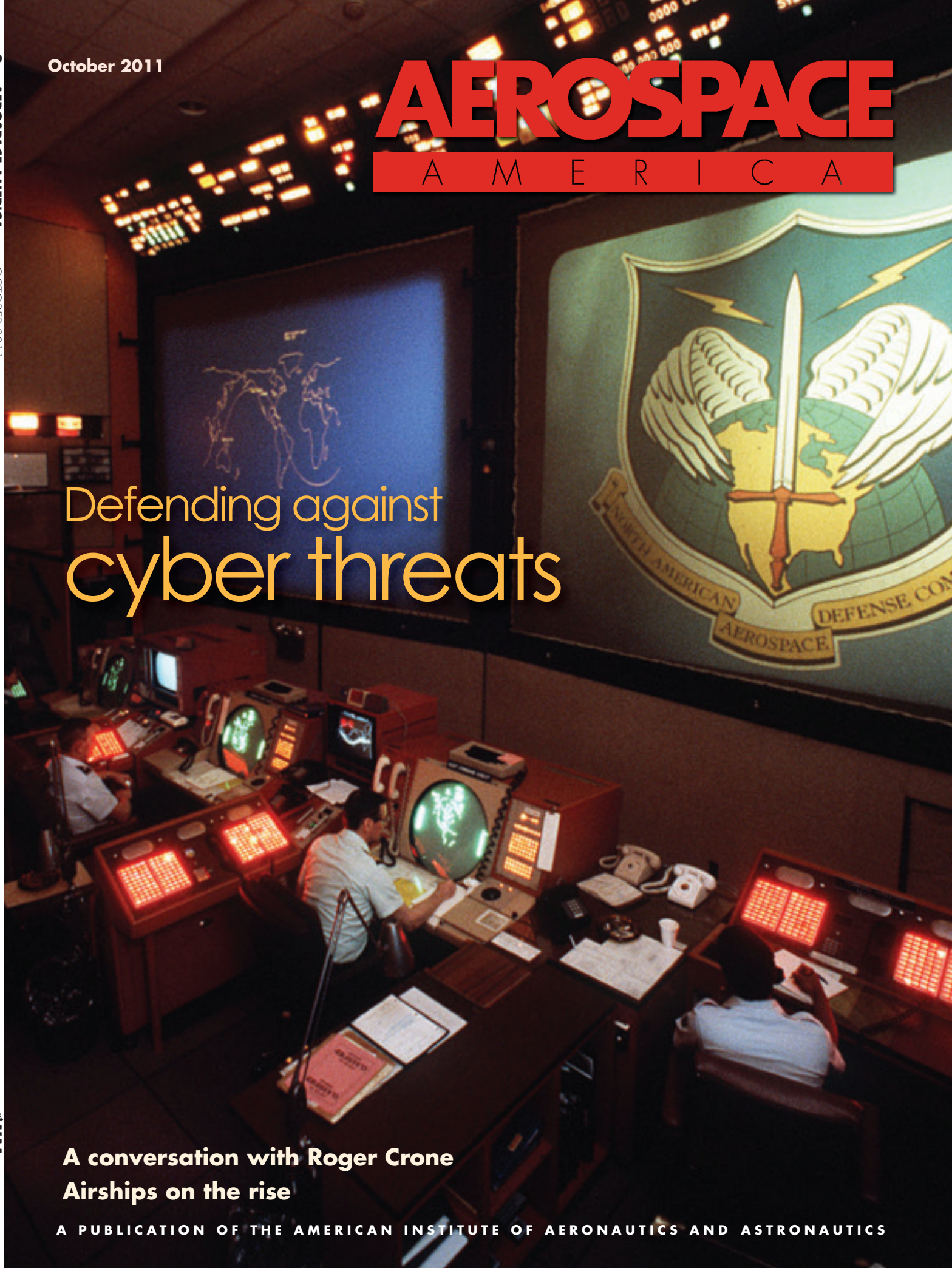
October 2011

AEROSPACE AMERICA



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DEPARTMENTS

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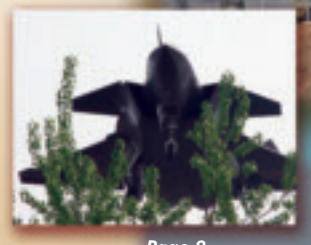

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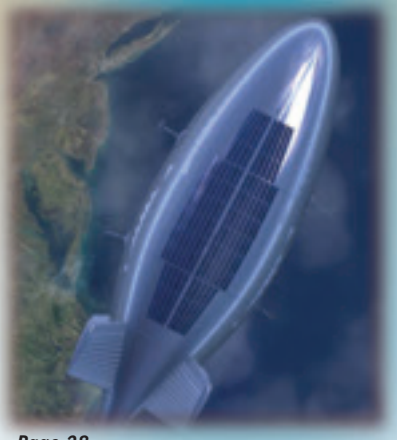

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BULLETIN

COVER
At the command post of the North American Air Defense Command Cheyenne Mountain Complex, workers must be vigilant against cyber attacks. Read about cybersecurity measures on page 22.

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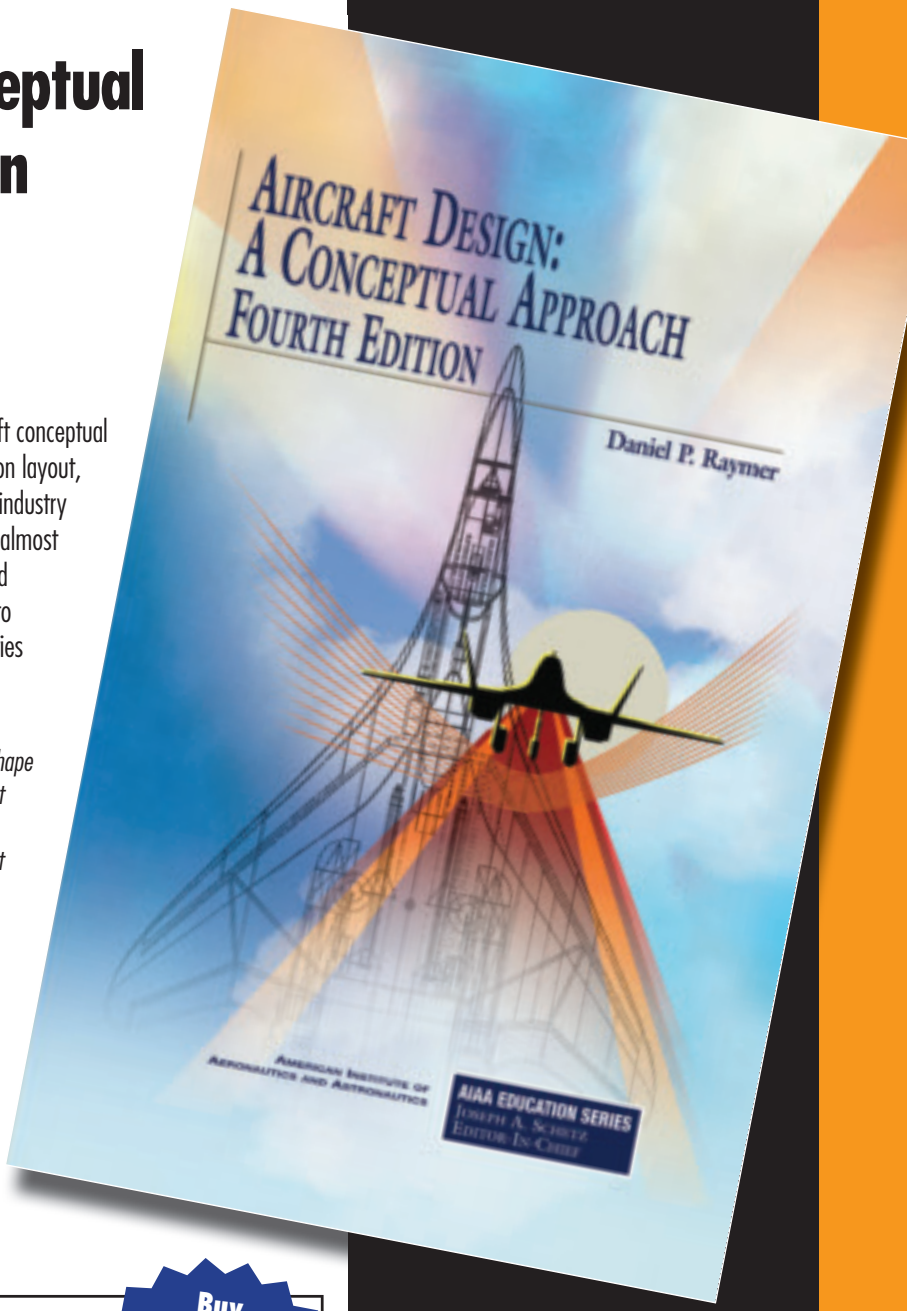

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American Institute of Aeronautics and Astronautics

Editorial

Where, and how, do we go from here?

Long before Atlantis touched down for the last time, the discussion about how the U.S. would take crews to and from the international space station had been going on in full force.

The government might falter on NASA's development of the new space launch system; the multipurpose crew vehicle might still have years to go in its development schedule, but commercial efforts appeared to be progressing. And one thing was sure—until the next U.S. launch vehicle and crew carrier were ready, the venerable Russian Soyuz-Progress combination would guarantee us assured access to the ISS. It was this assurance that made us comfortable with the notion of standing down the space shuttle.

But now, things seem to be slowly unraveling. On August 24, an unmanned Progress spacecraft carrying three tons of food and supplies to the space station failed to achieve orbit, as the third stage of the Soyuz-U rocket shut down prematurely. As the experts work to determine the exact cause of the problem, the vehicles are grounded. Nobody will be visiting the station anytime soon.

Eyes then turned to the U.S. front, where commercial vehicles seemed to be making progress. For example, after an aborted first launch in June 2010, SpaceX seemed quite close to being ready to supply the ISS with cargo, if not yet crew. But then it became clear that during a Falcon 9 launch with the company's reusable Dragon space capsule, which is meant for both cargo and then crew, the vehicle suffered an engine anomaly. The Dragon did in fact successfully reach orbit; however, it does mean more research must be done before NASA is prepared to send astronauts aboard.

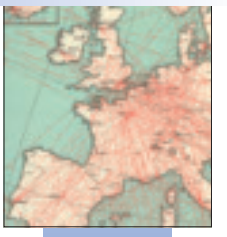
Another recipient of NASA Commercial Crew Development funds, Blue Origin, suffered a setback when its unmanned spacecraft had to be destroyed during a test flight.

No one ever said space was easy, and no one expects these vehicles and capsules to jump from paper to space. However, the Progress failure has brought the need for a launch vehicle into stark relief.

Meanwhile, NASA has finally announced its plans for its space launch system. It will use a liquid hydrogen and liquid oxygen propulsion system, including the RS-25D/E from the shuttle program for the core stage and the J-2X engine for the upper stage. It will also use solid rocket boosters for the initial development flights. The rocket is still years away, but at least there is now a plan in place. This vehicle is meant not only to travel to the station but also to continue onward, beyond low Earth orbit.

In the interim, the venerable Atlas V and Delta IV, both with superb track records, stand ready to rise to the task. While we are building a new vehicle to take us to destinations beyond LEO, why not use what we have at hand to get us where we need to be now? All these vehicles need is human rating …and a crew vehicle. And those vehicles could be ready long before a new ride comes along.

Elaine Camhi
Editor-in-Chief



Europe gears up for cyber warfare

OVER THE PAST FEW MONTHS EUROpean governments have reorganized their cyber defenses to take account of a general escalation in the number and sophistication of cyber attacks on government institutions. With cash-strapped governments increasingly looking to private partners for help in developing more cost-effective database and data communications, plus the advent of new remote storage systems such as cloud computing, more robust protective measures have suddenly become a priority throughout the continent.

In June the U.K.'s Ministry of Defence announced the creation of a new joint force command unit with an initial investment of £650 million, integrating the MOD's cyber warfare and military intelligence units. In the same month the EU announced the establishment of a Computer Emergency Response Team (CERT) made up of EU information technology security experts. Their work is paving the way to the development of an EU-wide network of national CERTs by 2012. The CERTs will exchange information on threats and how to handle them.

Also in June, Germany set up the National Cyber Defense Centre, which brings together civil and military bodies to improve protection against cyber attacks. And on June 8, NATO defense ministers approved a revised NATO policy on cyber defense—with all NATO structures to be brought under a centralized protection scheme. The new policy also set out the framework of NATO cooperation with allies, other organizations, the private sector, and academia.

These new initiatives are in addition to an already well-established set of European cyber defense institutions that have sprung up during the past few years at both a national and international level. In France the Agence Nationale de la Sécurité des Systèmes d Information (ANSSI) was formed in 2009. NATO set up its own Cooperative Cyber Defence Centre of Excellence (CCDCOE) in Tallinn, Estonia, in 2008, following a widespread cyber attack on that country the previous year.

The EU's own cyber defense organization, the European Network Security Agency (ENISA), was set up in 2005 to advise and assist the European Commission (EC) and member states on information security, to collect and analyze data on security incidents in Europe and emerging risks, and to promote security and risk awareness.

The Stuxnet worm succeeded in disrupting operations at Iran's Natanz nuclear facility.

Risks and vulnerabilities

A recent ENISA report on government agencies' use of cloud computing suggests that, for the moment at least, governments should be careful how and when they adopt this data storage strategy. According to Udo Helmbrecht, ENISA's executive director, "Public cloud offers a very high level of service availability, and is the most cost effective. Yet currently its adoption should be limited to nonsensitive or noncritical applications, in the context of a well-defined cloud adaptation strategy with a clear exit strategy."

Europe has some inherent structural vulnerabilities that make it particularly open to certain forms of cyber attack. Although each nation is responsible for securing its Internet and data communications networks, these systems are increasingly interdependent, with many different degrees of usage and sophistication among member states.

A particular concern is the potentially widespread damage that could result from a successful cyber attack on the electric grid and other energy supplies in South East Europe, which relies on Russia for many of its supplies. As the EC noted back in 2007, "Following the January Russia-Ukraine gas crisis, EU experts recently expressed concern that a collapse in any of the South East European countries would have triggered a long-lasting regional blackout."

With many of Europe's financial, energy, and transport supplies centered on a few major hubs, a successful attack on one of these areas of concentration would have a major impact throughout the continent.

"Depending on the architecture of communications networks, damage at one point can have a significant effect elsewhere—as in the recent flooding of a London exchange, which knocked out telecommunications and payment processing for thousands of local customers but also affected 437 other ex-

changes around the U.K.," according to a recent study, "Reducing Systemic Cybersecurity Risk," commissioned by the Organization for Economic Cooperation and Development (OECD). The authors are Peter Sommer of the Information Systems and Innovation Group at the London School of Economics, and Ian Brown of the Oxford Internet Institute, Oxford University.

But ENISA's role is not just about protecting infrastructure. Growth in information and communications technology (ICT) industries has been one of the main industrial economic drivers in Europe over the past few years. "According to the European Commission, ICT was responsible for 50% of overall productivity growth in the EU economy for the 10 years up to 2004, while the ICT industry itself drove 20% of the total productivity increase across the economy," says the study.

Blurred lines of responsibility

The new European cyber defense strategies and bodies are aimed predominantly at protecting vital civil information, transport, and energy networks, rather than developing cyber warfare offensive and defensive capabilities. But in a cyber war, the responsibilities that civil and military organizations have for protecting civil populations are separated by a line that is becoming increasingly blurred.

NATO established a CCDCOE in Tallinn after a widespread cyber attack on that country.

"A pure Cyberwar—wherein only cyber weaponry is deployed—is unlikely," says the OECD report. "Future wars and the skirmishes that precede them will involve a mixture of conventional or kinetic weapons with cyber weaponry acting as a disrupter or force multiplier. Downplaying the concept of Cyberwar also implies that armed forces have a relatively limited role in protecting nation states against cyber threats. Whilst the military undoubtedly rely on computers and networks for their own operations and obviously need to protect them, many of the victims of cyber attacks, or of outages of essential services dependent on the Internet and computers, are and will be substantially civilian. Thus, greater emphasis on governmental 'civil contingencies' programmes and a more thorough examination of some of the tensions within so-called Public Private Partnerships is desirable."

In setting up the U.K.'s new cyber intelligence unit the country's minister of state for the armed forces, Nick Harvey, made clear that the U.K. is now moving into areas beyond protection of civilian infrastructure. The unit is responsible for reducing vulnerability to cyber espionage, improving the ability to detect and defend against cyber attack, and incorporating cyber into mainstream defense concepts and doctrine.

"Action in cyberspace will form part of the future battlefield, but it will be integrated rather than separate, complementary rather than alternative," Harvey has written. "Suggestions that cyber weapons will replace traditional weaponry are fanciful to say the least. Cyber will be part of a continuum of tools with which to achieve military effect, both defensive and otherwise, and will be an integral part of our armoury."

State-sponsored attacks

While many large defense companies in North America and Europe, along with government organizations, are under almost constant attack from

Evolution of cyber attacks on European governments

March 2011: *The EC and the European External Action Service are the targets of a prolonged 'malware' attack in the run-up to a leaders' summit on economic reforms in Brussels. The European Parliament, with a separate IT system, is also attacked.*

Early 2011: *An attack against the EU's Emissions Trading Scheme sees at least €30 million of emissions allowances stolen from national registries.*

December 2010: *France's finance ministry is attacked by hackers using Internet addresses in China with the aim of stealing files on the G20 summit, held in Paris in February 2011.*

December 2010: *Sweden's prosecution service is targeted by computer hackers thought to be angered by its investigation against Julian Assange, founder of the WikiLeaks Web site.*

2008: *A nationwide cyber offensive against Georgia primarily comprises defacement of the country's public Web sites and the launch of a distributed denial of service attack.*

2007: *Another nationwide attack takes place, this time on Estonia, a country with a high level of connectivity. "The attacks hit many parts of the infrastructure, including the Web sites of the prime minister, parliament, most ministries, political parties, and three of the biggest news organizations. Members of the Estonian Parliament went for four days without email. Government communications networks were reduced to radio for a limited period. Financial operations were severely compromised, ATMs were crippled, and Hansabank, the largest bank, was forced to close its Internet operations. Most people found themselves effectively barred from financial transactions while the attacks were at their height. Estonia responded by closing large parts of its network to people from outside the country, and a consequence was that Estonians abroad were unable to access their bank accounts." – U.K. House of Lords report, Protecting Europe Against Large Scale Cyber Attacks*

2007: *Hackers attack a Spanish domain registration company.*

1999: *Thousands of Serbs flood NATO with emails protesting the alliance's bombing campaign in Kosovo.*

lone or small groups of hackers, a relatively new development is the appearance of state-sponsored attacks. These involve large-scale disruptions of national information networks—as in Georgia and Estonia—and of highly targeted, highly sophisticated offensive cyber weapons like the infamous Stuxnet malware, which successfully disrupted the centrifuge machinery in Iran's Natanz nuclear facility by sabotaging the systems' controllers. This was a remarkable technical achievement given that controllers are not, in themselves, computers.

Evolving with impressive speed, the military cyber threat has progressed from the ability to bombard a Web site with emails to the development of a program that can cause physical damage to a piece of machinery at a remote location.

Nevertheless, it has been hard to put the real threat of cyber attacks into a true perspective. Currently only a handful of states have the capability of launching the kind of attacks seen in Georgia, Estonia, and Iran—though most countries are now understood to have included cyber conflict to some extent in their military strategies. In the U.K., Maj. Gen. Jonathan Shaw is assistant chief of the defense staff with responsibility for cyber affairs. He pointed out at the recent CCDCOE international conference on cyber conflict that about 80% of cyber problems these days would disappear if people disciplined themselves with 'cyber hygiene.'

Europe must develop the kind of unified security protocols required to ensure its net-enabled military and security forces can equally share tactical data with allies. Infiltrating these networks is the biggest prize for any opposing military cyber warfare unit, and before such protocols can be developed, new institutional arrangements are needed to make sure there are no vulnerable entry points into the network. The flurry of new institutional cyber defense arrangements in June this year suggests that in both the civil and military fields, Europe may at last be starting to plug the holes.

Philip Butterworth-Hayes
Brighton, U.K.
phayes@mistral.co.uk

The U.K. Ministry of Defence has announced the creation of a new joint force command unit integrating its cyber warfare and military intelligence units.

Events Calendar

OCT. 3-7
Sixty-second International Astronautical Congress, Cape Town, South Africa.
Contact: www.iac2011.com

OCT. 5-6
Decoupling Civil Timekeeping from Earth Rotation, Exton, Pennsylvania.
Contact: Rob Seaman, info@futureofutc.org; www.futureofutc.org

OCT. 13-14
Acoustic Liners and Associated Propagation Techniques, Lausanne, Switzerland.
Contact: Herve Lissek, herve-lissek@epfl.ch, http://x3noise.epfl.ch

OCT. 16-19
International Conference on Space, Aeronautical and Navigational Electronics 2011, Bali, Indonesia.
Contact: Masanobu Yajima, yajima.masanobu@jaxa.jp; http://www.ieice.org/cs/sane/ICSANE2011/

OCT. 19-20
International Symposium for Personal and Commercial Spacecraft, Las Cruces, New Mexico.
Contact: www.ispcs.com

OCT. 20-21
Joint Conference on Satellite Communications, Nagoya, Japan.
Contact: Naoko Yoshimura, naoko@nict.go.jp; www.ieice.org/cs/sat/jpn/purpose_e.html

OCT. 23-26
Twentieth International Meshing Roundtable, Paris, France.
Contact: Jacqueline Hunter, jafinie@sandia.gov; www.imr.sandia.gov

OCT. 24-27
International Telemetering Conference USA, Las Vegas, Nevada.
Contact: Lena Moran, 575/415-5172; http://www.telemetry.org

OCT. 26-28
Second Aircraft Structural Design Conference, London, U.K.
Contact: Hinal Patel-Bhuya, Hinal.patel@aerosociety.com; www.aerosociety.com/conferences

NOV. 2-4
Sixth International Conference, 'Supply on the Wings,' Frankfurt, Germany.
Contact: Richard Degenhardt, richard.degenhardt@dlr.de

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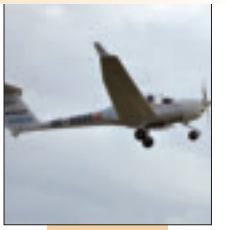

Electrifying flight

THE CLICHÉS SOUND FINE—THE AIR IS electric, the Electric Revolution—and so does the other PR material heralding Solar Impulse, the Swiss experimental solar-powered aircraft that flew at the Paris Air Show in June. But while the flight itself was an excellent achievement, the hoopla about Solar Impulse overlooks the significant number of other projects seeking to use electrical power for flight, including one in China whose progress was marred by a tragedy earlier this year.

It is everyone's goal these days to be green, and though civil aviation is widely thought to account for only 2-3% of mankind's carbon dioxide output, it is of course hugely visible. So along with the biofuels being developed to substitute for petroleum-based power, solar energy and other forms of electrical power are receiving much attention from researchers.

Unique achievement

The field's major problem—weight—has so far restricted most electric aircraft projects to the light sports category. In China, Yuneec International's first venture in this area was the two-seat E430, which first flew in June 2009. It was a small beginning, perhaps, but good enough to receive FAA certification and to win the Lindbergh Electric Aircraft Prize for the best practical example of such an aircraft at last year's Oshkosh AirVenture, an event sponsored by the Experimental Aircraft Association.

The 23-ft-long E430 is a high-wing, V-tailed composite structure with one propeller and a wingspan of 45 ft. Yuneec claims the aircraft has an endurance of up to 2.5 hr carrying a useful load of 390 lb, with a cruising speed of 60 mph and a still-air range of 140 mi. The price is around $89,000, with first deliveries expected later this year.

Yuneec's founder and chairman, Tian Yu, has funded the E430's development himself, looking at the market for kit aircraft in the U.S. The aircraft's power comes from up to five battery packs that cost $7,000 each and have a claimed life span of 1,500 hr. They can, says Yuneec, be recharged from a 230-V outlet in 3-4 hr. They provide power for a 40-kW (54-hp) electric motor turning a fixed-pitch propeller.

Power for the E430 comes from up to five battery packs.

Hard lessons

Yuneec's larger E1000 was designed as a four-seat aircraft with a high wing carrying two engines in tandem in a push-pull arrangement of 45 kW each, or about 120 hp in total. Tian Yu says he wanted to build an aircraft capable of flying at 110 mph (the E430's top speed was about 95 mph) with a range of 300 mi.

However, just after taking off on its second flight at its home base in Shanghai in May, the V-tail section suffered a catastrophic failure at a height of about 130 ft, and the aircraft crashed. The only occupant, German pilot and aeronautical engineer Martin Wezel, the E1000's designer, died in hospital. It is thought that the aircraft's ballistic parachute system may not have had time to deploy from such a low altitude.

No doubt the E1000's development will continue after the lessons from the accident have been identified and corrective action taken. It does in one sense illustrate the simplicity of aircraft powered by electricity: Once all the complexity of engine fuel, oil, and cooling systems is removed, there is little left but aerodynamic and structural matters to be considered.

The two types of Yuneec aircraft, and their comrades who ventured to the Paris Air Show, together make the point about weight: Batteries tend to be heavy, and so comprise a major limiting factor in the design and fabrication of electric aircraft. Paul Robertson of the engineering department at Cambridge University puts the pluses and minuses succinctly: Electric motors churn out huge amounts of torque, ideal for turning propellers. They do not need gearboxes, thus reducing complexity, and they have

fewer moving parts to break or wear. There is no fuel tank to leak, or to rupture in a crash and catch fire or explode. Lithium-ion batteries are lighter than their predecessors and have changed the game in favor of electric aircraft.

Against that, a lithium-ion battery's energy density—a measure of stored power—is only 4% of the same weight of gasoline, so an electric aircraft starts out with a hugely greater need for lift than a gasoline-powered type. Scale that up to airliner sizes and weights and there is not much chance in the near-to-medium term for electric power replacing Jet A or biofuels.

Solar outlook

So what about solar power? At this year's Paris Air Show, the Solar Impulse—after several days of being grounded by winds too strong for its delicate 208-ft wingspan—posed between its far larger cousins, as did several other electric aircraft, and flew a display on the show's final day. It had taken 16 hr to fly to the event from Brussels, for an average speed of about 31 mph.

But its wings are festooned with more than 11,000 thin solar cells to charge its batteries, enabling it on an earlier trial to fly through the night until daylight restored direct power from the cells. The next giant leap for the Solar Impulse team is to create a version of the aircraft that can fly nonstop around the world on solar power.

So where do solar cells come from? The largest single producing country is China, which accounted for close to 40% of the world's production capacity in 2010. Europe is the largest consuming area, with 71% of installed solar cell capacity in 2010, while the Asia-Pacific region was in second place at 14.9%, according to Renewable Energy World.com.

New technology is driving development of solar cells into thin-film versions, which are more efficient, lighter, and easier to manufacture. Once again, China is among the leading producers, along with Japan and the U.S.

The hybrid solution

Given the power demands and the potentially rapid draining of battery strength, it is only fitting that some aircraft makers are taking a leaf out of car companies' books and making hybrids. Just as a Chevrolet Volt or a Nissan Altima has engines that spring into life as generators when battery power falls to a certain level, so does Austro Engine's small Wankel engine on the European consortium's DA36, which is based on the Austrian Diamond Aircraft Industries' two-seater Super Dimona motorized glider. Partners in the consortium are Germany's Siemens, Austria's Diamond, and European aerospace giant EADS, which has supplied the aircraft's batteries.

The Solar Impulse uses more than 11,000 solar cells to charge its batteries.

There is no indication that anyone in China is building hybrids yet, but it would be surprising if researchers in the mainland were not considering the prospect. The tradeoff is obvious: the extra weight of a relatively small diesel engine running at a comfortable speed driving a generator versus the problem of carrying large numbers of batteries, as well as the extra endurance provided by carrying the ability to 'refill' the batteries in flight.

The DA36 flew at the Paris Air Show in June. Its hybrid power train is scalable for use in a large passenger aircraft, according to Siemens, which hopes to develop the system to use 25% less fuel.

Thinking big

The concept of electric aircraft is outgrowing its origins in light sports aircraft—or even smaller types: Yuneec's original background was in making electric motors for model aircraft, for instance.

The carryover from light sports aircraft was all too plain at the Paris show, where one of the highlights was a tiny twin-electric-engined plane named Cristaline. At the controls was French pilot Hugues Duval, who broke his own speed record by flying his 200-lb aircraft at over 175 mph.

To shift from that to thinking about electric power for airliners the size of, say, a Boeing 747 or an Airbus A380, or even the far smaller 737 and A320, may be a stretch too far and could remain so for a long time. But manufacturers and their researchers are thinking about it.

At EADS Innovation Works, for example, a group of projects entitled ECO2Avia includes a diesel-electric helicopter that swaps two gas turbine engines for a hybrid diesel-electric setup. The company also has an idea for an airliner it calls VoltAir that, given the prospect of new technology developing in the near future, may lead to batteries using liquid-nitrogen-cooled superconductors as highly efficient storage media for airliners. These battery packs could be exchanged at intermediate stops just as baggage containers are moved around today.

EADS believes the VoltAir could be flying in about 25 years—time enough perhaps for China to come up with its own version.

Fighter or bomber?

In the meantime, though, China and the media seem to be preoccupied with other aircraft—in particular the

so-called J-20 stealth fighter. Its 27th test flight on August 15 was responsible for a cascade of photographs of the aircraft parked at Chengdu in Sichuan province, with no discernible activity around it.

A debate has been under way for some time about the aircraft's true intended role—fighter or bomber? It seems very big for a fighter, about 70 ft long and weighing about 40 tons, compared with, say, the U.S. F-22 stealth fighter at 65 ft and 32 tons. The J-20's dimensions most closely match up with the now-retired General Dynamics F-111 bomber.

Strategists, both amateur and professional, have had several field days trying to work out just what the J-20 is supposed to do. One interesting argument is that it may be intended as a long-range interceptor to tackle USAF bombers in a future war operating out of Guam against China. Then again, its main benefit may be to help China's scientists understand stealth technology and how to improve it. If it happens to tie up Western resources such as military analysts trying to work out what it is meant to be, from China's perspective that is no bad thing.

It is unclear whether China's J-20 is a fighter or a bomber.

There has been nothing said in public about the prospects of using electric power to spin turbine engines, much modified of course, as there would be no need to burn Jet A in them, so no need for the compressor sections. Unless—could there be a way to use an electric oven to emulate the jet engine's cycle of producing thrust by taking in air, heating and expanding it, and pushing it out of the back? Now there's a thought for China.

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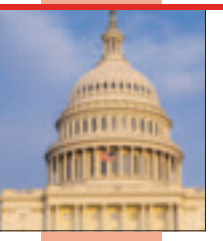

Facing decisions...later

In late summer, Congress was in recess after brickbats flew in a Washington-style slugfest that led to a conditional increase of the nation's debt ceiling. However, the compromise postponed most of the difficult decisions about deficits and the debt. Action on these and other serious issues, including jobs and the economy, should be taken up now that Congress is back in session.

On August 23, an earthquake of magnitude 5.8 sent federal workers scrambling home early and real bricks, not just symbolic ones, flying through the air in several places in the nation's capital. Behind schedule on a variety of issues, once again—as in most recent years—Congress appeared unlikely to enact a fiscal budget in time for October 1, the start of FY12.

More FAA budget woes

The FAA has not had a traditional budget in the memory of some of its younger employees and has been groping along under temporary funding that was scheduled to expire September 16. Congress has passed 20 short-term FAA funding bills since the agency's long-term authorization expired in 2007. One federal worker notes that Washington leaders in both parties "have found an awful lot of cans to kick down the road."

Sen. Barbara Boxer

Even by the standards of a seriously gridlocked Washington, the FAA's funding situation is painful for many. Already lacking a permanent budget, the agency in August also faced a brief absence of even temporary funding. The budgetary gap furloughed about 4,000 FAA workers (out of 47,000), idled an estimated 70,000 construction workers, and delayed several projects, including FAA certification of Boeing's 787 Dreamliner. (The aircraft finally received initial certification on August 26.) The issue prevented the Air Force from getting FAA clearance to operate the RQ-4B Global Hawk remotely piloted aircraft with a new squadron at Grand Forks, North Dakota. It also deprived the government of an estimated $350 million in revenue from airline ticket taxes.

For a brief period before passage of the latest temporary measure, FAA Administrator Randy Babbitt was in the awkward position of asking some FAA people to come to work without being paid.

Sen. Barbara Boxer (D-Calif.) put in an appearance at Oakland International Airport on August 23 to call for a permanent solution to the FAA's ongoing funding crisis. Boxer urged Rep. John Boehner (R-Ohio), speaker of the House, to appoint conferees to a conference committee that can resolve FAA funding issues. Because lawmakers differ over federal subsidies that support operations at about a dozen small airports, no one in Washington expects FAA funding to be appropriated on a regularized basis any time soon. Uncertainty over money means the aviation agency faces challenges in accomplishing mandated tasks, including implementation of the new NextGen aerial navigation system.

Boeing received certification for the 787 Dreamliner from the FAA and the European Aviation Safety Agency during a ceremony at the company's Everett, Washington, facility on August 26.

Tight times for NASA

NASA may face a less erratic budgetary situation than the FAA but it is feeling the pinch nonetheless. Agency managers are wondering how to make the 5-10% budget cuts ordered by the Office of Management and Budget.

At risk is NASA's heavy-lift Space Launch System (SLS). It does not help that an outside consultant firm, Booz Allen, is

Sen. Kay Bailey Hutchison

telling NASA that the agency's cost estimates for human spaceflight programs (including the SLS), which have not yet been made public, are unduly optimistic.

A Booz Allen report, which did not give numbers, says program estimates "are serviceable and can be used for near-term budget planning." But when looking three to five years into the future, the report says, the agency is trying to have it both ways by expecting to fulfill big-ticket developmental programs yet predicting "large expected cost savings."

Citing information about other aerospace projects whose costs grew by 23-77%, the report pointed out that human spaceflight is inherently less certain than any of those projects. The bottom line, the company found, is that funding reserves for SLS, the multipurpose crew vehicle, and ground infrastructure are not sufficient. Moreover, because of the uncertainty in projecting human spaceflight costs, the Booz Allen consultants were unwilling to recommend how much NASA should hold in reserve for these programs.

At press time NASA was saying that the exact numbers in its FY13 budget request were "sensitive but unclassified" and would not be released. Sen. Kay Bailey Hutchison (R-Texas) warns that because of SLS delays NASA contractors are laying off workers who have the skills needed to advance the SLS program.

Lacking Progress

With the U.S. 100% dependent on Russia to lift astronauts into LEO and to supply the ISS, no one was happy when a Russian Soyuz-U booster attempting to launch a Progress M-12M/44P unmanned cargo capsule into orbit crashed just 5 minutes after liftoff on August 24. The failure happened during ignition of the vehicle's third stage. This was the first postshuttle launch to the ISS. It was also the first crash of a vehicle supporting the station, although Russia has also lost three satellites within the past year.

The craft came down in the Altai Republic, part of the Russian Federation, near the border with Mongolia. The supplies lost were not irreplaceable, and the ISS is not yet in danger of running out of any needed items.

Moscow announced that it was grounding its Soyuz rockets, rescheduling a planned return to Earth by three ISS crewmembers to September 16 and leaving in doubt the planned September 22 launch to carry three more crew to the station.

"This failure should be a cause of grave concern, and a moment of reexamination of America's space strategy," said Rep. Dana Rohrabacher (R-Calif.), who has long expressed concern about the U.S. not having a follow-on to the shuttle. The loss "underscores America's need for reliable launch systems of its own to carry cargo and crew into space," he continued. "The only way to achieve this goal is to place more emphasis on commercial cargo and crew systems currently being developed by American companies."

Rohrabacher called on Bolden—who made no comment on the Soyuz crash—to propose an emergency transfer of funding from unobligated balances in other programs, including SLS, to NASA's commercial crew initiative, "to dramatically accelerate the commercial crew systems already under development."

Rep. Dana Rohrabacher

This Progress unmanned cargo capsule crashed just 5 minutes after launch on August 24.

Eye on China's military

The Pentagon released a long-awaited report on China's military power on August 24, flagging technology advances that include a new stealth fighter, the first Chinese aircraft carrier, and cyber warfare capabilities. Mandated by law and overdue since March, the report was received with concern by some on Capitol Hill, including Rep. Howard 'Buck' McKeon (R-Calif.), who warned of the "increasing assertiveness" of Beijing's armed forces. Two days before the document's release, Rep. Randy Forbes (R-Va.), a member of the House Armed Services Committee, wrote to Defense Secretary Leon Panetta to complain about the missed deadline.

The report, titled *Chinese Military Power*, concludes that weapons like the Chengdu J-20 fighter and a new generation of ICBMs improve China's "ability to strike regional air bases, logistical facilities, and other ground-based infrastructure." These capabilities could be used against Taiwan, which the U.S. is committed by treaty to defending.

In reality, China's aircraft carrier—unlike the high-tech ship pictured in a photoshopped urban-legend image making the rounds on the Internet—is the low-tech Varyag, a Soviet-era flattop that has been in Chinese hands since 1998, when it was purchased from Ukraine. After a decade of rework and refitting, the ship apparently has begun sea trials. Little is known about it, however, including its Chinese name. For aircraft like the Harrier, it appears to have a 'ski jump' flight deck intended for short takeoff/vertical landings, but China is not known to have any STOVL aircraft.

Western experts do not know whether the former Varyag uses gas turbine, steam turbine, or marine diesel engines.

Chinese Military Power consumed the efforts of dozens of analysts, but it contains little information that cannot be found elsewhere. It continues a tradition begun during the Reagan administration in 1981, when the Pentagon published what was meant to be a one-time, unclassified document, *Soviet Military Power*. A bureaucracy under the Defense Intelligence Agency emerged to transform that report into an annual publication from 1983 until the collapse of the Soviet Union in 1991. Officials deny that such reports are, in effect, propaganda aimed at justifying defense spending. Many in Congress like the China report because it puts an official imprimatur on information people already have.

Defense hunkers down

Supporters of defense spending are bracing for difficult times ahead. Neither the report on China's military nor the activities of defense supporters on Capitol Hill are likely to change prospects for near-term defense spending—which are for fewer, not more, military dollars.

In August, the OMB issued guidance to agencies to reduce their FY13 budget request proposals by at least 5% as compared with FY11 appropriations. Those cuts will be a down payment on the $1 trillion in cuts over 10 years required by the Budget Control Act. "Unless your agency has been given explicit direction otherwise by OMB, your overall agency request for 2013 should be at least 5% below your 2011 enacted discretionary appropriation," budget chief Jack Lew said in a memo to every agency in Washington.

Personnel costs, including a firmly rooted 20-year military retirement system, make up more than 10% of the Pentagon's budget but do not provide any easy targets for Capitol Hill cost cutters. Some in Congress fear that the F-35 Lightning II JSF could be endangered because of cost overruns and technical delays. When Pentagon acquisitions boss Ashton Carter appeared in the Senate on August 25 for a hearing on his nomination to be deputy secretary of defense, JSF supporters wanted Carter to offer assurances about the program. Sen. John Cornyn (R-Texas) issued Carter a strongly worded letter expressing "disappointment with your apparent lack of commitment" to JSF. Final assembly of all F-35s takes place in Fort Worth.

The F-35 fleet was temporarily grounded following an electrical failure in an aircraft conducting taxi runs, but returned to flight on August 25.

The Air Force's F-22 Raptor superfighters have been grounded since May 3 with a more serious problem and will not fly again until a Washington-based scientific advisory board conducts a study of these and other aircraft using onboard oxygen generation systems (OBOGS). Problems with the costly diamond-winged Raptor may be responsible for a fatal crash and may be the cause of toxins discovered in the blood of some of the USAF's 400 Raptor pilots—all of whom have lost their cockpit currency because of the grounding.

Ashton Carter

The F-22 was grounded in May and will not fly again until a science board completes its study.

Officials do not know whether the problem with toxins was a factor in the November 16, 2010, crash that killed one of the service's high-hour F-22 pilots, Capt. Jeffrey 'Bong' Haney, 31, of the 525th Fighter Squadron 'Bulldogs' at Joint Base Elmendorf-Richardson, Alaska.

OBOGS has also been linked to problems aboard Navy and Marine F/A-18C/D Hornets, which use a system developed by Cobham. The F-22 uses a Honeywell system. An OBOGS employs engine bleed air, separating out nitrogen and other components through a molecular sieve and providing a continuous supply of nearly pure breathing oxygen. A solid-state oxygen monitor ensures that the oxygen concentration meets requirements.

Display at Dover

An airplane that served as Air Force Two and carried vice presidents for three decades arrived on August 18 at the Air Mobility Command Museum at Dover AFB to become a key exhibit. Douglas VC-9C No. 73-1682 is a military derivative of the DC-9 airliner and served briefly as Air Force One, carrying President Bill Clinton on domestic trips. In a piece for this column, the author flew aboard this aircraft with Defense Secretary William Perry in 1996.

Museum Director Michael Leister says displaying the VC-9C will show "how we carry America's leaders."

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Roger Krone

Start off by telling us about your job, your responsibilities.

I'm in charge of Boeing's space business—satellites, space launch, crew transportation—with NASA and military and government customers.

The other side of my business is the network side, which is involved in some very exciting things. At the beginning of this year, seeing the evolution of what's going on in our information-dominated world, we stood up a new division called Information Solutions. It brings together all of the IT/IM [information technology and information management] work that we do within the Boeing Company to provide products and services to our government customers and eventually to some of our commercial customers.

How does cyber security fit in that?

In our Information Solutions Division is what I would call a cyber practice. Cyber is a word that is used by many and means different things. I think that 'cyber' today is viewed as synonymous with information sharing, and with the reliable operation of applications in what we call cyberspace, which is really the digital world of computers, software, the networks, and the transport layer that allows all of us to seamlessly connect and conduct commerce.

Everything depends upon the cyber world these days, doesn't it?

We have created this society that is network dependent. We have all come to rely upon our open and ubiquitous access to information connectivity, whether it is communication among college kids, or buying something off the Internet with three or four clicks, or closing some information pipes that allow us to protect the nation, including things like the transportation infrastructure and the power grid—all of the things essential to how we live in the 21st century.

Cyber security is a hot topic these days. The government and the private sector are intensely focused on it. Talk about that.

The defense industrial base has gotten heavily involved in cyber as our customers have become more and more network-centric. We have developed a set of tools and processes that allow us to secure our networks, and we have built some pretty significant capabilities. The DOD requires the reliable, seamless operation of its network, and we've seen they're willing to invest in securing that network.

Where does Boeing come in?

Boeing's role is significant in both the commercial and government marketplaces. Half of our effort is commercial; we sell large aircraft to airlines throughout the world, and we need connectivity at every commercial airport in the world. We need connectivity with every customer—all the major airlines—and with the FAA and every other major regulatory agency where we have maintenance data and get approval to operate, and all up and down our supply base. As a result, we have a very large virtual private network that we use 24 hours a day, 365 days a year, and we depend on that network to support the exchange of all kinds of information.

"We can build a firewall or put in a patch to counter a threat today, and two days later, four days later, we have a new threat."

And it goes without saying that the network absolutely has to be secure. How can you make sure that it is?

As this network-centric world has evolved, we have had to operate our network globally and build into it all of the cyber protection—the information assurance—that is necessary. We have a fairly large group of individuals in our office of the CIO [chief information officer] working on network architecture and information security. And we are constantly working with peer companies and with our vendor and agency partners to respond to a highly evolving threat.

Is the cyber threat getting worse? More frequent? More intense?

It is a persistent threat. I wouldn't say it is getting worse, but it is very reactive and evolving. We can build a firewall or put in a patch to counter a threat today, and two days later, four days later, we have a new threat. The threat requires all of industry to be responsive to it.

At Boeing we have built cyber defense that starts with monitoring our network, to enable us to examine in real time what's going on every minute; every second. We call it traffic and motion. In today's world, we need to be very reactive in real time. We can't just shut off the network, take it into a back room, and take a day to examine it. Because by then, the damage has been done.

Some people in the cyber field suggest that the whole system—the Web, the Internet—should be reengineered from top to bottom in order to have adequate security built into it; that the time will come when firewalls and patches won't be enough to stave off disaster.

There are different ways of building cyber security. There are some people who believe in having a government agency that determines how all of us operate on the Internet. I don't think that will happen. I think security will evolve in more of a tiered approach. I believe there will be a continuum of information assurance

Interview by James W. Canan

Roger Krone has been president of Boeing's Network and Space Systems since 2006, overseeing about 19,000 employees in 45 states and nine countries to provide innovative, integrated technologies for government and commercial customers.

With six operating divisions, Network and Space Systems encompasses the nation's critical space exploration efforts, cyber security, missile defense, satellite development, and intelligence networking, including programs such as the ISS, Ground- based Midcourse Defense, Airborne Laser, Wideband Global SATCOM system, and the Army's Brigade Combat Team Modernization program.

During his more than 30 years in the aerospace industry, Krone has held senior program management and finance positions at Boeing, McDonnell Douglas, and General Dynamics. He was vice president and treasurer of McDonnell Douglas at the time of its merger with Boeing, vice president and general manager of Boeing's Army Systems Division, and, at Boeing's Chicago headquarters, vice president of strategic programs. He also has held several other business management and finance positions with Boeing.

Krone earned a bachelor's degree in aerospace engineering from Georgia Institute of Technology, a master's degree in aerospace engineering from the University of Texas at Arlington, and a master's degree in business administration from the Harvard Graduate School of Business. He is an AIAA Associate Fellow and a Fellow of the Royal Aeronautical Society.

Krone serves as chairman of the board for the United Launch Alliance. He is a member of the advisory board of his alma mater, Georgia Tech, and of the board of WETA Public Television and Radio in Washington, D.C. He is a longtime supporter of the Urban League and recently served on the board of the Philadelphia chapter.

and security at various levels in cyberspace going forward.

Please elaborate on that.

I think cyberspace will run the gamut based on standards that will help us safely navigate the networked world. For example, people who operate on Facebook and Skype, who are willing to do that despite the risks, should be able to have unfettered access to the Internet in order to gain the tremendously valuable and desirable societal benefits derived from it.

So you would favor as much freedom of access and operation as possible on the Internet?

The Internet—cyberspace—has created some terrific advantages in the world in which we live. It has created a closeness in the world that was once unbelievable. You can play a video game with someone in Singapore. You can do all kinds of things.

So we need to keep a domain that is generally available to the masses. I use as an analogy the evolution of air travel. It may enable us to anticipate how the regulatory environment will evolve in cyberspace.

Can you expand on that?

I'm a pilot, and in the U.S. we have classes of airspace: Class A to Class G. Class B is the most regulated. We cannot fly an aircraft in Class B airspace, such as the airspace over and around Dulles [International Airport], without observing a whole lot of rules and specifications; we have to be validated, verified, and authenticated. The air traffic controller needs to know who we are, what we are, where we are going, and why we're there. We have to follow certain rules and be formally trained and retrained periodically. There are a lot of requirements.

And the opposite?

At the other end of the spectrum is Class G airspace, which is completely and totally unregulated. You can literally take off in an airplane—an ultralight or home-built—with no electrical systems and go fly around Class G airspace with no requirements or regulations. There are variations between Class B and Class G. Altogether, the system allows everything to operate together—big, heavy aircraft, military jet fighters, ultralights, homebuilts—and share the airspace.

These aircraft generally operate peacefully, whether flying aerobatics or commercially or for recreation or whatever. It took about 100 years to evolve airspace classifications and to get the regulations right.

You see the same sort of thing coming with regard to cyber security?

I absolutely do. To continue the airspace analogy, we have rules for flight in the U.S. and also for international flight. In a typical flight, a plane may take off at Dulles, land at Heathrow, take off for Frankfurt, go to Tel Aviv, then on to Hong Kong and Hawaii, and back to the continental U.S. So we have to have rules for international cooperation and collaboration. There has to be some standardization of transponders and other equipment, the VHF and UHF radios have to work

in the U.S. and in the U.K. and in the other countries that the airplane will fly to around the world, for example. The same goes for cyber security.

I take it you are rather optimistic that everything will fall into place over time, and that everybody—all nations—will get together to meet common threats in cyberspace.

Yes, because I believe that what ties the world together is global commerce—everyone has a stake in protecting and preserving it. And global commerce is enabled by the capabilities cyberspace affords.

What about the threats in cyberspace—how do you see them?

I'm worried more about the nongovernmental threats from nonaligned sources. Those threats could come from individuals, or even high-school kids doing it because they can. Those are the people I worry about the most. The nation-state actors should be more accountable in cyberspace because they have a vested interest in global commerce.

Good point. But what about the threats from nation-states who decide to engage in all-out cyber warfare? Some people in the U.S., including some top defense officials, say they are worried about that.

I am probably more optimistic about that than most. I think that *if* we have war, it will include cyber war but also other kinds of weapons. If there is an all-out war between two nations it won't be limited to kinetic weapons and ground troops.

If a nation can disable another nation's army through cyber means, they will try to do that. But they will use all means necessary, not just cyber, to create the effects they want.

And if you don't know where a cyber attack came from or who launched it?

We still worry about rogues in cyberspace. As the cyber world evolves, we are thinking about the tools we need to attribute cyber attacks. Those tools will be important to maintaining the balance necessary to keep cyber means being used for peaceful ends.

Can it be done? Can those tools be created?

What has been wonderful in my lifetime is that I have seen really smart people able to create just about anything we could have wanted. I believe it's going to take international cooperation in standardizing the architecture. We're going to have to do the same thing in cyberspace that we did before in airspace: Everyone will have to abide by certain standards, specifically for the more commerce-oriented parts of cyberspace.

Where do things stand on all that, by and large?

We are having a healthy debate about which government organization should take the lead in the U.S., and how we address the international aspect, just as we developed the international airspace. A lot of nations came together back in the first half of the 20th century and came up with the kinds of rules that were needed to govern intercontinental air travel.

"There will always be people out there who don't want to live by the rule of law, who have agendas that are different from those of the aligned nations."

In the same vein, the challenges posed by today's cyber landscape can be met by government and industry working together to create common standards and defensive capabilities to meet threats at all levels.

How long will it take the U.S. and the international community to come up with the common standards and regulations that are required?

We'll get there much, much faster in cyberspace than we did in airspace. But we are only at the beginning, and it won't happen in a day. It will take probably months and years to develop an environment that fosters international cooperation, so we can operate safely and efficiently in cyberspace.

But we're not going to be able to get the rogue groups and the individuals, the terrorists, to abide by all that, are we?

That's correct. There will always be people out there who don't want to live by the rule of law, who have agendas that are different from those of the aligned nations. There will be mistakes, and we will have to patch the holes in our regulatory environment and improve the ways in which we have applied technology to secure cyberspace. There could be data losses in commerce and elsewhere, but we will learn, and we will fix our networks and keep going forward.

So what it comes down to is that you don't see disaster ahead in the cyber world?

No, I do not. But I do see the emerging and evolving and pressing need to accelerate public-private partnerships and collaboration—and to increase the dialogue and to defend our networks. One of the best things going on is the sharing of best practices and technologies across the value stream of cyberspace—the users, the integrators, the acquirers, the application builders—so that we can bring the best that technology has to offer in securing our part of cyberspace.

Is there progress? Is the collaboration on the upswing?

It is, and the White House has taken the lead. Howard Schmidt [the Obama administration's cyber security coordinator] has brought together a lot of people and different organizations. There has been a great sharing of information. For example, the Defense Dept. has an organization called the Endurance Security Framework to share best practices and to talk about where we are going and what we have to do to operate safely in cyberspace.

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Protecting profits as defense markets decline

U.S. DEFENSE COMPANIES ARE WORKING to maintain profits even as budgets worldwide are coming under pressure and procurement terms become less favorable.

The five major U.S. defense firms—Lockheed Martin, Boeing Defense and Space, Raytheon, Northrop Grumman, and General Dynamics—reported combined operating profits totalling $16.9 billion in 2010. Operating profit margins were at respectable levels, ranging from 10.9% for General Dynamics down to 8.8% for Northrop Grumman. Their average operating profit was 9.6%.

During the past decade these companies have made considerable progress in profitability and will be working jealously to defend it. Profits have more than doubled in 10 years, the same five companies having earned $6.7 billion in 2000. This growth, however, was due to the rapid increase in defense revenues during that period. The average operating margin for these firms in 2010 was 9.8%, slightly worse than in 2000.

There are indications that defense profit margins may already be in decline. Although total profits for these companies continued to increase on rising sales, operating profit margins fell. Moreover, despite the record profits of 2010, they were up only slightly over those of the past four years. Aggregate profit levels of the five major defense contractors also reached record levels in 2010 but have grown only marginally since attaining their previous levels of $16.4 billion in 2007 and $16.5 billion in 2008.

That makes a likely decline in defense spending particularly ominous for the profitability of these companies. The large government deficit and efforts to close it promise to make defense spending a target in future years. The extent to which such spending declines in the coming years will be determined by the outcome of ongoing deficit talks between the administration and Congress. Declining sales for major defense companies threaten to put further pressure on profits.

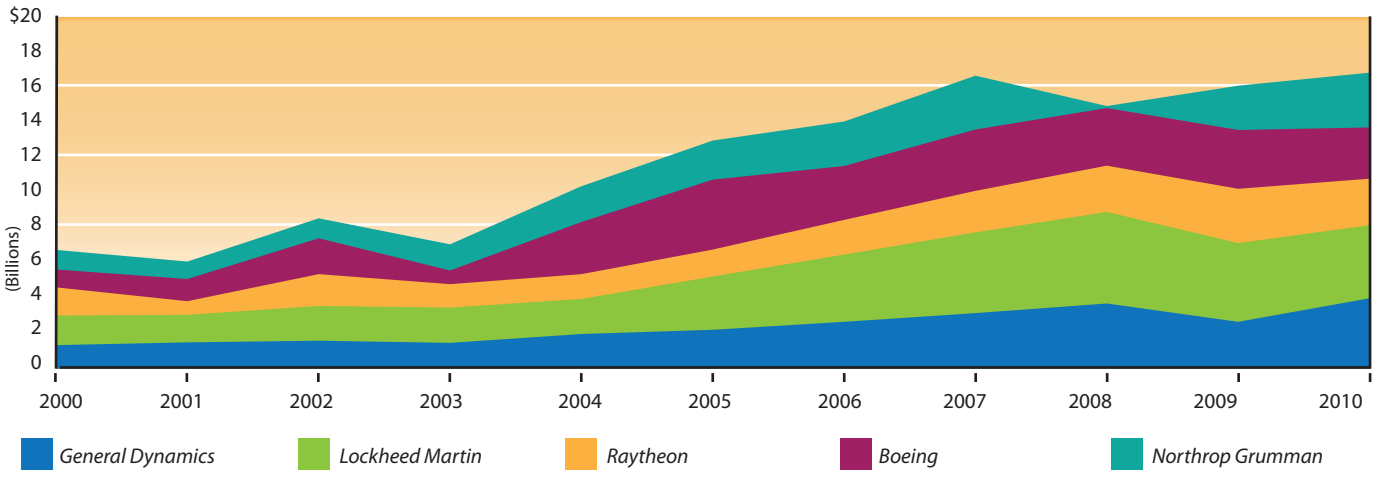
Ripple effects

A more austere budgetary environment has impacts beyond potential reductions in sales. It also affects the procurement environment for defense companies. In defense and space programs there is less tolerance for cost overruns and delays, which further stretch limited funds.

Defense companies also face tougher procurement conditions that promise to squeeze profits in future years. The exact extent to which that will happen remains uncertain, since many of the changes in procurement rules and procedures are still being developed.

A shift toward more fixed-price procurement contracts also will add to the pressures confronting defense companies. The Pentagon has shifted away from cost-plus price contracts toward fixed-price contracts, even in some cases where development has not been completed. In such instances there has been a risk of cost overruns in the development process. That shift

OPERATING PROFITS OF THE FIVE MEGA DEFENSE COMPANIES



is now toward defense contractors, a change that could create serious future writeoffs.

Boeing bid aggressively to win the fixed-price development contract for the $35-billion Air Force tanker program. It now is expected to overrun the initial $4.9-billion EMD (engineering and manufacturing development) contract for the first four aerial refueling tankers by $300 million. Boeing will bear the full costs of that overrun.

Other initiatives being pursued by the military would reduce the use of sole-source contracts and raise the number of bids, boosting bid and proposal costs. DOD is looking increasingly at opening up the aftermarket, allowing firms to compete for support of other companies' systems. With higher profits in aftermarket support, this too promises to put pressure on future profits.

Another threat to profitability comes with increased government regulation. Budgetary pressure and cost overruns have created a climate in which there is greater government scrutiny of the procedures used by defense contractors. In particular, contractors complain of increased requirements that involve their being charged with policing the subcontractor base. This requires more regulations, more procedures within corporations, more systems, and more people. The result is higher cost.

A little good news

While procurement policy is becoming increasingly unfavorable to defense companies, there have been some mitigating areas in which onerous regulations did not actually emerge.

In particular, the military worked to insource a number of functions with the expectation that there would be savings. Although this continues for some jobs considered to be inherently governmental, the drive toward insourcing as a way of saving money has lost steam, according to industry sources. There is growing recognition that it does not provide the savings anticipated.

One bright spot is international sales, including Boeing's sale of 84 new F-15s and upgrades to the 70 already owned by Saudi Arabia.

While the government is tightening conflict-of-interest regulations for defense contractors, the more draconian recommendations have been modified. Major defense contractors will not be forced to choose between systems development or systems evaluation and technical analysis work.

Grim outlook includes layoffs

Nonetheless the emerging outlook of lower government spending and a tougher procurement policy bodes ill for the defense industry.

The competitive environment will undoubtedly bring further challenges. Companies will be working aggressively to win new business. This includes European companies, which are even harder hit than U.S. firms by defense spending cuts at home. Almost all of the major European contractors are looking to compete for more U.S. defense business directly and also by making additional acquisitions of American companies to build a presence in the U.S. To win business, companies are likely to accept lower profits on new contracts while accepting greater risks to maintain revenues.

Despite having made strong efforts to keep their workforces lean, companies are already beginning layoffs. In June Lockheed Martin announced serious reductions amounting to 5% of its aeronautics workforce and 7% of its space systems division. Space systems plans to lay off 1,200 employees, with the reduction to be focused on managers; aeronautics announced plans to lay off 1,500 in areas to be determined by an organization assessment.

Lockheed Martin is only the most visible company to cut its workforce. Downsizing has accelerated in the defense industry, according to a July report by Challenger, Gray & Christmas, an outplacement company. It said the defense and aerospace sector has lost 20,857 jobs so far this year, compared to 6,121 in all of 2010.

The extent to which further savings can be achieved in some traditional areas of cost-cutting remains uncertain. Such cuts have already reached advanced levels, making it difficult to maintain profitability through additional austerity measures. Consider R&D. Lockheed Martin, the world's largest defense company, spent $863 million, or 3.5% of its 2000 revenues, on company-funded research. That has shrunk to $638 million, or 1.4% of 2010 revenues.

Lockheed Martin has the goal of increasing its international sales to 20% by 2012 or 2013, driven in part by prospects for the sale of hundreds of F-35s.

Reasons for hope

There are mitigating factors that will help profitability. As fewer programs move into development, for example, there will be a shift in defense company portfolios toward programs already in production, which generally offer higher profit margins than development programs.

International sales are another critical element in maintaining profitability for U.S. firms, offering not just potential sales growth but also higher profit margins than sales to the U.S. government offer.

Those hopes have been boosted by the announcement that Saudi Arabia will purchase $60 billion of U.S. military equipment, the largest U.S. foreign military sale ever. Boeing will win a considerable share of that business with 84 new F-15s and upgrades to the 70 already owned by Saudi Arabia. In addition, the company would sell Little Bird helicopters and AH-64 Apache attack helicopters. Boeing has boosted its foreign military sales to 18% of its defense revenue, up from 7% six years earlier. It plans to increase defense sales further, to 25%, within another five years.

Lockheed Martin has set another goal, that of increasing its international sales to 20% by 2012 or 2013, up from 14% in 2009. Underpinning the company's hopes for such increases is the prospect of hundreds of F-35 JSF orders from Australia, Canada, Norway, Turkey, the U.K., and the Netherlands, with deliveries to begin in the middle of the decade. Israel appears likely to be another near-term customer.

Raytheon, which already makes 20% of its sales overseas, sees the prospect of achieving high single-digit export growth in the coming years.

Still, there is considerable uncertainty in international markets now. Major European countries are making deep cuts in their defense budgets. Uprisings in the Middle East have created uncertainty there as well. In addition, European manufacturers are working aggressively to win international markets because of their defense budget difficulties at home. In many cases, they have been willing to take steps toward building a greater presence in emerging markets such as South Korea, Brazil, and India—countries that could be potential customers—by either buying companies, taking major stakes in firms, or setting up subsidiaries there.

U.S. defense companies, too, have been focusing on adjacent markets as one way of maintaining revenues. Homeland security has emerged as a major area, with the five biggest U.S. defense firms now ranking among the largest contractors to the Dept. of Homeland Security. Yet the $57-billion DHS budget request for 2012 is about one-twelfth the size of DOD's request.

Nor has it been easy for defense companies to build up those sales. In January, after cost overruns and serious delays, DHS canceled Boeing's $1-billion SBInet contract, which would have used technology to tighten control of U.S. borders. That same month the Coast Guard allowed the lead systems integrator contract for its $24-billion Deepwater Coast Guard modernization project to lapse following similar problems with costs and delays. The contract was held by Integrated Coast Guard Systems, a Lockheed Martin/Northrop Grumman joint venture. It had already been scaled back because of dissatisfaction with the contractors' performance.

Cyber security has emerged as another important adjacent market that holds promise. Raytheon, Lockheed Martin, Northrop Grumman, and General Dynamics all have considerable information technology expertise. Even Boeing is working to build up its position in the market.

Health information technology is a pursuit for Northrop Grumman and Lockheed Martin, which see the opportunity to apply skills developed elsewhere in their companies to this promising growth area. Lockheed Martin, Science Applications International, and Northrop Grumman, among others, are pursuing opportunities in energy and the smart grid.

As companies seek to bolster revenues by driving into international and adjacent markets, acquisitions will be a key element of the formula for success. Yet there are clear limits to the possibilities these offer. DOD will not allow any mergers among the five largest companies. Beyond that, a paucity of sellers has limited recent acquisitions to niche players. With major defense companies having reduced debt over the past decade and having considerable free cash flow, there are far more buyers than sellers in the current market.

Clearly, defense companies have already undertaken strategies such as cutting costs and moving into new markets, but even with these efforts they will definitely face difficult challenges in protecting their profitability.

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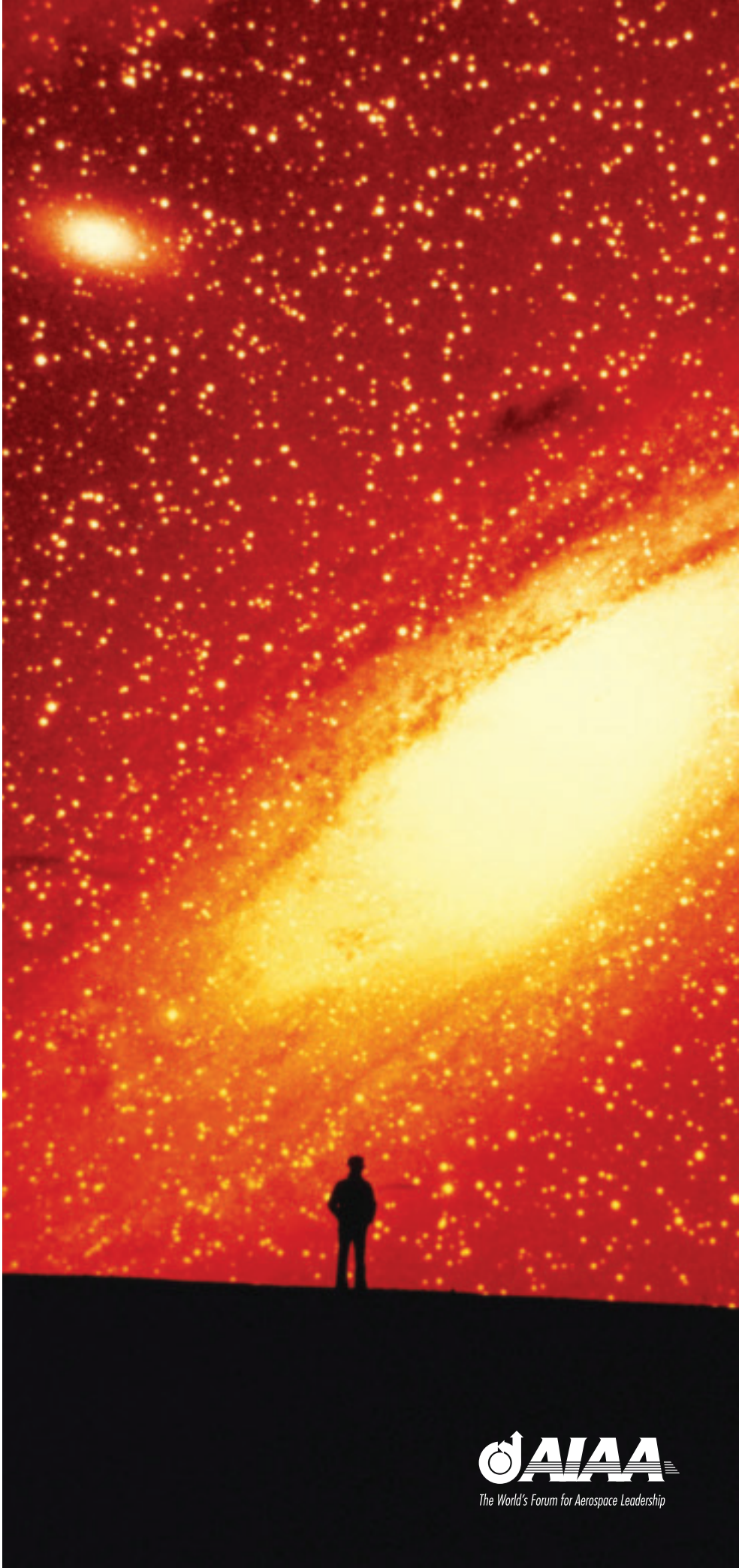

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Breaches of cyber security are rising exponentially. Each day, hackers scan millions of computer systems in the U.S. and successfully penetrate thousands. Although information technology has given the U.S. a great advantage in waging war, its cyber enemies are eroding that lead, threatening not just military assets but also power grids and other vital elements of the nation's infrastructure. Countering this threat is now a top priority for the U.S. government and its industry partners.

by James W. Canan
Contributing writer

Defending against cyber threats

Inside the Command, Control, Battle Management, and Communications control room, operators globally link, integrate, and synchronize individual missile defense elements, systems, and operations.

The U.S. military suffered perhaps its first deeply damaging cyber attack three years ago. A flash drive with a malicious computer code was inserted into a laptop at a U.S. military base in the Middle East. The surreptitious worm infiltrated a U.S. Central Command (CENTCOM) computer network, collected classified and unclassified data, and shunted it to the servers of a foreign intelligence agency.

That attack, reportedly Russian in origin, was the realization of "our worst fear: a rogue program operating silently on our system, poised to deliver operational plans into the hands of an enemy," said Deputy Secretary of Defense William Lynn in June at the International Workshop on Global Security. "The cyber threat continues to grow, posing new dangers to our security that far exceed the 2008 breach of our classified systems," he declared.

Variations of 'agent.btz,' the malicious code used to attack CENTCOM computers in 2008, are still penetrating U.S. computer networks, officials say. They agree that today's cyber threat to U.S. national security networks is far more severe than the one that did the damage in 2008.

Early responses

In response to that attack, DOD mounted a cyber initiative called Operation Buckshot Yankee that "marked a turning point in U.S. cyber defense strategy," Lynn said. The operation involved eradicating the worm from the CENTCOM network, a process that took more than a year, by one account.

The cyber attack on CENTCOM also prompted the Dept. of Defense to create U.S. Cyber Command, colocated with the National Security Agency at Ft. Meade, Maryland, to integrate all military cyber defense operations, and to begin building what Lynn described as "robust and layered defenses" against future attacks.

Gen. Keith Alexander, who heads both the National Security Agency and Cyber Command, has observed that Pentagon computer systems are probed by potential attackers 250,000 times every hour. Hackers have penetrated the networks of the CIA and the U.S. Senate, reportedly having acquired thousands of files from the networks of the U.S. and its allies and industrial partners. These files include operational plans, weapons blueprints, and surveillance data.

Proliferation continues

The trend is ominous. Invasions of military, government, and private sector computer networks have been on the rise for some time. Computer viruses and worms are proliferating and are difficult to trace and thwart. Some analysts suggest that the digitally dependent world may be entering a chaotic period of 'cyber civil unrest,' as one puts it, and that the time has come to give up on piecemeal preventive measures such

At Barksdale AFB, Capt. Jason Simmons and Staff Sgt. Clinton Tips update antivirus software for Air Force units to assist in the prevention of cyberspace hackers. USAF photo by Tech. Sgt. Cecilio Ricardo.

as firewalls and reengineer the worldwide cyber system to make it more thoroughly and innately secure.

Cyber attacks have been occurring in a widening variety of political, social, and governmental venues. Computers in the organizations of presidential candidates John McCain and Barack Obama were hacked in 2008. That same year, during the armed conflict between Russia and Georgia, Russia invaded the Web sites of Georgian government agencies and financial institutions. It disrupted Estonian Web sites as well. The computer networks of other nations, including Britain, France, India, Indonesia, and Iran, also have been corrupted.

Cyber security, or cyber combat, organizations have been created in the governments of more and more nations. Some of the most striking cyber attacks have been attributed to hackers in China and Russia, officials say, but it is often difficult or impossible to determine whether government or nongovernment hackers are to blame.

China is widely regarded as the first nation to mount cyber attacks on a relatively large scale. Last year, in a dispute between Google and China, Google accused the Chinese government of disrupting access to the company's services. WikiLeaks made public a U.S. diplomatic cable that blamed Beijing. The Chinese government denied involvement.

By some accounts, hackers operating in China have penetrated the networks of numerous U.S. government agencies and private companies, going so far as to cause power outages in the southeastern and northeastern U.S. Some cyber analysts in the U.S. blame the People's Liberation Army for the blackouts, but the allegation is said to be unverified.

DOD and its military services and intelligence agencies are responsible for confronting the cyber threat to the defense establishment and to national security interests around the globe. The Dept. of Homeland Security is the government's top gun against the cyber threat to nondefense government agencies, to the private sector, including corporations, and to academic and financial institutions. All are attempting to coordinate plans and operations in a concerted effort to get on top of the cyber threat. But the going is hard, and prospects are uncertain.

Digital combat in international cyberspace has escalated to the level of full-blown cyber warfare, say many in the U.S. defense establishment. National security is at risk in cyber attacks on both the public and private sectors, and both must work together, officials claim. Cyber attacks on the nation's infrastructure are as much a threat to national security as attacks on the U.S. military, they say.

Beyond the military sector

The cyber menace looms ever larger with the passage of time, as demonstrated by widely publicized, relatively recent penetrations of computer networks in the U.S. oil and gas sector, and in big-name companies and institutions. Examples are many: Lockheed Martin, Northrop Grumman, Dupont, Google, Sony, NASDAQ, Booz-Allen Hamilton, Citigroup, Morgan Stanley, the International Monetary Fund, and the U.S. Congress, among others. Last March, hackers broke into RSA, the cyber security division of EMC, a provider of storage hardware solutions that promote data recovery and cloud computing, and stole security codes.

Cyber experts worry about possible attacks on the U.S. power grid and on other segments of the computer-dependent na-

tional infrastructure and industrial base—banks, Wall Street, transportation systems, pipelines, nuclear power plants, medical facilities, and educational institutions are examples. Some say the escalating probes across this cyber landscape are advance reconnaissance operations for large-scale attacks that are certain to come.

McAfee, a leading U.S. cyber security company, and the Center for Strategic and International Studies issued a joint report last April on the extent and effect of cyber attacks on electric power infrastructures in 14 nations. Of 200 information technology executives interviewed for the study, 80% said hackers had targeted their networks.

The worst worm

Some electric utility companies reported having found chilling traces of the computer worm Stuxnet in their networks. Likely the most malicious malware yet to emerge, Stuxnet is said to epitomize the cyber threat to infrastructures and industrial processes throughout the world.

Stuxnet reportedly sabotaged the computer controls of thousands of centrifuges vital to the uranium-enrichment process of Iran's nuclear production facilities. No one has admitted to creating and implementing this worm. Partly because of Stuxnet's coding characteristics, Israel is widely regarded as a prime suspect but has kept silent.

Israel is said to have demonstrated its cyber war capability in 2007 by disabling the computer network of the Russian-made Syrian integrated air defense system. This action enabled Israeli strike aircraft to penetrate Syrian airspace undetected and destroy a suspected nuclear facility early in its construction.

The Stuxnet worm reportedly can hole up and hide in cyberspace for a long time. To varying degrees, it reportedly has infected Web sites in India, Indonesia, Pakistan, and the U.S., and seems to have spread through the global digital domain well beyond the sole control of its creator. The worm could be lurking in networks almost anywhere, ready to do its worst at the click of a keystroke or mouse. Hackers of all stripes can now gain access on the Internet to digital toolkits for writing Stuxnet-like malware, say these reports.

Stuxnet "significantly changed the landscape of targeted cyber attacks on industrial control systems," Rear Adm. Michael Brown, director of cyber security at DHS, told Congress earlier this year. DHS analysts concluded that the highly complex Stuxnet worm was the first of its kind, written specifically to break into and take control of the computer systems of industries and infrastructures, including those of power plants and grids, he explained.

"This code can automatically enter a system, steal the formula for the product being manufactured, alter the ingredients being mixed in the product, and indicate to the operator and the operator's antivirus software that everything is functioning normally," Brown declared.

Robert Brammer, vice president and chief technology officer for Northrop Grumman Information Systems, described Stuxnet as "a very large, sophisticated piece of software, on the order of a million and a half lines of code." It "reflected a deep knowledge of the particular types of industrial control systems that were targeted" and "was obviously written by a team of experts, as opposed to a single person," he said.

Brammer gave his views on Stuxnet earlier this year at a panel discussion of the Northrop Grumman Cybersecurity Research Consortium, which he oversees. The worm "concealed itself pretty well for a long period of time" in cyberspace, he said.

"The defense of U.S. national security interests in cyberspace depends on the talent and ingenuity of the American people," according to a DOD cyber strategy paper issued in July. "DOD will catalyze U.S. scientific, academic, and economic resources to build a pool of talented civilian and military personnel to operate in cyberspace and achieve DOD objectives.

"Technological innovation is at the forefront of national security, and DOD will foster rapid innovation and enhance its acquisition processes to ensure effective cyberspace operations. DOD will invest in its people, technology, and research and development to create and sustain the cyberspace capabilities that are vital to national security," states the paper.

"The development and retention of an exceptional cyber workforce is central to DOD's strategic success in cyberspace [and] is of paramount importance to DOD."

Countermeasures: A team approach

The Northrop Grumman consortium is a cooperative venture with MIT, Carnegie Mellon, and Purdue University to analyze the cyber threat, including attack strategies, and to develop and apply software countermeasures. The group has developed a large and growing database of malicious software, including some Stuxnet.

"The nature and seriousness of the threat is something that we're really just beginning to grapple with as a country right now," Brammer explained. "Over the next few years, the recognition will become more widespread that these cyber threats are not primarily about PCs; they are about the infrastructure."

There is broad agreement in the IT community that creating and implementing effective cyber security requires teamwork across government, industry, and academia,

and among nations. DOD and DHS joined forces for this purpose late last year, and such cooperation does seem to be increasing. DHS also works closely with other federal agencies and with state and local partners to protect government cyber networks.

"Partnerships are critical in cyber. Nobody can do this alone," declares Mike Papay, vice president of Northrop Grumman Initiatives.

Looking to DOD

The Defense Dept. is seen as the key to defending the nation against cyber attacks, and to mounting such attacks—defensive or preemptive—against hostile nations and organizations. The DOD has nearly 100,000 people involved in IT and operates 7 million computers and more than 15,000 networks in the U.S. and abroad. It also uses many nonmilitary commercial and government networks.

IT is the lifeblood of all military operations, including intelligence gathering, processing, and analysis, as well as command and control and the logistical support of land, air, and sea forces. IT operations give U.S. forces a big advantage over adversaries but have become all too vulnerable, defense officials say. DOD computer networks are scanned millions of times and probed thousands of times every day, they note.

Defense Secretary Leon Panetta, formerly the head of the CIA, told a Senate committee at his confirmation hearing in July of the "strong likelihood" that "the next Pearl Harbor" could come in the form of a cyber attack that cripples the nation's infrastructure. Within weeks of his testimony, DOD issued "Strategy for Operating in Cyberspace," a document many months in the making.

According to "Strategy for Operating in Cyberspace," "The challenges of cyberspace cross sectors, industries, and U.S. government departments and agencies; they extend across national boundaries and through multiple components of the global economy.

"Many of DOD's critical functions and operations rely on commercial assets, including Internet service providers and global supply chains, over which DOD has no direct authority to mitigate risk effectively.

"Therefore, DOD will work with the Dept. of Homeland Security, other interagency partners, and the private sector to share ideas, develop new capabilities, and support collective efforts to meet the crosscutting challenges of cyberspace."

"The nature and seriousness of the threat is something that we're really just beginning to grapple with as a country right now."

Robert Brammer
Northrop Grumman Information Systems

The paper notes that foreign cyberspace operations against U.S. public and private sector systems are increasing in number and sophistication. There is ample evidence of "adversaries focusing on the development of increasingly sophisticated and potentially dangerous capabilities," it states.

Cyber invasions have become so numerous and commonplace that the cyber security community now refers to them simply as APT, for advanced persistent threat. And APT has become synonymous with China, in the minds of many U.S. cyber security practitioners.

DOD's cyber strategy is based on five strategic initiatives set forth in the document, which asserts that "along with the rest of the government, the Dept. of Defense depends on cyberspace to function," and that "it is difficult to overstate this reliance." The paper also stresses that "the department and the nation have vulnerabilities" in this arena and that "our reliance on cyberspace stands in stark contrast to the inadequacy of our cyber security.

"Today, many foreign nations are working to exploit DOD unclassified and classified networks, and some foreign intelligence networks have already acquired the capacity to disrupt elements of DOD's information infrastructure. Moreover, non-state actors increasingly threaten to penetrate and disrupt DOD networks and systems," the document asserts.

At a briefing on DOD's cyber strategy, Lynn revealed that hackers had compromised the network of an unidentified U.S. defense contractor last March and had stolen 24,000 files of data on the development of a weapon system subsequently identified as the F-35 fighter. Lynn said the hacking "was done, we think, by a foreign intelligence service."

Lynn called the cyber theft "significant" and said it was "just the latest in a series" of such intrusions dating back five or six years. It prompted the Pentagon and the contractor to consider redesigning the weapon at issue, he said.

The new DOD strategy for defending against cyber attacks is based on what Lynn described as "deterrence by denial." This entails beefing up computer networks with new sensors, software signatures, and intelligence systems that together are capable of detecting and blocking malware before it can penetrate, Lynn explained. He said this approach should send would-be hackers the message that they might as well give up the game because they are bound to lose.

Attribution and other challenges

Attribution—tracing the source of an attack and positively identifying the attacker—is the key to cyber defense, officials say. "We have to have a [cyber security] system that

recognizes an attack, registers it, and then allows us to react in a way that's appropriate and proportional," says Lynn. Defense must also be "regional and global," not merely a "point defense," he notes.

Some cyber officials and experts in and out of government contend that the Pentagon's new strategy should be more robust. They say it falls short in not coming right out and warning the world that the nation is prepared to use cyber and/or kinetic weapons to counterattack or preempt cyber assaults on national security networks. The cyber security strategy document alludes to, but does not emphasize, that possibility.

There are those who believe the U.S. should adopt a digital-age variation of its Cold War nuclear retaliation strategy of mutually assured destruction. This would mean either responding in kind to a physically destructive cyber attack, or retaliating with kinetic weapons. But such a plan would be extremely difficult or impossible to carry out, opponents claim, because attribution of an attack would likely take a lot of time and might never reach the level of certainty required for a lethal response.

The attribution problem can and will be solved, in the opinion of many IT executives and experts. For example, Roger Krone, Boeing's vice president of network and space systems, observes that the U.S. is blessed with "really smart people" who are up to the task.

"We are thinking about the tools we need to attribute cyber attacks," Krone says. "These tools will be important to maintaining the balance necessary to keep cyber means being used for peaceful ends."

Avoiding the 'w' word

Although the term 'cyber war' has come into play as a description of what will happen (or is already happening) in the net-centric world, some cyber officials in and out of government decry it and caution against its careless and indiscriminate usage. Notable among them are Howard Schmidt, a former Microsoft security executive who was named the Obama administration's cyber security coordinator in the White House in late 2009, and James Lewis, a senior fellow at the Center for Strategic and International Studies.

Schmidt has said that, until now at least, cyber attacks against government and private sector computer networks can be legitimately characterized as cyber crime, cyber espionage, and cyber theft of intellectual property, but not as cyber war that causes physical damage.

Inside the Integrated Battlespace Arena, Michelson Laboratory, China Lake, warfighters keep a close eye on screens showing a real-time picture of theater air assets and a live feed from a Predator surveillance aircraft. USAF photo by Staff Sgt. John Houghton.

Lewis takes the same approach. He has written that "there have been many annoyances, much crime, and rampant spying" in cyber space, but that "the only incidents that have caused physical damage or disruption to critical services are the alleged Israeli use of cyber attack to disrupt Syrian air defenses, and the Stuxnet attacks against Iran's nuclear facilities."

Defense officials acknowledge the distinction but warn against taking the threat of lethal cyber attacks lightly. Lynn has observed that, along with exploitation and disruption of networks, "the third and most dangerous cyber threat is destruction, where cyber tools are used to cause physical damage." This, he said, "would mark a strategic shift in the cyber threat" and "is only just emerging."

"It is possible to imagine attacks on military networks or on critical infrastructure—such as the transportation system and the energy sector—that cause severe economic damage, physical destruction, or even loss of life," Lynn asserted. In this vein, he noted that cyber intruders have already probed the computer controls of the U.S. electrical grid and financial system.

Small attackers: A bigger threat?

In the short term, there seems to be more concern about threats from individual hackers and terrorist groups than about threats from hostile nation states. Cyber security experts in both the public and private sectors note that cyber terrorists can develop destructive software on their own or buy it on the black market.

It is now possible for hostile groups to "train a couple of hackers, give them Inter-

(Continued on page 41)

Airships

Airships, largely abandoned after the 1937 Hindenburg disaster, have made a steady resurgence in recent years. From the first military balloons used during the American Civil War, LTA platforms have evolved into huge vehicles capable of operating in wide networks carrying advanced sensors that provide battlefield views as large as a small city.

In the half-century since the last Navy blimp took to the air, a variety of airships, aerostats, balloons, and other lighter-than-air (LTA) platforms have been tested—and a few deployed—by the U.S. military.

In the 21st century, however, it is the Army and Air Force leading the way in advanced LTA, incorporating technologies and lessons learned from a decade of operating UAVs during combat in Southwest Asia. Except for the occasional reference to being 'optionally manned,' the brains aboard this new generation are silicon and—for at least one that will soon see duty in Afghanistan—in the supercomputer class.

by J.R. Wilson
Contributing writer

Design and capabilities

The USAF Blue Devil Block 2 (BD-2) is said to be about seven times the size of the Goodyear Blimp. Its manufacturer, Mav6 LLC, is a newcomer founded in 2006 by retired Army Maj. Gen. Buford 'Buff' Blount and Adam Jay Harrison. Blount is former Army deputy chief of staff-operations and former chairman of the Army Strategic Planning Board; Harrison is former director of the Army's Technical Operations Support Activity and former program executive for Army persistent surveillance programs.

Not much information is available on BD-2, except that it bears little resemblance to Blue Devil Block 1. BD-1 is a much smaller platform with some similarities to the Army EMARSS (enhanced medium altitude reconnaissance and surveillance system) now being developed by Boeing for near-term use in Afghanistan. Like EMARSS, BD-1 integrates an advanced wide-area surveillance payload aboard a Beechcraft C-12 Huron airframe, also using an existing fixed-wing platform, with the militarized version of Beechcraft's King Air 350ER again the leading choice.

Testing the Gorgon

BD-2, on the other hand, will help evaluate the Air Force's controversial Gorgon Stare intelligence, reconaissance, and surveillance (ISR) technology. Renamed in FY11, Gorgon Stare is a continuation of the Air Force WAAS (wide area airborne surveillance system), designed to meet an urgent operational need put forth by combatant commanders in Southwest Asia. The goal is to give all commanders and warfighters detailed surveillance of an area the size of a small city, from a single airborne pod.


on the rise

Built by Sierra Nevada, Gorgon Stare first flew at the end of 2010 over undisclosed parts of Afghanistan aboard a General Atomics MQ-9 Reaper hunter-killer UAV, one of the Air Force's preferred platforms for the sensor. But BD-2 will now add something new to the mix: Officials say the craft not only will have Gorgon Stare but also will serve as a 'mothership' to a fleet of Reapers equipped with the sensor.

Aboard BD-2, Gorgon Stare will be integrated with other systems, including the ARGUS-IS (autonomous real-time ground ubiquitous surveillance-imaging system), from BAE Systems/Lockheed Martin; signals intelligence sensors; and a pallet with a ground moving target indicator radar. In addition to having its own Reapers, each BD-2 will coordinate with other airships and their Reapers to create a vast real-time surveillance network with what Mav6 chief executive and retired Air Force Lt. Gen. David Deptula calls "unblinking coverage."

The area that could be covered by such an airship-based network could conceivably give the military something unequaled in the history of warfare—a unified, detailed view of all friendly-force and enemy locations and movements throughout an entire battlespace.

Deptula, who was the Air Force deputy chief of staff for ISR when he retired in October 2010, says the combination of a lighter-than-air vehicle with a multiintelligence payload and expansion of that capability across other airships and UAVs is key to his goal of helping provide "an asymmetric advantage to our 'edgefighters'—the soldiers, sailors, airmen, and Marines engaged in every corner of the battlespace."

A fleet of General Atomics MQ-9 Reapers will operate in concert with the BD-2.

From the Civil War to the Persian Gulf

LTA platforms were the first application of aviation to military operations, when observation balloons floated over the battlefields of America's Civil War. In September 1861, a Union balloon near Arlington, Virginia, telegraphed the location of Confederate troops at nearby Falls Church, enabling Union guns to fire accurately on them with neither side actually seeing the other—the first such directed fire in military history.

During that period a new type of LTA platform, the airship, was under development in Europe. Unlike balloons, it had onboard power and allowed controlled navigation, rather than going primarily where the wind would take it. Airships came with both rigid and semirigid hulls, and, as with the Union balloons, most were filled with hydrogen. (Confederate balloons used hot air, because the South lacked the ability both to produce hydrogen and to deliver it to the battlefield.)

Advancements through the closing decades of the 19th century led to the so-called 'golden age' of airships. This lasted from 1900, with the development of the first Zeppelin, to around 1930, when heavier-than-air powered aircraft began to attain dominance. While airships were widely used by all the major powers in WW I, the amount of militarily significant damage they did was slight.

By the mid-1930s, Germany was the only nation still pursuing airships to any significant degree, having shifted their use from carrying mail and other cargo to transporting passengers across the Atlantic. But the dream of building fleets of passenger airships ended on May 6, 1937, with the fire that destroyed the Hindenburg as it was attempting to dock in Lakehurst, New Jersey.

Although most people seeing the film and hearing the dramatic radio report thought the Hindenburg disaster must have killed most of those onboard, nearly two-thirds of the 97 passengers and crew survived. There would almost certainly have been a far different outcome had there been a comparable accident involving a passenger ship or airliner.

Germany essentially abandoned its airship plans after that, eliminating them especially from its massive military buildup. This left only the U.S. and the Soviet Union to continue the development and use of airships, largely for military purposes, through the 1950s. Ironically, U.S. Navy blimps played a significant role in WW II antisub-

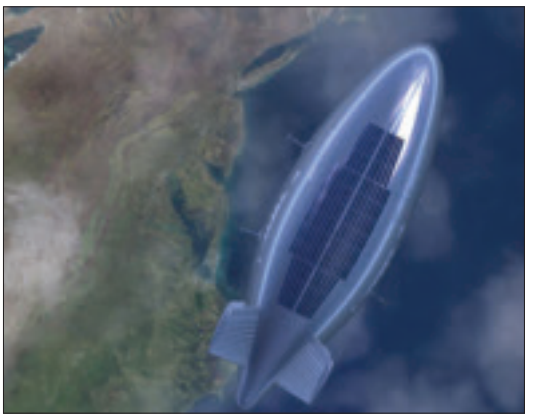
marine patrols, protecting Allied convoys from German U-boats in the North Atlantic.

After the Navy retired the last of its manned airships in 1962, blimps became best known for providing aerial views of outdoor sporting events, especially football games, and as flying billboards.

A new era

The dawn of the 21st century saw a variety of advanced technologies resurrecting the concept of the military airship, albeit without an onboard crew. Although there have been improvements in materials—lighter, stronger skins and skeletons—there are more similarities than differences between this new generation of airship and its predecessors. What has changed is the equipment that can be put onto such a platform and how that can contribute to a military mission, especially in an age of asymmetrical warfare involving nonstate antagonists.

The large surface area of an airship is one of its greatest assets. Developers are looking at covering the upper half with solar panels to provide power for both engines and payload. The lower half is then available for a wide range of sensors that go against the trend of the past three decades by being larger rather than smaller. Communications gear and other equipment not suited for mounting on the hull can be placed in a 'cabin' like those used by crews and passengers in the past.



"There will be tremendous advances in sensors in the next decade or two. The airship provides a much larger platform, so you can have antennae and lens apertures much larger," says Bob Boyd, advanced development projects program manager at the Lockheed Martin Skunk Works. "ISiS [integrated sensor is structure] is an excellent example of something you will never be able to do on a fixed-wing aircraft," Boyd explains. "So having an airship opens the battlespace to very large sensors, placing antennas far apart and so on.

"Any sensors can be used, of course, but the physical size and relatively slow speed of the airship are its primary advantages. Some sensors like slow speeds. But you want to be able to accommodate any sensor the customer wants to put on board. There are some natural fits, such as the ISiS aperture, which is several stories tall, down to existing sensors like EO/ IR cameras, ELINT [electronic intelligence], radio repeaters—digital nodes in the sky," Boyd explains.

The USS Macon was a familiar sight across the U.S. The Macon was constructed with a built-in aircraft hangar and a trapeze launch and recovery system to facilitate fighter planes intended to protect the aircraft in war.

In 2009, Lockheed Martin received a DARPA/Air Force contract to build and fly a demonstrator airship and scaled-down ISiS sensor system by 2013. As a possible replacement for the 35-year-old Boeing E-3 Sentry and the two-decades-old Northrop Grumman E-8C JSTARS (joint surveillance target attack radar system), the ISiS airship would use dual-band UHF ground-tracking radar and X-band radar to spot UAVs and cruise missiles.

According to DARPA, an operational system would cover more than 64,000 ft^2 of the airship's surface and be able to detect a car hidden under the cover of trees more than 160 n.mi. away. Solar-powered fuel cells would enable the craft to remain on station for several years without ground refueling, or move to any location on the globe within 10 days.

According to an Air Force budget request, ISiS would be "a radar of unprecedented proportions."

This year's Air Force budget proposal described the ISiS concept as "a radar of unprecedented proportions that is fully integrated into a stationkeeping stratospheric airship. ISiS will support the nation's need for persistent wide-area surveillance, tracking, and engagement of all time-critical air and ground targets. Automated surveillance and tracking includes all air targets to the radar horizon of 600 km, and all ground targets to a range of 300 km. The radar aperture also provides track data and other communications directly to users in-theater. The system is expected to be launched from CONUS locations with a multiyear operational life. No support personnel or facilities are required in-theater."

Overcoming preconceptions

The new century saw a number of airship companies and designs begin to compete for both civil and military requirements. This ultimately led to the airships now operating over Afghanistan. In joining other 'new' technologies that have taken decades to evolve into practical application—from satellites to UAVs such as Predator—airships have to overcome some preconceived notions about issues such as vulnerability to enemy fire and speed of movement.

"These are not the world's slowest aircraft—they are the world's fastest ships," says Chuck Myers, a veteran pilot and president of AeroCounsel, a Virginia-based aerospace think tank. "The next consideration is probability/character of damage and the vehicle's response to damage. That's where airplanes fare so poorly—and with disastrous outcome for the air crews." By contrast, he says, "badly damaged hybrids filled with helium might settle to Earth in 20 or 30 min, with little injury—if any—to the crews. If you might get shot down, which would you rather be in?"

The Army's LEMV was fully funded in 2010.

The Army's LEMV (long endurance multintelligence vehicle), being built by Northrop Grumman and the U.K.'s Hybrid Air Vehicles, was fully funded in 2010 to complement the PTDS (persistent threat detection system), a Lockheed Martin-built tethered aerostat. Used by the Army in Iraq and Afghanistan since 2004, the PTDS has a variety of multimission sensors to support coalition forces with long-endurance ISR and communications.

"There is a strong driving need for these very long endurance, persistent ISR missions. Intel operators need them to stay in one place for a long time, do some forensic analysis, understand patterns of life, and correlate those over a long time to establish a network of what is happening," Boyd says. "You can do it with fixed-wing aircraft, but you would need a large fleet, and that would be very expensive. Airships can stay in one place for a very long time, and do so affordably.

"In the longer term, you move into the lift class of missions—moving cargo to and from places difficult to access due to lack of infrastructure, up a mountain, hard to reach [places]—and doing that at reasonably long ranges. Fifty miles is fine for a helicopter, but 500 mi. or more and the airship makes more sense. Increasingly, we are finding ourselves involved in those kinds of difficult locations."

Other military missions for airships in today's complex combat and security environments include missile defense, border patrol, and support for antipiracy and antismuggling, from drugs and weapons to illegal migrants and terrorists.

"We are now seeing the biggest focus and emphasis on airships in decades, from both the military and industry," according to I. Steve Smith, program manager for the HiSentinel stratospheric airship at Southwest Research Institute.

"From a DOD perspective, airships can provide continuous communications on the battlefield and stare you don't have today," Rick Judy, space systems analyst at the High Altitude Technology Division of the U.S. Army Space and Missile Defense Command/Army Forces Strategic Command, explains. "From a DHS perspective, it could be used when communications are lost, as happened during Katrina, or for surveillance on the border—anywhere, CONUS or OCONUS [outside the CONUS), where there is a need for continuous stare or comms," he says.

Near-term prospects

"If we show the technology is something that can be used," Judy adds, "I believe you will see airships capable of giving you quick reaction, carrying specific payloads, launch on the battlefield, and probably heavy lift in the near future, taking payloads where you need them quickly. And possibly even transporting troops around the battlefield—although not over the oceans. You can design them for whatever the mission requirement and operating area may be. If we are successful in the next year or so, you may see an operational airship in the next five years."

New technologies and materials, combined with an abundance of long-endurance, persistent-stare missions, have brought the airship back as a serious contender for the 21s century military air fleet. Perhaps the biggest hurdle facing them now is not technology or capability, but perception and funding.

"All of the current [high-altitude] projects—HALE-D, ISiS, HiSentinel—are worth pursuing, but are technologically high risk, mostly because of trying to operate at 65,000 ft, where the operational challenges are enormous. So they are tenuous," says AeroCounsel's Myers, who served as director for air warfare at the Pentagon from 1973 to 1978.

At the same time, he continues, the requirement for such capabilities continues to grow. "We did a survey of U.S. port cities and found 50 or 60 that should have a manned airship over them 24/7; that would take about 100 classic commercial airships," Myers says. "That is a threat that not only has not gone away but grows every day. So the future of LTA should be very bright."

LEMV replaced an earlier Lockheed Martin program proposed by Myers and his group—PERSIUS (persistent elevated reconnaissance surveillance intelligence unmanned system)—which had almost identical specifications: Carry a payload of at least 2,500 lb to 20,000 ft for three weeks, giving it a line-of-sight of 173 mi.

"The idea is sound," says Myers, predicting that it "will translate into a fleet of unmanned airships that will be used in the next theater of operations or for counterpiracy. We could be flying free balloons over Afghanistan today—could have since we first got there, if somebody wanted to fund that. And we could do so now within a month, with balloons at 65,000 ft to provide a relay device for communications with forces separated by mountains. The same thing could be done for DHS agents over the U.S. southern border. That doesn't require any R&D. It's all done."

The Joint Land Attack Cruise Missile Defense Elevated Netted Sensor system (JLENS) consists of two tethered, 74-m aerostats connected to mobile mooring stations and a communications and processing group. One aerostat has a surveillance radar and the other lifts a fire control radar. The JLENS aerostats are designed to fly up to 10,000 ft and remain aloft and operational for up to 30 days. Image courtesy Raytheon.

✈✈✈

Airships have a long and successful history with the military. Moreover, the new generation—low and high altitude, tethered aerostats, balloons, and unmanned blimps—has shown that LTA can address both immediate and long-term battlefield requirements. Yet the future remains uncertain.

"No change is ever an easy sell, which is a challenge," Boyd concludes. "I think airship technology will find its home in the military in missions where efficiency is very important, where you have to stay somewhere a very long time. So cost-per-hour, cost-per-day are very important; missions where you really find the efficiency of the system brings benefit, such as transporting cargo by airship rather than helicopters, which cost more and can be better used in areas where quicker response is needed.

"It's certainly not a solution to problems requiring speed or stealth—more pickup truck than race car, just getting the job done affordably, reliably, and flexibly. It's an exciting future and an interesting idea that has been left on the shelf and is worth a relook, which we're seeing today. And as defense budgets get tighter, bringing something forward that can do the same job for less will become increasingly important to getting the mission done." ⩓

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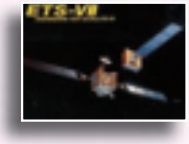

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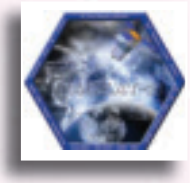

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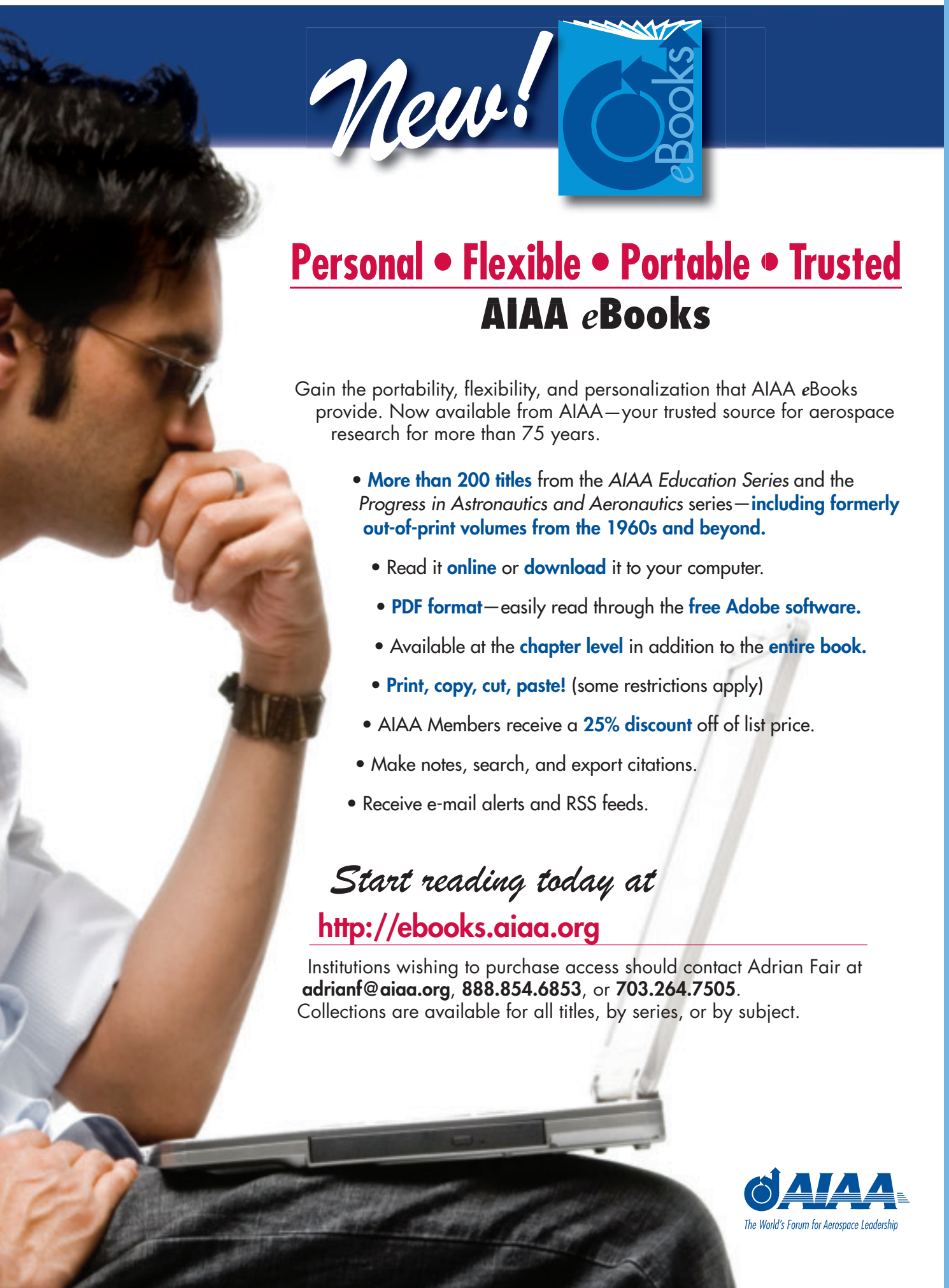

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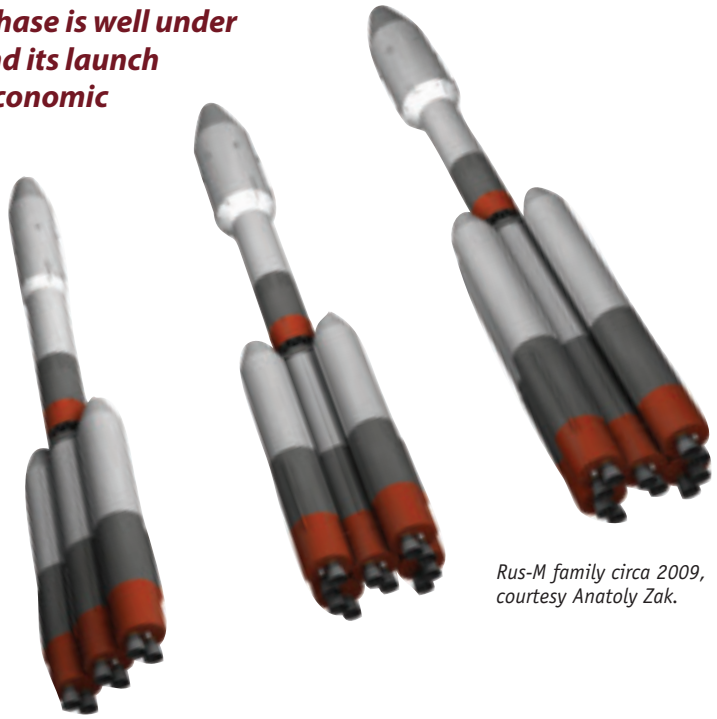
Russia's next-generation crew-carrying space vehicle, the Rus-M, will have a wide range of capabilities and built-in adaptability to multiple roles. The design phase is well under way, but ambitious plans for the booster and its launch facilities face mounting challenges. From economic turmoil to technical glitches to workforce shortages, harsh realities will make achieving the vision an uphill battle.



Rus-M family circa 2009, courtesy Anatoly Zak.

Perspectives on the

Rus-M booster project

Official Russian plans for the transition of human spaceflight to a new-generation spacecraft, launch vehicle, and launch site have been well publicized, with extensive details released during the past year. The replacement for the venerable Soyuz will be a 12-ton, six-person capsule with mission capabilities ranging from space station crew transport (with one-year on-orbit stay time) to lunar access and return.

The new carrier for human crews will be the Rus-M, a modular vehicle using new airframes with existing rocket engines. It will also feature the first Russian use of liquid hydrogen fuel for human spaceflight. The new launch site, a cosmodrome to be called Vostichniy ('Eastern'), will be built from scratch near the far eastern Pacific coast of Siberia.

Promises and problems

President Dmitry Medvedev and Prime Minister Vladimir Putin are among the top government officials who have promised that the three parallel developments will reach initial operational capability by 2018.

However, Russia's recent track record on meeting booster development schedules has not been encouraging. The much-touted Angara family of launch vehicles was expected to begin flight tests this year, but these have now been delayed into 2013-2014. A prototype first stage sold to South Korea for its own satellite launch vehicle failed on its second flight (the Russians blame the South Korean upper stage). The Soyuz launch pad at Kourou, French Guyana, was to have begun operational launches last year but has suffered repeated delays. These have led to cancellation of all the originally slated payloads, and first flight is now forecast for this fall.

In addition, development of the new-generation Bulava submarine-launched ICBM, a top-priority project supervised by Russia's Roskosmos space agency, until recently has been bedeviled by substandard components from key factories. The introduction last December of an upgraded Block D3 fourth stage for the venerable Proton booster was made with inadequate ground processing documentation and practices; this led to an accidental overloading of the propellant that resulted in dumping the too-heavy stage into the Pacific Ocean north of Hawaii.

Each of these setbacks can be officially blamed on inadequate funding, a problem that allegedly has been remedied. But

by James Oberg
Contributing writer

Zenit rockets are manufactured primarily in Ukraine.

space industry observers in Moscow have voiced concern that even with enough money, the rocket enterprises cannot hire enough skilled new employees to staff up for the increased efforts. Another widely acknowledged impediment to upgrades is the declining skill base of the Russian space and missile industry: More and more components, and in some cases even entire avionics and propulsion assemblies, must be purchased from foreign suppliers.

Meanwhile, the totally new Rus-M has been officially justified on the basis of the inadequacy of any further modifications to existing booster families, whatever their reliability or fabrication economy has turned out to be. Soyuz upgrades that preserve the classic frame have been marginal, but more are still under way for commercial payloads. The Proton has proven ecologically unsuitable because of the hypergolic fuels associated with its original mission as a super-ICBM. The Zenit is powerful enough, but it is manufactured mainly in Ukraine. Angara is a small to medium-weight family focused on military payloads, and heavy-lift proposals suffer from the program's inability to actually deliver even the smaller versions for flight.

One factor may prove crucial to the future of the Rus-M booster family and the space projects that will depend on it: the decades of experience Russian rocket manufactrers have had with upgrading and enhancing these rockets, which were originally built for military missions and then converted to spacelift. The Rus-M design, in contrast, has been chosen from the beginning not only to be useful in its first implementation but also to be readily adapted to much more powerful clustered variants. To an even greater degree than the modular Angara family, the Rus-M is to benefit from standardized ground processing interfaces in practically any upgraded configuration.

Test flights of the Angara family of small to medium-weight launch vehicles have been delayed into 2013-2014.

A closer look

After a two-year review, Roskosmos has settled on a Rus-M design that is also strong on classic components and familiar players. The Progress Plant will be responsible for the overall booster development. Located in Samara on the Volga River, the plant currently fabricates Soyuz boosters. It will also build the Rus-M's second stage, which will use four RD-0146 engines originally developed in the 1990s by the Khimavtomatika Bureau at Voronezh. Made for the upper stages of the Proton and Angara but never used, the RD-0146 was based on the Pratt & Whitney Rocketdyne RL10 engine originally built for Saturn and Centaur boosters more than 40 years ago.

The Makeyev Bureau at Miass will build the new rocket's first stage. The facility has built liquid-fueled submarine-launched missiles for almost 50 years but recently has undergone severe economic hardship. The first stage will use a core and two strap-ons with a total thrust of 916,500 kgf (almost twice that of the Soyuz); each booster module is limited to a diameter of 3.8 m, the size that can be transported by rail from factory to launch site. The engine selected is the kerosene-burning RD-180, now built by Energomash in Moscow for export sales to the U.S., which uses it in the Atlas-III. Rus-M will need a modified engine called the RD-180V with added diagnostic sensors for abort detection.

Rus-M will be the first Russian space booster specifically designed for human spaceflight. The baseline design reference mission is to carry a 23.8-metric-ton payload (three times the mass of the current Soyuz) into a 200-km orbit inclined 51.7 deg. Early this year, press reports stated that the payload was 1,660 kg overweight, and a design scrub was under way.

On March 31, Gennadiy Raykunov, general director of TsNIIMash (Central Machine-Building Research Institute), which provides safety and quality reviews of Russian spacecraft, reported that the vehicle was halfway through its design process. "Design and detail documentation is being drafted, integrated experimental method programs are being compiled," he told an Interfax reporter. "At least, following this stage, the paperwork will end and the hardware, tests, and development will begin," he said.

"Optimization in terms of the engines and the control system continues, operating procedures go on until there are no kinks," Raykunov added.

A number of stringent safety measures have been designed in from the start. For example, prelaunch processing would be entirely automated or teleoperated. The design also requires single-engine-out capability from liftoff, to reach an abort zone over the Pacific. From late in first-stage ascent, the booster must provide an abort-to-orbit capability. Ascent *g*-forces shall not exceed 4.0.

Detailed design work on launch support structures will allow facilities to handle

the Rus-M and all planned upgrades with minimal modifications. With a five-module combination first stage, the upgraded booster will be able to carry 60 tons into LEO. A mission architecture for a dual launch and rendezvous in lunar orbit could support an Apollo-class manned lunar landing. A single-launch vehicle with a 100-ton payload has also been designed, but it would require significant new engine work.

Other activities

The Progress Plant is also busy modifying the standard Soyuz launch vehicle for flight from French Guyana. In addition, the facility is conducting an upgrade using all-Russian guidance avionics for the Soyuz-2-1a, slated to be introduced as a carrier for the manned Soyuz spacecraft in about 2014. In direct competition with the supposedly 'universal' Angara family, the firm is also developing a 'Soyuz light' booster with the four strap-ons removed and an NK-33 engine installed in the core stage, to carry a 2,800-kg payload into a 200-km orbit.

The Moscow-based Khrunichev firm, which now manufactures Proton boosters and is responsible for developing the Angara series, also bid on the Rus-M project but received no contracts. Nevertheless it remains busy fabricating profitable Proton rockets, and in April explicitly posted those plans on its Web site: "The Proton-M will continue forming the core of Russia's federal space program in the category of heavy launch vehicles for the next decade," it wrote. This was in direct defiance of a quotation attributed to Roskosmos chief Anatoliy Perminov stating that if the first Angara launch is successful, "Proton rockets could start to be taken out of service gradually."

Khrunichev is also overseeing the complex transfer of Angara engine production and rocket body fabrication to two newly acquired subsidiaries in Perm and Omsk that formerly made smaller military missiles and launch vehicles. And it is developing plans for a pair of Angara pads at Vostochniy and another at Baikonur.

The bigger picture

Assembling the industrial team that will produce the Rus-M took place against the backdrop of an ongoing government effort to streamline and optimize the disparate elements of the Russian rocket/space industry. Many entities vanished entirely following the collapse of the USSR and its mandated subservience to central planning agencies. Others significantly shifted their industrial production, terminating fabrication of key spacecraft-related components.

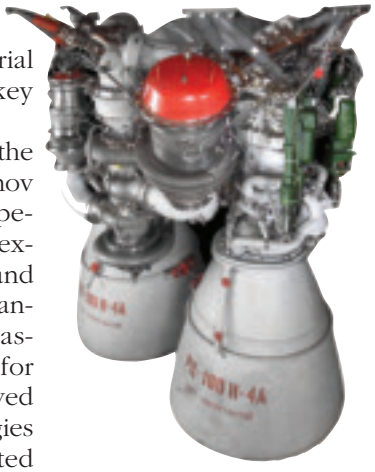
In a harsh assessment February 7 in the weekly *Nasha Versiya*, Aleksandr Stepanov wrote, "According to assessments of specialists, the Russian space industry has exhausted its scientific-technical resource and has lost the capability to develop and manufacture most of the instruments and assemblies. Extending the service life for those remaining in space today is achieved largely by bringing in foreign technologies and assemblies, and even the vaunted GLONASS satellites are being assembled with foreign parts for the most part."

Roskosmos deputy head Sergei Ponomaryov confirmed that information last March when he told Interfax that electronic components installed on Russian spacecraft have been increasingly foreign made in recent years. "The proportion of those electronic components is between 27% and 46%, depending on the type of the vehicle," Ponomaryov told a roundtable at the Russian Academy of Sciences in Moscow. Yuriy Solomonov, chief designer of the Bulava missile, concurred. In an April 20 interview, he lamented, "Hundreds of unique technologies have been lost. Many components are purchased overseas. Their manufacture here is now impossible."

No booster is useful without a launch site, and the fact that the new Rus-M booster is to fly from a site whose construction has not even started yet is another schedule threat. As of mid-2011, 24.5 billion rubles have been allocated for construction through 2013, but aside from some road signs, a stone obelisk, and a small visitors' pavilion for VIPs, nothing has been built.

Speaking to newsmen in Moscow on January 31, Perminov had described what would be built first: "A 4.5-km railroad line, a road from the Amur federal highway, and a construction depot will be ready this year," along with repair work on old power lines, he said. Housing for workers, a hotel for visitors, and a headquarters for management staff will also be built before any work begins on launch pads and processing facilities.

Perminov elaborated a month later: "Construction works will begin in June," he told an interviewer on Ekho Moskvi radio. "First and foremost, we will build roads, railroad tracks, energy and auxiliary facilities," he said. Mission support construction will require another 57 billion rubles in



A modified RD-180 engine will serve as the first stage booster for the Rus-M family.

2014, he added. But as June came and went there were no news reports of construction commencing.

Top Moscow political leaders have put their personal prestige behind the project. In January, Putin called the construction of the cosmodrome "a new big nationwide project," adding, "This will be a national cosmodrome meeting the highest international standards and capable of dealing with the whole range of space exploration tasks....[It] will guarantee Russia fully independent space activities, including the launch of all types of spacecraft, transport and cargo vehicles, modules, and orbital stations," Putin continued. He expects the site to be used for human flights to the Moon and Mars in the future, he said.

If activated, the base and the Rus-M booster will rapidly change the distribution of space traffic in Russia. Up until 2015, 64% of Russia's satellite launches have been from Baikonur, 30% from Plesetsk, and 6% from lesser cosmodromes. By 2020 that distribution is supposed to shift to 45% from Vostochniy, 44% from Plesetsk, and 11% from Baikonur.

Construction is ongoing for the Soyuz launches in French Guiana. Photographer: Aleksey Yakunin.

Doubts and objections

Inside Russia there are some who doubt that these vaulting ambitions can be realized, even if most of the promised funding is delivered (always a big 'if'). Even some of the Rus-M industrial team members have expressed reservations at being drafted into the grandiose project and consolidated into a larger space industry combine. Among them is the Energomash Research and Production Association, which is tasked to build the rocket engines for the first stage of the Rus-M.

Dmitriy Pakhomov, general director of Energomash, went public in June 2010 with his objections to becoming a branch of a 'Russian Space Corporation' based on the Energiya space facility in Moscow. He saw it as an immediate threat to seize his firm's rocket sales profits for the relief of other firms that were deeply in debt. In an interview, he pointed specifically to the demand that Energomash reduce the price of the RD-171 engine used in the Sea Launch program, to help that company—now wholly owned by Energiya—work its way out of bankruptcy. To help reduce Energiya's indebtedness over Sea Launch, Pakhomov complained, his company was supposed to lower its own profit margin.

"It is impossible to count on a positive outcome here," he noted. The vertical integration being implemented would steer all Energomash efforts to serving the engine needs of only a single rocket builder. "I have no doubts this will be done at the expense of limiting the possibilities for development of new models of engines that are required for the projects of other rocket engineering corporations, which are rivals of Energiya or can become rivals in the future," he explained, adding: "The research and design schools will be destroyed."

But Pakhomov's lack of enthusiasm counted for nothing, and his company—with or without him at the top—is firmly inserted into the project.

Bitter nostalgia

A more scholarly, independent skepticism comes from Konstantin Bogdanov, a respected specialist in the history of science. Now teaching in Germany, he wrote an essay for *Novosti* in April on the 50th anniversary of Yuri Gagarin's historic spaceflight. Bogdanov called his essay "Fallen giant: The Soviet space industry" and suggested it would never be able to revive past glories like those being nostalgically celebrated during the anniversary festivities.

"Its capacity for working miracles disappeared in the 1990s when the colossal monolith crumbled along with the system that had spawned it, leaving a sea of bitterness and grudges in its wake, as well as nostalgia for a lost paradise for engineers and technicians. The fall of the aerospace industry was cruelly sobering after several decades of intoxication with the limitless possibilities afforded under the Soviet space program.

"The seeds of the Soviet space industry's tragic downfall had been sown in its very creation," wrote Bogdanov. "It could not have been otherwise. Without those fatal flaws it would have never emerged, and would have failed to accomplish all those stunning feats that won respect [the] world over."

Time will tell if the Russian space program retains the talent and the governmental support to surmount this chosen new challenge, the greatest it has faced in 50 years. Dedication and history they clearly have in abundance, along with an inspirational motto that got them through the dark days of privation immediately after the USSR's collapse: "The difficulties ahead of us are less than those we have already overcome," workers told each other then. But is that enough? ⩓

Cyber threats
(Continued from page 27)

It is now possible for hostile groups to "train a couple of hackers, give them Internet space, and wreak havoc."

Lt. Col. Jeffrey Lipson
Marine Forces Cyber Command

net space, and wreak havoc," Lt. Col. Jeffrey Lipson, director of operations with Marine Forces Cyber Command, explained at a cyber security symposium earlier this year. He predicted that the capacity and capability of would-be attackers "will continue to grow exponentially in frequency, complexity, and severity. There is enormous talent out there" among the world's hackers, Lipson declared.

Observing that computer networks are "central to everything" the Army does, Col. Max Duggan, chief of operations in the Army Cyber Operations Integration Center, claims that "much more has to be done" to make Army cyberspace defensible, and that "a holistic approach" is required.

Lt. Gen. William T. Lord, the USAF's chief information officer, has said that the service's computers have been scanned thousands of times this year by hackers "who are accessing our networks for later exploitation."

With the cyber menace mounting, some military officers, including cyber specialists, have become more vocal in calling for increased military proficiency in 'full-spectrum cyber warfare'—offensive as well as defensive. In this vein, the services are said to be intent on training more and more cyber warriors who will enable them, as one officer puts it, to "fight a war without firing a shot."

A 'cyber warrior' culture seems to be catching on. Cdr. Scott Coughlin, director of current operations with U.S. Fleet Cyber Command, noted at the cyber security seminar that his command treats cyber operations "like air operations…like a flight line," and that calling for a cyber attack on an adversary would be comparable to calling for a cruise missile attack. ⍋

Out of the

25 Years Ago, October 1986

Oct. 15 A balloon carrying a telescopic camera to study cosmic rays originating from stars, black holes, and other sources is launched from the National Scientific Balloon Facility and reaches an altitude of 22 mi. The camera is the highest resolution one of its type. NASA, *Astronautics and Aeronautics, 1986-90*, p. 75.

50 Years Ago, October 1961

Oct. 4 The North American X-15 transonic rocket-propelled research aircraft is successfully tested without its detachable ventral fin. Test pilot Maj. Robert A. Rushworth takes the craft to a maximum speed of Mach 4.3, or 2,850 mph, at 74,000 ft. He reports that it handles even better without the ventral fin than it did in the simulator. *Aviation Week*, Oct. 9, 1961, p. 35.

Oct. 7 A Soviet Kamov Ka-22 compound helicopter achieves a new world speed record for vehicles in its class when pilots D.K. Yefremov and V.V. Gromov average 221.4 mph. The Ka-22 is 73 ft 10 in. long and has two 65-ft 7-in. tip-rotor blades. D. Baker, *Flight and Flying*, p. 377.

Oct. 7 The USSR's MiG Ye-166 high-speed experimental aircraft claims a new world speed record of 1,492 mph over a 100-km course. This is more than 100 mph faster than the previous record set in September 1960 by the U.S. F4H-1 Phantom II jet. The delta-wing MiG Ye-166 has a 22,050-lb-thrust augmented AL-7F engine, a top speed of Mach 2.82, and a ceiling of 82,000 ft. D. Baker, *Flight and Flying*, p. 377.

Oct. 11 On its 20th flight, the X-15 reaches a record altitude of 215,000 ft, besting the earlier mark of 169,000 ft and becoming the first manned aircraft to exceed 200,000 ft. Setting the new record is Maj. Robert M. White, who attains a maximum speed of Mach 5.01, then coasts to altitude and experiences 2 min of 0-*g* during the ballistic segment of the flight. Maximum surface temperatures reach 900 F. *Aviation Week*, Oct. 16, 1961, p. 32.

Oct. 12 The first preproduction Dassault Mirage IVA twinjet supersonic strategic bomber makes its maiden flight at Merlun-Villaroche, France. F. Mason and M. Windrow, *Know Aviation*, p. 62.

Oct. 21 The Midas 4 early warning satellite for the detection of nuclear attack is launched and becomes the last U.S. military satellite for which any information is released publicly. From here on, such spacecraft are announced with nondescript numbers or acronyms and little accompanying information. R. Zimmermann, *The Chronological Encyclopedia of Discoveries in Space*, p. 17.

Oct. 23 The all-solid-fuel Polaris A-2 medium-range ballistic missile is launched from under water for the first time, from aboard the USS Ethan Allen off Cape Canaveral, Fla. The missile reaches 1,500 mi. down the Atlantic Missile Range. *United States Naval Aviation 1910-1980*, p. 243.

Oct. 25 NASA announces that it will establish Mississippi Test Operations, a large rocket motor test facility on the Pearl River. Renamed the Mississippi Test Facility in 1965, it is designed to test huge Saturn rockets for Project Apollo. Subsequently, the Saturn S-II-T, an all-up Saturn V second stage, is the first vehicle static fired here, on April 23, 1966. D. Baker, *Spaceflight and Rocketry*, p. 127.

Oct. 27 The Saturn C-1, Block 1, is launched at Cape Canaveral. This is the first launch for the Saturn series of rockets in the Apollo manned Moon landing program, although the C-1 is an unmanned test vehicle. The largest U.S. rocket launched to date, it stands 162 ft tall and weighs 925,000 lb. Only the first stage is live, however. The second (S-IV) and third (S-V) stages are filled with 190,000 lb of water ballast. The first (S-1) stage is powered by eight H-1 engines with a combined thrust of 1.32 million lb. In its 6-min 48-sec flight, the vehicle reaches 84.6 mi. and goes downrange 206 mi. D. Baker, *Spaceflight and Rocketry*, p. 127.

Past

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

And During October 1961

—Information released by the Smithsonian Astrophysical Observatory and the Johns Hopkins University Applied Physics Lab reveals that the Navy's experimental Transit IV-A navigation satellite, launched on June 29, proves the Earth's equator is elliptical. This settles a long-standing scientific controversy and is vital to the accuracy of long-range missiles, for which the precise distance from launch point to target must be known. The new information is also important in determining launch parameters for spacecraft sent to the Moon and planets. *Aviation Week*, Oct. 9, 1961, p. 33.

75 Years Ago, October 1936

Oct. 5-11 Jean Batten, 27-year-old daughter of a New Zealand dentist, breaks the solo record for a flight from England to Australia when she arrives at Darwin in her Percival Gull Wing. She makes the 9,825-mi. flight in 5 days 21 hr 3 min after leaving Lympne, England. The previous record, almost exactly a day longer, was set a year ago by H.F. Broadbent, also in a Percival. Batten stopped at Marseille, Brindisi, Nicosia, Baghdad, Basra, Karachi, Allahabad, Akyab (Burma), Penang, Singapore, Rambang, and Koepang (Java). *The Aeroplane*, Oct. 14, 1936, p. 470.

Oct. 13 Lt. John W. Sessums of the Army Air Corps at Wright Field in Ohio visits rocket experimenter Robert Goddard at Roswell, N.M., to assess the military value of Goddard's work. Sessums reports that there is little military value, but notes that the liquid-fuel rockets appear useful for driving turbines and propelling gliders for use in towing targets. Meanwhile, in Germany, the secret large-scale military rocket base of Peenemunde is under construction, and the first designs of the 200-mi.-range A-4 rocket, later called the V-2, are under way. E. Emme, ed., *Aeronautics and Astronautics 1915-60*, p. 34; E. Goddard and G. Pendray, eds., *The Papers of Robert H. Goddard*, p. 1028.

Oct. 19 *New York World-Telegram* reporter H.R. Elkins completes a trip around the world in 18 days 14 hr 56 min using only scheduled modes of air travel. This is the fastest time yet attained by a commercial traveler. Journalists Dorothy Kilgallen and Leo Kieran also fly around the world for their news syndicates, but Elkins beats his two rivals by 10,000 mi. *Aero Digest*, November 1936, p. 72.

Oct. 21-24 Pan American Airways inaugurates regular commercial passenger service across the Pacific when its Martin M-130 China Clipper departs from Alameda, Calif., for Manila, island-hopping to Honolulu, Midway, and Wake before reaching Manila on October 24. The 15 passengers were chosen from more than 1,000 applicants. The round-trip service flies weekly. *Aviation*, November 1936, p. 52.

Oct. 22 The Short C-Class Empire flying boat leaves the Short Brothers works at Rochester, England, for the Mediterranean, where it will be tried out for regular service between Brindisi and Alexandria. The company is to build 30 of the 20-ton craft for Imperial Airways for use on major British Empire air routes. The speed of the 750-mi.-range flying boats is 200 mph. *The Aeroplane*, Oct. 28, 1936, pp. 521, 531-542. *Flight*, Oct. 29, 1936, p. 444.

Oct. 23 Pan American Airways' Martin M-130 Philippine Clipper flies from Manila to Macao on a survey flight. Pan American has the right to fly from the U.S. to Manila but is denied landing rights for Hong Kong. This flight is an attempt to persuade British authorities to allow the airline access to Hong Kong or risk losing its traffic to nearby Portuguese-controlled Macao. Eventually, the British accede to Pan American's request. *Aircraft Year Book, 1937*, p. 413.

Oct. 28-30 Capt. James A. Mollison flies across the Atlantic Ocean from Floyd Bennett Field on Long Island to Croydon, England, by way of Newfoundland. He sets a record flight time of 13 hr 17 min flying the leg from Newfoundland to Croydon. *Aircraft Year Book, 1937*, p. 413.

100 Years Ago, October 1911

Oct. 22 The earliest known use of the airplane in warfare occurs in the Italo-Turkish War when an Italian reconnaissance Blériot is sent from Tripoli to spy on Turkish positions near Azizia. The pilot is Capt. Carlo Piazza, known as the 'Commander of the Air Fleet.' Reconnaissance flights increase and some planes are shot at, with little effect. By January, 20 Italian planes are on the front. B. Collier, *A History of Air Power*, p. 41; C. Grahame-White and H. Harper, *The Aeroplane in War*, pp. 236-238.

Stanford University
Department of Mechanical Engineering

Faculty Opening

The Department of Mechanical Engineering at Stanford University (http://me.stanford.edu/) invites applications for a tenure-track faculty appointment at the junior level (Assistant or untenured Associate Professor) in Theoretical and Computational Fluid Dynamics. The winning candidate will work in an area of multiphysics transport and be able to use the most advanced computational methods and facilities. Example research topics include, but are not limited to, turbulent combustion and reacting flows, nonequilibrium and high-temperature transport, propulsion, multiphase phenomena, coupled fluid flow and heat transfer including radiation, boiling, and particle effects, energy conversion ranging from combustion to solar and nuclear systems, and multiphysics fluid transport in natural systems including the atmosphere.

An earned Ph.D., evidence of the ability to pursue a program of research, and a strong commitment to graduate and undergraduate teaching are required. Successful candidates 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.

Applications should include a curriculum vitae with a list of publications, a one-page statement each of research vision and teaching interests, and the names and addresses of five references. Please submit your application online at:

http://me.stanford.edu/research/open_positions.html

The review of applications will begin on October 1, 2011. However, applications will be accepted until the position is filled.

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 and members of minority groups, as well as others who would bring additional dimensions to the university's research and teaching missions.

POSITION ANNOUNCEMENT
PROFESSOR AND HEAD, SCHOOL OF MECHANICAL AND AEROSPACE ENGINEERING
OKLAHOMA STATE UNIVERSITY

The College of Engineering, Architecture and Technology at Oklahoma State University (OSU) seeks nominations and applications for the position of Professor and Head of the School of Mechanical and Aerospace Engineering (MAE). Candidates are sought who have: an earned doctorate and national reputation in mechanical or aerospace engineering, or a closely related field; an earned bachelor's degree in mechanical or aerospace engineering from an ABET accredited or equivalent program; a distinguished record of teaching and research in an appropriate area of mechanical or aerospace engineering; a strong record of externally funded research; a strong interest in educational programs at both the undergraduate and graduate levels; a record of participation in professional societies and interaction with industry; demonstrated intellectual leadership; strong administrative and financial management abilities; and strong communication and interpersonal skills. The successful candidate must qualify for appointment as a tenured Professor of Mechanical and Aerospace Engineering.

The School of MAE has 25 faculty members, with 950 B.S., 130 M.S., and 55 PhD students, with operations in both Stillwater and Tulsa, OK, together with excellent teaching and research facilities at both locations. Active research programs are conducted in: aerodynamics, aeroservoelasticity, biomedical engineering, computer vision and pattern recognition, heat transfer, dynamic systems and controls, fluid mechanics, materials, manufacturing processes, refrigeration, solid mechanics, thermal and HVAC systems, unmanned aerial systems, and web handling systems.

Screening of applications will begin December 1, 2011 and continue until the position is filled. Target starting date is July 1, 2012. Applicants should send electronically a letter of application, curriculum vitae, list of five references, and a statement of capabilities, qualifications, and interests to: Dr. Prabhakar Pagilla, pagilla@okstate.edu, Chair, MAE Head Search Committee, School of Mechanical and Aerospace Engineering, 218 Engineering North, Oklahoma State University, Stillwater, OK 74078-5016. Women and minority applicants are strongly encouraged. OSU is an equal opportunity/affirmative action employer. More detailed information about the School and OSU can be found at: www.mae.okstate.edu.

Faculty Position
Department of Aerospace Engineering

The Department of Aerospace Engineering at Mississippi State University (MSU) invites applications for a tenure-track faculty position at the assistant, associate, or full professor level. Although applicants with expertise in all areas of aerospace engineering will be considered, those with a background in the following areas are strongly encouraged to apply:

- Computational fluid dynamics
- Computational structural mechanics
- Aeroelasticity
- Propulsion
- Aeroacoustics
- Orbital mechanics and spacecraft systems engineering

A PhD in aerospace engineering or a closely related field is required. Preferred qualifications include a record of achievement in teaching and research, or equivalent industrial experience, along with a commitment to excellence in education, and demonstrated success in securing external research funding. The position is available January 1, 2012, although the starting date could be delayed until August 16, 2012. Recent graduates with exceptional credentials are encouraged to apply. Rank and salary will depend on qualifications. The position will remain open until filled.

The Department of Aerospace Engineering (http://www.ae.msstate.edu) currently employs 12 tenure-track/tenured faculty members. With an enrollment of approximately 200 undergraduate and 40 graduate students, the department offers an ABET-accredited BS degree in aerospace engineering with concentrations in aeronautics and astronautics as well as an MS degree in aerospace engineering and a PhD degree in engineering with a concentration in aerospace engineering. The department has research strengths in computational fluid dynamics, computational structural mechanics, composite materials and structures, fracture mechanics, design optimization, and guidance, navigation, and control. Department faculty are actively engaged in research at state-of-the-art research centers including the Center for Advanced Vehicular Systems (CAVS) and the Raspet Flight Research Laboratory (RFRL).

MSU (http://www.msstate.edu) is a comprehensive public institution with an enrollment of more than 20,000 located in Starkville, MS. MSU is among the nation's leading major research universities, according to the Carnegie Foundation for the Advancement of Teaching. In the foundation's latest analysis of American higher education, MSU is designated as "a very high research activity university," which represents the highest level of research activity for doctorate-granting universities in the U.S. With approximately 100 tenure-track/tenured faculty, the Bagley College of Engineering (http://www.bagley.msstate.edu) offers degree programs in eight different academic engineering departments, which are all ABET accredited, and 10 certificate programs. The college is ranked in the top 10% of engineering schools in the nation according to research expenditures.

Interested candidates must apply on-line at http://www.jobs.msstate.edu by submitting a cover letter, a curriculum vitae, and the names and contact information of at least three professional references. Candidates must also complete the on-line Personal Data Information Form. For further information contact:

David S. Thompson, Search Committee Chair
Department of Aerospace Engineering
P.O. Box A
Mississippi State, MS 39762
dst@ae.msstate.edu (Subject: Aerospace Faculty Position)

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MISSOURI S&T

MISSOURI UNIVERSITY OF SCIENCE AND TECHNOLOGY

MECHANICAL AND AEROSPACE ENGINEERING DEPARTMENT

Assistant Professor Position in Aerospace Engineering
(Ref # 000030914)

The Department of Mechanical and Aerospace Engineering at the Missouri University of Science and Technology (formerly the University of Missouri – Rolla) invites applications for a full-time tenure-track Assistant Professor position in the general area of Aerospace Engineering. Priority will be given to candidates with specialization in the areas of aerospace structures and aerospace dynamics and controls.

Applications are invited from candidates who possess an earned Ph.D. in Aerospace Engineering or a closely related field. This opening is anticipated to be filled at the Assistant Professor level, although qualified applicants will be considered for appointment to a higher level. The successful candidates will demonstrate the potential to establish and grow a strong research program and will participate in all aspects of the Department's mission, including research, teaching and service. Several active research centers on campus (http://www.mst.edu/research/) support these, as well as other research areas.

The department currently has 32 full-time faculty members, over 800 undergraduate and approximately 200 graduate students. The Department offers the B.S., M.S., and Ph.D. degrees in both Mechanical Engineering and Aerospace Engineering. The Department seeks to significantly increase its national visibility through research and graduate student enrollment while maintaining its high standards of teaching. A recently completed $29 million renovation project has produced a state-of-the-art Mechanical and Aerospace Engineering complex with 144,000 square feet of teaching and research laboratory space. Details regarding the department can be found at http://mae.mst.edu/.

Candidates should include the following with their letter of application: current curriculum vitae, statement of research plans including areas in which the candidate has an interest in collaborating with other faculty and potential funding sources, statement of teaching philosophy, and names and contact information for at least three references. Review of applications will begin on November 1, 2011, and applications will be accepted and reviewed until the position is filled. All application materials must be electronically submitted to the Missouri University of Science and Technology's Human Resource Office using the following address: hrsinfo@mst.edu. Acceptable electronic formats that can be used include PDF and Word.

The final candidate is required to provide official transcript(s) for any college degree(s) listed in the application materials submitted. Copies of transcript(s) must be provided prior to the start of employment. In addition, the final candidate may be required to verify other credentials listed in application materials. Failure to provide the official transcript(s) or other required verification may result in the withdrawal of the job offer.

Missouri University of Science and Technology is an AA/EEO employer. Females, minorities, and persons with disabilities are strongly encouraged to apply. Missouri University of Science and Technology participates in E-Verify. For more information on E-Verify, please contact DHS at: 1-800-464-3218.

NOTE: All application materials must have position reference number (R00030914) in order to be processed.

Sr. Fluid Dynamicist (Physicist)

Position available in Wilbraham, MA. Provide innovative solutions to enhance the efficiency and timely development of wind turbines. Responsible for performing analytical modeling of advanced fluid mechanics utilizing multiple Computational Fluid Dynamics (CFD) codes and engineering modeling tools. Perform fluid dynamic analysis utilizing analytical methods, testing, and CFD to support mixer ejector wind turbine design and certification. Send applications to: HRS/Mass Associates, P.O. Box 100, Wilbraham, MA 01095-0100


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AIAA Bulletin

On 11 June, AIAA's Historic Sites Program designated the site of Thaddeus Lowe's balloon flight in 1861 on what is now the National Mall, Washington, DC. The ceremony included Civil War reenactors, including a portrayer of Thaddeus S.C. Lowe (in basket), in front of a replica of Lowe's balloon from 1861. The bottom photograph is the plaque unveiling: (right to left) AIAA Executive Director Bob Dickman, National Air and Space Museum Associate Director Peter Jakob, and a reenactor portraying Thaddeus Lowe. More about AIAA's Historic Sites Program can be found on page **B11.**

OCTOBER 2011

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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.

Meeting Schedule

DATE	MEETING (Issue of *AIAA Bulletin* in which program appears)	LOCATION	CALL FOR PAPERS (*Bulletin* in which Call for Papers appears)	ABSTRACT DEADLINE
2011				
3–7 Oct†	**62nd International Astronautical Congress**	Cape Town, South Africa (www.iac2011.com)		
5–6 Oct†	**Decoupling Civil Timekeeping from Earth Rotation A Colloquium Exploring Implications of Redefining UTC**	Exton, PA Contact: Rob Seaman, 520.318.8248, info@futureofutc.org		
13–14 Oct†	**Acoustic Liners and Associated Propagation Techniques**	Lausanne, Switzerland Contact: H. Lissek, herve.lissek@epfl.ch, http://x3noise.epfl.ch		
16–19 Oct†	**ICSANE 2011 (International Conference on Space, Aeronautical and Navigational Electronics 2011)**	Bail, Indonesia, Contact: Masanobu Yajima, 81 50 3362 7573, yajima.masanobu@jaxa.jp, www.ieice.org/cs/sane/ICSANE2011		
20–21 Oct†	**Joint Conference on Satellite Communications (JC-SAT 2011)**	Nagoya University, Aichi Prefecture, Japan Contact: Naoko Yoshimura, 81 42 327 5336, naoko@nict.go.jp, http://www.ieice.org/cs/sat/jpn/purpose_e.html		
23–26 Oct†	**20th International Meshing Roundtable**	Paris, France Contact: Jacqueline Hunter, 505.284.6969, jafinle@sandia.gov, www.imr.sandia.gov,		
24–27 Oct†	**International Telemetering Conference USA**	Las Vegas, NV Contact: Lena Moran, 575.415.5172, info@telemetry.org, www.telemetry.org		
26–28 Oct†	**2nd Aircraft Structural Design Conference**	London, UK Contact: Hinal Patel-Bhuya, Hinal.patel@aerosociety.com, www.aerosociety.com/conferences		
2–4 Nov†	**6th International Conference "Supply on the Wings"**	Frankfurt, Germany Contact: Prof. Dr. Richard Degenhardt, +49 531 295 3059; richard.degenhardt@dlr.de; www.airtec.aero	*Feb 11*	**31 Mar 11**
28 Nov–1 Dec†	**Japan Forum on Satellite Communications (JFSC) and 29th AIAA International Communication Satellite Systems Conference (ICSSC)**	Nara, Japan Contact: http://www.ilcc.com/icssc2011		
2012				
9–12 Jan	**50th AIAA Aerospace Sciences Meeting Including the New Horizons Forum and Aerospace Exposition**	Nashville, TN	*Jan 11*	**1 Jun 11**
23–26 Jan†	**The Annual Reliability and Maintainability Symposium (RAMS)**	Reno, NV (Contact: Patrick M. Dallosta, patrick.dallosta@dau.mil; www.rams.org)		
24–26 Jan	**AIAA Strategic and Tactical Missile Systems Conference AIAA Missile Sciences Conference** (Oct) **(SECRET/U.S. ONLY)**	Monterey, CA	*Jun 11*	**30 Jun 11**
29 Jan–2 Feb†	**22nd AAS/AIAA Space Flight Mechanics Meeting**	Charleston, SC Contact: Keith Jenkins, 480.390.6179; keith@jenkinspatentlaw.com; www.space-flight.org	*Apr 11*	**3 Oct 11**
3–10 Mar†	**2012 IEEE Aerospace Conference**,	Big Sky, Montana Contact: David Woerner, 626.497.8451; dwoerner@ieee.org; www.aeroconf.org		
21–23 Mar†	**Nuclear and Emerging Technologies for Space 2012 (NETS-2012) held in conjunction with the 2012 Lunar & Planetary Sciences Conference**	The Woodlands, TX Contact: Shannon Bragg-Sitton, 208.526.2367, shannon.bragg-sitton@inl.gov, http://anstd.ans.org/NETS2012.html		
26–28 Mar†	**3AF 47th International Symposium of Applied Aerodynamics**	Paris, France (Contact: Anne Venables, 33 1 56 64 12 30, secr.exec@aaaf.asso.fr, www.aaaf.asso.fr)		
23–26 Apr	**53rd AIAA/ASME/ASCE/AHS/ASC Structures, Structural Dynamics, and Materials Conference 20th AIAA/ASME/AHS Adaptive Structures Conference 14th AIAA Non-Deterministic Approaches Conference 13th AIAA Gossamer Systems Forum 8th AIAA Multidisciplinary Design Optimization Specialist Conference**	Honolulu, HI	*Apr 11*	**10 Aug 11**
14–18 May†	**12th Spacecraft Charging Technology Conference**	Kitakyushu, Japan Contact: Mengu Cho, +81 93 884 3228, cho@ele.kyutech.ac.jp, http://laseine.ele.kyutech.ac.jp/12thsctc.html		

DATE	MEETING (Issue of *AIAA Bulletin* in which program appears)	LOCATION	CALL FOR PAPERS (*Bulletin* in which Call for Papers appears)	ABSTRACT DEADLINE
22–24 May	**Global Space Exploration Conference (GLEX)**	Washington, DC	*Oct 11*	**1 Dec 11**
4–6 Jun	**18th AIAA/CEAS Aeroacoustics Conference (33rd AIAA Aeroacoustics Conference)**	Colorado Springs, CO	*Jun 11*	**9 Nov 11**
4–6 Jun†	**19th St Petersburg International Conference on Integrated Navigation Systems**	St. Petersburg, Russia Contact: Prof. V. Peshekhonov, +7 812 238 8210, elprib@online.ru, www.elektropribor.spb.ru		
18–20 Jun†	**3rd International Air Transport and Operations Symposium (ATOS) and 6th International Meeting for Aviation Product Support Process (IMAPP)**	Delft, the Netherlands Contact: Adel Ghobbar, 31 15 27 85346, a.a.ghobbar@tudelft.nl, www.lr.tudelft.nl/atos		
19–21 Jun	**AIAA Infotech@Aerospace Conference**	Garden Grove, CA	*Jun 11*	**21 Nov 11**
25–28 Jun	**28th Aerodynamics Measurement Technology, Ground Testing, and Flight Testing Conferences including the Aerospace T&E Days Forum** **30th AIAA Applied Aerodynamics Conference** **4th AIAA Atmospheric Space Environments Conference** **6th AIAA Flow Control Conference** **42nd AIAA Fluid Dynamics Conference and Exhibit** **43rd AIAA Plasmadynamics and Lasers Conference** **44th AIAA Thermophysics Conference**	New Orleans, LA	*Jun 11*	**17 Nov 11**
27–29 Jun†	**American Control Conference**	Montreal, Quebec, Canada Contact: Tariq Samad, 763.954.6349, tariq.samad@honeywell.com, http://a2c2.ort/conferences/acc2012		
11–14 Jul†	**ICNPAA 2012 – Mathematical Problems in Engineering, Aerospace and Sciences**	Vienna, Austria Contact: Prof. Seenith Sivasundaram, 386/761-9829, seenithi@aol.com, www.icnpaa.com		
14–22 Jul	**39th Scientific Assembly of the Committee on Space Research and Associated Events (COSPAR 2012)**	Mysore, India Contact: http://www.cospar-assembly.org		
15–19 Jul	**42nd International Conference on Environmental Systems (ICES)**	San Diego, CA	*Jul/Aug 11*	**15 Nov 11**
30 Jul–1 Aug	**48th AIAA/ASME/SAE/ASEE Joint Propulsion Conference and Exhibit Future Propulsion: Innovative, Affordable, Sustainable**	Atlanta, GA	*Jul/Aug 11*	**21 Nov 11**
30 Jul–1 Aug	**10th International Energy Conversion Engineering Conference (IECEC)**	Atlanta, GA	*Jul/Aug 11*	**21 Nov 11**
13–16 Aug	**AIAA Guidance, Navigation, and Control Conference** **AIAA Atmospheric Flight Mechanics Conference** **AIAA Modeling and Simulation Technologies Conference** **AIAA/AAS Astrodynamics Specialist Conference**	Minneapolis, MN	*Jul/Aug 11*	**19 Jan 12**
11–13 Sep	**AIAA SPACE 2012 Conference & Exposition**	Pasadena, CA	*Sep 11*	**26 Jan 12**
17–19 Sep	**12th AIAA Aviation Technology, Integration, and Operations (ATIO) Conference** **14th AIAA/ISSMO Multidisciplinary Analysis and Optimization Conference**	Indianapolis, IN	*Oct 11*	**7 Feb 12**
23–28 Sep†	**28th Congress of the International Council of the Aeronautical Sciences**	Brisbane, Australia Contact: http://www.icas2012.com		**15 Jul 11**
24–27 Sep†	**30th AIAA International Communications Satellite Systems Conference (ICSSC) and** **18th Ka and Broadband Communications, Navigation and Earth Observation Conference**	Ottawa, Ontario, Canada Contact: Frank Gargione, frankgargione3@msn.com; www.kaconf.org		
1–5 Oct	**63rd International Astronautical Congress**	Naples, Italy (Contact: www. iafastro.org)		
2013				
7–10 Jan	**51st AIAA Aerospace Sciences Meeting Including the New Horizons Forum and Aerospace Exposition**	Dallas/Ft. Worth, TX		

To receive information on meetings listed above, write or call AIAA Customer Service, 1801 Alexander Bell Drive, Suite 500, Reston, VA 20191-4344; 800.639.AIAA or 703.264.7500 (outside U.S.). Also accessible via Internet at www.aiaa.org/calendar.

†Meetings cosponsored by AIAA. Cosponsorship forms can be found at http://www.aiaa.org/content.cfm?pageid=292.

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Progress in Astronautics and Aeronautics Series, 236
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AIAA Education Series
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AIAA Member Price: $84.95
List Price: $119.95

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Richard Blockley and Wei Shyy, University of Michigan

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From the **Corner** Office

UPDATE FROM THE PRESIDENT

Brian Dailey, AIAA President

The Board of Directors held its summer meeting on the morning of 11 August in Portland, OR, in conjunction with the AIAA Guidance, Navigation, and Control Conference. The Board also participated in a joint luncheon that day with Regional Leadership Conference (RLC) attendees to kick off the day-and-a-half session for the RLC.

Before summarizing the activities of the Board meeting, allow me to refer back to the January Board meeting in Orlando. At that meeting, members of the Board met with a group of young professionals who are active on the Board to ask them what is working, and what isn't working, with engaging YPs in an aerospace career. As a follow-on to that discussion, the Board engaged Edge Research (consulting) to conduct a market survey using focus groups of students and young careerists. A series of "what's working" questions ensued for the focus groups and their feedback is quite revealing and profound. Members of the Board were briefed on the full report findings during the Portland meetings, and we will be working with the various Institute leaders and staff to implement many of the excellent Young Careerists' recommendations.

Regular business for this board meeting included approval of the 2011–2012 Budget. Our thanks to Finance Vice President Tom Smith and the entire Finance Committee for their exemplary work in the face of intense budgetary challenges for the Institute and the industry at large. The Board was also asked to affirm (no vote) the 2011–2012 members of three committees of the Board. I personally want to thank the Chairs and other members who are serving on these important committees in the coming year.

- *Ethical Conduct Panel*—John Whitesides, Chair
- *Audit Committee*—Wayne Schroeder, Chair
- *Nominating Committee*—George Muellner, Chair (Past President); the Committee met on the afternoon of 11 August to discuss and develop the slate of the 2012–2013 Board of Directors; nominated candidates were announced in a press release issued on 18 August and on this page below.

Bob Dickman, Klaus Dannenberg, and members of the AIAA Board will represent AIAA at the upcoming International Astronautical Congress in Cape Town, South Africa. Of particular note, the AIAA took the challenge of submitting what was the successful nomination for the International Astronautical Federation (IAF) 60th Anniversary Award. The GPS Team will be honored at a ceremony on 4 October in Cape Town, and General William Shelton will attend to accept the award for the U.S. Air Force team. This GPS Team award would not have happened without the leadership and perseverance of Bob Dickman.

The AIAA Foundation Board of Trustees, Dave Thompson Chair, met during the week to receive a status of gifts to the Foundation. The need for our services provided through the Foundation is increasing each year, especially in workforce development and STEM education. The goal of the Foundation is to increase the current AIAA Endowment Fund level by $10 million dollars to meet the demand for our programs for the next generation and beyond. The Trustees are focused on major gifts from individuals and corporations, but I urge every AIAA member to consider a one-time gift or yearly pledge to this critically important endeavor.

We have a very full plate this year in carrying out all of the Institute's strategic goals for Public Policy, Technical Activities, International Activities, Education, Member Services, Standards, and Publications. I am confident that we have the talent and initiative throughout our membership to make these goals a reality and to continue to be the recognized premier aerospace industry association providing highest value to our members around the world.

2012 AIAA ELECTION SLATE ANNOUNCED

The 2012 Nominating Committee has selected candidates for next year's openings on the AIAA Board of Directors. The committee's chairman, AIAA Past President George K. Muellner, confirmed the names of the officer and director candidates who will appear on the ballot. They are as follows:

VP-Elect, Education
Steven Gorrell, Brigham Young University
Christopher Tavares, The Boeing Company

VP-Elect, Public Policy
John Rose, The Boeing Company
Mary Snitch, Lockheed Martin Corporation

Director–at-Large
James Horkovich, Raytheon Company
Robert Lindberg, National Institute of Aerospace
Mark Whorton, Teledyne Brown Engineering

Director–International
Essam Khalil, Cairo University, Egypt
Kevin Massey, Royal Melbourne Institute of Technology, Australia

Director–Technical, Aerospace Design and Structures
Russ Althof, Raytheon Company
Kathleen Atkins, Lockheed Martin Corporation

Director–Technical, Aerospace Sciences
James Keenan, U.S. Army Aviation and Missile Research Development and Engineering Center
Mark Melanson, Lockheed Martin Corporation

Director–Region 2
Alan Lowrey, Lockheed Martin Corporation

Director–Region 3
Sivaram Gogineni, Spectral Energies LLC

Director–Region 6
Jane Hansen, HRP Systems, Inc.
Dino Roman, The Boeing Company

The ballot will be sent to all voting members of the Institute in February 2012.

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.

CANDIDATES SOUGHT FOR 2012 BOARD OF DIRECTORS

Any AIAA member who wishes to propose a candidate for the 2012 Board of Directors through the petition process must submit a written petition, signed by at least 300 voting members, to the AIAA Secretary. To allow for verification of signatures by the cutoff date established in the bylaws, completed petition packets must be received by the AIAA Secretary by **1 December 2011**. Each petition must be accompanied by the petition candidate's written acceptance, biographical data, campaign statement, and photograph.

Open positions for the 2012 election are:

- VP-Elect, Education
- VP-Elect, Public Policy
- Director–at-Large
- Director–International
- Director–Technical, Aerospace Sciences Group
- Director–Technical, Aerospace Design and Structures Group
- Director–Region 2
- Director–Region 3
- Director–Region 6

Members intending to follow this process are asked to contact the AIAA Secretary, Klaus Dannenberg, at 703.264.7655, as soon as possible before the 1 December 2011 deadline for more specific instructions and coordination. Completed petition packets, containing at least 300 signed petitions, should be sent to:

Klaus Dannenberg
AIAA Secretary
1801 Alexander Bell Drive
Suite 500
Reston, VA 20191

AIAA DISTINGUISHED LECTURE SERIES IN AUSTRALIA

Ian Tuohy, Chair, AIAA Adelaide Section

The AIAA Adelaide Section coordinated a highly successful series of Distinguished Lecture presentations in Australia during May 2011. The presentations entitled "Boeing 787 Dreamliner: Future of Commercial Aviation Today" were delivered by Michael Drake, Technical Fellow for Aircraft Configuration Design with The Boeing Company in Seattle, WA. Michael is also Chair of the AIAA's Technical Committee on Aircraft Design.

Drake's visit to Australia was supported under the AIAA Distinguished Lecturer Program. In addition to Adelaide, Drake spoke in Sydney, Melbourne, Canberra, and Brisbane. Excellent support was provided by the Sydney Section and other AIAA members with advance planning and hosting of Drake's presentations.

Drake presented an outstanding talk that traced the 787 Dreamliner from inception, through the design and manufacturing process, to the first flight and current certification phase. Audiences in each city comprised AIAA members and students, members of other professional organizations, airline pilots, and the general public. Lively question-and-answer sessions ensued, with Drake offering advice and encouragement to aerospace engineering students who attended.

AIAA members in each city ensured that Drake experienced Australian hospitality during his 10-day visit, including escorted sightseeing excursions and post-talk dinners at local restaurants. Michael also had the opportunity to visit the Boeing facility in Melbourne and see Australia's contribution to the 787 program.

Overall, the 2011 Distinguished Lecture series was an outstanding success, and contributed greatly to enhancing local benefits for AIAA members and students, and to raising the profile of AIAA in Australia.

Members of the AIAA Adelaide Section with Michael Drake, Boeing Technical Fellow and AIAA Aircraft Design TC Chair, after his lecture.

GEORGIA TECH WINS AIAA MISSILE DESIGN GRADUATE STUDENT COMPETITION

A team of eight Georgia Tech Aerospace Systems Design Laboratory graduate students won the 2010–2011 missile design competition sponsored by the AIAA Missile Systems Technical Committee. Their design, called "Hypersonic Advanced Missile for Multi-Mission Execution and Rapid Response (HAMMERR)," met the requirements for a long-range, high-speed, precision strike tactical weapon with joint U.S. Navy and Air Force application. The study considered hydrocarbon-fuel scramjet and solid rocket propulsion concepts, and settled on an optimized, multi-stage solid rocket design.

An Auburn University team placed second with their "Sentinel" design that featured an innovative, deployable scramjet engine. The competition took place from October 2010 to June 2011.

The winning team from Georgia Institute of Technology: (left to right) Chris Brenci, Blaine Laughlin, A. J. Piplica, Scott Strong, Will Garrison, Addison Dunn, Jeremy Bennetch, and Grace Contino.

Not pictured are faculty advisors Dr. Dimitri Mavris and Ms. Rebecca Douglas, and Student Advisor Bradford Robertson.

AIAA-Utah's Regional Representative and former Chair Charlie Vono, University of Utah Student Branch Chair Shandra Corbitt, Utah State University student member Annika Jensen, and Utah State University student member Ben Stewart.

AIAA UTAH SECTION LED TOURS OF MUSEUM FOR AUGUST IS AEROSPACE MONTH / SMALL SATELLITE CONFERENCE

Jeff Boulware, AIAA Utah Section Vice Chair

As a joint activity for the AIAA/Utah State University Conference on Small Satellites and August is for Aerospace, the Utah Section of AIAA led tours of the Hill Aerospace Museum in Ogden, UT. Aided by volunteers from its student branches, the tours drew over 750 attendees from the conference and Utah area.

This event followed talks the day before by Congressman Jason Chaffetz and Tim Douglas of ATK. The talks, featured on Fox-13 news, focused on the future of aerospace in Utah and technical aspects of the James Webb Space Telescope, respectively.

PROF. ELI LIVNE SUCCEEDS WEEKS AS EDITOR-IN-CHIEF OF THE *JOURNAL OF AIRCRAFT*

On 30 August 2011, AIAA President Brian Dailey formally appointed **Professor Eli Livne** to succeed **Dr. Thomas Weeks** as editor-in-chief of AIAA's *Journal of Aircraft* (*JA*).

Prof. Livne is Professor of Aeronautics and Astronautics at the University of Washington in Seattle, WA. He has served as an associate editor of *AIAA Journal* for 10 years and was a guest editor for a *JA* special section on multidisciplinary optimization (MDO). Prof. Livne was one of the launch section editors and authors for the *Encyclopedia of Aerospace Engineering* and has published approximately 100 journal and conference papers. Livne is an Associate Fellow of AIAA.

Prof. Livne holds bachelor's and master's of science degrees in aeronautical engineering from Technion, the Israel Institute of Technology, and a doctoral degree in aerospace engineering from the University of California, Los Angeles (UCLA). After obtaining his undergraduate degree, he served in the Israeli Air Force (1975–1984) in research and development roles, eventually founding the aeroelasticity/structural dynamic section. He was involved in development work on the Lavi fighter jet; contributed to a number of joint Israeli Air Force/industry projects, including collaborations with McDonnell Douglas, General Dynamics, Israel Aircraft Industries, and Rafael, Advanced Defense Systems; and was head of the engineering team that accompanied the first F-16s received by Israel. During his Israeli Air Force years, Prof. Livne also worked jointly with the U.S. Air Force, and with NLR and Royal Netherlands Air Force.

In 1984 he left the Israeli Air Force to begin doctoral studies at UCLA, and after graduating UCLA, Prof. Livne joined the faculty of the University of Washington in 1990. Over the course of his academic career, Prof. Livne has continued extensive collaboration with both industry and defense organizations. Highlights of these collaborations include structural and aeroelastic optimization and lightweight airframe design with Boeing Commercial Aircraft, membership on the NASA-Boeing High Speed Civil Transport (HSCT) Aeroelastic Concept Evaluation Team and the Boeing HSCT Aeroservoelastic working group, and contributions to aeroelastic wind tunnel tests of the highly nonlinear Boeing/DARPA Solar Eagle UAV. Currently he heads the airplane design education and research program at the University of Washington.

Prof. Livne's accomplishments have been recognized by an ASME/Boeing Structures & Materials Award (1998), NSF National Young Investigator Award, and the Josephine de Kármán Fellowship. With expertise in aeroelasticty, aeroservoelasticity, multidisciplinary flight vehicle optimization, aircraft design, aerospace structures, structural optimization, and structural dynamics, Professor Livne's research has been funded by NASA, FAA, AFOSR, ONR, NSF, and by Boeing.

Prof. Livne, who will assume his duties 1 October 2011, was selected from a competitive pool of applicants. Following Dr. Weeks's request to step down as editor before his current term expired, AIAA Vice President of Publications Dr. Michael Bragg appointed an ad hoc search committee chaired by Dr. Darryll Pines, Dean of Engineering at the University of Maryland. The search committee represented the broad interests of *JA*'s scope, taking into consideration the traditional technical strengths of the journal as well as its peripheral but critical technologies.

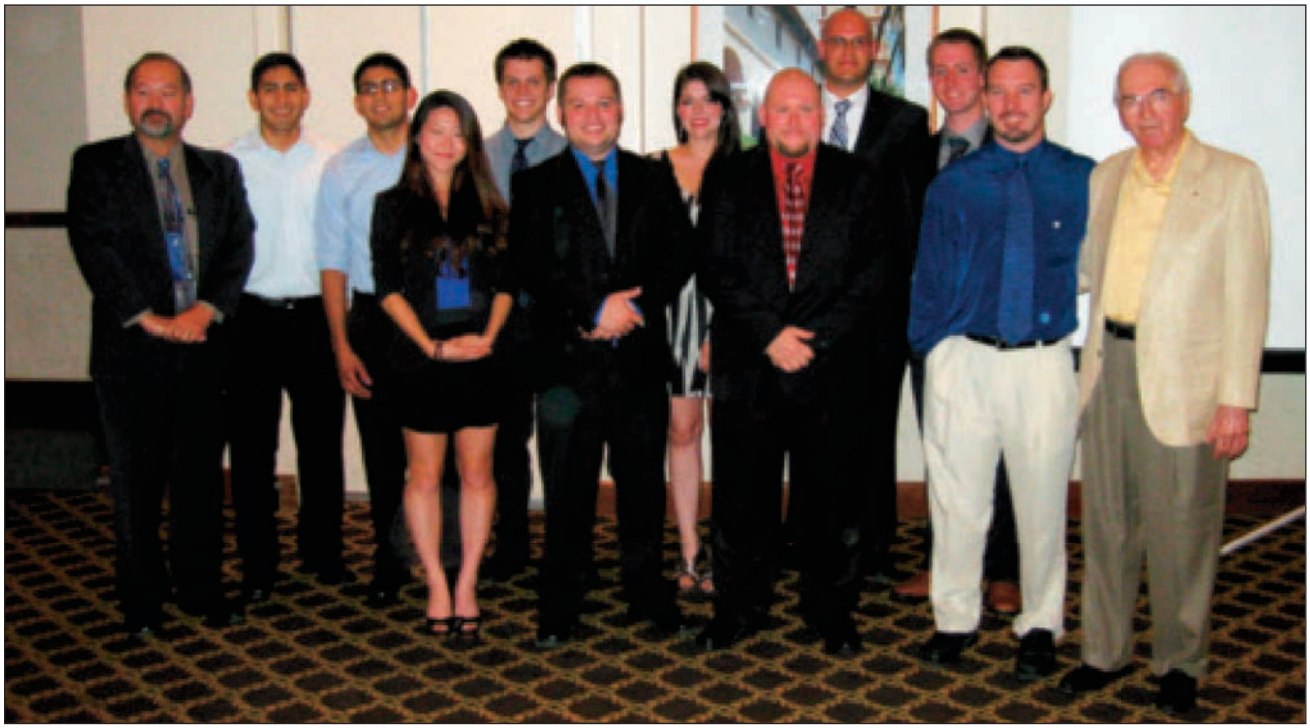
Livne becomes the fifth editor-in-chief of *JA*. Upon the merger of the American Rocket Society and the Institute of the Aerospace Sciences in 1963, the Officers and Directors of the newly formed AIAA established the *Journal of Aircraft* to complement the fundamental scientific contributions documented by *AIAA Journal* and to provide a venue for major aircraft systems developments and applications similar to the mission of the *Journal of Spacecraft and Rockets:* Volume 1, Number 1 of the *Journal of Aircraft* appeared in January–February 1964. As editor-in-chief of one of AIAA's oldest journals, Livne will be following in the proud heritage of Carl F. Schmidt (1964–1973), James E. Dougherty (1973), Allen Fuhs (1974–1979), and Thomas Weeks (1979–2011).

In summarizing the transition, Dr. Bragg shared that "Tom Weeks has served in this role for many years and, with his excellent group of Associate Editors, will hand over to Eli the premier scholarly journal in this area in the world. Prof. Livne has a wealth of experience to draw from and is a world-renowned researcher and scholar in his own right who is well known in the United States and across the world. I am confident he will skillfully guide the journal in maintaining and building on its leadership role. I welcome him to the family of excellent AIAA Editors-in-Chief and look forward to working with him in the coming months and years."

Tom Weeks was originally an associate editor of *JA*, first appointed in 1979. In recalling those early days, then *JA* Editor-in-Chief Allen Fuhs reflected on his January 1978 editorial: "The Associate Editors [or AEs] are volunteers who have a concern about their profession. The AEs spend many hours on behalf of *JA* (and AIAA). Occasionally the AE needs to make decisions that are not easy. To be, a good AE requires business-like organization, good technical judgment, and a desire to serve." When Fuhs was elected AIAA Vice President of Publications, taking office in April 1979, Dr. Weeks was selected from the nine associate editors for the position. Fuhs continued in his recollection: "[Considering t]hese are the standards for a good AE. The standards for *JA* Editor-in-Chief are much the same but are multiplied several times. The multiplication is only for one year of service as E-in-C. Next that product needs to be multiplied again by the number of year's service. Tom can feel a sense of accomplishment for his many years of service. The aerospace profession and AIAA owe him a resounding three cheers for a job well done….Now in 2011, we can definitely state that Tom was the right choice for E-in-C of *JA*."

Dr. Weeks' 32 years of service to *JA* has left a lasting impression on the journal, AIAA, and the fields of aircraft and aeronautics. AIAA Staff estimates that in his tenure at least 6251 papers were published in *JA*.

Reflecting on Weeks' tenure, AIAA Fellow, author, and aircraft design expert Dr. Daniel Raymer shared that "Tom's multi-decade stewardship of *JA* has been marked by what I would call quiet competence. With little fanfare or fuss, Tom made it all work. The *Journal* met its yearly publication goals and kept its high standards for quality." Raymer continued, "Under Tom's direction, the *Journal of Aircraft* maintained its world leadership as the archival journal of record for all matters related to aircraft design. He leaves a shining legacy and shoes difficult to fill." AIAA Honorary Fellow and former Vice President of Publications William Heiser said while he is very certain Weeks "holds the record for longevity as the Editor-in-Chief of an AIAA journal, he certainly holds the record for dependability. We will miss his steady hand and mind."



The 2011 Reuben H. Fleet Scholarship recipients (left to right): Phil Smith (Chair, AIAA San Diego), Octavio Ortiz (SDSU), Alexander Ortiz (SDSU), Joohyun Hwang (SDSU), Brandon Maryatt (UCSD), Daniel Nelson (SDSU), Alejandrina Nuno (SDSU), James Hroza (SDSU), Cesar Martin (SDSU), Tim Wheeler (UCSD), Alex Fleet (grandson of Reuben H. Fleet), and William F. Chana (co-founder of the Fleet Scholarship).

REUBEN H. FLEET SCHOLARSHIPS AWARDED BY THE SAN DIEGO SECTION IN MAY

At the AIAA San Diego Section Honors and Awards Banquet on 19 May, the AIAA San Diego Section Reuben H. Fleet Scholarships were awarded. Since 1983, 145 students have received the scholarship, which is made possible by the Reuben H. Fleet Foundation at The San Diego Foundation. Additional scholarships were awarded to the two top applicants, Daniel Nelson (SDSU) and Tim Wheeler (UCSD), in honor of William F. Chana, co-founder of the Reuben H. Fleet Scholarship and its long-time administrator.

PHOENIX SECTIONS HOLDS AUGUST FOR AEROSPACE EVENT

M. Brett McMickell, Chair, AIAA Phoenix Section

The AIAA Phoenix Section held an August is for Aerospace event on 27 August. The event featured a moderated panel discussion with state, university, and company representatives to start a dialogue on Arizona's future in space. Rich Christiansen, the AIAA Phoenix Section Public Policy Officer, organized the event. The subject of the panel discussion focused on the future of Human Exploration. The panelist were:

- Kip Hodges, Director of ASU School of Earth and Space Exploration
- Rob Morton, Vice President of Business Attraction for the Arizona Commerce Authority
- Taber MacCallum, CEO of Paragon Space Development Corporation
- Bill Gregory, Vice President of Business Development of Qwaltec and former Astronaut

Questions discussed by the panel included:

- With the retirement of the Space Shuttle, does America have the will and resources to develop a new manned spacecraft and heavy launch system any time soon?
- The Arizona contribution to space exploration is heavily influenced by science and astronomy missions—should Arizona encourage fewer manned missions and more science missions in the future?
- Arizona space industry generates over $250M annually and creates over 3,300 jobs—what strategy should Arizona take to sustain the local space industry with decreasing government funding?
- How does uncertainty in NASA funding and direction affect Arizona's economy?
- The early space programs inspired many to pursue a career in science, technology, engineering, and mathematics. Is NASA still providing inspiration to young students? Can commercial space inspire the future of aerospace?
- Many states are positioning themselves to attract space tourism industries (ex., New Mexico's funding of Spaceport America). Should Arizona be interested in the space tourism business?

After the panel discussion, the 67 attendees were given a tour of the Orbital SSG manufacturing facility. The highlight of the tour was to see the LandSat-8 in assembly. The Orbital Deputy Program Manager for LDMC, Chris Keeler, presented a brief overview LandSat satellite and mission before the tour. Several of the attendees met for lunch directly following the event to continue the discussion well into the afternoon.

AIAA FOUNDATION ANNOUNCES GRADUATE AWARD WINNERS

AIAA and the AIAA Foundation are pleased to announce the recipients of the AIAA Foundation's twelve Graduate Awards for the 2011–2012 academic year. The winning graduate students will receive a total of $80,000 in awards.

Each year the AIAA Foundation presents four Orville and Wilbur Wright Graduate Awards. These $10,000 awards, given in memory of the Wright brothers' contributions to the evolution of flight, are presented to students completing master's degree or doctoral thesis work. The 2011–2012 winners are:

- **Stephen Clark**, Duke University, Durham, NC
- **Sertac Karaman**, Massachusetts Institute of Technology, Cambridge, MA
- **Chandrashekhar Tiwari**, The Pennsylvania State University, University Park, PA
- **Jill Tombasco**, University of Colorado, Boulder, CO


Clark


Karaman


Tiwari


Tombasco

The AIAA Foundation also presents a series of $5,000 awards annually. The 2011–2012 winners are:

- **Myra Blaylock**, University of California, Davis, CA, who is the recipient of the *John Leland Atwood Graduate Award*. The Leland Award, sponsored by endowments from Rockwell and Boeing North America, Inc., and named in memory of John Leland "Lee" Atwood, former chief executive officer of Rockwell, North American, is presented to a student actively engaged in research in the areas covered by the technical committees of AIAA.
- **Brian Pomeroy**, Purdue University, West Lafayette, IN, who is the recipients of the *Martin Summerfield Graduate Award in Propellants and Combustion*. The AIAA Foundation presents this award in memory of Dr. Martin Summerfield, an early American rocket pioneer and co-founder of Aerojet, to a student actively pursuing research on propellants and combustion.
- **Brent Tweddle**, Massachusetts Institute of Technology, Cambridge, MA, who is the recipient of the *Guidance, Navigation, and Control Graduate Award*. The Guidance, Navigation, and Control Technical Committee presents this award to a student engaged in work relating to the committee's subject areas.
- **Sean Torrez**, University of Michigan, Ann Arbor, MI, who is the recipient of the *Gordon C. Oates Air Breathing Propulsion Graduate Award*. The AIAA Air Breathing Technical Activities Committee presents this award, named in honor of the late Gordon C. Oates, a professor in the Department of Aeronautics at the University of Washington, to a student conducting research in the field of air breathing propulsion.


Blaylock


Pomeroy


Tweddle


Torrez

In addition to these named awards, the AIAA Foundation presents four $5,000 awards for outstanding scholarship in fields covered by AIAA's technical committees. These open topic winners are:

- **Matthew Cannella**, University of Colorado, Boulder, CO, for his research topic "Rocket Propulsion/Propellants and Fluids."
- **Bruce Davis**, University of Colorado, Boulder, CO, for his research topic "Numerical Analysis of Nanoscale Materials."
- **Chelsea Sabo**, University of Cincinnati, Cincinnati, OH, for her research topic "Dynamic Pickup and Delivery Problems with Cooperative UAVs."
- **Ashivni Shekhawat**, Cornell University, Ithaca, NY, for his research topic "Fracture and Reliability in Engineering Materials."

For more information on the AIAA Graduate Awards program, please contact Stephen Brock at 703.264.7536 or stephenb@aiaa.org.

RECENT HISTORIC SITE ACTIVITIES

It's been a busy year for the Historic Sites Program. In June, Bob Dickman designated the site of Thaddeus Lowe's balloon flight in 1861 on what is now the National Mall. This flight, which marked the first use of balloon for aerial reconnaissance, and from which the first aerial telegram was sent, led to the creation of the U.S. Army Balloon Corps, used by the Federal army during the first years of the Civil War. The plaque is mounted on the Mall side of the National Air and Space Museum. Please stop and see it the next time you visit the museum!

Also in June, Bob Dickman travelled to Madrid to designate Getafe Air Base as a historic site, along with AIAA Associate Fellow and site nominator Erasmo Piñero. This plaque was cosponsored by the Colegio Oficial de Ingenieros Aeronáuticos de España (COIAE). Many AIAA and COIAE members attended the ceremony and the reception afterward.

AIAA also chose the Yesilkoy Military Apron, in Istanbul, as a historic site; they received a plaque but the ceremony, which was to have taken place as part of the celebration of the centennial of the Turkish Air Force, was cancelled due to reasons beyond the control of AIAA or the Turkish Air Force.

In early October, Region VII Director Jürgen Quest designated Bremen Airport as a historic site, based in particular on the development there of the Fw 61, developed by Focke-Wulf, the world's first fully operational helicopter.

There are more upcoming ceremonies planned: Delta Airlines' historic headquarters buildings in Atlanta on 9 November,

AIAA Executive Director Bob Dickman; AIAA Associate Fellow Erasmo Piñero; Domingo Escudero, Sub-director of the COIAE; and Antonio Martin Carrillo, past president of the Association of Spanish Aeronautical Engineers at the Getafe site plaque.

and Northrop Grumman's Space Park in mid-December. This site was previously the Ramo-Woodridge Corporation, Space Technology Laboratories, and later Thompson Ramo Wooldridge, Inc (TRW).

THIRTY UNDERGRADUATE SCHOLARSHIPS AWARDED

AIAA and the AIAA Foundation are pleased to have awarded 30 AIAA Foundation undergraduate scholarships for the 2011–2012 academic year, totalling $61,000 in awards. The AIAA Foundation presents two $2,500 Next Century of Flight Scholarships to students pursuing degrees in aeronautical science. The 2011–2012 winners are:

- **Adam Keith**, North Carolina State University, Raleigh, NC
- **Scott Neidrick**, Embry-Riddle Aeronautical University, Prescott, AZ

The AIAA Foundation also presents 28 $2,000 undergraduate scholarships. One of these, in its inaugural year, is the *David and Catherine Thompson Space Technology Scholarship*, awarded to **Sarah Arnac**, Purdue University, West Lafayette, IN.

Five AIAA Foundation scholarships are named for past presidents of AIAA. The 2011–2012 winners are:

- *Sam F. Iacobellis Scholarship*: **Eric Strom**, Daniel Webster College, Nashua, NH
- *L. S. "Skip" Fletcher Scholarship*: **Christopher Morrison**, Embry-Riddle Aeronautical University, Prescott, AZ
- *E.C. "Pete" Aldrige Scholarship*: **Horatiu Dragnea**, Rensselaer Polytechnic Institute, Troy, NY
- *A. Thomas Young Scholarship*: **Ya Yu Hew**, University of Texas, Arlington, TX
- *Robert L. Crippen Scholarship*: **Clayton Bargsten**, University of Colorado, Boulder, CO

The AIAA Foundation presents two undergraduate scholarships named for individuals who have contributed greatly to the field of aerospace science. The winners are:

- *Dr. James Rankin Digital Avionics Scholarship*: **Chelsea Welch**, University of Colorado, Boulder, CO
- *Leatrice Gregory Pendray Scholarship*: **Brandie Rhodes**, University of Kansas, Lawrence, KS. (This scholarship is presented to the Foundation's top female scholarship applicant.)

Five AIAA Foundation undergraduate scholarships are presented by AIAA Technical Committees:

Space Transportation Technical Committee
- **Kaylan Burleigh**, University of Arizona, Tucson, AZ

Digital Avionics Technical Committee
- **Emilio Botero**, Embry-Riddle Aeronautical University, Prescott, AZ (*Dr. Amy R. Pritchett Digital Avionics Scholarship*)
- **Peter Davidson**, Princeton University, Princeton, NJ (*Ellis F. Hitt Digital Avionics Scholarship*)
- **Nathan Wukie**, University of Cincinnati, Cincinnati, OH (*Cary Spitzer Digital Avionics Scholarship*)

Liquid Propulsion Technical Committee
- **Matthew Smith**, The Virginia Polytechnic Institute and State University, Blacksburg, VA

The Foundation presents nine $2,000 scholarships to juniors in their next to last year of undergraduate study. The 2011–2012 winners are:

- **Ethan Aaron**, The University of Pennsylvania, Philadelphia, PA
- **Libin Daniel**, Embry-Riddle Aeronautical University, Prescott, AZ
- **Steven Ericson**, Daniel Webster College, Nashua, NH
- **Cody Harris**, The Florida Institute of Technology, Melbourne, FL
- **Mathew Kudija**, The University of Notre Dame, South Bend, IN
- **Matthew Marcus**, The University of Maryland, College Park, MD
- **Kaizad Raimalwala**, Purdue University, West Lafayette, IN
- **Nicolas Schwartz**, University of Cincinnati, Cincinnati, OH
- **Emily Wolf**, Pennsylvania State University, University Park, PA

The AIAA Foundation presents five $2,000 scholarships to sophomores in their third to last year of undergraduate study. The 2011–2012 winners are:

- **Caleb Boe**, Inver Hills Community College, Inver Grove Heights, MN
- **Jordan Hoover**, The University of Notre Dame, South Bend, IN
- **Amber Kaderbek**, University of Alabama, Tuscaloosa, AL
- **Chesley Kraniak**, University of Texas, Arlington, TX
- **Branden Siegle**, Embry-Riddle Aeronautical University, Daytona Beach, FL
- **Harrison Wemple**, Embry-Riddle Aeronautical University, Daytona Beach, FL

For more information on the AIAA Foundation and its undergraduate scholarships program, visit **www.aiaafoundation.org**.

OBITUARIES

AIAA Senior Member Passed Away in August

Merven Mandel passed away on 22 August at age 90. Mr. Mandel was for many years, until recently, an active member of the AIAA Long Island Section Council. He co-chaired the 1999 essay contest and served on a number of committees.

Mandel earned B.S. and M.S. degrees in Aeronautical Engineering from Brooklyn Polytechnic Institute where he won many awards including election to the national engineering honor society. He served in the Navy from 1942 to 1946 and worked at Lockheed from 1948 to 1953. As an engineer for Sperry Gyroscope from 1957 to 1959, Mandel worked on missile aerodynamics design and performance and from 1967 to 1984 on submarine design and weapons system engineering. At General Applied Science Labs (GASL) (1959–1967), he designed the mission and trajectory analysis for the Supersonic Combustion Ramjet (SCRAMJET) experimental engine and became a vice president. He authored technical papers and NACA Reports.

Mandel flew powered and glider aircraft, sky-dived, drove race cars (with Paul Newman), and helped Janet Guthrie (first female Indy 500 driver) build her first race car. Mandel was a member of the Long Island Space Society and volunteered at the Cradle of Aviation Museum, where he served as a docent and helped restore aircraft. He was an AIAA member for more than 50 years.

AIAA Associate Fellow Lecat Died in August

Dr. Robert Lecat passed away on 23 August at age 84. For many years, Lecat was an active member of the AIAA Long Island Section Council, serving as Technical Chairman and on the Education and Nominating Committees. He earned a B.S. in 1949, an M.S. in 1953, and a Doctorate of Engineering in 1964, all in Aeronautical Engineering and all from the Catholic University of America.

Lecat was a French Navy pilot, and then worked at McDonnell Aircraft (Talos missile), Kellex, was a Project Engineer at the Johns Hopkins APL (high angle of attack section), Head of Preliminary design at Fairchild Guided Missiles Division, and joined Grumman in 1958 as an aerodynamics specialist. During his 40 years at the Grumman Corporation, Lecat was involved in a great variety of aerodynamics and design projects, from proposals and conceptual studies to test programs and hardware. He made major contributions to Grumman proposals for space programs from Project Mercury through the Grumman RV#1 lunar proposal. He was a preliminary design aerodynamicist for W2F, C-2, A2F, TACRV high speed train, and the Grumman lightweight fighter and project aerodynamicist for S-2 turboprop.

In March 2009, Lecat gave a fascinating presentation to the Long Island Section about interesting Grumman projects that he worked on or was familiar with but were not highly publicized—such as the Ben Franklin submarine, Earth atmosphere reentry vehicles, and Supersonic Towed Decoys. He was granted two patents and authored technical papers based on this work.

Lecat was an AIAA Associate Fellow, an adjunct professor at SUNY Stony Brook and Dowling College, participated in construction of a full-scale flying model of ME-109 fighter, and was the recipient of a 2006 IIE Long Island Section Achievement Award.

AIAA Fellow Randle Died in September

Kenneth W. Randle died 3 September, at the age of 88.

Randle attended the University of Kansas from 1940–1942 and then served in the U.S. Navy for over three years during World War II. The war ended before he could finish Navy flight school. After his discharge, he attended the University of Michigan and graduated with a B.S. in Aeronautical Engineering. He worked at Douglas Aircraft in El Segundo, CA, from February 1949 to June 1956. While there, he finished flight training and obtained his pilot license. He joined the Sperry Corp. in Salt Lake City in July 1956 and retired as an engineering manager in December 1986. He graduated with a Masters degree in Engineering Administration in June 1969, Phi Kappa Phi.

Randle was a member of the National Space Society, Utah Space Association, and he was an Associate Fellow of AIAA. He was a member of AIAA for more than 50 years. He served as the AIAA Utah Section Chair from 1972–1973 and served on the National Membership and Career Enhancement Committees from 1973–1987. In 1977, he received the AIAA Distinguished Service Award in Washington, DC, and received the AIAA Sustained Service Award in 2000, the first year it was offered. He was the Utah Engineers Council (UEC) Chairman from 1974–1975 and received the UEC Outstanding Service Award in 1975. In February 2008, Ken received the UEC "Lifetime Service Award."

Randle was Chairman of the United States Space Observance Proclamation Committee from 1972–1994 to commemorate the anniversary of the first landing of men on the moon by Apollo 11 on 20 July 1969. He was invited to the White House on 20 July 1984 to celebrate the fifteenth anniversary of Apollo 11 with all of the Apollo astronauts, the NASA Administrator, and President Reagan. Over the years, he obtained eight Presidential Space Observation Proclamations and hundreds of Governors Proclamations.

PS 116 THANKS THE LONG ISLAND SECTION

Recently, the AIAA Long Island Section tried sponsoring an essay contest. They asked high school seniors to write an essay and compete for college scholarships. Although they sent information packets to over 600 high schools in the area and got good initial feedback from some teachers, the response was disappointing and they were unable to award any scholarships.

Their Essay Contest Committee then explored alternate uses for the funds received from contributors that could support their original objective of motivating students toward aerospace. They chose the highly successful operation of the New York City Center for Space Science Education (NYCCSSE) in lower Manhattan (**www.nyccsse.org/mission.html**). This facility provides educational opportunities for all grades, primarily for middle school students, to participate in simulations of space station activities and aeronautical research.

With the agreement of the original contributors, the section awarded $1,400 to fund the NYCCSSE's new Aviation after school 8-week program, $900 for scholarships to sponsor two students to attend space camp for a week, and $1200 to support six class field trips to the center. The section received thank you notes from students in the Brooklyn Public School (PS) 116 4th grade class that recently visited the Center as recipients of their award. They all start with "Dear American Institute of Aeronautics and Astronautics." Two examples follow:

"I, Arrin, would like to thank you for granting us the opportunity to visit the New York City Space Science Center for Education. Now I can do the job I was chosen for. I hope it is fun. PS I wanted to do navigation team."

"I, Matthew, would like to thank you for granting us the opportunity to visit the Space Science Center for Education. I always liked space because it is so cool. I've heard about a little robot called probe. When I go there I would like to be on the nav, probe or geo team. All of them seem very fun so I don't care for the one that I get so I just want to be on a team. I would also like to thank you for the money again. A astronaut is what I want to be when I grow up. I might be able to go to space if I become an astronaut. It going to be so cool when I get there. Thank you for sponsoring us."

MEMBERSHIP ANNIVERSARIES

AIAA would like to acknowledge the following members on their continuing membership with the organization.

50-Year Anniversaries

Harry Barnard	North Texas
James Bethel	North Texas
Donald Bierley	Dayton/Cincinnati
Wilfred Billerbeck	National Capital
David Bloom	Northern New Jersey
Tarit Bose	India
Kenneth Brown	Alabama/Mississippi
George Carruthers	National Capital
P. Clemens	Tennessee
Stephen De Brock	San Francisco
George Del Monte	Central Florida
Charles Denton	Mid-Atlantic
George Dreibelbies	Point Lobos
James Ephgrave	Iowa
Rocco Figalora	Long Island
Robert Flagg	San Francisco
Dwight Florence	Greater Philadelphia
Jack Ford	Pacific Northwest
M. Frank	Rocky Mountain
Thomas Gagnier	Atlanta
Hector Garcia Jr.	Southwest Texas
Arthur Gelb	New England
Edwin Grant Jr.	Tucson
Edward Gravlin	Michigan
William Greenwood	New England
Stanley Greif	Cape Canaveral
Vassilios Haloulakos	San Fernando Pacific
John Hart	San Francisco
Roger Hawks	Indiana
Gene Herber	Southern Tier
Robert Herold	Arrowhead
Henry Heubusch	Niagara Frontier
Ernest Hilton	St. Louis
Martin Hoffert	Long Island
Dale Hoffman	Los Angeles
Siegfried Hoh	Cape Canaveral
D. Holmes	New England
W. Hoverman	Antelope Valley
Peter Hrycak	Northern New Jersey
William Johnson	Central New York
Gerald Jones	Phoenix
Thomas Jones	Los Angeles
Dominick Juarez	Indiana
David Kent Jr.	North Texas
Robert Kessler	Rocky Mountain
William King	Los Angeles
Helmut Korst	Illinois
Martin Koshar	Central Florida
David Kotker	Pacific Northwest
Munson Kwok	Los Angeles
Milford Leibman	Pacific Northwest
Sumner Lewis	New England
Stephen Maran	National Capital
Walter Martin	Canada
James Mc Lane Jr.	Houston
Alexander McCool Jr.	Alabama/Mississippi
Sidney Metzger	National Capital
Eugene Mleczko	St. Louis
Albert Momenthy	Northwest Florida
Willford Morrison	Northern New Jersey
William Mueller	Long Island
Bob Noblitt	Alabama/Mississippi
William ODonnell	New England
Franklin Ohgi	Orange County
Henry Oman	Pacific Northwest
Raymond Ortler	New England
Marvin Pastel	Hampton Roads
Fred Peitzman	Los Angeles
Julian Pfannmuller	St. Louis
Anthony Polikaitis	San Fernando Pacific
Tracy K. Pugmire	Orange County
Donald Reeves	Los Angeles
Thomas Rehder	Vandenberg
Leon Riley	Alabama/Mississippi
Jerry Rising	Pacific Northwest
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Ronald Schack	Mid-Atlantic
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Richard Schmidtke	Atlanta
Alan Schneider	San Diego
Henry Schowalter	New England
Edward Scicchitano	Mid-Atlantic
Norman Sears	New England
Pasquale Sforza	Palm Beach
Raymond Shreeve	Point Lobos
Gary Slater	Dayton/Cincinnati
Dale Smith	Orange County
Lloyd Smith	Antelope Valley
Richard Spann	Antelope Valley
Fridtjof Speer	Pacific Northwest
Donald Stone	Orange County
Robert Telakowski	Connecticut
Eric Ungar	New England
Ernest Wade	Los Angeles
Michael Walsh	San Fernando Pacific
Glenn Wasz	Orange County
Stacy Weislogel	Columbus
Robert Wertheim	San Diego
Charles White	Orange County
Robert Wiesner	Greater Philadelphia
Francis Wille Jr.	Northern Ohio
Joseph Yamron	New England
Melvin Zwillenberg	Northern New Jersey

60-Year Anniversaries

Donald Arenson	Illinois
Karl Bergey	Oklahoma
William Berks	Los Angeles
Bertrand Bertrando	Vandenberg
Rene Bloch	France
Erwin Branahl	St. Louis
Vincent Capasso Jr.	Dayton/Cincinnati
Julio Cordero	New England
J. Davis	Twin Cities
L. Dimmick	Sacramento
Franklin Eckhart	Oklahoma
Fredric Ehrich	New England
G. Elverum	Arrowhead
Jack Fairchild	Southwest Texas
Byron Fowler	Albuquerque
Frank Friedlaender	San Francisco
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Herbert Graham	Mid-Atlantic
Gerald Green	Connecticut
William Grove	San Fernando Pacific
Paul Gwozdz	Northern New Jersey
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Isao Sakata	San Fernando Pacific
Lucien Schmit Jr.	Pacific Northwest
Mannie Schneider	Orange County
Kenneth Sivier	Illinois
Michael Tauber	Pacific Northwest
John Tsirimokos	San Diego
Leslie Van Tassell	New England
Wallace Vander Velde	New England

70-Year Anniversaries

Harry Bloomer	Northern Ohio
Emanuel Boxer	Hampton Roads
William Cohen	San Fernando Pacific
Edgar Cortright	New England
Roy Jackson	Orange County
Artur Mager	Los Angeles
Frederick Ordway III	Alabama/Mississippi
August Paolini	Sacramento
Michael Paradiso	Sacramento
Richard Passman	National Capital
Francis Reynolds	Pacific Northwest
Joseph Sporcic	Los Angeles
John Stern	San Francisco
Linwood Wright	Greater Philadelphia
Keirn Zebb	Tucson

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**. A nomination form can be downloaded from **www.aiaa.org**. AIAA members may also submit nominations online after logging in with their user name and password.

Aerospace Guidance, Navigation, and Control Award is presented to recognize important contributions in the field of guidance, navigation, and control. (Presented even years)

Aerospace Power Systems 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.

Aircraft Design Award is presented to a design engineer or team for the conception, definition, or development of an original concept leading to a significant advancement in aircraft design or design technology.

Daniel Guggenheim Medal honors persons who make notable achievements in the advancement of aeronautics. AIAA, ASME, SAE, and AHS sponsor the award.

de Florez Award for Flight Simulation is named in honor for the late Admiral Luis de Florez and is presented for an outstanding individual achievement in the application of flight simulation to aerospace training, research, and development.

Energy Systems Award is given 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.

F. E. Newbold V/STOL Award is presented to recognize outstanding creative contributions to the advancement and realization of powered lift flight in one or more of the following areas: initiation, definition, and/or management of key V/STOL programs; development of enabling technologies including critical methodology; program engineering and design; and/or other relevant related activities or combinations thereof which have advanced the science of powered lift flight.

George M. Low Space Transportation 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. (Presented even years)

Haley Space Flight Award is presented for outstanding contributions by an astronaut or flight test personnel to the advancement of the art, science, or technology of astronautics. (Presented even years)

Hap Arnold Award for Excellence in Aeronautical Program Management is presented to an individual for outstanding contributions in the management of a significant aeronautical- or aeronautical-related program or project.

Hypersonic Systems and Technologies Award is presented to recognize sustained, outstanding contributions and achievements in the advancement of atmospheric, hypersonic flight, and related technologies. (Presented every 18 months)

J. Leland Atwood Award recognizes an aerospace engineering educator for outstanding contributions to the profession. AIAA and ASEE sponsor the award. *Nominations due to AIAA by 1 January.*

CALL FOR PAPERS
ICNPAA 2012 World Congress: Mathematical Problems in Engineering, Sciences and Aerospace
Vienna, Austria, 11–14 July 2012

On behalf of the International Organizing Committee, it gives us great pleasure to invite you to the ICNPAA 2012 World Congress: 9th International Conference on Mathematical Problems in Engineering, Aerospace and Sciences, which will be held at Vienna University of Technology, Vienna, Austria. This is an AIAA and IFIP cosponsored event.

Please visit the Web site: **www.icnpaa.com** for all details.

Mechanics and Control of Flight Award is presented for an outstanding recent technical or scientific contribution by an individual in the mechanics, guidance, or control of flight in space or the atmosphere.

Multidisciplinary Design Optimization Award is presented to an individual for outstanding contributions to the development and/or application of techniques of multidisciplinary design optimization in the context of aerospace engineering. (Presented even years)

Otto C. Winzen Lifetime Achievement Award is presented for outstanding contributions and achievements in the advancement of free flight balloon systems or related technologies. (Presented odd years)

Piper General Aviation Award is presented for outstanding contributions leading to the advancement of general aviation. (Presented even years)

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

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

Space Operations and Support 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 Systems Award is presented to recognize outstanding achievements in the architecture, analysis, design, and implementation of space systems.

von Braun Award for Excellence in Space Program Management recognizes outstanding contributions in the management of a significant space or space-related program or project.

William Littlewood Memorial Lecture was renowned for the many significant contributions he made to the design of an operational requirement for civil transport aircraft. The topics for the lecture deal with a broad phase of civil air transportation considered of current interest and major importance. AIAA and SAE sponsor the lecture.

Answers to frequently asked questions or guidelines on submitting nominations for AIAA awards may be found at **www.aiaa.org/content.cfm?pageid=289**. For further information on AIAA's awards program, contact Carol Stewart, Manager, AIAA Honors and Awards, at 703.264.7623 or carols@aiaa.org.

New and Best-Selling Books from AIAA

"An excellent way to get a solid grounding in the complex and challenging acquisition process."
—**Jacques S. Gansler**, Ph.D., University of Maryland, and former Under Secretary of Defense for Acquisition, Technology and Logistics

Management of Defense Acquisition Projects

Rene G. Rendon and Keith F. Snider
Naval Postgraduate School
2008, 292 pages, Hardback, ISBN: 978-1-56347-950-2
List Price $64.95
AIAA Member Price: $49.95

A History of Two CIA Projects. *Based on interviews, memoirs, and oral histories of the scientists and engineers involved, as well as recently declassified CIA documents, and photographs, reports, and technical drawings from Lockheed and Convair, this is a technical history of the evolution of the Lockheed A-12 Blackbird.*

From RAINBOW to GUSTO: Stealth and the Design of the Lockheed Blackbird

Paul A. Suhler
2009, 300 pages, Paperback, 1SBN: 978-1-60086-712-5
List Price $39.95
AIAA Member Price $29.95

While the focus of this book is on ground combat system vulnerability, many of the principles, methodologies, and tools discussed are also applicable to the air and sea system communities.

Fundamentals of Ground Combat System Ballistic Vulnerability/Lethality

Paul H. Deitz, Harry L. Reed Jr., J. Terrence Klopcic, and James N. Walbert
Progress in Astronautics and Aeronautics, Vol. 230
2009, 384 pages, Hardback, ISBN: 978-1-60086-015-7
List Price $119.95
AIAA Member Price: $89.95

"I urge all who are serious about understanding the development of the national security space arena to read it."
—Roger D. Launius
Smithsonian Institution

Shades of Gray: National Security and the Evolution of Space Reconnaissance

L. Parker Temple III
2005, 554 pages, Hardback, ISBN: 978-1-56347-723-2
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Also From AIAA

Weaponeering: Conventional Weapon System Effectiveness

Morris Driels, Naval Postgraduate School
2004, 466 pages, Hardback, ISBN: 978-1-56347-665-5
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The Fundamentals of Aircraft Combat Survivability Analysis and Design, Second Edition

Robert E. Ball, Naval Postgraduate School
2003, 889 pages, Hardback, ISBN: 978-1-56347-582-5
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Mathematical Methods in Defense Analyses, Third Edition

J. S. Przemieniecki, Air Force Institute of Technology
AIAA Education Series
2000, 421 pages, Hardback, ISBN: 978-1-56347-397-5
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The Missile Defense Equation: Factors for Decision Making

Peter J. Mantle, Mantle & Associates, LLC
2004, 525 pages, Hardback, ISBN: 978-1-56347-609-9
List Price: $99.95
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Effective Risk Management: Some Keys to Success, Second Edition

Edmund H. Conrow, CMC, CPCM, PMP
2003, 554 pages, Hardback, ISBN: 978-1-56347-581-8
List Price: $84.95
AIAA Member Price: $64.95

Approximate Methods for Weapon Aerodynamics

Frank G. Moore, Naval Surface Warfare Center
Progress in Astronautics and Aeronautics, Vol. 186
2000, 464 pages, Hardback, ISBN: 978-1-56347-399-9
List Price: $119.95
AIAA Member Price: $89.95

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- Meet with your clients and suppliers in the Aerospace Exposition. Exhibits from government, industry, and small businesses will feature hardware and software demonstrations and new products.
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- Network, discuss challenges, and share ideas during panel sessions, luncheons, receptions, coffee breaks, and off-site events.

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- Engineering Managers/Executives
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- Young Aerospace Professionals
- Educators and Students
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www.aiaa.org/events/asm

What to Expect?

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- More than 1,000 papers presented in over 30 technical tracks
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Management Program

- New Horizons Forum addressing air and space transportation for the future
- Career and Workforce Development Workshop

Networking

- Aerospace Exposition
- Coffee Breaks, Luncheons, Receptions
- Honky-Tonking at the Wild Horse Saloon
- Committee Meetings
- And more!

Continuing Education

Stay at the top of your game with AIAA's continuing education program. You will leave with invaluable improvements and solutions that you can put to immediate use. Seven courses will be featured this year prior to the conference (7–8 January 2012). Course registration includes full conference participation. A complete description of each course can be found at **www.aiaa.org/courses.**

- CFD for Combustion Modeling
- Concepts in the Modern Design of Experiments
- Fluid Structure Interaction
- Sustainable (Green) Aviation
- Systems Requirements Engineering
- Modeling Flight Dynamics with Tensors
- Best Practices in Wind Tunnel Testing

Courses subject to change

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AIAA Missile Sciences Conference
The U.S. Missile Industry: Balancing Capability and Affordability to Meet Warfighter Needs

SECRET/U.S. ONLY

24–26 January 2012
Naval Postgraduate School
Monterey, CA

Event Overview

Two classified AIAA conferences—the AIAA Strategic and Tactical Missile Systems Conference and the AIAA Missile Sciences Conference—will combine in January 2012 to provide one major event for the missiles systems community. The AIAA Strategic and Tactical Missile Systems Conference and the AIAA Missile Sciences Conference are long-standing AIAA conferences serving the weapons community. These conferences will be collocated as a single event for the first time in 2012 providing a forum for the exchange of information on a larger scale than was possible at separate events. The combined event will feature both programmatic and technical information while fostering beneficial networking opportunities. Material presented and attendance allowed at the event will be at the SECRET/U.S. ONLY clearance level. All attendees and speakers must have a SECRET clearance in order to participate.

The AIAA Strategic and Tactical Missile Systems Conference offers an excellent opportunity to hear senior Department of Defense officials and other noted authorities from the strategic and tactical missiles community speak about the issues and challenges that face the United States. Past program topics have included national defense strategy, defense acquisition, missile programs, homeland security, missile defense, research and development, and the industrial base.

The AIAA Missile Sciences Conference provides a forum for the presentation and discussion of classified and unclassified technical material related to missile system and subsystem technologies. The program addresses an array of topics including Air Force and Navy strategic missiles, tactical air-to-surface, surface-to-surface, anti-air missile systems, missile defense systems, targets and countermeasures, cruise missile defense, interceptors, weapon system effectiveness, hardware-in-the-loop testing of smart weapons, mission planning, mission assurance, system safety and insensitive munitions, and innovative technologies and concepts.

In addition to conference sessions, networking opportunities for attendees and speakers include two receptions, networking breaks between sessions, and a luncheon on each day of the conference.

Invited plenary speakers include:

- Shay Assad, Director, Defense Pricing, U.S. Department of Defense
- RADM Terry J. Benedict, USN, Director for Strategic Systems Programs
- Regina Dugan, Director, Defense Advanced Research Projects Agency (DARPA)
- LTG Richard P. Formica, USA, Commander, U.S. Army Space and Missile Defense Command
- Lawrence K. Gershwin, National Intelligence Officer for Science and Technology,
- Gen C. Robert Kehler, USAF, Commander, U.S. Strategic Command
- BG Ole Knudson, USA, PEO U.S. Army Missiles and Space
- Lt Gen James M. Kowalski, USAF, Air Force Global Strike Command
- Brett Lambert, Deputy Assistant Secretary of Defense for Manufacturing and Industrial Base Policy, U.S. Department of Defense
- Maj Gen Kenneth D. Merchant, USAF, Commander, Air Armament Center, and USAF PEO for Weapons
- James D. Miller, Jr., Principal Deputy Under Secretary of Defense for Policy, U.S. Department of Defense
- LTG Patrick O'Reilly, Director, Missile Defense Agency
- RADM William E. Shannon, USN, PEO Unmanned Aviation and Strike Weapons
- Chris Deegan, Executive Director, PEO Integrated Warfare Systems

Technical session topics include:

- Air Force Strategic Missiles
- Navy Tactical Missiles
- Tactical Air-to-Surface Missiles
- Tactical Surface-to-Surface Missiles
- Tactical Anti-Air Missile Systems
- Missile Defense Systems
- Missile Defense Targets and Countermeasures
- Missile Defense Interceptor Technologies
- Weapon System Effectiveness
- Innovative Technologies and Concepts
- Hardware-in-the-Loop Testing of Smart Weapons
- Mission Planning
- Mission Assurance
- System Safety and Insensitive Munitions
- Long Range Conventional Strike
- Asymmetric Missile Defense

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Special Events and Networking Opportunities

Accompanying Persons' Program
Accompanying persons are invited to meet on Tuesday, 24 January 2012, 0900 hrs, in the Cypress Room at the Hyatt Regency Monterey. Information about local attractions, activities, tours, shows, and restaurants will be available. Coffee and tea will be served.

Continental Breakfast
Continental breakfast for all attendees will be available Tuesday–Thursday, 24–26 January 2012, 0700 hrs, at the Naval Postgraduate School.

Luncheons
Luncheons for conference attendees will be held Tuesday–Thursday, 24–26 January 2012, in Hermann Hall at the Naval Postgraduate School. Tickets are required and are included in the conference registration fees where indicated. Additional tickets may be purchased upon registration or at the AIAA onsite registration desk.

Networking Coffee Breaks
Networking coffee breaks for all attendees will be held Tuesday–Thursday, 24–26 January 2012, in the morning and afternoon between sessions.

AIAA would like to thank Raytheon Company for its support of this year's event.

Receptions
Receptions for conference attendees will be held Tuesday and Wednesday, 24 and 25 January 2012, in the Pebble/Beach Room at the Hyatt Regency Monterey. Tickets are required and are included in the conference registration fees where indicated. Additional tickets may be purchased upon registration or at the AIAA onsite registration desk.

Conference Proceedings

All accepted and properly marked papers will be included in the proceedings provided to the Defense Technical Information Center (DTIC). No reference will be made to primary or alternate status. DTIC will make available individual copies of classified and certain limited distribution papers approximately eight weeks after the conference. To access DTIC on the Web, visit **www.dtic.mil**. DTIC is the Department of Defense focal point for collecting, storing, and disseminating information from, or relevant to, research, development, test, evaluation, analysis, and acquisition.

Registration Information

AIAA is committed to sponsoring world-class conferences on current technical issues in a safe and secure environment. As such, all delegates will be required to provide proper identification prior to receiving a conference badge and associated materials. All delegates must provide a valid photo ID (driver's license or government/military I.D.) when they check in.

All participants are urged to register online at **www.aiaa.org/events/strattac** or **www.aiaa.org/events/missilesciences**. Registering in advance saves conference attendees up to $200. A check made payable to AIAA or credit card information must be included with your registration form. A PDF registration form is also available on the AIAA Web site. Print, complete, and mail or fax the form with payment to AIAA.

Early-bird registration forms must be received by **19 December 2011**, and standard registration forms will be accepted until **21 January 2012**. Preregistrants may pick up their materials at the advance registration desk at the conference. All those not registered by **21 January 2012** may do so at the AIAA onsite registration desk.

Cancellations must be in writing and received no later than **10 January 2012**. There is a $100 cancellation fee. Registrants who cancel beyond this date or fail to attend the conference will forfeit the entire fee.

Note: *A Security Clearance Certification Form is also required for this event. The Security Clearance Certification Form is separate from conference registration. Submitting a Security Clearance Certification Form does not register you for the conference. You must also register with AIAA.*

For questions, please contact Sandra Turner, AIAA conference registrar, at 703.264.7508 or sandrat@aiaa.org.

Registration fees are as follows:

	Early Bird By 19 Dec	**Standard** 20 Dec–21 Jan	**On-Site** On-Site
Option 1: Full Conference			
AIAA Member or Government	$575	$675	$775
Nonmember	$730	$830	$930

Includes sessions; Tuesday, Wednesday, and Thursday luncheons; and Tuesday and Wednesday receptions.

Option 2: Discounted Group Rate			
	$518 per person	$518 per person	N/A

10% discount off AIAA member rate for 10 or more persons from the same organization who register and pay at the same time with a single form of payment. Includes sessions and all catered events. A complete typed list of registrants, along with complet-

ed individual registration forms and a single payment, must be received by the preregistration deadline of **21 January 2012**.

Option 3: Naval Postgraduate School Faculty and Students

NPS Faculty or Student	$0	$0	$0

Includes sessions only, with approved security clearance.

Option 4: Continuing Education Course and Full Conference
Missile Design and System Engineering (22–23 January 2012)

AIAA Member	$1,188	$1,338	$1,488
Nonmember	$1,265	$1,415	$1,565

Includes course and course notes; sessions (with approved security clearance form); Tuesday, Wednesday, and Thursday luncheons; and Tuesday and Wednesday receptions.

Extra Tickets

Tuesday Luncheon	$30
Tuesday Reception	$75
Wednesday Luncheon	$30
Wednesday Reception	$75
Thursday Luncheon	$30

On-Site Registration Hours

On-site registration and security check-in will be held as follows:

Monday, 23 January	1500–1900 hrs	Hyatt Regency
Tuesday, 24 January	0700–1700 hrs	NPS
Wednesday, 25 January	0700–1700 hrs	NPS
Thursday, 26 January	0700–1500 hrs	NPS

Security Information

Attendance at this event is restricted to U.S. citizens who possess at final SECRET security clearance verified by the Security Office Coordinator.

Security Clearance Certification Form

All attendees, including speakers, aides, executive officers, assistants, etc., must submit the Security Clearance Certification Form found on page **B22**. The Security Clearance Certification Form is separate from conference registration. Submitting a Security Clearance Certification Form does not register you for the conference. You must also register with AIAA. All forms are due on **19 December 2011** to:

Raytheon Company
AIAA Strategic/Tactical - Missile Sciences Conference 2012
Attn: Michael Vargo
1100 Wilson Blvd., Suite 1600
Arlington, VA 22209
E-mail: michael.s.vargo@raytheon.com
JPAS SMO: 3F4085
Fax: 703.284.5545

Photographs are required. Applicant's name, organization, and photograph will be used by Raytheon to issue the conference badge. Photo will be matched to security clearance information. Submit a JPEG digital photograph (from middle of chest to top of head), 300 dpi or greater, 2 x 2 inches or greater in size, to Raytheon via e-mail to michael.s.vargo@raytheon.com. *Note*: Label photo file as "last name, first initial.jpeg".

The deadline for receipt of all Security Clearance Certification Forms is **19 December 2011**. Early submittal of the Security Clearance Certification Form is strongly recommended. Several hundred forms must be reviewed and processed. To prevent delays, please submit your form by the deadline. You will receive an e-mail confirming receipt and approval of your clearance. ***Note: Hand-carried Security Clearance Certification Forms will not be accepted at the conference site.***

AIAA Continuing Education Course

In today's highly competitive marketplace, you need every advantage to stay on top! Let AIAA Continuing Education pave the way to your future and continuing success! As the premier association representing professionals in aeronautics and astronautics, AIAA has been a conduit for furthering continuing education for more than sixty years. AIAA is committed to keeping the aerospace professional at their technical best. AIAA offers the best instructors and courses to meet the professional's career needs.

The following AIAA Continuing Education Course is being offered on Sunday–Monday, 22–23 January 2012, at the Hyatt Regency Monterey, in conjunction with this event.

Missile Design and System Engineering *(Instructor: Gene Fleeman)*

This short course provides the fundamentals of missile design, development, and system engineering. A system-level, integrated method is provided for missile configuration design and analysis. It addresses the broad range of alternatives in satisfying missile performance, cost, and risk requirements. Methods are generally simple closed-form analytical expressions that are physics-based, to provide insight into the primary driving parameters. Configuration sizing examples are presented for rocket, turbojet, and ramjet-powered missiles. Systems engineering considerations include launch platform integration constraints. Typical values of missile parameters and the characteristics of current operational missiles are discussed as well as the enabling subsystems and technologies for missiles. Sixty-six videos illustrate missile development activities and performance. Attendees will vote on the relative emphasis of types of targets, types of launch platforms, technical topics, and roundtable discussion.

Security Badge

A security badge is required for admittance to the conference sessions. Each attendee will be required to produce a driver's license or military I.D. prior to receiving a conference badge. Badges must be worn at the conference.

Security Restrictions

No electronic devices or electronic equipment of any kind—including cell phones, radios, PDAs, laptops, cameras, video/audio recording equipment, and pagers—is allowed in the session rooms. One-way pagers must be placed on vibrate during the conference sessions. Note-taking is not permitted in or around the conference sessions. Books, magazines, fliers, brochures, and other paper products will not be allowed in the conference sessions. Luggage and other baggage will not be allowed in the conference area. All handbags, purses, and personal possessions will be inspected upon entry into the conference area. Security spot checks may be made at any time.

Hotel Reservations

AIAA has made arrangements for a block of rooms at the Hyatt Regency Monterey, One Old Golf Course Road, Monterey, CA 93940, Phone: 831.372.1234, Fax: 831.375.3960. Room rates are $169 per night for single or double occupancy. Please identify yourself as being with the AIAA conference. These

rooms will be held for AIAA until **21 December 2011** or until the block is full. After 21 December 2011, any unused rooms will be released to the general public. You are encouraged to book your hotel room early. *Government Employees*—There are a limited number of sleeping rooms available at the government per diem. Government I.D. is required.

Help Keep Our Expenses Down (And Yours Too!)

AIAA group rates for hotel accommodations are negotiated as part of an overall contract that also includes meeting rooms and other conference needs. Our total event costs are based in part on meeting or exceeding our guaranteed minimum of group-rate hotel rooms booked by conference participants. If we fall short, our other event costs go up. Please help us keep the costs of presenting this conference as low as possible—reserve your room at the designated hotel listed in this Event Preview and on our Web site, and be sure to mention that you're with the AIAA conference. Meeting our guaranteed minimum helps us hold the line on costs, and that helps us keep registration fees as low as possible. All of us at AIAA thank you for your help!

Meeting Site

The conference will be held at the Naval Postgraduate School (NPS) in Monterey, CA. Described as the "greatest meeting between land and sea," Monterey County encompasses some of California's most stunning scenery and world-renowned attractions, such as the Monterey Bay Aquarium, Cannery Row, Fisherman's Wharf, and 17-Mile Drive. For tourist information, visit the Monterey County Convention & Visitors Bureau at **www.montereyinfo.org**.

Car Rental

Hertz Car Rental Company saves members up to 15% on car rentals. The discounts are available at all participating Hertz locations in the United States, Canada, and where possible, internationally. For worldwide reservations, call your travel agent or Hertz directly at 800.654.2200 (U.S.) or 800.263.0600 (Canada). Mention the AIAA members savings CDP #066135 or visit www.hertz.com. Don't forget to include the CDP number.

Parking and Transportation

Parking facilities will not be available at Naval Postgraduate School for conference attendees. The Hyatt Regency Monterey is located directly across the highway from NPS. Shuttle bus transportation will be available from the hotel conference center to NPS each day of the conference. The cost is included in the conference registration fee. The bus schedule will be in the final program.

Certificate of Attendance

Certificates of Attendance are available for attendees who request documentation at the conference itself. Please request your copy at the onsite registration desk. AIAA offers this service to better serve the needs of the professional community. Claims of hours or applicability toward professional education requirements are the responsibility of the participant.

Program at a Glance

Tuesday, 24 January 2012

0800 hrs
Welcome and Opening Remarks

0830 hrs
Policy Speaker

0915 hrs
Threat Speaker

1000 hrs
Networking Coffee Break

1030 hrs
Technical Sessions

1200 hrs
Luncheon

1300 hrs
Defense Pricing Speaker

1345 hrs
Industrial Base Policy Speaker

1430 hrs
Networking Coffee Break

1500 hrs
Technical Sessions

1800 hrs
Reception

Wednesday, 25 January 2012

0800 hrs
U.S. Strategic Command Speaker

0845 hrs
AF Global Strike Command Speaker

0930 hrs
Army Space and Missile Defense Command Speaker

1015 hrs
Networking Coffee Break

1045 hrs
Technical Sessions

1215 hrs
Luncheon

1315 hrs
PEO Panel

1445 hrs
Networking Coffee Break

1515 hrs
Technical Sessions

1800 hrs
Reception

Thursday, 26 January 2012

0800 hrs
DARPA Speaker

0845 hrs
Missile Defense Agency Speaker

0930 hrs
Strategic Systems Programs Speaker

1015 hrs
Networking Coffee Break

1045 hrs
Technical Sessions

1215 hrs
Luncheon

1315 hrs
Technical Sessions

For the full conference program, including all paper titles, authors, and panel speakers, visit **www.aiaa.org/events/strattac** or **www.aiaa.org/events/missilesciences**.

AIAA STRATEGIC AND TACTICAL MISSILE SYSTEMS CONFERENCE
AIAA MISSILE SCIENCES CONFERENCE
(SECRET/U.S. ONLY)

24–26 January 2012
Naval Postgraduate School, Monterey, California

CLEARANCE CERTIFICATION FORM

Conference attendance requires U.S. Citizenship and at least a SECRET security clearance.

Applicant's Name _____
(Please print or type) Last First Middle

Name for Conference Badge _____

PERSONAL DATA *(To be completed by applicant)*

Social Security Number _____ Citizenship _____

Place of Birth _____ Date of Birth _____

If you were not born in the United States, indicate how and where your U.S. citizenship was acquired. Include Naturalization Certificate Number, if applicable.

Citizenship Acquired _____ *Where* _____

Naturalization Certificate Number (if applicable) _____

Affiliation _____ Title _____
Company, Military Activity, or Government Agency

Affiliation Address _____
Street City State Zip Code

Date _____ Signature _____

NOTE – PENALTY FOR MISREPRESENTATION: Title 18 of the United States Code makes it a criminal offense, punishable by a maximum of 5 years imprisonment, a $10,000 fine, or both, to make a false statement or representation to any department or agency of the United States. This includes any statement knowingly made by an employer or employee herein that is found to be incorrect, incomplete, or misleading in any important particular.

SECURITY *(To be completed by security official)*

I certify that the applicant has a _____ TOP SECRET _____ SECRET security clearance.

Date _____ Typed or Printed Name _____

Organization _____

FSC/CAGE Number _____ Signature _____

Must be submitted by 19 December 2011 to:
Raytheon Company
AIAA Strategic/Tactical - Missile Sciences Conference 2012
Attn: Michael Vargo
1100 Wilson Blvd., Suite 1600
Arlington, VA 22209
E-mail: michael.s.vargo@raytheon.com
JPAS SMO: 3F4085
Fax: 703.284.5545

SECURITY REQUIREMENTS
Notes may not be taken during the conference sessions. Electronic devices, including cell phones, radios, PDAs, laptops, cameras, video/audio recording equipment, and two-way pagers, must be left in the hotel room as they will not be allowed in the auditorium. One-way pagers must be placed on **vibrate** during the conference sessions.

PHOTOGRAPHS ARE REQUIRED: Applicant's name, organization, and photograph will be used by Raytheon to issue the conference badge. Photo will be matched to security clearance information. Submit a JPEG digital photograph (from middle of chest to top of head), 300 dpi or greater, 2 x 2 inches or greater in size, to Raytheon via e-mail to **michael.s.vargo@raytheon.com**. Note: Label photo file as "last name, first initial.jpeg". Badges for all conference sessions will be issued at the AIAA registration desk at the Hyatt Regency Monterey on Monday, 23 January, 1500–1900 hrs and in King Hall at the Naval Postgraduate School on Tuesday, 24 January, 0700–1600 hrs, Wednesday, 25 January, 0700–1600 hrs, and Thursday, 26 January, 0700–1300 hrs.

To confirm receipt of this form, contact **michael.s.vargo@raytheon.com**.
Note: You will be required to show photo identification for conference registration/badge issue (State driver's license, Military I.D. Card (DD Form 2) or company photo I.D.)

12th AIAA Aviation Technology, Integration, and Operations (ATIO) Conference
14th AIAA/ISSMO Multidisciplinary Analysis and Optimization Conference

17–19 September 2012
Hyatt Regency Indianapolis
Indianapolis, Indiana

Abstract Deadline: 7 February 2012
Final Manuscript Deadline: 28 August 2012

Theme: Diversity, Design, and Details—Facing the Challenge of Synthesis and Integration

In today's technologically advanced society, we rely on the seamless integration of technology, complex systems, and products to enhance and enrich our daily lives. Development of these innovative and practical systems and products is the result of multidisciplinary synthesis—the combination of different theories, ideas, and entities brought together to produce novel technology. Synthesis in design is a sophisticated and demanding challenge. People from diverse backgrounds, with vastly differing skill sets, must communicate with and learn from each other. Integration of tools and methods often developed in one field become useful to another. Finally, all of these skills, ideas, and theories must be brought together to produce useful and functional products.

AIAA brings together two of its premier conferences to explore the issues of synthesis, and encourage its occurrence, through the integration of two separate, yet synergistic, technical communities. Practicing engineers, researchers, and policymakers will interact to explore ideas, share research, and discuss the preeminent issues in design, optimization, and synthesis.

Abstract Submittal Guidelines

Submittals should be approximately 1,500 words and in the form of an extended abstract or draft paper; draft papers are encouraged. Submittals must clearly describe the purpose and scope of the work, the methods used, key results, contributions to the state of the art, and references to pertinent publications in the existing literature. The submittal should include figures and data that support the results and contributions asserted. Both abstracts and final papers should address adequately the accuracy of the numerical, analytical, or experimental results. Abstracts will be reviewed and selected based on technical content, originality, importance to the field, clarity of presentation, and potential to result in a quality full paper. As such, abstracts should describe clearly the work to be included in the full paper, its scope, methods used, and contributions to the state of the art. The abstract must include paper title, names, affiliations, addresses, and telephone numbers of all authors.

Abstract Submittal Procedure

Abstract submissions will be accepted electronically through the AIAA Web site at **www.aiaa.org/events/atio** and **www.aiaa.org/events/mao**. Once you have entered the conference Web site, log in, click "Submit a Paper" from the menu on the right, and follow the instructions listed. This Web site will be open for abstract submittal starting **10 October 2011**. The deadline for receipt of abstracts via electronic submittal is **7 February 2012**.

If you have questions regarding which conference to submit your paper to please contact the ATIO/MAO Liaison, Bill Crossley at crossley@purdue.edu. If you have questions regarding the submission criteria or questions about AIAA policy, please contact Institute Administrator Ann Ames at anna@aiaa.org or 703.264.7549. If you have any difficulty with the submittal process, please e-mail ScholarOne Technical Support at ts.acsupport@thomson.com or call 434.964.4100 or (toll-free, U.S. only) 888.503.1050.

Questions pertaining to the abstract or technical topics should be referred to the corresponding Technical Program Chair. General inquiries concerning the program format or policies of the conference should be directed to the corresponding conference Technical Program Chair.

Authors will be notified of paper acceptance or rejection on or about **14 May 2012**. Instructions for preparation of final manuscripts will be provided for accepted papers.

"No Paper, No Podium" and "No Podium, No Paper" Policies

If a written paper is not submitted by the final manuscript deadline, authors will not be permitted to present the paper at the conference. It is the responsibility of those authors whose papers or presentations are accepted to ensure that a representative attends the conference to present the paper. If a paper is not presented at the conference, it will be withdrawn from the conference proceedings. These policies are intended to eliminate no-shows and to improve the quality of the conference for attendees.

Duplicate Publishing

AIAA policy precludes an abstract or paper from being submitted multiple times to the same conference. Also, once a paper has been published, by AIAA or another organization, AIAA will not republish the paper. Papers being submitted to the Student Paper Competition being held in conjunction with this conference may not be submitted to the general sessions. Author(s) must choose to submit to the Student Paper Competition ***or*** to the conference. If your paper is selected for the competition, it will be published along with the conference proceedings.

Why Submit a Paper?

Networking
Build your professional network and interact with peers during your paper presentation.

Worldwide Exposure
Your paper will be added to the AIAA Electronic Library, the largest aerospace library in the world. More than two million searches are performed every year with 150 institutions as subscribers!

Respect
AIAA journals are cited more often than any other aerospace-related journal, and their impact factor is ranked in the top ten. Publishing with AIAA ensures that your name is connected with the most prestigious publications in the aerospace field.

Praise
Receive recognition from your peers for your presentation (or if your student paper is considered for the best student paper award).

12th AIAA Aviation Technology, Integration, and Operations (ATIO) Conference
The Next Generation of Aviation—Analysis and Design of a Complex System

Synopsis

The Next Generation Air Transportation System will depend on the concepts and results of synthesis. From the design of individual and diverse vehicles to the development and implementation of our air traffic control system, to the airspace system itself, the amalgamation of diverse knowledge, people, and ideas into a cohesive, optimized, and useful entity is critical. The design of aircraft and the systems in which they operate require advanced multidisciplinary design tools, methodologies, and optimization. New paradigms in technology, innovative vehicle configurations and design solutions, and new operational systems are emerging for this future synergistic aviation world.

The AIAA Aviation Technology, Integration, and Operations (ATIO) Conference has an established reputation for bringing together aviation professionals, practicing engineers, researchers, and policymakers to explore ideas, share research, and create interactive opportunities in response to these issues.

Technical Topics

Aircraft Design and Design Methodologies

The capabilities provided by advanced computational and analysis methods are being matched by developments in technologies, such as materials and propulsion systems in both military and civil sectors. Papers are sought on everything from design methods to case studies, from system and vehicle level down to detail sub-systems. Topic areas include but are not limited to:

- Design synthesis and multidisciplinary optimization
- Advanced systems integration
- Innovative concepts and technologies (including energy optimized systems, all-electric aircraft)
- Cost effectiveness and value engineering of aerospace systems

Air Transportation: Aircraft Operations and Air Traffic Management Systems

Also playing a vital role in addressing environmental concerns and transportation issues are the air traffic systems that guide aircraft and transport people/cargo around the globe. Research in technologies to increase system and aircraft efficiency and to manage aircraft operations at optimal levels are topics of interest for this conference. Papers are sought that discuss research and analyses on any of a broad range of topics, including but not limited to:

- System operational efficiency with increased demand and new aircraft types
- Enterprise architecture systems for communications, navigation, surveillance, flight planning, and air traffic control
- Integrated net-centric operations for air traffic management
- Safety certification of commercial, military, and general aviation aircraft, both manned and unmanned
- Security systems for airports and aircraft

Systems and Systems Integration

The supporting technologies and applications needed to facilitate developments in complex systems are key elements in the future of aviation, including those relating to future vehicle system concepts such as electric aircraft or fuel cell power systems, and operationally, as expounded by NextGen and the Single European Sky ATM Research (SESAR). Papers are sought that describe methodologies for systems analysis and applications in the context of these future concepts and technologies. Topic areas include but are not limited to:

- Design and analysis of complex aviation systems
- System-wide methodologies
- Application of systems analysis to aerospace design
- Integration of advanced technologies into vehicle and operational systems

Educational Outreach

AIAA has a strong commitment to supporting the education of the next generation of aerospace engineers. Following this year's technical portion of the conference will be a unique educational outreach event that brings together local students and aerospace professionals. The event will feature presentations given by members of the aerospace community, as well as a variety of relevant hands-on activities, including possible tours of local aerospace facilities. If you, as an aerospace professional or a local educator, would like to contribute ideas or resources, or otherwise be involved in the planning of this effort, please contact Dennis Carter at dennis.carter@wpafb.af.mil or Danielle Soban at danielle.soban@ae.gatech.edu.

14th AIAA/ISSMO Multidisciplinary Analysis and Optimization Conference
MDO: Solving Today's Synthesis and Integration Problems

Synopsis

The purpose of the Multidisciplinary Analysis and Optimization (MA&O) Conference is to bring together users, developers, and researchers to present the latest theoretical and computational developments, applications, ideas, and problems in the field of multidisciplinary analysis, design, and optimization. Advances in methodology, process, and tool development will be presented. Of particular interest are the continuing challenges associated with the design and optimization of large-scale coupled design problems, and the ways in which recent technological advances provide an enabling platform for achieving a truly integrated system design. Panel sessions and keynote speakers from industry, academia, and government will represent key views and issues in multidisciplinary design optimization (MDO) synthesis and integration. These events are always considered highlights of the program.

Technical Topics

Abstract submissions are invited for multidisciplinary applications ranging from aerospace to automotive to power systems. Of interest are contributions that address topics in MDO methodology development, optimization method development, uncertainty quantification and incorporation in MDO, design methods with a focus on complex system and vehicle design, MA&O applications and tools, and enabling technologies for MA&O (modeling, simulation, and visualization). Topics of interest include but are not limited to:

Enabling Technologies for MA&O

- Multidisciplinary analysis and design optimization software
  - Algorithms
  - Architectures and frameworks
- Visual design steering
- Design space exploration
- Visualization and interfaces for decision support in MDO
- Modeling methods
- Meta-modeling methods
- High-performance computing for MDO

12th AIAA Aviation Technology, Integration, and Operations (ATIO) Conference

Technical Program Chairs

Peter Hollingsworth
University of Manchester
peter.hollingsworth@manchester.ac.uk

Kapil Sheth
NASA Ames Research Center
Kapil.Sheth@nasa.gov

Theme Chair

Danielle S. Soban, PhD
Queen's University Belfast
E-mail: d.soban@qub.ac.uk

ATIO Technical Program Committee

Aircraft Design Technical Committee
Dennis Carter, Air Force Research Laboratory
William Crossley, Purdue University
Gil Crouse, Auburn University

Aircraft Operations Technical Committee
Brian Baxley, NASA Langley Research Center
Parimal Kopardekar, NASA Ames Research Center

Air Transportation Systems Technical Committee
Dave Maroney, MITRE Corporation
Joe Post, Federal Aviation Administration
Kapil Sheth, NASA Ames Research Center

Economics Technical Committee
Richard Curran, Delft University of Technology

General Aviation Technical Committee
Mark Moore, NASA Langley Research Center

Technical Activities Committee
Satish Mohleji, MITRE CAASD

Value Driven Design Program Committee
Paul Collopy, University of Alabama, Huntsville

14th AIAA/ISSMO Multidisciplinary Analysis and Optimization Conference

General Chair

James Chrissis
Air Force Institute of Technology
E-mail: James.Chrissis@afit.edu

Technical Program Chair

Christopher Mattson
Brigham Young University
E-mail: mattson@byu.edu

International Organizing Committee

International Chair (ISSMO)

Vassili Toropov
University of Leeds
E-mail: v.v.toropov@leeds.ac.uk

International Chair (South America)

Silvana Maria Bastos Afonso da Silva
Federal University of Pernambuco
E-mail: smb@ufpe.br

International Chair (Asia)

Masao Arakawa
Kagawa University
E-mail: arakawa@eng.kagawa-u.ac.jp

Student Paper Competition Chair

H. Alicia Kim
University of Bath
E-mail: H.A.Kim@bath.ac.uk

- Data handling in distributed computing for complex design
- Web-based computing and collaboration
- Multidisciplinary analysis methods that enable design and optimization

Multidisciplinary Design Optimization Methodologies
- Decomposition methods for MDO
- Value-driven design methods
- Design for X in MDO
- Decision theory in MDO
- Complex system design
- Aerospace vehicle design
- Aeroelastic/aeroservoelastic optimization and design
- Emerging MDO areas

Optimization Methods and Algorithms
- Sensitivity analysis methods
- Discrete variable optimization
- Nondeterministic optimization
- Evolutionary methods
- Multi-criteria optimization
- Gradient-based optimization
- Multi-scale optimization
- Shape and topology optimization
- Structural optimization
- Aerodynamic optimization

Uncertainty and Reliability Methods in MA&O
- Uncertainty quantification and analysis
- Methods for capturing uncertainty
- Methods for representing reliability
- Reliability in complex systems design
- Risk analysis
- Robust design

Applications of MA&O
- Aerospace systems
- Space launch systems

- Automotive systems
- Structural applications
- Manufacturing applications
- Weapon design and optimization
- Consumer products
- Renewable energy systems
- Micro- and nanotechnology
- Material design
- Biotechnology
- Chemical processes
- MDO benchmark problems

Specially Organized Sessions and Panels

The conference organizers welcome individuals who wish to organize a special panel or technical paper session. Those who wish to do so should submit a short proposal describing the nature of the session as it relates to the topics of interest specified in this call for papers. Importantly, the proposal should also include the names of the organizers and participants. Those interested in submitting proposals may contact Christopher Mattson at mattson@byu.edu. Please note that any paper proposed as part of a special session must have an abstract submitted by the abstract deadline and will be reviewed under AIAA guidelines.

Student Paper Competition

Undergraduate and graduate students are encouraged to submit papers in the technical topics listed in this call for papers. Co-authored papers are welcome. However, the first author must be a student, and the conference presentation should be made by a student author. The student must have played a key role in the research and writing of the paper, and must be a registered student at the time the final paper is submitted. When submitting an abstract for the Student Paper Competition, authors must choose a "Presentation Type" from the drop-down menu on the abstract submission website and click on "Technical Paper Eligible for Student Paper Competition". The deadline for the student paper abstracts is the same as the conference abstract deadline and the student paper abstracts will be reviewed in the same way as the usual conference abstracts. The full papers of the Student Paper Competition are to be submitted by **13 July 2012**. They will be judged by two expert reviewers and finalists will be selected. The judging criteria are: 1) the originality of work; 2) the paper's potential importance to the field; and 3) its clarity. The finalists will be notified by **27 August 2012** and will be invited to prepare a poster. The award decision will be based on the poster presentation held during the conference. For more information, contact Dr. H. Alicia Kim at H.A.Kim@bath.ac.uk.

Joint Sessions

Given the critical importance of design of complex systems to global interests and technological competitiveness, the 12th AIAA ATIO Conference and the 14th AIAA/ISSMO MDO Conference have identified synergistic topics for joint sessions, aimed at promoting collaboration between communities as well as providing a venue for dissemination to a much broader audience. The topics for these sessions include:

- Aircraft design
- Aerospace system applications of MDO
- Complex system design methodologies
- Decision support processes and tools for complex systems
- Enabling technologies for complex system design

Global Space Exploration Conference (GLEX)

22–24 May 2012
L'Enfant Plaza Hotel
Washington, DC

Abstract Deadline: 1 December 2011

The IAF and AIAA are pleased to announce the Global Space Exploration Conference to be held in Washington, DC, on 22–24 May 2012. This major event is being organized jointly with the International Space Exploration Coordination Group (ISECG).

The conference will bring together the global space exploration stakeholder community representing governments, industry, academia and NGOs. Leaders in the field will converge in Washington to present results, exchange ideas, debate roadmaps, and discuss the future opportunities provided by human and robotic space exploration. The Global Exploration Conference is also endorsed by the IAA, ILEWG, and IMEWG.

For more information on the conference, go to **http://www.glex2012.org**.

Technical Program Overview

The technical program is designed to stimulate dialogue and exchange of ideas related to human and robotic space exploration through technical sessions, plenary events, and panel discussions. Highlight lectures will offer the opportunity for leaders to share their perspectives on timely issues. Conference participants will share results, exchange ideas, debate roadmaps, and discuss ways to enable future opportunities.

Today's global economic challenges highlight the importance of continuing to invest in innovative research and technology developments that will enable challenging and complex exploration missions. As missions gain complexity, partnerships become an increasingly important tool for achieving these objectives. Public/private partnerships, international partnerships, human/robotic partnerships, and intergovernmental partnerships are all examples of the types of partnerships gaining momentum today. When partners bring their unique capabilities and resources together, the result is safe, successful, and affordable space exploration.

Through ISECG, space agencies have begun a road mapping activity aimed at charting a course for sustainable human exploration leading to exploration of Mars. The first results of this important dialogue will be released in September 2011 with publication of The Global Exploration Roadmap. The Global Exploration Roadmap is a significant step in collaboratively planning human missions beyond low Earth orbit. The Global Exploration Conference provides the opportunity for the broader community to contribute innovative ideas and solutions to the challenges ahead.

Space exploration brings significant social, intellectual, and economic benefits to people on Earth. Yet, we must continue to be innovative in order to deliver the benefits expected by such significant investments. Understanding how we deliver benefits and remaining focused on this important point is crucial.

The technical program is designed to enable the opportunity for various space exploration stakeholder communities to exchange ideas and look for opportunities to collaborate in ways that enhance innovation and increase the value of space exploration investments.

Technical Sessions

Using the ISS to Prepare for Exploration

Not only is the ISS the current focus of human spaceflight for many nations, it provides the opportunity to perform research, demonstrate key technologies, and test operational capabilities

and procedures for exploration. This session will examine efforts ongoing, planned, and potential for maximizing the use of ISS to prepare for exploration.

Return to the Moon
This session will review concepts for missions to the moon, ranging from robotic orbiters and landers to eventual human missions. The role of robots in preparing for human exploration of the moon will be discussed, as well as the importance of humans and robots working together on the lunar surface.

Robotic Precursors to Human Exploration
Robotic precursors have always prepared the way for human followers. Missions that are conceived as science missions or primarily as human precursor missions offer the opportunity to close key knowledge gaps in preparing for human exploration. This session will examine key knowledge gaps for each destination and the contribution of recently completed or planned robotic missions to closing these gaps. It will also explore concepts for maximizing the return on any robotic mission in preparing for future human missions.

Human Robotic Partnerships for Exploration
This session will examine how robotic systems (tools, rovers, etc.) can be used to enhance human exploration missions, before, during, and after human activities are complete.

From Earth Missions to Deep Space Exploration
This session will deal with sounding rockets, LEO and GEO spacecraft, examining how they can be used to develop and demonstrate technologies that will feed into deep space exploration, including cis-lunar servicing and mission applications.

Exploration of Near Earth Asteroids
This session will review concepts for missions to near-Earth asteroids, ranging from robotic missions to eventual human missions. The role of robots in preparing for human exploration of asteroids will be discussed, as well as the importance of humans and robots working together on the asteroid.

The Human Space Exploration Value Proposition
What are the benefits of human space exploration, how can investments bring benefits to the global stakeholder community?

Exploration of Mars
This session will review concepts for missions to the Mars system, ranging from robotic missions to eventual human missions. The role of robots in preparing for human exploration of Mars will be discussed, as well as the importance of humans and robots working together on and near Mars. Relevant results from past missions, and planned future missions will be discussed.

Technology Roadmaps for Space Exploration
What are the key enabling technologies? How do we ensure they are available to support future missions? How does technology readiness affect exploration mission planning and timing? Presentation of various roadmaps for technology developments to support space exploration programs will be organized.

Life Support Challenges for Human Space Exploration
Robust and reliable life support systems represent one of the major challenges in preparing for deep space exploration missions. Current results, research, and theories leading to meeting the challenges of providing food, water, and shelter will be discussed.

Lunar and Asteroid Mining
The moon and the asteroids hold the promise to be a source of vast mineral riches, as well as a source of other valuable resources required for exploration such as oxygen, hydrogen, etc. Concepts to exploit these resources will be examined.

Participatory Exploration for Inspiration and Education
How can we motivate and involve the public? Concepts and ideas for involving this key stakeholder group in the planning and implementation of space exploration missions will be discussed. How can we turn the fascination about exploring the unknown (or the universe) into effective and sustainable education initiatives for the next generation? Lessons learned from past efforts, including results of successful initiatives and future plans will be discussed.

Legal Issues Related to Space Exploration
There is currently little legislation to govern space exploration. The Outer Space Treaty and the Moon Treaty have their limits. What are the legal issues with space exploration, and exploitation and what mechanisms can be proposed to address them?

New Business Models for Space Exploration
Public-private partnerships, as well as commercial and entrepreneurial models that have been proposed for space exploration will be examined. What is the role of governments vs. commercial industry and how can they contribute to each other's success?

Interdependency
As human and robotic exploration missions become increasingly complex, space agencies turn to partnerships to realize their goals and objectives. These partnerships are increasingly putting partners on the critical path the success of the overall effort. Human exploration missions will benefit from interdependency at the architecture, mission, and capability level. This session will examine the barriers, opportunities, and lessons learned in establishing an effective interdependent partnership.

ISECG Global Exploration Roadmap Panel Discussions

In addition to participation in technical sessions, selected authors will be asked to summarize their concepts and ideas relevant to the Global Exploration Roadmap in panel sessions. Panels of international experts representing government and industry will review and discuss meritorious concepts and ideas for human exploration scenarios and preparatory activities, looking for consensus recommendations to inform individual and collaborative agency planning.

Panels are anticipated in the following areas:

- Mission scenarios and design reference missions
- Use of ISS for exploration: Building on ISS capabilities and systems to prepare for beyond LEO missions
- Advanced technologies
- Next-generation space systems and infrastructure

Standard Information for all AIAA Conferences

This is general conference information, except as noted in the individual conference preliminary program information to address exceptions.

Photo ID Needed at Registration

All registrants must provide a valid photo ID (driver's license or passport) when they check in. For student registration, valid student ID is also required.

Conference Proceedings

This year's conference proceedings will be available in an online format only. The cost is included in the registration fee where indicated. If you register in advance for the online papers, you will be provided with instructions on how to access the conference technical papers. For those registering on-site, you will be provided with instructions at registration.

Young Professional Guide for Gaining Management Support

Young professionals have the unique opportunity to meet and learn from some of the most important people in the business by attending conferences and participating in AIAA activities. A detailed online guide, published by the AIAA Young Professional Committee, is available to help you gain support and financial backing from your company. The guide explains the benefits of participation, offers recommendations and provides an example letter for seeking management support and funding, and shows you how to get the most out of your participation. The online guide can be found on the AIAA Web site, **www.aiaa.org/YPGuide**.

Journal Publication

Authors of appropriate papers are encouraged to submit them for possible publication in one of the Institute's archival journals: *AIAA Journal*; *Journal of Aircraft*; *Journal of Guidance, Control, and Dynamics*; *Journal of Propulsion and Power*; *Journal of Spacecraft and Rockets*; *Journal of Thermophysics and Heat Transfer*; or *Journal of Aerospace Computing, Information, and Communication*. You may now submit your paper online at **http://mc.manuscriptcentral.com/aiaa**.

Speakers' Briefing

Authors who are presenting papers, session chairs, and co-chairs will meet for a short briefing at 0700 hrs on the mornings of the conference. Continental breakfast will be provided. Please plan to attend only on the day of your session(s). Location will be in final program.

Speakers' Practice

A speaker practice room will be available for speakers wishing to practice their presentations. A sign-up sheet will be posted on the door for half-hour increments.

Timing of Presentations

Each paper will be allotted 30 minutes (including introduction and question-and-answer period) except where noted.

Committee Meetings

Meeting room locations for AIAA committees will be posted on the message board and will be available upon request in the registration area.

Audiovisual

Each session room will be preset with the following: one LCD projector, one screen, and one microphone (if needed). A 1/2" VHS VCR and monitor, an overhead projector, and/or a 35-mm slide projector will only be provided if requested by presenters on their abstract submittal forms. AIAA does not provide computers or technicians to connect LCD projectors to the laptops. Should presenters wish to use the LCD projectors, it is their responsibility to bring or arrange for a computer on their own. Please note that AIAA does not provide security in the session rooms and recommends that items of value, including computers, not be left unattended. Any additional audiovisual requirements, or equipment not requested by the date provided in the preliminary conference information, will be at cost to the presenter.

Employment Opportunities

AIAA is assisting members who are searching for employment by providing a bulletin board at the technical meetings. This bulletin board is solely for "open position" and "available for employment" postings. Employers are encouraged to have personnel who are attending an AIAA technical conference bring "open position" job postings. Individual unemployed members may post "available for employment" notices. AIAA reserves the right to remove inappropriate notices, and cannot assume responsibility for notices forwarded to AIAA Headquarters. AIAA members can post and browse resumes and job listings, and access other online employment resources, by visiting the AIAA Career Center at http://careercenter.aiaa.org.

Messages and Information

Messages will be recorded and posted on a bulletin board in the registration area. It is not possible to page conferees. A telephone number will be provided in the final program.

Membership

Professionals registering at the nonmember rate will receive a one-year AIAA membership. Students who are not members may apply their registration fee toward their first year's student member dues.

Nondiscriminatory Practices

The AIAA accepts registrations irrespective of race, creed, sex, color, physical handicap, and national or ethnic origin.

Smoking Policy

Smoking is not permitted in the technical sessions.

Restrictions

Videotaping or audio recording of sessions or technical exhibits as well as the unauthorized sale of AIAA-copyrighted material is prohibited.

International Traffic in Arms Regulations (ITAR)

AIAA speakers and attendees are reminded that some topics discussed in the conference could be controlled by the International Traffic in Arms Regulations (ITAR). U.S. Nationals (U.S. Citizens and Permanent Residents) are responsible for ensuring that technical data they present in open sessions to non-U.S. Nationals in attendance or in conference proceedings are not export restricted by the ITAR. U.S. Nationals are likewise responsible for ensuring that they do not discuss ITAR export-restricted information with non-U.S. Nationals in attendance.

Technical Committee Nominations

Membership nominations are now open for AIAA Technical Committees (TC) for 2012/2013. Our TCs have between 30 and 35 members each. Nearly one-third of the members rotate off the committees each year, leaving six to ten openings per TC.

The TC chairs and the Technical Activities Committee (TAC) work diligently to maintain a reasonable balance in (1) appropriate representation to the field from industry, research, education, and government; (2) the specialties covered in the specific TC scopes; and (3) geographical distribution relative to the area's technical activity. TAC encourages the nomination of young professionals, and has instituted a TC associate member category (see associate membership guidelines). Associate members, with identified restrictions, are included on TCs in addition to the 35 regular member limit.

If you currently serve on a TC, do not nominate yourself. You will automatically be considered for the 2012/2013 TC year.

Enclosed are instructions for nominations as well as the form needed. Please feel free to make copies as necessary. Nominations may also be submitted online. The TC nomination form can be found on the AIAA Web site at **www.aiaa.org**, under "Inside AIAA," then "Technical Committees." We look forward to receiving your nominations. If you have any questions or need more forms, please call Betty Guillie at 703.264.7573.

Nominations are due by **1 November 2011**.

Current AIAA Technical Committees

Adaptive Structures

Aeroacoustics

Aerodynamic Decelerator Systems

Aerodynamic Measurement Technology

Aerospace Power Systems

Air Breathing Propulsion Systems Integration

Air Transportation Systems

Aircraft Design

Aircraft Operations

Applied Aerodynamics

Astrodynamics

Atmospheric & Space Environments

Atmospheric Flight Mechanics

Balloon Systems

Communications Systems

Computer Systems

Design Engineering

Digital Avionics

Economics

Electric Propulsion

Energetic Components & Systems

Flight Testing

Fluid Dynamics

Gas Turbine Engines

General Aviation

Ground Testing

Guidance, Navigation & Control

High Speed Air Breathing Propulsion

History

Hybrid Rockets

Information and Command & Control Systems

Intelligent Systems

Legal Aspects of Aeronautics & Astonautics

Life Sciences & Systems

Lighter-Than-Air Systems

Liquid Propulsion

Management

Materials

Meshing, Visualization & Computational Environments

Microgravity & Space Processes

Missile Systems

Modeling & Simulation

Multidisciplinary Design Optimization

Non-Deterministic Approaches

Nuclear & Future Flight Propulsion

Plasmadynamics & Lasers

Product Support

Propellants & Combustion

Sensor Systems

Society & Aerospace Technology

Software

Solid Rockets

Space Architecture

Space Automation & Robotics

Space Colonization

Space Logistics

Space Operations & Support

Space Resources

Space Systems

Space Tethers

Space Transportation

Structural Dynamics

Structures

Survivability

Systems Engineering

Terrestrial Energy Systems

Thermophysics

V/STOL Aircraft Systems

Weapon System Effectiveness

Instructions for Completing Technical Committee Nomination Forms

1. Submit one nomination form for each nominee. Nominees who are not selected for committee membership for 2012 will automatically be considered for membership in 2013. As the nomination forms are held for an additional year, it is not necessary to resubmit a form for someone not selected for the 2011/2012 term. You may send updated information to be attached to an existing nomination form.
2. You do not have to be nominated by someone else; you may submit an application for yourself.
3. A resume or biographical data must be attached and submitted with the nomination form.
4. Membership is usually restricted to one technical committee (TC) at a time. If you nominate someone to more than one committee, use one form. All information should be detailed and complete. Please list each TC for which you wish to be considered. It is recommended that you do not apply to more than 2 TCs at a time. This form will be duplicated at AIAA and sent to each TC indicated. In the event of selection by more than one TC chair, the nominee will be contacted to select one committee for membership.
5. The Technical Activities Committee (TAC) strongly suggests that special consideration be given to members 34 years of age and under or who obtained their professional degree less than 10 years ago. See attached Technical Committee Associate Membership Guidelines.
6. All TC members must join AIAA (if they are not already members) within 45 days of their appointment to a technical committee.
7. TC membership is generally for one year with two additional years possible, but contingent upon committee participation, ongoing projects, and AIAA membership. It is not necessary to send a new nomination form for someone who is already on a committee. All committee members are automatically considered for a second and third year of membership.
8. Deadline for receipt of nominations is **1 November 2011**. Nominations received after this date will be held for consideration until the next year.

Technical Committee Associate Membership Guidelines

1. Associate membership is restricted to those who have not yet reached their 35th birthday, or who obtained their professional degrees less than 10 years ago.
2. Associate membership is a one-year term renewable to three years.
3. Associate membership is restricted to current AIAA members.
4. Selection to associate membership is based on technical merit. The associate members should show promise within the field of the technical committee.
5. Associate members may attend TC or subcommittee meetings and will assist in carrying out committee work.
6. At the discretion of the TC, associate members may be assigned a volunteer full member as a counselor. The counselor will advise and guide the associate member on TC procedures and activities.
7. Associate members will have no voting privileges on the TC, but may (with consent) act as a substitute for their counselor.
8. Associate members will not count toward the TC membership limit.
9. Application forms for associate membership are the same as those of full membership, but a resume is a required attachment. Applicants for full membership who were not selected may be considered associate members provided they meet the age restriction.
10. At least two associate members should be appointed to each TC. At no time should the number of associate members exceed that of full members.
11. An endorsement form from the nominee's department head, indicating that the nominee may travel to two meetings per year and have some time to devote to committee business, must accompany each nomination form.

Send nominations to:

AIAA TC Nominations
1801 Alexander Bell Drive, Suite 500
Reston, VA 20191-4344

The World's Forum for Aerospace Leadership

AIAA TECHNICAL COMMITTEE (TC) NOMINEE FORM

Please submit one copy (photocopies are acceptable) of this form, and one copy of nominee's resumé to: AIAA Technical Committee Nominations, 1801 Alexander Bell Drive, Reston, VA 20191. Fax number is 703.264.7551. Form can also be submitted via our web site at www.aiaa.org, Inside AIAA, Technical Committees

For additional information about AIAA Technical Committees, please see http://www.aiaa.org/content.cfm?pageid=192

Date_____

Name: Mr/Ms/Dr/Prof_____

Title _____

Are you applying for an associate membership? (Yes/No)_____
Associate membership is available only for members under 35 years.

Organization _____

Address _____
_____
_____

Telephone _____ Fax _____

E-mail _____

Home Address _____
_____
_____

Home phone (to be used by TC chairman only - not published)
_____

Preferred mailing address: (This is the address where your Aerospace America and Technical Journals will go, and this is the address that will be published in the Technical Activities Roster)
( ) Business ( ) Home

Technical Activities Committee

College or University _____

Degree _____Year _____

Major/Field of Study _____

Graduate degrees: _____

College or University _____Year _____

AIAA Membership Grade and Number _____
You must be a current member of AIAA to join a Technical Committee.

Are you currently a member of any AIAA Technical Committee? Yes / No

If yes, what technical committee are you a member of, and when does your term end?_____

_____

Individuals should not apply for membership on more than 2 Technical Committees at the same time.
Individuals are not allowed to join two Technical Committees simultaneously. After you have been a member of a Technical Committee for at least 1 year, you may apply to join a second Technical Committee.

Please list the TC(s) you are interested in joining in priority order:
1._____
2. _____

Please explain briefly why you would like to join these Technical Committees, any activities associated with these Technical Committees that you are currently supporting, and what you hope to accomplish as a member of the Technical Committee.

_____
_____
_____
_____
_____

AIAA
The World's Forum for Aerospace Leadership

Technical Activities Committee

Please list activities you have been active in that are relevant to the Technical Committee charter _____

AIAA offices held _____

Membership in other societies, committees, boards, or other AIAA activities

Primary professional interest _____

Secondary professional interests _____

Positions held pertinent to above _____

Professional publications (attach additional pages if necessary)

Honors and/or awards _____

Please provide a brief description on what projects you have recently worked on or are currently working on _____

Nomination submitted by (if other than self)

Title _____

Organization _____

Address _____

E-mail _____

Please feel free to attach separate sheets as needed. If you have any questions, please contact Technical Activities at 703.264.7573.

ENDORSEMENT

This form must be signed by the nominee's supervisor to document the understanding of time and travel commitments.

I endorse the nomination of _____

for membership on the _____

_____ Technical Committee.

I understand that he/she will be expected to commit time and travel resources to support committee activities and meetings.

SIGNATURE _____

NAME _____

TITLE _____

ORGANIZATION _____

TELEPHONE _____

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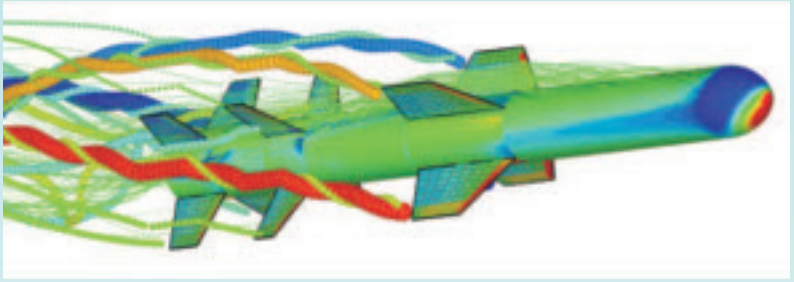

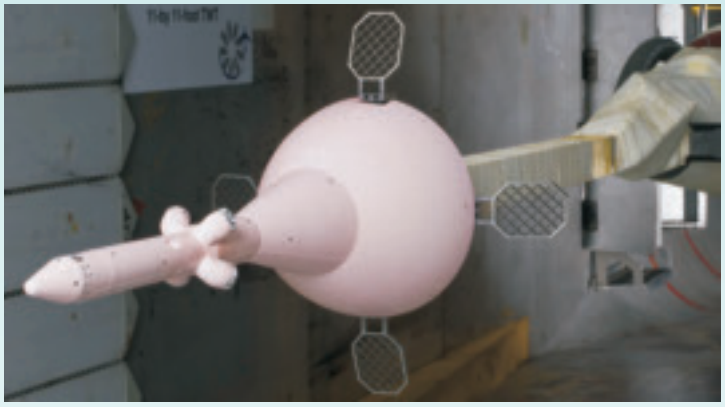

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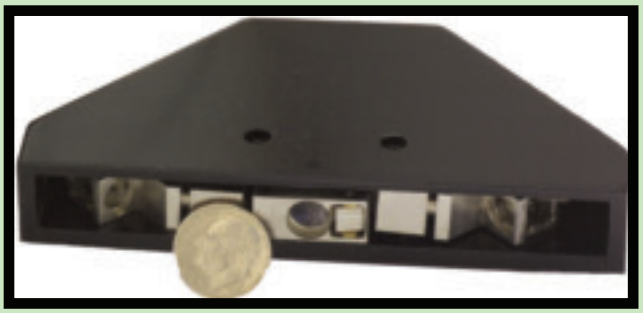

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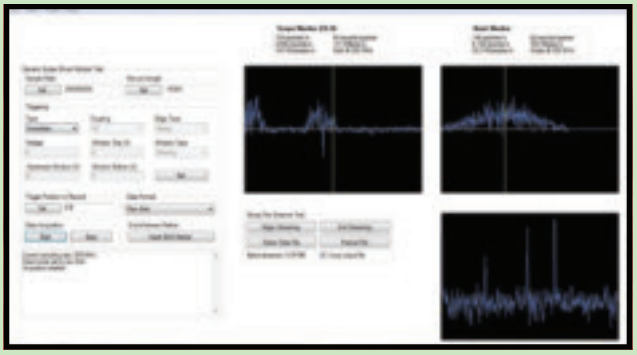

Contact us to discuss your requirements:

www.aurinc.com
aur@aurinc.com
Ph: 540.797.0643

AIAA
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