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Person of the Year

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Chief Aircraft Evaluation Editor Fred George

For individual e-mail addresses, telephone numbers and more, go to www.AviationWeek.com/editors

EDITORIAL OFFICES
2 Penn Plaza, 25th Floor, New York, N.Y. 10121
Phone: +1 (212) 904-2000, Fax: +1 (212) 904-6068

BUREAUS

AUCKLAND
53 Staincross St., Green Bay, Auckland 0604, New Zealand
Phone: +64 (27) 578-7544
Bureau Chief Adrian Schofield

BEIJING
D-1601, A6 Jianguo Menwai Ave., Chaoyang, Beijing 100022, China
Phone: +86 (186) 0002-4422
Bureau Chief Bradley Perrett

BRUSSELS
Rue de L'Aqueduc 134, 1050 Brussels, Belgium
Phone: +32 (2) 648-7774
Contributing Editor Cathy Buyck

COLUMBIA, S.C.
1120 Baffin Road, Columbia, S.C. 29212
Phone: +1 (803) 727-0309
Managing Editor, AviationWeek.com Sean Meade

FRANKFURT
Am Muhlberg 39, 61348 Bad Homburg, Germany
Phone: +49 (6172) 671-9817 Fax: +49 (6172) 671-9791
Bureau Chief Jens Flottau

LONDON
20 Canada Square, 7th floor
Canary Wharf, London E14 5LH, England
Phone: +44 (207) 176-2524
Bureau Chief Tony Osborne
Multimedia Manager Rupa Haria

LOS ANGELES
10 Whitewood Way, Irvine, Calif. 92612
Phone: +1 (949) 387-7253
Bureau Chief Guy Norris

MOSCOW
Box 127, Moscow, 119048, Russia
Phone: +7 (495) 626-5356; Fax: +7 (495) 933-0297
Contributing Editor Maxim Pyadushkin

NEW DELHI
Flat #223, Samachar Apartments,
Mayur Vihar—Phase-I (ext.)
New Delhi 110091, India
Phone: +91 (98) 1154-7145
Contributing Editor Jay Menon

PARIS
40 rue Courcelles, 75008 Paris, France
+33 (06) 72-27-05-49
Bureau Chief Amy Svitak
Contributing Editor Pierre Sparaco
pierre.sparaco@orange.fr

SAN FRANCISCO
310 Brandon Court, Pleasant Hill, Calif. 94523
Phone: +1 (925) 934-6813
Bureau Chief Michael Mecham

SINGAPORE
12 Marina Blvd.,
Level 23. Marina Bay Financial Centre Tower 3
Singapore 018982
Phone: +65 6530-6532
Bureau Chief Leithen Francis

WASHINGTON
1200 G St., N.W., Suite 922, Washington, D.C. 20005
Phone: +1 (202) 383-2300, Fax: +1 (202) 383-2347
Bureau Chief James R. Asker
Congressional Editor Jen DiMascio
Administrator of Bureaus Kyla Clark

Art Department Scott Marshall, Colin Throm
Copy Editors Andrea Hollowell, Patricia Parmalee
Director, Editorial and Online Production Michael O. Lavitt
Production Editors Elizabeth Campochiaro, Bridget Horan, Ellen Pugatch
Contributing Photographer Joseph Pries

Finance Director Hing Lee

President/Publisher Gregory D. Hamilton
hamilton@aviationweek.com

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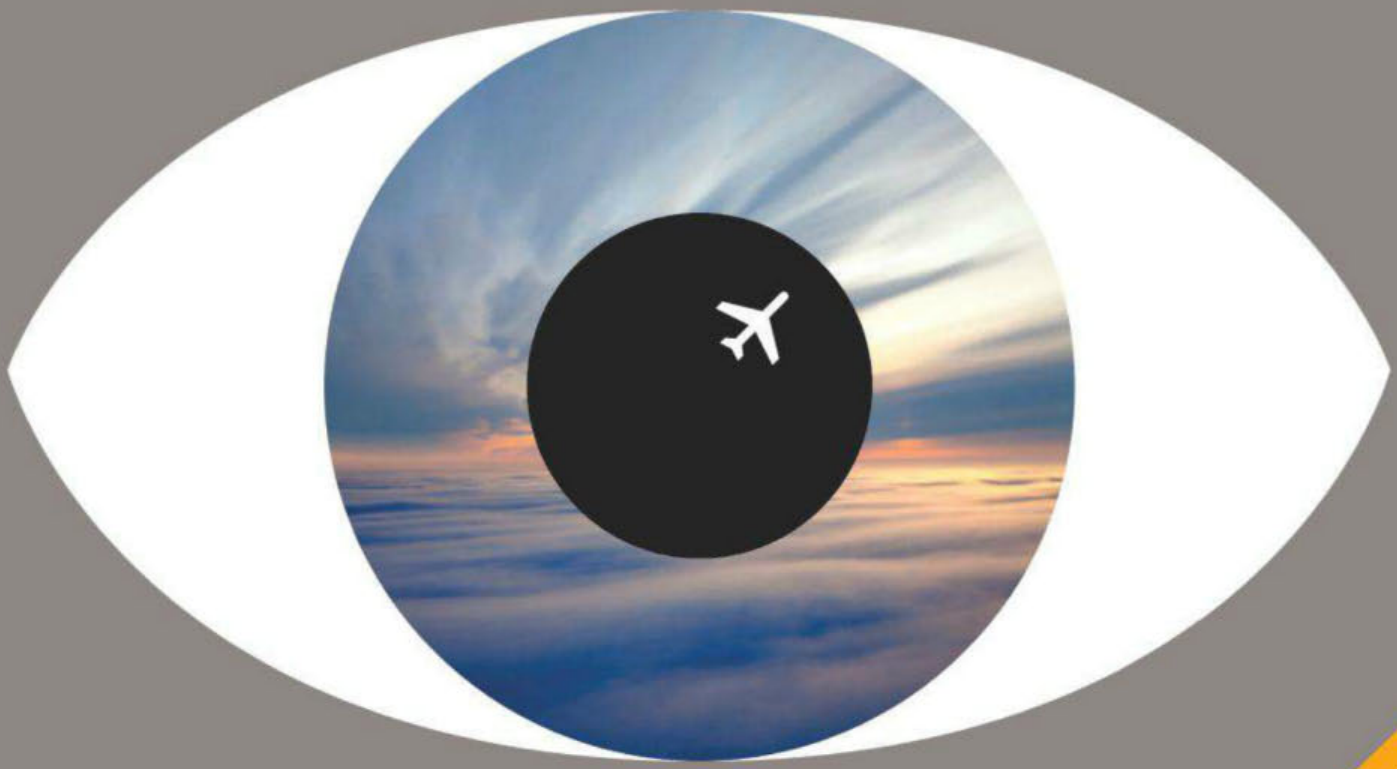

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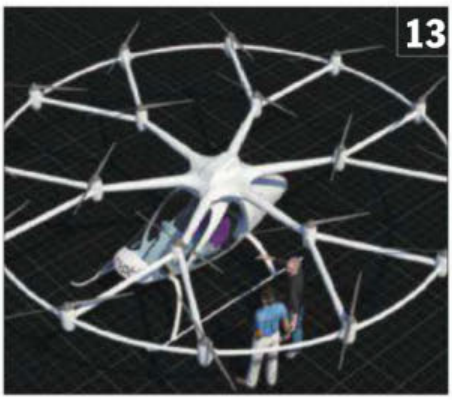
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On the Web

A round-up of what you're reading on AviationWeek.com

More than 200 airlines have signed up on Twitter, but less than half are actively tweeting. Those that have invested in social media as a customer relations, marketing and research tool are seeing a return on investment and plan to **increase their spending,** but resource **challenges persist in 2013.** Our **Things With Wings** blog looks at the metrics of airline social media spending *ow.ly/gEXkj*

MILITARY WINGLETS

Airbus Military is flight-testing drag-reducing winglets on its C295 light transport. *ow.ly/gEXyf*

AviationWeek.com/ares

TRIAL BALLOON

Our **Ares blog** reports on the progress of the **Aeros experimental variable buoyancy airship.** The design and engineering of the airship, called Pelican, was discussed at length by readers. **Keep an eye on Ares for more updates** as Aeros prepares for further demonstrations *ow.ly/gEWrn*

PREMIUM CONTENT

Use the **World Aerospace Directory** to find suppliers in **thousands of product categories** and subcategories. Its **powerful search function** allows you to find suppliers by location, company size, minority- and disadvantaged-owned status and more. **AviationWeek.com/awin**

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READER COMMENT

On the news that Sikorsky is the **sole bidder** in the U.S. helicopter contest: **"A contest with no competition...what else better could Sikorsky have hoped for?"** *ow.ly/gEXWv*

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Letters should be shorter than 200 words, and you must give a genuine identification, address and daytime telephone number. We will not print anonymous letters, but names will be withheld. We reserve the right to edit letters.

TURN TO COMMON SENSE

Sharon Weinberger's "Mining The Gap" (*AW&ST* Dec. 24, 2012, p. 36) was very informative as to how data extracted from social media and other databases can be intelligently manipulated and "real" threat data extracted. However, using Benghazi as an example illustrates how often we rely on computer algorithms while ignoring common sense. The overthrow of the Libyan government resulted in a country with a very weak regime not fully in control of a large portion of their territory and opposed by a number of armed factions equally hostile to Western governments. Essentially, post-Muammar Gaddafi Libya had a well-armed and nearly lawless social structure.

How much "intelligence" does it take to realize that in such a situation any U.S. embassy or other government entity requires significantly more protection than one located in a politically stable country? The attack on U.S. consulate personnel in Benghazi happened because the people who could have prevented it were absent from the scene and the decision process was driven by a bureaucracy more interested in Washington politics than operational necessities.

When you are living in such a hostile environment you really don't require "Internet chatter" to tell you that on any given day you are going to be attacked unless you are perceived to be too tough a target to take on.

Perhaps if we instituted a program where we rotate some of the decision-makers out of the Beltway and into the field for a six-month "wake-up" tour, common sense would trump computer algorithms.

C. Paul Daelemans
WEST BLOOMFIELD, MICH.

NO LESSONS LEARNED

NASA's decision to launch the Glory climate-monitoring spacecraft in spite of a recommendation from its own engineering safety office not to (*AW&ST* Dec. 17, 2012, p. 24) is disturbingly reminiscent of some Columbia Accident Investigation Board findings. Equally disturbing is the risk that was taken to avoid "the cost that would be tied up with a very long launch delay."

Had Glory launched successfully, NASA likely would have considered it validation of known flawed hardware, devaluing engineering safety office efforts, and fostering a "normalization of deviance" culture. Such a culture was found to be causal in the Challenger and Columbia disasters.

Steven P. Bezman
ALEXANDRIA, VA.

SLS/ORION DILEMMA

Frank Morring, Jr.'s commentary "Bring the Mountain . . ." (*AW&ST* Dec. 17, 2012, p. 22) highlights the difficulties NASA is facing in establishing a meaningful mission for the SLS/Orion system. Both the Moon and Mars beckon, but due to politics and economics NASA is instead considering the capture and return to cislunar space of a small near-Earth asteroid.


'Bring the Mountain . . .'

Science and operational objectives of such a mission are highly questionable. The main mission objective appears rather to give SLS/Orion a purpose. The estimated $2.65 billion for the mission would be better spent on developing lunar resources—the next logical next step in human space exploration.

George Mancuso
SAN DIEGO, CALIF.

LIVING IN GLASS HOUSES

Reader Todd M. Edward made offensive remarks about Muslims that struck me as extremely prejudiced (*AW&ST* Dec. 3, 2012, p. 10).

Unfortunately, this kind of thinking has been common in our country since the 9/11 attacks, attempting to paint all Islamic culture with one brush. These views reveal a breathtaking absence of historical perspective, let alone facts.

It is not just Muslims, but many people around the world who view the creation of Israel as being accomplished through terrorism and violence. It is an aggressor, continually provoking the Palestinians in order to gain cover for its expansionist endeavors. I doubt that Edwards would hold those views if it had been his family that had lost their home, their land and their lives in the unjust displacement of 1948.

Neither Israel nor the U.S. should do any boasting about the moral legitimacy of their warfighting techniques. One need only look to past and recent history to recall Hiroshima and Nagasaki, Japan, napalm, Agent Orange, depleted uranium, drones, white phosphorus, 2,000-lb. Joint Direct Attack Munitions dropped on apartment complexes and more.

People should not lecture about the morality of Muslim culture unless they are willing to assess their mother country's ledger, too.

Christopher Egli
DEVON, PA.

ADVERSE ADVERTISING?

Do you have any policy regarding advertising copy? A recent Airbus ad is infuriating, at best (*AW&ST* Dec. 17, 2012, pp. 4-5). It attacks a U.S. company with an excellent history. Of course, what is missing from the ad copy is any reference to safety and the number of lives lost on Airbus fly-by-wire aircraft.

As for cockpit commonality, the Boeing 747-8 has it, as do virtually all of that manufacturer's widebodies. The 747-s also boasts an entirely new high-efficiency wing. Boeing still acknowledges that pilots have the intelligence and training to overcome unusual situations.

Although I am a retired 747 pilot, I know that many of my still-active colleagues agree that we would rather fly on any Boeing aircraft than the Airbus A380.

UAL Capt. (ret.) J. Lepkovsky
NOVATO, CALIF.

Aviation Week allows advertisements that directly take on competitors. The content of advertisements has no bearing on our editorial coverage—Ed.

NOTICE:
Due to a recent software anomaly, the Aviation Week letters email portal was intermittently inoperable for about three weeks in December. The problem has been resolved, but any letters sent during that period should be resent to: **awstletters@aviationweek.com**
We apologize for the inconvenience.

Who's Where

Alex Battaglia

To submit information for the Who's Where *column, send Word or attached text files (no PDFs) and photos to:* awinder@aviationweek.com *For additional information on companies and individuals listed in this column, please refer to the* Aviation Week Intelligence Network *at* AviationWeek.com/awin *For information on ordering, telephone U.S.: +1 (866) 857-0148 or +1 (515) 237-3682 outside the U.S.*

Alex Battaglia (see photo) has been promoted to senior vice president for system operations from vice president-airports and operations of *JetBlue Airways*.

Scott E. Kuechle and **H. Jay Winship** have been appointed to the board of directors of the *Esterline Corp.*, Bellevue, Wash. Kuechle is former executive vice president/CFO of the Goodrich Corp., and Winship is principal/senior managing director of Relational Investors.

Boaz Levi (see photo) has been nominated as corporate vice president/general manager of the Systems, Missiles and Space Group of *Israel Aerospace Industries*. He has been general director of the Air Defense Systems Div.

Michael DiGeorge has been named managing director of *Arinc's* Singapore-based Asia-Pacific Div. He was senior director for e-enabled programs and based in the company's Hong Kong office.

Richard Baudouin, co-founder of Aviation Capital Group and a principal in Infinity Aviation Capital, has been appointed to the board of directors of the *Air Transport Services Group*, Wilmington, Ohio. He succeeds **Jeffrey A. Dominick**, who has resigned to join an aviation investment unit of Blackrock Inc.

USN Vice Adm. (ret.) **Jack Dorsett** (see photo) has been named vice president of the Integrated Mission Systems business for Herndon, Va.-based *Northrop Grumman's* Information Systems sector. He was vice president-cybersecurity and command, control, communications and computers on the corporation's government relations staff. And, Vice Adm. (ret.) **P. Stephen Stanley** has become vice president of the company's Falls Church, Va.-based cybersecurity/C4 portfolio, also on its government relations staff. Before retiring from the Navy, Stanley was principal deputy director of cost assessment and program evaluation in the Office of the Secretary of Defense.

U.S. Army Col. **Leon N. Thurgood** has been nominated for promotion to brigadier general. He has been deputy program executive officer for missiles and space, Redstone Arsenal, Ala.

Boaz Levi

Jack Dorsett

Steve Cass

Doug Meador

Mark Taylor

Doug Nichols

Steve Cass (see photo) has been appointed vice president-communications for the *Gulfstream Aerospace Corp.*, Savannah, Ga. He was director of sales support. **Brian Schank** and **Darwin Stout** have been named East Coast and West Coast U.S. product support sales directors, respectively. Schank will be based in Savannah, and Stout in Southern California. Schank was director of business and program support for product support sales, and Stout was a West Coast-based national sales manager for product support sales.

USAF Brig. Gen. **Kenneth S. Wilsbach** has been selected for promotion to major general and appointment as commander of the 9th Air and Space Expeditionary Task Force-Afghanistan of Air Combat Command/deputy commander-Air of U.S. Forces-Afghanistan/deputy chief of staff-Air of the International Security Assistance Force Joint Command in Kabul. He has been deputy director for operations at U.S. Pacific Command Headquarters, Camp H. M. Smith, Hawaii. Brig. Gen. **Jay B. Silveria** has been named vice commander of the 14th Air Force (Air Forces Strategic) of Air Force Space Command, Vandenberg AFB, Calif. He has been deputy chief for support of the Office of Security Cooperation-Iraq of the U.S. State Department in Baghdad. He is swapping positions with Brig. Gen. **Thomas F. Gould**. Col. **Sarah E. Zabel** has been nominated for promotion to brigadier general and assignment as special assistant to the commander of the Air Force Sustainment Center, Air Force Materiel Command, Tinker AFB, Okla. She has been commander of the 75th Air Base Wing of the command's Air Force Sustainment Center, Hill AFB, Utah.

Doug Meador (see photos) has been named president of *BAA Aviation's* Dallas Airmotive subsidiary and **Mark Taylor** managing director of its H+S Aviation subsidiary, Portsmouth, England. Meador was CFO and has been vice president/general manager of operations for Dallas Airmotive's Forest Park maintenance, repair and overhaul facility. Taylor was general manager of H+S and had been head of BBA's component and accessory repair business.

Doug Nichols (see photo) has been promoted to CEO from chief operating officer of the *Aerion Corp.*, Reno, Nev. He is also a former Boeing executive.

Rick Howard has been named chief information security officer for *TASC Inc.*, Chantilly, Va. He was general manager of the iDefense business unit of VeriSign and had led the intelligence-gathering activities at Counterpane Internet Security.

Stacey Turnbull has become marketing communications manager of *Optellios Inc.*, Newtown, Pa. She was a marketing specialist for NaviNet Inc. in Boston.

Chris Miner has been promoted to vice president of in-service aircraft carrier programs for *Huntington Ingalls Industries'* Newport News (Va.) Shipbuilding Div. from director of the Virginia-class submarine program.

HONORS AND ELECTIONS

USAF Maj. Gen. (ret.) **John Speigel** has been elected chairman of the Maxwell AFB, Ala.-based *Civil Air Patrol's* board of governors, succeeding Brig. Gen. **Richard Anderson**, whose term ends in February. CAP Lt. Col. **Ned Lee** was elected vice chairman.

The World

SPACE

Company Pilots Will Fly First

Non-government test pilots will make the initial flights in commercial crew vehicles under development with NASA funds, and later train astronauts once the agency certificates their spacecraft for human flight, according to agency and company managers. Garrett Reisman, the commercial crew project manager at SpaceX, says his company plans to begin flying its own test pilots in 2015 on an upgrade of the Falcon 9/Dragon combination that already has reached the International Space Station (ISS) twice in a cargo configuration. Plans call for Boeing pilots to inaugurate the company's CST-100 capsule in a 2016 launch on an Atlas V, according to John Mulholland, commercial programs space exploration vice president and program manager And Mark Sirangelo, Sierra Nevada vice president and chairman of its Space Systems unit, says his company plans to fly the Dream Chaser lifting-body crew vehicle from an Atlas V, both autonomously and with its own crew.

Beidou Operational in Asia

China has declared its Beidou (formerly Compass) satellite-navigation system fully operational, although the service remains limited to most of the Asia-Pacific region. The operating office says it is "accelerating" construction of the system but repeats the long-standing commitment to achieve global coverage from about 2020; no earlier possibility is mentioned. An initial operational service began a year ago.

Rocket Pitch

Internal studies by Ad Astra Rocket propose key propulsion roles for its Variable Specific Impulse Magnetoplasma Rocket (Vasimr) on formative space missions that draw interest from Washington and abroad. Those missions include the retrieval of a Near Earth Asteroid to prepare for human deep-space exploration and mitigation of the Earth orbital debris threat, as well as commercial initiatives to reboost and refuel Earth-orbiting spacecraft. In December, Ad Astra signed a third extension of its 2005 Space Act agreement with NASA to place the VF-200-1, a prototype of the Vasimr engine, on the ISS in early 2016 for its first inflight characterizations.

Robonaut Redux

Robonaut 2, a NASA and General Motors collaboration to develop an astronaut-friendly humanoid, is due a pair of legs and a battery backpack later this year to give it more mobility inside and eventually outside the ISS. The two-armed, camera and force-sensor-laced torso launched to the station aboard a February 2011 space shuttle mission. It has been restrained to a stanchion in the station's U.S. Destiny laboratory since it was awakened electronically late in August 2011. Once equipped with "climbing legs" and an independent power source, R2 will be gradually liberated, though under the oversight of ground controllers or astronauts as it takes on internal housecleaning chores and eventually more risky external tasks typically carried out by spacewalkers. The robot was given a human form so it can work with the same tools as used by the astronauts.

MOUS Delivery

Lockheed Martin has finally delivered the waveform needed to fully utilize the Wideband Code Division Multiple Access capabilities offered by the new Mobile User Objective System narrowband communications satellites.

AIR TRANSPORT

Faster 777 Factory

Boeing has achieved its highest widebody production rate—8.3 aircraft per month, or 100 per year—with a Korean Air 777 Freighter that rolled out Jan. 8. The company has increased 777 production rates twice in the past 31 months, moving from five to seven per month to the 8.3 in about 16-month intervals. Last year, Boeing shipped 83 777s, the equivalent of 6.9 per month. Previously, the 747 had been the rate champion at a peak of seven per month. The 737 narrowbody production line is now turning out 38 aircraft per month. Meanwhile, Airbus is producing A330s

A Big Burst in the Milky Way

Astronomers using NASA's Stratospheric Observatory for Infrared Astronomy (Sofia), a highly modified Boeing 747SP that carries a 100-in.-dia. IR telescope, have created a series of multiple exposures revealing a ring of gas and dust created in a burst of energy 4-6 million years ago at the center of the Milky Way.

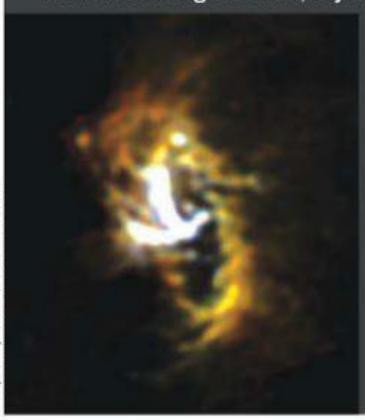
The burst created the galaxy's circumnuclear ring (CNR), a neighboring quintuplet cluster (QC) and other massive star field exotica not imaged before, says Matt Hankins of the University of Central Arkansas, lead author of a paper presented last week to the American Astronomical Society.

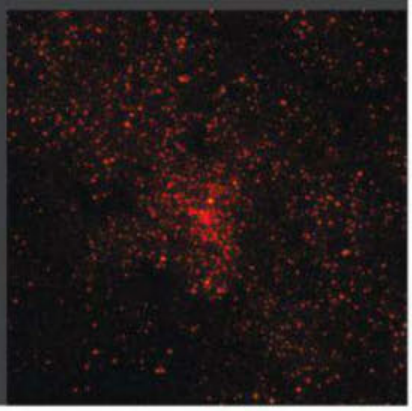
CNR surrounds a black hole at the nucleus of the Milky Way that has 4 million times the mass of the Sun. CNR is seven light years in diameter.

Hankins and colleagues used a mid-IR camera called Forecast from Cornell University to image these formations during flights last year on Sofia. Operating at altitudes of as much as 45,000 ft., the aircraft lifts the telescope free of atmospheric water vapor and dust that prevents such images being made by ground observatories.

The CNR image at left reveals a bright Y-shaped feature that is believed to be material falling from the ring toward the black hole, located where the arms of the Y intersect. In contrast, opaque dust in the plane of the Milky Way hides features of the same region (right) as seen by the Hubble Space Telescope's Nicmos near-IR imager.

"The focus of our study has been to determine the structure of the circumnuclear ring with the unprecedented precision possible with Sofia," says Cornell's Ryan Lau, a Forecast team member. "Using these data, we can learn about the processes that accelerate and heat the ring."





NASA/SOFIA/FORECAST TEAM PHOTOS

at a 9.5-per-month rate in Toulouse and expects to achieve 10 per month in the second quarter. Boeing is setting its fastest production rate climb for the 787, which is now at five per month and expected to reach 10 in 2014. However, 787s are built in two factories; the A330 and 777 each roll out from one facility.

Mixed Fortunes

Improved demand for larger regional jets and sustained sales of its Q400 turboprop helped Bombardier in 2012 post its highest level of regional aircraft net orders since 2007. The 138 sales in 2012 compare with 54 net orders in 2011 and exceed all annual sales since the airframer posted a record 238 orders in 2006. Bombardier's 2012 total includes 73 CRJs—up from four in 2011—and 50 Q400s, up from seven in 2011. CSeries sales, however, fell to 15 in 2012 from 54 in 2011. Business aircraft net orders, meanwhile, blossomed to 343 from 191 in 2011 and deliveries grew to 179 from 163. While sales improved, years of depressed orders and lowered production rates are still reflected in Bombardier's commercial delivery rates, which dropped to 50 in 2012, 28 fewer than in 2011. There were triple-digit rates in most of the preceding decade.

DEFENSE

Eagle, Hornet Spending

The U.S. Navy is expected to spend $31.9 billion for F/A-18-related programs in fiscal 2008-17, which would be about the same amount that the service spent for all fixed-wing aircraft in the previous decade. The biggest chunk of expected F/A-18 spending will be for the production of E/Fs, about $14.1 billion, according to an exclusive Aviation Week Intelligence Network analysis of data provided by Avascent050. Likewise, the Air Force will spend about $5.8 billion on F-15 programs, with F-15E Strike Eagles accounting for $3.2 billion. Almost all of the work is for sustainment and modification of the F-15Es.

Eclipse Seeks USAF Deal

While it still is ramping up production on the Eclipse 550, Eclipse Aerospace is hoping to make a case that the U.S. Air Force should buy up to up to 100 of its very light jets (VLJs) to supplant the aging fleet of 178 T-1A Jayhawks (Beechjet 400s) flown for the USAF Specialized Undergraduate Pilot Training program. Eclipse Jan. 7 responded to a request for information for a commercial off-the-shelf fleet of VLJs to support the program's training track. Eclipse believes it can fulfill the same requirement with 100 trainer versions of the Eclipse 550.

Another Uclass Slip

The U.S. Navy has delayed plans until spring to kick off a long-awaited competition for the Unmanned Carrier-Launched Airborne Surveillance and Strike aircraft. A draft request for proposals was slated for release this month. Ongoing discussions on requirements are to blame for the slip.

AAS Competition Nears

The U.S. Army is leaning toward starting a competition to replace the OH-58D Kiowa Warrior with a new Armed Aerial Scout (AAS) rather than upgrading the fleet. But, Vice Chief of Staff Lloyd Austin, 3rd, has requested more information, adding to a delay to kick it off. He wants more analysis of how the AAS will fit into forthcoming Army technologies. If a competition commences, the Army is slated to buy up to 368 new rotorcraft.

Skyteam's Greater China Members Forge Deeper Ties

Four Skyteam members on either side of the Taiwan Strait are deepening their relationship with closer collaboration in their shared market between the island nation of Taiwan and China.

The so-called Great China Connection service also marks one of the biggest steps forward in cooperation between China Southern and China Eastern airlines since the latter's 2010 application to join Skyteam. The application put both carriers in the same alliance and raised the question of whether the two state airlines would ultimately be merged.

Those two carriers plus Taiwan's China Airlines and China Southern affiliate Xiamen Airlines will use code-sharing to carry each other's passengers between Taiwan and China. While that air transport market has strong routes, such as Shanghai to Taipei, much of it is fractured into many thin, low-frequency services connecting secondary cities, thus increasing the attraction of code-sharing. The four carriers will cooperate at 41 airports and on more than 270 cross-strait flights a week, about half of the market. The airlines are also cooperating on airport services offered to passengers in the market.

While China Airlines strengthens its relationship with Skyteam, Taiwan-based rival EVA Airways, working to join Star Alliance by June, aims at early membership for short-haul subsidiary Uni Airways. The move would strengthen Uni against competition from budget carriers. The hope is to bring Uni into Star well within three years of EVA joining, says EVA Executive Vice President Austin Cheng. Merging Uni's frequent-flier program with those of the other Star members would be an especially desirable move for warding off competition from budget airlines, he notes. Cheng's comments suggest Uni itself will not become a budget airline, though EVA said in April that it might.

Separately, China Airlines plans to lease Boeing 777-300ERs from GE Capital Aviation Services (Gecas), accelerating its phase-out of its less fuel-efficient widebodies. The first of the leased aircraft is scheduled to arrive in 2014. The December announcement followed China Airlines' statement it would buy six 777-300ERs.

The 777s will replace 747-400s and Airbus A340s. Gecas notes that China Airlines also has been adding A330-300s. The leasing company said in November 2011 that it would lease four new A330-300s to the carrier. The first two were delivered in October and December. China Airlines has expressed a keen desire to get rid of its A340s.

OBITUARY: Jesco von Puttkamer, a protege of Wernher von Braun whose NASA career ranged from the Apollo manned lunar landing project to the International Space Station, died Dec. 27, of a flu-like illness at home in Alexandria, Va. He was 79. At his death, von Puttkamer was still active at the U.S. space agency, producing a daily online rundown of activities on the International Space Station.

Born in Leipzig, Germany, von Puttkamer earned a degree in mechanical enginnering at the Technische Hochschule in Aachen, and joined von Braun's organization at the Marshall Space Flight Center in Huntsville, Ala., in 1962 to work on Apollo. Von Puttkamer moved to NASA headquarters in 1974 to manage planning for human spaceflight beyond low Earth orbit.

Von Puttkamer wrote more than a dozen books and contributed to the On Space blog at www.aviationweek.com. He won NASA's Exceptional Service Medal, and was named German-American of the Year in 2008 by the German-American Heritage Foundation of the USA.

By Bill Sweetman

Read Sweetman's posts on our weblog **Ares**, *updated daily:*
AviationWeek.com/ares
sweetman@aviationweek.com

COMMENTARY

Weight-Loss Surgery

Budget shock could be healthy

Deep and long-term budget cuts could be the best thing to happen to the U.S. defense enterprise in decades.

Austerity should enforce long-overdue change in the relative size and influence of air/space, land and sea forces. For the last decade of mostly land combat, the ground forces have dominated discussion of strategy, and the doctrine that no war can be won except by taking and holding ground has become a shibboleth to which all who aspire to be "joint" must pay homage.

U.S. Army and Marine strategists today are simultaneously challenging the Air-Sea Battle (ASB) concept, which U.S. Air Force and Navy planners developed to counter anti-access threats, and trying to shoehorn infantry and amphibious forces into a central role in ASB. But it is hard to argue with Center for Strategic and Budgetary Assessments President Andrew Krepinevich, who says: "If the Marines and the Army landed on the coast of China, it would be a story on page A17 of *The People's Daily*."

U.S. NAVY

The tough lesson of Iraq and Afghanistan is that "invasion is not a business we can afford to be in," Krepinevich says. One reason that defense cuts look as scary to the industry as they do is that personnel costs have ballooned, to sustain recruitment and retention through the longest and largest combat deployments ever attempted without conscription. Consequently, budget cuts will fall heavily on procurement.

Land force structure will not be alone in facing review. The last 30 years of U.S. combat aircraft procurement have been about adding stealth technology to every combat aircraft in the force while protecting the numbers of squadrons and wings. In 2030 we will be nearly halfway there, if all goes well, which so far it has not.

The Navy planned its smallest warship in decades, the Littoral Combat Ship, to sustain the count of surface commands as the Navy commissioned the stealthy Zumwalt-class, a so-called destroyer that is the biggest Navy surface combatant in 50 years. But even with the Zumwalt program cut back, the Navy faces a tough time building and sustaining a balanced fleet unless it is ready to reduce numbers.

The common thread to all of the points above: Strategy is matching resources to goals, and does not start with force numbers—although they make impressive images (see photo). Another area where austerity will drive change is the business of procurement: not another well-intentioned "reform" that entrenches an extra layer of bureaucracy, but a restructuring that reflects the unique realities of defense. These include monopsony (a single customer), long product lives (defense equipment sees relatively little use in peacetime) and consequently low production rates (because replacement is slow). Between them, they drive the enterprise away from a free-market ideal.

After the Cold War, the U.S. used its monopsony power to enforce consolidation in the arms industry. Money was poured into a few winner-take-all-forever programs, whereupon most participants dumped their remaining plowshare divisions, acquired competing sword-makers and (in many cases) shut them down to reduce capacity and raise margins.

The pure-play defense companies which emerged from this process cannot generate growth for their shareholders if the procurement budget slumps, and will be under increasing pressure from more-diverse companies. That may not be a bad thing. This isn't the 1950s, when military aircraft were built in thousands and successful commercial aircraft in hundreds, and the cutting edge of almost every technology was in defense. Defense systems should harvest commercial supply chains for subsystems and materials, reducing cost and development time. One way to facilitate that will be for armed forces to buy more materiel (including components) from mixed-economy contractors.

It is time for defense customers to recognize that when it comes to big-ticket items, competition in the development stage is an expensive fiction. Again, this is not the era where you could lose one fighter competition and win another two months later. France has been managing without prime-contractor competitions since Dassault bought Breguet in 1971, and Sweden has never done it any other way. The challenge today is to identify what skills and technologies are unique and vital, and preserve them as efficiently as possible. State capitalism, industrial policy and mercantilism are naughty words today, but unfortunately are inevitable in defense.

Huge organizations, Krepinevich points out, seldom change their behaviors except in response to a major change in resources or catastrophic failure. When it comes to defense, better the former than the latter.

By Graham Warwick

Senior Editor-Technology
Graham Warwick blogs at:
AviationWeek.com/leadingedge
warwick@aviationweek.com

COMMENTARY

Branching Out

Electric propulsion enables an innovative approach to vertical takeoff

What better way to start the new year than with a look at a project that suggests creativity is alive and well in aviation, despite the economic gloom. Advances in electric power are proving to be a motivator for that creativity, enabling configurations in which propulsion is more closely coupled with aerodynamics and control than ever before.

One of more unusual configurations to emerge in recent years comes from Germany's E-volo, which is developing an electric-powered rotorcraft called the Volocopter. Karlsruhe-based E-volo made history in October 2011 when its proof-of-concept Volocopter, the single-seat VC1, became the first purely electric vertical-takeoff-and-landing (VTOL) manned aircraft to fly.

The Volocopter concept is the result of an Internet discussion on quadcopter model aircraft between E-volo co-founder Stephen Wolf and physicist Thomas Senkel, a specialist in electric drives and ultralight vehicles. Wolf and Alexander Zosel, an entrepreneur and inventor, came up with the idea of scaling the model up to a manned aircraft and together they built the VC1.

Now, armed with a €2 million ($2.6 million) subsidy from Germany's Federal Ministry of Economics and Technology, E-volo is developing the VC200, a two-seater aimed at the European ultralight-aircraft market. In place of a helicopter's rotors and drivetrain, the aircraft has an array of 18 electric-driven propellers mounted on a fixed structure that branches tree-like above the cabin (see photo).

Weighing in under the 450-kg (990-lb.) ultralight limit, the VC200 has serial hybrid propulsion, says Zosel, CEO of E-volo. A Wankel rotary engine will drive a generator to power the electric motors and recharge onboard batteries, which provides a flight time of more than an hour. The batteries will provide a backup for safe landing, but the aircraft also has a ballistic recovery parachute.

E-VOLO

Although some Volocopter concepts have a pusher propeller for faster forward flight, Zosel says the VC200 does not because the aircraft is capable of reaching 50 mph (45 kt.) by tilting the rotor plane 15-20 deg. Flight control is fly-by-wire and accomplished by varying the speed of the individual two-blade, fixed-pitch rotors, collectively for VTOL and selectively for directional control.

The VC200 prototype is scheduled to fly in July at Bruchsal, home of DG Flugzeugbau, which is building the carbon-fiber airframe. To help get production off the ground, E-volo is receiving support from the Federal Ministry of Transport, Building and Urban Development, which has launched a trial program to create a new ultralight-aviation category for the Volocopter.

Under the 2-3-year program, Germany's Ultralight Aviation and Sports Aircraft Associations, plus the LBA civil aviation authority, will work with E-volo to create a manufacturing specification, legal regulations and training requirements for the new Volocopter ultralight category. In Germany, a private pilot's license will be required to fly the aircraft, says Zosel.

The plan is to issue a provisional airworthiness certification for the VC200 after endurance testing of the airframe, landing gear and rotor array has been completed. This will allow flight testing to begin. After the trial program is complete, the next step will be to secure a VC200 prototype certification under the new category to allow production to begin.

Zosel says E-volo has raised about $4 million to take the VC200 through to certification. Now the company is looking for another $5 million to develop a single-seat version, the VC100, for the U.S. market. This would meet the FAA's Part 103 regulations for ultralights, which restrict the aircraft to a single occupant and an empty weight under 254 lb.

By Pierre Sparaco

Former Paris Bureau Chief Pierre Sparaco has covered aviation and aerospace since the 1960s.

COMMENTARY

The Battle of Brittany

A seemingly local problem becomes a French national one, thanks to the players involved

Planning a new regional airport near Nantes, Brittany, at first sight a low-priority issue, has evolved into a political controversy encompassing a wide range of problems that extend far beyond the airline industry. The government of French left-wing Prime Minister Jean-Marc Ayrault, which has ratified the plan (as did that of his right-wing predecessor) is running into serious trouble with no compromise in sight.

The new airport, dubbed Notre-Dame-des-Landes (NDDL) initially appeared in the news as a relatively low-profile, low-cost undertaking conceived to replace nearby Nantes Atlantique airport to reduce noise and create more runway capacity. Residents are complaining about aircraft flying over the city's center during final approach, while local politicians, on the other hand, support NDDL as a symbol of modernity. But this fairly routine give-and-take debate belies the nationwide political battle that is brewing.

The numbers in question are not dramatic. Nantes Atlantique handles fewer than 3.5 million passengers per year, the envisioned two-runway NDDL would gradually be able to handle nearly 9 million by 2050. In other words, saturation is not an argument and comments about improved flight safety are weak. However, some experts claim that moving the airport to the other side of Nantes would be a good idea. So says Jean Fleury, former chairman/CEO of Aeroports de Paris.

Conversations about NDDL have moved from the fairly routine discussions of a few years ago into a complex debate centered on a consumer society comprising ecologists, Third World advocates, a variety of far-left politicians and sundry other activists. Speaking with a single voice, they claim NDDL is troubling to them, but they are inarticulate about their grievances. Some of their nonsensical remarks confirm that they do not understand the needs of the air transport sector. For example, opponents stress that it doesn't make sense to plan new airports when the airline industry "obviously" has no future. Such a laughable statement—to which there is no reasonable response—illustrates that French authorities have lost control of the situation, although they have no intention of canceling the project. Ayrault, as is President Francois Hollande, are watching their poll numbers plummet and both would eschew another symbolic defeat.

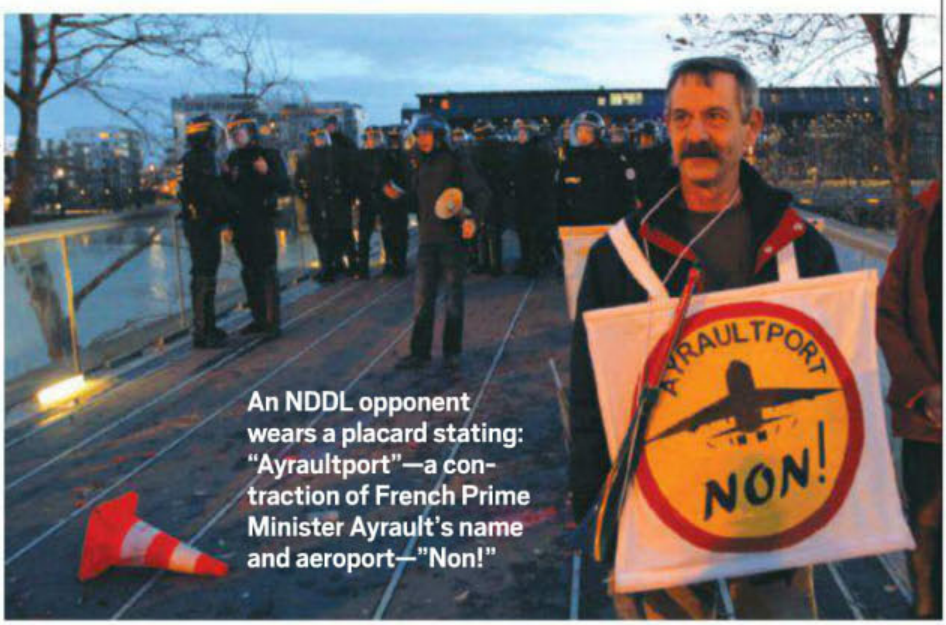
In addition, Ayrault is not trusted to be an impartial judge where NDDL is concerned. Before being appointed prime minister by Hollande in mid-2012, he was the long-serving mayor of Nantes and, in this capacity, firmly promoted the NDDL project.

Ironically, Nantes Atlantique is characterized by the European Regions Airline Association as the ideal gateway to Brittany, with "optimized infrastructures . . . and no slot, no environmental restrictions."

Let's face it: The controversy surrounding NDDL looks microscopic, but it cannot be ignored. It is frequently headline news in France. Day after day, dozens of demonstrations have taken place in the past several weeks, requiring up to 600 police officers to maintain law and order. Construction of the new airport, which was scheduled to begin recently, is currently on hold and the building site is protected but abandoned. Transport Minister Frederic Cuvillier remains remarkably mute.

Airbus observes a strict "no comment" policy, although it is very interested in the outcome. The European commercial transport manufacturer produces airframe subassemblies at Nantes Atlantique. When completed, these are flown to final assembly lines located in Toulouse in southwest France and Hamburg in northern Germany on A300-600ST outsize airlifters. So Airbus needs Nantes Atlantique to remain open, even if NDDL eventually becomes a reality.

REUTERS/LANDOV FILE PHOTO



An NDDL opponent wears a placard stating: "Ayraultport"—a contraction of French Prime Minister Ayrault's name and aeroport—"Non!"

By Christine Grimaldi

Transport Editor
Christine Grimaldi blogs at:
AviationWeek.com/thingswithwings
christine_grimaldi@aviationweek.com

COMMENTARY

Canada Rising

Air Canada, WestJet to launch ventures in 2013

This year could see substantial changes to the roster of North American airlines, from the potential merger of US Airways and American Airlines to significant industry expansion that is expected to unfold north of the border. Two prominent Canadian carriers seem unafraid of risk in 2013 as they plan to launch ventures that could have far-reaching impacts on fares, routes and ultimately competition. Rival carriers Air Canada and WestJet are set to create new airlines, each staking a claim over a different corner of the marketplace.

RONALD ADAM

International capabilities will take on a new significance as Air Canada proceeds with the launch of a low-cost carrier, Rouge, in July that will fly to leisure destinations in Europe and the Caribbean. The initial Rouge fleet will consist of two Airbus A319s to operate the North American flights and two Boeing 767-300ERs for the transatlantic services. The aircraft will be reassigned from the mainline fleet as Air Canada takes delivery of two Boeing 777-300ERs in 2013, part of five firm orders for 777s. Air Canada's mainline operations, meanwhile, are set for substantial expansion in Asian markets next year as the carrier plans to establish an Istanbul gateway.

A different narrative is unfolding over at WestJet. While the low-cost carrier remains years away from launching an international network, conversations continue about how to take that "logical next step," a spokesman tells Aviation Week. Ultimately, he says those conversations came down to whether WestJet should first branch out with a regional airline or invest in transatlantic widebody aircraft. The result? WestJet Encore, the regional carrier scheduled to begin service in the second half of 2013.

Executives reached the conclusion "that it would make more sense for the natural evolution of WestJet's development to go smaller to start off with," the spokesman says. "As we begin to fill the [regional] network, it makes sense for us to then look abroad."

On the home front, Encore could undercut fares on short-haul routes considered too small for the mainline carrier's Boeing 737 fleet. And that could only ratchet up domestic rivalry. Yet, WestJet seems more than ready to inject a little healthy competition into the marketplace. "We've never been afraid of competition," the spokesman says of Air Canada's various inroads. "Our attitude toward competition is: Bring it on."

Encore will transport passengers on domestic and transborder routes, flights to new destinations, new routes between existing destinations and short-haul routes that could benefit from increased frequencies. The first of 20 Bombardier Q400s will join the Encore fleet in June and options for another 25 of the turboprops remain. Although WestJet has big plans for its mainline fleet in this year—including a retrofit of its Boeing 737s (seen in photo below) with four rows of premium-economy seating—a similar overhaul is not in the works for the regional. The spokesman says WestJet will not include premium-economy seating on the Encore Q400s because of the short flights.

Despite the obvious differences in strategy, Air Canada and WestJet both intend to implement changes reflective of evolving trends, particularly when it comes to the passenger experience. As passengers continue to demand that regulators permit the use of portable electronic devices (PED) across all stages of flight, Air Canada Rouge will offer wireless content streaming to such devices, including tablet computers. WestJet similarly is looking at a new inflight entertainment system for the mainline 737s that will at least be announced—if not rolled out—this year, the spokesman says.

"It's likely to be a combination of some sort of stored content as well as some sort of a connectivity solution," he says, allowing passengers to stream that content to their own PEDs from a server aboard the aircraft. No inflight entertainment options will be offered at Encore, however. "There's no real demand for inflight entertainment when you're only sitting in the chair for an hour or two," the spokesman says.

Air Canada and WestJet are poised to pursue very different approaches in the immediate future as they look to expand their business models. They are motivated, though, by the same philosophy. Both plans reflect the same self-awareness of what the carriers' capabilities are in the present—and what they could become in the future. It is a smart way to think and an even smarter way to do business.

By Frank Morring, Jr.

Senior Editor Frank Morring, Jr., blogs at:
AviationWeek.com/onspace
morring@aviationweek.com

COMMENTARY

Long Pole

Funding uncertainty trumps engineering in NASA's human exploration planning

Congress took time out from its last-minute hustle away from the "fiscal cliff" to declare its continued support for NASA's plans to send human explorers beyond low Earth orbit. The White House position is a little less clear. The Office of Management and Budget (OMB) still hasn't responded to the space agency's internal budget proposal, known as a "pass-back," leaving program planners guessing on the critical question of future funding even as they march ahead on the technical work.

Top exploration-systems managers will meet for three days in Houston this week to review how well the separate human-exploration systems will work as an integrated whole, and identify the issues that must be resolved before humans fly into space on the vehicles they are developing. They don't expect any major technical issues, but their funding expires in March, and that is a problem.

"Right now, for [fiscal 2013], I'm working on a [continuing resolution] that ends March 27," says Dan Dumbacher, deputy associate administrator for exploration systems. "I don't know what my funding level is after March 27, so the best thing you can do is to keep going."

Lawmakers reaffirmed their support for NASA's current spending priorities in a housekeeping measure adopted in the final hours of the 112th Congress Jan. 2. The legislation, needed to extend government indemnification of third-party damages from commercial space launches and allow NASA to continue buying human-spaceflight services from Russia, also included "sense-of-Congress" language reaffirming support for a mix of government and commercial human space vehicles. The law specifically lists the heavy-lift Space Launch System (SLS), the Orion multipurpose crew vehicle, and commercial crew and cargo space vehicles under development with NASA backing as "inherently complementary and interrelated," and it forbids the use of SLS or Orion funding to pay for commercial-vehicle development.

A systems review in Houston this week will decide if all of NASA's advanced exploration hardware can work together.

NASA CONCEPT

The sense-of-Congress approach isn't binding on the White House, which has made no secret of its preference for commercial human spaceflight over the government-backed SLS, sometimes dubbed the "Senate Launch System." But it sends a signal that Congress still supports the compromise embodied in NASA's 2010 authorization act. To be fair, uncertainty over the outcome of fiscal cliff negotiations may have delayed the OMB passback. But things are pretty far along for senior managers to be in the dark about their funding. The systems definition review at Johnson Space Center this week will build on design work already done on the SLS, Orion and modifications at Kennedy Space Center to make sure all of the requirements and interfaces match.

A highlight will come on Wednesday with formal announcement of the European Space Agency's participation in developing the Orion service module, using propulsion-system hardware from ESA's Automated Transfer Vehicle (*AW&ST* Nov. 26, 2012, p. 13).

From an engineering standpoint, things are lining up well for the human-exploration program. The engineering test flight of an Orion capsule remains scheduled for September 2014. Designed to bring an instrumented test article back into the atmosphere at 80% of the speed it would see in a return from the Moon, the test flight will help engineers better determine mass margins on the capsule structure and heat shield. Right now, Orion is about 4,000 lb. too heavy for its recovery parachutes, and the flight-test results may help trim that (although Dumbacher stresses that the margins may also prove too light).

The first combined flight of an unmanned Orion on an SLS is scheduled in 2017 and the first flight with a crew for 2021. With a flat budget at the current $3 billion-a-year rate, and the relatively low level of development needed on the high-heritage systems, Dumbacher sees time to finish the work.

Deliberations at both ends of Pennsylvania Avenue, the historic route President Barack Obama will follow to the White House from his second inauguration at the Capitol, may be another story.

By Jen DiMascio

Congressional Editor
Jen DiMascio blogs at:
AviationWeek.com/ares
jennifer_dimascio@aviationweek.com

COMMENTARY

Preparations Begin

Panetta takes first crack at sequestration cuts

Warning that a looming trio of budget disasters would hollow the military and devastate readiness, Defense Secretary Leon Panetta has asked the military to begin to prepare for one of them—sequestration. "We really have no choice but to prepare for the worst," Panetta told reporters during a Jan. 10 news briefing.

Congress has until March 1 to avoid an across-the-board budget penalty that would cut at least $45 billion from the Pentagon's fiscal 2013 budget (see page 22). Since Congress did not avert sequestration, but simply delayed it by two months, Panetta is taking steps to save money. In a five-page memo, Pentagon leaders are asked to curtail facilities maintenance, freeze hiring of civilians and delay contract awards. The document gives the green light to the Pentagon to plan for sequestration. And as a precaution, the Pentagon will also notify Congress about the potential to implement civilian furloughs, Panetta said.

KYODO/LANDOV FILE PHOTO

Former Sen. Chuck Hagel (R-Neb.) backs a pledge to reduce the U.S. and Russian stockpiles to a maximum of 900 total nuclear weapons over 10 years.

The outgoing secretary and veteran of numerous Washington budget wars says governing used to be "good politics" but that is no longer the case. "Frankly, my fear in talking to members of Congress is that this issue may now be in a very difficult place in terms of their willingness to confront what needs to be done on sequester."

COLD WAR

When former Sen. Chuck Hagel (R-Neb.) appears before the Senate Armed Services Committee as the president's choice to succeed Defense Secretary Leon Panetta, look for him to be grilled about his past statements on Iran, Israel and maybe even his views about sexual orientation. But former colleagues in the Republican Party are also likely to take him to task for his support of downsizing the U.S. nuclear force.

Republicans in the House are not pleased by Hagel's nomination, either. Rep. Michael Turner (R-Ohio), who in the last Congress led the House Armed Services Committee's strategic forces subcommittee, is calling on Senate colleagues to carefully review the nomination and characterizing Hagel's views as "at odds with mainstream thinking."

Hagel, who served on the Senate Foreign Relations Committee with then-Sen. Barack Obama, has taken the talking point further than others in the party. He has signed onto a report by Global Zero that would reduce the U.S. and Russian stockpiles to a maximum of 900 total nuclear weapons over 10 years, on the way to completely eliminating the world's deadliest weapons by 2030. Coupled with the nomination of fellow foreign relations committee colleague Sen. John Kerry (D-Mass.) for secretary of state, Obama has created a "very strong team on arms control," says John Isaacs, executive director of the disarmament advocacy group Council for a Livable World.

SPACE SAFETY

"Funding uncertainty" tops the list of concerns raised by the Aerospace Safety Advisory Panel (ASAP) in its 2012 report to NASA, and so far the panel's experts do not see the agency doing much about it. "As budgets are reduced and funding uncertainty increases, it is essential that NASA increase its awareness of possible safety implications and address those immediately," states the report, released Jan. 9, in a reference to the continuing shortfall in funding for NASA's commercial crew program. ASAP agrees with top NASA managers that without the requested $850 million annual funding, schedules will slip. But the panel also worries the agency might "waiver or reduce requirements in order to accept less expensive or more readily available designs that otherwise would not have been accepted as safe." In an unrelated Jan. 9 briefing on commercial crew program progress, none of the program managers from the companies receiving NASA funds to develop commercial crew vehicles—Boeing, Sierra Nevada Corp. and SpaceX—offered to take up the slack if Congress again short-changes the government's share of the "public-private partnership." NASA tells Congress that, collectively, the companies are kicking in only 10-20% of the total cost of developing their spacecraft.

ANOTHER TOUR

Now that he has retired from Congress, outspoken former Rep. Steven LaTourette (R-Ohio) and his wife Jennifer are creating a Washington branch of a law firm that is based in his hometown of Cleveland. His wife served as her husband's chief of staff before becoming a lobbyist for Van Scoyoc Associates, representing Airports Council International-North America. He was a member of the House Appropriations transportation subcommittee and a leading voice on transportation matters. Revolving-door rules prevent him from lobbying Congress for one year. LaTourette, who left Congress partly because of disgust with partisan rancor, is also making news in his new role as president of the moderate Republican Main Street Partnership. First step: removing the word "Republican" from the group's name.

Embraer Shifts Gears

E-Jet selection marks big gain for Pratt as Embraer prepares for formal launch

Guy Norris Los Angeles

Embraer has made a habit of surprising the industry over the past two decades with the scope and ambition of its commercial airliner development strategy. Now, as it prepares to launch its second-generation "E-Jet" family, the Brazilian manufacturer is continuing that tradition with the unexpected selection of Pratt & Whitney as engine provider.

Having partnered with Rolls-Royce for its ERJ regional jet series, and moved to General Electric for its larger E-170 and E-190 airliner families, Embraer was widely expected to stick with GE for its next-generation family. The selection of Pratt's PW1000G geared turbofan therefore not only marks a decisive milestone for Embraer's second-generation family plan, but poses questions over how quickly Pratt's aggressive market penetration strategy will begin to impact the long-term dominance of GE's smaller commercial engine family.

Embraer plans to formally launch the second-generation E-Jet family later this year, says the company's Commercial Aviation Market President Paulo Cesar Silva. Provisionally outlined for 78-122 seats, the aircraft will be reconfigured with an all-new wing, a full fly-by-wire flight-control system and extended main landing gear to provide more clearance for the higher-bypass engines. Major decisions on other system upgrades and changes are expected later this year, says Silva.

The aircraft will succeed the current GE CF34-powered E-170/-175 and E-190/-195 versions from 2018 onward, though decisions on which second-generation variant is introduced first, and how long production of all the models will overlap are still to be determined, adds Claudio Camelier, Commercial Aviation market intelligence vice president. "The E-Jet family continues to do well, and there will be some overlapping going forward. We also continue to improve the current E-Jets and a big development program is ongoing."

Embraer has taken orders for approximately 1,100 E-Jets, of which more than 900 have been delivered. However with the rise of Bombardier's CSeries, the backlog shrinking, and having already claimed 43% of the 60-120-seat market segment, Embraer says the time is ripe to move ahead on the second-generation plan. "We have decided to reinforce our position and take the necessary steps to maintain or even grab more market share in this segment," says Silva.

For now, however, Embraer's engine decision remains the key talking point as it marks both a significant victory for Pratt's continuing campaign to penetrate the single-aisle market as well as a major blow for GE, which was believed to be in pole position with a mix of the next-generation NG34 and, possibly, a de-rated CFM Leap. The NG34 is based on the common "eCore" design used in the CFM Leap engine and is earmarked as a successor to the CF34. Rolls-Royce, which hoped to build on its relationship established with Embraer on the earlier AE3007-powered ERJ 145 family, had also been in the competition with a new two-shaft engine design.

Two new versions of the PW1000 family will be developed for the Embraer program, unofficially dubbed the "G2." Covering a range of 15,000-22,000 lb. thrust, they comprise the PW1700G and PW1900G, the former aimed at the second-generation E-170/-175 and the latter the new variant of the larger E-190/-195. Silva says the engine decision was made on the basis of technical and commercial considerations. "We do appreciate the relationship with GE, but the proposition that Pratt is offering seems to us [to bring] more value to our customers based on fuel burn and maintenance costs. So we believe it is the best option."

Despite the busy development schedule now facing Pratt, Silva says Embraer is "very comfortable in that regard. United Technologies/Pratt & Whitney is a big organization." Silva adds that Pratt's ongoing progress with development of geared turbofans for CSeries, the Mitsubishi Regional Jet (MRJ), Airbus A320NEO and Irkut MS-21 has reassured the Brazilians that "their engine will deliver the savings our customers are looking for. The decision we are making today is the most credible and we are comfortable with it."

Part of Embraer's comfort level is based on the fact the PW1700G will

Second-generation Embraer E-Jets will feature new wings and taller landing gear to accommodate the higher-bypass geared turbofans.

EMBRAER CONCEPT

be configured with a 56-in.-dia. fan, while the PW1900G will have a 73-in. fan. The smaller engine is therefore a clone of the same-sized PW1200G in advanced development for the MRJ, while the PW1900G is similarly almost identical to the PW1500G now poised to power the first flight of the CSeries. The first engine to go to test is expected early in 2015 in order to provide ample margin for the planned start of flight tests of the initial next-generation Embraer jet in 2016.

Pratt Next-Generation Product Family Vice President Bob Saia says commonality with the MRJ and CSeries engines eases the engine-maker's workload. "These will be newly certificated by model, but a lot of the reports will be based on initial certification tests already conducted on the other engines, such as fan-blade-out and so on." He adds that the selection by Embraer represents "a good fit" for Pratt's overall market penetration strategy.

GE says it submitted a "very competitive bid that was good for our business and shareholders," but adds that its "development and production plates are full for the next several years, including significant engine deliveries to Embraer." The company also says it "looks forward to supporting the more than 1,900 CF34s in service on E-Jets. The engine base will continue to grow since the E-190/-195 is just halfway through its lifecycle." Currently, 780 CF34-8Es are in service on the E-170/-175, and 1,200 -10Es power the larger variants.

Electric Shock

Boeing calls for calm as baffling fire sparks new jitters over 787 electrical issues

Guy Norris Los Angeles

If the Jan. 7 fire on a Japan Airlines 787 at Boston's Logan International Airport proved anything to Boeing, it was that no amount of exhaustive pre-service testing can guard against the unexpected.

It also showed that the 787 remains under unprecedented scrutiny. Even with deliveries well underway and the aircraft performing better than specification, the market reaction to the Boston event demonstrated that the whole company still catches a cold when the program so much as sneezes. The smoke had barely cleared before Boeing's stock began a slide that within hours saw more than $2.6 billion temporarily wiped off the value of the company.

The question now facing Boeing and the regulators is whether the latest incident, which was centered on a lithium-ion battery unit, is more serious than a sneeze and could be the possible trigger for a system modification or redesign. The fire caused "severe fire damage" to the aft electrical/electronics (E/E) bay in which the battery—one of two on the 787—is located, states the NTSB, which is heading the investigation.

The powerful battery is designed to start the auxiliary power unit (APU) and provide back-up lighting power. The Japan Airlines (JAL) 787, which was delivered on Dec. 20, had been on the ground for around 25 min. when smoke was detected in the cabin. Airport firefighters responded and extinguished the fire in 40 min. Although Boeing is not discussing details of the Boston incident while investigations continue, Mike Sinnett, 787 vice president and chief project engineer, says the decision to use lithium-ion technology "was the right choice for us at the time. Knowing what I know now, it would be the same choice."

The fire caused a media furor not only because it was the latest in a series of electrical system-related issues to dog the 787 in recent weeks, but also because it concerned the lithium-ion battery, the use of which was flagged by the FAA in 2007 as a special condition for certification.

Earlier electrical system issues were focused on a rash of problems in a power distribution panel which began on Dec. 4, when a United Airlines 787 was forced to divert to New Orleans. Further problems with the same system were later reported by Qatar Airways and LAN.

However, for all the attention given to these and other early in-service problems, such as leaks in the fuel system addressed by a recent FAA airworthiness directive, Boeing is adamant that the 50-strong 787 fleet is performing to a similar reliability level as the 777 was at this early stage in its service life. It also says dispatch reliability rates are better than for some other early Boeing model fleets. The number of electric-related issues appears to be worse than it is simply because the 787 is the world's first more-electric aircraft and therefore has a disproportionate number of these systems compared to other models, the company avers.

"When I look at these issues they're the same kind we've had on other aircraft. We didn't want those, and we worked just as hard to make those problems go away. We're not complacent and we're not sitting back." None of the problems have "raised significant concerns beyond our experience base," says Sinnett.

However Sinnett acknowledges that the spate of electrical system issues last month "was a surprise. Certainly the event on United Airlines was a surprise to us—we'd only seen one thing that looked like that before (a previously undisclosed event in June), then we saw three more. We were in the middle of corrective action. We had a one-off manufacturing flaw that led to a generator channel (one of six) becoming inoperative. We'd only seen it once in 100,000 hr. on the system. Then we had the similar event on the United airplane and two days later a similar one on Qatar. We realized all three of those

boards came from the same 16 boards in one manufacturing lot."

Sinnett says the Boston event has no connection to other events and is not a sign of widespread design issues. "We are certain that whatever took place at Logan is not related to any previous power-system event. It was a different part of the system with different results and different manifestation. There have been no other endemic issues. We replaced and did some minor redesign of generators but we haven't seen anything that would lead us to question the overall safety or design of that system," he adds.

The APU battery is one of two primary batteries in the 787; the other is the main battery in the forward E/E bay. Both are provided by Japan-based battery manufacturer GS Yuasa as part of the Thales-supplied electrical-power conversion system. The 787 contract, first announced in 2005, marked the first commercial aviation application of lithium-ion technology and was selected over contemporary nickel-cadmium because it provided 100% greater energy storage capacity and double the energy from the same-size unit.

However, in April 2007 the FAA issued a notice of proposed special conditions concerning the use of lithium-ion batteries on the 787 in which it noted that these types of batteries "are significantly more susceptible to internal failures that can result in self-sustaining increases in temperature and pressure (thermal runaway) than their nickel-cadmium or lead-acid counterparts."

The agency said that overcharging, in particular, could result in a "self-sustaining fire or explosion."

Sinnett says, "Because they're lithium ion, the batteries contain a lot of

ENGINEERING

Putting It Together

Constrained by funding, NASA bets on the technologies that will deliver fuel-burn, noise and emissions reductions

Graham Warwick Fort Worth

Limited and uncertain funding has forced NASA to make hard decisions as it selects which technologies to take to the next level in its pursuit of aggressive fuel-burn, noise and emissions reductions for next-generation commercial transports.

A victim of its own success, NASA's refocused aeronautics research program has advanced more technologies than its diminished budget can afford to take forward into the next phase of its Environmentally Responsible Aviation (ERA) project.

So, from a portfolio of 17 different technology suites, the agency has selected eight large-scale demonstrations to be performed under Phase 2 of ERA, a six-year effort launched in 2010 to mature technologies to reduce the environmental impact of aircraft that could enter service by 2025.

The eight integrated technology demonstrations (ITD) range from active flow control to cut drag, through stitched composites to save weight and ultra-high-bypass engines to save fuel, to fuel-flexible combustors to minimize emissions, and redesigned flaps and landing gear to reduce noise.

The ERA project was launched with the objective of maturing technologies to help meet NASA's 2025-timeframe goals of reducing fuel burn by 50% and nitrogen-oxide (NOx) emissions by 75%—relative to today's General Electric GE90-powered Boeing 777—and noise to a cumulative 42 dB below Stage 4 limits.

NASA and Boeing have modified the unmanned, subscale X-48C to demonstrate the noise-shielding potential of a hybrid-wing-body configuration.

NASA

More than 55 individual technologies have been researched during the three-year first phase, and downselecting the demonstrations for Phase 2 "was a more arduous process that we thought," says Tony Washburn, the ERA project engineer who led the team that selected the final eight technology work packages.

The ITDs are intended to increase technology readiness levels (TRL) to between 4 and 6—TRL 6 being the widely accepted threshold for use in product development. "TRL 6 is our goal, but some will not achieve that within the life of ERA," Washburn told the American Institute of Aeronautics and Astronautics' 51st Aerospace Sciences Meeting here last week.

EPA/LANDOV

Firefighters investigate the damaged interior of a Japan Airlines' Boeing 787 at Boston Logan International Airport Jan. 7.

energy and can release it quickly. Unless you design it appropriately that can be a problem. When it is overcharged it can carry more than it is designed for. It is designed so you can never over-charge it. Multiple redundancies are built into the system. Two [safeguards] are built directly in the battery and two are located outside and are independent of the battery. So it is protected with multiple layers. We demonstrated by test and analysis that we are sufficiently safe."

Presenting other scenarios, Sinnett explains "there are a number of things that can cause a single cell to overheat, to discharge and then to vent smoke and—if it gets hot enough—to burn. One is over-discharge in which you let the battery go down too low over successive periods. That can cause damage and lead to a short circuit. So we protect against it by putting in a circuit which protects it from over-discharge or over-charging.

"The other is over-heating of cells, [which could] cause them to vent, or a manufacturing defect could cause a short circuit. But we've had 1.3 million hr. of operation in flight and are pretty confident in the overall design. However we can't assume anything, so if there was a manufacturing defect that would lead to a discharge of potential energy we'd expect the battery cell to vent—which looks like smoke. If the system detects smoke it configures the airflow so it goes through the E/E bay and overboard. If there are failures we know of, that is how it would work."

A requirement for Phase 2 was that the demonstration could be completed by 2015, when the ERA project ends. "It's a finite-life project, so if we couldn't finish, we wouldn't start," he says. And the technologies had to be on a path to a potential product. "It had to have a life beyond ERA."

The active flow-control experiment will flight-test sweeping-jet actuators on the vertical tail to increase rudder effectiveness. Handling an engine failure on takeoff sizes the tail, and increasing the sideforce by making the rudder more effective will allow the tail to be smaller, reducing drag and weight.

The goal is to increase the sideforce 20% on demand using sweeping-jet actuators on the rudder hinge line, for 1-2% fuel saving. Wind-tunnel tests have demonstrated a 50% improvement. The flight test is planned for 2014-15 and will take active flow control to TRL 6, says Washburn.

A second experiment on the same aircraft will test engineered surfaces designed to prevent insects from adhering to the wing leading edges and disrupting natural laminar flow, a key drag-reduction technology. NASA is testing several engineered surfaces combining hydrophobic coatings and laser patterning to mitigate insect adhesion during takeoff and landing.

The second ITD will ground-test damage-arresting stitched composite structures that promise to reduce airframe weight by 25% over Boeing 787-level technology. The demonstration in 2015 will involve the 80%-scale, 30-ft.-wide wingbox for a hybrid-wing-body aircraft, a configuration NASA believes offers fuel-burn and noise advantages over conventional tube-and-wing designs.

The adaptive compliant trailing-edge experiment will replace the conventional flaps on a Gulfstream III with flexible composite flaps that form continuous bendable surfaces with a gapless transition between wing and flap. Flights are planned for 2014-15 and will take the technology to TRL 6, Washburn says.

A wind-tunnel experiment will test designs that reduce noise from flap edges and landing gear, using an 18%-scale semi-span model of a Gulfstream III. NASA is aiming for a reduction of 4-5 EPNdB in flap noise and 3-4 EPNdB in gear noise with minimum weight and drag increases. Flight tests will follow in 2014.

Aiming for a 2-3% reduction in specific fuel consumption (SFC), NASA will rig-test a highly loaded three-stage "front block" compressor—the initial stages of a high-pressure compressor with a pressure ratio in the 30:1 class. "Front block losses limit aerodynamic efficiency," he says.

Another ITD will mature ultra-high-bypass (UHB) engine technology, aiming for a reduction of 9% in SFC and 15 EPNdB in noise. Targeted at second-generation geared-turbofan engines, the ground demonstration will test over-the-rotor and soft-vane acoustic treatments and low-loss fan exit guide vanes.

A further engine-related demonstration will involve full annular rig tests of a low-NOx, fuel-flexible combustor. The goal is a 75% reduction in landing and takeoff NOx emissions. In Phase 1, small-sector tests of lean-burn combustor designs from General Electric and Pratt & Whitney exceeded the goal, with Pratt's design achieving an 88% reduction, says Washburn.

The final ITD involves integration of UHB engines on a hybrid-wing-body aircraft, in pursuit of SFC savings of at least 50% through propulsion/airframe integration. "We hope to do it with no more than a 1% drag penalty," says Washburn. "But we would be thrilled with 1.5% and accept up to 3%." Wind-tunnel tests will take the technology to TRL 4. "To get to TRL 6, we need a large-scale flight vehicle." NASA has been unable to secure funding yet for a hoped-for subscale test vehicle.

The ITDs selected will have to be phased to stay within the $70-73 million in annual funding allocated for Phase 2 of the ERA project. "Flat is not the best profile as we ramp up, but we will phase resources for the ITDs, with some up-front and some moved later," Washburn says.

"With these demonstrations we will take what we've learned and move from the laboratory to more flight and ground tests," says Fay Collier, ERA project manager. "We have made a lot of progress in our research toward very quiet aircraft with low carbon footprints. But the real challenge is to integrate the pieces together to make an even larger improvement."

Uncertain Times

Signs of Pentagon spending plans emerge

Jen DiMascio Washington

The financial woes of the U.S. were hardly solved by a deal to extend taxes at the end of 2012. In fact, over the next two months, the U.S. government faces a new confluence of deadlines: a potential default on its debt obligations, across-the-board budget cuts of nearly $1 trillion and a possible government shutdown. The combination of events has even the most seasoned budget planners on their heels.

"I've never seen a period featuring any greater budget uncertainty," says Pentagon Comptroller Robert Hale, who has worked with U.S. defense dollars since the 1970s. "It gives a whole new meaning to the term 'March Madness,' and I can't wait for it to be over."

Government and industry planners are looking to navigate the madness as it becomes clear that regardless of sequestration, the Pentagon's investment programs are going to take a hit. The question is the extent to which the cuts will be directed and where they will fall.

In its final days, the 112th Congress averted a so-called fiscal cliff by extending tax cuts and delaying the budget penalty known as sequestration. Now the government has until March 1 to come up with a new agreement. But the Bipartisan Policy Center warns that the U.S. will hit the debt ceiling between Feb. 15 and March 1, putting pressure on lawmakers to reach a deal next month to increase the debt limit and substantially reduce the federal deficit.

The proximity of those two deadlines "implicitly ties" sequestration to the debt-ceiling debate says Todd Harrison, senior budget studies fellow at the Center for Strategic and Budgetary Assessments.

Whether sequestration happens is still a very open question. Answering it involves the ongoing three-way tussle over taxes, entitlements and discretionary spending, the first chapter of which was only partially addressed in an agreement between Vice President Joe Biden and Senate Minority Leader Mitch McConnell (R-Ky.) as 2012 turned into 2013. The delay to sequestration was added to the deal late in the process, Harrison notes.

Analysts and industry officials are fairly divided as to whether lawmakers will succeed in this round of deficit talks.

With a more Democratic Senate and a second Obama term, McConnell may be more willing to compromise. But the same spirit does not hold true on the other side of the Capitol, where House Republicans have not gone along with House Speaker John Boehner's latest proposals.

And if Democrats are unwilling to give ground on cuts to entitlement programs, Republicans could hold firm on sequestration, a defense lobbyist says.

According to the new law, the penalty of sequestration imposed for lawmakers' failure to reduce the deficit by $1.2 trillion would be imposed on March 1, Harrison explains. But new budget caps are imposed on March 27, the same day that the current continuing resolution expires.

If sequestration takes place, the cut to defense in fiscal 2013 is just $45 billion, down from a Pentagon-estimated $62 billion, according to Hale.

Hale and Deputy Defense Secretary Ashton Carter testified to Congress in August that sequestration would force a cut of four F-35 Joint Strike Fighters in fiscal 2013, compared with the budget request. If sequestration does take place in March, it would represent a 9% reduction on every line item in the budget, Hale now says. That would include JSF production and research for Lockheed Martin's prized fifth-generation fighter, though program officials will have to decide how those cuts are directed within each project line item.

Decreasing production quantities could force the government to renegotiate contracts—without much leverage, Harrison says, citing the KC-46A tanker program as an example. The program is receiving $1 billion less than it expected under the terms of the fiscal 2013 continuing resolution. Boeing bid aggressively to win the contract. Now, if the government has to renegotiate, Harrison asks: "Are we in position to maintain a competitive price?"

A number of defense industry analysts believe that the deal on tax extensions paves the way for an agreement to avert across-the-board spending cuts.

"It looks like a small step, but I think it was quite a big one," says Richard Aboulafia, vice president for analysis at the Teal Group. "Hopefully, it's a small bite out of a big balloon."

According to Aboulafia, because those who were unwilling to compromise on spending issues were marginalized in the fight over tax increases, a deal on avoiding sequestration is more likely.

Loren Thompson, chief operating officer of the industry-backed Lexington Institute, expresses a similar view in a column in *Forbes* magazine: "When the chips were down, the parties proved to be flexible. So it seems a safe bet that the same thing will hap-

Budget Dates To Watch

- **Feb. 4** — Would-be release of fiscal 2014 budget. Likely to be delayed.
- **March 1** — Deadline to replace sequestration with deficit deal.
- **March 27** — Government to implement sequestration for fiscal 2013 if no deal is reached; continuing resolution that provides fiscal 2013 funding expires.
- **April 15** — Deadline to complete congressional budget resolution that sets spending levels for fiscal 2014.
- **Oct. 1** — Start of fiscal 2014.

pen when more crises come along in March," Thompson writes.

"The debt limit will be raised, the stopgap spending measure currently funding government operations will be replaced by something that avoids a shutdown, and the sequestration provisions of the Budget Control Act will be diluted," he continues.

Industry experts project that even if sequestration is averted, the Pentagon could face cuts of $30-45 billion per year over the next 10 years.

"If we can plan it, it would be a glide-slope as opposed to a karate chop," says Tom Captain, Deloitte's global leader for aerospace and defense. "That would be making the best out of a bad situation."

If the Budget Control Act already takes 10-12% off the top lines of the major defense contractors, additional cuts are likely to reduce them by another 6-12%, Captain says. While a 25% total reduction would be a less severe drawdown than historical postwar averages, the abruptness and uncertainty of these budget negotiations mean neither government nor industry can plan efficiently, he says.

The best outcome, says Harrison, is for the government to provide a gradual, annual 2.2% decline in defense spending over the decade. The deficit savings would be the same as the sequester, but the gentle slope would allow the Pentagon to plan adequately for the change. But such an outcome is far from likely, he admits.

If lawmakers do reach a deal that still makes cuts to Pentagon spending, then defense companies that have been united in a "Second-to-None," don't-cut-the-budget campaign will take to their individual bunkers, and a war for scarce dollars will begin.

The Pentagon already appears to be positioning to sell additional reductions. During a recent speech at the Brookings Institution, Hale noted that the Pentagon seeks to continue its strategy of improving the way it does business to achieve savings through what are known as "efficiencies."

But a drawdown will mean changes—and they will hit modernization accounts first. "There's a long history and a good reason why early in a drawdown, the cuts tend to be heavily on the investment portion of the budget, because it takes us awhile to make force-level decisions and then we gradually draw down the size of our forces," Hale says. "If we are allowed the ability to make choices, they will probably be investment-heavy at the beginning."

The revised sequester would leave the fiscal 2013 base defense budget slightly higher than it was in fiscal 2007.

In its fiscal 2013 budget request, the Pentagon asked for the authority to begin cutting bases and outlined current and future force structure cuts. It has also been begging Congress to make changes to military health care and entitlement programs. But last year, lawmakers continued to push back on all three fronts.

Expect the Pentagon to repeat those requests. Hale is putting the onus on Congress to give the Pentagon the tools it needs to reduce the budget. "If the Congress wants us to hold down defense spending and . . . they want us to reduce the number of civilian personnel, they need to give us authority to move ahead with infrastructure consolidation," Hale says.

The 2005 base-realignment effort, which cost the government rather than adding savings, should not be used as a guide, he asserts. Rather, two rounds of base closures in the 1990s eventually provided an average annual cost savings of $2-3 billion per year, Hale adds.

The president, now past his final election, could push for a base closure round. And Congress has a year to put it forward that is not consumed with a presidential election. But, a lobbyist points out, midterm congressional elections are just around the corner.

The outlines of investment cuts are taking shape, says a Senate aide. The Army is transforming costly heavy brigades into lighter ones and aiming for an earlier down-select of one contractor for the Ground Combat Vehicle—both moves that could save dollars.

Once the initial block-buy of Littoral Combat Ships is completed in 2015, the Navy could opt to truncate the purchase of more vessels or down-select to one contractor in favor of purchasing Virginia-class submarines or Aegis ships, the aide says.

Plenty of think tanks have offered up their ideas about how the Pentagon can extract dollars. Michael O'Hanlon of the Brookings Institution suggests a number of options, including halving the purchase of F-35 Joint Strike Fighters and scrapping the replacement program of Ohio-class submarines while continuing to make the older version. Both ideas would encounter significant resistance among lawmakers.

On top of all of these potential outcomes, the situation within the Pentagon is compounded by the fact Defense Secretary Leon Panetta is retiring and the approval of former Sen. Chuck Hagel (R-Neb.) as successor is still not certain.

Hagel, whose confirmation is under fire in part because he bucked the Republican Party's position on Iraq war policy, earned a reputation for backbone. "He's willing to say 'no' and alienate people," says John Isaacs, executive director of the Council for a Livable World.

'Critical Shortfalls'

Audit report highlights delays in U.K. air transport and air-to-air refueling programs

Tony Osborne London

The U.K. faces capability gaps in tactical air transport and air-to-air refueling as it prepares to pull troops out of Afghanistan. Delays in the introduction of the Airbus Military A400M airlifter and A330 Voyager tankers purchased through the Future Strategic Tanker Aircraft (FSTA) program as well as budgetary constraints have created "critical shortfalls in some capability areas," according to the U.K. National Audit Office (NAO).

In its annual Major Projects report, which looks at the 16 largest procurements being undertaken by the British Defense Ministry, the NAO says both air transport programs along with the development and construction of the Queen Elizabeth II aircraft carriers are responsible for the biggest cost increases. The report states that expenses for FSTA rose by £257 million ($412 million) between 2011 and 2012, while those for the A400M program went up by £163 million during the same period. However, the NAO points out that these costs were caused by higher fuel prices and contributions to export levy facilities, respectively, over which the ministry has little control.

Delays in the two programs have forced the ministry to find expensive workarounds as it prepares to begin withdrawing troops from Afghanistan at the end of 2014. According to the NAO, £787 million has been spent on air transport and air-to-air refueling aircraft to support current operations and address capability gaps. The late arrival of the A400M has led to the life extensions of several increasingly elderly and maintenance-intensive Lockheed Martin C-130K Hercules models to meet tactical transport needs, while extra capacity will come from the purchase of two BAe 146-200 airliners now being converted for operations in Afghanistan in the coming months.

The NAO also states that there will be a one-third gap in tactical air transport starting in 2022 when the Lockheed Martin C-130J is retired. Strategic airlift provided by the Royal Air Force's fleet of eight Boeing C-17s will "essentially be able" to meet the requirements, the report says. The C-17 fleet was boosted in 2012 by the arrival of an eighth aircraft, and work is progressing on the possible addition of a ninth before the expected closure of the C-17 line in Long Beach, Calif.

Ongoing issues to clear A330 Voyagers for air-to-air refueling has forced the RAF to retain the Vickers VC10 fleet beyond its March 2013 retirement date until September at least, the NAO says, while the Lockheed Martin TriStar tanker/transport's retirement has been moved to March 2014 from July 2013 at a cost of £7 million. The Voyagers are expected to achieve full air-to-air refueling capability in May 2014.

But in an open letter to the NAO, Phill Blundell, CEO of AirTanker Ltd., which provides the Voyager tankers under the FSTA contract, says that although the report highlights that the program is on time and on schedule, the report "significantly distorts perception of its performance, especially against other programs where those same inflationary costs are not considered."

Blundell's letter also states that "the suggestion made in the report that the [Defense Ministry] is extending the service life of its VC10 and TriStar fleets because of perceived risk of 'delays' in the FSTA program is disappointing given the report's acknowledgement that the program, in actuality, is very much on schedule."

In the letter, Blundell asserts that the report is a "detraction from a program that continues to make good progress toward full service capability. This includes our expectation of imminent release to service from the [Defense Ministry] to begin air-to-air refueling operations ahead of substantial buildup of capability throughout this year and next."

Three Voyagers have entered service with the RAF, but they are only cleared for use in the air transport role because of issues with their hose-and-drogue refueling system. After problems were discovered with the basket, AirTanker says a new one has been "trialed and successfully tested and is waiting for 'paper' approval from the [Defense Ministry]." The company says it expects this "imminently."

The NAO report also focused on helicopter lift, in particular updating of

The A400M's late arrival has forced the U.K. to spend extra money to keep aging fleets operational.

TONY OSBORNE/AW&ST

CH-47 Chinook avionics and the introduction of the AgustaWestland AW159 Wildcat. Project Julius is a £280 million effort to achieve a common avionics standard among the 46 Chinooks now in operation with the U.K. armed forces and the 14 extra aircraft ordered from Boeing. Due to delays in the software integration process for the Thales TopDeck cockpit, officials pushed service entry back 19 months to April 2013 from September 2011. However, the first Julius aircraft were able to reenter service last summer and were deployed to Afghanistan in December, reducing the delays by 10 months.

Introduction of the Wildcat into British Army service has been shifted to August 2014 from January 2014, while the naval version is still expected to enter service in January 2015.

Less clear, though, is progress in co-developing with France the naval Wildcat's primary weapon, the Future Air-to-Surface Guided Weapon (FASGW) (Heavy). According to the NAO, decision points for the new weapon, which will replace the Sea Skua antiship missile, were delayed last year because of the need to secure approval from France.

"Discussions are still ongoing, but are dependent on the outcome of the French government's spending review that is currently being undertaken," the NAO says. "There will now be at least a 19-month gap between the existing capability leaving service and the new missile being available." The NAO adds that the Defense Ministry is examining whether it can extend the life of the Sea Skua until the FASGW weapon is operational.

The in-service date of the new Meteor air-to-air weapon has been pushed back to June 2017 because of delays in the completion of the Eurofighter Typhoon's Future Capability Program 1, which is now expected to enter operation in December 2013, boosting the type's multirole capabilities in the air-to-air and air-to-ground role.

Meanwhile, costs for the development and introduction of the Queen Elizabeth II-class aircraft carrier also increased by £217 million between 2011 and 2012. The NAO points out that the increased expenses are a result of the ministry and industry "having greater understanding of the costs and not being able to fully deliver agreed cost-reduction opportunities."

Amyas Morse, NAO comptroller and auditor general, says the Defense Ministry "faces a difficult task of striking a balance between delivering the capabilities it wants and those it can afford. There will always be factors over which [it] has limited control, but it must do more to learn from previous projects."

While the NAO report focuses on program management problems, several former senior commanders have expressed concern that defense is seen as a "sacrificial lamb," suffering larger cuts to meet austerity measures than other government departments.

In a report for lobbying group the U.K. National Defense Association, former Air Chief Marshal Michael Graydon writes that "mass matters, and all the armed forces, the Royal Navy and RAF in particular, will have to find a better balance between the demands of high-tech warfare and the simple fact that quantity has a quality of its own; it will require an honest recognition that without the United States we are severely restricted in what we can actually achieve."

Detour from Rome

Finmeccanica takes another blow in the U.S. market as Air Force walks away from the G222

Amy Butler Washington and Tony Osborne London

The last few years have been tough for European defense manufacturers that planned a decade ago to boost their presence and, if possible, establish manufacturing sites in the U.S.

The past year has been a bitter pill particularly for Italian conglomerate Finmeccanica, which owns Alenia Aeronautica. The top two programs cited by the company's North American branch—both centered on a tactical cargo airlifter—have now fizzled in the U.S. market. A recent decision by the U.S. Air Force to end work on a training and support contract for the Afghan Air Force's refurbished G222 transports was a major blow last month, right on the heels of its decision last winter to end buys of a new version of the aircraft, called the C-27J.

The company was already disillusioned with its Pentagon experience after the abrupt 2009 cancellation by the Navy of the next-generation U.S. presidential helicopter program, for which Finmeccanica's AgustaWestland helicopter unit was teamed with Lockheed Martin.

Despite these setbacks, Finmeccanica officials say they do not plan to cut back their U.S. operations. "Finmeccanica's presence in the United States dates back more than a century and our commitment to this country extends long-term. We remain highly optimistic about our future prospects in the largest defense and security market in the world," says a statement provided by Finmeccanica North America spokeswoman Angelica Falchi. "We are currently in pursuit of both near- and long-term programs with the U.S. government."

Potential opportunities include a forthcoming competition to replace the aging Air Force T-38 fast jet trainer fleet with about 350 new airframes as well as an Army OH-58D Kiowa Warrior follow-on.

Finmeccanica North America's 2008 acquisition of DRS Technologies, primarily known for providing electronic systems to the Pentagon, is expected to be a major growth area. The company's North America operation is in the midst of a restructuring designed, in part, to adjust to U.S. market realities. Headquarters in Rome has also undergone a restructuring, including consolidations aimed at operating efficiencies.

The G222's demise is not only a bad mark for Alenia; it is the latest in a

string of failures by the Pentagon to efficiently field aviation assets for Afghanistan as the White House presses ahead with plans to pull forces out in 2014.

The Army botched its plans to sole-source and field Mi-17s there. And the Air Force has yet to make good on a promise to field a light attack/armed reconnaissance aircraft for Afghanistan after a contractor protest waylaid its source selection process.

Meanwhile, Finmeccanica's hopes of establishing a stateside final assembly footprint in the near term are dashed. And it is nearly impossible for the company to meet its internal growth plans in the U.S. without these major contracts.

The U.S. Air Force is halting funding for Alenia to operate the G222 fleet in Afghanistan and train pilots there on the tactical transport.

TONY OSBORNE/AW&ST

Unlike the C-27J program, which was outright terminated, the Air Force opted simply not to renew its contract with Alenia North America to support and induct the G222s, dubbed the C-27A by the service, into the Afghan Air Force.

The final decision was relayed by the Air Force in a Dec. 18 letter following two earlier warnings of dissatisfaction with Alenia's work.

The G222 program was Alenia's first as a prime contractor for the Pentagon. The Air Force paid Alenia $341 million to refurbish 20 aircraft—bringing five configurations of the G222 into a single C-27A variant—for the Afghan Air Force. USAF officials praised Alenia's performance, despite some early refurbishments requiring 50% more hours than planned, for which the company picked up the tab.

But major issues surfaced as Alenia moved forward in executing a second deal worth more than $600 million to train Afghan pilots and crews and support the fleet in Afghanistan.

The decision comes after what Air Force officials call "failed attempts" by Alenia to "generate a sufficient number of fully mission-capable aircraft for effective [Afghan] airlift capability." According to Ed Gulick, a USAF spokesman, "though the Air Force assisted Alenia throughout the program in an effort to help the program succeed, Alenia struggled to consistently achieve key contractual requirements."

An industry official says Alenia is exploring whether it has any recourse to the decision. As this is not a contract termination, there is little opportunity for significant termination liability costs to be reimbursed. And without a major U.S. prime contractor involved, the company does not have significant weight in Congress to seek political help outside the Pentagon.

Sixteen of the 20 aircraft have been delivered to Afghanistan—though not all are flyable. Four remain in Italy. Despite a deployed team of contractors, and a decision by Alenia to bring in DynCorp last March to help rectify the problems, the fleet has been temperamental and was grounded twice, once in December 2011 on airworthiness grounds and again last March because of safety issues that delayed the training of Afghan personnel.

While acknowledging problems with the aircraft's introduction, a company official says the fleet is now exceeding the requirements set by the U.S. Air Force. The industry official says Alenia was sent notices warning it of contract deficiencies but never received Air Force feedback on its responses. Alenia funded some contract activities, although terms were not fully ironed out.

"Conservatively, we spent around $20 million of our own money sourcing new parts for these aircraft. That was spent in good faith to retain the contract," the industry official says. Alenia sourced parts from G222s stored in Argentina to keep the Afghan fleet going and brought in DynCorp for engineering and training and General Dynamics for translation services. Engineers were limited by the number of available hangar slots as they worked on the aircraft, the industry source notes.

Air Force officials acknowledge that 10 aircraft are now flying, and the industry official points out that this exceeds the six required.

Around $600 million has now been spent on the program, and the industry official believes that spending another $60 million would ensure the type's continued operation. This would cost less than introducing a new type such as the C-130, into the fleet, according to the industry official, who says such a move would require the retraining of personnel on a more complex system.

Air Force officials note that they will provide some C-130 support to help close the gap left without the G222s. Also, 26 Air Force-procured Cessna 208s and the Mi-17s bought by the Army are providing airlift in Afghanistan.

In a statement, an Alenia spokesman says the company remains committed to the success of the G222 program and the U.S. Air Force as it stands up a trained and capable Afghan Air Force. "Our team works tirelessly to support the program, meet our commitments and swiftly address any concern, big or small, even those connected to other parties," the company says.

The NATO Training Mission and the USAF will suspend C-27A flight operations in Afghanistan in the coming weeks, but no decision has been made on the final disposition of the aircraft and the associated support equipment and spare parts.

Gulick says, "Air Force leadership continues to recognize and support Afghanistan's need for a sustained medium-airlift capability to meet current and future Afghan national security requirements. U.S. and Afghan Air Force leadership are engaged in talks . . . on the next steps."

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Shields Up

Wraparound magnets studied for deep-space radiation protection

Frank Morring, Jr. Washington

Astronauts on deep-space missions may one day deploy protective magnetic fields similar to those that shelter us from deadly space radiation on Earth, just as they will carry the necessary food and atmosphere.

NASA and its industrial and academic partners are studying ways to use superconducting magnets to generate magnetic fields around deep-space habitats. A promising approach would use coils that "inflate" with their own magnetism to deflect solar-flare protons and galactic cosmic rays that otherwise would restrict human travel time in space.

"The concept of shielding astronauts with magnetic fields has been studied for over 40 years, and it remains an intractable engineering problem," says Shayne Westover of Johnson Space Center (JSC). "Superconducting magnet technology has made great strides in the past decade."

Westover is principal investigator on a NASA Innovative Advanced Concepts (NIAC) grant to study high-temperature superconductor technology as an approach to active radiation shielding for astronauts. Under the grant, JSC is working with a company that has expertise in superconducting magnets to gain some definition on just how effective they can be in protecting spaceflight crews.

"Radiation shielding, if it is not at the top of the list, is No. 2," says Palm Bay, Fla.-based Advanced Magnet Lab President Mark Senti. "They have propulsion figured out, and I'm not trivializing anything. They have solar protection and energy, but if you don't solve radiation shielding, there's no sense in doing engineering everywhere else."

That was essentially the conclusion of the panel headed by former Lockheed Martin CEO Norman Augustine that studied the future of human spaceflight, at the beginning of President Barack Obama's first term. Since then, NASA has increased its focus on "enabling technology" for deep-space human exploration. The two-year, $500,000 NIAC grant headed by Westover is examining an AML concept that would launch superconducting-magnet coils and then expand them to provide the diameter necessary to produce enough magnetic shielding to protect a crew.

AML Chief Scientist Rainer Meinke conceived of attaching superconducting magnetic tape to a flexible material such as Kevlar. The perpendicular expansion provided by the Lorentz force when current is passed through the tape opens it from a collapsed configuration maintained during launch into large coils that can encircle a habitat. The current concept would launch six collapsed coils and the habitat separately, and then set up the active shielding in space (see illustration).

"In a superconducting magnet, because you're able to transmit electricity with zero resistance, [you can] pass very high currents, which means very strong magnetic fields," Senti says.

AML plans to conduct a subscale demonstration of the coil expansion at the National High Magnetic Field Laboratory in Tallahassee, Fla. However, most of the work under the NIAC grant will be analytical. Westover and his colleagues at JSC, AML, NASA's Ames Research Center and Italy's University of Perugia plan to move beyond the Phase 1 concept definition already funded into more detailed engineering.

Among the issues to be considered, says Westover, is gaining a "total spacecraft" understanding of the radiation dose a crew would receive inside the magnetic shield surrounding a 6-meter-dia. X 10-meter-long (19.6 X 32.8-ft.) cylindrical habitat. Because the shielding does not cover the cylinder's end caps, Westover and his team will calculate the passive shielding that would be provided at one end by a propulsion module and at the other, by a docking mechanism for the planned Orion multipurpose crew vehicle. Scientists in Perugia will conduct Monte Carlo simulations of radiation traces through the notional hab, which will include a compensation coil to protect crew and electronics from prolonged exposure to the strong magnetic "fringe fields" that would otherwise enter the living space.

Also on the agenda is a search for ways to expand manufacture of superconducting magnetic tape from hundreds of meters to the "kilometers" that would be needed in the concept. While the tape exerts almost zero resistance on an electrical current—allowing it to maintain its magnetic field with only a "trickle current" from the habitat's solar arrays—splices in the tape add resistance and increase power requirements, says Westover.

NASA/NIAC

For years, engineers also have studied toroidal coils as a way to shield space habitats. But the structure needed to hold the magnets in place—and the power necessary to produce a magnetic field strong enough to protect the crew—creates "very large forces on the hab." In concept at least, that problem would be mitigated by the expandable-coil approach. The NIAC study should help refine the understanding of just how much better that setup will be at lowering the lifetime radiation doses for deep-space crews.

As a practical matter, the shielding can be expressed as the number of space launches needed to deliver enough of it to protect a crew for a mission lasting a year or more. Compared to passive shielding, the effectiveness of active shielding "might be as high as two to five launches," Westover says.

Reflecting Confidence

Russian Helicopters believes final assembly outside the CIS could boost opportunities

Tony Osborne London

Plans to produce helicopters in India and China indicate a new direction for Russian Helicopters as the state-owned manufacturer makes bigger strides to take on its Western rivals.

The consortium, 100% owned by Oboronprom, Russia's aerospace holding company, wants to open an assembly line for helicopters in India. The new facility would be a critical component in the push to win the Indian armed forces' requirement for 197 light multirole helicopters—a program in which the coaxial Kamov Ka-226 is competing. It would also provide a useful advantage as India's civil helicopter market begins to take shape.

Russian Helicopters signed an agreement on Dec. 26 with Elcom Systems Private Ltd., part of the Indian investment conglomerate SUN Group, to set up a new facility to build models from the Mi- and Ka-families of helicopters. The move is significant because until now Russian Helicopters has not built a single helicopter outside the Commonwealth of Independent States (CIS), instead operating from its facilities inside the Russian Federation.

But now, Russian Helicopters, under the leadership of CEO Dimitry Petrov, is taking a view similar to that of its Western rivals, Eurocopter and AgustaWestland, both of which have set up final assembly lines overseas to establish a greater foothold in the region. Russian Helicopters currently claims a 14% share of the military and civil market, but is keen to boost that figure as it introduces new products.

While it is recognized that ambitious fighter programs may deliver groundbreaking technologies, the local manufacture of helicopters, particularly for the commercial and parapublic market, can deliver useful skills and knowledge. The increased use of rotary-wing aircraft as air ambulances and for law enforcement also indicates improvements in a population's quality of life.

Russian Helicopters has so far provided only scant details on the India project. But it is likely to start with the production of components for the Ka-226 light helicopter before expanding to build and complete final assembly of the aircraft, as well as engage in ground and flight testing of the type and other models in the Russian Helicopters stable. The move comes following Russian President Vladimir's Putin's pledge to strengthen historically strong ties between his country and India, despite the fact that several significant defense programs have not all gone Moscow's way.

RUSSIAN HELICOPTERS

The two countries did, however, sign off on a significant contract to purchase new Sukhoi fighters and Mi-17 helicopters. Similar plans for helicopter production have also been discussed for China, another strong Russian Helicopters customer, which recently ordered 52 Ulan-Ude-built Mi-171s. In conjunction with Chinese manufacturer Avicopter, joint production of the Kamov Ka-32 model is being explored and work is pushing ahead on the development of a new heavy-lift helicopter—smaller than the 56-ton Mi-26 with a maximum takeoff weight of around 30-40 tons. It has been suggested that production of Ka-32s in China could begin in two years. A similar scheme discussed for Jordan in conjunction with Oboronprom back in 2006, also to build the Ka-226, has fallen by the wayside.

Russian Helicopters believes that orders of around 50-70 medium helicopters would provide a promising business case for local assembly, given reduced labor costs, and would open the possibility of new supply options for components.

Russian Helicopters' plans mirror those adopted by its European rivals. Indeed, the company already works with AgustaWestland to produce the AW139 medium helicopter in Russia, through the Helivert joint venture. The two companies are also working on a light helicopter program. In Brazil, companies such as Aernnova do Brasil hope that successful production of tail booms for Eurocopter subsidiary Helibras could ultimately result in securing work now done on the EC725 and EC225 heavy helicopter production line in France. Production in Brazil could yield savings of between 10-20%, according to Eurocopter.

The Indian air force operates a large number of Russian-built helicopters.

Aernnova started building the tail booms in mid-2012 to feed Helibras' newly opened production line for the EC725 helicopter, of which 50 will be built for the Brazilian armed forces. Under Brazilian law, the new aircraft must feature 50% Brazilian content. As a result, Helibras has contracted work on key structures and other major components to local companies. With the production line, Helibras also has the capability to build the civil version of the helicopter, the EC225, allowing Helibras to serve the burgeoning Brazilian oil and gas market. The skills developed through the program will also ultimately allow Helibras to play a role in the development of future products in the Eurocopter stable.

Eurocopter believes this model can work elsewhere, and is offering it to the Polish government as Warsaw seeks options to replace its aging fleet of Mi-8, Mi-14 and Mi-17 transport helicopters. AgustaWestland and Sikorsky already have established mechanisms to offer helicopters to Poland through the purchase of Polish manufacturers PZL-Swidnik and PZL-Mielec.

The Hybrid Way

European airlines test diminished customer-service offerings to counter low-cost carriers, but success is in no way assured

Jens Flottau Frankfurt and Cathy Buyck Brussels

Europe's network airlines are finally realizing that low-cost carriers are here to stay. More importantly, they are also conceding that passengers are willing forgo some creature comforts and pay extra for add-ons such as checked baggage, seat selection and food.

Air France, which has long-resisted the idea of mixing "no frills" with its traditional full-service approach, last year took a first U-turn on the matter and vowed it would develop its low-cost Transavia subsidiary to respond to the growing leisure travel segment. The in-house low-cost carrier (LCC) will develop its network and expand its Boeing 737-800 fleet to 20-22 aircraft by 2015.

Now the carrier is taking a further step in bringing its short- and medium-haul non-hub operations more in line with LCCs in an effort to return the division to profitability. A new pricing and service structure is being introduced on flights from and to its French provincial bases and Paris Orly Airport. The revamp includes the launch of the "MINI" low-cost model fare which does not include checked luggage, online seat selection or frequent-flier miles. "Low-cost carriers are upgrading their product offering to capture the business traveler. We extend the scope of our traditional service offering on the other end to accommodate the budget traveler," the airline states.

Air France research shows that 60% of passengers see price as a determining factor when choosing a flight. With the unbundling of its services and fares, the flagship carrier aims to recapture market share lost to low-cost carriers such as EasyJet and Ryanair—France's second- and third-largest airlines by enplanements, respectively.

The new fare category, which is offered in parallel to Air France's standard all-inclusive fares, initially is available on flights to 58 destinations on the short- and medium-haul network from Paris Orly to Marseille, Nice and Toulouse. The airline operates a single-class cabin on these routes. Under the new pricing system, checked-baggage fees will be €15 ($19.60) online or €30 at the airport—a price segmentation which is typically used by LCCs. One-way tickets, which start at €49 including tax, are not refundable or transferable, but passengers will receive a limited choice of free drinks and snacks during the trip.

Air France however is keen to emphasize that it remains a full-service carrier. "We're not becoming a low-cost airline, we are continuing to offer the Air France quality of service," CEO Alexandre de Juniac says.

The move reflects similar initiatives proposed by its biggest rival in Europe, Lufthansa. The carrier is transferring a large part of its short-haul network to low-fare affiliate Germanwings starting next summer. Germanwings will try to combine product elements typically provided by full-service airlines such as flexible tickets, free catering, lounge access and priority check-in and security as well as business-class-like seating with a much more downscale product that includes a pay-on-board concept.

Many airlines have decided to a least consider outsourcing the entire narrowbody operation to become more cost-competitive.

While the Germanwings transfer is likely to bring some improvements, there are still some obstacles: The LCC unit is moving to an all-Airbus A319/A320 fleet, whereas Lufthansa operated a mixed Airbus, Boeing and regional jet fleet in its previous direct services division. However, Germanwings will still wet-lease a substantial number of Bombardier CRJ900s from Eurowings, raising questions about its unit-cost performance. Also, at least initially, pilots and cabin crew will paid at Lufthansa rates.

Germanwings has been grappling with its own cost issues and has posted substantial losses linked to its closer integration with Lufthansa in recent years. But the transfer is not intended to lead to lower costs compared with the previous levels, it merely aims at keeping unit costs flat.

Iberia, like British Airways an International Airlines Group (IAG) unit, is facing crucial negotiations with its unions this month as the company seeks substantial job and pay cuts. The airline's revamped short-haul program essentially focuses on feed for long-haul services from its Madrid hub. The future of Iberia Express, a more productive short-haul affiliate, is unclear. Mediation is ongoing and indications are that its growth will be curtailed. At the same time, IAG is preparing a full takeover of successful Spanish low-fare carrier Vueling, in which Iberia already is a large minority shareholder.

However, the hybridization of airlines is by no means a

Air France is revamping its short-haul operation to compete more effectively with low-cost carriers.

AIR FRANCE

guarantee for success. Air Berlin has claimed it is a hybrid carrier for years. But there are two different definitions of hybrid: Combining product and operational elements of full-service and low-fare airlines in one consistent strategy appears to be much more likely to lead to success than operating separate models alongside, such as Air Berlin does. It offers long-haul leisure routes, an increasing number of business-traveler-oriented services, short-haul low-cost and leisure services, plus it runs a tour operator business.

Since launching the Shape & Size restructuring program in 2011, the airline initiated a second cost-cutting initiative, Turbine 2013, late last year. Now the carrier has taken the drastic step of replacing CEO Hartmut Mehdorn with Wolfgang Prock-Schauer much earlier than expected. The 56-year-old executive was always meant to lead Turbine 2013 from the start, the airline avers. Prock-Schauer joined the German airline only three months ago as head of strategy.

The decision ends months of speculation over who will replace Mehdorn. According to industry sources, Prock-Schauer was one of two remaining candidates for the job, with the other one being Stefan Pichler, CEO of Kuwait-based Jazeera Airways. Over the past few months, CEOs Christoph Mueller (Aer Lingus), Thomas Winkelmann (Germanwings) and Ralf Teckentrup (Condor) were thought to be in contention.

Prock-Schauer began his career at Austrian Airlines, which he left to become CEO of Jet Airways in India. In 2009, he returned to Europe to run BMI British Midland on behalf of its parent, Lufthansa. That effort to turn around the carrier ultimately failed with BMI being sold to British Airways and folded into the larger carrier. His background is mainly in network planning, strategy and alliances.

Mehdorn's main achievement during his tenure was to keep loss-making Air Berlin flying. He sold a 29% stake in the airline to Etihad Airways and the main shareholder also bought a majority stake in its frequent-flier program late last year, giving Air Berlin enough liquidity for the winter. Mehdorn also cut costs, but as a non-airline industry expert he did not address a fundamental strategy review, which would have probably been much needed.

On Top

Deliveries improved and orders are flowing as Boeing likely tops Airbus

Michael Mecham San Francisco

It is a yardstick often cited, given to market timing and not always related to profits. Nonetheless, Boeing is on track to win the orders "race" in 2012 and the title of "world's biggest aircraft maker."

The company recorded 1,203 net orders for the year, second only to its 1,413 performance in 2007. Last year's performance was led by order-taking for the 737 MAX as it battles the Airbus A320NEO in the reengined-narrowbody category, and by the ongoing strength the U.S. manufacturer enjoys in twin-engine widebody sales with the 777. Carriers placed a record 200 net orders for the 777 in 2011, but slowed the pace last year with 68.

Boeing achieved 1,339 gross orders but had 136 cancellations, a bump up from 2011's 116 cancellations. All its commercial aircraft programs were in the black for orders last year with the exception of the 787, which ended the year with 12 more cancellations than new orders.

Led by 415 deliveries of 737s, the company delivered 601 aircraft last year, its highest count since 1999's 620 aircraft and a 124 jump over 2011 figures. The 777 continued as the company's most-efficient widebody assembly line with 83 deliveries, 10 more than 2011. But the 787's improvement was the standout among widebodies. The Everett, Wash., and North Charleston, S.C., 787 factories delivered 46 aircraft, including 23 in the fourth quarter, a marked improvement over three recorded in all of 2011 when the first aircraft went to launch customer All Nippon Airways. Eight 787 customers now operate the 150-seat jet on five continents.

Airbus will report its 2012 orders and delivery totals Jan. 17. In November, it said it was headed for a delivery count that will exceed last year's 534. But Aviation Week Intelligence Network's (AWIN) Fleet Database estimates the total will reach 584, including 453 for the A320 family, 101 A330-200/-300s and 30 A380s. AWIN estimates Airbus's 2012 orders at 731. However, that analysis must take into consideration December as a wild-card month for order announcements, as happened in 2005 when Airbus collected 420 orders from 20 customers to seize the "biggest manufacturer" title from Boeing.

American Airlines was the recipient of the most Boeing aircraft—28 737s and two 777s. But Emirates took the most widebodies—18 777s. Southwest Airlines led 737 customers with 29 deliveries, while All Nippon received the most 787s—14.

Boeing's year-end data underscore how smoothly its factories have been operating even as all of the main ones—737, 777 and 787—are increasing production rates. But that progress could stumble in 2013.

After contract negotiations with its engineers and technicians proved

Boeing 2012 Orders and Deliveries

Model	Net Orders	Change From 2011	Deliveries	Change From 2011	Unfilled* Orders
737	1,124	▲ 573	415	▲ 43	3,074
747	1	▲ 2	31	▲ 22	67
767	22	▼ 20	26	▲ 6	68
777	68	▼ 132	83	▲ 10	365
787	▼12	▼ 25	46	▲ 43	799
TOTALS	1,203	▲ 398	601	▲ 124	4,373

As of Dec. 31.

Source: Boeing

so contentious that the company had to seek a cooling-off period, talks on a new four-year agreement resumed Jan. 9. The Society of Professional Engineering Employees in Aerospace characterizes the two sides as being "far apart" on wages and benefits and promised demonstrations in Everett, Portland and Ogden, Utah. Speea does not have a history of striking, but when it has—including a 40-day walkout in 2000—picket lines formed early in the year after talks broke down on a contract that expired the previous year. Speea's present contract expired at midnight Dec. 25. The last time Boeing faced a strike, the machinists shut down its factories for two months in 2008 and upset delivery rhythms until mid-2009.

A combination of the 46 787 and 31 747-8 deliveries placed Boeing comfortably in the middle of its goal of 70-85 for the two aircraft for the year. In 2011 the goal was 40 787 and 747 deliveries, but only 12 occurred, mostly because 787 testing and certification were late.

Additionally, the company edged past its guidance of 585-600 deliveries for all models in 2012, another improvement over 2011 when it was three shy of its 480 goal. December was a surge month with 51 deliveries, including seven 787s among 15 aircraft in a 24-hr. period Dec. 19 and 20. Fourteen of them flowed from factories in Seattle and one from North Charleston.

Boeing Commercial Airplanes President/CEO Ray Conner called the 737 order rate "unprecedented for any of our models in a single year." He noted that the newest version of that venerable design, the reengined 737 MAX, achieved 914 net orders in the year. With the Jan. 2 announcement of an order for 50 737-8s and 10 737-9s from Aviation Capital Group of Newport Beach, Calif., the MAX has accumulated 1,029 firm orders. MAX orders are all for the -8 and larger -9s.

The A320NEO got nearly a year's jump on the MAX when it entered the market in 2010 and it remains the single-aisle to beat. AWIN's Fleet Database shows the NEO with 1,648 net orders, including 45 A319s, 1,486 A320s and 117 A321s.

At Boeing Defense Space & Security, new production of the AH-64 Apache and continued work on CH-47D/F Chinooks were leaders in the 144 military aircraft delivered in 2012. They included 34 in the fourth quarter.

Last year, Boeing's production facilities worked on only rebuilt Apaches, so this year's 19 new-build deliveries of the attack helicopter are notable.

At the same time, the company's new Chinook assembly line in Philadelphia turned out 51 last year, up from 32 in 2011. The Chinook program celebrated its 50th year in production last August.

Military aircraft deliveries depend heavily on military ordering cycles that do not mix products in the assembly process as easily as civilian aircraft factories can, so defense output totals can vary considerably year-to-year.

Boeing delivered one 737-derived Airborne Early Warning and Control aircraft in 2012 and 10 C-17 transports.

Eight F-15s and a total of 48 F/A-18E/F and EA-18G Growlers were delivered in 2012.

Last year's deliveries also marked the debut of the P-8 maritime patrol aircraft on the list with five deliveries, including three to the U.S. Navy and two to India.

Preparing For Change

Virgin Atlantic taps American Airlines executive for CEO as part of its strategical realignment

Cathy Buyck Brussels

Virgin Atlantic Airways' choice to recruit American Airlines executive Craig Kreeger as new CEO indicates the London-based airline is preparing for a new chapter in its history, jettisoning its historic independent streak to embrace a future as a fully fledged network carrier and possible alliance member. But the new CEO will have his hands full.

Since its launch in 1984, Virgin Atlantic has followed a straightforward course operating as a non-aligned, customer-centric point-to-point long-haul airline growing organically. A dire economic environment in Europe, increasing competitive pressure and consolidation in the industry have been driving the need for Virgin to reinvent itself. The appointment of an external candidate will make the change easier. Julie Southern, Virgin Atlantic's chief commercial officer, was seen as an internal front-runner for the CEO post.

Kreeger's appointment comes just weeks after Delta Air Lines signed an agreement to acquire a 49% stake in Virgin Atlantic from Singapore Airlines for £220 million ($360 million) and speculation that the U.K. airline will join the SkyTeam alliance. Kreeger brings a wealth of alliance knowledge and experience to Virgin Atlantic, which has been fiercely critical of the transatlantic joint venture of its archrival British Airways (BA), American Airlines (AA) and Iberia.

Kreeger worked at American for 27 years in commercial, financial and strategic roles, and in 2012 was appointed senior VP for customer service. He spent six years in London as senior VP-international, responsible for American's operations and sales throughout Europe, the Middle East, Africa and the Pacific. He also helped broker American's joint ventures with BA and Iberia across the Atlantic, and the airline's partnership with Japan Airlines in the Pacific.

The hiring of Kreeger is an opportunistic move by Virgin Atlantic and will not be welcomed by BA and its Oneworld partner AA. "We believe Craig has the experience and passion

Virgin Atlantic is entering a transatlantic joint venture with new shareholder Delta Air Lines in an effort to become profitable.

VIRGIN ATLANTIC AIRWAYS

to drive Virgin Atlantic forward and capitalize on the opportunities created by our new venture with Delta Air Lines," Virgin Atlantic founder and President Richard Branson says, noting it is a "dynamic and challenging time for our airline."

As part of the shareholder deal, Virgin Atlantic and Delta intend to set up a fully integrated joint venture that will operate on a "metal neutral" basis with both airlines sharing the costs and revenues from all joint venture flights. The airlines will operate a combined transatlantic network between the U.K. and North America with 31 roundtrip flights per day, of which a combined total of nine daily roundtrips will be from London Heathrow to John F. Kennedy International and Newark (N.J.) Liberty International airports.

The companies will file an application with the U.S. Transportation Department for antitrust immunity. The transatlantic Virgin Atlantic/Delta joint venture will run separately from the existing transatlantic joint ventures of Delta, Air France-KLM and Alitalia, a Virgin spokeswoman says. The transaction will also be reviewed by the U.S. Justice Department, European Union's competition regulator and other relevant authorities for merger clearance. The share purchase and the joint venture are expected to be implemented by year-end.

The entry of Delta in Virgin Atlantic's ownership and the implementation of a joint venture are not without challenges to the tenaciously independent U.K. airline. Singapore Airlines Group—never a very involved shareholder—has been trying to sell its unprofitable stake for years. Singapore acquired the 49% stake in March 2000 for £600 million and will now sell it for about a third of this. As a U.S. citizen and veteran of American Airlines, Kreeger could be helpful to Virgin Atlantic to adjust to a more forceful U.S. shareholder and the give-and-take process of running a joint venture.

The new CEO will also have other challenges. Kreeger will have to bring the operator to profitability, integrate the new Boeing 787 fleet from 2014 and oversee Virgin's plans to start its first short-haul operations in the next International Air Transport Association summer schedule, connecting London Heathrow with Manchester, England, and Edinburgh and Aberdeen, Scotland. Virgin Atlantic reported a pretax operating loss of £80.2 million in its latest fiscal year to the end of February, compared with a profit of £18.5 million in the previous year. Revenue for the company, which includes Virgin Atlantic Airways and tour operator Virgin Holidays, rose 3% year-over-year to £2.74 billion in the last fiscal year. According to figures from the U.K. Civil Aviation Authority, enplanements of the airline have declined from 5.7 million in 2008 to 5.3 million in 2011.

All eyes are on how Virgin Atlantic will generate profits from its short-haul operations. The airline lost important passenger feed for its long-distance flights when British Airways combined with BMI in April last year. Virgin is launching its first short-haul flights from London Heathrow to Manchester on March 31, Edinburgh on April 5 and Aberdeen on April 9. Virgin Atlantic reached a preliminary agreement in December with Aer Lingus to wet-lease four of its Airbus A320s to operate the domestic routes for Virgin under Virgin livery for an initial period of three years.

Current CEO Stephen Ridgway announced last September that he would step down this year. Kreeger, who assumes the post Feb. 1, is the second high-level American Airlines executive to join Virgin Atlantic in recent months. Maria Sebastian signed on as director of worldwide sales in August 2012.

WI-FI WATCHERS

John Croft Washington

U.S. government agencies are quietly making "direct arrangements" with airborne Internet providers to obtain certain information flowing through broadband Wi-Fi systems for data and voice in airline passenger cabins.

The actions were revealed in the Federal Communication Commission's (FCC) Dec. 28 "report and order" that, in part, streamlines the approval process for airborne Internet providers by establishing technical and licensing rules for a new category to be called Earth Stations Aboard Aircraft (ESAA). Rules are already in place for terrestrial vehicles and ships communicating with geostationary satellites for broadband connectivity.

U.S.-based airborne broadband providers include Panasonic, which owns an estimated 70% market share of the airline seat back inflight entertainment (IFE) systems, and Gogo, which owns an air-ground network in the continental U.S. and is moving into satellite services.

During the ESAA proceedings, the Justice and Homeland Security departments requested "operational requirements" that go well beyond the generally accepted bounds of the information Internet providers must give to the government under the Communications Assistance for Law Enforcement Act (Calea). Under Calea, providers, after receiving an "intercept order" that typically comes from the FBI, have to be able to extract certain information from data packets in a certain timeframe.

The additional "operational requirements" in the request included the ability to identify where a particular person is sitting on an aircraft, what mobile devices he or she is using, the ability to identify all aircraft with ongoing passenger communications, the ability to disrupt or conference into ongoing communications, and the ability to redirect communications from an aircraft.

The FCC ultimately did not incorporate the requests, in part because it said "satellite providers have traditionally addressed specific public safety, law enforcement and national security concerns through individual negotiations with law enforcement agencies."

Individual negotiations have already occurred or are ongoing between the government and Panasonic, related to the company's eXConnect IFE, and Gogo during the approval process for its air-ground broadband network.

"Panasonic is engaged in active discussions with U.S. law enforcement officials regarding lawful interception and network security functionality to be deployed in the eXConnect [IFE] system," the FCC report states, adding that the IFE-maker is implementing "additional functionality" subject to final agreement with U.S. law enforcement.

Seven Runways—or Nine?

Beijing's vast new airport proceeds

Bradley Perrett Beijing

Reporting in 2008 on Beijing's studies for a new airport, Aviation Week suggested that the facility would "probably be planned on a gargantuan scale."

We were not wrong. Plans show that the new facility at Daxing, now going ahead, could ultimately handle 130 million passengers a year with seven runways, possibly nine. One of the runways will be reserved for the air force.

It was also apparent five years ago that Beijing Capital International Airport, then newly expanded, would again hit capacity early this decade. And now it just about has. The city, facing a capacity crunch, is not helped by a delay of at least three years in building Daxing. Tearing up old plans, officials will probably order construction of a fourth runway for Capital. Daxing (pronounced DAH-shing) is not due to go into service until the first half of 2018.

The State Council (cabinet) and Central Military Commission finally approved construction of Daxing on Dec. 22, almost 20 years after planners began looking for a site for a second Beijing airport. The approved site is, as expected, directly south of the city center, 46 km (29 mi.) from Tiananmen Square and 67 km from Capital, to the northeast of the city.

When Daxing's first stage opens in five years, capacity will be 45 million passengers a year, 80% domestic. That figure has been mentioned before, but it turns out to be the limit for an incomplete first stage. When the stage is completed in 2025, Daxing will be able to handle 72 million passengers a year, says Zhu Wenxin, a senior executive working on the project. By comparison, 83 million passengers passed through Capital last year, nudging its designed capacity of 85 million.

Even in its first stage, Daxing will have four civil runways plus the military strip on the eastern side of the field. The three parallel runways should be far enough apart for independent takeoffs and landings.

Two more runways, and a second, mirror-image terminal are planned for the second stage, construction of which is apparently not yet scheduled. Capacity will then rise to 100 million passengers a year. As at Shenzhen Baoan International Airport, which has a similar terminal plan, the mirror-image terminal will be fed by a second set of roads to ease congestion (see page 39).

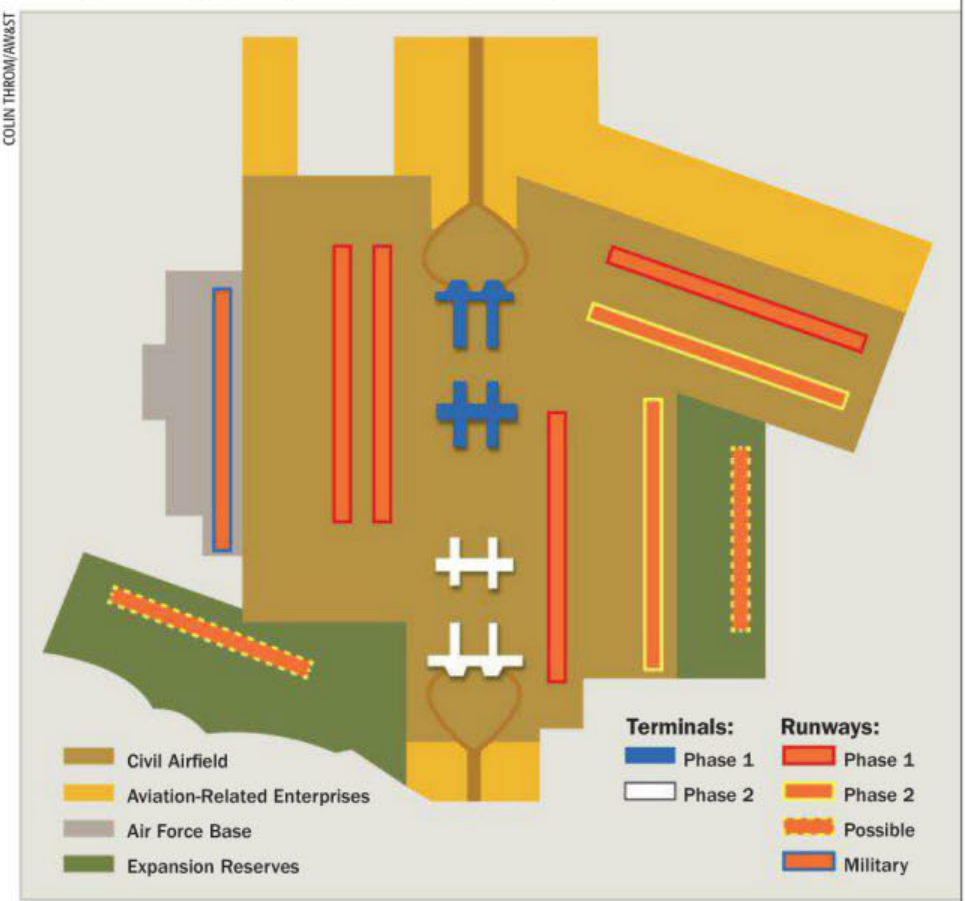
Reports of Daxing having nine runways have appeared from time to time, though by last year officials were referring to only the four first-stage civil runways, suggesting that the plans had been greatly scaled down. The nine-runway scheme is not dead, however: It is still evident on a master plan that Zhu, general manager of the project's terminal engineering department, exhibited at Oppland's Airport Expansion Conference here this month. Along with the seven definitely planned runways, the map showed two dotted strips on swathes of territory intended as reserve land for further airport expansion.

Probably related to that, Beijing New Airport Construction Headquarters forecasts Daxing's "ultimate" annual capacity at 130 million passengers, apparently after further terminal construction beyond Phase 2.

The terminals will be between the main north-south runway pairs but their exact configuration is not set. Project managers are still considering competing designs from local and foreign architects. They include one by a Chinese company that shamelessly seeks political advantage by shaping the main concourses like Communist stars—painted red and gold, just in case anyone misses the point.

Freight capacity at Daxing will be 1.5 million tons a year when it opens, 2 million when the first stage is finished, 2.4 million on completion of the sec-

COLIN THROM/AW&ST



Work on Beijing's Daxing airport will begin this year, at least three years late. It will have four runways for civil operations when its first stage opens in 2018, but until then Beijing Capital's capacity will be increasingly strained.

ond stage and ultimately 3.2 million.

Capital has no rail service except an express metro connection to the northeast of the city center that opened only five years ago. Daxing, by contrast, will have several city train lines plus a station on the country's enormous high-speed rail network. A rapid train service linking Daxing with Capital is also planned, mainly using existing track. The planners see Daxing serving adjacent cities, including Tianjin, itself a great metropolis with a large and underused airport.

So far, China Southern Airlines and China United Airlines are the only confirmed users of Daxing. Officials have proposed to move the whole SkyTeam Alliance there, taking a step beyond the common policy of shifting all carriers in an alliance to a newly built terminal.

In calculating likely capacity and infrastructure, the planners are working on the basis of three possible levels of air-traffic efficiency: the present, low level dictated by China's conservative separation standards; the tight spacing achieved under U.S. FAA rules, which they see as the ideal; and something in between, which is seen as the most feasible.

The prohibition against flying over central Beijing and the presence of nearby military air bases further complicated the job of designing Daxing, says Zhu. The closure of the military-civil field at Nanyuan, north of Daxing, has long been expected to follow opening of the new airport, but Zhu mentioned only that the airspace of the two facilities would be consolidated.

Despite a 2008 declaration that Capital would not be further developed, the fourth runway that has been under study is quite likely to be built, increasing movement capacity by 10-15%, says a senior airport official. Laid parallel to and east of the three current runways, which are aligned approximately north-south, the new one would be only 2,800 meters (9,200 ft.) long and used mainly for landings, the official says.

Capital's giant Terminal 3, opened in 2008 in time to serve the Beijing Olympic Games, is still not fully commissioned, because the facility is limited not by such ground features as gates, security lanes and road access but by air transport capacity. Construction of the extra runway should begin this year if it is to make much difference to the city's air traffic capacity before Daxing is ready, says another official.

Laying it will be difficult. Because Beijing Capital was never supposed to have a fourth runway, the field is hemmed in on its eastern side by a canal and the outermost of Beijing's five ring roads. Buildings for airport-related businesses have cropped up near the perimeter fence. A third official says much demolition will be needed, but it can be minimized by siting the new runway farther south. That will reduce taxiing, too, since aircraft generally approach Capital from the south; at the end of their landing rolls, they should not be far from Terminal 3.

In other Chinese airport expansions, extra runways are often built so close to existing ones that their aircraft movements cannot be independent. That seems to be the plan at Beijing Capital, judging from the estimate that capacity will rise by 10-15%, even though the number of runways will increase by a third. Previously, officials have doubted that an extra runway would help at Beijing, because of airspace constraints.

Those constraints explain why the airport has not bothered to open one of the two satellite buildings of Terminal 3, T3-D. Officials said opening it would have given them nothing but more places to park aircraft. Since traffic is now near the designed level that included operation of T3-D, the main terminal building and its working satellite, T3-E, are evidently beyond capacity already. Still, T3-D will open this year, says an airport official.

Under Fire

Berlin airport authority says it does not know when Brandenburg will finally open

Jens Flottau Frankfurt

Berlin should have opened its new international airport two years ago. But not only has the launch now been delayed a fourth time, the airport operator has conceded for the first time that it has no idea when the facility will be ready.

Berlin Airports last week called off the planned Oct. 27, 2013, opening of Berlin Brandenburg Airport, saying that persisting problems with the fire protection system are so complex that the date no longer seems tenable. Technical Director Horst Amann, who joined the operator only months ago after overseeing the building of Frankfurt Airport's fourth runway, says it is too early to determine a new opening date.

Industry officials say there is some likelihood the date will not move beyond 2014. But Amann and construction experts need at least six months to identify remedies before they can determine a new schedule. Scenarios include demolishing large parts of terminal interiors and rebuilding the fire protection system more or less from scratch to comply with regulations.

The construction of the airport is therefore turning into an ever more bizarre disaster. While the fire protection system is the most immediate challenge, there are other issues with deeper roots. The airport authority took over planning late in the construction phase after having fired the companies it had contracted.

There has also been a huge lack of oversight from the supervisory board, which is dominated by politicians from Berlin, Brandenburg and the federal government. Berlin Mayor Klaus Wowereit has so far resisted calls to resign—despite increasing pressure even from within his own party—though he says he will step down as chairman of the supervisory board. Airport CEO Rainer Schwarz is also expected to be ousted during the board's next meeting, possibly as soon as this week.

The delay mainly affects operations at Air Berlin, which has been struggling to keep service levels up at Tegel Airport. The airline was in the process of turning Berlin into a hub-and-spoke operation, but the airport problems have seriously hampered that. The airline says it is "disappointed" and that the delay has caused continuous service issues for passengers.

Leading-Edge Slowdown

Double-digit commercial aviation growth does not last forever, a major Chinese city discovers

Bradley Perrett Shenzhen, China

For a glimpse of China's commercial aviation future, take a look at Shenzhen, the mainland's most developed city. The immediate outlook for the metropolis of 10 million, and therefore the more distant future for the rest of the country, is slower commercial aviation growth and less urgent need for new infrastructure.

Shenzhen Baoan International Airport is building a big new terminal and has plans for one more—but it does not expect to need the extra one until well into the 2020s. Although passenger volumes at the airport have gown at an annual average of 13% since 2003, airport planners believe 6-8% is more likely for the future. The reason is simply that the market in Shenzhen (pronounced shen-JEN) is maturing. With economic output of $17,000 per person, four times the national average, the city is about as developed as South Korea and the Czech Republic. Further growth in its economy, and therefore demand for commercial aviation, will not come so easily.

The expansion of Shenzhen Baoan Airport leaves land at the north end of the field for a mirror image of Terminal 3.

The managers at Baoan have the great advantage that the early planners of the city, which was built from almost nothing over the past 30 years, may have ensured that a second airport will never be needed. Baoan, which opened in 1991, is well-located and has plenty of space for expansion.

The airport's Terminal 3 is nearing completion and due to go into service between June and August. When it does, Baoan is likely to abandon its current two terminals, A and B. So the designed passenger capacity of the airport will be that of T3, 45 million a year, compared with the combined 17 million of the two old terminals, which are heavily overloaded. They handled 28 million last year and should reach 30 million this year, says Long Qi, deputy chief of Shenzhen Airport Co.'s planning department. Baoan was the sixth-busiest airport in China in 2011, despite strong competition from others in the Pearl River Delta. Reflecting slow growth that has already set in, it has slipped from the fifth place it occupied for most of the previous decade.

With 6-8% future annual growth in passenger volumes, T3 should reach designed capacity in 2018. Since completion of the next terminal is not expected until well after 2020, the operating company evidently assumes that T3 can exceed capacity without great difficulty.

T3 is 1,000 meters (3,300 ft.) long and lies between the original, 3,400-meter runway and a 3,800-meter runway that opened last year. Long says the next terminal will also be built between the runways probably as a mirror-image of T3, with its entrance at the north end of the field instead of the south. "It could be smaller or the same size [as T3]," but it will not be larger, he says, wondering how Shenzhen could ever need an airport with a capacity of 90 million people a year, more than now pass through the country's largest airport, Beijing Capital International. London Heathrow handled 69 million passengers last year.

Shenzhen borders Hong Kong and is only about 100 km (60 mi.) from Guangzhou. Both of those cities have airports larger than Shenzhen's. Work has begun on expanding the capacity of Guangzhou Baiyun, mainland China's second-busiest airport, to a capacity of 80 million passengers a year by 2020 (*AW&ST* Aug. 20, 2012, p. 37). Guangzhou, also a well-developed city, has a population of 13 million.

In an earlier plan, T3 would have been later expanded with satellite buildings, but Long says the roads approaching it could not have handled the traffic. By building a mirror-image terminal, a second set of roads can feed the facility from the other end. T3 is being built with provision for an underground train that would connect it with the future mirror-image terminal, as well as a city metro stop. It also has an underground box for a station on a high-speed train line that the Hong Kong government proposed several years ago to link Baoan with Hong Kong International Airport. Baoan's managers now expect Hong Kong to take quite a few years before launching that project, however.

Terminals A and B, which also have a metro station, may be turned into shopping or exhibition centers, says Long. It is also possible that Hainan Airlines, with one of the smaller operations at Shenzhen, could take over one of the old terminals. Other airlines rejected them; they all wanted to move to shiny new T3.

A third runway of 3,400 meters is also planned. It would be about 450 meters from the second runway, too close for independent operations but still increasing capacity. Aircraft are staggered on arrival and departure on such closely spaced runways.

From the perspective of air traffic capacity, Shenzhen's expected modest growth rate can only be a good thing. The Pearl River Delta's notoriously constrained capacity is being challenged as new runways open, with more planned. A second airport is planned for Guangzhou.

A probable secondary factor in growth at Baoan is the entry of home carrier Shenzhen Airlines into the Star Alliance on Nov. 29. Although superficially attractive as the Star Alliance hub for southern China, Baoan cannot in practice compete against Hong Kong or even Guangzhou.

Singapore Airlines and Thai Airways International appear to be the main short-term beneficiaries of the arrival of the new Star member because Shenzhen is a good connecting point between Southeast Asia and China. But, conversely, it is poorly located for any carrier whose flights arrive from the north, as would Chinese services of most Star Alliance carriers. Star Alliance airline executives agree that it is difficult to imagine introducing intercontinental services to Shenzhen in the near future.

With Shenzhen Airlines aboard, Star now has two of mainland China's six largest carriers, while SkyTeam has three. The sixth, Hainan Airlines, is not affiliated with an alliance.

With the notable exception of Hainan Airlines, alliance memberships in mainland China, Hong Kong and Taiwan are now largely locked up. Taiwan's EVA Air is due to join Star, and the island's China Airlines is already a member of SkyTeam. Oneworld has only one asset in the Chinese-speaking territories, but it is Cathay Pacific, which has a commanding position at Hong Kong.

Shenzhen Airlines, 51% owned by Air China, does bring 400 flights a day to add to the alliance's 21,500, says Star CEO Mark Schwab, as well as its frequent-flier members. And, in contrast to some airlines that enter alliances, Shenzhen presents little or no difficulty in overlapping routes; it is predominantly a Chinese domestic carrier. It even dropped some international services last year because it could make more money domestically.

Singapore Airlines CEO Goh Choon Phong says his company is negotiating with Shenzhen Airlines on how to promote connections between their networks. At the moment, they are at a low level, with only four flights a week by narrowbody aircraft operated by Singapore Airlines subsidiary Silkair. While stressing that Silkair will make its own decisions, Goh expects that a first step in exploiting the Shenzhen Airlines network would be to increase frequencies.

Devolving Powers

Welsh government seeks a fresh start for Cardiff Airport

Tony Osborne London

The Welsh government is looking for ways to turn around the fortunes of its capital's long-suffering international airport.

Since passenger numbers peaked at just over 2 million in 2007, the number of people using the airport—which sits 15 mi. to the west of the Welsh capital—have fallen by half. Passenger numbers for 2012 were expected to barely break the 1-million mark.

The airport is a major headache for the Welsh government, which was formed from the devolvement of powers from London in 1999. As the center of power in Wales and the 10th-largest city in the U.K., the devolved government anticipated that the airport could play a major part in the future of the Welsh transport network with links to the U.S. and the Middle East as well as the rest of Europe.

CARDIFF AIRPORT

However, the airport has never really enjoyed the support of the Welsh population, many of whom prefer to use English airports for their leisure and business travel. This, along with few opportunities for growth, means that many airlines have stayed away, starving the airport of growth and much needed investment.

Many Welsh have turned to nearby Bristol International Airport just over the Severn Bridge, which enjoyed a Continental Airlines transatlantic service until 2010 to Newark (N.J.) Liberty International. Today, Bristol is a major hub for low-fare carriers EasyJet and Ryanair and says 14% of its nearly 6 million passengers come from Wales.

Now, the government is examining whether a wholesale purchase of Cardiff International Airport would give the facility the fresh start it urgently needs. It is owned now by TBI, part of the Spanish Abertis Airports group that also owns London Luton Airport and Belfast International Airport in Northern Ireland.

"We know it is vital to have a strong international gateway and strong international connectivity to and from Wales as well as a welcoming open door for tourism," says Welsh First Minister Carwyn Jones. The government is undertaking due diligence to ensure the airport is a sound investment, but it could be in public ownership early in the first half of 2013. As part of the takeover, the airport would be run by a commercial interest, with the government exerting what it calls a "strong strategic interest."

A lack of low-fare carriers has sent Cardiff Airport's fortunes plummeting since 2007.

"I believe the time is right for the airport to come once again under public ownership," says Jones.

The Welsh government believes that airlines could be attracted back to Cardiff if the central government gives Wales the power of the devolved Air Passenger Duty. This would incentivize airlines to start new routes at lower costs, making marginal routes more viable than they otherwise would have been, the Welsh government hopes. A similar idea was carried out in Northern Ireland and made the growth of transatlantic services possible there.

Moscow Movements

Larger Vnukovo terminal provides expansion opportunity for UTAir

Maxim Pyadushkin Moscow

The opening of an expanded terminal at Moscow's Vnukovo Airport signals its aspirations to compete with the larger two airports in the Russian capital, and it also opens capacity for UTair Aviation and its Star Alliance partners.

The first stage of the airport's Terminal A expansion became operational in July 2010 but its capacity was increased by an additional 96,000 sq. meters (1 million sq. ft.) to reach the planned 270,000 sq. meters in December. The number of check-in desks grew to 154 from 104, and the new five-level terminal now has 52 boarding gates, 31 of which are equipped with boarding bridges. They include two double bridges to serve Boeing 747s and one triple bridge for Airbus A380s. The new terminal building also incorporates a 40-meter-high (131-ft.) air traffic control tower.

Moscow's Domodedovo Airport and Sheremetyevo International Airport still each handle more passengers than Vnukovo. For instance, Domodedovo, Russia's largest airport, served 25.7 million passengers in 2011, and Sheremetyevo 22.4 million, while just 8.2 million passengers used Vnukovo, which ranked fourth in the country behind St. Petersburg Pulkovo Airport.

The opening of the new terminal, together with the existing smaller Terminals B and D, brings Vnukovo's annual capacity to 30 million passengers. The chairman of the airport's board, Vitaly Vantzev, tells Aviation Week that Vnukovo planned to serve 10 million passengers in 2012 and increase the number to 15-17 million in 2013. UTair Aviation generates more than 60% of airport passengers now, but Vantzev says the airport has attracted carriers such as Russia's Transaero Airlines, Lufthansa and Turkish Airlines with the new terminal.

UTair CEO Andrey Martirosov tells Aviation Week his airline will use the enlarged Vnukovo to expand its route network from Moscow. "We expect to receive about 100 new aircraft in the next five years, and we need an airport to operate them from," he says. Transaero, Russia's second-largest carrier, came to Vnukovo last March; it also now flies from Domodedovo and Sheremetyevo.

FYODOR BORISOV/TRANSPORT-PHOTO.COM

The expanded terminal at Vnukovo airport opened on Dec. 18. It incorporates a 40-meter-high air traffic control tower.

Transaero CEO Olga Pleshakova says the airline will move to Vnukovo's Terminal A its New York and Miami Boeing 747 flights from Domodedovo. In the first week of the new year, it also began serving Paris Orly Airport with a Boeing 777 from the new Vnukovo terminal. Transaero previously operated these flights with Boeing 737s from Vnukovo. In March, Transaero will open new flights to European and Commonwealth of Independent States destinations from Terminal A, says Pleshakova.

Both CEOs confirmed that UTair and Transaero signed an interline agreement to share the transit passengers in the new terminal.

Lufthansa started to move its flights to Vnukovo from Domodedovo last March. At the beginning of November, it had carried 200,000 passengers there from Frankfurt, Dusseldorf, Hamburg and Berlin. The German carrier is turning Vnukovo into a base for its Star Alliance partners, such as Turkish, which also shifted operations there last March. The Star Alliance has no other options, as the other two Moscow airports are occupied by rival alliances. SkyTeam is represented in Sheremetyevo, the home airport of Aeroflot, while Oneworld is concentrating on Domodedovo, where its Russian member S7 Airlines operates.

The Star Alliance has no Russian partner so far, but UTair is considered to be a possible candidate. UTair signed a code-share agreement with Turkish early last year.

Meanwhile, Vnukovo is going to continue to modernize. One of its two crossing runways will become fully operational after a repair in March, says Vantzev. Moscow city authorities also promise to improve ground transport infrastructure from the capital to the airport. As a part of the plan to consolidate its airport assets, the Russian government plans to create a single company by mid-2013 that will jointly operate Vnukovo and Sheremetyevo.

Vnukovo started constructing Terminal A in 2006 as a part of a large-scale airport modernization program costing 44 billion rubles ($1.4 billion) provided by the Moscow city government, the airport's largest shareholder, and private investments.

Attila Arrives

Technologies meter arrivals to save airlines money

Jerome Greer Chandler Dallas

Even as carriers await the full flowering of the FAA's Next Generation Air Transportation System and Eurocontrol's Single European Sky ATM Research (Sesar) effort, a purely intra- and inter-airline arrivals synchronization technology is racking up solid savings for one major carrier.

"While we're waiting for NextGen and Sesar, there are a lot of things an airline can do to manage its own house," asserts Keith Wichman, director of ATM and airline efficiency services for GE Aviation Systems. "They don't have to tolerate the lack of system predictability that we have today."

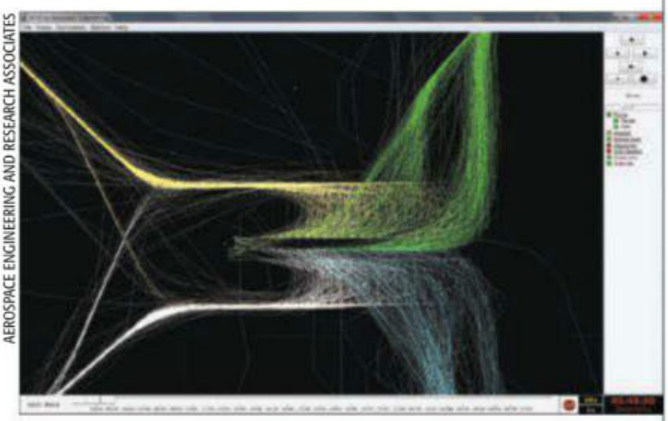
Expelling inefficiencies from the system, to remove arrivals' randomness, is the aim of Attila, a technology developed by Colorado-based ATH Group. It is predicated on the premise that "an airline is nothing more . . . than a relatively simple production process," says R. Michael Baiada, a Boeing 747-400 captain for a major international airline and president of ATH.

In Attila's scheme of things, the carrier collects passengers, bags and cargo at one end. It processes the "raw material" and puts it out the other end. The aim is to produce "a high-quality product . . . a smiling passenger with bag in hand," he says. That, of course, is not always the case. Baiada asserts airlines employ what amounts to a "fire and forget" philosophy, one in which a flight is "launched off the departure date and arrives at the destination sometime thereafter—sometimes close to schedule, sometimes not."

Variability is the villain, in this instance the variance with which aircraft achieve terminal area arrival fixes that are typically 30-40 mi. from touchdown. It is around those fixes that inbound flights congregate. Attila's aim is to meter the inbound flow so that air traffic control can better digest it.

Baiada likens the process to a funnel, one which inefficiently sorts arrivals and sequences them for landing. Meter the flow in the en route environment, the theory goes, and aircraft present themselves to controllers so they feed through a "soda straw." It is through that straw that ATC "can shoot them through the narrow end "just in time."

That's the theory. But does it work? Delta Air Lines contends it does. The carrier began validating the concept at its Atlanta Hartsfield-Jackson International Airport hub in 2007. It then followed up with tests at Minneapolis-St. Paul International Airport in the fall of 2011 and Detroit Metropolitan Wayne County Airport in early 2012. It tracked "dwell time" minutes saved per flight within the airports' arrival fixes. In each instance, "We [found] real value" in the process, says Kevin Mathison, Delta's managing director of performance and planning in ops control. Initially at Atlanta, Attila saved 1.7 min. per flight.



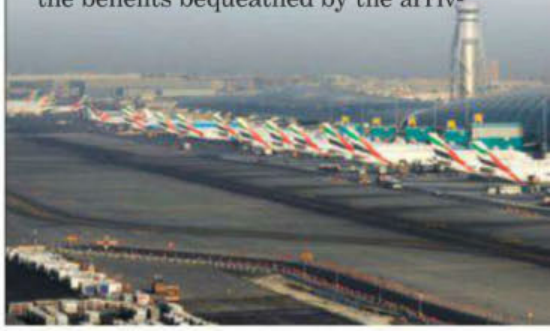
Attila arrival-flow data into Atlanta Hartsfield are displayed on a 4-D trajectory visual analysis tool supplied by a sister company to ATH Group.

The salient issue for the airline is getting pilots to comply with the Required Time of Arrival (RTA) messages that Attila sends out. Attila digests Aircraft Situational Display to Industry information, data noting position, speed, time and altitude. Then it calculates a flight's RTA at a particular fix. Attila transmits this request automatically via the Aircraft Communications Addressing and Reporting System. One Delta aircraft might receive an RTA calling for a 12:29 arrival at the fix, the other asking for 12:31. Pilots make adjustments during the en route phase of the trip, speeding up or slowing down. Baiada says they need not hit the fix precisely. If the aircraft hits the fix within a minute of RTA, "We consider that a win," says Mathison.

Based on that 1-min. window, Delta's Atlanta hub averages 40.4% compliance. That's good enough to shave an average of 0.99 min. per flight dwell time. At Minneapolis-St. Paul, compliance averages 35.2%, rendering a 0.95 per flight cut in dwell time within the arrivals fix, Mathison says. At the carrier's Detroit hub, the compliance is 34.5%, and the savings average 1.03 min. per flight.

Speaking to the compliance issue, "The problem with a technology like this is that a lot of the variables the aircraft has to deal with are beyond the control of the pilot," says John Vensveen, global head of Airline Advisory Services for Radixx International. Vensveen says pilots who have employed the system "for the most part, find it beneficial. But [they] see it more as a teaching aid than anything else."

Whether it is a teaching aid or significant slice of the solution, per-flight fuel savings go hand-in-hand with reducing dwell. For competitive reasons, Delta declines to release specific numbers. "The really big" savings come in the terminal area, because "that's where you burn the most fuel," says John-Paul Clarke, a professor at Georgia Institute of Technology's School of Aerospace Engineering and director of the Air Transportation Laboratory. He worked with both Delta and ATH Group defining test scenarios and analyzing the benefits bequeathed by the arriv-



The ATH Group is working with GE Aviation Systems to better manage arrivals for Emirates at its Dubai hub.

als synchronization system. The intent was "to make sure that the time spent in the terminal area was reduced."

ATH says Attila data from August 2006 through August 2012 indicate the system cut Delta's fuel burn by 26.1 million gal., or a savings of $60.9 million. It did this while reducing flight time by 1.4 million min. In an industry increasingly focused on CO_2 effluent, Attila data indicates a reduction of 551 million lb. of carbon dioxide emissions.

Overall, Mathison characterizes Delta's return on investment in the system as "superb," noting, however, that "what we invested in this is not typical," because Delta is Attila's launch customer.

Delta continues to implement Attila at Atlanta Hartsfield, Minneapolis-St. Paul and Detroit Metropolitan airports. In each instance, it is an intra-airline arrangement. Other carriers do not participate. At Charlotte (N.C.) Douglas International Airport, however, a variant was tested called Attila Exchange. Delta did not participate in this study. The second-generation of the system allows two carriers to share ATC and trajectory information. The airlines might be scheduled for a 16:30 arrival time at a given fix. Exchange might give Carrier A an RTA of 16:30; Carrier B a 16:31 time. But next time, Carrier B gets the preferential RTA. Essentially, Attila Exchange aims to optimize airline operations, without sharing business information.

That is not to say optimizing a given carrier's business *per se* is not one of Attila's aims. Baiada offers this instance of an aircraft going from Dallas-Fort Worth to Boise, Idaho. On the westbound leg, there may be few if any connections out of Boise for passengers on board. On the return route, however, "It's critical to get that aircraft back to Dallas on time, from a connection standpoint." The system takes such scenarios into consideration.

When two carriers must get to their respective gates on time is where the rub could result, and that is why the exchange system might favor one airline one time, and the other the next.

The ultimate challenge for a system such as this could come in the variegated airspace above the New York metro area, where no one carrier, except perhaps for United Airlines at Newark (N.J.) Liberty International Airport, exercises a dominant position at any airport. Mathison says Delta is exploring the possibility of implementing Attila Exchange in New York. The carrier is a major player at both Kennedy International and LaGuardia airports.

While ATH Group has been working with Delta for years on refining Attila, ATH also is embarking on a venture with GE Aviation Systems to better manage arrivals for Emirates at its Dubai hub. ATH provides the software while GE adapts it. "At Emirates, the availability of traffic data in the environment is very sketchy," says Wichman. It is employing company data and flight management system numbers to fill in those holes. "That's where GE's expertise comes into play," he says.

Emirates was clear that the ability to improve predictability is a money-saver. Bob Everest, the Dubai-based carrier's vice president of flight operations support, says initial expectations are that Attila will "enable less ATC vectoring, but not eliminate it; less holding, but again, not eliminate it." Emirates wants to banish as much unpredictability in the system as possible, and let the benefits flow from there.

Everest accedes that fuel savings are important, but there are other possible perks. One is to better sequence arrivals of Airbus A380s (Emirates is the largest operator of the type) "so that ATC can minimize the separation based on wake turbulence criteria and thus increase runway throughput."

Attila in the U.S. operates virtually independent of air traffic control, at least for now. However, "In my view," says Georgia Tech's Clarke, it's just one component of a larger vision." That is the way others envision it too—near-term gains independent of air traffic control (ATC), greater payoff down the line if and when it is melded with ATC.

To that end, the second phase of Emirates' Attila validation "will be to see how we can integrate with ATC systems," says Everest. There have been discussions with both the United Arab Emirates Area Control Center at Sheik Zayed Center and Dubai ATC on how Emirates can provide RTA estimates so as to "understand if these can be integrated into the arrival manager."

And it is the same in Atlanta. Mathison envisions the possibility of employing an arrivals sequencing tool such as Attila in concert with operational descent profiles (ODP). Such profiles are designed so pilots can descend in smooth curvilinear swoops, without having to adjust the throttles, without having to level off. That in itself saves fuel. Combine ODP with arrivals sequencing and you get a continuum.

Mathison says the FAA is testing the concept, but the agency did not comment on Attila-related issues. He says FAA and Delta conducted a brief test at Atlanta in which Attila collaborated with ODP. The test window was very short, and therefore not conclusive. But the combination "seems to work."

Another combination that could work to reduce flight time is the wedding of Lockheed Martin's Time-Based Flow Management (TBFM) with the ATH Group system. The Lockheed Martin set-up is operational in all 20 FAA ATC centers, the ATC System Command Center and the top 25 U.S. airports, according to Diane De Sua, the company's manager of NextGen programs.

TBFM assigns each inbound aircraft a unique slot, relative to other flights. The system can be fully integrated in to ATC automation.

At this juncture at least, TBFM and Attila differ. The former is intimately wedded to FAA; the latter is an intra- and inter-airline affair. "TBFM takes into account FAA's density issues," says Kevin Hightower, Lockheed Martin's TBFM system architect. But it does not consider an airline's business goals.

This begs the question: Can TBFM and Attila work together to even better meter inbound flow? Hightower "thinks they [will be] working together in the future to do just that." The systems are more complementary than competitive. "We have different information," says De Sua. "They have airline information. We have FAA information, and both are needed to make the right decisions."

EMIRATES

Frau Nein

The German chancellor wields singular influence on the A&D industry's future

Jens Flottau Frankfurt

On a sunny weekend in the south of Germany last August, the new chief of EADS, Tom Enders, had a rare opportunity to relax and take some time for his hobbies, such as paragliding. And although many consider it a dangerous pastime, Enders had never been seriously injured. So why should this time be different?

As it turned out, Enders should not have jumped that day. The CEO hurt himself seriously enough during a landing that he had to cancel what might have been the most important business trip of his career and an historic meeting for the giant aerospace company he leads.

Enders had planned to accompany German Chancellor Angela Merkel on a state visit to China as part of the official delegation. Trips to China involve long flights and the chancellor's VIP Airbus A340 has enough room to allow private meetings. EADS's

EPA/LANDOV FILE PHOTO

The Unmaking of a Merger

June 1, 2012
Tom Enders officially becomes CEO of EADS, succeeding Louis Gallois.

Early summer 2012
Initial merger talks begin between EADS and BAE Systems, and European governments are briefed.

Mid-August
Tom Enders suffers a sporting accident injury that prevents him from accompanying German Chancellor Angela Merkel on a trip to China.

Aug. 29
Merkel flies to China, without Enders. A telephone call is arranged nevertheless, in which Enders tells Merkel about the merger plans for the first time. She says Enders will hear back from her.

Sept. 12
BAE Systems confirms in a regulatory filing that it is in talks with EADS about a possible merger. EADS shareholders would control 60% of the new company, BAE Systems' owners 40%. Management proposes veto rights for governments as protection against hostile takeovers.

Sept. 13
There are mixed reactions to the proposed merger among governments. Britain is broadly supportive, France seems to be willing to discuss it, and Germany officially says there are serious talks, but government sources already indicate their opposition. Intense multilateral negotiations with governments and company officials start.

master plan for communications foresaw Enders meeting with Merkel on the flight to Beijing and having plenty of face time with her in which to make a concerted effort at winning her approval of a merger of EADS and BAE Systems.

That merger would have changed the landscape of the global aerospace industry. Not only would it have created by far the biggest company in the sector, with $100 billion in annual revenues, surpassing even mighty Boeing, it would also have provided remedies for many of the shortfalls the two companies individually suffer.

BAE Systems is a large defense contractor in the U.S. and some other overseas markets, but it does not really have a civil business anymore. With defense budgets declining, there are serious questions about what the future holds for a company with an exclusive defense exposure. Conversely, EADS is so dependent on Airbus that it has been seeking ways to strengthen its defense unit, Cassidian, for years, without much success. One of its big weaknesses is its tiny presence in the U.S., still by far the world's largest defense market. A combined EADS-BAE Systems group would have split revenues almost evenly between the civil and defense units, becoming a powerhouse like Boeing, only much larger.

And the deal would have led to much needed consolidation in a contracting global defense market. Surely the political implications would also have been felt down the road. Combining Europe's defense capabilities would have been a strong statement in politically challenging times.

But with Enders in medical treatment instead of flying with Merkel to Beijing, only a short telephone call could be scheduled between the two. Enders could do no more than outline the merger plans, make a quick pitch about the benefits he believed would accrue and seek Merkel's commitment to try to gain German government approval. A few weeks later, the deal was dead.

Angela Merkel, chancellor since 2005, was the one person to block what would have been the biggest merger in the global aerospace industry. It may not have led to the kinds of benefits business leaders outlined in their lobbying campaign, and by no means were all investors as convinced of its merits as the two companies. But it has been a long time since any government intervened in the aerospace industry so forcefully—and for purely political reasons, not over competition concerns.

Merkel simply did not want the merger and not even France's President Francois Hollande and Britain's Prime Minister David Cameron could do anything about it. On Oct. 9, a day before a regulatory deadline expired, Merkel called Hollande and told him that she did not want things to proceed. And when Cameron then tried to reach her for a last-ditch attempt to rescue the deal, she would not even pick up the phone, insiders say.

Merkel, Aviation Week's 2012 Person of the Year, has had huge influence on the aerospace industry. That influence did not simply sink an EADS/BAE Systems merger, it changed the very arc Europe's largest aerospace and defense company was on and altered the transatlantic industrial landscape.

Shortly before the turn of the year 2013, the German government became a direct and major shareholder in EADS. Germany's political establishment has long quipped about the tight grip the French government has on what it considers industries of strategic importance. Germany has not been as intimately involved in the running of its industries. Ironically, it is a coalition of conservatives and liberals—usually those that argue the loudest against state interference in private enterprise—that has changed the previous course and started reining in aerospace in a previously unheard of way.

The reasons why all of this is going on have little or nothing to do with aerospace but show how easily the industry's course can be changed by forces outside the markets or its products. For EADS and BAE, the reasons had to do with the sad realities of a Europe in turmoil, disagreement and mistrust. And they had to do with Angela Merkel's own background.

Merkel, 58, was born in Hamburg, but moved to East Germany with her family in 1954. Following graduation from high school, she studied physics in Leipzig and started a university career that ultimately landed her a job at the academy of sciences in East Berlin. Although she would quickly become involved in the first freely elected government of East Germany in 1990, she was not politically active during the Communist era. Her father was a Protestant minister and Merkel never became a member of SED, the ruling socialist party nor of the former so-called "bloc parties" that served as charade of pluralism but actually were all part of the establishment.

After the collapse of SED and the first democratic elections in East Germany, Merkel's began her political career as spokesperson for Demokratischer Aufbruch (DA, Democratic Awakening), one of the new parties that quickly merged with CDU, the conservative party. In 1991 and in the reunified Ger-

Sept. 28
Arnaud Lagardere, chairman of EADS and owner of its minority shareholder Lagardere Group, says the deal would have to be reworked to better meet EADS shareholder interests. Lagardere wants to sell his stake in the group soon.

Oct. 1
Enders and BAE Systems CEO Ian King write a joint op-ed article that is published in several European newspapers to garner political support and lobby for the merger. It has become increasingly clear that the German government does not want the deal to go ahead and some key shareholders are concerned, too.

Oct. 4
Enders says in an interview that he is willing to give job guarantees in an effort to alleviate concerns over German defense labor cuts.

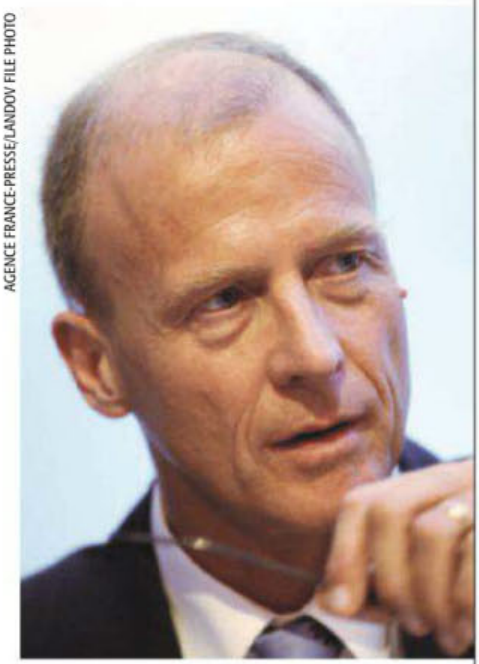
Oct. 5
A group of 45 British members of Parliament writes to Prime Minister David Cameron demanding that all government stakes be given up before a merger is approved.

Oct. 8
Invesco Perpetual, BAE Systems' biggest shareholder, says it does not understand the strategic logic of a merger.

Oct. 9
Merkel tells French President Francois Hollande that she will not approve the merger.

Oct. 10
BAE Systems and EADS decide to terminate their talks and say they will not file for an extension of the regulatory deadline.

many, she became minister for youth and women in Helmut Kohl's third cabinet and, in 1994, minister for the environment. Following Kohl's defeat in 1998, she continued to rise through the CDU ranks and took over its chairmanship in 2000. In 2005, she became chancellor, leading a grand coalition with the Social Democrats before joining forces with the Liberals in 2009. Merkel is up for reelection in September.



AGENCE FRANCE-PRESSE/LANDOV FILE PHOTO

Ironically, the failure of the EADS-BAE merger served to enhance Enders' job security.

Merkel is often described as being extremely pragmatic, non-ideological and unemotional. But what is perhaps the most striking feature of her policies is a distinct coolness about grand visions of European integration. Helmut Kohl, her predecessor at the party's top and as CDU Chancellor, chose European integration as his overarching foreign policy goal. Merkel, it seems, could not care less about Europe or visions. Of course, Europe is important to her when it comes to protecting German interests, but Merkel certainly does not serve well as a visionary. "If you have visions, go see a doctor," said former Social Democratic Chancellor Helmut Schmidt. That statement could well have been one of Merkel's.

If she does have a vision, then it is about fiscal discipline. Merkel has been the driving force behind efforts to bring public spending more in line with budgets. She was willing to accept the social ruptures as a consequence and was long unsure about whether Greece should exit the eurozone. The suspicion among her fellow heads of state may be mutual. *Time* magazine put it succinctly on the cover of its international edition recently with the words, "Why everybody loves to hate Angela Merkel."

Merkel's skepticism of a grand, unified European community and her wariness of European partners played a key role in the decision not to allow the EADS/BAE merger and push through her own corporate governance reform at EADS.

"What really shocked us, even looking back, is the approach of the German government that followed one simple rule: If France, the U.K. and EADS management like it, then there has to be something wrong with it," says one executive who participated in the negotiations. "But what does that tell us about European unity?" Merkel studied Russian in school and she admires the U.S. (She was one of the very few European politicians with a close relationship to then-U.S. President George W. Bush.) But France? That's a different story. Because Merkel mistrusts France, she could not allow the merger, and she believes Germany needs to own as many shares in EADS as France.

It was not Merkel alone who formed the government's aerospace policy, of course. For the details, she relied on an old ally, Peter Hintze, whom she hired as state secretary in the ministry of youth and women in 1991. Today, Hintze is the deputy economics minister, with the additional title of aerospace coordinator. Hintze was against the merger, in favor of government intervention all along.

After Enders's missed trip to China in August and his brief chat with Merkel on the phone, he never really heard back. One Enders aide says the company offered further explanations and proposed meetings numerous times only to hear that Merkel's schedule did not permit additional discussion.

In September, the merger story leaked and it was all over the news. Things were about to go terribly wrong from the industry's perspective, and everyone on the inside of the deal knew it.

"That leak was catastrophic," says one industry official, because it put pressure of all sorts on all sides. The parties had agreed on what they would say publicly in case information about the plans became known prematurely. And so the official German government spokespersons said the two companies and the governments were in a "constructive dialog," with an open outcome. However, on the same day, several German newspapers quoted an anonymous government source as saying there were serious concerns and approval was unlikely. Most observers are certain that source was Hintze, Merkel's top aide.

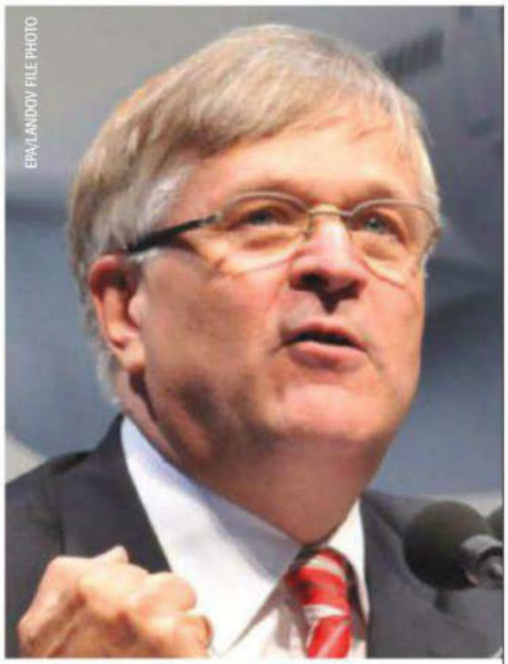
Officially, the process continued normally. An inter-ministerial working group was set up to look at the various possible implications—but Hintze never attended its meetings. The government ministries sent different people all the time, citing vacations and illnesses. But there was never an official indication that "no" would be the answer to the proposed merger until almost the very end. Says one senior executive, "It would have been much more honest to simply say 'no' right from the start."

REUTERS/LANDOV FILE PHOTO

Merkel's vision has been one of fiscal discipline rather than European integration.

By not allowing the merger, the German government not only missed what many regarded as a great opportunity for European aerospace, one that one industry official lamented "will never come back." It also inflicted a wound to Enders that well might have led to his resignation, if EADS were a more ordinary company.

Enders has been fighting hard


EPA/LANDOV FILE PHOTO

Deputy Economics Minister/Aerospace Coordinator Peter Hintze has been Merkel's ally since 1991.

against the sort of government influence that prevented the merger since he took on his current job. The irony is that the same outlook on the part of Merkel that nixed the deal may have kept Enders in his job. A resignation would have led to a fundamental EADS leadership crisis that would have been difficult for all parties to handle.

Merkel's intervention marks a turn in economic policy and a departure from the previous laissez-faire attitude. Only a few years ago, it would have been unthinkable for the German government to block a merger for the reasons that were key in this case and subsequently buy a significant minority stake in a large corporation. Major concerns such as the postal service or former national carrier Lufthansa were privatized more than a decade earlier and keeping the state out of business seemed like a good strategy that large parts of the political spectrum could agree on, even the German left. It also seemed acceptable that France has owned a stake in EADS since the company's inception in 2000 and Germany did not.

But that policy fell by the wayside in the wake of the global banking crisis, which required massive intervention and, among others, the nationalization of Germany's second-largest bank, Commerzbank. The policy shift that was unavoidable to keep the banking sector from collapsing four years ago had serious ramifications elsewhere, too. It helped change the mind-set of key decision makers who came to the conclusion that state intervention was a suitable measure in other areas, too.

Long before the first rumors about a possible combination of EADS and BAE emerged, Merkel had decided that German interests can only be served well in the future if the government owns an EADS stake of the same size as France to ensure the much-sought-after balance of power.

Since EADS was set up 12 years ago, the French and German sides within the company have often argued that more workshare is about to move across the border, leading to the loss of highly qualified jobs, engineering and development competencies and production facilities. None of that has happened, at least not to any noticeable degree. Similar concerns were at the core of Germany's opposition to the merger. With the Airbus business centered in Toulouse and the defense business likely being run out of the U.K., wasn't it only a question of time until Germany would become disadvantaged?

Things became serious when car manufacturer Daimler made clear that it will sell down its 15% stake in EADS over time. Daimler has long functioned as Germany's representative on the EADS board in times when it did not appear opportune to have a direct government stake. With the process dragging on over several years, Daimler became increasingly nervous and eventually told Merkel's government that it might sell its shares over the stock exchange. The existing shareholder pact regulating powers between Daimler, France's Lagardere Group, and the French and Spanish governments would have imploded.

Merkel realized it was time to do something. A plan to step in was crafted and even Tom Enders's best efforts to come up with a corporate governance scheme that would keep the government out proved to be unsuccessful. He had hoped that as part of the merger, governments would opt out. Now, more of them opt in.

Germany will, like France, control 12% of EADS; Spain's share will be 4%. The combined 28% is significantly more than the 20% previously held by France and Spain. There are some remedies, though, which make the new governance easier to cope with. Administrative board members can only be proposed by the nomination committee and each shareholder is limited to 15% of voting rights.

EADS has come up with some surprisingly positive statements about the new setup, but it is evident that, again, politics and diplomacy are at play. Following the recent clashes over the failed merger (Enders and Hintze still don't talk to each other), EADS believed the situation needed to be calmed. Ultimately, despite outward appearances, it will still be Hollande and Merkel who call the shots at EADS. Even as the near-merger recedes in time, that is not good news for the company.

PERSON OF THE YEAR 2005-12

Aviation Week & Space Technology's Person of the Year feature debuted in 2006 to recognize individuals who had the most impact in the previous year on the aerospace, defense or aviation industries—for better or worse.

2005
PIER FRANCESCO GUARGUAGLINI
CEO, Finmeccanica

2006
ALAN R. MULALLY
CEO, Ford Motor Co., and former CEO, Boeing Commercial Airplanes

2007
QIAN XUESEN
Chinese space pioneer

2008
ROBERT M. GATES
U.S. Secretary of Defense

2009
THE SPACE ENTREPRENEUR

2010
JEFFERY A. SMISEK
CEO, United Continental Holdings

2011
LOUIS R. CHENEVERT
Chairman and CEO, United Technologies Corp.

2012
ANGELA MERKEL
Chancellor of Germany

Check out past Person of the Year selections in the digital edition of *AW&ST* on leading tablets or go to **AviationWeek.com/person**

The Odd Couple

Reid, Boehner at the helm of a Congress adrift

Jen DiMascio Washington

XINHUA/LANDOV FILE PHOTO

Sen. Harry Reid (left) and Rep. John Boehner.

Senate Majority Leader Harry Reid (D-Nev.) and House Speaker John Boehner (R-Ohio), were presented with a challenge at the start of 2012: get their parties to agree to cut $1.2 trillion from the budget and deal with a series of tax extensions. Failing meant a likely recession caused by inaction, and election-year inertia only raised the stakes.

They averted economic disaster—sort of. Instead, leaders of Democrats and Republicans in Congress were sidelined in the final negotiations with an agreement that will require yet another agonizing exercise in brinksmanship this March.

Through the year, Reid and Boehner managed to pass bills that felt like big victories.

They started out on what seemed like a high note. After shutting down the FAA for two weeks in summer 2011 and 23 short-term extensions, Reid and Boehner overcame a brutal partisan disagreement over union voting rules to pass the FAA Modernization and Reform Act that set development goals for the Next-Gen air traffic modernization program and established deadlines for rules of the burgeoning civilian unmanned aerial vehicle industry.

By May, the parties were at war again over whether to extend the Export-Import Bank's operating authority. The two-front conflict played out between corporate giants Boeing and Delta Air Lines and, politically, with conservative Republicans vilifying the Ex-Im Bank as being a form of corporate welfare and a contributor to the U.S.'s massive debt. Ultimately, Reid and Boehner reached a compromise—victories to be sure, but ones that did not need to be so contentious.

Institutional factors are driving the legislature's lack of success. Gerrymandering has made congressional districts safer for each party, contributing to polarization and making the art of compromise more difficult. The elimination of earmarks and removal of power from committee leaders have eroded lawmakers' ability to trade parochial self-interest for political conviction. And the presidential campaign tamped down action on the economic crisis until the polls closed in November.

Rather than embrace the opportunity to solve the congressionally inflicted debt crisis, Reid poked at a Boehner still raw from the inability to corral his delegation around an ill-advised last stand on the deficit. Boehner made matters worse by cursing at the Senate leader outside the Oval Office. That left the nation's economic health in the hands of Vice President Joe Biden and Senate Minority Leader Mitch McConnell (R-Ky.).

Says Sen. Lindsey Graham (R-S.C.): "I hope the 113th Congress will do better than the 112th: The good news is the bar is so low you can't help but do better."

Frank, Feared and Respected

Bogdan focuses on accountability for Pentagon procurement

Amy Butler Washington

LOCKHEED MARTIN FILE PHOTO

U.S. Air Force Lt. Gen. Christopher Bogdan

Air Force Lt. Gen. Christopher Bogdan has become a procurement "fixer" for the service, which has endured a decade of acquisition foul-ups resulting in thorny relations with top contractors.

To the delight of Congress and the Pentagon—and often the dread of contractors—he has set a new standard for being plainspoken and transparent. Though his style has some contractors nervous, his impact is perhaps evident by their respect for him. "You know where you stand [and] there is no ambiguity," says one industry official close to dealings with Bogdan. "He cuts through the red tape and the fog" and focuses on execution. Unlike some program managers, Bogdan is willing to take a chance. "He is not one to sit around studying a problem for too long" and get bogged down by risk aversion, the official says.

In taking his most recent post overseeing the Pentagon's massive F-35 program, Bogdan left no room for interpretation about what he felt his job—and measure for success—is. In his first major public appearance as the deputy director last fall (he assumed the post as program executive officer last month), Bogdan stunned the audience by declaring the relationship between the Joint Strike Fighter Joint Program Office and its prime contractor, Lockheed Martin, "the worst I have ever seen."

Lockheed Martin officials in the audience looked on uncomfortably as the general said he was willing to "shed baggage" in the form of letting go of personnel—in government or industry—unwilling to move forward on the program productively. But, again, a contractor noted with respect that the general is as willing to put blame on stubborn personnel in industry as on the government.

He is now infusing into the F-35 the strategy of a shared risk and gain between contractor/government that he instituted in the Air Force tanker program. As Boeing paid high premiums in a campaign to win the KC-135 replacement contract back at nearly all costs, Bogdan took the company at its word. Boeing won over bitter rival EADS, but only after agreeing to underwrite up to $400 million of the development of its KC-46 because it is expected to exceed the target price. Time will tell whether Boeing's gamble will pay off, but in crafting the contract Bogdan earned a reputation as a hard negotiator.

This quality is rare in the Pentagon, but one that is much needed in the face of the national focus on deficit reduction.

Weather Warning

Wired world is increasingly vulnerable to coronal ejections from the Sun

Frank Morring, Jr. Washington

Powerful solar storms are an imperfectly understood threat to the world's power grids, but one with the potential for economic damage so catastrophic that the estimated $100-200 million it would cost annually to deploy an operational space-weather warning system could be trivial by comparison.

In a "perfect storm" scenario, when a high-power coronal mass ejection (CME) of charged particles slams into Earth at a time when the delicate balance operators try to maintain in electric power grids is precarious, the resulting damage could take a decade to repair at a cost very roughly estimated by the National Academies of Science as high as $1 trillion.

In recent congressional testimony and a public forum in Washington, space-weather experts caution that the 1859 solar storm observed by British astronomer Richard Carrington is only the most powerful one detected so far. That storm took down parts of the growing U.S. telegraph network, starting fires in the process and subjecting some telegraph operators to electric shock.

Recent calculations suggest there is a 6-12% chance of another storm at that level in any given year. But since there were no networks of long electric wires crisscrossing the planet before the 19th century, there is really no way to know precisely how bad "the Carrington event" really was, according to Tom Mahony, senior advanced systems manager at Ball Aerospace.

"We've only had 150 years to observe these events," he says. "We're projecting this as a 100-year event when we've only observed it for 150 years. We have geological records that go back millennia."

"We are so dependent on electronic transactions for everything—buying groceries, buying gas—that you can easily see how this could decay into serious civil discord"

Solar storms, and particularly CMEs, can pose a health threat to astronauts in space and passengers on airliners passing over the poles, where protection from Earth's mag-

netic field is weakest. They also can damage spacecraft electronics, and increase drag on satellites so they consume more fuel to maintain their proper orbits. But the most serious potential for damage rests with the transformers that maintain the proper voltage for efficient transmission of electricity through the grid.

On Dec. 4, Mahony told a panel sponsored by the Space Enterprise Council and the George C. Marshall Institute that by National Academies' calculations, there are 2,000 ground transformers and 140 million more mounted on power poles that are vulnerable to CMEs. Under the right conditions, it is at least possible that a major CME could cause so much damage that power would be off or compromised indefinitely. Listing the resulting impacts on food and water distribution, health care and the economy, Mahony warned the results could be dire.

"We are so dependent on electronic transactions for everything—buying groceries, buying gas—that you can easily see how this could decay into serious civil discord," he says. "We can't really avoid the event. We *can* mitigate the impacts, and that means we need to know what's coming."

NJAAL GUBARNDSEN

Auroras like this one over the Kjell Henriksen Observatory in Svalbard, Norway, are beautiful, but the terrestrial impact of the solar events that cause them can be devastating.

With warning, says Catholic University of America economist Kevin Forbes, power-grid operators can take precautions to protect their systems, including making sure they have enough "reactive power" available to expend on keeping the networks balanced during a storm, and perhaps "ease up on their transmissions so as to produce closer to home so they're not vulnerable to those fluctuations in the electricity flows."

Forbes has calculated the outage costs that electric utilities pass along to their customer base at $5,000-10,000 per megawatt hour. At that rate, paying for an operational warning system is cost effective.

"Would it make economic sense," he says. "The answer is probably 'yes,' because the economic cost of a blackout—even if the transformers are not permanently damaged—is huge, given that $5,000-10,000 figure that I put forward."

In a House Science Committee hearing on the same subject, witnesses agreed with the thrust of the latest National Research Council decadal survey on space weather, which was released in August. At the top of the priority list, which was based on a survey of researchers in solar and space physics, was a call to complete the present program of spacecraft designed to expand knowledge of how the Sun's violent nature impacts the space around it.

Collectively the 18 solar-observation spacecraft NASA is flying, and the network of ground facilities run by the National Science Foundation (NSF) comprise a virtual "Heliophysics Systems Observatory" that collects information on the solar flares and CMEs, as well as how the solar wind spreads through the solar system and interacts with Earth's magnetic field.

But the scientific satellites in the virtual observatory have limited lifetimes that will begin to expire by late in the current decade, and so far there is no plan or money to use the knowledge they collect to establish an operational system.

"We have to have complete observations of the Sun, the interplanetary medium, the effects at Earth," says Daniel N. Baker of the University of Colorado, who chaired the NRC's decadal survey committee. "We have to have the models, the tools that are necessary to tie all this together."

Just doing that "requires an investment of more resources than are presently available in the budgets of any of the agencies," Baker testified. "And so the vision we laid out was one which would require another $100-200 million per year over this next decade, without doing damage to the basic science or the ongoing activities of [the National Oceanic and Atmospheric Administration] or NSF or any of the other agencies."

Baker's panel called for a follow-on study to address the issue of funding and division of labor between NOAA and NASA. Near-term, he says, NASA could take on more of the operational role carried by NOAA's National Weather Service if funds for a dedicated operational system are not forthcoming.

That is likely, committee members warned, given the current budget crunch across the U.S. government. The decadal survey report included "decision rules" for policymakers to follow as they try to wedge the appetite for expensive space and ground hardware into the dwindling budgets for the relevant agencies. While NOAA and NASA take the lion's share of responsibility for solar-weather science and forecasting, a senior Democrat on the Republican-led panel suggested the Pentagon could play—and fund—a bigger role.

"One thing that we didn't have a chance to get on the record was not just the impact to us as civilians, and the impact in this environment, but what the impacts are on our critical infrastructure that is related to national security," says Rep. Donna Edwards (D-Md.).

Given the predictions of what could happen to civil society if the grid goes down, and the high cost of repairing it if it does, a military contribution to fielding a constellation of satellites able to monitor the Sun—and issue warnings as soon as possible based on models derived from the ongoing scientific research funded by NASA and the NSF—would neither be unreasonable nor particularly burdensome.

"At $5,000 to $10,000 of damage for every megawatt hour that doesn't get delivered, you don't have to prevent that many blackouts to recoup that $100 million," says Forbes.

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Jan. 22-25—National Business Aviation Association's Schedulers and Dispatchers Conference. H.B. Gonzalez Convention Center, San Antonio. See www.nbaa.org/events/sdc/2013
Feb. 17-21—Gulf Defense Conference and Official Conference of IDEX. Abu Dhabi, United Arab Emirates. See http://www.idexuae.ae/page.cfm
Feb. 26-March 2—Australian International Airshow and Aerospace and Defense Exposition. Avalon Geelong Airport. See www.airshow.com.au/airshow2013
March 5-6—Defense Technology and Affordability Requirements. Hilton Arlington (Va.). See http://events.aviationweek.com/current/dtar/index.htm
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NextGen Is Threatened, Too

BY MICHAEL J. DYMENT

Dyment is a general partner of the NextGen Equipage Fund LLC. He is based in Washington.

The gridlock and political temper tantrums of the U.S. Congress as 2012 drew to a close threatened to derail America's fragile economic recovery. Now, the specter of weeks of debate on the government's debt ceiling and deep, automatic spending cuts known as "sequestration" promises more chaos.

In just the first year of sequestration, the FAA Operations Account and the Facilities and Equipment Account would each be cut by 8.2%, or $377 million and $229 million, respectively. NextGen programs would absorb the majority of those cuts, delaying programs already under funding pressure, such as ERAM (En Route Automation Modernization), ADS-B (Automatic Dependent Surveillance-Broadcast) and Data Communication.

The pressing need for such upgrades has been partially obscured by cuts in the capacity of U.S. airlines. By removing aircraft, flights and seats, carriers have been able to raise ticket prices and bolster profits—leading to more crowded cabins and, temporarily, less crowded skies. That is good, because airlines need a few years of profitability to accumulate capital, strengthen balance sheets and better manage the burden of investing in new aircraft and technologies, to reduce delays and operating costs caused by older aircraft and antiquated ATC.

> "The pressing need for ATC upgrades has been partially obscured by cuts in the capacity of U.S. airlines."

But capacity reduction cannot be a long-term national airline policy. The FAA predicts that by 2032, the U.S. airline industry will need to fly 1.2 billion passengers, a substantial increase from the 731 million carriers served in 2011. If the system cannot handle those traffic levels, the nation's economy will suffer, and passengers will pay much higher ticket prices.

Aggressively proceeding with NextGen is the only solution for U.S. airspace modernization. Yet oddly, most of the increased capabilities NextGen would offer remain unfunded or underfunded by Congress. Sequestration would exacerbate the situation. For instance, the FAA's projected facilities and equipment budget cannot adequately support critical and capital-intensive future programs such as Datacomm, Future Facilities Modernization, Tower Flight Data Manager, Common Support Services and Multi-mission Phased-Array Radar.

Concerns over NextGen funding are driving airlines to slow-roll much-needed efforts to retrofit aircraft with new avionics. This is alarming. The full benefits of NextGen can only be realized once the U.S. fleet has reached "predominant equipage"—with upwards of 65% of in-service passenger aircraft having the necessary avionics. Meanwhile, the clock is ticking. It will take the better part of a decade for fleet retrofits to be completed. The deadline for the ADS-B mandate is barely seven years away.

Despite Congress's dilatory performance, there is a bright spot. Innovative approaches can be used to bring private sector capital into NextGen infrastructure renewal. In its 2010 report, the National Commission on Fiscal Responsibility and Reform, commonly known as Simpson-Bowles, called for government to leverage private capital through an infrastructure bank and other forms of credit enhancement. With this political endorsement, the FAA can pursue public-private partnerships, tapping considerable commercial funding sources, while resting assured that it is on the right side of the fiscal debate.

Our NextGen Fund LLC has been established to address the airline equipage funding gap and finance the sector's way to predominant equipage, using a public-private partnership that taps aerospace industry investment and federal loan guarantees.

Happily, both Congress and the Obama administration are open to these partnerships and understand that under the right circumstances, almost unlimited sources of private sector capital can be made available for NextGen and other FAA facilities renewal. That is critical, because the real cost of bringing the nation's air traffic infrastructure fully into the 21st century is probably $30-40 billion.

Aviation is a linchpin of national economic prosperity. Innovative financing can provide the missing element to allow aviation to expand to support growth. These approaches should become integral to all major FAA procurements. The politicians may be gridlocked but that does not mean our airways have to follow suit.

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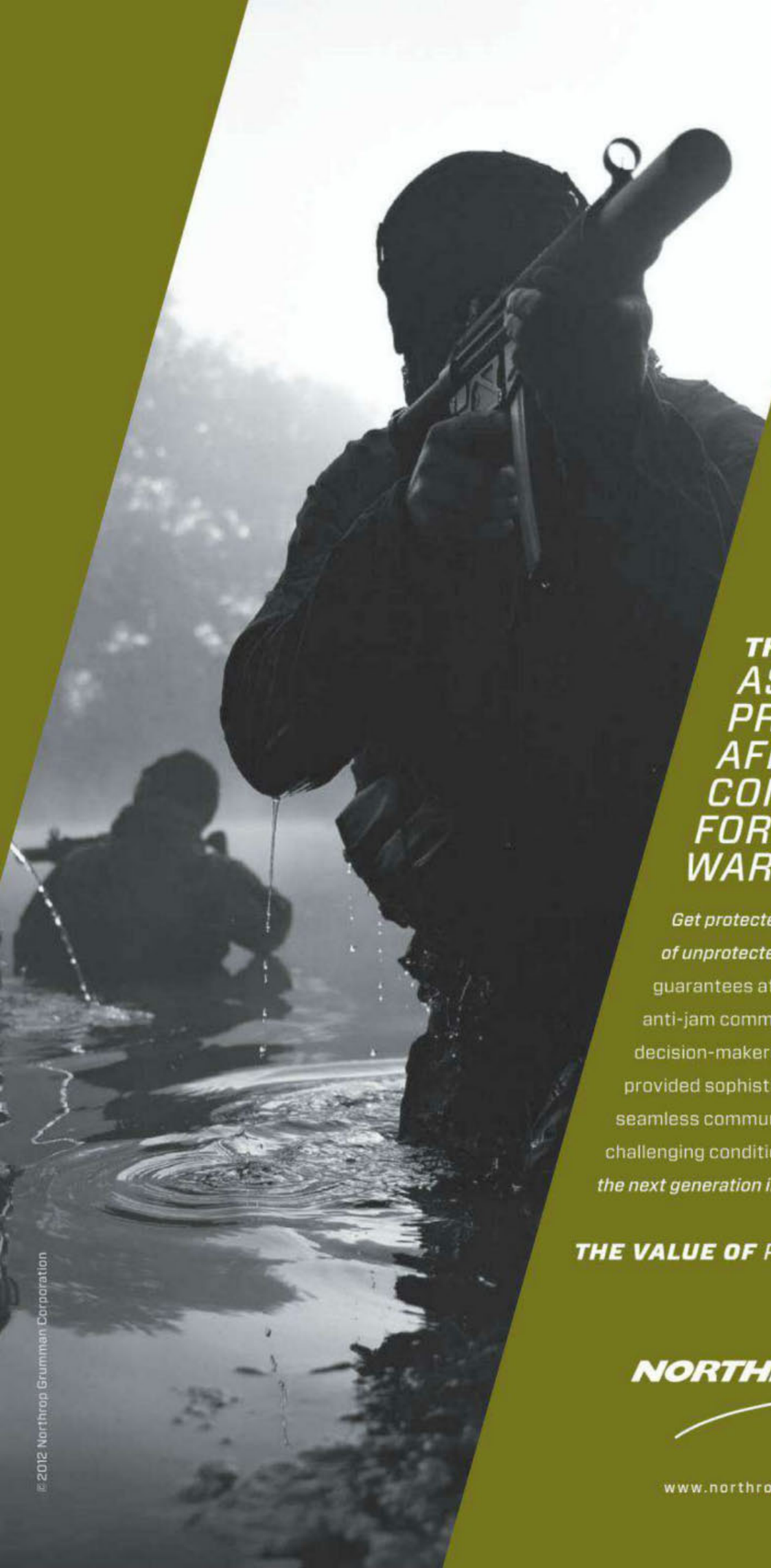

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