below the wings, said Langley's Rich Wahls, project scientist for NASA's Fixed Wing Project, which includes the D8. The final results will likely be presented at the AIAA SciTech Forum in January in Kissimmee, Fla.

"If the latest results hold up in the final analysis, which I think they will…the results would certainly support further research," Wahls said.

A NASA-funded research team led by the Massachusetts Institute of Technology in Cambridge, Mass., developed the 1/11th-scale model.

NASA has incorporated the D8 concept into a broad set of research activities to find out if an airliner based on its design could be ready by 2035. The goal would be to replace Boeing 737-800s with aircraft that would burn 70 percent less fuel, something engineers know will require major improvements in aerodynamics, engines, structures, and air traffic management.

"There is no single, silver bullet technology to get that large of a gain," Wahls said.

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The double bubble concept is one of the designs NASA is studying for quieter, cleaner, more fuel-efficient airliners by 2035.

NASA Langley

Turning around NextGen

Retired Air Force Maj. Gen. Edward L. Bolton Jr., FAA's assistant administrator for NextGen

After three decades in the U.S. Air Force, including two years at the National Reconnaissance Office, Ed Bolton probably could have landed a big industry job. Instead, this engineer-turned-manager now oversees one of the country's great technical challenges: modernizing the civilian air traffic control system into one based on 21st century networking technology and GPS. In his first year, he has flown with pilots, coordinated with counterparts in Europe, and added fresh management rigor to NextGen's seven flagship hardware and networking programs. He spoke by phone with Ben Iannotta about cybersecurity, congressional oversight setting near-term priorities via a management roadmap due for release in October.

Bolton at AIAA's Aviation 2014 Forum

AIAA

When I first started learning about NextGen, I thought, "Isn't there somebody from the military side who can wrestle NextGen to the ground?" And then I said, "Ah, they've got Ed Bolton, I'm a genius." Well, I guess that remains to be seen.

[Laughs]I'm going to try to make it look like you're a genius

Good. You're the assistant administrator for NextGen. Does that mean you're the program manager?

That's an interesting question. As the assistant administrator for NextGen I have overall responsibility and so I integrate all activities across the agency associated with NextGen. And so, some of the people that work NextGen are program managers. They do not work for me. They're in the ATO [Air Traffic Organization]. Some of the people that work NextGen are engineers. A large portion of those

Interview by Ben Iannotta

folks work for me. Systems engineers; human factors professionals; the entire tech center, about a 1,000 folks, focus not just on NextGen, but focused on testing and modernizing the NAS [National Airspace System] going forward.

How does NextGen compare to what you've done for the military and the intelligence community and are there any lessons you can apply from that?

From a scope perspective, I've run multibillion-dollar programs. And also from a people perspective, I've found that you have some tremendously talented people in the DoD and intelligence community, and you have some tremendously talented people here. And of course the national importance. The NRO and the Air Force are doing critically important missions, and so is the FAA.

Is there some technology in the intelligence community or military that can serve as a template for NextGen?

It's not that literal, but the closest template I can think of is the space ranges, Vandenberg and Patrick [Air Force bases]. It was very, very similar because the space ports are like airports. You had radars, optics, telemetry, command transmitters. You had controllers — people with headsets. In cases where you had the [space] shuttle, I guess you could say you had pilots. And this gets to a question I know you're going to ask — what makes this challenging? At Vandenberg and Patrick, you had to operate and maintain and modernize — all at the same time. That's what we're doing with NextGen.

How did you grasp the problem when you arrived in September 2013?

One of the things that I bring is a fresh set of eyes because I'm not a pilot. Although I ran the Air Force budget, which obviously was a lot about flying, a large part of my experience was not [about] flying. For engineers turned managers, I'd say play to your strength. Don't be afraid to come with a fresh set of eyes and ask questions when things don't make sense, based upon the years of experience. However, I think you need to be open, and you need to have respect for the people who have been there long enough to understand the problem. And, you know, engineers have a tendency to want to own the problem. Managers have to give problems away. No matter how smart you are, no matter how good you are, you're not better than a thousand people.

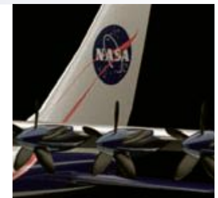
Online, somebody can't post a news story about NextGen without snarky comments like, "Hey, it's been eight years." Has anything been accomplished yet on NextGen?

We first started getting money in the 2009 timeframe, and when you start an acquisition program, you have pre-implementation dollars in which you're taking R&D and turning it into programs. And it takes a certain amount of years for those to come out in the pipeline. We have infrastructure that's being completed — ERAM [En Route Automation Modernization] and TAMR [Terminal Automation Modernization and Replacement], which is going to revolutionize the work environment of the air traffic controllers. We [will start] to see delivery of those capabilities in the '15 and '16 timeframe. And then the seven flagship programs, ADS-B, Data Comm, ERAM and TAMR, TFDM [Terminal Flight Data Manager], Voice [the National Airspace System Voice System] and SWIM [System Wide Information Management]. Those programs will all resolve in the 2018 to 2020 timeframe, except for those that I said would resolve sooner. For ADS-B we had to do 634 ground stations — they were completed in March. We've done a handful of metroplexes [urban regions with multiple airports]. We just did Houston, which had 61 new procedures. We're getting ready to do Northern California, Atlanta and Charlotte next. We decided in the beginning of this year to start measuring them more closely, and so, for those seven programs you have 19 milestones in '14 and '15. We're 10 for 10 for what we're supposed to have done so far of those 19 milestones. And so I would say that you can't put a billion dollars in and get a program in one year, two years, three years. You have to go through a development process.

When you said we've done Houston, what does that mean?

We went from four [flight] entry points to two entry points, and we wrote performance-based navigation procedures which go from zigzag routes to more direct and more curved routes. You can do a specific design for each route you would like an aircraft to choose from. That saves on fuel quite a bit. We expect that's going to save $9.2 million a year in Houston. One of the jump seat rides I did was from National, from D.C., into Phoenix. We used what's called an optimized profile descent. An optimized profile descent allows you to — rather than descending and leveling off, and descending and leveling off, like going down a flight of stairs — put it on idle and then you kind of glide down smoothly, like sliding down a banister. That's a tremendous savings on fuel. I'm told by US Airways officials that they save a million dollars a month in Phoenix alone, using opti-

(Continued on page 15)



The power of electricity

A team of NASA and industry engineers is almost ready to start ground testing a wing and propeller system that could point the way toward the first electrically propelled commuter and general aviation planes.* Ben Iannotta *tells the story of LEAPTech, the Leading Edge Asynchronous Propellers Technology project.

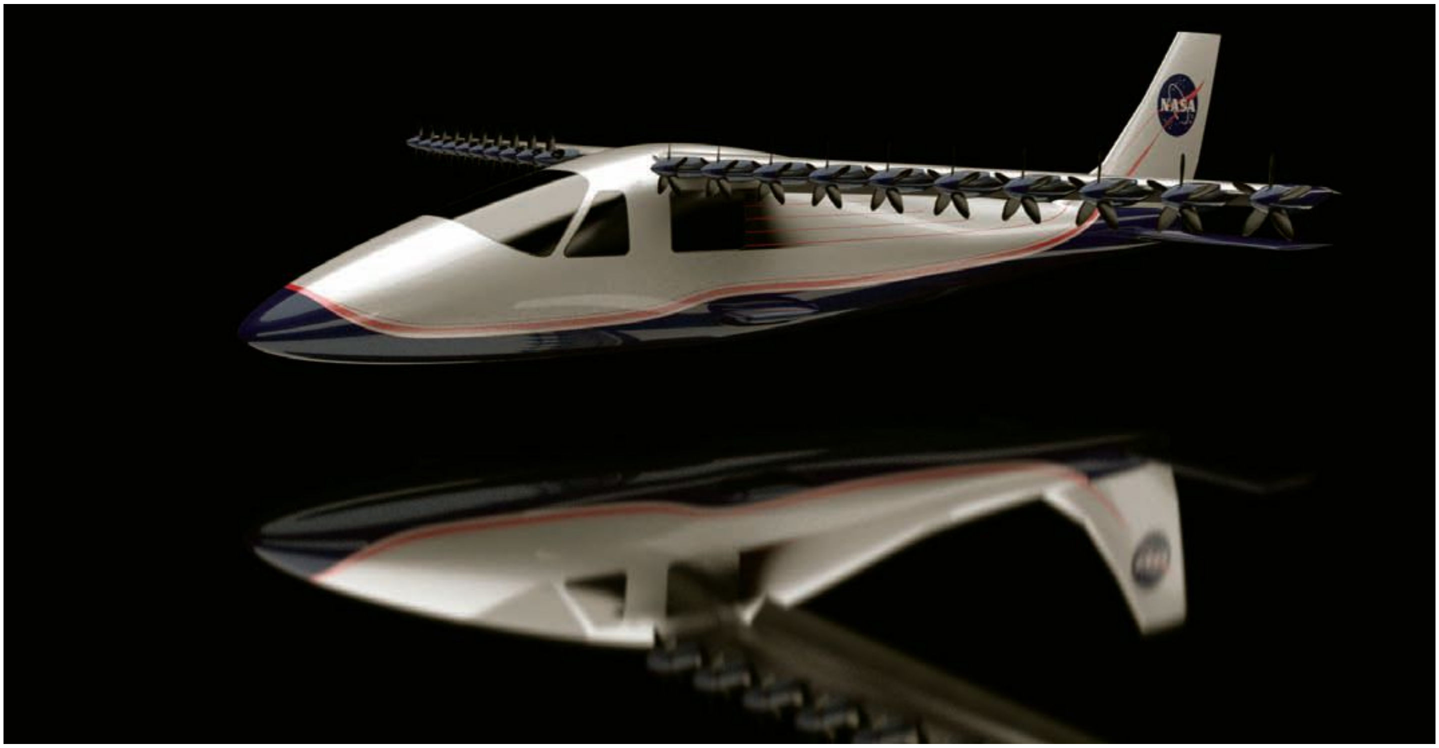
[illegible] a NASA technician will hop in the cab of a large truck and accelerate across a California dry lake bed to a speed of 70 miles per hour, pulling a 31-foot carbon composite wing span attached to a hydraulic jack. The wing will stay on the truck while 18 propellers whirl, powered by motors and lithium phosphate batteries.

The 12,000-foot run is to be the first of many across the dry lake and will mark the start of a new phase of a project called LEAPTech, short for Leading Edge Asynchronous Propellers Technology — asynchronous because each LEAP motor can be operated at a different speed. The researchers hope to show that the noise from all those propellers can be rendered less annoying for people on the ground by running them at slightly different revolutions per minute. The wing, designed by NASA and Joby Aviation of Santa Cruz, Calif., will be laced with pressure and other sensors to measure the effects of the air rushing over it as it is accelerated by the 18 propellers.

LEAPTech is a key element of

Desert runner: This refurbished water truck will carry an experimental wing and electric propellors across a dry lake to simulate various flight angles.

NASA



X-plane: A team led by NASA Langley Research Center plans to convert a conventional Tecnam plane into an electrically propelled experimental aircraft. Joby Aviation

NASA's plan to help the aircraft industry transition to electrically propelled planes, and relatively soon — within 10 years in the case of the general aviation and regional planes LEAPTech will target.

The project represents "a very different way for NASA Aeronautics doing research," says principal investigator Mark Moore of NASA's Langley Research Center in Hampton, Va. "In the past we tended to do these really big projects that take a lot of time. And now, essentially, NASA Aeronautics is pushing to be able to do this rapid, spiral development kind of research. We're the first project out the door to be pushing for this really rapid-style development effort."

The team wants to be flying a piloted X-plane within three years, and to do that it will take the wings and engines off an existing Italian-built Tecnam P2006T — a popular air taxi plane — and replace them with an improved version of the wing they'll test on the dry lake. Engineers can then easily compare the performance of the X-plane with the original P2006T, Moore says.

The dry lake tests at NASA's Armstrong Flight Research Center will be in lieu of wind tunnel tests, because engineers don't want to wait for availability at the National Full-Scale Aerodynamics Complex in California, which has the only tunnel in the U.S. large enough to accommodate their wing.

New freedom

Other aerodynamic and propulsion projects are aiming at incremental overall efficiency improvements of 10 or 20 percent, but LEAPTech's distributed electric propulsion technique could lead to a plane that uses 500 percent less energy to carry the same payload as a conventional P2006T, Moore says.

Leaving off combustion engines gave the team a new design freedom. "It's not that we need 18 electric motors and propellers" because the plane will be electric, Moore says. "It's that we can have 18 electric motors and propellers without any [design] penalties. It would be an absolute nightmare to try to do this with reciprocating or turbine engines. I mean, think about it. You'd have...18 little lawn mower engines, which would be a pain in the butt maintenance-wise."

Moore thinks the X-plane could have a range of about 200 miles flying at a cruise speed of 200 miles per hour. A hybrid version incorporating a combustion-powered auxiliary power unit could have a range of 400 miles.

All the propellers will be needed during taking off and landing, but during cruise 16 of them will be folded up and stowed, leaving a single propeller on each wing tip to provide propulsion. That's possible because the tip motors are more powerful than the others. The aerodynamic environment at the tips is also helpful. "As the wing generates lift, there's vortex that rolls up at the tips that creates this very intense whirlwind, or vortex. By putting the propellers in that vortex, we can dramatically improve our efficiency," Moore says.

The main job of the propellers will be to accelerate the speed of the air by about 50 percent during takeoffs, approaches and landings, when the plane is flying slowest. This means that when the wing is dragged across the dry lake at a top speed of 75 miles per hour in later tests, the air will cross the wing at about 115 miles per hour. This induced velocity will increase the dynamic pressure on the wing — one of the factors determining how much lift a wing can generate. The greater dynamic pressure means the same amount of lift is generated but with a smaller wing, which means a higher wing loading figure. That's the plane's total load (the weight of the passengers and luggage, for instance) divided by wing area. Moore thinks the team can double or even triple wing loading compared with conventional planes of the same size. Higher wing loading is good for two reasons:

- It will spell a smoother ride for passengers in windy conditions. "If you have a smaller wing that is more heavily loaded, when that same gust appears, it doesn't make as much of a change in lift," Moore explains. The quality of ride is "purely a function of how hard the wing is pushing the air down."
- Aerodynamic efficiency is improved, which means regional planes operating from smaller airports will now have "the same high aerodynamic efficiency at high cruise speeds as large commercial transports," Moore says.

Controlling noise

A highly efficient plane won't be of much use if it's too loud to be tolerated by people who live near airports. Engineers will dampen the noise from the propellers in two ways. First, LEAPTech's propellers will spin at up to 6,300 rpm, but this will translate to a tip speed of about 500 feet per second — "far lower than typical propellers that are designed for 800 to 900" feet per second, Moore says. "By being at almost half the tip speed, we're able to have propellers that are about 15 [decibels] lower noise."

The conventional wings and engines of an Italian-built Tecnam P2006T air taxi will be replaced with composites wings and electrically-driven propellers. NASA

Decibel level, it turns out, isn't the only factor that determines how annoyed people on the ground are by aircraft noise. The LEAPTech engineers have found a way to turn the noise into a sound they hope will be less grating. "By running every propeller at a slightly different rpm, we can distribute the noise along the frequency spectra to create a more distributed 'white noise,'" Moore explains.

Measurement challenges

Gaining confidence in the wing's performance will require gathering lots of data, including pressure readings. Enter ESAero, a company of 14 people based at Oceano County Airport near San Luis Obispo, Calif. The company converted an old Peterbilt water truck into a 33,000-pound test rig for NASA, and it is installing pressure and other sensors at 200 locations inside the wing to assess the structural dynamics during the tests.

That was challenging because there's not much room inside the wing. "While the wingspan of the test article is very large, the available internal space is only about the size of a loaf of bread at the center narrowing to about the thickness of your hand at the wing tip," says Andrew Gibson, an aerospace engineer and president of ESAero, by email.

The tight space led to another issue. The wires supplying power to the 18 motors are also inside the wing, and engineers had to figure out how to cope with the threat of electromagnetic interference from them. "Many of the sensors have a very low power output and the EMI being generated had the potential to drown out their signal," Gibson says. "Therefore all of the sensor wiring harnesses were fabricated with a double or triple shield to minimize interference."

Challenges aside, the engineers are reveling in newfound design freedom. "We're answering the question: 'What does that [freedom] do for you?'" Moore says. "The answer is it lets you go to integrations that give you much better aerodynamic efficiency, much better ride quality, much lower noise." December begins the process of proving it.

Ben Iannotta
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(Continued from page 11)

mized profile descent, which is part of Performance Based Navigation, which is part of NextGen.

How does ERAM fit in?

ERAM is [for] the air traffic controllers in the 20 centers across the United States that do the very high routes. It modernizes their work stations. It allows them to input [data] from additional radars. It has better visual displays. The ERAM guys would hand [a flight] off before it would go to a descent. That's more in the terminal than tower area.

How do you set priorities?

We've asked the community through the NextGen Advisory Committee to prioritize the work we're doing. We've come up with four areas that we're focused on — delivering benefits in the one-to-three-year timeframe, and that's PBN [Performance Based Navigation], multi-runway ops, surface ops and Data Comm. And so, stand by: We're going to have a signed, sealed and delivered document by the end of October with a milestone plan for each of those four that will have timelines, milestones, costs and metrics, by location, in which we're going to deliver capabilities that will deliver results and capabilities in the one-to-three-year timeframe.

What's the problem that roadmap solves?

Well, I think, Yogi Berra once said, "If you don't know where you're going, any path will get you there," and so from my systems management and systems engineering background, I'm very focused on having a specific plan. If you're going to remodel your kitchen, or drive to San Diego, planning is a good thing. Planning allows us to first of all decide exactly what work has to be done, put that work in a sequence, add cost to it, make sure that we deconflict the locations, make sure that we have the right personnel assigned to it, and also make sure that we can track and monitor and then redirect energy and effort where appropriate.

Will it be publicly available?

It will be publicly available. It's in response to a Hill tasking. Engineers get all excited about milestones, but the customers care about capabilities and benefits. The roadmap will codify the milestones we need to give capabilities as defined by the customers.

Usually managers kind of chafe, "Oh, all these reports Congress requires."

I don't chafe at it at all. I'm not one that's big for oversight, but what Congress asked me to do is what we have to do anyway to get the work done. The concept was our idea. June of last year Deputy Administrator Mike Whitaker just got into the job. He asked the NextGen Advisory Committee to take the operational improvement areas and prioritize them into tier 1, tier 2 and tier 3 and then further subdivide tier 1 into tier 1A and 1B. We made a commitment at the 20 Feb 2014 [NextGen Advisory Committee] meeting to summarize the tier 1A into PBN, multi-runway ops and surface and, at special request, because of its game-changing nature, we added Data Comm, which is a 1B. Congress then tasked us to put together specific implementation plans.

Have you coordinated with industry and airlines about ideas for reducing cost?

Yes, as part of this NAC priorities [process], several of the ideas that came forward significantly reduce costs. Performance Based Navigation significantly reduces cost. What the airlines are looking for is predictability. On one of the jump seat rides I took, the time on the ticket was 120 minutes. The actual fight time, it turns out, was 80 minutes. Right? So that leaves you 20 minutes on either end — 40 minutes to play with. Where are you in those other 40 minutes? You're sitting on the tarmac. If you can squeeze that time, and then, more importantly, make that time predictable, everyone benefits.

On cybersecurity, can you seal the NextGen window shut to hackers, as the FAA's Michael Huerta put it a few years ago after personnel information was hacked from FAA employees?

[Laughter] I agree with whatever Michael Huerta said.

I didn't mean to pin you down on that.

You've worked cyber, so you've looked into quite a bit.

I have.

So you know you can't seal the window shut. We have an interagency planning office that integrates efforts for the good of NextGen. One of the initiatives they have taken on is to make sure that we are moving forward aggressively in the cyber realm. Kind of the leader in the cyber realm is DoD, and so we have got one of their folks detailed to us in that area. Natesh Manikoth is my chief scientist for software and software engineering, and he is working with the [chief information office] on cyber and cyber initiatives. We understand that it is a concern, and we're putting a significant amount of energy in working to address those concerns.

Is there one prime contractor for that aspect of NextGen?

No, there's not because there's not going to be any aspect of NextGen that's not affected.

On international harmonization, what are the questions that need to be answered so you don't end up in a position where aircraft can't enter each other's airspaces?

My bosses Michael [Huerta] and Mike [Whitaker] have put a priority on harmonization. Our initial focus is on Europe. We've put together a presentation that shows: Here's our emphasis areas for harmonization, and we're required at the NAC meeting, which is a public meeting three times a year, to do a joint briefing on where we are toward checking of milestones. I think a challenge always is to find ways to connect, build relationships, and work well together, and develop continuity. I believe we've done that very well with our European counterparts on SESAR [the Single European Sky Air Traffic Management Research initiative].

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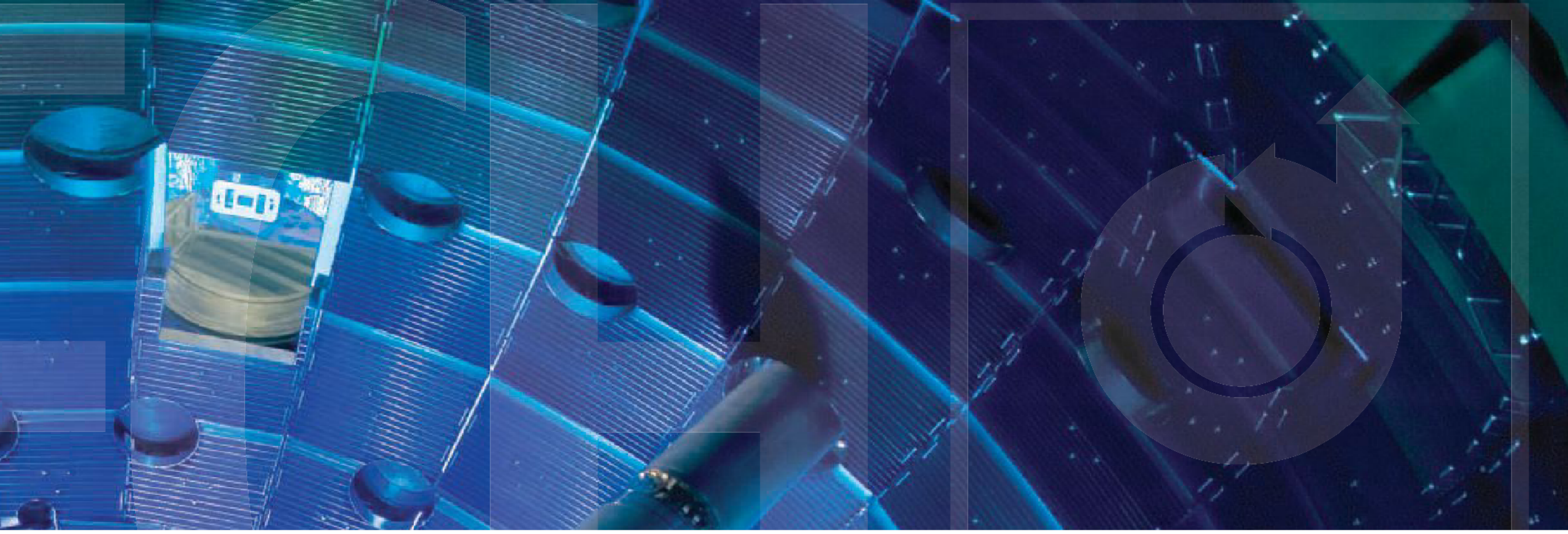
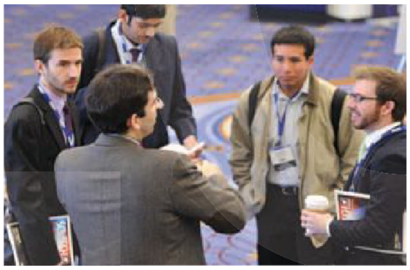
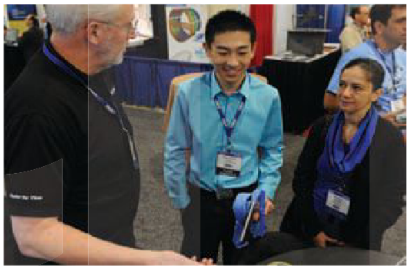
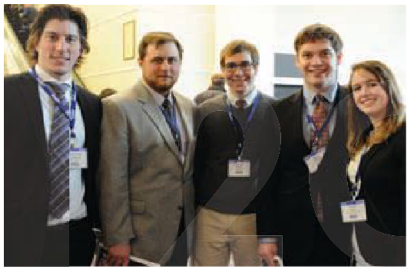
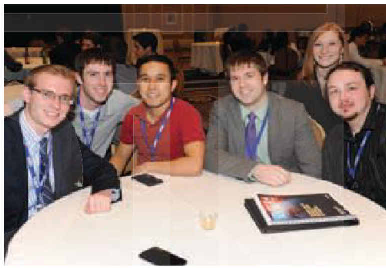






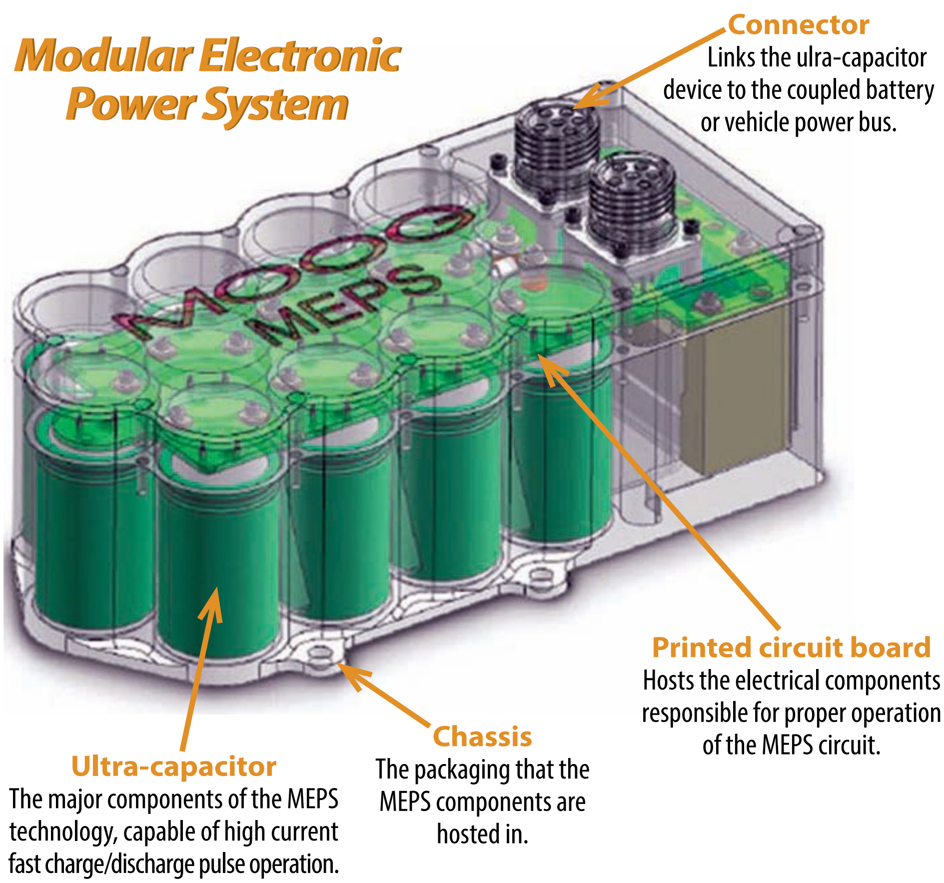




A power system — reimagined

Rocket makers are always looking for ways to shave kilograms out of their designs so they can launch bigger sat-ellites or more payloads for paying customers. Moog engineers Jonathan Kasper and Greg Semrau describe research on a power concept that could do that and possibly much more.

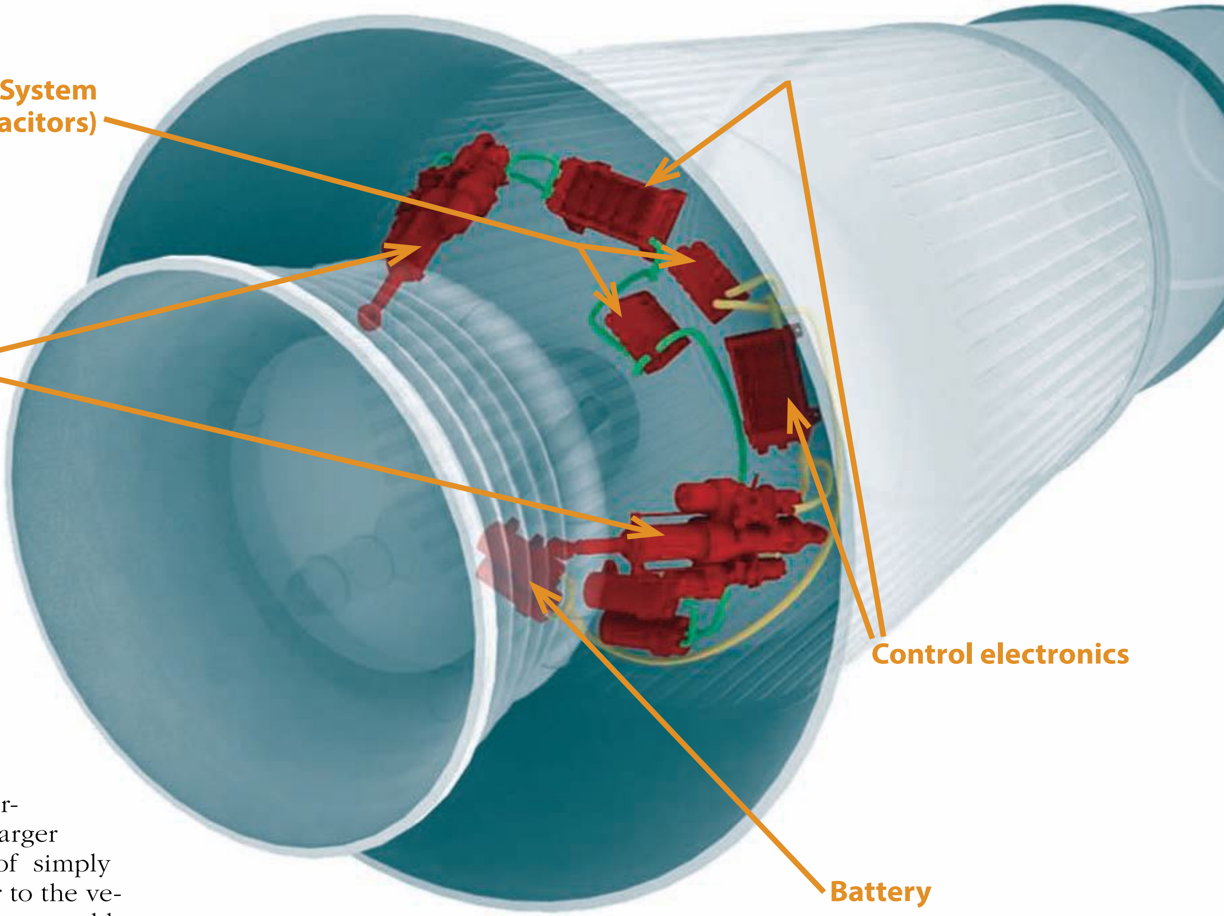
Launch vehicle manufacturers are shifting from traditional hydraulic to new electrically driven motion-control solutions, including versions made by Moog. In these systems, motion arms, called actuators, push and pull on a rocket's nozzles to adjust the direction of thrust during flight. These adjustments are small but they require a large amount of electrical power for a few seconds. The shift toward electric thrust vector control systems has complicated matters for the power system architects who must determine how many batteries a launch vehicle will need to ensure peak power demands are met.



In early 2013, Moog set out to make life easier for system architects by replacing many of the lithium-ion batteries in their designs with ultra-capacitors like those used in the hybrid cars and buses. Ultra-capacitors are a form of double-layer capacitor that uses a nonsolid electrolyte; the separation of charge between electrode and electrolyte provides a means to electrostatically store and transfer energy. Ultra-capacitors act as electric accumulators, accepting current from a source or sources such as a stack of batteries, to deliver electricity to power consuming components. One could think of capacitors as short-term power boosters that are recharged after depletion.

Moog has performed ground tests with a prototype Modular Electric Power System, or MEPS, unit, and the results suggest applications for thrust vector control as well as in the aviation domain, for example to supply power to flight control surfaces of military and commercial aircraft.

Moog's concept calls for combining ultra-capacitors and lithium-ion batteries to form a hybrid system. While the immediate problem being addressed is the power-hungry nature of motion-control systems, we believe this technology will ultimately let system architects in many domains reimagine their design approaches.



Adding ultra-capacitors

Moog's experience shows that motion-control systems are usually one of the most power-dense needs within the larger vehicle system. Instead of simply handing that problem over to the vehicle architects, Moog proposes adding ultra-capacitors to increase the flexibility of the design, which would reduce the number of batteries that must be stacked or packaged together to meet the peak power needs. The weight savings could be as much as 30 percent compared with the power systems that today supply electricity to thrust vector control systems or flight surface control systems.

Currently, the MEPS ultra-capacitors are supplied to Moog by Ioxus of Oneonta, N.Y., which makes them for the transportation industry. The big breakthrough was devising circuitry robust enough to connect these ultra-capacitors to the batteries within a launch vehicle or other aerospace systems. If someone were to simply hook up an ultra-capacitor to a battery, there would be a large rush of current that would destroy the copper wire and circuitry over which the current must flow. Moog has developed a circuit that will maintain each ultra-capacitor in a zero voltage off state until there is a need. The circuitry then modulates the current to prevent overcharging and returns to a passive state for operation.

Moog's innovation does not stop with clever circuitry. Moog used the MEPS endeavor as an opportunity to apply additive manufacturing processes. First, a plastic version of the case for the first prototype was made, and then a titanium version was grown at the Moog additive manufacturing center in East Aurora, N.Y.

The big attraction of ultra-capacitors is that they have roughly an order of magnitude less internal impedance than batteries. This characteristic means that for the same amount of power going through a system, there is less heating within the individual cells that comprise the ultra-capacitor, and therefore a reduced thermal concern for designers. There is also a much greater regenerative energy capture potential because of the voltage flexibility of an ultra-capacitor. Architects using MEPS ultra-capacitors can remove the burn-off resistors in their design, which are necessary because not all energy regenerated by an aircraft's flight control surface, for example, can be directed back to its turbine generator or possibly a battery. This limitation exists as a result of the tight window of upper and lower voltages that designers must stay within when using batteries.

Another advantage for rocket designs is that an ultra-capacitor could be installed adjacent to the control box of its thrust vector control system. That's a lot different than today's architectures in which cables are run 10 or 20 feet from a centralized battery to the control box.

All told, with the use of ultra-capacitors, designers can use smaller, more optimized batteries, and smaller gauge wire between batteries and electrical control boxes. All of which adds to the weight and cost savings of replacing some batteries with ultra-capacitors.

The ultra-capacitors can be used in a centralized system in which the ultra-capacitor would be packaged with batteries, known as a MEPS hybrid module. A second architecture is a decentralized one in which the MEPS ultra-capacitors would be packaged separately from batteries, allowing direct connection to a central vehicle power system — the main wires and electronics running through a satellite, rocket or aircraft.

In either configuration, the MEPS

ultra-capacitors would provide a buffer action, similar to an accumulator, between those loads and the batteries or central vehicle power system. This approach decreases the load placed on the central vehicle power system. Thus, designers could downsize a lot of the components that connect all of the pieces together.

In a very dynamic load situation, think of the battery as a brick with a string and feather tied to it. The ultra-capacitor is the feather, and the blowing wind from a fan is like voltage: The feather's going to blow uncontrollably in response to the load. The battery (or directly connected vehicle power system) is still needed for voltage regulation, because the ultra-capacitor is just like a regular capacitor in the fact that it has limited energy storage capability. Without the battery, the feather simply blows away.

Moog has performed experiments on a thrust vector control inertial load simulator and exercised MEPS under loads in the 300-volt, 300-amp regime. Moog engineers are now in the process of qualifying the technology for flight on launch vehicles.

Rocket applications are just the beginning for MEPS. In the aviation domain, researchers are trying to migrate toward all-electric or electrically driven propulsion systems in addition to electrically controlled flight control surfaces. Moog proposes to insert the MEPS ultra-capacitors and use them as a buffer between the vehicle power system and the load to provide regenerative energy capture capability, as well as reduce the power burden on the vehicle power system. Military aircraft, for example, have a very high peak driven load because of their control surfaces. With the addition of ultra-capacitors, the vehicle power system, instead of being responsible for supplying hundreds of amps, now has a dramatically reduced requirement.

Our engineers have provided a solution for a technical challenge as well as afforded our customers a new level of system design flexibility.

Jonathan Kasper is the project engineer for the Modular Electric Power System research at Moog in East Aurora, N.Y. Greg Semrau is a system engineer at Moog. This article was adapted from a presentation delivered by Semrau at AIAA's Propulsion and Energy Forum in Cleveland in July.

Embedded with astronauts

'Infinite Worlds: The People and Places of Space Exploration'

Reviewed by Natalia Mironova

Photographer Michael Soluri had waited decades to ask an astronaut: "What is the quality of light really like in space?" He got a chance to pose the question to space shuttle mission specialist Michael Massimino in early 2007. Soluri was in Houston to negotiate access for a Discover magazine assignment to take behind-the-scenes photographs of preparations for the May 2009 shuttle Atlantis mission to extend the life of the Hubble space telescope.

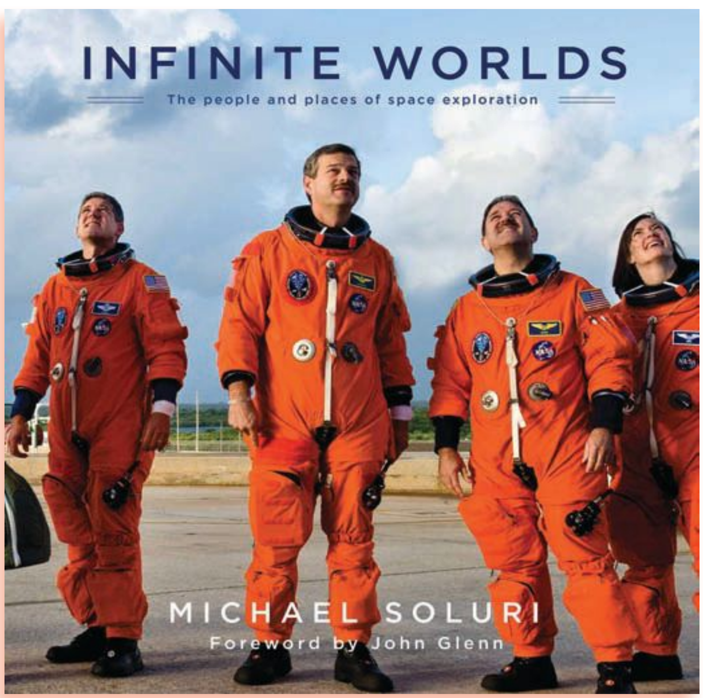
Soluri hit it off with the crew, and viewing himself as an artist more than a photojournalist, he accepted an invitation from the astronauts to continue chronicling their preparations on a volunteer basis and to teach them how to take better photos in orbit.

The result of Soluri's collaboration is a visually arresting book, "Infinite Worlds: The People and Places of Space Exploration," due to be published by Simon and Shuster Oct. 28.

The hardcover book, which I reviewed in pdf form, is a collection of archival images, Soluri's photographs and photos taken by the astronauts during the 2009 mission, tied together by 18 essays by astronauts, scientists and engineers involved in what was to be the last misson to Hubble.

"I was interested in discovering the humanity in these people," says Soluri. "I was trying to find the awe and wonder in what they did."

Soluri was given two-and-a-half years of remarkable access to the crew members as they spent time at NASA Johnson, Kennedy Space Center in Florida and Goddard Space Flight Center in Maryland preparing for the mission. He was allotted 3-hour portrait sessions; given access to astronauts during their suiting up for the mission; and he had a makeshift studio set up at Goddard where he photographed the Hubble extravehicular activity tools as they were readied for the 2009 mission.

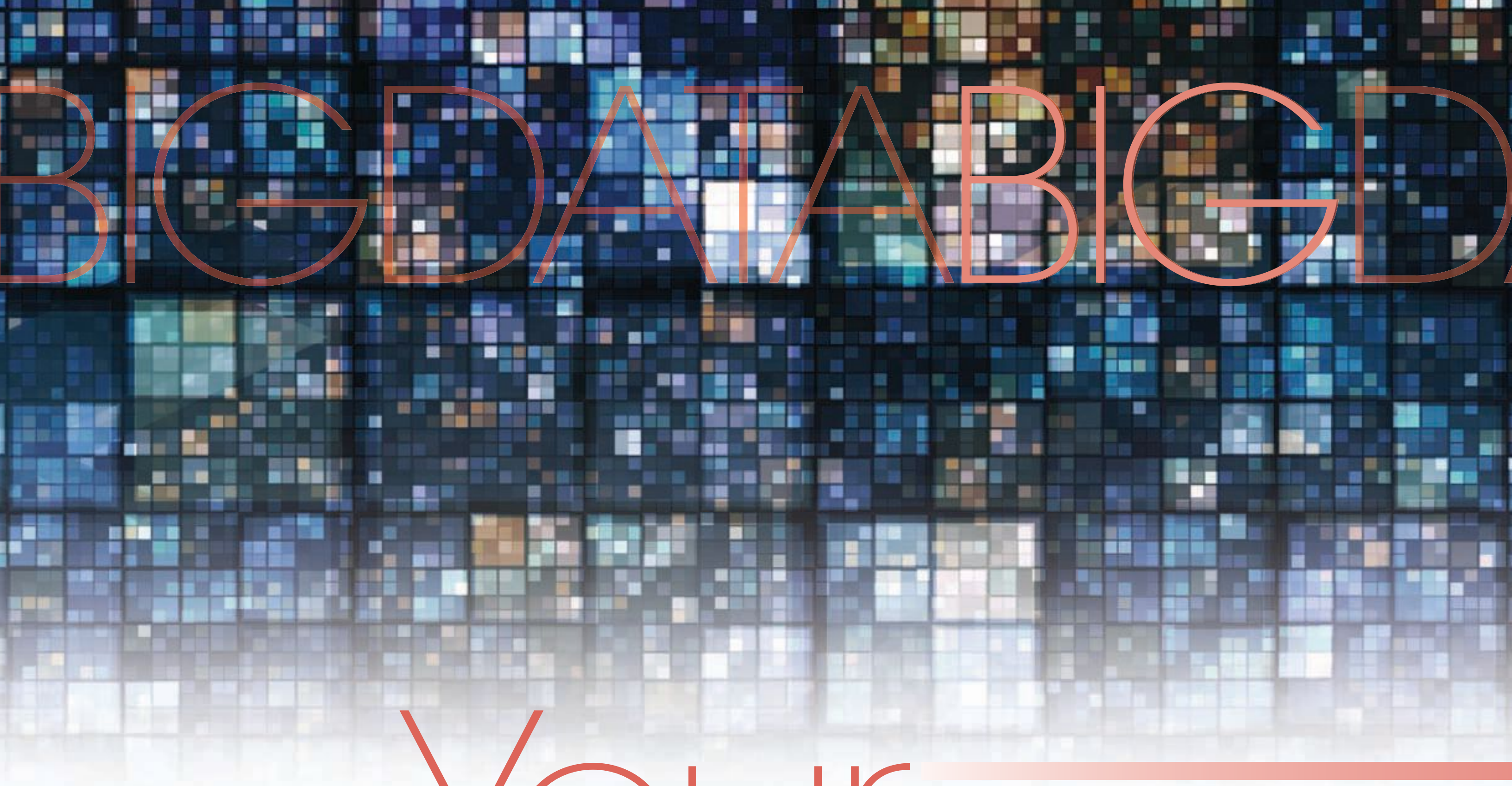


Simon & Schuster

How did he manage such access? Soluri says religiously adhering to NASA protocol helped him gain the trust of the NASA team. "The idea was to convince everybody in the food chain that I get it. So enough people who I got to know simply passed on the word that 'Mike gets it', and then one thing begat another, next thing I know I am in the aft engine section of Atlantis, the next day I am on top of the service tower. It all worked out like that," says Soluri.

He has managed to put a human face on a NASA workforce that's sometimes perceived as clinical and emotionless. His photos show that although astronauts must have the "the right stuff" and can appear super-hero like in their orange flight suits, astronauts are as vulnerable as any of us. Images of each astronaut's clothing and personal effects meticulously laid out on chairs before suiting up are juxtaposed with the starkly-lit portraits of the Atlantis crew. A photograph of the mural drawn by the crew's children before the mission — a tradition that began after the Challenger disaster — reminds the public that these men and women are also mothers and fathers doing a very dangerous job.

Soluri says the essay sections were inspired by Studs Terkel's 1974 book "Working: People Talk About What They Do All Day and How They Feel About What They Do." Terkel's book "was pivotal in how I approached the notion of having essays woven in the book as opposed to me writing. First, it's not up to me to write — I am a photographer. The idea of people writing in their own voices — that was great," says Soluri.



Your secret weapon

Some aerospace and defense companies are applying big data analytics to sharpen their business decisions, improve designs and add autonomy to complicated aerospace hardware. Wise companies will join the revolution, says analytics expert Sam Adhikari.

VIEWPOINT

BY SAM ADHIKARI

The amount of business and technical data available to aerospace and defense companies is exploding. For any major aerospace product, the identities and attributes of thousands of suppliers in a chain spanning from materials to components can now be tracked. The fine details of manufacturing logistics, including tallies of which vendors have how much of a given product and their projected availabilities, can be recorded. The challenge of harnessing all this information — called big data — for operational decision making and strategic insight can at times seem overwhelming. The very point of looking at big data is to analyze and spot patterns that answer questions you did not know to ask: Is a vendor deep in the supply chain going out of business? Is there a developing pattern of critical component failures?

Big data can do that and more. What if you could evaluate, analyze and interpret every transaction? What if you could capture insights from unstructured data? Or detect changing patterns in best value supply channels? What if you did not have to wait hours or days for information?

Wise aerospace and defense companies are fast adopting in-memory high-performance computing, a relatively new technology that allows the processing of massive quantities of real-time data in the main memory of a company's system to provide immediate results from analyses and transactions.

Big data analytics also enables optimal decision making in complex systems that are dynamic and dependent on real-time data. Engineers can use big data in their design work as valuable guidance. Spotting patterns of success and failure from the past data in a dynamic real-time environment brings a new dimension in design optimization. A computer in a rocket using big data can autonomously decide its next course of action by matching patterns from the past that worked. Cybersecurity applications in aviation can use big data predictive analytics to initiate preventive actions to protect an aircraft. Using predictive patterns from the past, an autonomous system can make intelligent decisions in a challenging dynamic environment. Big data analytics can crunch massive quantities of real-time data and reliably balance safety, security and efficiency. Airlines are adopting big data analytics to maximize operational efficiency, minimize cost and enhance security. Computational fluid dynamics systems continue to manage the vast amounts of data generated by current and future large-scale simulations. Aerospace industry, research, and development are impacted profoundly by the big data revolution.

Unfortunately, the potential of big data analytics has not been fully realized. Some executives and managers do not understand how to apply statistical, predictive analytical tools and machine-learning algorithms. In addition, the process of collecting multidimensional data from many sources impacts the quality of massive data sets. The real potential of big data analytics comes from harnessing data sets from diverse sources with unpredictable quality of data. The technique of preprocessing the data to achieve high quality is critical for the success of big data implementation. We are seeing some early pioneers trying to implement predictive analytics by using big data to improve technical and business processes. I'm confident big data usage will eventually reach its full potential.

Aircraft engine diagnostics

Pratt & Whitney, for example, is collaborating with IBM to use its big data predictive analytics to analyze data from thousands of commercial aircraft engines, according to CIO Review. The data is used for predicting and interpreting problems before they occur. Huge amounts of data generated from aircraft engines are analyzed and interpreted with the help of big data analytics, resulting in foreseeing discrepancies and early signs of malfunctions.

Shrewd insights like these can help companies alert customers with maintenance intelligence information and provide intuitive flight operational data at the right time. Reducing customers' costs, a major strategic goal of any company, is accomplished by this proactive real-time monitoring of the state and robustness of customers' engines. In addition, it provides sustained visibility to plan ahead for optimized fleet operations. Applying real-time predictive analytics to huge amounts of structured and unstructured data streams generated by aircraft engines empowers companies to utilize proactive communication between services networks and customers, resulting in critical guidance at the right time. Pratt & Whitney anticipates an increase in its product's engine life by up to six years with the help of big data predictive analytics, according to Progressive Digital Media Technology News. The company also forecasts a reduction in its maintenance costs by 20 percent.

Airline operations

Generally, an airline depends on the pilots for providing estimated times of arrival. If a plane lands later than expected, the cost of operating the airline goes up enormously because the staff sits idle and adds to the cost of associated overhead. On the other hand, if a plane lands ahead of the estimated arrival time before the ground staff is ready for it, the passengers and crew are effectively trapped in a taxiing state on the runway, resulting in customer dissatisfaction and operational chaos. Andrew McAfee and Erik Brynjolfsson, writing in the Harvard Business Review in October 2012, described how a major U.S. airline decided to use big data predictive analytics after determining that approximately 10 percent of flights into its major hub were arriving 10 minutes before or after the estimated time of arrival. Today airlines are using decision-support technologies and predictive analytics to determine more accurate estimated arrival times. Using big data analytic tools and collecting a wide range of information about every plane every few seconds, the airlines and airport authorities are virtually eliminating gaps between estimated and actual arrival times. This requires handling a huge and constant flow of data gathered from diverse sources interfacing various networks. A company can keep all the data it has gathered over a long period of time, so it has a colossal amount of multidimensional information. This allows sophisticated predictive analytics and deployment of pattern matching algorithms with the help of data mining tools, machine learning technologies and neural networks. The pattern predicting and supervised and unsupervised learning algorithms answer the question: "What was the actual arrival time of an aircraft that approached this airport under similar conditions? Given the current condition is slightly different, based on learning algorithms when will this aircraft really land?"

Computational fluid dynamics

According to NASA's "CFD Vision 2030 Study: A Path to Revolutionary Computational Aerosciences," effective use of very large amounts of data generated by computational fluid dynamics will be critical to advancing aerospace technologies. Big data predictive analytic tools have already started analyzing large CFD-generated data sets to immensely improve the overall aerodynamic design and analysis process. With the advent of more powerful computing systems, big data predictive analytics will enable a single CFD simulation to solve for the flow about complete aerospace systems, including simulations of space vehicle launch sequences, aircraft with full engines and aircraft in flight maneuvering environments.

Corporate business intelligence

Today's businesses require fast and accurate analytical data in a real-time dynamic environment. Traditional database technologies cannot cope with these demands for increased complexity and speed. The new computing trend supporting big data analytics in corporate environments is to process massive quantities of real-time data in the main memory of a server to provide immediate results from analyses and transactions. This new technology is in-memory computing. It provides the ability to open up predictive and analytical bottlenecks and enables companies to access existing as well as newly generated or acquired, granular and accurate trend-predicting large data sets. Real-time enterprise computing infrastructure with in-memory business applications modules enables business processes to analyze large quantities of data from virtually any source in real time with fast response time. Big data predictive analytics combined with in-memory computing has had a massive impact on program management, manufacturing, procurement, supply chain management and planning, operations, and aftermarket services. The biggest corporate headaches today are reduced customer intuitiveness and familiarity, missed revenue opportunities, blind spots in the supply chain, and increased exposure to regulatory risk resulting from distributed processes, disparate information and unmanageable amounts of data from diverse sources. Companies are gaining sustainable competitive advantages by effectively managing their big data and associated analytics. Excellence in big data management and analytics enables an organization to improve its ability to sense changes in the business environment and react quickly in real time to changes in trends and data.

Pratt & Whitney

Pratt & Whitney and IBM are reportedly partnering on aircraft engine performance monitoring using big data predictive analytics.

Data mining strategies

Big data has all the characteristics of small data. Data becomes information when it becomes effectively usable. Big data like any other data needs to be clean and consistent. If the data is unstructured, it can be processed into structured data sets with the help of natural language processing and text mining tools. The biggest challenge in big data analytics is dealing with missing or corrupted elements, rows, columns and dimensions. Modern applied statistical data mining tools are employed to remove these anomalies, readying the data for predictive analytics.

Assuming the right choices are made, the next few decades will see enormous big data applications in medicine, business, engineering and science. Aerospace will become intelligent, cost effective, self-sustaining and productive with big data applications.

Sam Adhikari
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Sam Adhikari teaches big data analytics at various universities, performs graduate studies at Stanford University and leads the Intelligent Systems and Informatics Division of Sysoft Corp. of Whitehouse Station, N.J. He chairs AIAA's Software Technical Committee and Aerospace Cybersecurity Working Group and is a member of the Intelligent Systems Technical Committee.

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AIAA is proud to recognize the very best in our industry: those individuals and teams who have taken aerospace technology to the next level… who have advanced the quality and depth of the aerospace profession… who have leveraged their aerospace knowledge for the benefit of society. Their achievements have inspired us to dream and to explore new frontiers.

We celebrate our industry's discoveries and achievements from the small but brilliantly simple innovations that affect everyday lives to the major discoveries and missions that fuel our collective human drive to explore and accomplish amazing things. For over 75 years, AIAA has been a champion to make sure that aerospace professionals are recognized for their contributions.

Michael Werner (right), accepting the Space Science Award at AIAA SPACE 2014.

AIAA congratulates the following individuals who were recognized from July 2014 to September 2014.

Aerospace Communications Award

Peter J. Garland
Director, Advanced Programs
MacDonald Dettwiler & Associates Corporation
Ste-Anne de Bellevue
Quebec, Canada

Air Breathing Propulsion Award

Ashwani Gupta
Distinguished University Professor
Department of Mechanical Engineering
University of Maryland
College Park, Maryland

Energy Systems Award

William E. Lear
Associate Professor
Department of Mechanical and Aerospace Engineering
University of Florida
Gainesville, Florida

George M. Low Space Transportation Award

Automated Transfer Vehicle (ATV) Industrial Team
Airbus Defence and Space Transportation
Bremen, Germany
Award accepted by:
Gilles Debas, ATV Program Manager

Haley Space Flight Award

James H. Newman
Professor, Space Systems
Naval Postgraduate School
Monterey, California

Jeffries Aerospace Medicine and Life Sciences Research Award

Paul Webb, M.D.
Webb Elastic Garments Group
Yellow Springs, Ohio
Award accepted by: Michael Webb

Thank You, Nominators!

AIAA appreciates your time and efforts in preparing the nomination package!

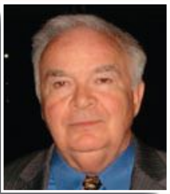
Brij Agrawal
James B. Armor, Jr.
David C. Byers
Mario Caron
Rodrigo Da Costa
Sivaram Gogineni
Edward Hodgson
Scott Jensen
Yiguang Ju
David Lilley
Warren Yasuhara

At AIAA Propulsion and Energy 2014: (Left to right) Roger M. Myers, William E. Lear, and Frederick L. Dryer

Eugene Fleeman (right), recipient of the Missile Systems Technical Award.

James H. Newman (right), recipient of the Haley Space Flight Award.

Michael Webb (right) accepts Jeffries Aerospace Medicine and Life Sciences Research Award on behalf of his grandfather, Paul Webb.



Missile Systems Technical Award

Eugene Fleeman
Consultant
Missile Design and System Engineering
Lilburn, Georgia

Propellants and Combustion Award

Frederick L. Dryer
Professor Emeritus, Senior Scholar
Mechanical and Aerospace Engineering
Princeton University
Princeton, New Jersey

Space Science Award

Spitzer Space Telescope
NASA Jet Propulsion Laboratory
Pasadena, California
Award Accepted by: Michael Werner, Project Scientist

Space Systems Award

Michael Trela
Vice President, Satellite Systems
Skybox Imaging Inc.
Mountain View, California

Von Braun Award for Excellence In Space Program Management

Frank Cepollina
Associate Director
Satellite Servicing Capabilities Office
NASA Goddard Space Flight Center
Greenbelt, Maryland

Wyld Propulsion Award

Roger M. Myers
Executive Director, Advanced In-Space Programs
Aerojet Rocketdyne
Redmond, Washington

AIAA
Shaping the Future of Aerospace

BIOFUELS NOW

Amyris partnered with Brazilian airline GOL to fly the first international commercial flight using farnesane, the recently approved renewable jet fuel. GOL committed to fly its Boeing 737 fleet with up to a 10 percent blend of the renewable farnesane fuel starting with this initial flight.

by Debra Werner

Yeast microorganisms can be genetically engineered to consume sugar and excrete a long-chain hydrocarbon called farnesene. The beauty of farnesene molecules is that they can be created from renewable sources and burn cleaner than today's kerosene jet fuels and yet release the same amount of energy. On July 30, a Boeing 737 took off from Orlando Interna-

Companies are learning how to turn sugar and alcohol derived from plants into jet fuels, and at costs low enough to capture a portion of the estimated $212 billion a year global market. Debra Werner examines the way three firms are approaching that challenge.

Amyris

tional Airport powered by a fuel consisting of 10 percent farnesane — the biofuel derived from farnesene molecules — and 90 percent conventional fuel. The plane, operated by the Brazilian airline GOL, landed uneventfully in Sao Paulo, in what the fuel maker says was the first international commercial flight to use a sugarcane-derived biofuel.

So far, only farnesane and a fuel made from vegetable oil and another made from coal, natural gas or biomass — dead plants and sometimes animals — have been approved for use in airliners. Companies around the world are scrambling to develop many more in hopes of carving a profit by helping airlines meet bold emissions goals set by the International Air Transport Asso-

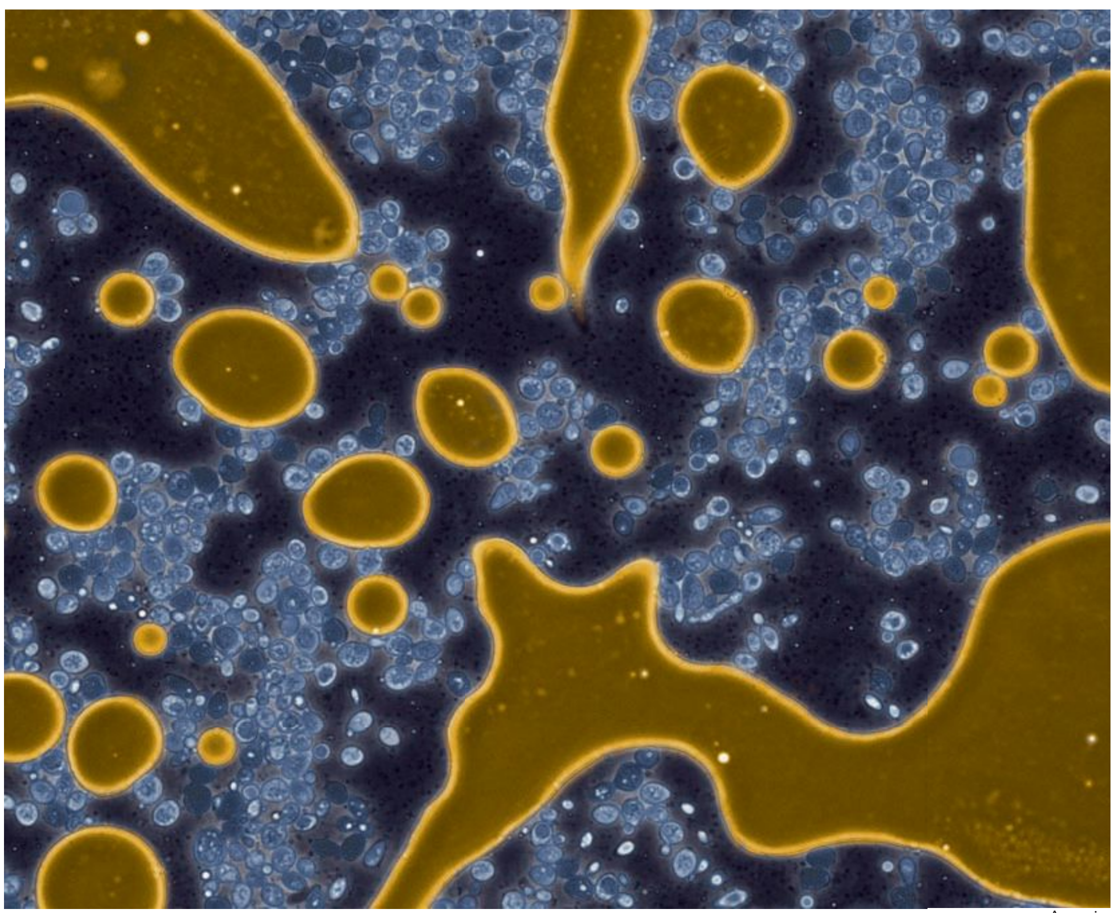
ciation. IATA plans to cap carbon emissions from aviation by 2020, and begin reducing them thereafter, until by 2050 emissions are slashed to 50 percent below their 2005 level. In the U.S., FAA Administrator Michael Huerta has challenged U.S. airlines to use 1 billion gallons of alternative fuel by 2018.

Winning approval to put a strange new fuel into an airliner full of people does not come without effort. Airlines, regulators, equipment manufacturers and standards bodies must be convinced that alternative fuels won't freeze, foul fuel systems or make hardware wear out more quickly. In short, they want alternative fuels that behave nearly identically to petroleum-based fuels. Fuel producers can only prove that by running synthetic fuels in actual planes with engines, tanks and fuel lines, and that is turning out to be a big hurdle in adoption of alternative fuels.

"You can't just go to a shop and say, 'Can I borrow your 747 for my testing?'" says Fernando Garcia, the senior director for scientific and regulatory affairs at Amyris, the Emeryville, Calif., company that made the farnesane for the 737 that landed in Sao Paulo. Amyris is marketing the fuel along with the French energy giant Total. "Renewable fuel companies accept that we have to fund the validation, but access to stakeholders, equipment and funding to compensate these stakeholders for equipment was a huge challenge and will continue to be a huge challenge," Garcia adds.

Amyris solved this problem by partnering with Boeing, Embraer and General Electric, who agreed to test the fuel on the ground and in the air. The Sao Paulo flight concluded a two-year campaign by Amyris and Total to earn a nod from the standards group ASTM International, formerly the American Society for Testing and Materials. ASTM works with FAA and other regulatory authorities around the world to establish voluntary, consensus standards. In 2007, the group established criteria for evaluating and testing synthetic fuels, which are derived from a variety of substances, including plants and animals. Conventional jet fuels are made by refining petroleum crude.

ASTM gave its stamp of approval in 2009 to a fuel made by extracting carbon monoxide and hydrogen from coal, natu-

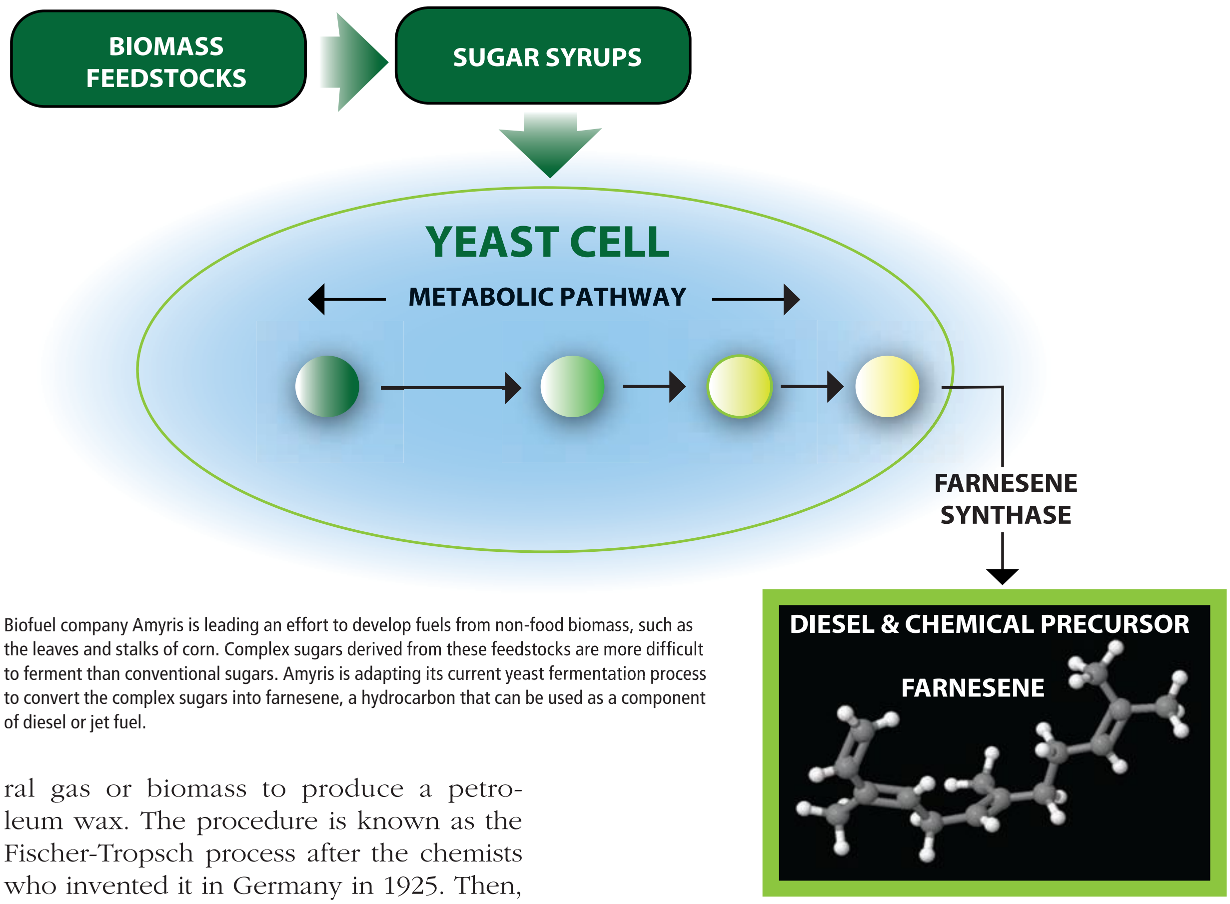


Farnesene, shown here under a microscope, is a long-chain, hydrocarbon molecule. Advocates say a 10 percent blend of farnesene-derived fuel can reduce greenhouse gas emissions by up to 80 percent compared to petroleum fuels.

Amyris

Sweet path to power

The fermentation of sugars



Biofuel company Amyris is leading an effort to develop fuels from non-food biomass, such as the leaves and stalks of corn. Complex sugars derived from these feedstocks are more difficult to ferment than conventional sugars. Amyris is adapting its current yeast fermentation process to convert the complex sugars into farnesene, a hydrocarbon that can be used as a component of diesel or jet fuel.

National Advanced Biofuels Consortium

ral gas or biomass to produce a petroleum wax. The procedure is known as the Fischer-Tropsch process after the chemists who invented it in Germany in 1925. Then, in 2011, ASTM added vegetable-oil-derived fuels, known as hydroprocessed esters and fatty acids, to its list of sanctioned fuels. Both the Fischer-Tropsch and vegetable-oil-based fuels can be used in blends as high as 50 percent with traditional jet fuel.

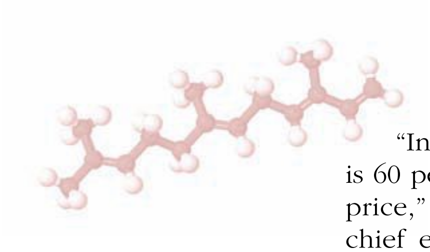
Today, it's hard to make synthetic biofuels cheaper than petroleum fuels, because they are not yet produced in large enough quantities to bring down the cost. The goal of synthetic fuel makers and airlines is to achieve a cost similar to that of petroleum fuels. Also, airlines hope the new fuels will mean fewer price swings, since production of them is tied to fewer geostrategic variables.

"The increasing and fluctuating price of oil has been a real headache for the aviation industry," says Steve Csonka, executive director of the Commercial Aviation Alternative Fuels Initiative, a coalition of airlines, aircraft and engine manufacturers, energy producers, government agencies and researchers working to promote alternative jet fuels.

Worldwide, airlines devote roughly one-third of their operating costs to fuel — approximately $212 billion in 2014 — making that market a tempting target for alternative fuel developers.

"The aviation sector is viewed as one of the best targets for biofuels," says Tom Richard, director of the Penn State Institutes of Energy and the Environment. Aircraft around the world don't consume as much fuel in total as cars, trucks and trains, but "the aviation sector has shown a lot of interest in moving away from petroleum fuels."

Airlines are seeking safe, inexpensive, high-energy density fuels that work in existing turbine engines. Companies trying to derive those fuels from sugar or by fermenting sugar into alcohol must find inexpensive supplies of plants and the technology to turn massive quantities of this raw material or feedstock into fuel.



"In any fuel, the cost of the feedstock is 60 percent to 75 percent of the final fuel price," says Kevin Weiss, president and chief executive of Byogy Renewables of San Jose, Calif. "You need abundant supply and it has to be cheap."

Byogy thinks it has found a promising feedstock in the agave plant, best known as the succulent used to make tequila. In June, Byogy announced a strategic partnership with AusAgave Australia, a company that specializes in maximizing the yield of various types of agaves used to produce sugars and fibers. AusAgave has demonstrated that it can derive up to two times more sugar from agave than from sugarcane by planting specific types of agave in well-drained soil, preventing disease and harvesting the plants at just the right moment, Weiss says.

Byogy's goal is to produce a synthetic stand-alone jet fuel that can be burned in existing engines without blending in kerosene. Using giant vats at its facility in Bryan, Texas, Byogy produces ethanol from a variety of crops, including agave, sugarcane, corn, sweet sorghum, cassava and sugar beets. The company then dehydrates the alcohols to make ethylene, which is then piped into a petrochemical reactor. Here, the ethylene comes into contact with metal catalysts that transform its molecules into a hydrocarbon needed for liquid fuels.

The U.S. Air Force and a partnership formed by British Airways and Rolls-Royce conducted extensive testing of Byogy's alcohol-based fuel with funding from the FAA's CLEEN program, short for Continuous Lower Energy, Emissions and Noise. Rolls-Royce analyzed the fuel's compounds, material properties and performance, aromatic content, emissions, and thermal stability, and tested the fuel in auxiliary power units and engine rigs.

"We have already gone through 80 to 90 percent of the testing we need to achieve a global ASTM certification," Weiss says.

Obtaining that certification is an arduous process. Synthetic-fuel developers compile voluminous data on fuel properties, composition and performance. Typically, airframe, engine and auxiliary-power-unit manufacturers put the fuels through a variety of tests: Engine components are soaked in the fuels to make sure the fuels don't corrode them; fuels are run through pumps and nozzles to make sure they don't gum up the works. Only by passing those exams can synthetic fuels make their way into full-scale engine testing, including cold start tests, ignition testing requiring the engine to relight at altitude, and acceleration and deceleration tests. Tests might be done at government labs or at Airbus, Boeing, GE, Pratt & Whitney or Rolls-Royce.

Gevo of Englewood, Colo., has completed that lengthy process and compiled hundreds of pages of test results in its data report seeking to establish an ASTM specification. The company hopes to win approval in early 2015 to begin selling its synthetic fuel commercially in a 50 percent blend with traditional jet fuel. Down the road, the firm hopes to prove that the fuel can be used alone. "We are a drop-in jet fuel," Johnston said. "But the industry has used kerosene for eons and engine manufacturers want to start with a 50 percent blend."

Gevo uses genetically engineered yeast biocatalysts to ferment sugar from corn, wheat, sorghum, barley, sugarcane or ined-

Under controlled conditions, agave plants can yield twice as much sugar as sugarcane, potentially lowering the cost of the raw materials needed to produce synthetic fuels.

Blue Agave Farms

ible cellulosic plants to produce isobutanol, which it then separates from the fermentation broth.

"We've made truckloads of fuel and conducted extensive testing with original equipment manufacturers, major airlines and the military," says Glenn Johnston, Gevo's vice president of regulatory affairs.

The 50-50 blend has been ground tested on General Electric F414 engines, the kind used on F/A-18 jet fighters. Late this year, the Navy plans to load the blend onto F/A-18s and fly them over the test range offshore from Naval Air Station Patuxent River in Maryland. The U.S. Air Force conducted similar tests with A-10C ground-attack aircraft in 2012, and the U.S. Army followed suit in 2013, using the isobutanol fuel to power UH-60 Black Hawk helicopters.

So far, the hurdles to adopting alternative fuels haven't quelled excitement in the industry. Amyris plans to trim the cost of farnesane by improving the yield of its fermentation process and expanding manufacturing. Company executives are wrestling with the question of whether to expand farnesane production ahead of demand or to pursue demand in the hopes that they will be able to respond quickly.

"The technology does scale up well but there are economic challenges and lead times to ratchet that capacity up," says Garcia. "We are seeking launch partners to serve as the base for our manufacturing." Amyris is enticing early adopters with favorable terms for multiyear contracts.


US Navy

Navy F/A-18 Super Hornets will fly with a 50-50 blend of synthetic and conventional fuels in tests scheduled for later this year.

Future

Top American rotorcraft makers are anxious to square off with radically different approaches to the problem of

The competition to develop what will be the first clean-sheet design of a new rotorcraft for the U.S. military since the 1980s has come down to two teams with radically different approaches to outperforming today's rotorcraft, including the V-22 tiltrotor.

For rotor heads and engineering types, it doesn't get better than the demonstration flights planned for 2017 by a team headed by Bell Helicopter and by a rival team headed by Boeing and Sikorsky. The demonstrations hinge, though, on the Army completing talks with the companies and the Army leadership giving its blessing.

The Defense Department has challenged the competitors to prove capabilities that are unheard of in today's production rotorcraft — the ability to fly as far as 900 miles without refueling and at speeds of 265 miles per hour while carrying soldiers and cargo that would today be hauled by the UH-60 Black Hawks or weapons that would be flown by AH-64 Apaches. Bell, with Lockheed Martin contributing electronics, is developing the V-280

By Keith Button

rotorcraft

flying farther and faster, writes Keith Button. Success could buoy a rotorcraft industry that's clamoring for new starts.

Valor, a tiltrotor design that will be a modern take on the Bell Boeing V-22 Osprey designed in the 1980s. Tiltrotors gain speed and range by transitioning from helicopter mode to airplane mode once they are airborne. Boeing and Sikorsky, however, favor coaxial rotors. Their demonstrator, called the SB-1 Defiant, will have two rotor blades that will spin in opposite directions on the same axis, maximizing lift without the need for a tail rotor to counteract torque, while a rear propeller provides additional thrust while in forward flight. The design is based on an experimental coaxial helicopter called the X2 that Sikorsky started flying six years ago.

At stake in the 2017 demonstrations is the U.S. Defense Department's goal of affordably replacing Army Black Hawks, Apaches and similarly sized helicopters in the other military branches with higher performing aircraft that would have lower operating and maintenance costs. The V-22 is a heavier class of aircraft, and replacing that fleet is not a goal of the demonstrations.

Bell Helicopter

Artist's rendering: The Bell Helicoptor V-280, with electronics supplied byLockheed Martin, will vie against a Boeing-Sikorsky dual rotor coaxial design.

US Navy

The V-22 Osprey tiltrotor provides the Marine Corps and Air Force with an aircraft that combines the vertical-lift characteristics of a helicopter with the superior range and speed of an airplane.

The Army and its contractors must convince doubters that this initiative won't be a repeat of false starts like the Comanche reconnaissance helicopter program cancelled in 2004.

"We enter any kind of new program like this, especially from a vertical lift perspective, with a stigma – huge stigma – attached to us," said the Army's Dan Bailey, speaking at an American Helicopter Society International event in September. Bailey said the Army and contractors will need to "build a case as a community."

Bailey is program director for the competition — formally called the Joint-Multi Role Technology Demonstrator program — and the Future Vertical Lift acquisition program that would follow it. The two demonstrators are meant to prove concepts that might eventually be incorporated into new helicopters for any of the services. Although the Army isn't calling it a fly off, the demonstrator aircraft will help the Army evaluate two distinct approaches to replacing the approximately 4,000 medium-sized helicopters in service today, mostly the Apaches and Black Hawks but also aircraft flown by the U.S. Navy and Marine Corps.

The Future Vertical Lift aircraft would be fielded by 2034, but industry experts say the Navy may be shooting for an earlier fielding date of around 2025, and the industry is anxious to move the dates forward. Bailey said that could be done if Congress provides the procurement funds to do so.

The rotorcraft engineering work force has been re-energized by the leap in range and speed the military is after. Black Hawks and Apaches typically cruise at 130 knots, or about 150 miles per hour, but the Army is looking for 230 knots — 265 miles per hour — or better.

Out of four teams, the Army in July selected the Bell team and Boeing-Sikorsky, industry officials say, although as of September the Army had not announced the selection. "Unfortunately, that path forward requires us to do some work with our industry partners and our Army leadership to ensure we can proceed down that path," Bailey said. The other two competitors, Karem Aircraft of Lake Forest, Calif., whose founder developed predecessors of the MQ-1 Predator unmanned planes, and AVX Aircraft Co. of Fort Worth, Texas, will not have their designs considered, but industry officials suspect they will continue developing certain technologies in the demonstrator project.

The Bell and Karem proposed designs are similar to the V-22 in key respects: Dual rotors tilt up for hovering and vertical takeoff and landing, and they tilt to horizontal for forward flight, with static wings providing additional lift. Some consider the Karem design more of a risk because the company is relatively small and young — founded in 2004. The Boeing-Sikorsky and AVX designs have compound coaxial rotors — two rotors stacked on top of each other. In the Boeing-Sikorsky design, the rotors provide lift and forward flight, and a rear-mounted propeller provides rapid acceleration and deceleration. The AVX design uses

Sikorsky built the experimental X2 to investigate the utility of a modern helicopter with coaxial rotors and a pusher propeller.

Sikorsky

two side-mounted ducted fans — shrouded propellers — for propulsion with the coaxial rotors providing only lift in cruise flight. Ducted fans typically are quieter and can rotate faster than uncovered propellers, but are more complicated technically.

Keeping the Karem and AVX teams involved and working on unique parts of their designs is seen by some industry officials as a wise strategy for Army managers.

"They've made a compromise, which is a good one," an industry expert says. "They've pushed forward two [designs] that are pretty disparate, in terms of their solutions, and they keep going forward on the other two, which are perhaps higher risk, more novel configurations, asking them to push forward the unique parts of their technology."

Which of those technologies will be carried forward is not clear. AVX says its design has 80 percent of a tiltrotor aircraft's speed at less than half the cost of a V-22. Industry officials say the tiltrotor design's advantages are in long-distance flight and speed, while the coax design is easier to hover and maneuver in vertical takeoff and landing mode.

Another consideration for designers was how the Army executes its missions and the characteristics an aircraft would have for carrying and deploying soldiers, such as accommodating rope-rappelling from a hover, says Chris Gehler, business development manager for Bell Helicopter.

With its fixed wings and tiltable rotors, the Bell V-280 is designed to cruise at about 320 mph and fly more than twice as far as the latest version of Black Hawk utility helicopters and three to four times as far as Apache attack helicopters. As for vertical capabilities, Black Hawks and Apaches can hover fully loaded at 6,000 feet in 95-degree weather, which is the performance level the V-280 will start at.

Range-wise, current helicopters have top out at 250 nautical miles, or nearly 290 statute miles, while the V-280 will have a range of between 500 and 800 nautical miles, or 575 to 920 land miles, Gehler says.

"That's what's drawing the Army and DoD to the platform; it's because the performance is that good," he says. "The question, from their standpoint, is whether or not it performs well in low-speed hover and agility."

So, the focus for the Bell team has been to reduce the weight compared with the V-22 and improve the low-speed agility and hover performance, along with reducing downwash — the downward blast of wind that can make matters difficult for troops boarding or exiting the aircraft, including rope exits.

One of the main differences between the V-280 and the V-22 is how the rotors tilt. With the V-22, the engines rotate with the rotor system. In the V-280, just the gearbox and mast with the rotors rotate, while the engine remains fixed, and in a higher position than on the V-22. That allows for clear fields of fire for troops exiting the aircraft through side doors under the wings. With the V-22, the entire engine rotates and hangs lower in the vertical mode.

Sikorsky

Using lessons learned from the X2 helicopter, Boeing and Sikorsky are developing the SB-1 Defiant, an aircraft with coaxial rotors that eliminate the need for a tail rotor. A pusher propeller adds acceleration and deceleration.

One advantage of the coaxial configuration of the Boeing-Sikorsky design is its size compared to a tandem-rotor CH-47 Chinook, for example.

"So you're getting the physical lift, but it's a compact system, and because they're counter-rotating, it doesn't require tail rotors. So you've got that advantage of weight savings," the helicopter industry expert says. "Coax also allows you to make more use of the lifting capabilities."

Another advantage of the design is that the blades are very rigid, which allows them to be closely spaced compared to coaxial designs of the Russian Kamov company.

A coaxial design also achieves greater lift when moving forward than is possible with a traditional helicopter design. That's because a traditional helicopter creates more lift on the advancing side of the spinning rotor — the right side as the rotor rotates counterclockwise — than the retreating side, so the lift on the advancing side has to be limited. That makes the helicopter less efficient, with less and less lift, the faster it flies forward.

One of the design challenges with the V-280 is reducing weight and cost, which go hand in hand with performance and reliability.

The V-280 team is devising a new metric for performance beyond the traditional cost-per-flight-hour measurement. Bell contends that a high cost per flight hour for the V-280 isn't an accurate reflection of the cost relative to its capabilities — namely, covering greater distances at greater speeds than existing helicopters. The company wants to add in a measure of productivity per hour. According to Gehler, the Army and DoD are looking into new metrics to measure cost.

"That's one of the challenges that we have in helicopter mode, is we've got that wing there as well, and added weight that the helicopter doesn't have," Gehler says. "We've really looked at designing out complexity; making our design elegant but less complex. So use technology to reduce complexity and that will make it more reliable and most cost-effective."

By adopting a platform with the characteristics of the V-280, the Army would be able to change its wartime force structure, Gehler says.

"You're able to fast rope in a hover, do a very high hot hover, and to that kind of performance with 280 knots and ranges of 500 to 800 nautical miles, you have a capability that really transforms the force that's using it, from being a forward-operating base/forward arming and refueling-point-centric force to one that can cover great distances in the Pacific or, really, all of Afghanistan, rather than having nine or 10 FOBs [forward operating bases] out there."

In Afghanistan, for example, the locations of forward operating bases was designed around the Black Hawk's range, and the medevac requirements for U.S. troops. "That's why you'll see the V-22s now performing the medevac mission in Afghanistan, because they have the speed and range to cover that distance, whereas the current Army platforms don't," Gehler says.

While there are still decisions to be made on the design for an attack version of the V-280, most of the aircraft's parts would be common between the utility and attack versions.

"You could think about this platform going down an assembly line and that the commonality level between the utility and attack is very high," Gehler says. "All of the engines, drivetrain, everything on the wing and above would be common. The fuselage for the most part would be common."

With an attack helicopter, the troop doors would be replaced by actuators to bring weapons out as needed from internal spaces or weapons pylons, he says. "We want to keep everything inside the aircraft as much as possible to prevent drag. That's one of the concerns with Apache is, it's got so much drag, it hinders performance."

In the event of an engine outage, in a V-280 a driveshaft runs through the wing to drive the other rotor. With both engines out, the aircraft would land using its fixed wing, like an airplane. If the aircraft landed with rotors in airplane mode, the long rotors would fracture in a "broom-straw" pattern rather than breaking off completely, Gehler says.

The Bell team has begun its detailed design phase and started to manufacture parts. The team has also flown the aircraft in a simulator.

"It's not that great a transition to go from a helicopter to a tilt rotor," Gehler says. "Really they fly very similarly in helicopter mode, then it's just transitioning to the speed part and how you deal with going that much faster."

The Defense Department wants to replace Army Apaches (top), Black Hawks, and similarly sized military helicopters with higher performing aircraft that would have lower operating costs.

US Army

US Army

According to Chris Seymour, a Bell program manager who has flown the V-280 simulator, the aircraft flies like a very maneuverable 30,000-pound helicopter and a midsize turboprop.

"The aircraft is going to be very maneuverable in the slow speed environment like an Apache. The control strategies are similar in some ways to a V-22, with the exception that this aircraft will have side stick controllers and a 21st century cockpit design," he says.

While the difficulties of flying a completely new aircraft are mitigated by methodically building up from models that have been tested over time, there are a lot of new things the pilots have to learn, Seymour says. With the V-280, part of that process is learning the side stick controls of a tiltrotor.

"This is a new control strategy, never implemented before on a tiltrotor like the V-22, BA-609 or the XV-15," he says.

One challenge will be figuring out how to make the best use of the control surfaces available to the pilot with the new designs, the industry expert says. For example, with the coaxial/pusher-prop design, when should the pusher prop be used for axial acceleration and when should the rotors be used?

"There are opportunities for using the pusher prop to do all kinds of interesting maneuvers," he says. "You've got an extra force generator; you can stop on a dime. You can imagine all kinds of maneuvers that are made possible by having this additional force generator."

With a single-rotor helicopter, the aircraft will trim at a certain body level, and the pilot has few choices. But with a pusher prop, the pilot can hang the weight of the aircraft off the prop and point the aircraft in different directions. A tilt rotor also can do things, with extra control surfaces, that aren't possible with a conventional helicopter.

A conventional helicopter has four control surfaces: three on the rotor and one on the tail rotor. With the two new designs, "there's all kinds of control surfaces that provide the opportunity to fly the aircraft in different ways for peak performance; in more creative ways," the expert says.

Ben Iannotta contributed to this article.

Out of the

25 Years Ago, October 1989

Oct. 18-23 The Space Shuttle Atlantis is launched and deploys the Galileo space probe toward Venus where it is to use gravity assist to head toward Jupiter. Galileo is to release a descent module through the upper Jovian atmosphere and send back data before it is destroyed by the atmosphere's intense pressure. Prior to the launch of Atlantis, the Galileo project created much controversy and protests out of a fear of radioactive contamination from its radioisotope thermal generators if the probe were destroyed upon launch. NASA, Astronautics and Aeronautics, 1986-90, Page 235.

50 Years Ago, October 1964

Oct. 1 The Lockheed YF-12A, 2,000-mph interceptor aircraft is publicly demonstrated at Edwards Air Force Base in California. The YF-12 is a twin-seat version of the secret single-seat Lockheed A-12 reconnaissance aircraft, which leads to the U.S. Air Force's Lockheed SR-71 Blackbird twin-seat reconnaissance variant. Flight International, Oct. 8, 1964, Page 616 and Oct. 15, 1964, Page 669.

Oct. 2 For the first time, a major hurricane is monitored directly from its genesis and throughout its course by aircraft that consist of three heavily instrumented DC-6As and one B-57A of the Weather Bureau's Research Flight Facility, based in Miami, in a five-day operation that began on Sept. 27. The storm is Hurricane Hilda. Normally, planes are deployed when storms are in progress. In this operation, the flights are made all the way to the eastern end of Cuba, off the coast. Meteorologists as well as electronic technicians, radio operators and observers participate in these missions, and the data are turned over to the National Hurricane Research Laboratory. Aviation Week, Oct. 19, 1964, Page 80-81, 83, 87-88.

Oct. 5 A newly issued U.S. air mail stamp honors the American rocket pioneer Robert H. Goddard and is the second U.S. stamp to feature a rocket motif. The first was issued in 1948 and depicted a captured German V-2 rocket, although it was the 3-cent Fort Bliss (Texas) Centennial stamp. (The rockets were actually launched during that time at nearby White Sands Proving Ground in New Mexico.) Aviation Week, Oct. 5, 1964, Page 18.

Oct. 7 A Syncom 3 communications satellite link is inaugurated for transmissions to the U.S. from the satellite orbiting over the Pacific via a ground station at Kansima, Japan, and a receiving station at Point Mugu, Calif. Among the first broadcasts is the opening games of the 1964 Olympic Games, transmitted on Oct. 10. Wall Street Journal, Oct. 8, 1964.

Oct. 12 The Soviet Union orbits its three-man Voskhod 1 (Sunrise 1) spacecraft, commanded by Vladimir M. Komarov with a crew of cosmonaut Konstantin P. Feoktistov and physician-cosmonaut Boris B. Yegorov. This is the world's first multi-manned spaceflight and the first carrying a physician. The Voskhod 1 lands at a predetermined spot the following day after 16 orbits. It is speculated that the spacecraft returned earlier than expected due to the ousting of Premier Nikita Khrushchev and his replacement by Leonid Brezhnev, although it is also reported there were communications problems. The attitude control system of the Voskhod is based on an ion engine as part of a new reentry and landing system. New York Times, Oct. 13, 1964, Page 1; New York Times, Oct. 14, 1964, Page 1; New York Times, Oct. 22, 1964, Page15; Aviation Week, Oct. 19, 1964, Page 36-37.

Oct. 14 The Sikorsky CH-53A Sea Stallion prototype, designed for the U.S. Marine Corps and considered the Western world's largest and fastest transport helicopter, makes its first flight at the Sikorsky plant at Stratford, Conn. Powered by two GE T64-6 turboshaft engines of 2,850 horsepower each, the CH-53A, can carry a payload of up to 18,000 pounds or up to 38 combat troops. Flight International, Oct. 29, 1964, Page 737.

Oct. 15 The Air Force's variable-sweep F-111A Aardvark medium-range tactical strike fighter aircraft is rolled out at General Dynamics plant at Fort Worth, Texas, in ceremonies in which Secretary of Defense Robert S. McNamara and Air Force Secretary Eugene M. Zuckert are present. Washington Evening Star, Oct. 15, 1964, Page 64; Aviation Week, Oct. 16, 1964, Page 32.

Oct. 15 Craig Breedlove beats his own world land-speed record at Bonneville Flats, Utah, when he drives his three-wheeled turbojet-powered automobile named Spirit of America at an average of 526.28 mph. This is also the first time Breedlove has breached the 500-mph barrier, after his previous run two days earlier reached 468.71 mph. The Spirit uses a General Electric J47 engine from an F-86 Sabre. New York Times, Oct. 16, 1964, Page 48.

Oct. 17 The first prototype of an EVA (extravehicular activity) spacesuit developed by the David Clark Co. is delivered to NASA and assigned to astronaut James McDivitt for tests in the Project Gemini mission simulator. David Baker, Spaceflight and Rocketry, Page 172.

Oct. 20 The U.K. launches its second Blue Streak rocket booster, the vehicle chosen to be the first stage of the European Launch Development Organization's Europa launch vehicle, from Woomera Rocket Range, Australia. The Blue Streak lands 1,000 miles

Past

An Aerospace Chronology
by **Frank H. Winter**
and **Robert van der Linden**

down range. However, the Europa is later canceled. Missiles and Rockets, Oct. 26, 1964, Page 11.

Oct. 27 A balloon is launched from Holloman Air Force Base, N.M., that carries a giant telescope and instruments up to 86,000 feet, where it focuses on observing the planet Venus for more than three hours. It is a scientific project of the Johns Hopkins University and financed by the U.S. Air Force. New York Times, Dec. 8, 1964.

Oct. 30 NASA pilot Joe Walker makes the first flight in the Bell Aerosystems Lunar Landing Research Vehicle using a variable-stabilization system that simulates reactions of operating Apollo Lunar Excursion Module descent paths. David Baker, Spaceflight and Rocketry, Page 172.

Oct. 31 U.S. Air Force Capt. Theodore C. Freeman becomes the first U.S. astronaut to lose his life. His T-38 jet trainer crashes near Houston after it hits a snow goose. He had been chosen as an astronaut with the Group 3 team on Oct. 18, 1963. David Baker, Spaceflight and Rocketry, Page 172.

75 Years Ago, October 1939

Oct. 5 A Russo-Latvian treaty authorizing the USSR to establish naval and air bases on Latvian soil is signed. On Oct. 11, a similar pact is concluded with Lithuania. Estonia had signed a similar treaty in September. Interavia, Oct. 13, 1939, Page 4.

Oct. 8 The first American aircraft victory in World War II occurs when a Lockheed Hudson of the Royal Air Force's No. 224 Squadron shoots down a German Dornier Do 18 flying boat. Rene J. Francillon, Lockheed Aircraft Since 1913, Page 151.

Oct. 10 It is reported that German Air Minister Herman Goering presents Soviet Defense Commissar Marshal Voroshilov with a Fiesler Fi 156 Storch aircraft. The plane is flown to Moscow by the German air attaché in Moscow. Interavia, Oct. 13, 1939, Page 4.

Oct. 15 New York's Municipal Airport, a day later rechristened La Guardia Field after Mayor Fiorello La Guardia, is officially dedicated. When fully completed, the airport will cost $50 million, cover 558 acres, and have four runways. La Guardia served as a major in the American Flying Corps during World War I. Aircraft Year Book, 1940, Page 435; Interavia, October 20, 1939, Page 12.

Oct. 23 The prototype of Japan's Mitsubishi G4M bomber, later known to the Allies as the "Betty," makes its maiden flight. It becomes Japan's most widely produced bomber and is known for its speed and outstanding range. It is also known later as the "flying cigar" for its propensity to catch fire when under attack. Rene J. Francillon, Japanese Aircraft of the Pacific War, Page 378-379.

And During October 1939

— German A-5 test rockets are flown near the rocket development center of Peenemuende. The rockets, weighing about 2,000 pounds each, are stabilized by gyroscopic controls and are recovered by parachute. Altitudes of 7.5 miles and ranges of 11 miles are reached. The A-5 series is part of the development of the A-4 rocket, later known as the V-2, which is used extensively against Britain, Belgium, Holland and France during the latter part of World War II. Eugene M. Emme, ed., Aeronautics and Astronautics 1915-60, Page 38; Walter R. Dornberger, V-2 (Bantam edition), Page 62-64.

— As recommended by President Franklin Roosevelt, 300 colleges are selected to undertake student flying training programs under which 11,000 students, including up to 10 percent women, will be trained up to "A" licenses. Congress authorizes $4 million for the programs, which will be administered by the Civil Aeronautics Administration. Interavia, Oct. 20, 1939, Page 11.

100 Years Ago, October 1914

Oct. 5 A German two-seater airplane, possibly an Aviatik B-11, becomes the first to be shot down in aerial combat. It is taken down over Rheims, France, by Sgt. Joseph Frantz and Cpl. Quénault, flying a Voisin L-3 armed with a Hotchkiss gun. Frantz lives into the Space Age and dies in 1979 at age 89. Francis K. Mason and Martin Windrow, Know Aviation, Page 17; Aviation Week, September 17, 1979, Page 24.

And During October 1914

— Massachussetts Instititute of Technology establishes an undergraduate class and graduate degree in Aeronautical Engineering. To support the course, graduate student Jerome C. Hunsaker and his assistant Donald Douglas, built a wind tunnel on MIT's new Cambridge campus.

Correction

The September 17 item in last month's "Out of the Past" should have identified Robert R. Gilruth as the director of the Manned Spacecraft Center in 1964, a facility later renamed Johnson Space Center.

Faculty Opening

STANFORD UNIVERSITY

Department of Aeronautics and Astronautics

The Department of Aeronautics and Astronautics at Stanford University invites applications for a tenuretrack faculty position at the Assistant or untenured Associate Professor level.

We are seeking exceptional applicants who will develop a world class research program and innovative courses at the frontier of areas such as aerospace structures and materials, autonomous systems, aviation and the environment, control and navigation, propulsion, space systems engineering, and system simulation and design. This is a broad area search. We will place higher priority on the impact, originality, and promise of the candidate's work than on the particular sub area of specialization within Aeronautics and Astronautics. Evidence of the ability to pursue a program of innovative research and a strong commitment to graduate and undergraduate teaching is required. The successful candidate will be expected to teach courses at the graduate and undergraduate levels, and to build and lead a team of graduate students in Ph.D. research.

Applicants should include a cover letter, their curriculum vitae, a list of publications, a one or two page statement of research vision, a one or two page statement of teaching interests, and the names of five potential references. Please submit these materials as a single PDF file labeled "AA_Search_LastName_FirstName.pdf" to aasearch@lists.stanford.edu. For additional information, please contact Professor Brian Cantwell (cantwell@stanford.edu). Applications will be accepted until the position is filled; however the review of applications will begin on January 5, 2015.

Stanford University is an equal opportunity employer and is committed to increasing the diversity of its faculty. It welcomes nominations of and applications from women, members of minority groups, protected veterans and individuals with disabilities, as well as from others who would bring additional dimensions to the university's research, teaching, and clinical missions.

College of Engineering: Open Rank Faculty

Department of Aerospace Engineering

College of Engineering

University of Illinois at Urbana-Champaign

The Department of Aerospace Engineering at the University of Illinois at Urbana-Champaign is seeking highly qualified candidates for multiple faculty positions with emphasis on the areas of space systems/propulsion, autonomous aerospace systems, multi-disciplinary design optimization, aeroelasticity, and aerospace materials and structures. Particular emphasis will be placed on qualified candidates who work in emerging areas of aerospace engineering and whose scholarly activities have high impact.

Please visit http://jobs.illinois.edu to view the complete position announcement and application instructions. Full consideration will be given to applications received by November 3, 2014. Applications received after that date will be considered until the positions are filled.

ILLINOIS
UNIVERSITY OF ILLINOIS AT URBANA-CHAMPAIGN

Illinois is an EEO Employer/Vet/Disabled - www.inclusiveillinois.illinois.edu and committed to a family-friendly environment (http://provost.illinois.edu/worklife/index.html).

DEPARTMENT OF INDUSTRIAL & SYSTEMS ENGINEERING & ENGINEERING MANAGEMENT

Eminent Scholar in Systems Engineering

The Industrial and Systems Engineering and Engineering Management Department offers BSIE, MSE, MSOR and Ph.D. degree. The Department has an ABET-accredited undergraduate program in Industrial and Systems Engineering. Aerospace and Systems Engineering is one of the top strategic research priorities of the University. Rapid growth in faculty, students, and research funding is intended in this field. The Department is currently engaged in NASA's largest fundamental research program in systems engineering, with related work and collaborations with NSF and the US Army, among others.

APPLICATION DEADLINE: The search will remain open until the position is filled. The earliest start date is January 2015.

JOB DESCRIPTION/REQUIREMENTS: The successful candidate must be internationally recognized as a research leader in the area of systems engineering, particularly with application to large complex systems, such as aerospace systems. The candidate will make major impacts in the theory, education, and practice of systems engineering, and lead research projects at UAH from proposal through execution to dissemination. The Eminent Scholar is expected to be appointed at the rank of Full Professor with tenure in the Department of Industrial and Systems Engineering and Engineering Management (ISEEM). The candidate will also build and lead collaborations with other US institutions and international partners. The successful candidate will contribute to developing one of the nation's top graduate education programs in systems engineering, through a continuous infusion of the latest research, and evolving a curriculum that combines a rigorous foundation in mathematics and social science with current applications to aerospace projects widely available in Huntsville.

Applicants must have an earned doctorate, preferably in Systems Engineering, Aerospace Engineering, or a related field. Applicants must also possess an established record of research scholarship and an ability to develop externally funded research programs; a strong commitment to teach graduate and undergraduate students, and to mentor graduate students, post-doctoral scholars, and junior faculty; and dedication toward service to the university and the systems engineering professional community. Applicants will be expected to have an outstanding track record in research, teaching, and service. An ability to obtain a security clearance is desirable.

APPLICATION PROCEDURE: Application material, including a cover letter, curriculum vitae, summary of current research interests (2-4 pages), teaching philosophy (1-2 pages), and the names of 3 references, should be sent to SEscholarsearch@uah.edu for consideration.

The University of Alabama in Huntsville is an Equal Opportunity/Affirmative Action Institution. Consistent with our core values of integrity, respect, diligence, excellence, inclusiveness and diversity, the University strongly encourages applications from members of all under-represented groups. An offer of employment at the University is contingent upon the results of a criminal background check.

PLEASE REFER TO LOG NUMBER: 15/16-230

Mechanical Automotive and Material Engineering

Tenure-Track Assistant Professor in Aerospace Engineering

The Department of Mechanical, Automotive and Materials Engineering (MAME) at the University of Windsor's Faculty of Engineering invites applications for a tenure-track faculty position at the rank of Assistant Professor in a newly established Aerospace Program commencing as early as May 1, 2015. This position is subject to final budgetary approval.

Located at one of Canada's major international intersections, the University of Windsor plays a leading role in the future of the region and the province of Ontario. With approximately 16, 000 students, including 1,700 students in a broad range of masters and doctoral programs, the University of Windsor is Canada's most personal comprehensive university. MAME Department (*www.uwindsor.ca/mame*) being the largest in the Faculty of Engineering offers a multi-faceted program that tackles real-world problems, interacts with local industry, and provides to students ample opportunities for hands-on experience. The major research areas are in design and optimization of energy conversion systems, light weight and low wear materials, and design of innovative mechanical structures and manufacturing processes.

The successful candidate is expected to engage in establishing and leading an exciting and innovative undergraduate program in Aerospace Engineering that spans over the theme of: Aerospace and airplane infrastructures and related systems design. Concurrently, applicants should have a research expertise and proven track record and/or industrial experience in areas including but not limited to: Aerospace structures and Aerospace composite materials manufacturing, repair and maintenance of such structures. Further, we are interested in candidates whose research interest is aligned with one or more of the above specified teaching themes.

It is expected that the successful candidate will establish a dynamic externally funded research program that complements existing Mechanical and Materials Graduate programs, offer graduate courses, supervise graduate students and engage in department and university service activities

Preferably, applicants should have a doctoral degree from an aerospace engineering department, an undergraduate degree in Aerospace Engineering, or significant aerospace engineering expertise and experience. Candidates must have or be eligible for a Professional Engineer (PEng) licensure in Ontario. This normally requires an undergraduate engineering degree from an accredited university. The selection will be primarily based on the applicants' potential for excellence in teaching and research.

Applications should include:

- A letter of application, including a statement of citizenship/immigration status,
- A detailed curriculum vitae,
- A concise statement of teaching and research interest,
- A sample of published research papers,
- Names and addresses of four referees that the Department will contact for letters of reference.

The short-listed candidates may be invited to provide further information in support of their applications. To ensure full consideration, complete an online application by the deadline date of **December 31, 2014**

Application materials to be sent to:

Dr. A. Sobiesiak, Department Head
Faculty of Engineering
Department of Mechanical, Automotive & Materials Engineering
University of Windsor, Ontario
Canada N9B 3P4
Phone: 519-253-3000 Ext. 2596
Email: asobies@uwindsor.ca

Applications may still be received after the deadline date. The acceptance of a late submission is at the discretion of the Appointments Committee.

AIAA Bulletin

OCTOBER 2014

AIAA Executive Director Sandy Magnus presents the Outstanding Activity Section Award to the Greater Huntsville section, represented by Region II Director Alan Lowrey. The awards ceremony took place in August during AIAA's annual Regional Leadership Conference in San Diego.

AIAA Directory

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To join AIAA; to submit address changes, member inquiries, or renewals; to request journal fulfillment; or to register for an AIAA conference. **Customer Service: 800/639-AIAA†**

Other Important Numbers: ***Aerospace America*** / Greg Wilson, ext. **7596*** • ***AIAA Bulletin*** / Christine Williams, ext. **7500*** • **AIAA Foundation** / Karen Thomas, ext. **7520*** • **Book Sales** / **800.682.AIAA** or **703.661.1595**, Dept. 415 • **Corporate Members** / Merrie Scott, ext. **7530*** • **International Affairs** / Betty Guillie, ext. **7573***; Emily Springer, ext. **7533*** • **Editorial, Books and Journals** / Heather Brennan, ext. **7568*** • **Honors and Awards** / Carol Stewart, ext. **7623*** • **Journal Subscriptions, Member** / **800.639.AIAA** • **Exhibits / Journal Subscriptions, Institutional / Online Archive Subscriptions** / Michele Dominiak, ext. **7531*** • **Continuing Education** / Chris Brown, ext. **7504*** • **Public Policy** / Steve Howell, ext. **7625*** • **Section Activities** / Chris Jessee, ext. **3848*** • **Standards, Domestic** / Amy Barrett, ext. **7546*** • **Standards, International** / Nick Tongson, ext. **7515*** • **Student Programs** / Stephen Brock, ext. **7536*** • **Technical Committees** / Betty Guillie, ext. **7573***

* Also accessible via Internet. Use the formula first name last initial@aiaa.org. Example: megans@aiaa.org.
† U.S. only. International callers should use 703/264-7500.

Addresses for Technical Committees and Section Chairs can be found on the AIAA Web site at **http://www.aiaa.org**.

We are frequently asked how to submit articles about section events, member awards, and other special interest items in the *AIAA Bulletin*. Please contact the staff liaison listed above with Section, Committee, Honors and Awards, Event, or Education information. They will review and forward the information to the *AIAA Bulletin* Editor.

Event & Course Schedule

DATE	MEETING (Issue of *AIAA Bulletin* in which program appears)	LOCATION	ABSTRACT DEADLINE
2014			
29 Sep–3 Oct†	**65th International Astronautical Congress**	Toronto, Canada (Contact: http://www.iac2014.org/)	
5–10 Oct†	**33rd Digital Avionics Systems Conference**	Colorado Springs, CO (Contact: Denise Ponchak, 216.433.3465, denise.s.ponchak@nasa.gov, www.dasconline.org)	
20–23 Oct†	**International Telemetering Conference USA**	San Diego, CA (Contact: Lena Moran, 951.219.4817, info@telemetry.org, www.telemetry.org)	
22–26 Oct†	**30th Annual Meeting of the American Society for Gravitational and Space Research**	Pasadena, CA (Contact Cindy Martin-Brennan, 703.392.0272, executive_director@asgsr.org, www.asgsr.org)	
23–24 Oct†	**Joint Conference on Satellite Communications (JC-SAT 2014)**	Busan, Korea (Contact: Satoshi Imata, +81 80 6744 6252, sat_ac-sec@mail.ieice.org, www.ieice.org/cs/sat/jpn/purpose_e.html)	
24–25 Oct†	**combustionLAB and fluidsLAB Workshops**	Pasadena, CA (Dr. Francis P. Chiaramonte, 202.358.0693, francis.p.chiaramonte@nasa.gov, http://icpi.nasaprs.com/cflab-info)	
3–6 Nov†	**28th Space Simulation Conference**	Baltimore, MD (Contact: Andrew Webb, 443.778.5115, Andrew.webb@jhuapl.edu, http://spacesimcon.org/)	
12–14 Nov†	**Aircraft Survivability Technical Forum 2014**	Laurel, MD (Contact: Meredith Hawley, 703.247.9476, mhawley@ndia.org, www.ndia.org/meetings/5940)	
2015			
3–4 Jan	**Aircraft and Rotorcraft System Identification: Engineering Methods and Hands-On Training Using CIFER®**	Kissimmee, FL	
3–4 Jan	**Best Practices in Wind Tunnel Testing**	Kissimmee, FL	
3–4 Jan	**Third International Workshop on High-Order CFD Methods**	Kissimmee, FL	
4 Jan	**Introduction to Integrated Computational Materials Engineering (ICME)**	Kissimmee, FL	
5–9 Jan	**AIAA SciTech 2015 (AIAA Science and Technology Forum and Exposition)** **Featuring:** **23rd AIAA/ASME/AHS Adaptive Structures Conference** **53rd AIAA Aerospace Sciences Meeting** **AIAA Atmospheric Flight Mechanics Conference** **AIAA Infotech@Aerospace Conference** **2nd AIAA Spacecraft Structures Conference** **AIAA Guidance, Navigation, and Control Conference** **AIAA Modeling and Simulation Technologies Conference** **17th AIAA Non-Deterministic Approaches Conference** **56th AIAA/ASME/ASCE/AHS/ASC Structures, Structural Dynamics, and Materials Conference** **8th Symposium on Space Resource Utilization** **33rd ASME Wind Energy Symposium**	Kissimmee, FL	**2 Jun 14**
8–9 Jan	**Fundamentals and Applications of Modern Flow Control**	Kissimmee, FL	
11–15 Jan†	**25th AAS/AIAA Space Flight Mechanics Meeting**	Williamsburg, VA (Contact: AAS—Roberto Furfaro, 520.312.7440; AIAA—Stefano Casotto, Stefano.casotto@unipd.it; http://space-flight.org/docs/2015_winter/2015_winter.html)	**15 Sep 14**
26–29 Jan†	**61st Annual Reliability & Maintainability Symposium (RAMS 2015)**	Palm Harbor, FL (Contact: Julio Pulido, 952 270 1630, julio.e.pulido@gmail.com, www.rams.org)	
7–14 Mar†	**2015 IEEE Aerospace Conference**	Big Sky, MT (Contact: Erik Nilsen, 818.354.4441, erik.n.nilsen@jpl.nasa.gov, www.aeroconf.org)	
10–12 Mar	**AIAA DEFENSE 2015 (AIAA Defense and Security Forum)** **Featuring:** **AIAA Missile Sciences Conference** **AIAA National Forum on Weapon System Effectiveness** **AIAA Strategic and Tactical Missile Systems Conference**	Laurel, MD	**4 Nov 14**

DATE	MEETING (Issue of *AIAA Bulletin* in which program appears)	LOCATION	ABSTRACT DEADLINE
11 Mar	**AIAA Congressional Visits Day**	Washington, DC	
25–27 Mar†	**3rd Int. Conference on Buckling and Postbuckling Behaviour of Composite Laminated Shell Structures with DESICOS Workshop**	Braunschweig, Germany (Contact: Richard Degenhardt, +49 531 295 3059, Richard.degenhardt@dlr.de, www.desicos.eu	
30 Mar–2 Apr	**23rd AIAA Aerodynamic Decelerator Systems Technology Conference and Seminar**	Daytona Beach, FL	**30 Sep 14**
13–15 Apr†	**EuroGNC 2015, 3rd CEAS Specialist Conference on Guidance, Navigation and Control**	Toulouse, France (Contact: Daniel Alazard, +33 (0)5 61 33 80 94, alazard@isae.fr, w3.onera.fr/eurognc2015)	
6 May	**Aerospace Spotlight Awards Gala**	Washington, DC	
25–27 May†	**22nd St. Petersburg International Conference on Integrated Navigation Systems**	St. Petersburg, Russia, (Contact: Prof. V. G. Peshekhonov, 7 812 238 8210, icins@eprib.ru, www. Elektropribor.spb.ru)	
4 Jun	**Aerospace Today ... and Tomorrow—An Executive Symposium**	Williamsburg, VA	
22–26 Jun	**AIAA AVIATION 2015 (AIAA Aviation and Aeronautics Forum and Exposition)** **Featuring:** **21st AIAA/CEAS Aeroacoustics Conference** **31st AIAA Aerodynamic Measurement Technology and Ground Testing Conference** **33rd AIAA Applied Aerodynamics Conference** **AIAA Atmospheric Flight Mechanics Conference** **7th AIAA Atmospheric and Space Environments Conference** **15th AIAA Aviation Technology, Integration, and Operations Conference** **AIAA Balloon Systems Conference** **AIAA Complex Aerospace Systems Exchange** **22nd AIAA Computational Fluid Dynamics Conference** **AIAA Flight Testing Conference** **45th AIAA Fluid Dynamics Conference** **22nd AIAA Lighter-Than-Air Systems Technology Conference** **16th AIAA/ISSMO Multidisciplinary Analysis and Optimization Conference** **AIAA Modeling and Simulation Technologies Conference** **46th AIAA Plasmadynamics and Lasers Conference** **45th AIAA Thermophysics Conference**	Dallas, TX	**13 Nov 14**
6–9 Jul	**20th AIAA International Space Planes and Hypersonic Systems and Technologies Conference**	Glasgow, Scotland	**8 Dec14**
27–29 Jul	**AIAA Propulsion and Energy 2015 (AIAA Propulsion and Energy Forum and Exposition)** **Featuring:** **51st AIAA/ASME/SAE/ASEE Joint Propulsion Conference** **13th International Energy Conversion Engineering Conference**	Orlando, FL	
31 Aug–2 Sep	**AIAA SPACE 2015 (AIAA Space and Astronautics Forum and Exposition)**	Pasadena, CA	

For more information on meetings listed above, visit our website at www.aiaa.org/calendar or call 800.639.AIAA or 703.264.7500 (outside U.S.).

†Meetings cosponsored by AIAA. Cosponsorship forms can be found at https://www.aiaa.org/Co-SponsorshipOpportunities/.

AIAA Continuing Education courses.

From the Corner Office

FORUMS FOR SUCCESS

Sandy H. Magnus, Executive Director

Doing something for the first time is not easy. Having completed our first year implementing AIAA's new cutting-edge forums, I can admit that this has been anything but easy. Exciting, educational, inspirational … all can apply. Your patience and willingness to engage, both in the planning and feedback aspects, has been much appreciated.

And when evaluating the success of the new forums, it is important to recall our reasons and strategy for making this fundamental change to our conference format. With this transition, our goals, without losing our important technical focus, were to also achieve the following:

- Ensure our Institute is relevant to aerospace professionals
- Ensure our conferences integrate a wide spectrum of topics of interest and importance to the profession (technical disciplines, systems, policy, operations, etc.) and other areas of the Institute
- Ensure our overall events provide meaningful professional development and opportunities for interaction across the broad aerospace community (conference papers/presentations, networking, education, exhibits, etc.)
- Ensure our events are financially viable (both for the attendee and for the Institute)
- Ensure that our conferences are "must attend" events for all those in our profession—across industry, government, and academia—and can accommodate expansion into new technology and program areas

I am happy to report that the first year of the new forums were a success on multiple levels. Through the hard work and dedication of so many of you, the Institute achieved the majority of our forum goals and made great strides toward achieving the balance of them. Although we still have work to do, I am confident we are on an upward trajectory.

Why do we consider the forums successful? Because people of all ages from industry, government, and academia were excited to attend, participate, and connect with their communities. These forums brought together different technical conferences like never before, enabling attendees to broaden their professional horizons and explore new technical areas and tracks. The plenary sessions featured industry leaders and experts who were engaging, intriguing, and thought provoking. The Forum 360 program component was introduced, allowing us to feature conversations with experts that covered a spectrum of timely topics including programs, systems, policy, operations, applications, platforms and more. We maintained our strong technical core while successfully adding other content of interest to the aerospace community.

While the government travel restrictions did impact attendance at the 2014 forums, we began seeing a better environment evolve beginning with the summer forums. We continue to see very strong student participation in the forums, especially graduate students, and we are providing targeted programming for students and young professionals to bring the next generation of aerospace into the AIAA fold. In addition, active non-U.S. participation in AIAA forums continues to demonstrate the global nature of the aerospace industry.

Understanding the importance of networking, we tried to balance forum-wide opportunities for interacting with colleagues and idea exchange across the aerospace industry with the ability for you to easily connect within your technical communities. Sessions were organized in zones based on technical discipline interest. Throughout committee meetings, recognition activities, the exposition hall, receptions, luncheons, and casual hallway conversations, the forums had a great networking buzz. AIAA AVIATION 2014 coincidently occurred at the same time as the 2014 FIFA World Cup, and the matches provided an added benefit of bringing groups together in an informal and fun way.

An area where we did see a big change was in how we reach the broader community. Press attendance at forums was larger than in the past, so AIAA and the "cool stuff" we do received attention in the media and with the general public. There was tremendous social media chatter during the forums, and at times AIAA was actually trending on Twitter! We had social media ambassadors from local sections help foster the discussion, which was a great way to connect the sections to the AIAA national activities.

During 2014, we livestreamed plenary and selected panel sessions to those who could not attend the forums in person. Hopefully, we also connected to some folks who don't know AIAA well and will consider attending AIAA's forums in 2015. We will continue to evolve how we share information virtually from, and on, the forums to be more accessible to a larger and wider national and international audience.

We want to continue to improve and evolve the forums. We experimented with the format of each forum to understand what might work best (and this is why your continued feedback is so important). We incorporated numerous suggestions as the year progressed, to make improvements as quickly as possible. Some things went well right out of the gate. Some areas were identified that will need more adjustment—**but to reiterate, overall the forums have been a success!**

Although we weren't able to organize the fifth planned forum in 2014, the AIAA Defense and Security Forum (AIAA DEFENSE) will join the lineup next year. AIAA DEFENSE is a classified and unclassified U.S.-only event for technical, programmatic, and policy issues pertaining to aerospace in U.S. national security. Addressing the theme "Where Complex Defense Challenges Meet Global Solutions," the objective of this forum is to create a non-biased, non-partisan forum for defense officials to interact with industry partners, aerospace R&D community, and government decision and policymakers. Three long-standing classified conferences—AIAA Strategic and Tactical Missile Systems Conference, the AIAA Missile Sciences Conference, and the AIAA National Forum on Weapon System Effectiveness—will combine to lay the foundation of the new AIAA DEFENSE Forum.

Together, we achieved so much in one year. A major reason for that is because so many of you participated, and participation is power. As we look toward next year and the year after, **please continue to attend the forums and provide feedback and suggestions**. In addition to attending, consider being a part of a Forum Organizing Committee or Technical Program Committee. It's a great opportunity to help AIAA, our industry, and the whole aerospace community succeed. I look forward to seeing you at our forums in 2015!

See a complete list of the 2015 forums on the AIAA Meeting Schedule on pages B2–B3.

To submit articles to the *AIAA Bulletin*, contact your Section, Committee, Honors and Awards, Events, Precollege, or Student staff liaison. They will review and forward the information to the *AIAA Bulletin* Editor. See the AIAA Directory on page **B1** for contact information.

AIAA ANNOUNCES CANDIDATES FOR 2015 BOARD OF DIRECTORS ELECTION

AIAA is pleased to announce that its 2015 Nominating Committee has selected candidates for next year's openings on the AIAA Board of Directors. The Committee's chairman, Michael Griffin, confirmed the names of the officer and director candidates who will appear on the ballot. They are as follows:

President-Elect
Jim Maser, James G. Advisors, LLC

Vice President-Elect, Education
K. Ravindra, Saint Louis University
Richard Wlezien, Iowa State University

Vice President-Elect, Public Policy
James Horkovich, Raytheon Missiles Systems
John Rose, The Boeing Company

Director–At-Large
Brett Anderson, Boeing Defense, Space & Security
Benjamin Marchionna, Lockheed Martin Corporation
Charles Radley, Leeward Space Foundation
Karl Rein-Weston, Boeing Engineering, Operations and Technology

Director–At-Large, International
Juergen Drescher, DLR – German Aerospace Center
Christian Mari, SAFRAN Group

Director–Technical, Aerospace Design and Structures Group
Russ Althof, Raytheon Missile Systems
Achille Messac, Mississippi State University

Director–Technical, Aerospace Sciences Group
James Keenan, U.S. Army, Aviation and Missile Research, Development, and Engineering Center

Director–Region 2
John Blanton, GE Power & Water
Mark Whorton, Teledyne Brown Engineering

Director–Region 3
Daniel Jensen, Rolls-Royce Corporation
Timothy Roussos, Avaya

Director–Region 6
L. Jane Hansen, HRP Systems, Inc.

The AIAA Constitution also allows board nominations to be made via petition. Members intending to follow this process are asked to contact the AIAA Secretary, Bill Seymore, at 703.264.7540 or bills@aiaa.org, as soon as possible before the **1 January 2015** deadline for more specific instructions and coordination. The petition must be supported by at least 300 voting members of the Institute.

All eligible voting members of AIAA will be able to cast their ballot beginning in February 2015.

BRAUN APPOINTED AS NEW EDITOR-IN-CHIEF OF THE *JOURNAL OF SPACECRAFT AND ROCKETS*

On 5 August 2014, AIAA President Jim Albaugh formally appointed **Dr. Robert Braun** as editor-in-chief of the *Journal of Spacecraft and Rockets* (*JSR*).

Dr. Braun holds a B.S. in Aerospace Engineering from Pennsylvania State University, an M.S. in Astronautics from George Washington University, and a Ph.D. in Aeronautics and Astronautics from Stanford University. Currently Braun is the David and Andrew Lewis Professor of Space Technology in the Daniel Guggenheim School of Aerospace Engineering at the Georgia Institute of Technology. He is the Director of the Space Systems Design Laboratory and Founding Director of the Center for Space Technology and Research at Georgia Tech. Dr. Braun's research and personal interests are closely aligned with the scope of *JSR*, focusing in particular on the design of advanced flight systems and technologies for planetary exploration.

In addition to his research at Georgia Tech, Braun works to foster educational quality and scholarship among his students. To this end, he supervises graduate and undergraduate research, and leads curriculum development in the areas of astrodynamics, space systems design, atmospheric entry, and multidisciplinary design optimization, among other duties. Before joining Georgia Tech, Dr. Braun was a member of the technical staff at NASA Langley Research Center for close to 15 years. He also served as NASA Chief Technologist and oversaw technology and innovation policy and programs for the NASA Administrator from 2011 to 2012. He is a member of the National Academy of Engineering and an AIAA Fellow.

Dr. Braun is one of the preeminent aerospace engineers of his generation with an international reputation for the quality of his work and leadership capabilities. He has been a champion of *JSR* for many years and is well placed to provide strategic vision and strong stewardship for the journal. Braun is a prolific conference contributor, presenter, and journal author, with the majority of his published papers appearing in *JSR*. His support for scholarly research includes a commitment to the peer-review process and service over the years as a *JSR* Associate Editor and Guest Editor for special sections and issues.

Dr. Braun was selected from a competitive pool of applicants, and becomes the ninth editor-in-chief of the journal. The *Journal of Spacecraft Rockets* was among the journals established by AIAA in 1964, following the merger of the Institute of the Aerospace Sciences and the American Rocket Society, in an effort to ensure that significant application papers had an appropriate outlet for publication. Since its inception, *JSR* has filled a specific and continuing need in the community of aerospace-related archival journals. Braun succeeds E. Vincent Zoby, who served as editor-in-chief of *JSR* from 1993 to 2014.

During the editor search process, one enthusiastic recommendation on Braun's behalf noted that if selected for the position, Dr. Braun would "inspire the highest quality from his fellow editors and prospective authors." Looking toward the future, it is clear that Dr. Braun's demonstrated commitment to the journal and his ability to think creatively and work collaboratively will serve to enhance the quality, rigor, and reach of *JSR*.

CALL FOR PAPERS FOR *JOURNAL OF AEROSPACE INFORMATION SYSTEMS*

Special Issue on Optimal Decision Making in Aerospace Systems

The *Journal of Aerospace Information Systems* is devoted to the applied science and engineering of aerospace computing, information, and communication. Original archival research papers are sought that include significant scientific and technical knowledge and concepts. The *Journal* publishes qualified papers in areas such as aerospace systems and software engineering; verification and validation of embedded systems; the field known as 'big data,' data analytics, machine learning, and knowledge management for aerospace systems; human-automation interaction; and systems health management for aerospace systems. Applications of autonomous systems, systems engineering principles, and safety and mission assurance are of particular interest. Articles are sought that demonstrate the application of recent research in computing, information, and communications technology to a wide range of practical aerospace problems in the analysis and design of vehicles, onboard avionics, ground-based processing and control systems, flight simulation, and air transportation systems.

Information about the organizers of this special issue as well as guidelines for preparing your manuscript can be found in the full Call for Papers in Aerospace Research Central (ARC); arc.aiaa.org. The journal website is **http://arc.aiaa.org/loi/jais**.

This special issue will focus on algorithms for optimal decision making in aerospace systems. In many complex aerospace applications, systems must interact with dynamic environments, be robust to uncertainty in sensor information, and reliably balancing safety and efficiency. Recent advances in decision theoretic optimization have shown tremendous promise in addressing the challenges of engineering such systems.

Key research areas in the special issue include:

- Decision theoretic models: MDPs, POMDPs
- Multi-agent systems: MMDPs, Dec-POMDPs, POSGs, i-POMDPs
- Solution methods: dynamic programming, online planning, robust optimization
- Approximation techniques: structured approaches, Monte Carlo methods, dimensionality reduction, linearization
- Learning algorithms and adaptive methods
- Application domains: decision support for air traffic control, mission planning, unmanned aircraft, autonomous spacecraft, etc.
- Verification and validation methods for decision-making systems

Deadline: Submissions are due by **15 December 2014**.
Anticipated Publication Date: **May 2015**.
Contact Email: Mykel Kochenderfer, mykel@stanford.edu

NEW STANDARD AVAILABLE: AIAA QUALIFICATION AND QUALITY REQUIREMENTS FOR SPACE SOLAR CELLS (S-111A-2014)

This standard is a revision of a document developed by the AIAA Solar Cells and Solar Panels Committee on Standards. It focuses on space solar panel qualification; much effort and care has been taken to clarify requirements and resolve other issues that were present in the original version. It establishes the quality requirements and provides the methods for establishing the qualification of electrical components integrated onto spacecraft solar panels. The result is a new standard that defines the best practices for space solar panel qualification. Standards are free to AIAA members; download a copy today!

2014 AIAA SECTION AWARDS

What are Section Awards?

The AIAA Section Awards honor particularly notable performances made by an Institute section working as a unit, and are intended to formally underscore the AIAA conviction that intellectually stimulating section activity is fundamental to the health of the Institute. All awards are bestowed annually in five section member categories, based on the number of members in the Section: Very Small, Small, Medium, Large and Very Large. A cash award and certificate is presented to the winning sections in all size categories. The award period covered is 1 June–31 May of any Section year.

Outstanding Section Award

The Outstanding Section Award is given to sections based on their overall activities and contributions through the year.

Very Large Section
1st: Hampton Roads, Eric Walker, Section Chair
2nd: Dayton/Cincinnati, Oliver Leembruggen, Section Chair
3rd (tie): Greater Huntsville, Ram Ramachandran, Section Chair
3rd (tie): National Capital, Supriya Banerjee, Section Chair

Large Section
1st: Northern Ohio, Kevin Melcher, Section Chair
2nd: Phoenix, Rob Trepa, Section Chair
3rd: Orange County, Gene Justin, Section Chair

Medium Section
1st: Long Island, David Paris, Section Chair
2nd: Tucson, Elishka Jepson, Section Chair
3rd: Michigan, Thomas Mirowski, Section Chair

Small Section
1st: Savannah, Christopher Kaburek, Section Chair
2nd: Northwest Florida, Benjamin Dickinson, Section Chair
3rd (tie): Twin Cities, Kristen Gerzina, Section Chair
3rd (tie): Northeastern New York, Eric Ruggiero, Section Chair

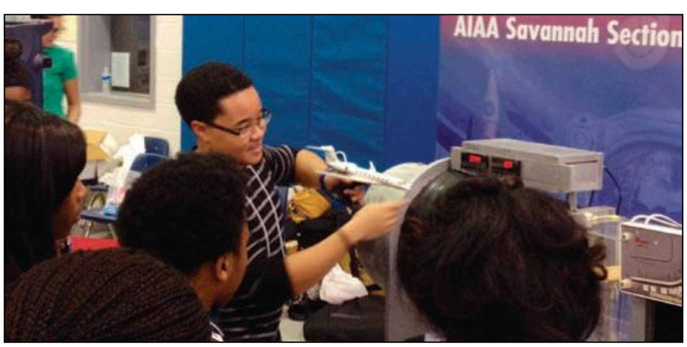
Very Small Section
1st: Sydney, Michael West, Section Chair
2nd: Delaware, Eric Spero, Section Chair
3rd: China Lake, Randall Drobny, Section Chair

Communications Award

The Communications Award recognizes sections that develop and implement an outstanding communications outreach program. Winning criteria include level of complexity, timeliness, and variety of methods of communications, as well as frequency, format, and content of the communications outreach.

Very Large Section
1st: Hampton Roads, John Lin, Newsletter Editor
2nd: Dayton/Cincinnati, Michael List, Secretary/Newsletter Editor
3rd: Houston, Michael Martin, Section Chair-Elect

Large Section
1st: Northern Ohio, Edmond Wong, Communication Officer
2nd: San Diego, Cesar Martin, Secretary



3rd: Cape Canaveral, Jennifer Holland, Newsletter Editor/Communication Officer

Medium Section
1st: Tucson, Elishka Jepson, Section Chair
2nd: Long Island, David Paris, Section Chair/Newsletter Editor
3rd: Michigan, Dustin Moyer, Communication Officer

Small Section
1st: Twin Cities, Andrew Carlson, Section Webmaster
2nd: Savannah, Johanna Bussell, Communication Officer

Very Small Section
1st: Delaware, Daniel Sutton & Daniel Nice, Section Webmasters
2nd: Sydney, Rounak Manoharan and Amelia Greig, Secretary and Membership Officer
3rd: China Lake, Jeff Scott, Vice-Chair & Communication Officer

Career and Workforce Development Award

The Career and Workforce Development Award recognizes section activities focusing on career development, such as time management workshops, career transition workshops, job benefits workshops, and technical vs management career path workshops.

Very Small Section
1st: Sydney, Michael Spencer, Career & Workforce Development Officer

Membership

The Membership Award is presented to sections that have increased their membership by planning and implementing effective recruitment and retention campaigns.

Very Large Section
1st: Hampton Roads, Marlyn Andino, Membership Officer
2nd: Los Angeles-Las Vegas, Nicola Sarzi-Amade and Sy Ferdman, Membership Officers

Large Section
1st: Cape Canaveral, Taylor Dacko, Membership Officer
2nd: Orange County, Bob Welge, Membership Officer
3rd: Phoenix, Rick Kale, Membership Officer

Medium Section
1st: Tucson, Elishka Jepson, Section Chair

Small Section
1st: Twin Cities, Christopher Sanden, Vice Chair and Membership Officer
2nd: Savannah, Adam Hart, Membership Officer

Very Small Section
1st: Sydney, Michael West, Section Chair
2nd: Delaware, Eric Spero, Section Chair
3rd: China Lake, Randall Drobny, Section Chair

Public Policy Award

The Public Policy Award is presented to stimulate public awareness of the needs and benefits of aerospace research and development, particularly on the part of government representatives, and for educating section members about the value of public policy activities.

Very Large Section
1st: Dayton/Cincinnati, Mike White, Public Policy Officer
2nd (tie): National Capital, Supriya Banerjee, Section Chair
2nd (tie): Hampton Roads, Lena Little and Melissa Carter, Public Policy Officers

Large Section
1st: Orange County, Kamal Shweyk, Public Policy Officer
2nd: Northern Ohio, Amber Abbott-Hearn, Public Policy Officer
3rd: Phoenix, Rob Trepa, Section Chair

Medium Section
1st: Long Island, Frank Hayes, Public Policy Officer
2nd: Michigan, Bob Everett, Public Policy Officer
3rd: Tucson, Elishka Jepson, Section Chair

Small Section
1st: Utah, Ron Thue, Section Chair

Very Small Section
1st: China Lake, Steve Goad, Public Policy Officer
2nd: Delaware, Timothy Dominick, Public Policy Officer
3rd: Sydney, Amelia Grieg, Membership Officer

STEM K–12 Award

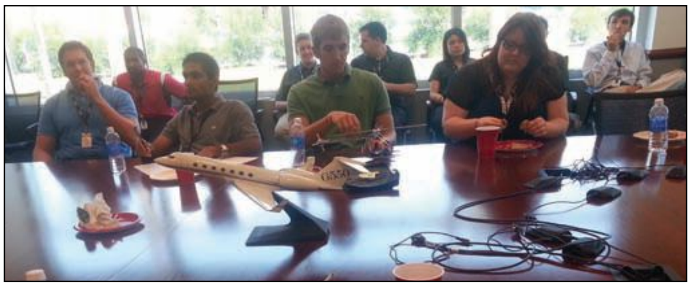
The Harry Staubs Precollege Outreach Award is given to sections that develop and implement outstanding STEM K–12 outreach program that provides quality educational resources for K–12 teachers in the STEM subject areas of science, technology, engineering, and mathematics.

Very Large Section
1st: Dayton-Cincinnati, Carl Tilmann, STEM K–12 Officer
2nd (tie): Hampton Roads, Karen Berger and Shann Rufer, Education/STEM K–12 Co-chairs
2nd (tie): National Capital, Supriya Banerjee, Section Chair

Large Section
1st: Orange County, Janet Koepke, STEM K–12 Officer
2nd: Phoenix, Robe Trepa, Section Chair
3rd: Northern Ohio, Julie Kleinhenz, STEM K–12 Officer

Medium Section
1st: Tucson, Elishka Jepson & Michelle Rouch, Section Chair and Society & Aerospace Technology Officer
2nd: Michigan, Michelle Clark, Education/STEM K–12 Officer
3rd: Central Florida, Randal Allen, Section Chair and STEM K–12 Officer

Small Section
1st: Savannah, Francois Hugon, Jason Riopelle, & Craig Willis, STEM K–12 Officers
2nd: Northwest Florida, Tucker Hamilton, STEM K–12 Officer
3rd: Utah, Ron Thue, Section Chair



Very Small Section
1st: Delaware, Elishabet Lato, STEM K–12 Officer
2nd: Wisconsin, Todd Treichel, Section Chair
3rd: Sydney, Andrew Neely, STEM K–12 Officer

Young Professional Award

The Young Professional Activity Award is presented for excellence in planning and executing events that encourage the participation of the Institute's young professional members, and provide opportunities for leadership at the section, regional, or national level.

Very Large Section
1st: Dayton/Cincinnati, Robert Mitchell, YP Officer
2nd: National Capital, Scott Fry, YP Officer
3rd: Hampton Roads, John Wells, YP Officer

Large Section
1st: Northern Ohio, Roger Tokars, YP Officer
2nd: Cape Canaveral, Anthony Mansk, YP Officer
3rd: Phoenix, Joshua Loughman, YP Officer

Medium Section
1st: Tucson, Eric Hoffman-Watt, YP Officer
2nd: Tennessee, Henry Horne, YP Officer

Small Section
1st: Savannah, Kyle Finnegan and Ryan Vas, YP Officers

Very Small Section
1st: Sydney, Arnab Dasgupta, YP Officer
2nd: Delaware, Daniel Nice, YP Officer

Outstanding Activity Award

This award allows AIAA to acknowledge sections that have held an outstanding activity deserving of additional recognition.

Very Large Section
Greater Huntsville, National Engineers' Week Activities
Pacific Northwest, Rising Leaders' Forum

Large Section
Orange County, Team America Rocketry Challenge, Year-Long Event

Medium Section
Michigan, Rocket Labs, May 2014

Small Section
Northwest Florida, Exploring Mars Speaker Event with Bobak Ferdowski, 28 April 2014

Very Small Section
Adelaide, International Space Station – International Young Professional Panel, 27 February 2014

REGIONAL LEADERSHIP CONFERENCE HELD IN AUGUST

The 2014 Regional Leadership Conference was a great success. There were 52 attendees from 30 different sections. The conference opened with a fun icebreaker. A variety of informative presentations were given and AIAA received a lot of very positive feedback.

What members seemed to enjoy most was the opportunity to network with people from other sections and share their experiences. There was a Breakout Planning Session where the members discussed event planning and what either worked or did not work well for them. On the first evening Sandy Magnus gave out first-place section awards during the reception.

Sandy Magnus presenting an Outstanding Activity Award to the Northwest Florida Section, accepted by Tucker Hamilton, STEM K–12 Officer.

Icebreaker exercise to learn more about each other.

John Rose on public policy.

Attendees enjoying themselves at the paper airplane contest.

SPACE 2015

31 AUGUST – 2 SEPTEMBER 2015 **PASADENA, CALIFORNIA**

AEROSPACE COMPANIES IN CALIFORNIA

- Account for over $62 billion in industry revenues;
- Support 511,000 jobs; and
- Represent 9% of the global market.

WHAT TO EXPECT

- Almost 800 participants from more than 300 institutions in more than 20 countries.
- More than 250 papers reporting on the latest innovations in space technology, exploration, and operations.

AUDIENCE

• Industry	52%
• Government	31%
• Education	6%
• Others	11%

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AIAA
Shaping the Future of Aerospace

14-438

FOUR AIAA YOUNG PROFESSIONALS RECOGNIZED BY *AVIATION WEEK*

Lawrence Garrett

One of the primary missions of the Institute is to support and help foster the next generation of leaders who will shape the aerospace industry, as well as the future of their organizations, for decades to come. For this reason the Institute recognizes and celebrates four extraordinary AIAA young professionals who were recently honored as part of *Aviation Week*'s 40 under Forty, their list of "top industry talent who are younger than 40 years old."

The four AIAA young professionals, **Jason Crusan**, **Jason Olivarez**, **Ryan Rudy**, and **Christine Edwards Stewart**, named to the list not only exhibit solid leadership skills, but also possess considerable technical abilities, and a bold approach to tackling challenges.

Jason Crusan, 37, is an AIAA Senior Member, and an active member of AIAA's Small Satellites Technical Committee. He serves as NASA's director for the Advanced Exploration Systems (AES) Division with the Human Exploration and Operations Mission Directorate (HEOMD), based in Washington, DC. He leads integration with the Space Technology Mission Directorate and other programs such as the International Space Station and the Exploration System Division Programs. For the past two years Crusan has led a team of more than 550 civil servants in an effort to rejuvenate and modernize the way NASA conducts rapid and innovative technology and systems development.

Crusan has served in multiple roles at NASA since 2005, including as Chief Technologist for Space Operations, Program Executive, and project manager on various technical and management initiatives. He was a key member of the Mini-RF (Miniature Radio Frequency) Program team, which delivered two radar instruments to the moon to map the lunar poles, search for water ice, and demonstrate future NASA communication technologies.

In addition to serving as mission manager for NASA's contributions to the Indian Space Research Organization's Chandrayaan-1 mission to the moon, Crusan's career includes numerous other accomplishments such as a highly successful Morpheus test vehicle campaign that resulted in 14 free flights; the creation of the first cost-sharing contract for technology advancement for a large-scale, human-class module in space that is set to be demonstrated on the ISS in 2015; the successful consolidation of all radiation sensor development for human spaceflight into a single, synergistic, development effort; and, through his leadership and participation in the Mars 2020 mission, helping ensure that NASA has its strongest-ever collaborations between the Science and Human Exploration mission directorates.

When asked how he feels about being named to *Aviation Week*'s 40 Under Forty list, Crusan said, "While I'm honored to be named to [the] list, it's really a recognition of the teams I work with and our ability to work together to do innovative things at NASA, changing the traditional aerospace development process," adding that he prefers "to share this award with those teams, as we go about leading an aerospace transformation."

Crusan holds Bachelor's Degrees in Electrical Engineering and Physics, a Master's in Computer Information Systems, and is currently a Ph.D. candidate in Engineering Management at George Washington University.

Jason Olivarez, 32, an AIAA Senior Member, is a principal project engineer at Honeywell, based in Phoenix, AZ. Having begun his career in 2004 as a bearing/gear design engineer, Olivarez rapidly ascended from designing low level components on commercial aircraft to integrating large-scale aircraft systems and helping develop a revolutionary test facility.

In 2008, Olivarez transitioned into his current role, working in systems integration on the Airbus A350 Extended Mechanical System Perimeter program where his contributions eventually earned him Honeywell's 2012 Outstanding Engineer award.

Olivarez, a patent holder since 2013, was part of the Honeywell team that developed a first-of-its-kind technology integration facility known as the Air Systems Integration Bench (AirSIB), where Olivarez and his team determined how to integrate Honeywell and customer-supplied equipment and software safely, and defined, tested, and analyzed flight-like test conditions and procedures. Honeywell called development of the AirSIB one of the "100 Years—100 Firsts" in its Aerospace Centennial.

When asked how membership in AIAA might benefit other young professionals, Olivarez said that as an AIAA member, "it's been great to see the increased focus on young professionals and the resources that are now available to help YPs navigate the technical challenges and career decisions that come with working in aerospace."

We asked how he feels about being named to *Aviation Week*'s 40 Under Forty list, and Olivarez said that he is "very excited and honored to be included in *Aviation Week*'s 40 Under Forty," adding, "it's great to be recognized professionally at this level, especially when you look at the accomplishments of all the people on the list." He said that he's been "very lucky to have had great mentors and team members" throughout his career at Honeywell and looks forward "to what lies ahead." Olivarez continued, "Hopefully by highlighting the achievements of young professionals in the aerospace industry we can help encourage and inspire the next generation of engineers."

Olivarez earned Bachelor's and Master's Degrees in Aerospace Engineering from Arizona State University.

Ryan Rudy, 34, a Boeing flight-test engineer, is an AIAA Lifetime Senior Member and has been an active member on AIAA's Young Professional (YP) Committee since 2008. Rudy currently serves on the AIAA Board of Directors as the YP Liaison (2013–2015). Previously, he served as chair of the YP Committee from 2012–2013, as well as on the AIAA Publications Committee from 2008–2012.

Based in St. Louis, MO, Rudy currently works on the F-15 Saudi advanced flight-test program for Boeing Test & Evaluation. Rudy made his mark within the industry by helping the Boeing 787-8 program achieve a critical milestone in its path to first flight by serving as the project lead and technical expert for gauntlet testing. Rudy's efforts and leadership also helped demonstrate that the 787 could maintain and operate at exceedingly low temperatures in environments such as Alaska.

When asked how membership in AIAA has helped advance his career, Rudy spoke of the many ways that AIAA has helped him. "AIAA has given me numerous opportunities to continue to develop and practice leadership skills," adding, "it's one thing to be lead teams within one's company where the chain of command or program priorities incentivize completing a task, [but] having to recruit team members, motivate and influence them to complete tasks in a volunteer organization is a completely different leadership challenge."

Rudy went on to say that AIAA has given him the "opportunity to connect with many talented individuals who are passionate about aerospace," adding that the connections "with these colleagues and friends" are something that "continually re-energizes" him each time he attends an AIAA conference. He is also thankful for the opportunities that AIAA involvement has presented him with, such as serving on the advisory board to the yearly *Aviation Week* Workforce studies, which has given him "the opportunity to influence national issues like the aerospace workforce."

When asked how he feels about being named to *Aviation Week*'s 40 Under Forty list, Rudy said, "I'm humbled by this award, thankful for the opportunities I've had to make a difference, and proud of the work our teams have done that [has been] recognized."

Rudy earned a Bachelor's Degree in Aeronautical Engineering from the Pennsylvania State University and is nearing completion of a Master's degree in Systems Engineering, also from Penn State.

Christine Edwards Stewart, 30, an AIAA Senior Member, currently serves as Lockheed Martin's Mars Reconnaissance Orbiter (MRO) Operations Systems lead, based in Littleton, CO, and is responsible for MRO spacecraft operations. She led the flight team that executed MRO observations of the comet ISON. These observations were later featured in a Science Channel special called, "Super Comet ISON 2013."

Before working on MRO, Edwards Stewart was a key member of the Grail-A spacecraft extended mission team, developing and executing flight operations that allowed the two Grail spacecraft to fly at unprecedented low altitudes over the moon. These low-level flybys allowed for measurements of the moon's gravity field with extraordinary accuracy.

In addition, Edwards Stewart was a mission controller for the launch of the Jupiter-bound Juno spacecraft and the comet flyby of the Stardust spacecraft. Recently, she has been focusing on, and developing methods for, how aerospace companies can apply model-based systems-engineering and 3-D virtual-reality environments for spacecraft development and production. In August, she was presented with Lockheed Martin's Technical Innovation Award for her team's efforts in creating a virtual development environment.

When asked how membership in AIAA has helped advance her career, Edwards Stewart replied that the AIAA community provided her with her "first opportunity to give a technical presentation in a professional setting." Describing how that opportunity came to fruition, Edwards Stewart said that while a student at MIT, an AIAA chapter had just launched an annual symposium where students could present their internship experiences. She called that symposium "a defining moment" of her early career because she "not only learned how to give professional presentations, but also realized that [she] loved doing it." She added that since making that first presentation, she has "enjoyed presenting research results at conferences and speaking at many events as a JPL Solar System Ambassador."

When asked how she feels about being named to *Aviation Week*'s 40 Under Forty list, Edwards Stewart replied, "I am honored, and I am inspired by the accomplishments of the others [on] the list. In the future, I hope to continue to make a difference in the aerospace industry and inspire the next generation of space explorers."

Edwards Stewart earned both her Bachelor's and Master's of Science Degrees in Aerospace Engineering from the Massachusetts Institute of Technology. While at MIT, she helped teach classes as a Graduate Teaching Fellow and worked on the SPHERES miniature satellites.

AIAA SYDNEY SECTION HELD STUDENT & INDUSTRY NETWORKING EVENT

On 8 September at the Seymour Centre, the **AIAA University of Sydney Student Branch** hosted a networking event. Industry representatives paid it forward by inspiring the younger generation of aeronauts and astronauts, and students recognized the importance of networking and all the opportunities that lie ahead! As the saying goes, "For most people, the sky is the limit. For us, it's home."

YMCA ROCKET RAMPAGE! SUMMER CAMP

During the week of 7 July, the **AIAA Delaware Section**, in conjunction with ATK Missile Defense & Controls, sponsored the Rocket Rampage! summer camp at the YMCA in Elkton, MD.

On day 1, campers took Rockets 101, constructing balloon rockets and straw rockets, followed by rocket manufacturing, where campers made rocket “propellant” on day 2. Using the analogy that making a cake is like making propellant, they baked a cake, complete with their 5-inch center-perforate (CP) (Savarin) pan and “burning rate additives” (sprinkles).

Midweek, campers toured ATK’s Elkton facility and rotated through three stations: 3-D printing, rubber lay-up, and cork bonding. They watched as rocket models were being made on the 3-D printer, which they were given later in the week. They also toured the production area. On Mission Day, campers built their own helmets, went on a “mission” to Mars/the moon/an asteroid to pick up “samples,” and then built a glider to fly home.

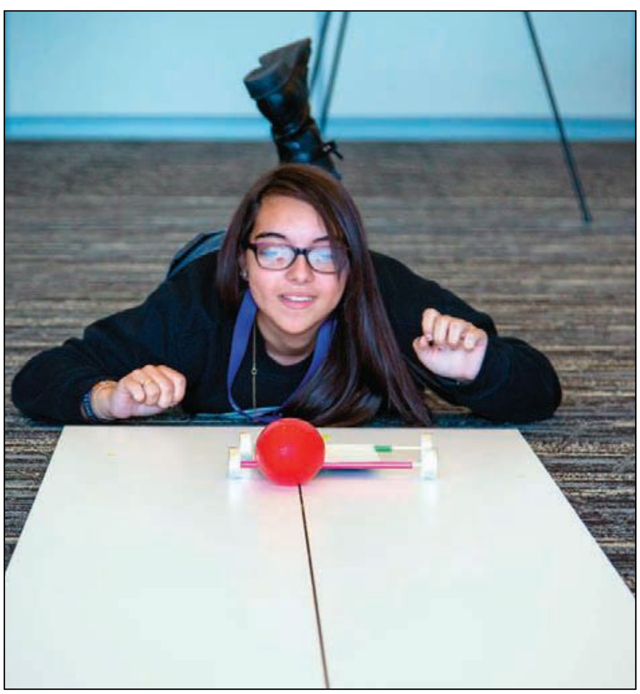
The week culminated in Rocket Launch Day, and campers launched the Estes model rockets that they had worked on all week. Launches were nearly flawless, with only one hangfire, and one chute fail. The rest worked well, avoiding the rocket-eating tree syndrome and launching 200 to 300 feet. About 200 participants from the other YMCA camps and preschool classes watched the launches and joined in the countdowns.

One of the parents posted this comment on the AIAA Delaware Section Facebook page: “Joey and Danny truly enjoyed camp this week. Thank you for taking time out of your busy schedules to teach our children how to think like scientists! Not sure anything else they do this summer will top this!”

Clockwise from bottom right: Campers watching the 3D printer made model rockets, which they flew later in the week.

NORTHERN OHIO SECTION HOSTED A STUDENT OPEN HOUSE IN JULY

On 29 July, **AIAA Northern Ohio Section** held an Aerospace STEM Lab Outreach Open House at AIAA Propulsion and Energy 2014. Dr. Sandra Magnus and other volunteers inspired and guided students on a series of design challenges. (Photos by Edmond Wong)



OBITUARIES

AIAA Senior Member Pauplis Died in August

Leonard M. Pauplis, 88, of Hudson, died on 19 August.

After graduating from high school in 1944, Mr. Pauplis served aboard the H.M.S. Empire Mace in the Philippines, Subic Bay, and Gamadodo, New Guinea during World War II. He attended Harvard University and received a degree in Engineering.

Mr. Pauplis had a long and rewarding career as an engineer. He worked for the Homestake Gold Mine in North Dakota; Surprenant Co. in Clinton; Raytheon Co. in Bedford; Mitre Corp. in Burlington and Colorado; N.A.S.A. Electronic Research Centre in Cambridge and retired from the Sylvania GTE Co. in Needham. His final project with Sylvania GTE placed him in Lille and Versailles, France.

AIAA Associate Fellow Nagel Died in August

Former astronaut and professor of mechanical engineering **Steven Nagel** passed away on 21 August. He was 67.

Mr. Nagel earned a Bachelor of Science degree in aerospace engineering with high honors from the University of Illinois in 1969 and a Master of Science degree in mechanical engineering from California State University at Fresno in 1978. He received his commission in 1969 through the Air Force Reserve Officer Training Corps program at the University of Illinois, and completed pilot training at Laredo Air Force Base in February 1970, followed by F-100 training at Luke Air Force Base.

In 1975, he attended the USAF Test Pilot School at Edwards Air Force Base, before being assigned to the 6512th Test Squadron at Edwards. As a test pilot, he worked on various projects, including the F-4 and A-7D. He logged more than 12,600 hours flying time, including 9,640 hours in jet aircraft.

Mr. Nagel became a NASA astronaut in August 1979. He first flew in space as a mission specialist on Discovery's STS-51G. In 1985, he flew as pilot on Challenger for STS-61A, and he commanded STS-37 in 1991 and STS-55 in 1993. Mr. Nagel logged a total of 723 hours in space.

After retiring from the Air Force and the Astronaut Office in 1995, Nagel became deputy director for operations development in the Reliability, and Quality Assurance Office at Johnson Space Center. In September 1996, he moved to the Aircraft Operations Division as a research pilot, chief of aviation safety and deputy division chief. Nagel retired from NASA in 2011, and joined the University of Missouri College of Engineering in Columbia, where he served as an instructor in the Mechanical and Aerospace Engineering (MAE) Department.

With Professor Gary Solbrekken, Nagel co-taught a course on aerospace propulsion. He also introduced an honors course in the MAE department during the spring of 2013 on the history of NASA. During his time as a professor, Nagel was a faculty advisor for the MU student chapter of AIAA and assisted students during the process of designing and building rockets for an annual rocketry competition.

His numerous awards include the Air Force Distinguished Flying Cross and the Air Medal with seven Oak Leaf Clusters. For pilot training he received the Commander's Trophy, the Flying Trophy, the Academic Trophy and the Orville Wright Achievement Award (Order of Daedalians). He also received the Air Force Meritorious Service Medal. He earned four NASA Space Flight Medals, two Exceptional Service Medals, an Outstanding Leadership Medal, the AAS Flight Achievement Award, the Outstanding Alumni Award of the University of Illinois, a Distinguished Service Medal, the Distinguished Alumni Award, California State University, Fresno and the Lincoln Laureate of the State of Illinois.

CALL FOR NOMINATIONS

Recognize the achievements of your colleagues by nominating them for an award! Nominations are now being accepted for the following awards, and must be received at AIAA Headquarters no later than **1 February**. Awards are presented annually, unless other indicated. However AIAA accepts nomination on a daily basis and applies to the appropriate year.

Any AIAA member in good standing may serve as a nominator and are highly urged to carefully read award guidelines to view nominee eligibility, page limits, letters of endorsement, etc.

AIAA members may submit nominations online after logging into **www.aiaa.org** with their user name and password. You will be guided step-by-step through the nomination entry. If preferred, a nominator may submit a nomination by completing the AIAA nomination form, which can be downloaded from www.aiaa.org.

Aerospace Power Systems Award
This award is presented for a significant contribution in the broad field of aerospace power systems, specifically as related to the application of engineering sciences and systems engineering to the production, storage, distribution, and processing of aerospace power.

Air Breathing Propulsion Award
This award is presented for meritorious accomplishment in the science of air breathing propulsion, including turbomachinery or any other technical approach dependent on atmospheric air to develop thrust, or other aerodynamic forces for propulsion, or other purposes for aircraft or other vehicles in the atmosphere or on land or sea.

Daniel Guggenheim Medal
The industry-renowned Daniel Guggenheim Medal was established in 1929 for the purpose of honoring persons who make notable achievements in the advancement of aeronautics. AIAA, ASME, SAE, and AHS sponsor the award.

Energy Systems Award
This award is presented for a significant contribution in the broad field of energy systems, specifically as related to the application of engineering sciences and systems engineering to the production, storage, distribution, and conservation of energy.

George M. Low Space Transportation Award
This award honors the achievements in space transportation by Dr. George M. Low, who played a leading role in planning and executing all of the Apollo missions, and originated the plans for the first manned lunar orbital flight, Apollo 8. The award is presented for a timely outstanding contribution to the field of space transportation. (Presented even years)

Haley Space Flight Award
This award recognizes outstanding contributions by an astronaut or flight test personnel to the advancement of the art, science, or technology of astronautics. It honors Andrew G. Haley, who has been described as the world's first practitioner of space law and an expert on rocket propulsion. (Presented even years)

J. Leland Atwood Award
Established in 1985, this annual award is given to an aerospace engineering educator to recognize outstanding contributions to the profession. AIAA and ASEE sponsor the award. Note: Nominations should be submitted to ASEE (**www.asee.org**) no later than **15 January**.

Missile Systems Award—Technical Award
This award is presented for a significant accomplishment in developing or using technology that is required for missile systems.

Missile Systems Award—Management Award
This award is presented for a significant accomplishment in the management of missile systems programs.

Propellants and Combustion Award
This award is presented for outstanding technical contributions to aeronautical or astronautical combustion engineering.

Space Automation and Robotics Award
This award recognizes leadership and technical contributions by individuals and teams in the field of space automation and robotics. (Presented odd years)

Space Science Award
This award is given to an individual for demonstrated leadership of innovative scientific investigations associated with space science missions. (Presented even years)

Space Operations and Support Award
This award is presented for outstanding efforts in overcoming space operations problems and assuring success, and recognizes those teams or individuals whose exceptional contributions were critical to an anomaly recovery, crew rescue, or space failure. (Presented odd years)

Space Processing Award
This award is presented for significant contributions in space processing or in furthering the use of microgravity for space processing. (Presented odd years)

Space Systems Award
This award recognizes outstanding achievements in the architecture, analysis, design, and implementation of space systems.

von Braun Award for Excellence in Space Program Management
This award gives recognition to an individual(s) for outstanding contributions in the management of a significant space or space-related program or project.

William Littlewood Memorial Lecture
The William Littlewood Memorial Lecture, sponsored by AIAA and SAE, perpetuates the memory of William Littlewood, who was renowned for the many significant contributions he made to the design of operational requirements for civil transport aircraft. Lecture topics focus on a broad phase of civil air transportation considered of current interest and major importance.

Nominations should be submitted by **1 February** to SAE at **http://www.sae.org/news/awards/list/littlewood/**.

Wright Brothers Lectureship in Aeronautics
The Wright Brothers Lectureship in Aeronautics commemorates the first powered flights made by Orville and Wilbur Wright at Kitty Hawk in 1903. The lectureship emphasizes significant advances in aeronautics by recognizing major leaders and contributors. (Presented odd years)

Wyld Propulsion Award
This award is presented for outstanding achievement in the development or application of rocket propulsion systems.

For further information on AIAA's awards program, please contact Carol Stewart, Manager, AIAA Honors and Awards, carols@aiaa.org or 703.264.7623.

AIAA Aviation and Aeronautics Forum and Exposition 2015

22–26 June 2015
Hilton Anatole
Dallas, Texas
aiaa-aviation.org

Call for Papers

Executive Steering Committee
Juan Alonso, Department of Aeronautics and Astronautics, Stanford University
Jennifer Byrne, Vice President, Technical Operations, Lockheed Martin Aeronautics
Victoria Cox, Former Assistant Administrator for NextGen, Federal Aviation Administration (retired)
Rich Wahls, Associate Head, Configuration Aerodynamics Branch, NASA Langley Research Center
John O'Leary, Vice President, Engineering, Airbus Americas

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The ability to network with people from all over these different technical areas in one place in one location where you're not running all over the place has just been terrific.—Edgar G. Waggoner, Program Director—Integrated Aviation Systems, Aeronautics Research Mission Directorate, NASA Headquarters

AIAA AVIATION 2015 combines the best aspects of technical conferences with insights from respected aviation leaders, providing a single, integrated forum for navigating the key challenges and opportunities affecting the future direction of global aviation policy, planning, R&D, security, environmental issues, and international markets. More than 1,500 papers will be presented on more than 125 specialized topics in the technical program.

Participation is Power

- Expose your work to those who will integrate your discoveries into the next generation of aircraft.
- Expand your knowledge, as expert engineers and scientists share their latest research and development findings.
- Find out what lies ahead, as senior leaders in industry discuss their programs and business challenges during plenary and interactive Forum 360 panel sessions.
- Network, discuss challenges, and share ideas during technical sessions, luncheons, networking breaks, and social activities.

Technical conferences meeting as part of AVIATION 2015:

- 21st AIAA/CEAS Aeroacoustics Conference
- 31st AIAA Aerodynamic Measurement Technology and Ground Testing Conference
- 32nd AIAA Applied Aerodynamics Conference
- AIAA Atmospheric Flight Mechanics Conference
- 7th AIAA Atmospheric and Space Environments Conference
- 15th AIAA Aviation Technology, Integration, and Operations Conference

- AIAA Balloon Systems Conference
- AIAA Complex Aerospace Systems Exchange
- 22nd AIAA Computational Fluid Dynamics Conference
- AIAA Flight Testing Conference
- 44th AIAA Fluid Dynamics Conference
- 21st AIAA Lighter-Than-Air Systems Technology Conference
- 15th AIAA/ISSMO Multidisciplinary Analysis and Optimization Conference
- AIAA Modeling and Simulation Technologies Conference
- 45th AIAA Plasmadynamics and Lasers Conference
- 45th AIAA Thermophysics Conference

Important Dates

Abstract Submission Opens: 17 September 2014
Abstract Submission Deadline: 13 November 2014
Manuscript Deadline: 28 May 2015

Student Paper Competitions

Learn critical presentation skills, build your resume, and earn money when you present your paper at AIAA AVIATION 2015. Competitions include:

- Aeroacoustics Student Paper Competition
- Atmospheric Flight Mechanics Student Paper Competition, with the support of Calspan Corporation
- Multidisciplinary Design Optimization Student Paper Competition

Location

Texas is the ideal location AVIATION 2015 because it is:

- No.1 in Air Transportation Jobs
- No. 1 in Air Force Personnel
- No. 2 in Aerospace Manufacturing Output

Dallas-Fort Worth boasts the state's largest concentration of aerospace manufacturing workers. It's home to the headquarters of American Airlines and Southwest Airlines, and facilities for companies such as Bell Helicopter, Boeing, Bombardier, General Dynamics, Gulfstream, Lockheed Martin, Mitsubishi, Pratt & Whitney, and hundreds more aviation manufacturers.

Accommodations

The Hilton Anatole is conveniently located in the Design District, just north of downtown Dallas, near many attractions including the Dallas Convention Center, Dallas Market Center, and American Airlines Center. It stands on 45 lush acres with an array of indoor and outdoor facilities, including indoor and outdoor pools, restaurants, indoor basketball court, and Sculpture Park. Summer activities on the property include Bocce ball, croquet, dive-in movies, volleyball, and more.

Learn More and Submit Your Abstracts
aiaa-aviation/org/CallforPapers

20th AIAA International Space Planes and Hypersonic Systems and Technologies Conference

6–9 July 2015
Strathclyde University Technology & Innovation Centre
Glasgow, Scotland

Abstract Deadline: 8 December 2014

The 20th AIAA International Space Planes and Hypersonic Systems and Technologies Conference will be held in Glasgow, Scotland, the birthplace of modern engineering and a vibrant center of UK hypersonic activity. The conference will provide a forum for international discussion and exchange of information about leading-edge research and development activities associated with space planes and hypersonic atmospheric flight vehicles and the technologies underpinning these capabilities. The conference will consist of overviews of national programs from Asia, Australia, Europe, and North America; programmatic summaries of major ongoing activities; keynote lectures by distinguished researchers and industry leaders; technical oral and poster presentations; and panel discussions on current issues and future directions in reusable access to space and hypersonic air transport.

In addition to the technical program, there we will be a full schedule of social events, including a "Meet the Experts" network event, the gala dinner, and a full accompanying person's program.

Technical Committee Representatives

Dr. Adam Siebenhaar, Chair, USA
Prof. Richard Brown, Co-Chair, United Kingdom
Dr. Vincent Wheatley, Australia
Prof. Jing Fan, China
Francois Falempin, France
Prof. Klaus Hannemann, Germany
Prof. Maita Masataka, Japan
Dr. Gennaro Russo, Italy
Prof. Sergey Chernyshev, Russia
Prof. Johan Steelant, The Netherlands

Technical Program

In keeping with the objectives of this conference, the organizers are soliciting papers from space plane and hypersonic programs and technologists from the international community. Papers are solicited in the following topic areas:

Missions and Vehicles including:
- Planned and ongoing space plane and hypersonic national and international collaboration vehicle programs and approaches
- Advanced launch vehicle and hypersonic atmospheric flight vehicle concepts, including commercial space tourism and intercontinental transport
- Reentry vehicle systems and technologies
- Overall system performance & optimization
- Economic and market analysis
- Environmental effects, including chemical pollution and noise
- Regulatory, certification, operation, health & safety issues
- Historical aspects, analyses and assessments and lessons learned

Thermal Management Systems for vehicles and all subsystems addressing:
- Advanced concepts
- System & component performance, dynamics & active or passive control
- System & component development & manufacturing
- Thermal protection systems, coatings & ablative systems
- Thermal protection of non-operating propulsion systems (cocooning)
- Advanced computational techniques, CFD & engineering models

Propulsion Systems, including rocket, ramjet, dual mode ramjet, scramjet, rocket and turbine combined cycle, detonation engines, electric propulsion, and other advanced propulsion systems addressing:
- Advanced cycles & concepts including plasma assisted combustion techniques
- Performance enhancement concepts, e.g., advanced nozzles
- Airframe interaction and integration
- Conventional & alternative fuels, additives, catalysis
- System & component performance, dynamics & control
- System & component development & manufacturing
- Advanced computational techniques, CFD & engineering models

Control Systems, including flight mechanics, guidance, navigation, routing, trajectory optimization, operations research, sensors, actuators, controllers and algorithms, and health monitoring addressing:
- Advanced concepts for vehicles and subsystems
- System & component performance, dynamics & control
- System & component development & manufacturing
- Advanced computational techniques, CFD & engineering models

Power Systems for vehicle, subsystems, and payload, including sources, conversion and distribution systems addressing:
- Advanced concepts including heat exchangers, Hall effect and MHD devices
- System & component performance, dynamics & control
- System & component development & manufacturing
- Advanced computational techniques, CFD & engineering models

Materials and Structures for vehicle and all subsystems addressing:
- Metallic & non-metallic materials for hot and cooled structures and thermal protection systems
- Active/functional materials
- Quality control, damage tolerance, structural health monitoring, and survivability
- Materials manufacturing and processing
- Advanced modeling & computational techniques

Test & Evaluation addressing:
- Ground test facilities, flight test operations, and simulations
- Diagnostics and data systems
- Scale limitations and facility effects
- Validation and verification
- Facility modeling & simulation

Hypersonic Fundamentals addressing:
- Basic materials science with application to hypersonic flight
- Experimental and analytical studies in the hypersonic regime, including aero-thermodynamics, gas physics and chemistry, radiation physics and fluid-structure interaction
- Advanced modeling & computational techniques with application to hypersonic flight
- Historical aspects, analyses and assessments and lessons learned

Location

Glasgow is the city of art and culture and the birthplace of modern engineering. It is the safest city in the United Kingdom, houses all major hotel chains, and is easy to navigate. The Technology and Innovation Centre at Strathclyde is a hub for world-leading research, transforming the way academics, business, industry, and the public sector collaborate. It's in the heart of the Merchant City, has on-site dining facilities, and more than 50 restaurants located within a square mile.

Learn more at **http://www.aiaa.org/hypersonics2015**.

Upcoming AIAA Continuing Education Courses

AIAA now offers live and on-demand Continuing Education webinars.
Viewers can enjoy excellent tutorials at home or in the office.
For more information please visit www.aiaa.org/webinars.

Workshop and Courses at AIAA Science and Technology Forum and Exposition 2015 (AIAA SciTech 2015)
www.aiaa-scitech.org/ContinuingEd

3–4 January 2015

Aircraft and Rotorcraft System Identification: Engineering Methods and Hands-On Training Using CIFER®

Instructor: Dr. Mark B. Tischler

The objectives of this two-day short course is to 1) review the fundamental methods of aircraft and rotorcraft system identification and illustrate the benefits of their broad application throughout the flight vehicle development process; and 2) provide the attendees with an intensive hands-on training of the CIFER® system identification, using flight test data and 10 extensive lab exercises. Students work on comprehensive laboratory assignments using student version of software provided to course participants (requires student to bring NT laptop). The many examples from recent aircraft programs illustrate the effectiveness of this technology for rapidly solving difficult integration problems. The course will review key methods and computational tools, but will not be overly mathematical in content. The course is highly recommended for graduate students, practicing engineers, and managers.

Key Topics

- Overview of system identification methods and applications
- Flight testing and instrumentation for handling-qualities and manned/unmanned control system development
- Simulation model fidelity analysis and design model extraction from prototype flight testing
- Flight test validation and optimization of aircraft dynamics and control
- Hands-on training in system identification training using CIFER®
- Students work on 10 comprehensive labs on model identification and verification using flight test data

Who Should Attend

The course is intended for practicing engineers and graduate students interested in learning the principles and applications of system identification for aircraft and rotorcraft. The course assumes some basic knowledge of the concepts of: dynamics, frequency-responses, transfer functions, and state-space representations. The course is not highly mathematical and no experience with other tools is a prerequisite.

3–4 January 2015

Best Practices in Wind Tunnel Testing

Instructors: David Cahill, Mark Melanson, and Allen Arrington

This course provides an overview of important concepts that are used in many wind tunnel test projects. The course is based largely on AIAA standards documents that focus on ground testing concepts. In particular, the course will address project management aspects of executing a testing project, the use and calibration of strain gage balances, the use of measurement uncertainty in ground testing, and the calibration of wind tunnels.

Key Topics

- Wind tunnel test processes
- Measurement uncertainty analysis for wind tunnel testing
- Internal strain gage balances for wind tunnel testing
- Aero-thermal calibration of wind tunnels

Who Should Attend

The course is designed for engineers who are involved with ground testing, particularly wind tunnel testing. The course will be beneficial to all levels of ground test engineers; it could be a primer for engineers new to testing but also will be of value to senior engineers as it will include lessons learned that can be directly applied by test project leaders.

3–4 January 2015

Third International Workshop on High-Order CFD Methods

Workshop Co-Chairs: H. T. Huynh and Norbert Kroll

High-order numerical methods for unstructured meshes offer a promising route to solving complex industrial fluid flow problems by combining superior accuracy with geometric flexibility. The 3rd International Workshop on High-Order CFD Methods is being organized by a committee of 21 international members co-chaired by H. T. Huynh of NASA Glenn Research Center and Norbert Kroll of DLR.

Workshop Objectives

- To provide an open and impartial forum for evaluating the status of high-order methods (order of accuracy > 2) in solving a wide range of flow problems

• To assess the performance of high-order methods through comparison to production 2nd order CFD codes widely used in the aerospace industry with well-defined metrics
• To identify pacing items in high-order methods needing additional research and development in order to proliferate in the CFD community

The workshop is open to participants all over the world. To be considered as speakers, participants need to complete at least one sub-case.

A number of fellowships will be provided by Army Research Office (ARO) and NASA to pay registration fees for undergraduate and graduate students to attend the workshop and present their work. If you are interested in applying for this registration waiver, please contact H. T. Huynh at huynh@grc.nasa.gov. For more information, please visit the https://www.grc.nasa.gov/hiocfd/.

4 January 2015

Introduction to Integrated Computational Materials Engineering (ICME)

Instructor: Dr. Vasisht Venkatesh

Designed to provide an overview of integrated computational materials engineering (ICME), this course offers a primer on the various types of models and simulation methods involved in ICME. It is aimed at providing a general understanding of the critical issues relative to ICME, with the goal of increasing participants' knowledge of materials and process modeling capabilities and limitations. The important aspects of linking materials models with process models and subsequently to component design and behavior analysis models will be reviewed.

Key Topics

- Obtain awareness of ICME as an emerging technology area
- Understand general models and simulation methods involved in ICME
- Articulate critical issues/challenges with ICME
- Build awareness of materials and process modeling capabilities and limitations
- Understand important aspects of linking material models with process models and their integration into component design and behavior analysis.

Who Should Attend

This course is aimed at materials, mechanical design, and manufacturing engineers; program managers; and engineering management looking to introduce or apply ICME methods in the future. This course will not provide hands-on training, but rather will provide an appreciation for the types of models available, their benefits, and how various model outputs should be interpreted.

8–9 January 2015

Fundamentals and Applications of Modern Flow Control

Instructors: Daniel Miller, Louis N. Cattafesta III, and Tony Washburn

Modern passive and active flowfield control is a rapidly emerging field of significant technological importance to the design and capability of a new generation of forthcoming air-vehicle systems, spawning major research initiatives in government, industry, and academic sectors of aeronautics. This completely revised two-day short course will address introductory fundamentals as well as several emerging air-vehicle applications of modern aerodynamic flowfield control techniques. The first day will cover a brief overview of the fundamentals of flow control, including basic concepts, terminology, history, strategies/techniques, actuators, sensors, modeling/simulation, and closed-loop control. The second day will cover applications of flow control to current and next-generation air vehicle systems, including vehicle propulsion integration, airfoil control, noise suppression, wake control, and some forthcoming non-aeronautical applications. A multi-institutional team of eight researchers from government, industry, and academia will cooperatively teach this course.

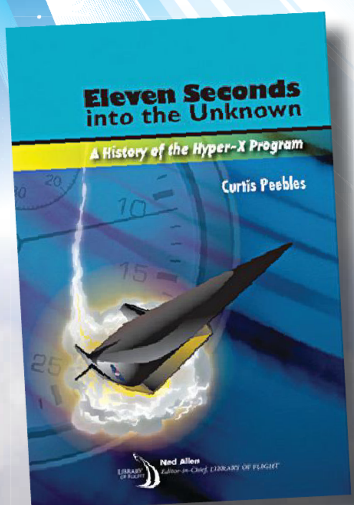
Key Topics

- Concepts, terminology, and history of flow control
- Flow control strategies
- Actuators and sensors
- Modeling and simulation techniques
- Closed-loop flow control
- Air vehicle applications: propulsion, airfoil, dynamic flowfield, non-aero apps

Library of Flight

Suitable for all reading levels, the Library of Flight series encompasses a wide variety of general-interest and reference books, including case studies. Appropriate subjects include the history and economics of aerospace as well as design, development, and management of aircraft and space programs.

FEATURED TITLES



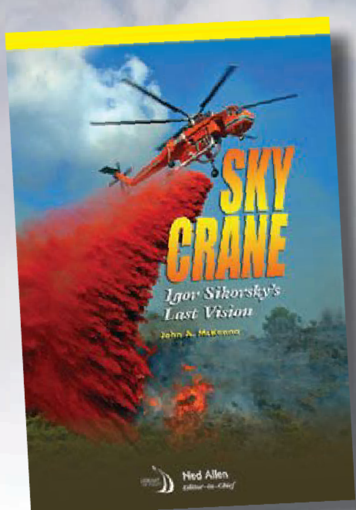
Eleven Seconds into the Unknown: A History of the Hyper-X Program

Curtis Peebles
342 pages

This is the highly-anticipated sequel to Peebles' first book on the X-43A/Hyper-X project, *Road to Mach 10: Lessons Learned from the X-43A Flight Research Program.* A central theme of the Hyper-X story is how disparate groups and organizations became a unified team working toward a common goal.

ISBN: 978-1-60086-776-7
List Price: $39.95
AIAA Member Price: $29.95

"Perfect for those interested in high-speed flight, aerospace history, the organization and management of technological projects, and the future of spaceflight."



Skycrane: Igor Sikorsky's Last Vision

John A. McKenna
136 pages

The Skycrane was the last creation of aircraft design pioneer Igor Sikorsky. In *SKYCRANE: Igor Sikorsky's Last Vision*, former Sikorsky Aircraft Executive Vice President John A. McKenna traces the development of this remarkable helicopter from original concept and early sketches to standout performer for the military and private industry.

ISBN: 978-1-60086-756-9
List Price: $39.95
AIAA Member Price: $29.95

"An inside look at the continual innovation and perseverance required for the creation and development of one of the world's most unusual helicopters."

– Michael J. Hirschberg, Managing Editor, Vertiflite magazine

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