

January 2010

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flying a float plane and let me  
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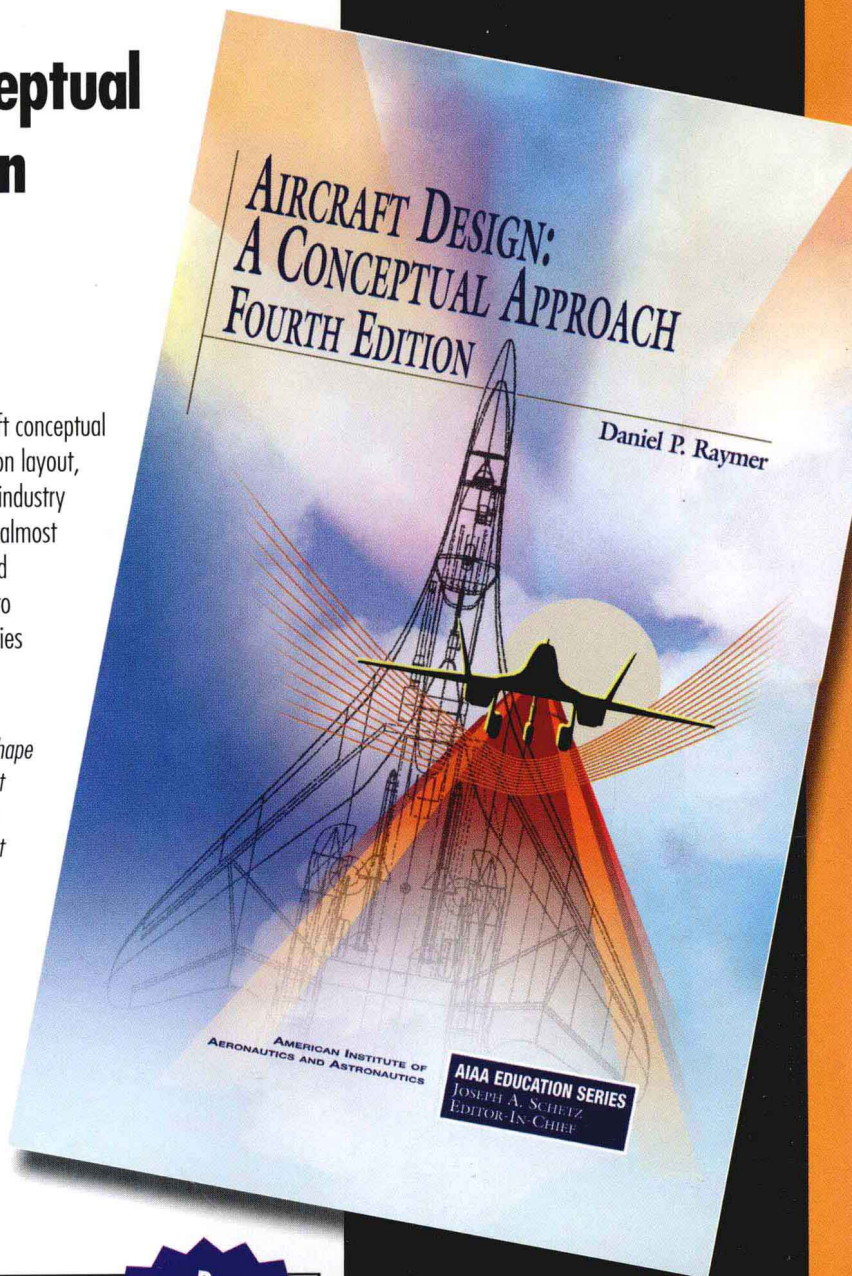
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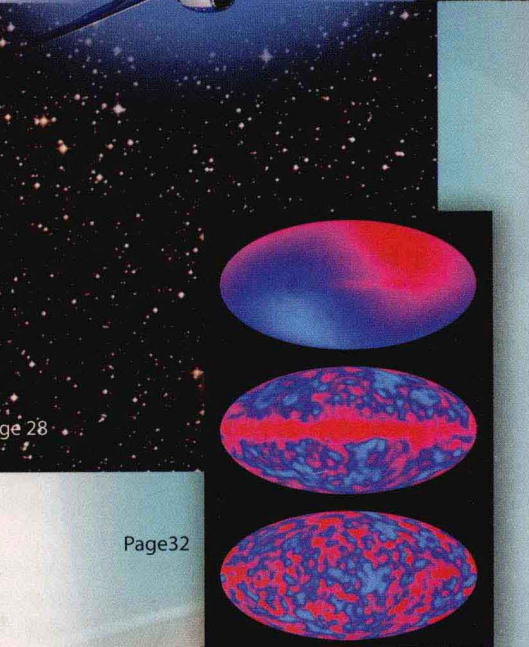
This image from NASA's Kepler mission shows the telescope's full field of view—a star-rich patch of sky in the constellations Cygnus and Lyra. To learn about this effort to find Earth-like planets, turn to page 36



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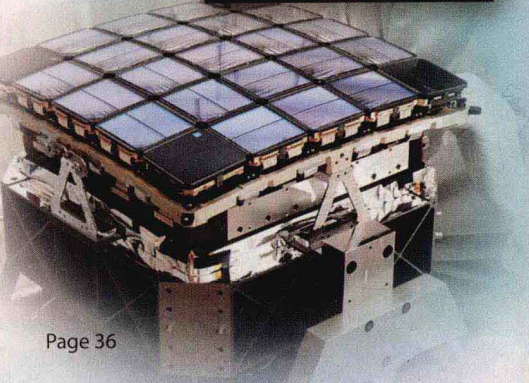
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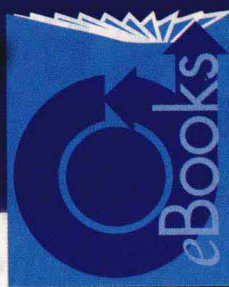


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## Editorial

### Mitigation and adaptation

For 12 days last December, government representatives from 190 nations came together in Denmark to participate in the United Nations Framework Convention on Climate Change. The convention, according to its official site, "sets an overall framework for intergovernmental efforts to tackle the challenge posed by climate change. It recognizes that the climate system is a shared resource whose stability can be affected by industrial and other emissions of carbon dioxide and other greenhouse gases."

The end product of the meeting was to be known as the Copenhagen Protocol, supplanting the Kyoto Protocol that has been ratified by 184 parties but is due to expire in 2012. Squabbling arose over targets, and politics often drove the debate, but while no party attending the meetings argued about the need for greenhouse gas mitigation, the final outcome was far from certain.

But that these discussions could be held at all is in no small measure thanks to the data provided by instruments aboard satellites from many nations.

During the convention, representatives from a broad spectrum of space agencies attended a side event, hosted by the European Space Agency, entitled Global Monitoring of our Climate: the Essential Climate Variables. Speakers there highlighted the vital role these satellites play in climate change research. These spacecraft measure not just carbon dioxide emissions levels, but changes in the atmosphere, oceans, and ice caps that collectively describe the state of our planet.

Monitoring the changes in the color of the seas, for example, can tell us about chlorophyll pigment and sediment concentration, which affect the life that thrives within the waters. Instruments aboard a newly launched ESA satellite, SMOS, will be measuring ocean salinity, which contributes to ocean circulation patterns. These data are crucial, because the health of Earth's oceans dictates the health and welfare of its inhabitants.

On a positive note, recent satellite images show the Earth's ozone layer to be healing. According to NASA, "Researchers have no doubt that the increase in ozone is because nations followed the 1987 Montreal Protocol on the Substances that Deplete the Ozone."

At the same time that these efforts at mitigation are being made, steps are also being taken to adapt to the changes that have already taken place. As we search for methods to slow down or halt man-made changes to the global climate, we must also find mechanisms to adapt to those that have already taken place and that are, for the most part, irreversible. Once again, satellites and other Earth-monitoring devices can play a significant role.

As wind patterns evolve, for example, farmers can alter where, and perhaps even what, they plant. As changes in ocean circulation and salinity become clear, fisheries may be relocated; rises in sea levels can be monitored and buildings and roads rethought or relocated; changing herd migrations can be observed and accommodated. Weather changes can be predicted with greater accuracy, allowing people more time to prepare for cataclysmic events.

As the nations of the world strive to mitigate the negative effects of some modern human activity, aerospace advancements enable us to measure them, halt their progress, and adapt to what cannot be undone.

Elaine Camhi  
Editor-in-Chief



# Europe looks to outsourcing



OVER THE NEXT FEW YEARS, EUROPE'S defense departments will increase the amount of non-front-line services they outsource to private companies.

"A combination of budgetary pressures and the fact that the nature of warfare has changed will mean European defense departments will have to look increasingly at outsourcing as a future option," says Peter Howson, director of London-based consultants AMR, specialists in this area. "There are other factors, such as an end to conscription, also involved. In labor-intensive areas such as facilities management, where you need a large workforce involved in cleaning and maintenance of facilities, it makes no sense to tie up troops in these activities, especially at times of turbulence."

### Mapping the trend

The degree to which European countries have already outsourced military training, logistics, and facilities management services to private companies is surprisingly extensive.

"We recently mapped the extent to which EU member states have outsourced, and we found that, on average, up to 50% of the total costs of an operation are now sometimes being performed by outside contractors," says Gerard Heckel, assistant capability manager (maneuver) at the Brussels-based European Defence Agency (EDA).

For example, in recent EU crisis management operations (CMO) in Chad, the Congo, and Bosnia and Herzegovina, outsourcing accounted for 50% of all operational costs incurred by EU operational units, with the single largest outsourcing expenditure going to transport (around 30%), followed by food supplies/catering (20%), and communications and information technologies (8%).

European defense departments currently contract out a wide range of aircraft overhaul, facilities management, and training services. The U.K. has generally been at the forefront of outsour-

ing initiatives, with East European countries more reticent. Continental European military organizations have tended to prefer combining services with their neighbors rather than outsourcing to the private sector.

### Learning from failure

But the outsourcing process has not been universally successful. The crash of an RAF Nimrod MR2 aircraft with the loss of 14 military personnel while on intelligence gathering operations in Afghanistan during 2006 occurred because of "a systemic breach of the military covenant brought about by significant fail-

***"Adaptation to requirements for change, even when they clearly reflect the wishes of the taxpayers and the armed forces, is not always as easy as we could imagine."***

ures on the part of the MOD [Ministry of Defence], BAE Systems, and QinetiQ," according to an accident report commissioned by the MOD [<http://www.nimrodreview.org.uk/documents.htm>]. BAE Systems was responsible for drawing up the "Nimrod Safety Case" between 2001 and 2005 to analyze possible defects in the aircraft, while QinetiQ was employed as an independent advisor on the work.

All sides have since acted on the report's recommendations—but this was not the only case where contractor performance has been criticized; the outsourcing experience in EU's operations in the Congo was unanimously seen as "a complete disaster....it failed to meet the EU demands," according to EDA experts and a report on the operation [<http://www.iss.europa.eu/uploads/media/op-72.pdf>].

"Furthermore, no standalone outsourcing strategy can exist outside an overall EU-led CMO logistics strategy," say the report's conclusions. They add, "Tactically, outsourcing seems to function poorly for short operations; large-

scale single-sourcing strategy should be used cautiously....Because of poor planning, the military sometimes pushes too much responsibility onto the contractor, thus creating unbalanced risk/reward situations for the contractor, which then delivers unsatisfactory services."

But the lessons are being learned from all sides on how government departments and private contractors should best work together. There is now a growing understanding that an excessive focus on price can lead to poor contracting performance.

"A great deal of the knowledge in maintaining ordnance and equipment

lies with the original equipment manufacturers [OEMs] anyway," according to Howson. "But the onus is on the defense departments to ensure they agree on the best deal."

### Building on success

As European governments seek to control their defense expenditures while increasing their commitment to national and EU operations overseas, outsourcing is likely to become an increasingly integral part of their future operational planning. Not only is the range of activities about to widen, but the way in which contracts are tendered and managed also will change radically over the next few years, as will the mutual understanding between contractors and suppliers.

European defense industry experts point to the success of the Strategic Airlift Interim Solution strategic transport program, which has provided many European countries with access to heavy-lift transporters they would otherwise have been denied. "This has made strategic military transport not just 'nice



## Correspondence

to have,' but a backbone to future capabilities for many states," says one industry official.

EDA staff are now looking at the possibility of using a private contractor to provide military air-to-air refueling services for a number of states, following the concept laid down by the AirTanker consortium in the U.K. and the U.S. Navy's use of the Omega Aerial Refueling Services commercial operations.

### Going online

Another catalyst to further outsourcing by EU member states has been the development of an Internet-based European Third Party Logistic Support portal, hosted by the EDA, to link commercial sector capabilities with military requirements.

"What we have done is to facilitate the outsourcing process," said the EDA's Gerard Heckel. "There is also a need to further optimize this process, which we have found can produce savings of up to 20-30% over legacy services.

"The first objective was to increase the visibility of commercial services and to consolidate the offer and the requirement. We also wanted to offer assistance to member states throughout the entire contractual process. In multinational operations there is often a lack of visibility, with each state working with its own database of contractors. With this portal we can introduce more competition and more transparency in the cross-border market. It's not always about savings—it's about paying the right price for the job."

The EDA has been working alongside other institutions such as NATO and its Maintenance and Supply Agency, as well as the U.N. World Food Program and Dept. for Field Support, to share best practices and lessons learned and avoid any unnecessary duplication. "The initial focus is on crisis management," says Heckel, "but the portal can support any type of activity, and registered companies offer IT and training services, as well as logistics." The portal is open to any commercial organization established in an EU country.

The ultimate decision about what to outsource and what to retain in-house

remains with member states, which have differing views on what is a "core" or "noncore" military capability. But there is a widespread view among Europe's military that there are now clearly defined areas where outsourcing has been shown to have worked, despite initial reservations.

### Military aviation outsourcing among EU member states

**Aircraft maintenance, repair, and overhaul**  
EADS Military Aircraft carries out depot inspections on the E1F-18 Hornets flown by the Spanish air force. The maintenance program covers the engines, fuel systems, installation of new equipment, and repair work.

QinetiQ has been awarded a U.K. MOD contract by the Harrier integrated project team for through-life support to the Harrier aircraft to 2018.

EADS Military Aircraft provides system support for the German navy's eight P-3C Orion long-range maritime patrol and anti-submarine warfare aircraft.

Fokker Services maintains, modifies, and repairs a wide range of military aircraft, from jet fighters to fixed-wing patrol and transport platforms to helicopters, including F-16 midlife upgrade work for NATO air forces.

Saab has a 550-million-SEK order from the Swedish Defense Material Administration, FMV, to support the Saab Gripen's operative capacity. The order includes program management, product maintenance, support, flight testing, pilot equipment, and simulators.

#### Air traffic control

The U.K. MOD has signed a contract with National Air Traffic Services (En Route) to provide an en route ATC facility to the MOD until 2021. Military personnel manage en route traffic in a joint and integrated operation alongside NATS (En Route) staff.

#### Pilot training

The French ministry of defense has a contract with EADS' Military Air Systems and Socata for the supply of new training aircraft, the procurement of line and base aircraft maintenance, and ground-based training devices such as flight simulators, and integrated logistics support, with supply chain management plus infrastructure handling. EADS has set up a subsidiary in Cognac, the EADS Cognac Aviation Training Services, to fulfill the contract.

Ascent, a consortium formed by Lockheed Martin and VT Group, has a \$12.7-billion

"Adaptation to requirements for change, even when they clearly reflect the wishes of the taxpayers and the armed forces, is not always as easy as we could imagine," said Åke Svensson, chief executive of Saab AB, at a 2008 EDA conference on outsourcing. "However, in several countries, best practices

contract with the MOD to supply all aircrew training for the U.K.'s armed force.

Alenia provided the Italian air force with simulator training for Eurofighter pilots at its Turin facility between 2003 and 2007. Alenia is building simulators for the Italian and Romanian air forces, as well as teaming with L-3 to build a simulator for U.S. pilots, to be operational this year or next.

#### Information technology

Project Hercules is a 2006 \$10.6-billion 10-year program in which a consortium of private companies, notably Siemens and IBM, upgrade and support nonmilitary IT and communications systems for the German defense department. The work is undertaken by BWI Informationstechnik GmbH (BWI IT), 49.9% owned by the German government, with the remaining 50.1% split equally between IBM and SBS.

#### Military airlift

Several European NATO member countries and partners have pooled their resources to charter six heavy-lift Antonov An-124-100 transport aircraft under the Strategic Airlift Interim Solution operation. The consortium includes 16 NATO nations (Belgium, Canada, the Czech Republic, Denmark, France, Germany, Greece, Hungary, Luxembourg, the Netherlands, Norway, Poland, Portugal, Slovakia, Slovenia, and the U.K.) and two partner nations (Finland and Sweden).

#### Air to air refueling

AirTanker is a U.K. company created to provide the Future Strategic Tanker Aircraft (FSTA) service to the U.K. MOD under a 27-year private finance initiative contract. The FSTA program will replace the RAF's current fleet of VC-10s and TriStars with 14 Airbus A330-200 aircraft, the first of which will be delivered in 2011. These new aircraft will be owned, supported, and operated by AirTanker, who will also provide all support services, including construction of a two-bay hangar, training, maintenance, flight operations, fleet management, and ground services.



at [a] national level exist today that lead to 'win-win' solutions."

### Teaming for security

Another impetus for increased outsourcing will be the growth in combined EU security operations overseas. These tend to be led by the larger EU states, which are often farther down the outsourcing road than small countries—and the use of a single logistics supplier to a number of different national military units can make clear economic sense.

"Using commercial support services can help to release military personnel that are badly needed for operations in the field," said EDA Secretary General Javier Solana at a February 2008 EDA conference. "Second, there is the argument of cost-effectiveness. Outsourcing can save money while enhancing overall logistics performance. Crucially, cost savings will increase when logistic support is

organized on a multinational basis.... Finally, third-party logistics can sometimes compensate for the absence of support assets of the member states. The lack of such assets has increased in the past decade as many armed forces had to transform from static to more mobile structures. This required new investment, which often led to shortfalls, in particular in logistic and technical support."

New EU security initiatives—such as combined maritime surveillance operations and support to security operations in Somalia—offer new opportunities for logistics outsourcing. One key requirement is for more helicopters and more helicopter support services, a need that will not be easily met even by combining national assets.

"This is a problem for NATO and the European Union alike," said Solana in March 2009. "Inventories are high in numbers, but the problem is that they are not deployable outside Europe in sufficient numbers. Third-state partners assist in our ESDP operations. We are grateful to them for their contributions, but we must not be dependent on them for key capabilities such as helicopters.... For the medium term, the EDA is looking at options for upgrading existing assets, in particular the Mi-type helicopters, hundreds of which are in the inventories of Central and East-European countries. European helicopter industries will have to be closely involved to provide upgrade packages at reasonable cost."

### Growing demand for MRO

The demand for new maintenance, repair, and overhaul (MRO) services to European military aircraft operators, which currently account for the bulk of military aerospace outsourcing, is also large. The global estimated military aircraft MRO market in 2009 was \$61.1 billion, according to a recent Aerostrategy report, which has highlighted the European platforms of the NH-90 and the Eurocopter Tiger as particularly significant.

Europe's largest military spenders have already outsourced many of their military MRO requirements, mainly to the national OEMs. Eurocopter, Dassault, and Snecma have extensive military MRO contracts in France, according to Aerostrategy. Eurocopter's business interests include a €319-million contract

for Eurocopter to support over 600 platforms, and a 22-year contract to provide E120 training.

The U.K. has restructured its entire approach to aircraft support through the creation of the Defence Equipment and Support Agency and the sale of DARA Fleetlands (a helicopter support center) to Vector Aerospace. Prime contractors are now providing "through-life" support packages, with BAE Systems providing MRO services to all fast jets and to most AgustaWestland helicopters.

In Germany a number of public/private MRO contracts have been signed, for example, with MTU on engine support for the RB199 and EJ200 power plants. Helicopter Flight Training services, a consortium of CAE, Eurocopter, Rheinmetall Defense Electronics, and Thales, has a €488-million 14-year contract with the defense department to provide NH90 training. In Italy, military MRO work is undertaken by AgustaWestland, Alenia, Avio, and Aeronavali.

There is a limited amount of outsourcing to OEMs of different states. In Sweden, for example, AgustaWestland performs support work on the military's AgustaWestland A109s (known as the Hkp 15 in Sweden), while Saab supports the Saab 105 trainer and the coast guard's Bombardier Dash 8s.

"Attitudes of other countries vary, but in most cases there's a mix of organic capability and outsourcing," says Aerostrategy's David Stewart. "Is outsourcing becoming more commonplace? I believe so, yes. However, the change of practice mostly occurs at the point of fleet replacement or new acquisitions, so the change is happening slowly."



In general terms there is agreement within Europe that using private companies to perform front-line security tasks would be a step too far. But with platforms, weapons, and communications becoming increasingly complex and European nations now involved in a growing number of overseas operations at a time of immense budgetary pressure, the benefits of outsourcing have never looked more attractive.

**Philip Butterworth-Hayes**  
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## Correspondence

**Our future in space** (October 2009, page 3) and **Is Human Space Flight Optional** (October 2009, page 18) deserve comment. Both start with the premise that the U.S. should venture into space with a premature and irresponsible plan using existing, inefficient technology. No other plans were considered. The complaint against the space shuttle program is that it is too expensive. The current plans will create another system which is too expensive to operate because it is based on inefficient rocket engines. "...the committee identified five alternative scenarios for...human space transportation....None could be realized under the present NASA budget...." The only thing the Advisory Committee on the Future of the United States Space Program could recommend was to spend more money to implement premature and irresponsible plans.

A new plan that stays within budget would seem to be in order, but the committee did not even consider such a plan.

A plan that develops advanced performance rocket engines (APREs) before we return to the Moon or venture to Mars is such a plan. APREs would be more efficient because they would use less fuel. Hence the fuel tanks would be smaller and would therefore have less aerodynamic drag. A vehicle with APREs would put a greater payload in orbit at lesser cost. APREs on the shuttle would mean a \$7-million saving in fuel costs each flight, a 15% reduction in the cost of an external tank, and a 24% reduction in aerodynamic drag of the external tank. The shuttle would become a less expensive vehicle to operate.

Also, development of APREs would make it possible to develop a single-stage-to-orbit vehicle such as the X-33, Venture Star, which failed because of its inability to build tanks large enough to carry the fuel. APREs could be developed within the current budget. NASA is doing that now with the J-2 rocket engine; a redevelopment effort costing \$1.5 billion over seven years. We should be able to develop an APRE for \$2 billion in five years. Such a program will maintain the U.S. leadership in space.

**Dale L. Jensen**  
Jentec

**Editor's Note** Both authors take issue with the writer's opening premise.



I just read **Nuclear propulsion—the affordable alternative** (November 2009, page 3). Some of authors' points are valid, especially those relating to safety of nuclear propulsion. However, they neglected or misrepresented some salient points, and I am troubled by several erroneous assertions.

First, nuclear propulsion, at least in the NERVA format and probably in any form, cannot be used for an Earth-to-orbit launcher. Too much radiation, bad mass fractions. With today's knowledge, chemical propulsion is the only feasible way of safely getting heavy payloads out of the Earth's gravity well. Therefore, for human Mars exploration programs, for the foreseeable future, we will need the large chemical rockets, which tend to cost-optimize in the 90-120-tonne to orbit size. But we can do a lot of good planetary work, perhaps even human exploration, without a generation of new launchers, using the existing fleet.

Nuclear propulsion, once activated, is extremely radioactive, and cannot be safely returned to Earth. But in nuclear-safe orbits and for planetary injection and transit, it is fine. This is where nuclear propulsion comes into its own, and I am an advocate for using it.

To claim that billions of dollars could be saved by using nuclear propulsion may be true in an extended Mars program, but in the early phases, would add billions of dollars of development costs to an already too-thin NASA budget.

In an ideal world, a six or seven year development may actually be possible, but it is not hard to envision the practicalities, including the environmental work, doubling or tripling that time.

**Hum Mandell**  
Former manager, NASA SEP

Hum Mandell's letter alleges neglect or misrepresentation of several salient points and erroneous assertions. These criticisms have missed their mark.

First, in our commentary there is no advocacy of nuclear propulsion for LEO transports. On the other hand, the bene-

fits of nuclear rockets in upper stages are well established, even for lunar flights and use. The many ferry flights of propellant stores to LEO demanded by chemical propulsion to Mars are greatly diminished by using the much higher performing nuclear rockets for Mars transport propulsion. This reduction in ferry flights (a factor of around four) can enable utilization of lower cost shuttle-derived transports from LEO. Shuttle-C derivatives offer over 90 mT cargo to orbit using a proven flight system and existing launch base facilities, requiring no massive new transporter (Ares V) that are costing billions to develop and later about \$1 billion+ a launch. Yes indeed, implementation of the nuclear rocket saves many billions vs. chemical rockets, even at the inaugural mission.

The last 50 years are a testament that large-scale, man-rated space exploration will *not* occur with chemical propulsion. While we can send flyweight robots to Mars, Jupiter, and Saturn, nuclear propulsion must be recaptured for the ultimate manned mission to Mars. The reliance on large chemical rockets for Mars has already been demonstrated to be a self-defeating, bottomless cost pit, and a change of propulsion technology must be followed up.

As to radioactivity post flight, it is well known that reactor "cooldown" occurs with exponential rapidity after core shutdown, and a number of days in parking orbit enables straightforward, safe operations with a postfired nuclear rocket.

The Rover/NERVA program was shut off in 1972 after an investment of \$1.5 billion. A total of 21 cores and rocket engines were fired, with thrust up to 210,000 lb. A flight engine capable of 10 hr and many restarts was the next iteration in the program when it was terminated. Much of that legacy is still in hand, and a fast-track seven-year project to get the flight engine is realistic.

**Stanley V. Gunn**  
**Ernest Y. Robinson**

*All letters addressed to the editor are considered to be submitted for possible publication, unless it is expressly stated otherwise. All letters are subject to editing for length and to author response. Letters should be sent to: Correspondence, Aerospace America, 1801 Alexander Bell Drive, Suite 500, Reston, VA 20191-4344, or by e-mail to: elainec@aiaa.org.*



# Money woes take center stage

THE NATION'S FUTURE POLICY ON HUMAN spaceflight, as well as the future path for NASA, are waiting to be defined as debates on the economy, health care, and troop levels in Afghanistan continue.

### NASA fits and starts

A plea by 81 members of the House of Representatives for more money for human spaceflight drew little press outside the insular realm of those who focus on space developments. A successful shuttle mission, one of the last unless current plans change, was scarcely noticed by Congress, the media, or the public. Also making little news were the first flight of a rocket booster for the next-generation human spacecraft and the discovery of water on the Moon.

The 81 representatives wrote President Barack Obama, urging the White House to increase NASA funding by up to \$3 billion annually so that the agency can accelerate a plan Obama inherited to send astronauts beyond LEO.

Rep. Suzanne Kosmas (D-Fla.) organized the appeal and attracted cosigners from Florida, Texas, and California—all with important NASA installations.

"We believe an increased level of funding is essential to ensure NASA has the resources needed to meet the mission challenges of human space flight," wrote the lawmakers. They pointed to the importance of the space station, the future of which is closely interwoven with that of a next-generation human spaceflight vehicle.

"The International Space Station should remain operational as long as it can be productive without being constrained by an arbitrary, budget-driven termination date," the representatives wrote. "The [NASA] Authorization Act of 2005 designated the ISS as a U.S. National Laboratory to conduct research for other federal agencies and the commercial sector. Extending the ISS, at least through 2020, is necessary in order to maintain and improve important in-



Rep. Suzanne Kosmas

ternational partnerships, maximize the return on our nation's investment, and spur discoveries that will enable exploration of our universe and improve life here on Earth."

A next-generation human spaceflight vehicle is essential to support the space station. But critics who question its scientific value argue that the station exists merely as a reason to justify a next-generation vehicle. As of now, the shuttle is still slated for retirement this year, a new vehicle is still under development (without additional funding), and NASA says it will be able to resume putting American astronauts into low Earth orbit in 2016 or 2017. In the interim, Americans will journey into space and service the station using Russian spacecraft.

The appeal to Obama for spaceflight funding could not have come at a worse time in the larger national context. Although the government will show a \$1.4-trillion deficit for FY09, which ended on September 30—by far the largest in history—the administration is operating several programs aimed at controlling, and not increasing, government-wide funding of programs.

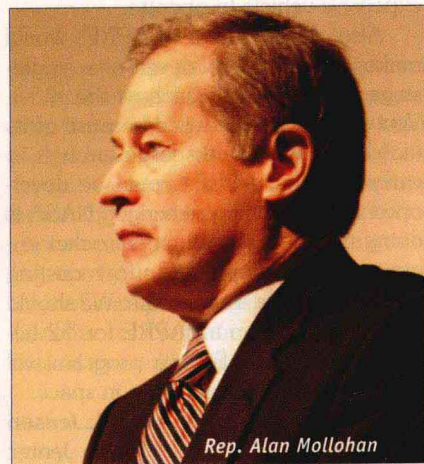
Critics of human spaceflight spending pointed out that Rep. Alan Mollohan (D-W.Va.) did not sign the letter. Mollo-

han is chair of the House subcommittee that oversees NASA funding. Also not participating in the appeal was Rep. Bart Gordon (D-Tenn.), chair of the House Science and Technology Committee and usually a highly visible figure during space deliberations.

The much-anticipated October 28 launch of NASA's Ares I-X flight test vehicle was seen by some as a milestone on the way to a next-generation human spaceflight program. Others wondered if it was the last gasp in a program that could be fundamentally altered or canceled. After routine delays, the rocket apparently performed flawlessly on its 2-min flight.

Although it was an important scientific find that might have seemed dramatic in some other era, few in the capital took much notice of what NASA Administrator Charles Bolden called a "bright moment" when scientists found nearly 25 gallons of water on the Moon in the aftermath of an October experiment in which they slammed a spacecraft into the lunar surface. The crash was part of NASA's Lunar Crater Observation and Sensing Satellite mission.

If water can be harvested on the lunar surface, astronauts might be able to establish a colony or a jumping-off base for flights farther out into the solar sys-



Rep. Alan Mollohan



tem. Water is also a key ingredient for rocket fuel. The bloggers who pooh-poohed the discovery pointed out that, in any event, the nation is nowhere near sending astronauts to the Moon.

On November 27 the shuttle Atlantis and its seven-person crew commanded by Marine Corps Col. Charles Hobaugh touched down after undocking from the ISS and heading home from 11 days in space. When launched on November 16, the STS-129 mission established a record for the fewest problems reported in any NASA launch sequence in the history of the program.

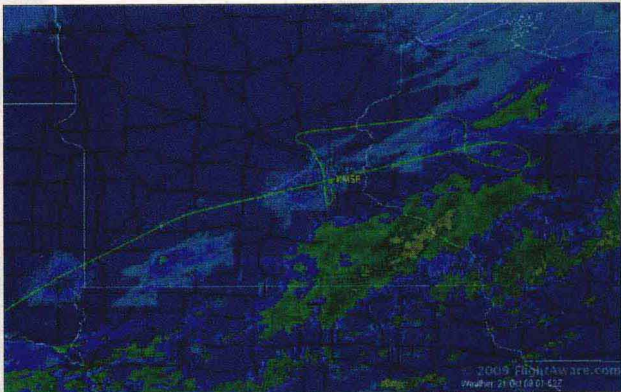
**The FAA and an air emergency**

The government's reaction when an out-of-communication airliner flew past its destination October 21 was hindered by poor communication and a failure to notify the military for more than an hour, say officials in Washington.

The two pilots of Northwest Airlines Flight 188 from San Diego to Minneapolis, an Airbus A320-200 with 144 passengers and three flight attendants, were out of contact with air traffic controllers for 78 min. This condition is known as NORDO (no radio communication) and is considered an emergency. At 37,000 ft in busy airspace, the Airbus overflew its destination, Minneapolis-St. Paul Wold-Chamberlain International Airport, by 150 miles.

Initially suspected of drifting asleep while at the controls, Capt. Timothy Cheney and First Officer Richard Cole later said they were distracted in the cockpit while using laptop computers. The use of laptops on the flight deck is prohibited by Northwest company policy and the ban is likely, now, to become a federal regulation. Northwest is owned by Delta Airlines. The FAA revoked the pilots' licenses; they have appealed.

Air Force Gen. Victor E. Renuart Jr., who heads both the North American Aerospace Defense Command and U.S. Northern Command, said he learned the airliner was out of touch only minutes before the FAA belatedly restored com-



*Northwest Airlines Flight 188 overflew its destination by 150 miles.*

munication with the pilots. In several interviews, the general's displeasure was palpable.

Had the incident been a hijacking, he would have been responsible for scrambling jet interceptors. If a hijacked airliner were being aimed like a missile toward a U.S. city, the general would be expected to pass a presidential order to fighter pilots to shoot the airliner down, killing innocents on board in order to save a larger number of lives on the ground. But all plans for using interceptors to halt a repeat of the events of September 11, 2001, rely on prompt notification, and in the first "real world" test of the arrangement, nothing happened promptly.

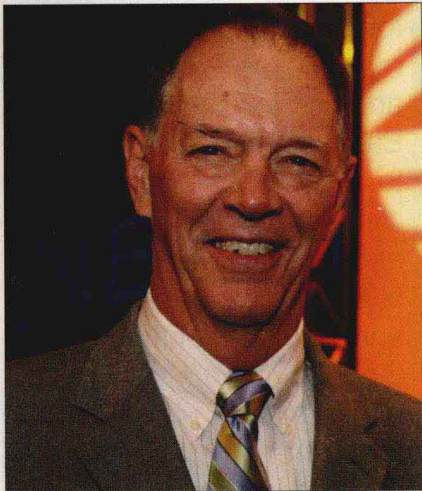
"No secret. We could have done better," said FAA Administrator Randy Babbitt.



*Gen. Victor E. Renuart Jr.*

bitt, referring to communication between his agency and the military. He characterized the lapse as an internal communication problem and said the FAA would retrain employees to follow the rules for missing-airplane incidents. Babbitt also said that the Northwest Airlines overflight was part of a larger problem—eroding professionalism among commercial airline pilots.

Lawmakers on the Hill expressed concern over both the failure to notify the military and the evidence of pi-



*FAA Administrator Randy Babbitt*

lot ineptitude. Referring to the Northwest incident and to a recent Continental Airlines crash in Buffalo that was blamed on a lack of focus by pilots, Sen. Byron Dorgan (D-N.D.) said, "We need to know a lot more about what's happening in cockpits." He and Sen. Amy Klobuchar (D-Minn.) introduced a bill to prohibit pilots from using personal electronic devices while in flight.

"Passengers should not have to worry about whether the pilots are flying the plane or checking their laptops," said Klobuchar, in whose state the aircraft was supposed to land. "This legislation will allow the FAA to make sure distractions are removed from the cockpit and increase the safety of our air carriers." Observers in Washington did not expect the legislation to reach the Sen-



## AIAA FORMS NEW EARTH OBSERVATION TASK FORCE

AIAA has created a new task force to assist in the formulation of a national road map for the U.S. to address investments in the Earth-observing industry to adequately inform future climate change debates and decisions. Composed of leading experts on policy and climate-monitoring technology from within AIAA and in collaboration with other organizations, the task force is developing a strategy to come up with recommendations to help reach this goal.

For more information,  
contact **Craig Day**  
at **703.264.3849**  
or **craigd@aiaa.org**.



The World's Forum for Aerospace Leadership

ate floor, because Babbitt's staff was likely to preempt it by establishing a ban in the form of a federal regulation.

### Fighter falls behind

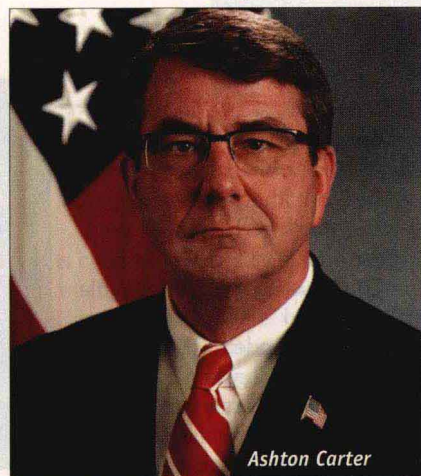
Ashton Carter, who became the Pentagon's acquisitions boss last April, ended 2009 under pressure to reshape the F-35 Lightning II Joint Strike Fighter program. Carter is a longtime defense professional and physicist who handled the Pentagon's international affairs office in the early Clinton years.

The aircraft is running above cost and behind schedule, and could become a burden on the administration as it prepares its FY11 defense budget proposal. Carter called a weekend meeting in November to address JSF cost issues. He was reacting to a report from the Defense Contract Management Agency disclosing significant delays on deliveries of test airplanes and components for future production aircraft.

JSF is important because by early 2013 it could become the only manned warplane being manufactured in the U.S. Under current plans, the Air Force's F-22 Raptor and the Navy's F/A-18E/F Super Hornet will be out of production then. Small numbers of F-15 Eagles and F-16 Fighting Falcons are being assembled for overseas purchasers but not for U.S. forces. Defense Secretary Robert Gates has postponed development of a new manned bomber.

Never before has the nation staked its air warfare future on a single aircraft type, let alone one that is still at an early stage in its flight-testing program and far from becoming operational. Yet the Pentagon is committed to buying 2,456 JSFs in three versions, with other na-

The F-35 BF-2 aircraft made its initial flight on February 25, 2009.



tions purchasing perhaps 2,000 more.

Lockheed Martin is prime contractor for the F-35, but the contract management report was also critical of other participants in the program. Lockheed's senior JSF official, Dan Crowley, acknowledges that the report is largely accurate but says the worst delays have been overcome and good progress is now being made.

The first conventional, runway-based F-35A version of JSF for the Air Force made its maiden flight December 15, 2006. After 43 subsequent flights, technical problems prevented F-35A tests from staying on schedule. The first short takeoff vertical landing F-35B version for the Marine Corps, known as BF-1, made its initial flight on June 11, 2008, followed by BF-2 on February 25, 2009. A second F-35A, paradoxically called AF-1 rather than AF-2, made its first flight on November 12, 2009. The carrier-based F-35C version for the Navy has yet to fly, in part because of a conscious Navy plan to conduct this part of the program at a deliberate pace.

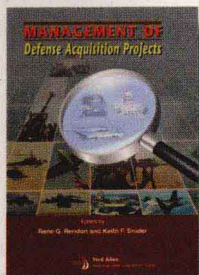
Thus, only four examples of the aircraft—representing two of the three versions—have taken to the air. The critical report noted that just seven of 13 test aircraft have been completed, even though all 13 were to have been completed and delivered for testing by October 2009. Nevertheless, production is under way: Any design changes made as a result of flight testing would have to be incorporated into the initial production aircraft after they are built, increasing costs.

**Robert F. Dorr**

robert.f.dorr@cox.net



# New and Best-Selling Books from AIAA

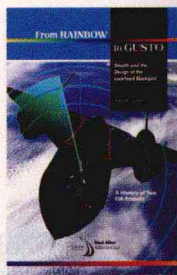


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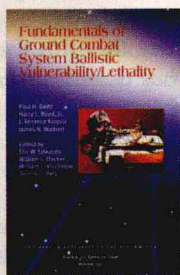


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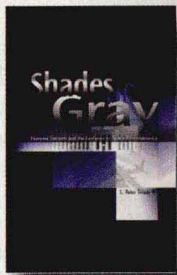


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## **Gen. Norton A. Schwartz**

***As chief of staff, you seem to have put a premium on jointness, on making sure that the Air Force performs in harmony with the other services. Tell us about it.***

We, as an institution, have to play our part on the joint team. All of us—all of the services—have to operate collectively in order to succeed for our country. Secretary [of the Air Force Michael] Donley and I and the rest of the Air Force leadership believe it is very important that the Air Force prepares itself and positions itself in ways that enable us to be the best possible partner on the joint team. That is our ethic.

***The Air Force has been portrayed in some circles as having been marginalized in comparison to the ground services in Iraq and Afghanistan. How do you respond to that?***

There will be times when the Air Force is ascendant in whatever missions might be assigned. At the moment, that is not the case. The missions in Iraq and Afghanistan are largely ground-force-intensive. That does not threaten us, does not threaten the Air Force. Nor should it. We must field a body of airmen with the equipment and the know-how to do our work with precision and reliability, and to engender trust, not only among our immediate teammates but among the folks who rely on us—the broader American public. This is why the nuclear incidents of 2008 were so difficult, because they undermined that fundamental trust in this wonderful institution, the United States Air Force.

***The previous chief of staff and secretary of the Air Force were asked to resign as a result of those incidents, which involved the Air Force unwittingly flying nuclear warheads over the continental United States and mistakenly shipping ICBM components to Taiwan. So the Air Force was under a cloud at the time of your appointment to chief of staff. Tell us about that.***

People worried legitimately whether we had our act together, whether our nuclear enterprise was locked up tight. Our goal—mine and Secretary Donley's—was to settle things down and reestablish the level of trust, which is essential for a national security institution to succeed and remain viable. So we went back to basics—as in football, the fundamentals like blocking and tackling—emphasizing the things that are really important, including precision and reliability in our nuclear operations and management.

***What happened?***

We stood up Global Strike Command last August, to combine our ICBMs and our nuclear-capable bombers under a single authority. This was not a case of going back to SAC [Strategic Air Command], but there are aspects of the SAC culture that are worth emulating.

One of those is the focus on professionalism, on precision, on compliance. There are some disciplines that require higher levels of compliance than others. There are some that allow for more innovation, but the nuclear business is not among them. In the nuclear business, we have procedures that stand until officially amended. Sure, in a crisis, people have to make judgments. But what we experienced in our nuclear incidents was an insufficient level of focus, and in some cases a lack of compliance. So we have emphasized correcting that, making sure that it never happens again.

***How has your approach affected the Air Force as a whole?***

The beauty of this, I think, is that the discipline that characterizes Global Strike Command will migrate out into the larger Air Force organization, and that is healthy. I'm not saying that we

don't value innovation or that we do not want our people to think about how to improvise. We're not stifling imagination. But there are some disciplines where there is absolutely no room for error, and the nuclear discipline is one.

***Back to the Air Force role in Iraq and Afghanistan. How do you assess the performance and the importance of your UAVs, and what does that have to do with the evolution of the Air Force and your goals for it?***

I think the short answer is that the best shooters in the world won't go around a corner or through a door or a window without the situational awareness that the Air Force provides with our persistent, 24/7 surveillance. I think the reality is that we have enabled our teammates to be successful at less risk to themselves, and to exercise greater precision themselves with respect to positively identifying the enemy and neutralizing or detaining the enemy—whatever the requirement might be.

***And your UAVs have played a big part in making this possible?***

Yes, and by the way, "unmanned" is not an accurate description. They are piloted and heavily manned—about 140 airmen per orbit. Remotely piloted vehicles is probably a better description.

***They were called RPVs in the beginning, weren't they?***

Yes, way back when. These platforms in a relatively benign environment allow us to maintain a level of surveillance that was unthinkable even 10 years ago. And the surveillance and targeting that they provide enable other aircraft and other systems to maximize their capabilities as well. A UAV may tip

***"My view is that yes, the unmanned systems are a powerful capability, and one that's growing in prominence and value, but that does not suggest that the manned systems are declining in value."***



Interview by James W. Canan

a gunship, or tell a rescue helicopter crew where their pickup needs to occur. These are the kinds of things that are happening all the time.

### **Are we heading for an all-UAV Air Force?**

I do not think that we will get to that point, at least not in the near future. This may be hyperbole, but would you put your wife or your grandchildren on a passenger-carrying aircraft without a pilot aboard? Maybe someday our aircraft will be totally unmanned, but we're not there yet. The reality is, at least in my mind, that there will be a continuing need for tactical aviation—some of the tactical aircraft will be manned and some unmanned.

### **What is the trend in Air Force procurement of manned and unmanned aircraft?**

In the current year, our aircraft procurement is about one-third unmanned and two-thirds manned. The percentage of unmanned will probably increase over time.

### **To one-half perhaps?**

I would say so. But I think it will be some time before it goes beyond one-half. This is a period of change in the Air Force and it does make some people nervous about their future. My view is that yes, the unmanned systems are a powerful capability, and one that's growing in prominence and value, but that does not suggest that the manned systems are declining in value.

### **Again, back to the action in Iraq and Afghanistan. The Air Force has taken a lot of criticism for civilian collateral damage from both manned and unmanned air strikes, for killing non-combatants as well as combatants. How do you respond to that?**

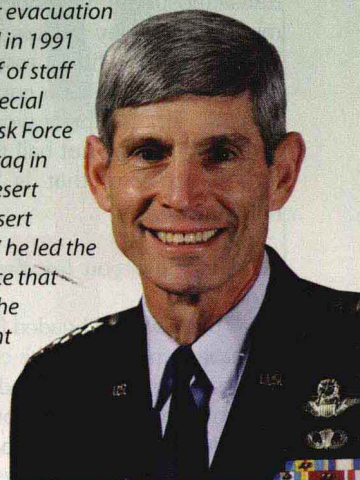
Do I apologize for civilian casualties? Of course I do. We want to minimize them, and we strive diligently to do so. If you talk to the commanders in Iraq and Afghanistan, they will confirm that. At

*Gen. Norton A. Schwartz is chief of staff of the Air Force, responsible for the organization, training, and equipping of nearly 700,000 active-duty, guard, reserve, and civilian forces serving in the U.S. and overseas. As members of the Joint Chiefs of Staff, the general and other service chiefs function as military advisors to the secretary of defense, the National Security Council, and the president.*

*A 1973 graduate of the U.S. Air Force Academy, Gen. Schwartz is also an alumnus of the National War College, a member of the Council on Foreign Relations, and a 1994 Fellow of MIT's Seminar XXI. He has served as commander of the Special Operations Command-Pacific, the Alaskan Command, Alaskan North American Aerospace Defense Command Region, and the 11th Air Force, Elmendorf AFB. Before assuming his current position, he was commander, U.S. Transportation*

*Command, and served as the single manager for global air, land, and sea transportation for the Dept. of Defense.*

*Gen. Schwartz is a command pilot with more than 4,400 flying hours in a variety of aircraft. He participated as a crewmember in the 1975 airlift evacuation of Saigon, and in 1991 served as chief of staff of the Joint Special Operations Task Force for Northern Iraq in Operations Desert Shield and Desert Storm. In 1997 he led the Joint Task Force that prepared for the noncombatant evacuation of U.S. citizens in Cambodia.*



the same time, we want to be sure that when the chips are down, our airmen deliver. We want them to be what they need to be in tough spots. That is true for the ground forces, too. We also want them to exercise judgment. So we need mature and sophisticated and talented people in order to do this—people who can think while they are flying airplanes.

### **Do you have them, or enough of them?**

Yes. And if they are trained well and have decent equipment, and if we provide them the insights they need to make good decisions in real time, then they will deliver.

### **Your aircrews don't have to do it all by themselves, do they?**

No. Unlike even 10 years ago, when our people in the cockpits were operating alone much more, there is connectivity today. There is data passing from command and control nodes that allows those flying the aircraft to make more informed decisions. Our people are very good at inter-

acting with the joint terminal attack controller on the ground, for example, who has eyes on the target, at weaponeering their targets—choosing from among a mix of weapons—and at taking advantage of the precision that our weapons give us. Our choice and delivery of weapons is done in such a way as to generate just the desired effect and no more.

### **But the civilian casualties still happen.**

Are civilian casualties an inherent part of our business? I would argue that that they are the exception. We are far from perfect; I wouldn't argue that. Avoiding civilian casualties means in some cases that our airmen don't shoot, and that's true for ground forces as well.

**You mentioned the increasing importance of persistent ISR [intelligence, surveillance, and reconnaissance] and the role that UAVs play in that. Are unmanned systems supplanting space systems to some extent in ISR, and is space becoming less important in the**