FINMECCANICA CORRUPTION PROBE

$7.95 FEBRUARY 18, 2013

AVIATIONWEEK & SPACE TECHNOLOGY

ISR's Shifting Priorities

RICH MEDIA EXCLUSIVE

Platforms, Systems, Sensors

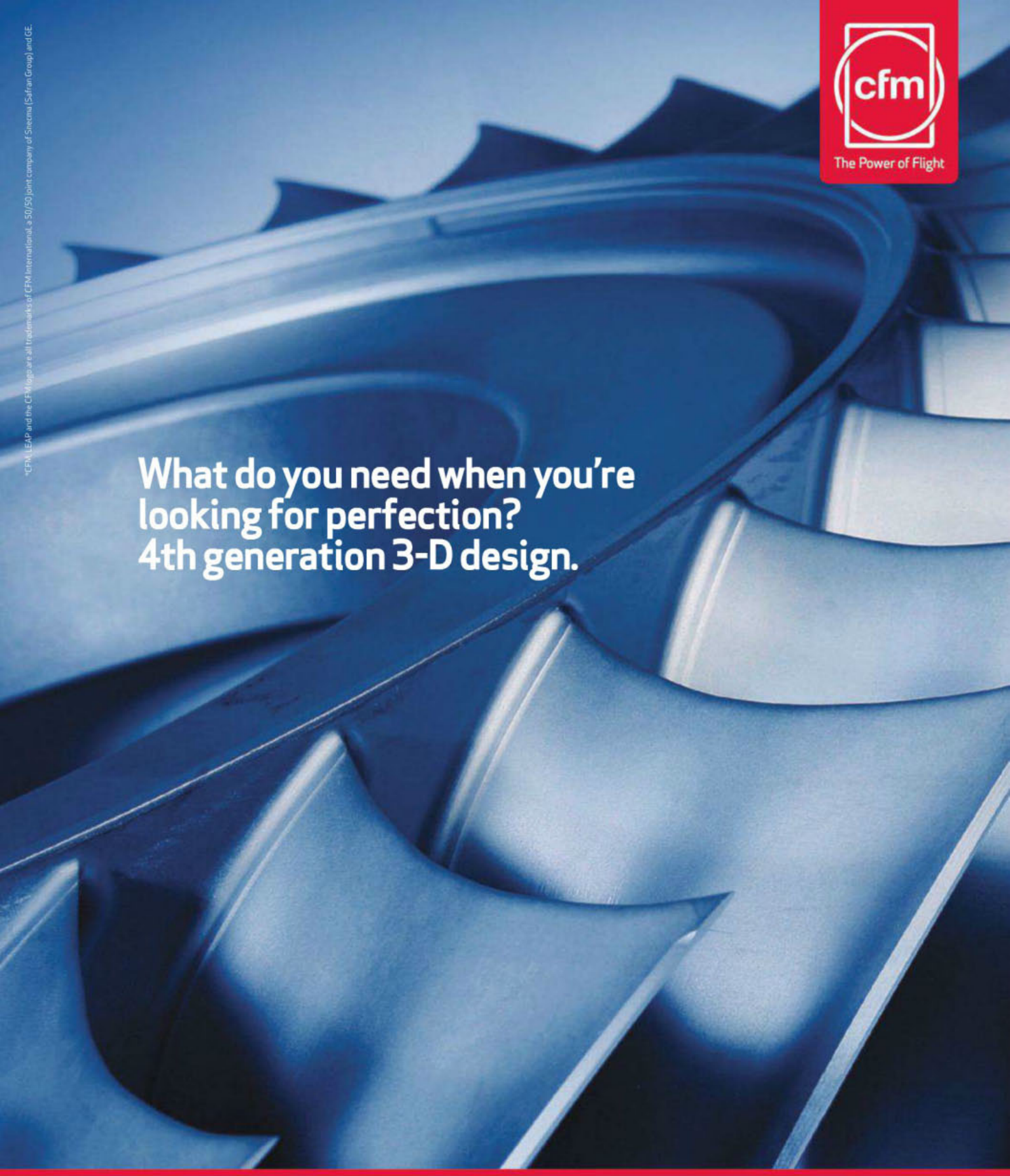
787 GROUNDING
Impact on Airlines

CFM56 ENGINE
Thrust Anomalies

AUSTRALIAN DEFENSE
In China's Shadow

The McGraw·Hill Companies

AviationWeek.com/awst



Another proven breakthrough for LEAP technology.

Advanced 3-D aero technology from CFM*. Inspired design. Unmatched experience. Improved operational efficiency. Our 4th generation 3-D design isn't the future. It's the present. Visit it at cfmaeroengines.com

cfm LEAP

AVIATION WEEK & SPACE TECHNOLOGY

Editor-In-Chief Joseph C. Anselmo
Executive Editor James R. Asker
Managing Editors Michael Bruno, Jens Flottau, Graham Warwick
Assistant Managing Editor Michael Stearns
Art Director Lisa Caputo
Executive Editor, Data and Analytics Jim Mathews

DEFENSE, SPACE AND SECURITY
Editors Michael Bruno (Managing Editor), Jefferson Morris (Associate Managing Editor), Amy Butler, Michael Fabey, Sean Meade, Frank Morring, Jr., Bill Sweetman (Chief Editor, Defense Technology Edition)

CIVIL AVIATION/MAINTENANCE, REPAIR AND OVERHAUL
Editors Jens Flottau (Managing Editor), Darren Shannon (Associate Managing Editor), Andrew Compart, John Croft, Leithen Francis, William Garvey, Fred George, Christine Grimaldi, Rupa Haria, Kerry Lynch, Bradley Perrett, Jessica Salerno, Adrian Schofield, Lee Ann Tegtmeier (Chief Editor, MRO Edition), Madhu Unnikrishnan

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

Please Recycle This Magazine
Magazine Publishers of America

FOR SUBSCRIBER SERVICE TELEPHONE/FAX NUMBERS, SEE "CONTACT US" PAGE
Printed in the U.S.A.

February 18, 2013 **Contents** Volume 175 Number 6

AVIATION WEEK
& SPACE TECHNOLOGY

Digital Extras Tap this icon in articles in the digital edition of *AW&ST* for exclusive features. If you have not signed up to receive your digital subscription, go to AviationWeek.com/awstcustomers

38 *U.S. Air Force plans to add four more collection bands to the U-2's spectral sensor, one of several upgrades as the vintage aircraft will see frequent use for intelligence-collection flights.*

DEPARTMENTS

UP FRONT

THE WORLD

INVESTIGATIONS

DEFENSE

AIR TRANSPORT

AIR TRAFFIC MANAGEMENT

COVER STORIES

Boeing's Phantom Eye hydrogen-fueled, long-endurance unmanned air vehicle undergoes a 40-kt. taxi test Feb. 6 at Edwards AFB, Calif., on its takeoff trolley before a second flight attempt. The 150-ft.-span aircraft was damaged on its first flight in June 2012 when its landing skid dug into the lakebed runway, but Boeing is persisting in its hopes of building a still larger operational version. A survey of intelligence, surveillance and reconnaissance technology strategies worldwide, including new and unconventional platforms, starts on page 38. NASA/Carla Thomas photo.

18 *Arrest of Finmeccanica CEO and the prospect that the company could be barred from doing business in India is shaking the defense giant's foundations.*

26 *Although most airlines with 787s are facing serious disruptions, some with the aircraft on order are relieved that they will not get them just yet.*

Agility is the new differentiator. In a world where customers need immediate solutions, L-3 continuously delivers on its reputation for superior mission availability and contract performance. We are changing the game by leading the charge in small aircraft ISR integration. Our solutions include state-of-the-art data links, full-motion video encryption and the industry's most powerful high-definition EO/IR sensors. We consistently find cost-effective answers to critical needs and challenges — agility realized on every front.

Agile — It's how we deliver.

L-3com.com

Contents

Volume 175 Number 6

ISR

AUSTRALIAN AIR SHOW

VIEWPOINT

On the Web

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

"Dendrites" became the aviation social media buzz word after it was reported that these chemical structures **may have caused the 787 lithium-ion battery fires. Aviation Week was the first to report it** and our exclusive Feb. 4 story was the most read that week on **Aviation Week.com.** Read the comments: *ow.ly/hGci0.* And stay up-to-date throughout the week on **787 developments** at **AviationWeek.com/787**

FIRST 787 BATTERY TEST FLIGHT

ZA005 took off from Boeing Field on Feb. 9 for the first in a series of 787 battery system test flights *ow.ly/hGd6N*

JOE WALKER

Follow Keep up with all the news and blogs from Aviation Week's editors.
Follow @AviationWeek or 'like' us at **Facebook.com/AvWeek**

NAV WEEK

On our Ares blog, check out Michael Fabey's new weekly feature, **NavWeek.** His first post covers the **Littoral Combat Ship,** which, Fabey says, could be called **the Accidental Combat Ship,** given its development challenges. *ow.ly/hGmaH*

READER COMMENT

In response to our Things With Wings blog on the **success of Delta Air Lines' acquisition** of a refinery, Chalete wrote: "As any **MBA student** will tell you, one of the very first things to learn is that **companies should stick to what they know best."** ow.ly/hGfeJ

PREMIUM CONTENT

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

AVIATION WEEK Laureate Awards

Aviation Week's 56th annual Laureate Awards will recognize individuals/teams for their extraordinary accomplishments. Their achievements embody the spirit of exploration, innovation, vision or any combination of these attributes that inspire others to strive for significant, broad-reaching progress in aviation and aerospace.

Join Us!

March 7, 2013
National Building Museum
Washington, DC • 6:00 p.m.

To reserve a table contact Regan Pickett at +1.540.349.5738 or reganpk@aol.com

The following categories will be recognized:

- Aeronautics/Propulsion
- Business/General Aviation
- Commercial Air Transport
- Defense
- IT/Electronics
- MRO (Maintenance, Repair & Overhaul)
- Space
- Workforce
- The Philip J. Klass Award for Lifetime Achievement
- Aviation Week Heroism Award

In addition, Aviation Week will present the Tomorrow's Leaders Award. This award honors the young men and women who have chosen career paths in the armed forces: graduates from the US Naval Academy, US Coast Guard Academy, US Air Force Academy and the US Military Academy.

Feedback

Aviation Week & Space Technology *welcomes the opinions of its readers on issues raised in the magazine. Address letters to the Executive Editor, Aviation Week & Space Technology, 1200 G St., Suite 922, Washington, D.C. 20005. Fax to (202) 383-2346 or send via e-mail to:* **awstletters@aviationweek.com**
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.

BACKBURNER THE BATTERIES

I was surprised when I first discovered that Boeing used lithium-ion batteries. I am retired from the aeropsace industry and now convert my interest in the field into radio-controlled electrically powered models. My model supply shop has insurance which excludes its stock of lithium-ion batteries from coverage. You can buy the batteries directly from China, but delivery is six weeks by sea. On more than one occasion I have burned my fingers.

For once the motor industry appears to lead the aerospace industry. Hybrid car batteries so far are all nickel-metal-hydride, even after more than 10 years of continuing effort to harness lithium types.

On the up side, if Boeing drops a few seats to compensate for the inevitable weight change, we could all have more room.

R.L. Creedon
OCEANSIDE, CALIF.

ONE QUESTION ANSWERED

I noticed in "Question Time" (*AW&ST* Jan. 28, p. 30) that you write about the two 32-volt main lithium-ion batteries on the 787. Later, you say that the batteries are made up of eight


Question Time

Digging Deeper

3.7-volt cells Do your math and you will find that 8 X 3.7 is 29.6 volts—a far cry from 32 volts. Are there more cells or is the voltage per cell wrong?

Joe Harrington
MONROE, WASH.

(The nominal voltage for each cell in the battery is 3.7, and for the battery as a whole it is 29.6. However, the operational voltage range of the entire battery encompasses 20-32.3 volts, hence the rounded-out reference to 32—Ed.)

HELP FROM ALL QUARTERS

You mention in "Safety First" (*AW&ST* Feb. 4, p. 24) that Elon Musk, SpaceX chief and founder of the Tesla electric car, which is powered by lithium-ion batteries, offered to help Boeing with the 787 battery situation. The FAA should require the aircraft manufacturer to accept it. Musk suggests that using many smaller batteries would render a better ratio of volume to surface area resulting in improved cooling.

The old Canadian bush pilot axiom says: "What you do not have cannot break," which augers for having fewer components, although this case may be an exception if having more batteries results in better cooling.

Boeing needs to more forcefully face this colossal error and rectify it. All genuine offers of assistance should be accepted. As we know from the DC-10 debacle, a sufficiently long grounding can do mortal damage to a commercial airplane program.

Dan Perley
COSTA MESA, CALIF.

DETAIL-DRIVEN

Hooray and hallelujah! Reader Myron Kayton (*AW&ST* Jan. 28, p. 8) put into words something I too found lacking in your magazine—an emphasis on how things work.

I have subscribed ever since I was very young person interested in all things aeronautical. I continue to subscribe well into my adulthood for much the same reason, despite the current emphasis on various forms of marketing, which I fully understand are subjects of interest to a large segment of your readers in the aerospace industry.

Still, I'll bet a regular nuts-and-bolts explanation of "What you always wanted to know about but were afraid to ask" would be a welcomed feature.

For instance, how fly-by-wire ends up actually moving a control surface, or an in depth explanation of emdrive—a concept recently mentioned in Aviation Week that made my hair stand on end!

Keep up your good work, but please add to it.

Mike Ford
RESCUE, CALIF.

FIND THE APP FOR THAT

Editor-in-Chief Joseph C. Anselmo recently asked for suggestions and ideas as *Aviation Week* heads into its 100th anniversary (*AW&ST* Dec. 31, 2012/Jan. 7, p. 154) Well, I am 62 so I am a "legacy reader," but one who reads the magazine now almost 100% on my Samsung 7-in. tablet. Until not so long ago I had a clear preference for the paper version even though I have spent a lifetime among computers and avionics. The major change came when the portability of tablets made me realize I could carry with me not only my favorite magazines but also the complete International Civil Aviation Organization library and much more.

I consider it a a huge bonus that I have virtual and physical access. From this vantage point, I must emphasize that when you look for ideas to get the balance right between legacy and electronic, you will probably want to find the killer apps that will get your legacy readers to approach the 20-somethings in their habits.

I think it is essential to narrow the gap between your readers because finding the ideal balance can be frustrating, and it is not without its dangers. But if you offer a product that entices the legacy folk toward less-legacy solutions, everybody wins.

Steve Zerkowitz
ZAVENTEM, BELGIUM

BROAD VIEW

My professional life encompassed a career in aerospace that culminated in my heading the Radiocommunication Bureau at the International Telecommunication Union in Geneva.

Now that I am retired, I still read Aviation Week avidly and I do have some recommendations, as recently requested in your pages.

First, I would like to see a reduced rate for retired aerospace professionals. And, in terms of content, I would like to see more coverage of accident investigations. There seems to be more coverage of miitary matters than there used to be, whereas my primary interests are in the civilian field.

Robert W. Jones
KELOWNA, BRITISH COLUMBIA

Who's Where

Steve Hogan

Mary Petryszyn

Christine Tovee

Richard Glass

Deborah Meehan

Dan Nale

Phil Stearns

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.*

Matt Ganz has been appointed president of Berlin-based *Boeing Germany* and Northern Europe and VP-European technology strategy, effective April 1. He succeeds **Marlin Daily**, who has retired. Ganz has been VP and general manager of Boeing Research & Technology.

Steve Hogan (see photos) has been named sector VP and general manager for Herndon, Va.-based *Northrop Grumman's* Integrated Logistics and Modernization division within the Technical Services sector. He was VP and integrated product team leader for the F/A-18 and information operations and electronic attack program. **Mary Petryszyn** has become VP-international in the Aerospace Systems sector. She was director of engineering at Raytheon Co. Strategic Systems. Also in Aerospace Systems, **Gene Fraser** has become VP-programs, quality, engineering and technology, succeeding **John Chino**, who plans to retire after 40 years with the company. Fraser was VP-engineering and global product development.

Dean Athans has been named president of the East Hartford, Conn.-based *Engine Alliance*, succeeding **Mary Ellen Jones**, who will return to a senior leadership position at Pratt & Whitney. Athans led the LMS100 power turbine product line at GE Power & Water Aero Derivatives business.

Philippe Campenon has been appointed deputy director for space and Earth observation and **Deepu Krishnan** senior consultant for the satcom business division of Paris-based *Euroconsult*. Campenon was business development manager for Astrium GEO-Information Services, and Krishnan held the same title at a European satellite provider. New senior affiliate consultants are **Jean Paul Carnicer**, procurement of satellite programs and launches; **Eric Choi**, space systems engineering and business development; **Dennis Jones**, U.S. Earth-observation industry; **Frank Niehaus**, satellite and ground segment operations; and **Jean-Pierre Patureau**, space technology and industry assessments.

Christine Tovee (see photo) has been selected as chief technology officer of Herndon, Va.-based *EADS North America*. She was the CTO's chief of staff to the CTO.

Jeffrey Vail has been appointed chief marketing officer for Radnor, Pa.-based *Quintig*. He was senior VP-global corporate marketing for Siemens Enterprise Communications.

Richard Glass (see photo) has joined Kansas City, Mo.-based *PAS Technologies* as senior VP-aerospace. He was VP-sales and marketing at VAS Aero Services Eurasia.

Roscoe C. Armstrong has been named chief operating officer of *StarPort*, a Cambata Aviation International company based at Orlando-Sanford (Fla.) International Airport. He has held key management positions in federal and commercial aviation sectors, including the FAA and L-3 Communications.

Deborah Meehan (see photo) has been appointed CEO and president of Vancouver-based *InterVistas*. She was president and chief operating officer of SH&E.

Paul Dailey has been named managing director of revenue and competitive analysis and corporate forecasting at *Delta Air Lines*, succeeding **Dwight James**, who will become managing director of transatlantic/joint-venture pricing and revenue management. He follows **Mark DeFrancesco**, who has become director of domestic pricing.

Dan Nale (see photo) will become senior VP-programs, engineering and test at Savannah, Ga.-based *Gulfstream Aerospace Corp.*, effective April 1, succeeding **Pres Henne**, who plans to retire March 31. Nale is VP-advanced aircraft programs.

David Herr has been appointed executive VP of Arlington, Va.-based *BAE Systems'* Service Sectors. He was president of the Support Solutions Sector.

Phil Stearns (see photo) has been promoted to general manager of Greenville, S.C.-based *Stevens Aviation's* Dayton, Ohio facility, succeeding **Ron Tennyson**, who plans to retire after 25 years with the company. Stearns was technical sales manager.

HONORS AND ELECTIONS

David J. Barger, president and CEO of JetBlue Airways, has received the Transatlantic "Leading Edge" Award presented by the Washington branch of the *Royal Aeronautical Society*. The award recognizes leadership and achievements that contributed to the advancement of aerospace technology and safety between North America and Europe.

Steven H. Walker, deputy director of the U.S. Defense Advanced Research Projects Agency, has been named a fellow within the Washington-based *American Institute of Aeronautics and Astronautics*. The honor recognizes longstanding contributions to the aerospace community.

Romain Bausch, **Robert Zitter**, **Susan Irwin**, Prof. **U.R. Rao** and **Dick Tauber** are scheduled to be inducted into the New York-based *Society of Satellite Professionals International* (SSPI) Hall of Fame on March 19. Bausch is president and CEO of SES and Zitter is executive VP and chief technology officer of Home Box Office. Irwin is president of Euroconsult U.S. and one of the founders of SSPI; Rao is chairman of the Governing Council of the Physical Research Laboratory at Ahmedabad, India; and Tauber is VP-transmission systems and new technology for the CNN News Group.

SPACE

Landsat 8

Scientists, land-use planners and others who track changes in the Earth's surface could get another decade of data from the newest in a series of Landsat spacecraft, launched Feb. 11 on an Atlas V 401 from Vandenberg AFB, Calif. Built by Orbital Sciences Corp., the Landsat Data Continuity Mission (LDCM) separated as planned and deployed its solar arrays 86 min. after launch. That set the stage for a two-month trek to its operational 705-km (483-mi.) Sun-synchronous polar orbit that will include a comparison of data from its two sensors with data from Landsat 7. Once checkout is completed, LDCM will be renamed Landsat 8.

Aerojet Wins Parts Pact

Aerojet will develop a 550,000-lb.-thrust-class main injector and thrust chamber for an oxidizer-rich, staged-combustion, kerosene-fueled rocket engine under a $23.3 million risk-reduction contract. The engine is targeted for NASA's proposed advanced strap-on boosters for the heavy-lift Space Launch System (SLS). Under the contract, the fourth that NASA has awarded to begin bringing the heavy-lift SLS to the 130-metric-ton capability ordered by Congress, Aerojet also will prepare for hot-fire tests designed to demonstrate performance and combustion stability.

Hot Mess

International Launch Services (ILS) says the Dec. 8, 2012, failure of a Proton rocket equipped with a Briz M upper stage has been traced to too-high propellant temperatures at liftoff that caused damage to a bearing in the Briz M main engine turbo pump. ILS says the most probable root cause of the failure was a combination of adverse thermal conditions that caused damage to a bearing on the oxidizer side of the turbo pump. The result was a failure of the bearing that caused the fourth burn of the Briz M to end about 4 min. early, with subsequent separation of the spacecraft. ILS says Proton will return to flight March 27 with the launch of the Satmex 8 satellite.

REUTERS/LANDOV FILE PHOTO

India To Pursue Larger-Capacity Ballistic Missile

India is developing the sixth in its series of Agni ballistic missiles, this time with multiple independently targetable reentry vehicle (MIRV) capability.

Defense and Research Development Organization (DRDO) chief V.K. Saraswat, who is also the science adviser to the defense minister, did not divulge the range of the new missile. But a ministry official indicates it is likely to be 8,000-10,000 km (5,000-6,000 mi.), far beyond the 5,500-km range of the Agni-V. While Agni-V can carry up to three nuclear warheads, Agni-VI is being designed to be able to carry up to 10. India test-fired the Agni-V in April 2012. Saraswat says Agni-V will be inducted in 2014 after user trials.

The Indian government has yet to give its formal approval for the Agni-VI project, but the DRDO chief says, "Work is on in this area and designs have been completed. We are now in the hardware realization phase."

The ministry official says DRDO soon will begin development trials of the new missile. It is likely to be a three-stage missile weighing around 55 tons with the capability to be launched from land and submarine.

Secure Space

Astrium, the space division of EADS, will begin development of Europe's first military high-speed satellite broadband network under a roughly €40 million ($52 million) contract awarded by French defense procurement agency DGA. The agency had budgeted €221.36 million through 2030 for the program, known as "Comcept." The all K_a-band

Losing Ground

French arms exports were down sharply last year, from €6.5 billion ($8.7 billion) in 2011 to an estimated €5 billion in 2012, thanks to stiff competition from increasingly hungry U.S. contractors and technological gains in countries that until now posed little threat to the world's No. 4 defense exporter.

"The Americans are on the offensive with reductions in their own R&D budget," says Laurent Collet-Billon, head of French defense procurement agency DGA. "And some nations have reached a technical level where they can offer serious competition," he said, citing Israel, Italy and South Korea.

France's inability to sell the Dassault Rafale fighter is chief among missed marks last year, with Paris and New Delhi still negotiating a 2011 agreement for 126 aircraft. The sale topped French President Francois Hollande's agenda during a visit with Prime Minister Manmohan Singh in New Delhi Feb. 14, but a contract is not expected before mid-2013.

France did seal a nearly €1 billion deal with India last year for 500 MBDA Mica air-to-air missiles, part of a broader agreement signed in 2011 to upgrade the air force's Mirage 2000 fighters. Collet-Billon says the defense ministry is also supporting French contractors at home, including speeding license clearances. He says basic technology research will grow to €750 million in 2013 from €725 million in 2012 to maintain industry competitiveness, while another €50 million is earmarked for projects proposed by small and medium enterprises, which account for about 5% of French defense exports.

In the meantime, France's challenging economic climate resulted in a drop in equipment orders, from €8 billion in 2011 to €6.4 billion last year. DGA awarded a handful of contracts in 2012, including next-generation software-defined radios, an upgrade for the M51 ballistic missile,

ground network is expected to complement the French military's Syracuse telecommunications satellites starting in 2014, providing French defense forces access to broadband capacity through the Franco-Italian Athena-Fidus satellite slated to launch in the coming year.

AIR TRANSPORT

Noise, CO_2 Limits Backed

A new, lower noise limit for aircraft and certification procedures supporting the first CO_2 standard for aircraft have been recommended by the International Civil Aviation Organization's (ICAO) Committee for Aviation Environmental Protection (CAEP). The new level, to be called Chapter 14 by ICAO, is a cumulative 7 EPNdB below current Chapter/Stage 4 limits. After looking at noise cuts of 3-11 dB, analysis ahead of the CAEP/9 meeting in Montreal had indicated a 5-dB reduction taking effect in 2020 was most cost-effective. But political pressures to reduce airport noise resulted in the committee agreeing to a more stringent limit to be introduced in two stages. New type certifications will have to include the 7-dB limit beginning in 2017 for aircraft weighing 55 metric tons or more, and beginning in 2020 for smaller aircraft.

Superjet 100LR Tests Begin

Sukhoi has started flight-testing the long-range version of its Superjet 100. But if the SSJ program is to become a success, the company needs to tackle technical flaws affecting the baseline version. The first prototype of the SSJ 100LR version made its maiden flight on Feb. 12. Because of several different technical issues, four of Aeroflot's 10 SSJs are grounded.

the new Rafale F3R standard, a next-generation laser targeting pod and a new military satcom network. The agency also paid €11 billion for deliveries in 2012, up 10% over the previous year, including the first Rafale C137 with active, phased-array radar, the first NH90 NFH and the first Fremm multipurpose frigate. Collet-Billon says France may take delivery of the first Airbus Military A400M this year, and operational trials of the Watchkeeper tactical drone are slated to start in March. But until Hollande issues a new defense strategy and spending plan in the coming weeks, the agency remains in limbo.

MS-21 Assembly Begins

AVIASTAR-SP

Initial components of Russia's new MS-21 narrowbody airliner are starting to be assembled. Ulyanovsk-based Aviastar-SP, a United Aircraft Corp. (UAC) subsidiary, completed the first rear-fuselage section of the MS-21. This section will be used for fatigue testing in Riga, Latvia, according to Irkut Corp., which is developing the aircraft.

In 2013, Aviastar-SP plans to manufacture the first composite tail assembly for MS-21 and will be responsible for metal parts of the aircraft's wing. The composite part of the wing is being designed and produced by AeroComposit, a joint venture UAC and Sukhoi. In December, it completed the first stage of the endurance test for the MS-21's composite wingbox.

The first variant, the 180-seat MS-21-300, is expected to make its maiden flight in 2015, and entry into service is now planned for 2017. Irkut and UAC say they have 256 firm and preliminary orders for the MS-21. The aircraft family will also include the 150-seat -200 and 210-seat -400. Customers can choose between Russian Aviadvigatel PD-14 and Pratt & Whitney PW1400G engines.

UNMANNED SYSTEMS

FAA Addresses UAS Privacy

The long-delayed solicitation for proposals to host six unmanned aircraft system (UAS) test sites across the U.S. has been issued by the FAA, along with the agency's proposed approach to addressing public concerns over privacy. Initially ignored by the FAA, concerns voiced by civil-liberties organizations that UAS operations at the sites could potentially violate individuals' privacy forced a lengthy delay in responding to the February 2012 congressional direction to establish the test centers.

ROTORCRAFT

Eurocopter Expands

Eurocopter Mexico has opened an aerostructures manufacturing plant at Queretaro's Aerotech Park that will provide assemblies for its own Ecureil single-engine helicopter series and the Airbus A320 and A330 airliners. The $100 million facility was built as an offset for the Mexican air force and navy's purchase of 15 EC725 helicopters in 2010.

DEFENSE

Nowhere To Go

Two Lockheed Martin F-35As ordered by the Netherlands and due to be delivered this year may go directly into storage, according to a Feb. 8 letter from its defense ministry to a parliamentary committee. The Netherlands ordered the two $140 million aircraft in 2008, on the basis of assurances from Lockheed Martin and the Joint Strike Fighter Project Office that initial operational test and evaluation of Block 3 software would start this year. The ministry now says this will not happen until at least early 2015. The first Netherlands aircraft was rolled out last April and flown in August, and the deadline for delivery is March 31 with the second following later in the summer. The aircraft could either be stored or used for training.

Satellites Tip SM-3 Intercept

The U.S. Missile Defense Agency intercepted a medium-range ballistic missile target using an Aegis-launched SM-3 Block IA made by Raytheon. New for this mission is the use of the Space Tracking and Surveillance System demonstrator satellites to cue the Aegis ship on the target's whereabouts; using such an offboard sensor to launch an interceptor is called "launch on remote" and it allows for longer-range engagements.

New Arms for B-2

Northrop Grumman officials have begun ground testing for integration of an upgraded Massive Ordnance Penetrator (MOP) with the stealthy B-2 bomber. Pentagon officials are mum on the upgrade, but have previously complained about an unreliable fuze. And, engineers have been working to improve GPS accuracy. Flight-testing of the two systems together is to begin shortly.

By Michael Bruno
Managing Editor for Defense and Space
Michael Bruno blogs at:
AviationWeek.com/ares
michael_bruno@aviationweek.com

COMMENTARY

Slaughterhouse Five

If sequestration can rewrite U.S. strategy, it's time to kill sacred cows in industrial policy

Shortly after the Obama administration unveiled its so-called pivot to Asia-Pacific in early 2012, top Pentagon leaders began warning everyone that the new defense strategy could not survive further budget cuts. So sure were they that the 2011 Budget Control Act's automatic, across-the-board spending cuts would not be allowed to occur that White House and Pentagon officials had no qualms with pegging the pivot's foundations to the last five-year defense budget plan.

U.S. DEPARTMENT OF DEFENSE

Just how wrong they were is now brutally clear. It will take a miracle for "sequestration" not to take effect March 1, triggering $490 billion in additional cuts to defense spending over the next 10 years—essentially doubling the $487 billion in cuts imposed in 2011. "We built a strategy last year that we said we could execute and absorb $487 billion," the chairman of the Joint Chiefs of Staff, Army Gen. Martin Dempsey, told lawmakers last week. "I can't sit here today and guarantee you that if you take another $175 billion that the strategy remains solvent."

Andrew Krepinevich, president of the Center for Strategic and Budgetary Assessments, fears a train wreck is coming, even if sequestration is stretched out over several years. "I can see us losing significant parts of the industrial base," he tells me.

How much of the Pentagon's "pivot" needs to be rewritten remains to be seen, but one thing is for sure: Austerity will drive much of U.S. strategy. But that also provides an opportunity to reexamine all aspects of national security—and finally kill some sacred cows. Here are five to consider.

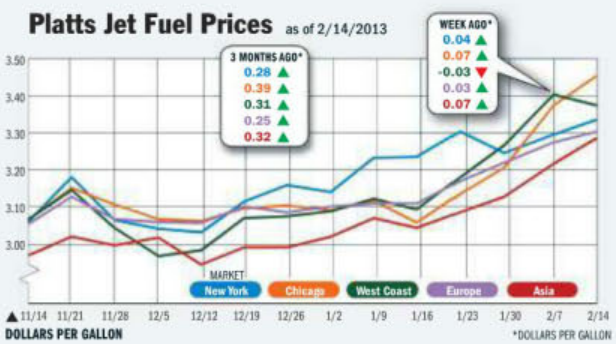
- Lift the ban on top-tier contractor consolidation. We are racing toward a quasi-arsenal approach to weaponry and defense services providers, anyway, where the fates of every prime provider reflects their closeness with government: BAE in the U.K., EADS in Germany and France, Finmeccanica in Italy and China's state-sponsored companies. Artificially maintaining the current number of U.S. primes will only hollow them out or drive them out of the defense sector.
- Drop the 8(a) goals for small and disadvantaged defense contracting. The Pentagon will be stretched too thin to devote time and money trying to maintain companies simply due to their size.
- Drop "50-50," the rule requiring half of military maintenance to go through military depots. It is outdated and no longer applies to the maintenance and spending needs of the 21st century.
- Stop stalling and name winners and losers. Two years ago, Pentagon leaders paid lip service to technologies they see as critical to future capabilities, such as cyber, UAVs and ISR. Now is the time to make the list formal—and include capabilities the military no longer needs.
- Fine losers of Government Accountability Office contract protests. Only in the government do we allow losers to have another bite at the apple, and at the taxpayers' expense. No wonder the number of protests filed doubled over the last decade.

What other sacred cows should be challenged? Send me your ideas at Michael_Bruno@aviationweek.com

AW&ST/S&P Market Indices as of 2/13/2013

Source of data: Standard & Poor's and Capital IQ Inc. (a Division of Standard & Poor's).

Platts Jet Fuel Prices as of 2/14/2013



All data, except for Asia/Pacific, represent latest spot price data as of Wednesday. Asia/Pacific data represent latest spot price data as of Thursday.
Source: Platts. Subsequent use of these data in index-format or in derived financial instruments requires a licensing agreement with Platts.
For related questions contact Gerald_Bueshel@platts.com

By Guy Norris

Southern California Bureau Chief Guy Norris blogs at: **AviationWeek.com**

guy_norris@aviationweek.com

COMMENTARY

Mojave Skies

Old hangar spawns breed of resuable launchers

Rattled by cold California high-desert winds, and little changed since its days as a Second World War motor pool for the U.S. Marine Corps, the old hangar that Masten Space Systems calls home seems an incongruous incubator for low-cost flights to sub-orbit.

Yet within this unremarkable structure at Mojave Air and Space Port, Masten has already perfected a series of reusable vertical takeoff and landing (VTOL) rockets that are paving the way for a new set of vehicles which will eventually take payloads to 200 km (125 mi.). From the familiar hobbyist-like surroundings that typify those of many of his "new space" contemporaries, company founder and President Dave Masten is rushing to serve a growing microgravity market impatient for its ride to space.

Spurred by a win in the October 2009 NASA/Northrop Grumman-funded Lunar Lander Challenge with the Xombie VTOL rocket, Masten's development strategy is closely linked to NASA's Flight Opportunities program for which it is one of the vehicle providers. The program recently selected 13 space-technology payloads for flights on commercial reusable launch vehicles, balloons and a commercial parabolic aircraft in 2013 and 2014. The flights will be carried aloft by Zero-G's Boeing 727, high altitude balloons from Near Space in Tillamook, Ore., as well as reusable launch vehicles including Virgin Galactic's SpaceShipTwo and RLVs from UP Aerospace and Masten Space Systems.

Almost touching the rafters of the building, Masten's latest vehicle, the Xaero-B (shown under construction), is nearing completion. Built to carry payloads to altitudes above 20 km, the reusable liquid-fueled vehicle will stand around 16 ft. tall when complete. "We should be hot-fire testing in March and flying in April," says Masten. Although the company's previous designs won plaudits for

MASTEN SPACE SYSTEMS

demonstrating pinpoint landings after carefully controlled translating flights, Masten says Xaero-B's purpose is more straightforward.

"It is designed to go straight up and straight down. We may end up doing some translations, but for now our focus is on straight-up elevations. We want to go to 6 km above ground level as soon as we can, just so we are eligible for the Flight Opportunities program," he explains. While the NASA effort is attracting experiments and interest from far afield, the Flight Opportunities program itself is designed to foster the development of the commercial reusable suborbital transportation industry. Seen by NASA as an important step in the longer-term path to lower-cost, more frequent and more reliable access to orbital space, vehicles like Xaero-B will be in the vanguard.

Beyond proving its capability to travel to 6 km and back, Masten's next focus is how to recover the vehicle from very high altitude. Three main options are being evaluated: a controlled parachute descent; deployable drag devices; and a nose-first descent with a last-minute, low-altitude recovery maneuver with engine re-light. This latter option will involve "doing some magic with flight controls and guidance, navigation and control (GNC)," he adds.

Masten engineer and Xombie launch coordinator Travis O'Neal says, "We have several projects to help us decide. We are the 'customer' for one of the Flight Opportunities with a 'drag flaps' experiment." A model vehicle, dropped from high altitude, will demonstrate the drag flap devices. "It will help us decide on that approach. We also have a project on dropping with a parachute and flying to a specific location using a guided parachute." The final decision "depends on what is safer," says Masten. "How do you convince the FAA you are safer with a parachute? You could end up anywhere coming down from 100 km if you pass through the jetstream," he adds.

Beyond Xaero-B, the company plans development of the reusable sub-orbital Xogdor. A scale-up of the Xaero, the vehicle will have larger propellant tanks and an engine thrice as powerful. "The next vehicle will go to 200 km with the same payload as the Xaero-B. We're pretty much waiting to get going on that, and we are waiting for all the lessons learned from Xaero," Masten adds.

Fired for the first time last May, the Katana-class engine will generate up to 3,500 lb. thrust compared to the 1,200-lb.-thrust Scimitar fitted to the Xaero-B. Like the Scimitar, which demonstrated an engine module thrust-to-weight of 40:1 and a throttle ratio of over 10:1, the Katana is designed for deep-throttling to enable a controlled descent and landing.

Thanks to the success of Masten's GNC systems, demonstrated during recent tests including a record-breaking 750-meter translation flight of Xombie undertaken for NASA in 2012, future vehicles may not have fixed landing legs. "When we start going over 6 km, we will take the gear off and takeoff and land in a cradle," says Masten. "We will bolt the gear to the ground instead of to the vehicle—the landing is that precise. For most of our landings, the accuracy is 5 cm or less," adds O'Neal.

As for the payloads on these future flights, "people have started to think outside the box and come to us with very interesting ideas we hadn't even thought of doing with the rocket," says O'Neal.

By William Garvey
Business & Commercial Aviation *Editor-in-Chief*
William Garvey blogs at:
AviationWeek.com
william_garvey@aviationweek.com

COMMENTARY

Kissing Frogs

Some see ugliness, others opportunity

It's no secret that business aviation has been enduring hard times for too long. The gloom took hold in 2008, and since then thousands of workers have lost their jobs, companies have gone bankrupt, and flight activity has slowed. Almost no one is happy.

Then there's Kenn Ricci, business aviation's not-so-minor mogul with a knack for making business happen.

A Cleveland native, Ricci (photo) entered business aviation after being furloughed from the airlines. He made the most of the downtime by enrolling at the Cleveland-Marshall College of Law and flying charters on weekends. By the time he obtained his law degree, he was hooked on business aviation and never bothered to hang his shingle.

NEXTANT

A natural entrepreneur, the charter pilot recognized the profit potential in managing aircraft for others, and thus in 1980 was born Corporate Wings, which he steadily expanded into maintenance, fueling and storage services. Next, Ricci noted that as new technologies came to the fore, inertial nav users were being left wanting for technical support. Accordingly, in 1990 he created Inertial Airline Services to fill that need; the company won clients among airlines, military and business aircraft operators by the time he sold it years later.

FLIGHT OPTIONS

In 1998 he founded Flight Options, a fractional aircraft service touted as the lower-cost alternative to the entrenched competitors, thanks to its practice of equipping with used aircraft. The operation grew, but struggled in a difficult economic environment. In 2002, Ricci exited after merging his operation with Raytheon's Travel Air. Next, he set off to lead and expand the Mercury Air chain of fixed-base operators, which he sold to Macquarie Infrastructure Trust in 2007 in a $615 million transaction.

By then, Raytheon decided it wanted out of business aviation. It found a willing buyer in Directional Capital, an investment group led by—you guessed it—Ricci. And so, a decade after he founded it, Ricci was Flight Options chairman once again.

While Flight Options is Directional Capital's most prominent business aviation entity, it's just one of a family that now includes Constant Aviation, Nextant Aerospace, aircraft broker Sojourn Aviation, charter brokers/consolidators Spinnaker Air and, notably, Sentient Jet, Everest Fuel Management and Corporate Wings. Combined, those companies employ 2,000 people, operate a fleet of nearly 100 jets—with dozens more ordered—and account for more than 7,000 fractional and charter flying hours per month.

Moreover, with facilities at Cleveland-Hopkins International, Birmingham, Ala., and Las Vegas, Constant Aviation is a large and growing business aircraft MRO operation. And Nextant, which is also based in Cleveland, has made a name for itself remanufacturing Beechjets as 400XTs (photo above), featuring Rockwell Collins Pro Line 21 avionics suites and Williams FJ44-3AP engines.

The businesses often complement each other—for example, Flight Options is the launch customer for the 400XT—but are standalone entities with independent management and profit goals.

More are on the way. "People know we're closers," Ricci says, so they regularly propose deals. "We kiss a lot of frogs," he acknowledges, but sometimes magic happens. For instance, he's in negotiations for two companies, one involved in maintenance, while the other, he says, will "help us expand into international operations." The combined deals, expected to close in the first half of the year, constitute what he describes as "the last great buying opportunity in my business career."

"In my view this is the right time to buy companies," he says, citing low interest rates and the market's inclination to consolidate. And even though business aviation has slowed, he says the businesses serving the industry have become extremely efficient and will be richly rewarded once activity accelerates again.

Considering Ricci's record, Kermit may need extra lip balm.

CURTAIN TIME

Gene Autry's "Rudolph the Red-Nosed Reindeer" may have helped Santa find his way, but Jackie Autry, the singing cowboy's widow, understands how unwelcome outside illumination can be for passengers trying to sleep, view computer screens or watch videos.

Accordingly, she became the principal investor behind Aerospace Technologies Group (ATG) Inc., a Boca Raton, Fla.-based manufacturer of aircraft window shades. Powered, multilayered, durable and easily replaced (photo below), the shades have proven to be so popular with airfamers including Gulfstream, Cessna, Bombardier, Dassault, Honda, Airbus and Boeing, that ATG ships 600 of them a month.

At roughly $5,000 per window system, ATG can sing another Autry classic: "Gold Mine in the Sky."

ATG

By Jens Flottau

Managing Editor for Civil Aviation Jens Flottau blogs at:
AviationWeek.com/thingswithwings
Jens_flottau@aviationweek.com

COMMENTARY

Not Fast Enough

Legal hurdles confound the expansion of Fastjet

When Ed Winter decided to accept an offer to become CEO of Fastjet, a new highly ambitious low-cost carrier (LCC) for Africa, the challenges seemed clear: infrastructure constraints, taxation and other regulatory issues, low Internet penetration. It was not exactly going to be easy.

But around three months after the launch of flight operations, it is becoming increasingly apparent that there are other and unexpected issues threatening the fast growth of Fastjet: a series of lawsuits, some partially connected and some unrelated. All of these legal battles, which are complex and difficult to judge without insider knowledge, can be traced back to the way Fastjet was set up. It was built by taking on existing regional air operators' certificates. The new airline hoped this would be a good way to speed up the process of becoming established.

As it turns out, it is slowing it down. Fastjet already saw itself forced to buy another operation in Kenya to get around the troubles of Fly540—its original local base—hopefully by not repeating mistakes. The idea of buying into defunct local airlines was also followed in South Africa, where Fastjet is trying to get bankrupt carrier 1time back in the air. But that process, too, is taking much more time than expected given the slow negotiations with 1time's former owners and creditors.

So Fastjet has not yet reached the stage where it can prove that the low-cost model works in Africa; it still needs to prove a new airline can be set up within a reasonable time frame. The progress is being closely watched by would-be airline investors that are looking at participating in the expected huge growth in air travel in the region. Air France in particular plans to be part of new operations in Central Africa and Ivory Coast, at least one of which is to be launched this year.

The hurdles to simply getting the airline up and running are more tedious than expected and the fact that the process is moving more slowly than expected surely has had an impact on the Fastjet business plan. While it is OK to start with a three-aircraft operation in Tanzania, that will not be sustainable for an extended period. The whole organization is built on the expectation that the fleet will become much bigger pretty quickly.

Fastjet has been talking about developing a fleet of around 40 aircraft within 2-3 years, given the current difficulties. And as things drag on, regional Fly540 operations in Ghana and Angola cannot be turned quickly into the low-cost offers they were intended to become, adding a further drain on management and financial resources.

None of the above says anything about the model as such. In fact, there is no reason why Africans should not accept low-cost flying the same way Americans, Europeans and Asians have done over the past decades.

Of course, there needs to be some adaptation to local conditions. But that was the case when European LCCs were launched in the 1990s and the first Asian operators got started 10 years later. Similar adaptations will be needed and some will have to come as the result of a learning process. However, in order for that process to be begin, Fastjet needs to win its legal battles.

With operations in Kenya, Angola and Ghana still some way off, Fastjet continues to focus on Tanzania. However, the market has its limits. There may be room for a couple more aircraft at the local base. But the airline is already looking at international destinations: Entebbe, Uganda, and Johannesburg are on the list. Getting the local South African airline 1time back in the air quickly is therefore all the more important.

FASTJET

By Frank Morring, Jr.

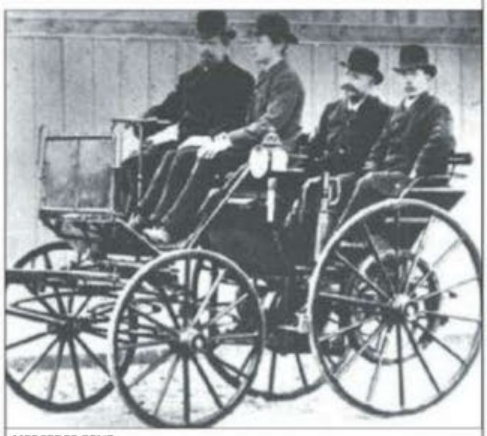
Senior Editor Frank Morring, Jr., blogs at:
AviationWeek.com/onspace
morring@aviationweek.com

COMMENTARY

Getting Organized

Ex-shuttle manager: Industry standards could ease regulatory burden on commercial spaceflight

When we need brake pads or a fuel pump for our automobile, we assume the garage will have one in stock or know where to get it. But at the dawn of the automobile age, when this Daimler car was new, it wasn't that simple. Every automobile was essentially a one-off, custom-built as a worldwide cadre of tinkerers and engineers struggled to invent an industry. A few years later, the same held true as the aviation industry was born. If Orville and Wilbur Wright needed a new piece of flight hardware, they crafted it in their famous bicycle shop if they couldn't adapt something built for another purpose. Today, as every air traveler knows, airlines typically leave us sitting in our seats while their mechanics fetch the part they must have before we can take off. The delay is irritating, but we usually get where we're going, and in one piece.



MERCEDES-BENZ

Now, the commercial spaceflight industry is almost to the point when the four gentlemen in the photo put on their bowlers and went for a ride. Several companies—SpaceX, Sierra Nevada, Blue Origin, Boeing—are at work on commercial crew vehicles for low Earth orbit, and at least as many more are developing suborbital spacecraft for adventure and research. Spaceports are sprouting like weeds in the U.S., and nations as diverse as Sweden and Dubai are working to get in on the ground floor as launch sites for private space travel.

At the same time, governments are beginning to realize they have a role in ensuring that commercial space travel is safe. In the U.S., Congress and the FAA have set up a licensing process that includes financial protection for third parties on the ground who might suffer injury or damages from spaceflight activities. And with commercial cargo flights underway to the International Space Station, more detailed, and potentially intrusive, regulations are probably inevitable. The industry itself is beginning to see that if it does not want government regulators making critical decisions about spacecraft-component and ground-infrastructure design and operations, it is going to do the job itself. The automobile industry more than a century ago adopted industry standards that governments could accept, and the aircraft business followed.

"Standards can cover many things," says Bruce Mahone, director of Washington operations for SAE International, which promulgates standards for the aerospace, automotive and other industries. "At the basic level they will cover a standard for the quality of the raw material that makes up a vehicle. They can be standards for the pieces, parts, the bolts and rivets that hold a spacecraft or launch vehicle together. They can be standards for the seats, if there are people, because the seats have to handle several Gs of pressure for reentry and takeoff. They can be standards for the landing gear."

So far, the nascent commercial spaceflight industry has not adopted standards at those levels. The three companies that NASA is funding to develop vehicles to take its astronauts to the Internagional Space Station (ISS) have just started telling the agency how they will meet its human-rating requirements to do that, but they plan to launch their own test pilots first (*AW&ST* Dec. 17, 2012, p. 31). And NASA has lined up those companies—Boeing, Sierra Nevada and SpaceX—to test its new docking system at the ISS as a potential international standard for all vehicles. But the types of standards long in use in cars and airplanes are still in the talking stage, and a very early stage at that.

Wayne Hale, a former space shuttle program manager and a flight director on 40 shuttle missions during his 30-year NASA career, is urging the commercial spaceflight industry to adopt voluntary standards that the U.S. government and others can recognize, as a way to "keep the regulatory count down."

"What is the advantage of this for a group such as the commercial spaceflight industry," he said during the FAA's commercial spaceflight conference Feb. 6. "First of all, it gives control to the industry. You get to write the standards and policies that make sense for the industry, and if you can come to consensus and agree on them, and everyone follows them, then that perhaps alleviates the concern of the government for having to have regulations."

Hale concedes that setting standards is not as glamorous or exciting as "making smoke and fire." But he argues that in the long run, it will make the smoke and fire of routine commercial spaceflight operations more likely by giving industry—and its government overseers—more flexibility in meeting changing circumstances such as the introduction of new technology. And it will be able to adapt more rapidly than through typical government processes. As a result, industry will face fewer obstacles to growth, Hale says, citing former Lockheed Martin CEO Norman Augustine's observation that left unchecked, government regulations "grow like weeds."

By Jen DiMascio

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

COMMENTARY

Darkest Before Deal?

FAA foresees $619 million sequestration cut

After months and months, the military-industrial complex is finally getting some company in fighting nearly $1 trillion in across-the-board budget cuts set to begin March 1 and last for a decade. That includes air travel, an impact that could hit home for lawmakers who routinely shuttle from Washington back to their home districts.

Homeland Security Secretary Janet Napolitano lays it out plainly for the Senate Appropriations Committee: "At the major international airports, average wait-times to clear customs will increase by 50%." Wait times at the busiest U.S. airports are already more than 2 hr. long and could double, she says. And other domestic passenger wait times would increase by more than 1 hr.

WASHINGTON TIMES/LANDOV

Those delays would be caused by reductions to transportation security funding, and they would likely be compounded by a $619 million decrease in the FAA's nearly $15 billion fiscal 2013 budget request. The FAA may focus modernization funding on its "mature programs" such as En-Route Automation Modernization (ERAM) and the Automatic Dependent Surveillance-Broadcast (ADS-B) system, at the expense of future facilities and the data communications contract awarded last fall, according to a congressional report on the cuts. The FAA needs to trim $136 million from its modernization accounts in fiscal 2013.

Air traffic control would also feel the pinch, as 10% of the administration's workforce would be furloughed on any given day, "resulting in reduced air traffic control, longer delays and economic losses for air transportation, tourism and the economy as a whole."

Airports would face a downstream affect. The Airport Improvement Program is exempt from sequestration, because a decrease in passenger volume would bring in less money through excise taxes, but cuts in the aviation safety workforce would slow approval of new air carriers and equipment. The FAA estimates up to 1,480 aircraft and parts manufacturing projects may be impacted. And general-aviation airports would be affected, too, as the FAA may close or reduce traffic at hundreds of "lower-level federal and contract air traffic control towers."

If it will be harder for U.S. lawmakers to get home, it will also be more difficult for astronauts to hitch rides to the International Space Station. NASA Administrator Charles Bolden sent the Senate committee a Feb. 5 letter outlining NASA budget cuts including a $441.6 million decrease in the fiscal 2013 budget request for commercial spaceflight, throwing off the schedule for a host of commercial crew milestones.

Ideally, the threats of longer lines at airports and economic harm would be enough to force lawmakers into action. But Democrats and Republicans continue to talk past each other when it comes to a solution. Lawmakers go out of town this week for the Presidents' Day recess, leaving four congressional workdays before March 1. But then again, sequestration negotiations are driven by high-level deals secured just before the deadline, and do not involve rank-and-file lawmakers. The last version was reached by Vice President Joe Biden and Senate Minority Leader Mitch McConnell (R-Ky.) on New Year's Eve.

At this point, Democratic and Republican leaders are still accusing each other of political theater and sophomoric stunts. McConnell spokesman Don Stewart points out that the White House has yet to act. "The White House never has an interest in doing it until the last second," Stewart says. "They haven't talked to us since New Year's Eve. That's how serious they are."

MIDWEST OPTIMISM

Hope is fading in Washington that Republicans and Democrats will put aside their differences and find a way to head off $490 billion in automatic cuts to U.S. defense spending due to take effect on March 1. But a top official at Ohio-based Eaton Corp., which derives 35% of its aerospace sales from military programs such as the F-35, remains optimistic about a last-minute deal. "We're not banking on across-the-board cuts in military spending that aren't more thoughtful," says Craig Arnold, the chief operating officer for Eaton's industrial businesses. "We think eventually Congress and the president will find a better solution." While there is no doubt that defense spending will decline, Arnold finds it hard to believe that Beltway politicians would allow indiscriminate, unplanned cuts to take effect. He calls on lawmakers to "stop playing politics and do what they were put in office to do, which is to govern and manage. That's what we expect of them."

Arrested Development

CEO held in kickback probe that could lead to Finmeccanica being blacklisted in India

Jay Menon New Delhi and Tony Osborne London

The arrest of Finmeccanica's chairman and CEO and the prospect that the company could be barred from doing business in India's lucrative defense market is shaking the foundations of the Italian aerospace and defense giant, which already was struggling to restructure in the wake of high debt and declining government spending in Europe.

Giuseppe Orsi was held by Italian authorities on Feb. 12 as part of a corruption probe into the sale of 12 AW101 helicopters to the Indian government in 2010, when Orsi ran AgustaWestland, Finmeccanica's rotary-wing division. Investigators allege that the company paid as much as €50 million in kickbacks in order to win the €560 million ($754 million) contract for the U.K.-built helicopters, which were purchased to replace aging Russian Mil Mi-8s that transport Indian government VIPs. AgustaWestland's current CEO, Bruno Spagnolini, was placed under house arrest on the same charges.

In an emergency meeting on Feb. 13, the company's board of directors voted to replace Orsi with Chief Operating Officer Alessandro Pansa, who will act as interim CEO. Further meetings to discuss the composition of the board were scheduled for April.

Orsi took on the top job in 2011 amid great hopes that he could revive the company's fortunes and reputation after allegations of illegal payments by company executives led to the forced resignation of his predecessor, Pier Francesco Guarguaglini. But Finmeccanica, which is 30% owned by the Italian government and had estimated sales of €17.1 billion ($23.4 billion) last year, has struggled to sell underperforming assets in a bid to reduce its hefty debt.

Italian investigators are believed to have been delving into the alleged AW101 kickbacks since early 2012. Orsi's arrest and a search of Finmeccanica's offices in Rome and Milan triggered India's Central Bureau of Investigation (CBI) to launch its own probe. Meanwhile the Indian Ministry of Defense has suggested that the entire deal could be canceled, even though three of the AW101s have already been delivered.

"Under the terms of the integrity pact, if corruption is proved, then we can cancel the contract and get back whatever money has been paid," says Defense Minister A.K. Antony. "We are examining everything. If [contractual] terms have been violated, we will take the strongest action."

FINMECCANICA

Giuseppe Orsi was recently ousted as CEO of Finmeccanica.

But the danger to Finmeccanica is more dire than the loss of one contract. If the company is found by Indian authorities to be involved in corrupt behavior, the CBI could recommend it be barred from India's growing defense market, a prime target for contractors in Europe and the U.S. The blow would be especially painful to the company's Alenia division, which is promoting its C-27J transport for India's tactical transport needs.

Finmeccanica also is interested in India's planned procurement of a medium-range maritime patrol aircraft; its Selex Sistemi Integrati subsidiary has won a €10 million contract to provide an air surveillance naval radar for the country's indigenous aircraft carrier, INS Vikrant.

A move to blacklist Finmeccanica in India would not be unprecedented. Foreign companies barred from doing business there include Singapore Technologies Kinetics; Israel Military Industries; Rheinmetall Air Defense of Zurich; and Corporation Defense of Russia.

Finmeccanica also made inroads into the U.S. defense market with its $5.6 billion acquisition of DRS Technologies in 2008. It does not appear that the kickback investigations in India and Italy will affect its U.S. operations. "This will only really impact on Finmeccanica in India," says Nick Cunningham, a managing partner at the London-based Agency Partners financial analysts firm. "It would only spread further if the U.S. authorities became involved . . . which is an unlikely stretch. Even though Finmeccanica owns DRS, the division is pretty much hermetically sealed from Europe."

Orsi, who has known he was under investigation for months, denied any wrongdoing before his arrest and had said he would only resign at the behest of the Italian government. Before taking his present job, he earned high marks for transforming AgustaWestland into one of Finmeccanica's crown jewels.

And he still has supporters who believe he is the right man to lead a turnaround. "Orsi had a mandate of change," says Cunningham. "He was taking the company through a process of restruc-

Three of the AgustaWestland AW101s built in the U.K. have already be delivered to India.

NICK MARTIN

turing, putting the right people in place, and he is two-thirds of the way there. It would be unfortunate if he wasn't able to stay and complete his work."

Analysts say the aftershocks from the investigation could affect other defense contractors by holding up pending defense procurements. "This will definitely slow down the ongoing process of acquiring aircraft and military weapons as companies reassess decisions about defense deals with India," says Rajiv Chib, an aerospace and defense analyst at PwC. "India's image will be taking a beating due to such scandals."

Finmeccanica says its activities and projects will continue as usual "in order to limit the impact from the judicial activities on, among other things, the [selling off of some assets], which is already underway. Furthermore, the company is evaluating the risks and the industrial, economical and financial effects from the above-mentioned judicial activities."

Corruption allegations involving government officials and defense companies have been relatively frequent in India's defense deals. The most notorious was a bribery scandal involving Swedish armament firm Bofors. It was accused of paying kickbacks to secure a deal to provide howitzers for the Indian army, resulting in the ousting of then-Prime Minister Rajiv Gandhi in 1989. Last year, former army chief V.K. Singh alleged he was offered a bribe of 140 million rupees ($2.7 million) by a defense lobbyist to clear the purchase of military vehicles.

Meanwhile, Alenia is refocusing its U.S.-based operation to be leaner—a practical reflection of its limited opportunities in Washington. The goal is to more tightly integrate it into the Italian headquarters operation, effectively running the North America outfit as a "Washington office" rather than as a separate, independent entity. Accordingly, the incoming head of Alenia North America, Ben Stone, will not be named CEO, as was his predecessor, Alan Calegari, who recently resigned. Stone will function much like a CEO, but his title will be executive vice president for North American operations and general manager.

Stone's primary near-term focus is on the C-27J and G222. Both have been disappointments for Finmeccanica. The U.S. Air Force opted to shelve its recently purchased C-27Js in favor of Lockheed Martin C-130Js for transporting small loads for the U.S. Army. Also, the service plans to discontinue funding for Alenia North America's first prime contract with the Pentagon—to train Afghanistan forces to use the G222. Service officials say the company's performance was subpar. Stone says the C-27J has garnered interest from other U.S. agencies, including Customs and Border Patrol and Air Force Special Operations Command.

Longer term, Stone says, he is committed to continuing the campaign to sell the M346 jet trainer to the USAF.

—With Amy Butler in Washington

Culture Clash

Lawmakers revisit long-standing feud over new NASA approach to spaceflight

Frank Morring, Jr. Washington

A pair of powerful Republican congressional committee chairmen with NASA oversight have highlighted a growing schism in U.S. space policy with their public charge that a senior NASA manager failed to protect sensitive U.S. defense technology being adapted for civil use. In suggesting that "political pressure may be a factor" in a Justice Department decision not to issue criminal charges in the case, they are raising the stakes in an ongoing debate about the proper roles of government and the private sector in space exploration.

The official in question, Ames Research Center Director Simon P. "Pete" Worden, vehemently denies he has been lax in protecting technology covered by International Trade in Armaments Regulations (ITAR), and says he has never been approached by federal law enforcement officials about the matter.

But Worden and his supporters epitomize the "new space" approach adopted by the Obama administration, including freewheeling efforts to promote innovation, international outreach and open-handed transfer of technology developed at taxpayer expense to the private sector. In the process, they have drawn sharp criticism from some whose interests and experience follow a more traditional line, including the drafters of an unsubstantiated but highly detailed whistleblower document that has circulated on Capitol Hill for months.

The 55-page document charges that Worden has allowed unauthorized foreign nationals access to ITAR-protected technology, including Chinese engineers attending an International Space University session at Ames in 2009, and has favored idealistic young staffers from other nations at the expense of national security.

Reps. Frank Wolf (R-Va.) and Lamar Smith (R-Texas), who chair a key House Appropriations subcommittee and the House Science, Space and Technology

Committee, respectively, drew on the whistleblower charges in joint letters to FBI Director Robert Mueller and Michael Horowitz, the Justice Department's inspector general, dated Feb. 8.

Regarding a federal criminal investigation into the "alleged illegal transfer of ITAR-controlled technology by individuals at the NASA Ames Research Center," the lawmakers wrote: "It is our understanding that this illegal technology transfer may have involved classified Defense Department weapons system technology to foreign countries, including China, potentially with the tacit or direct approval of the center's leadership."

According to sources at Ames and on Capitol Hill, the technology in question includes propulsion and other systems originally developed for missile defense applications that was adapted for civil spacecraft, including a robotic lunar lander prototype and NASA's Lunar Atmosphere and Dust Environment Explorer (Ladee), now entering thermal vacuum test at Ames.

Worden, a retired Air Force brigadier general with a long resume in highly classified military space activities, including missile defense, says he has ensured that ITAR technology at Ames is well protected, and that any non-U.S. citizens who have access to it have proper licenses.

"Whenever I get information from any source that makes allegations, I turn it over immediately to the investigative folks," Worden says. "And it's for them to go do what they will with it. I've been in the government my whole career, and I've found the best way to make sure the truth gets out [is to] turn it over to the investigative folks and say 'we'll let the chips fall where they may.'"

Smith, who recently became chairman of the science panel that authorizes NASA spending, and Wolf, a veteran appropriations subcommittee chairman who has blocked NASA from spending any money for space cooperation with China on human-rights grounds, also charged that a computer hard drive confiscated from one member of Worden's staff was "corrupted, as were all the backup copies in the government's possession." In addition to that suggestion of evidence tampering, which a congressional staffer says may have occurred while the hard drive was in the possession of the NASA inspector general, the two chairmen also implied that the Justice Department blocked prosecution of the case for reasons that go beyond evidence and legal judgment.

"We are deeply concerned that political pressure may be a factor and are formally requesting an investigation into the circumstances of the Justice Department's actions with regard to this case," they wrote.

When Melinda Haag, U.S. attorney for the Northern District of California, denied publicly that she had sought indictments in the Ames case, Smith and Wolf said they had information to the contrary from "federal law enforcement sources," and expressed the "hope that the DOJ IG will take our request seriously."

NASA AMES RESEARCH CENTER

Australian Chris Boshuizen inspects Hover Test Vehicle at NASA Ames. House Republicans question why an FBI investigation of foreign access to ITAR-covered technology has not led to criminal charges.

"I think you've had violations of the law," says Wolf, who oversees appropriations for NASA, the Justice Department and the FBI. "You've had the FBI look at this. You've had the U.S. attorneys make a decision to move ahead, and you've had somebody stop it at the Justice Department. I think you have a criminal and a scandal here."

Among the technologies allegedly leaked at Ames are designs for high-performance rocket engines, fuel and oxidizer tanks from an "ASAT" (anti-satellite weapon), guidance and terrain-mapping systems from the Tomahawk cruise missile and a radar altimeter from the F-35, an Ames whistleblower tells Aviation Week, requesting anonymity on advice of counsel.

However, Worden says all of the technology used in the Ladee spacecraft is "100% commercial" and no defense technology "to the best of my knowledge" was used on the robotic lunar lander prototype, a "pretty simple device" which was subsequently transferred to the Marshall Space Flight Center. The non-U.S. staffers mentioned in the whistleblower document no longer work at Ames.

The charges raised by the two committee chairmen are not the first time Worden has run into trouble over his approach to innovation. He tangled with Rep. Pete Olsen (R-Texas) last year about the transfer of NASA arc-jet test gear from Johnson Space Center in Houston to Ames, and he was frustrated with Administrator Charles Bolden in 2010 over the latter's denial of a $10 million request for alternate-fuels research at the Mountain View, Calif., field center.

According to a report by the NASA inspector general on ethics charges against Bolden—later deemed unfounded—Worden complained to Deputy Administrator Lori Garver about the "good ole boy networks" at the agency. The ethics case arose after the administrator sought input on alternative fuels from an oil company in which he held stock.

"This is frankly the worst of NASA and I don't like it," Worden wrote in an e-mail to Garver quoted in the IG report. He continued that theme in an interview Feb. 13.

"Some people accuse me of being the newest of new space," he says. "Others accuse me of being the oldest of old space. We're trying to figure out how to do the really cool stuff NASA has to do in science, in technology and in human exploration, in the most efficient, affordable and effective manner."

Tap here in the tablet edition of *AW&ST* to read our account of an uproar over space technology transfer to China in the late 1990s, or go to **AviationWeek.com/techtransfer**

Slow Burn

Obama inches forward with new nuclear plan

Jen DiMascio Washington

On the heels of a North Korean nuclear weapon test, U.S. President Barack Obama is preparing to move forward with a new approach to the U.S. nuclear arsenal.

The changes have been a long time coming. Obama outlined a vision for a world without nuclear weapons in a 2009 speech. After securing initial reductions in a New Start treaty with Russia, administration officials discussed deeper cuts, but progress was stalled during the 2012 presidential campaign.

With a new four years in office, greater reductions are coming. Yet basic philosophical differences about the future role of nuclear weapons could fuel a backlash among Republicans.

Obama gave the issue a brief mention in his State of the Union address last week: "We will engage Russia to seek further reductions in our nuclear arsenals, and continue leading the global effort to secure nuclear materials that could fall into the wrong hands because our ability to influence others depends on our willingness to lead," Obama said.

Obama is preparing to endorse a plan that calls for revisions to the nation's nuclear strategy and discusses the possibility of a one-third reduction to the arsenal, according to the Center for Public Integrity. The document does not call for immediate changes to the nuclear force; rather, officials are seeking to negotiate further reductions in nuclear weapons with Russia.

USMC Gen. (ret.) James Cartwright, a former vice chief of staff, participated in administration talks about reducing the nuclear force and is an outspoken advocate of the need to revamp it. The difficulty that the U.S. has with Iran and North Korea is symptomatic of a larger problem facing the globe—that even though nuclear weapons are expensive, nations that truly want the weapons can obtain them, Cartwright said over the summer. The relationship between the U.S. and Russia on nuclear weapons is governed by a sense of responsibility. But now a nation would export its nuclear capability to a third party that operates outside the bounds of global governance. "The response to that is not a nuclear response," Cartwright said.

Rep. Adam Smith (Wash.), the top Democrat on the House Armed Services Committee, agrees. "We can reduce the size of our nuclear arsenal, potentially saving billions of dollars and strengthening national security, while at the same time maintaining a strong deterrent and the ability to destroy any entity that threatens our nation with nuclear weapons," he said.

Other arms control think tanks are also promoting the change on economic terms. Reducing the arsenal to 1,000 strategic weapons could save more than $113 billion over 10 years, according to the National Security Network.

Republicans are pre-emptively balking at any consideration of reductions, dismissing the savings that could be achieved through nuclear weapons cuts as negligible and cautioning against unilateral action. Republicans also say that reductions to the numbers of U.S. nuclear weapons would only embolden North Korea, Iran and other nations to pursue new nuclear weapons.

"It is even more disturbing to learn that while North Korea is expanding its weapons programs, the president is contemplating unilateral disarmament," said Rep. Michael Turner (R-Ohio), who last year led the House Armed Services strategic forces subcommittee. "This is the wrong time to say to the North Koreans: 'we'll lay down our weapons, while you raise yours.' It is no coincidence that this test has occurred hours before the president's State of the Union Address."

Sen. Jeff Sessions (Ala.) leads Republicans on the corresponding panel of the Senate Armed Services Committee. He says that while the U.S. could continue to reduce the arsenal to a figure of about 1,500 nuclear weapons, reductions beyond that would be "outside the mainstream." Sessions warned Obama against using illustrations outlined by Global Zero, which included reductions down to 800 nuclear weapons, including ending the intercontinental ballistic missile leg of the nuclear triad.

"Congress will need to be engaged to see exactly what his plans are, and we need to be sure that they're not destabilizing," Sessions says. "The president needs to be careful about what he says."

When Obama made his 2009 speech in Prague, he laid out three themes: using an agreement with Russia to set an arms control example, countering the threat of proliferation from North Korea and Iran, and policing loose nuclear materials, says a Republican aide on the Senate Armed Services Committee. If Obama keeps stressing the first goal at the expense of the other two, he will squander valuable time and will not be able to work on other aspects of his nuclear agenda, the aide says.

Republicans will also be closely watching the administration's support for nuclear modernization promises that were made to secure passage of the New Start treaty with Russia. If they sense the administration is backing off from those commitments, Obama will face strong GOP opposition. "We can do a lot to gum up the works," the aide says.

New Start Treaty Numbers of Strategic Offensive Arms

Category of Data	U.S.	Russia
Deployed ICBMs, deployed SLBMs and deployed heavy bombers	806	491
Warheads on deployed ICBMs, on deployed SLBMs and nuclear warheads counted for deployed heavy bombers	1,722	1,499
Deployed and non-deployed launchers of ICBMs, deployed and non-deployed launchers of SLBMs, and deployed and non-deployed heavy bombers	1,034	884

U.S. Data

ICBMs and ICBM Launchers	Minuteman III	Peacekeeper	Total
Deployed ICBMs	449	0	449
Non-deployed ICBMs	263	58	321
Deployed and non-deployed launchers of ICBMs	506	51	557
Deployed launchers of ICBMs	449	0	449
Non-deployed launchers of ICBMs	57	51	108
Test launchers	6	1	7

Source: U.S. State Department

Independent Thought

Defense remains one of the key talking points in debates about Scottish independence

CROWN COPYRIGHT

Establishing a new home outside Scotland for the U.K.'s missile submarines would prove carrying difficult.

Tony Osborne London

In 2014, the people of Scotland will be asked whether their country should become independent. A "yes" response will have dramatic consequences for the defense of the British Isles.

Since 1707, Scotland has been a part of the United Kingdom and has almost always been governed centrally from London. But the creation of a devolved government in 1999 and the 2011 swearing in of a nationalist administration has accelerated the march to independence. Under Scottish National Party (SNP) plans, an independent Scotland would keep sterling as its currency—at least initially—and retain the queen as its head of state. Though a close relationship with England seems solid, defense remains something of a sticking point.

Since the 1960s, the U.K.'s submarine-based nuclear deterrent has been situated on the highly guarded Faslane Naval Base. Four Vanguard-class submarines, each capable of carrying 16 Trident submarine-launched ballistic missiles, maintain a constant vigil. But the SNP has a rigorous non-nuclear weapons policy and wants the Trident system withdrawn as early as possible.

This could prove precarious, because "unlike most nuclear powers, the U.K. has just one single delivery method for its nuclear weapons," says Prof. Malcolm Chalmers, an expert on U.K. defense policy at the Royal United Services Institute think tank. "If it wanted to be belligerent, an independent Scotland could demand the removal of Trident and the U.K. would have no choice but to unilaterally disarm, because there is no alternative [site to house the subs].

"If we still had an airborne nuclear deterrent . . .we would have simply moved the aircraft and the weapons to another base in England, but the infrastructure for these submarines has been built up over time to very specific standards . . . ," adds Chalmers. It would take more than a decade to recreate the infrastructure, he says.

Such a "radical" move is unlikely, as it would upset NATO and European Union members. Until October 2012, the SNP was anti-NATO because it felt the organization was a "nuclear weapons-based alliance," but the party now feels it could be a member of NATO's "Partnership for Peace" program.

Chalmers believes that Scotland will take a cautious approach, urging that the nuclear weapons be moved at London's earliest convenience. That might make some Scots unhappy, but at least they will no longer be paying for the system or the multibillion-pound program that will eventually replace it.

But others are concerned that the country's small but important defense industry could move to the U.K. as well. Shipbuilding, which employs 5,000 people in Scotland, would be most at risk, particularly as current British government policy is to produce ships and submarines for the Royal Navy using national industry. Much of this capacity is in Scotland, but in the event of independence it is likely that military vessel manufacturers would exit.

The U.K. would also likely move its 15,000 employees south of the border, along with four Army infantry battalions, two Royal Marine Commando units and five squadrons of Tornado and Typhoon fighter aircraft.

Scotland will then need to consider its own defense. Government ministers have already disclosed that a Scottish defense budget would be around £2.5 billion a year ($3.9 billion), enough, according to Chalmers, for a defense force larger than that of Ireland but—as a proportion of GDP—around the same as the smaller Scandinavian countries. Scotland has significant interests to look after. Many of its exports come from North Sea oil, so capabilities will have to be created to patrol the oil and gas fields, and capabilities must be put in place to deal with cyberwarfare and counter-terrorism.

"There would not be much point in Scotland inheriting equipment and assets from the U.K. because the U.K. armed forces have now been structured for deployment overseas. . . . [Creating a] new military from scratch will not be easy. Significant one-off costs will also be involved," adds Chalmers.

There are also questions about the make-up of a Scottish armed force. Would it comprise an entirely fresh pool of Scottish citizens? But then, exactly who is a Scottish citizen? Currently, nearly 800,000 Scotland-born people live elsewhere in the U.K. and will not be able to vote in the referendum. Yet, 400,000 denizens who were born outside Scotland but now reside there—can.

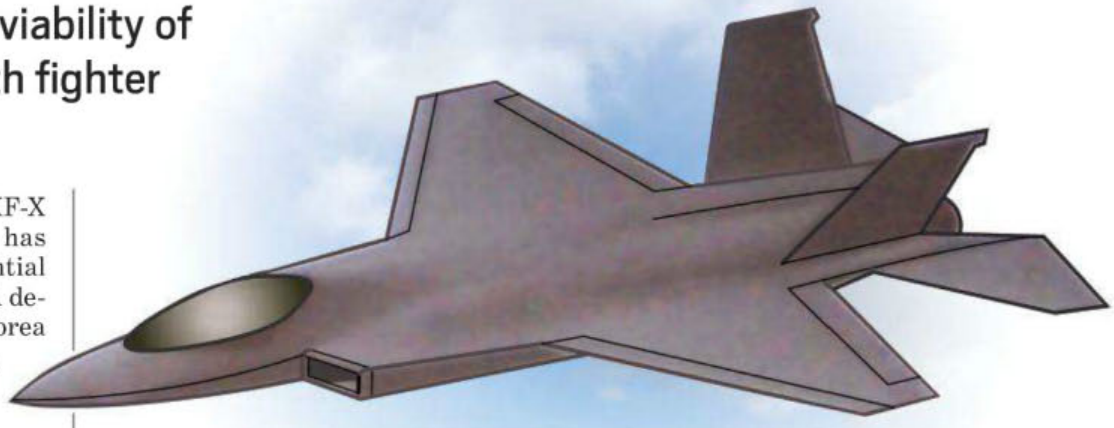
Recent opinion polls suggest enthusiasm for Scottish independence has slumped somewhat. Approximately 23% are saying they would vote "yes," so it is perhaps no wonder that government departments are spending more time studying how to urge Scots to say "nay" rather than planning for an affirmative outcome.

The Scottish government is planning to hold its referendum in fall 2014, and if the people green-light the idea, it is the administration's intention is to have a constitutional platform in place for Scotland to become independent by March 2016.

Another KF-X Enemy

Critics question the viability of South Korea's stealth fighter

Bradley Perrett



C103 is the current aft-tail design for KF-X. An alternative, C203, has a canard planform.

South Korea's proposed KF-X stealth fighter program has not been short of influential opponents. Now it has another. A defense ministry think tank, the Korea Institute for Defense Analysis, has told a public meeting that the country is not technologically equipped to develop the aircraft, that the project is economically unviable and that the KF-X would not be a successful export product. The institute challenges cost estimates by the Agency for Defense Development, which is leading development of the aircraft.

KF-X development would cost more than 10 trillion won ($9.2 billion), one of the institute's researchers, Lee Juhyeong, has told a seminar on the program. Over the life of the program, the KF-X would cost the country more than twice as much as an imported aircraft, Lee says.

The institute's stance has not previously been publicly stated, although the *Naeil* newspaper reported last year that it had submitted a confidential report doubting the viability of the project. Now speaking openly, the institute questions whether the U.S. will be willing to help develop the KF-X. Other skeptics wonder how it could be exported in competition with U.S. aircraft, since South Korea would probably have to use major U.S. components, whose export could be blocked by Washington. Another influential think tank, the Korea Development Institute, reported as early as 2007 that the KF-X was not viable.

KF-X program director Lee Daeyearl, of the Agency for Defense Development, told the same seminar that the fighter would cost 6 trillion won in development, 8 trillion in production, and 9 trillion for operations over 30 years, according to an aerospace industry executive who attended.

South Korea needs to develop its own fighters to be capable of upgrading them and to install South Korean weapons systems, Lee Daeyearl says. "It will contribute to the nation's aerospace industry in the future," Yonhap news agency quotes him as saying. "Without making a first step, we'll have to rely on imported aircraft and that will benefit foreign defense contractors."

The agency has prepared two series of designs, one for an aircraft with its horizontal stabilizers aft, which it considers to be a U.S. style, and one for a "European" fighter with a canard stabilizer. The aft-tail series has run through the iterations C101, C102 and, now, C103, all with two engines and a single seat. The C102 design was further broken down into three variants: C102E with one engine, C102I with internal weapons and C102T with two seats. Those ideas have been discarded, however; the current aft-tail design is C103. Similarly the C201, C202 (with variants E, I and T) and the current C203 follow the same pattern, except for a canard planform.

The agency proposes that either C103 or C203, whichever was chosen, would then advance through three design standards. Block 1 would be "reduced observable," which it says would be equivalent to the B-1B, Boeing F/A-18E/F Super Hornet and Eurofighter Typhoon. For its low signature, Block 1 would rely on fuselage and inlet shaping, including edge alignment, and on radar-absorbing material and semiconformal weapons carriage.

Block 2 would carry weapons internally, a provision for which would be made in the Block 1 design. Antennas would be conformal, and sensors would be "integrated"—for example, in the radar, radome and apertures. There would be minimal gaps and a radar-absorbing coating on the canopy, and the structure of the aircraft, not just its paint, would absorb radio waves. The result would be an aircraft as stealthy as the F-117, the agency proposes.

Block 3 would advance the aircraft to the level of the B-2, F-22 and F-35, but no details are given.

All of this is a step beyond the previous concept, in which the KF-X would have aimed only at something like the Block 1 standard.

The aircraft is expected to be between the Lockheed Martin F-16 and Boeing F-15 in size. Consistent with that, the agency shows the C103 design with two engines of 18,000 lb. thrust each. According to a 2009 external review of the program, the empty mass of the KF-X should be 10.4 metric tons.

Since work began in 2002, the KF-X has been stuck in feasibility studies, concept definition and preliminary design. The finance ministry last year put a stop to it entering full-scale development this year. Instead it allocated just 4.5 billion won for further studies.

The agency's Lee says that if full-scale development begins in October 2014, the first prototype could be rolled out in August 2019 and fly in September 2020. Two years ago, the South Korean air force said it expected the KF-X or an alternative to enter service in 2021. That would obviously be impossible for a type that made its first flight in 2020.

Parker's Deal

American, US Airways advance consolidation, but can mergers be as effective as Chapter 11?

Jens Flottau Frankfurt and Christine Grimaldi Washington

MICHAEL B. ING/AIRLINERSGALLERY.COM

When US Airways tried to merge with United Airlines in 2010, Continental Airlines CEO Jeff Smisek, called his counterpart at United, Glenn Tilton, to persuade him otherwise. "I did not want him to marry the ugly girl," Smisek said. "I am much prettier." Smisek was convincing enough then and has been leading the merged United Continental ever since. But now the "ugly girl" has found a partner—the much bigger American Airlines. And with few options left, the 35-year history of consolidation in the U.S. airline industry since deregulation in 1978 takes an unusual turn.

It is unusual in several respects. The new airline—poised to become the largest in the world—will be effectively controlled by management of the far smaller partner, US Airways. One of the most outspoken characters in the industry and at the same time the longest-serving CEO of any major U.S. carrier, 51-year-old Doug Parker has pushed hard to make the combination happen. The merger is occurring in spite of the fact that American did not want it and arguably needed it less than US Airways. American CEO Tom Horton will remain, as executive chairman, but only until the new company's first annual general meeting. While unions or shareholders have stood in the way of other mergers, workers and owners/creditors have long been convinced that Parker's proposal is the way to go, even if American's management was not.

Union support and management caution may become important factors as the two carriers integrate over the next few years. As convincing as mergers may look on paper, history shows that it is often much tougher to reap the benefits in reality. A lot of mergers in the last three decades did not work as smoothly as the companies involved had hoped. In fact, some argue that while the deals have been beneficial for the industry as a whole, they typically have not been advantageous for the two new partners. And among those on the bleeding edge of consolidation in the past have been American and US Airways.

Tap here in the tablet edition of *AW&ST* for more analysis and data on American Airlines and US Airways fleets, traffic and finances, or go to **AviationWeek.com/newamerican**

American bought Trans World Airlines (TWA) out of bankruptcy in 2001 just ahead of the major industry downturn initiated by the Sept. 11, 2001, terrorist attacks in New York and Washington. American subsequently shut down TWA's St. Louis hub and cut capacity roughly equivalent to the former rival's size. US Airways itself is an amalgam resulting from a series of takeovers. And it is still struggling to integrate America West, the latest carrier it bolted on, following a deal Parker engineered in 2005.

Among the more strategic issues the new American-US Airways combination must address is the shape of their future network. The carriers will have to resolve competition between US Airways' hub at Phoenix Sky Harbor International Airport and American's much larger one at Dallas/Fort Worth International Airport as well as their East Coast hubs used for transatlantic operations, US Airways' at Philadelphia International Airport and American's at John F. Kennedy International Airport. Nevertheless, the merged carrier, to be based at American's Dallas hub, plans to operate more than 6,700 daily flights to 336 destinations in 56 countries without giving up any of the current hubs.

Combining the fleets appears to be the least of the challenges ahead. Although US Airways operates mostly Airbus aircraft, American has already committed to a mixing of its narrowbody fleet, with large concurrent orders of Boeing 737 and Airbus A320-family aircraft, says Craig Jenks of New York-based Airline/Aircraft Projects Inc. In terms of widebodies, a merged carrier would add just one type—the Airbus A330-200/-300. American has simplified its Boeing fleet to 767s and 777s, with 787s scheduled for delivery in 2014. Adding the

New American Airlines	
Employees	AMR Corp., 81,400; American Airlines, 66,600; US Airways, 32,213
Destinations	American, 260; US Airways, 198
Hubs	American Airlines, 5; US Airways, 3
Aircraft	American Airlines, 608 (mainline) and 281 (regional); US Airways, 340 (mainline) and 282 (regional) as of 2012
Full-Year 2012 Operating Revenue	AMR, $24.9 billion and US Airways, $13.8 billion
Full-Year 2012 Operating Expenses	AMR, $24.7 billion and US Airways, $13.0 billion
Full-Year 2012 Operating Income	AMR, $107 million and US Airways, $856 million
Full-Year 2012 Available Seat Miles	AMR, 166.2 billion (consolidated) and US Airways, 88.4 billion (consolidated)

Delta Air Lines	
Employees	80,000
Destinations	330
Hubs	11
Aircraft	717 (mainline) and 562 (regional for Delta Connection)
Full-Year 2012 Operating Revenue	$36.7 billion
Full-Year 2012 Operating Expenses	$34.5 billion
Full-Year 2012 Operating Income	$2.2 billion
Full-Year 2012 Available Seat Miles	230.4 billion (consolidated)

United Airlines	
Employees	87,867
Destinations	381
Hubs	10
Aircraft	699 (mainline) and 554 (regional)
Full-Year 2012 Operating Revenue	$37.2 billion
Full-Year 2012 Operating Expenses	$37.1 billion
Full-Year 2012 Operating Income	$39 million
Full-Year 2012 Available Seat Miles	248.9 billion (consolidated)

American presented its new livery only weeks before the merger was announced.

A330 will carry some cost disadvantages but also some revenue benefits, Jenks notes.

The industry's poor track record on specific mergers has led many to conclude that they do not eradicate fundamental airline weaknesses. But lately that perception has changed. The combinations of Delta and Northwest Airlines as well as United and Continental, among others, have arguably led to tighter capacity control. Even Southwest Airlines gave up its conservative stance and bought AirTran Airways in 2010.

The Delta-Northwest and United-Continental mergers featured similar divisions in fleet types. Analysts agree their examples—and fleet integration—will prevail over the long term. More broadly, recent precedents bode well for American and US Airways. "The challenges of implementing this merger are all challenges which have been shown to have been surmountable [in previous mergers]," Jenks says. "I do not believe there is a new challenge out there that hasn't already been addressed."

The merger represents an evolution—not a revolution—of the competitive landscape of the U.S. airline industry, he adds: "It's simply a continuation of an existing trend." Just three U.S. legacy carriers will remain, down from six only a few years ago.

As a whole, U.S. airlines have been able to orchestrate a remarkable turnaround in recent years. They have lagged behind European competitors—not to mention fast-growing carriers in Asia, the Middle East and Latin America—operating older fleets with uncomfortable seats and mediocre in-flight services. But that is beginning to change. As their financial results have improved, U.S. airlines are beginning to invest in renewing old fleets. And offerings in long-haul premium cabins of United and American, for example, are again competitive with those of their European counterparts, which are now struggling financially and cutting back on service.

However, while these improvements are certainly the result of capacity discipline and cost-reduction—in other words, consolidation—the better financial performance may not be primarily due to the mergers. Chapter 11 bankruptcy protection has proven to be a very efficient restructuring tool for the big U.S. legacy carriers, to the envy of their international competitors. Achieving the same kinds of benefits by merely combining two carriers requires a much more tedious effort spanning years.

JetBlue Airways President/CEO David J. Barger says the merger is good news for his carrier and the U.S. airline industry as a whole. "It's a consolidating industry, which is rationalizing capacity with leaders who are focused on return on invested capital for our shareholders," he said during a Feb. 13 address to the Royal Aeronautical Society's Washington branch. "This capacity rationalization is going to be good for the industry and very, very good for JetBlue."

Barger notes that the U.S. airline industry has not, in aggregate, made a single penny of profit in its 99 years of existence. He hopes the American-US Airways tie-up will usher in a more profitable era. "Somebody asked me, 'Are you looking for the platinum age?'" he says. "We'll take the silver age."

He adds that the consolidation and resulting antitrust reviews could create some "disruption opportunities" that would give JetBlue more slots at lucrative airports such as Ronald Reagan Washington National Airport.

Among the skeptics of the American-US Airways deal is Virginia-based consultant George Hamlin, who does not think the merger was essential to US Airways' survival in a sea of bigger competitors. He argues that increasing the size of operations will not necessarily produce cost efficiency. US Airways has a better cost structure than American, Delta and United when adjusted for stage length, Hamlin says, while Southwest Airlines' is better than any of the four legacy carriers. "Big is not necessarily better," he notes.

Jenks thinks otherwise. If not essential, the merger certainly represents the "best possible outcome" for US Airways, he says.

Although the merger must still pass regulatory muster, few foresee major problems. The Justice and Transportation departments have to approve the pairing, but in recent years they OK'd the Delta-Northwest and United-Continental mergers, both of which had more overlaps.

Whether the tie-up represents sound policy is another matter. Consumer advocates worry about higher fares, but some economists say that airline stability—noticeably lacking over much of the U.S. industry's history—will prove to be the greater good. The financial community welcomes this merger and industry consolidation as a whole, though passengers are left with fewer choices. But all the previous mergers did not lead to raising fares: U.S. travelers are paying less for tickets than in 2000. And Parker asserts that having three strong network carriers will give many U.S. fliers more options, not fewer.

Government regulatory authorities could still ask the merged carrier for certain concessions, if they determine that its combined marketshare would be too large. It might be required to divest some takeoff and landing rights at certain slot-controlled airports, such as Washington's National, where the merged carrier would dominate.

Other changes await on the regional front. Three wholly owned regional carriers—AMR Corp.'s American Eagle Airlines and US Airways' Piedmont Airlines and PSA Airlines—will continue to operate as distinct entities. American Eagle eventually will be the brand for those.

The US Airways-American combination may not look so significant from a global perspective, but there are some important ramifications to keep in mind. There will now be three big airline blocks in each of three major air transport markets: China (Air China, China Southern Airlines and China Eastern Airlines), Europe (Lufthansa, Air France-KLM and International Airlines Group) and the U.S. (American, United and Delta).

The merger will lead to one major change in the alliance world, with the Star Alliance losing U.S. partners, as the combined carrier will stay in American's Oneworld.

With Joseph C. Anselmo in Washington.

Qatar Airways is among the airlines most affected by the 787 grounding.

BOEING

Misleading Silence

Airlines slowly begin to plan for a summer without Boeing 787s

Jens Flottau Frankfurt, Cathy Buyck Brussels and Bradley Perrett Beijing

Boeing is finally telling some of its customers not to expect the 787s they have ordered to be delivered as scheduled. While for a few, that notice is a disaster, and although most airlines are facing serious disruptions, some are quietly relieved that they will not have to take the aircraft just yet.

Norwegian Air Shuttle was the first airline to confirm it has been alerted by Boeing. Deliveries of its first two aircraft, previously scheduled for April and June, are likely to be affected. The carrier says Boeing has not announced a new delivery date or given written confirmation of potential delay.

Boeing's customer warning is only the latest sign that the manufacturer now recognizes what others have been predicting for some time: The 787 grounding is likely going to be a matter of several, if not many, months, rather than a short-term issue that can be resolved quickly. The National Transportation Safety Board (NTSB) has indicated that it will take weeks to identify the root causes of thermal runaway in a lithium-ion-battery on a Japan Airlines aircraft in January that led to the grounding of the 50-strong 787 fleet.

In addition to Norwegian, several other carriers are due to receive their first 787s in the next several months, including British Airways, TUIfly, China Southern Airlines, Air China and Aeromexico. And besides these, there are a number of operators that have been looking at growing their fleets—such as United Airlines, Qatar Airways, All Nippon Airways, Japan Airlines, Air India, LOT Polish Airlines and LAN. Boeing planned to deliver more than 60 aircraft this year and was about to raise the monthly production rate to 10 from five by year-end. Analysts including Ed Greenslet of *The Airline Monitor* are starting to revise their delivery forecasts downward. Greenslet tentatively expects 50 787s to be delivered this year, "but even that might prove to be high," he notes.

Just one Dreamliner has been delivered this year, to Air India on Jan. 3. Unlike Norwegian, the other affected carriers have made no public comment about the impact on their operations, but that should not lead Boeing to believe all its customers are patiently waiting. Because the grounding is linked to fundamental aircraft safety, no airline wants to be caught publicly demanding a quick return to routine 787 flight operations before the root cause of the battery problems has been determined and sorted out.

In the meantime, some carriers are expressing support for Boeing. While Emirates President Tim Clark says "things will get worse before they get better" for the aircraft maker, he also believes that "in the end, they will get it right." To Clark, there is also a more fundamental dimension to the battery defects, which Greenslet describes as "the largest product disaster in the history of the Boeing company." Clark stresses that "it is vital that innovation continues to take place in an industry which relies on technology."

But Clark's support and other carriers' silence do not mean that huge disruptions are not already occurring. Airlines such as Qatar Airways that have based the launch of new routes on 787 arrivals must revise their plans because they are lacking aircraft. Qatar could be forced to significantly curtail network growth if deliveries are extensively delayed.

Similarly, a crucial part of Norwegian's future business model hinges on the availability of the 787. It is now a European low-fare airline, but it planned to open its first long-haul services to New York and Bangkok in the summer using the 787. It is considering leasing another aircraft type for three months in order not to have to cancel the launch of the new operation. "As one of Boeing's biggest customers in Europe, we expect that the aircraft manufacturer will do everything in its power to get the aircraft ready for delivery as soon as possible," Norwegian CEO Bjorn Kjos says.

Thus, lessors and short-term aircraft, crew, maintenance and insurance (ACMI) providers might benefit from the grounding of the 787. If Boeing does not find a quick fix for its battery problem, customers with parked 787s will have to start looking for replacement capacity as the busy summer schedule nears. The situation will be most pressing for operators that have proportionally larger 787 fleets, although some seem to be compensating for the grounding relatively well. All Nippon Airways (ANA), the largest operator to date with 17 aircraft, is trying to improve productivity of its remaining fleet, particularly Boeing 767s and 777s, to limit the capacity shortfall.

For those that do not have enough aircraft themselves, the most sought replacement aircraft will likely be smaller widebodies, such as Airbus A330-200s and Boeing 767-300ERs.

There is some excess capacity on the market for the moment and airlines should have no trouble finding replacement aircraft for short-term requirements. But, as Greenslet puts it, the question could be: "What lift may be available at any price?"

Extended Range
Predator B

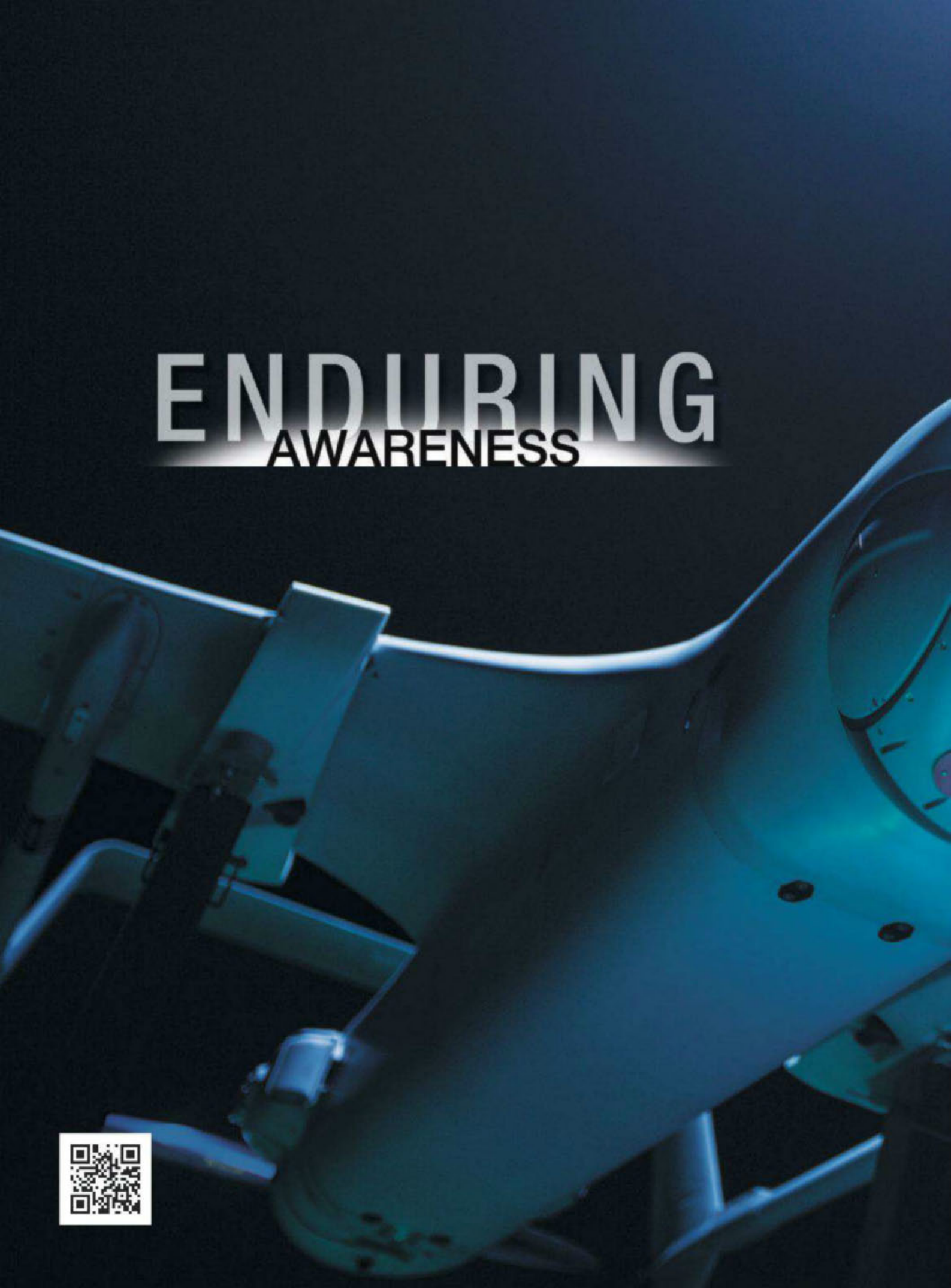
EXTREME PERSISTENCE

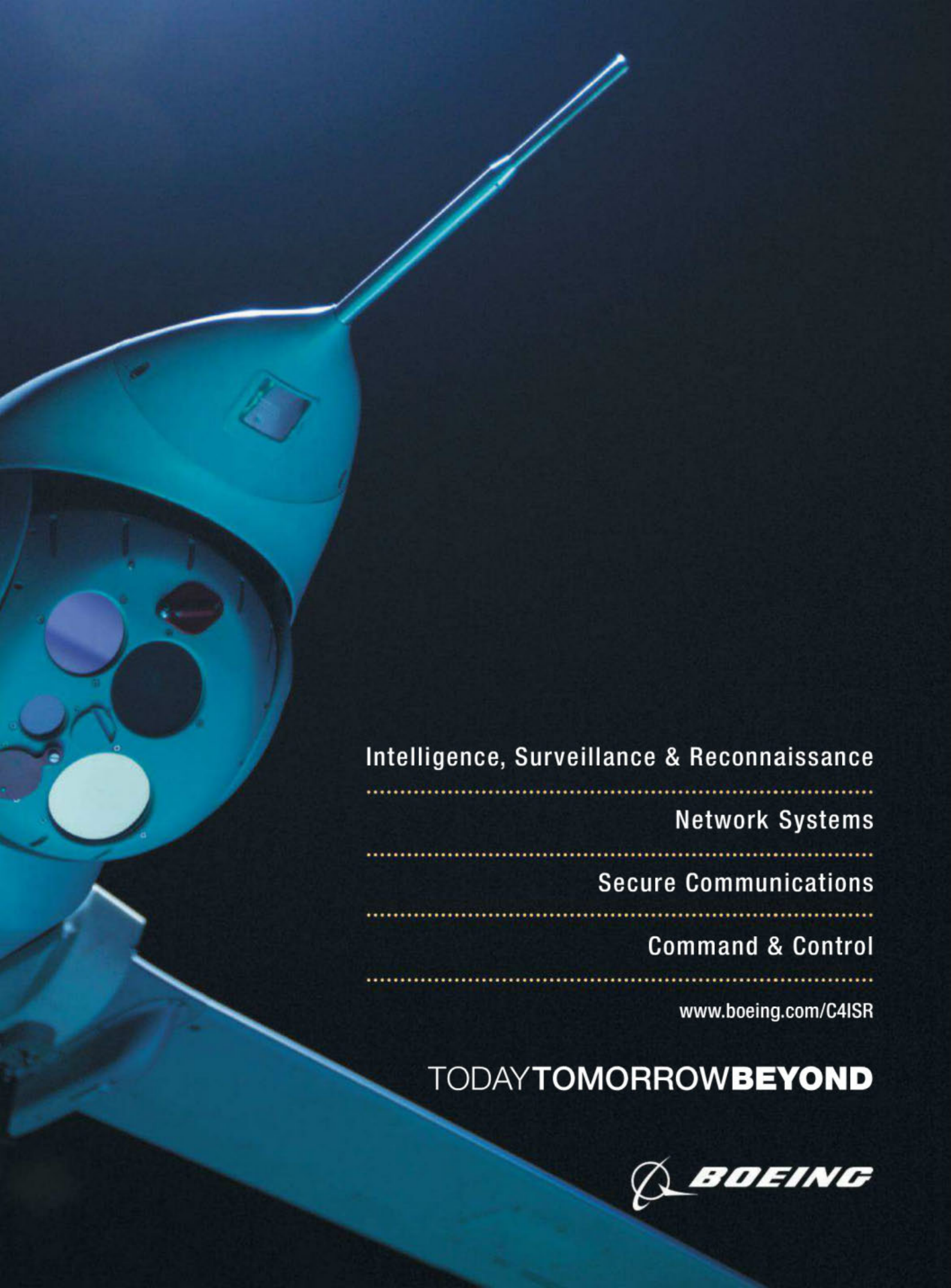
- 42-hour ISR-only endurance
- 2,900 nmi mission radius
- Field retrofitable to standard MQ-9 Reaper/Predator B
- High-capacity landing gear
- Proven multi-role platform for long endurance Intelligence, Surveillance and Reconnaissance (ISR) missions

GENERAL ATOMICS
AERONAUTICAL

www.ga-asi.com

Leading The Situational Awareness Revolution


ENDURING
AWARENESS


Intelligence, Surveillance & Reconnaissance
Network Systems
Secure Communications
Command & Control
www.boeing.com/C4ISR
TODAYTOMORROWBEYOND
BOEING

April 16-18, 2013
Georgia World Congress Center
Atlanta, GA

Trade Show Executive's FASTEST 50

Named one of *Tradeshow Executive Magazine*'s Fastest 50 growing shows!

MRO Americas is leading the airline and MRO industry forward!

- Increased focused content areas
- Expanded exhibition hall
- New products and services
- Cutting edge technology
- Enhanced opportunities to connect with the MRO community

Don't miss this mega event, designed to meet your end-to-end MRO needs!

AVIATION WEEK MRO AMERICAS MEGA

- ADVANCED MATERIALS
- AIRLINE OPERATIONS
- AVIONICS
- CABIN/IFE
- ENGINEERING
- FINANCE
- GSE & LINE MAINTENANCE
- IT/DATA/IP
- LEASING
- LOGISTICS AND SUPPLY CHAIN
- MRO MILITARY
- PROPULSION
- SKILLS/TRAINING

Find Aviation Week

Register today and secure your place!
www.aviationweek.com/events

Many 767-300ERs are aging and airlines are phasing them out. It is very likely that the lessors to whom the aircraft are returned have not yet locked in a new lease. They will be happy to extend the leases and put themselves in a "comfortable" position, an industry insider points out.

"A sustained grounding and halt of new deliveries of 787 aircraft would support certain used aircraft values and rentals, especially for A330-200s and 767-300ERs," says Amentum Capital CEO Martin Bouzaima. "Airlines with 787 orders would seek to delay redeliveries of legacy aircraft, leading to an excess demand relative to what the market had priced in as of January. The effect is likely to be short-term only, but it is all a function of how long it takes Boeing and its suppliers to fix the technical issue."

Bert von Leeuwen, managing director of aviation research at DVB Bank, believes airlines will look at extending existing widebody leases, primarily for 767s, A330s and 777s, that would otherwise have been terminated. He argues that this should have an impact on lease rates with demand rising, and the effect could be felt most on the A330 fleet, half of which is controlled by lessors.

Greenslet argues that the most difficult issue for Boeing will be "to assure airlines and passengers that whatever is done to fix the problem does, in fact, fix it." He notes that it is "not hard to imagine that all the assurances in the world may not, for a long time, overcome the concerns that users of the airplane have about its safety. That, more than the costs of the fix, of delayed deliveries and of compensation to airlines, may be the greatest consequence of, and threat to, the 787 program from this. And it is what may, in the end, force Boeing to change to a different battery."

"A sustained grounding and halt of new deliveries of 787 aircraft would support certain used aircraft values and rentals, especially for A330-200s and 767-300ERs"

John Mowry, vice president at ICF SH&E, expects "an increase in demand for other medium twin-aisle aircraft" generated by a need to replace the grounded aircraft and find alternatives for those that will not be delivered on schedule.

Airlines will continue to operate their current aircraft longer and postpone planned retirement to the extent possible, Mowry argues. Many carriers that lease alternative medium twin-aisle aircraft will seek to extend their existing leases. "In addition to these fleet-management techniques, airlines can also delay new route launches or reduce route frequencies," he says.

Mowry anticipates "a modest lift in dry-lease rates for alternative medium twin-aisle aircraft particularly for short- to medium-term lease extensions," but he does not expect to see a material effect on aircraft values. And not all lessors will benefit to the same extent. "Most benefits will accrue to larger lessors with significant inventory flexibility in current lease-extension negotiations, and those lessors with speculative orders yet to place," he notes.

For their part, airlines are tight-lipped about the consequences of the 787 groundings, despite the very real impact on operations. But a consultant describes the operational effect as "an enormous problem" touching on a wide range of elements such as schedules, seat capacity, crew rosters and securing replacement aircraft. Airlines also have to address onboard service concerns and undeliverable customer expectations.

International Airlines Group CEO Willie Walsh says he has been briefed by Boeing on what might happen next. "There are some changes to the systems that I know they are going to introduce, but I can't disclose too much of it because I have been given information on a confidential basis," he says. Walsh expects "some redesign" of the battery system which would take "a couple of months."

IAG subsidiary British Airways has 24 787s on firm order, eight of them 787-8s and 16 787-9s. The airline has expected its first 787-8 in May and a total of four are due this year.

American Airlines, United, Air Canada, Qantas Airways and others say they have not been formally notified yet of delivery delays for their 787s. Some, like American, are not due to receive their aircraft until the end of 2014.

For other carriers, the persisting Dreamliner problems are a godsend. Gulf Air, for instance, used the past 787 delivery delays to cancel part of its order without penalty, and the troubled Bahraini airline might follow suit to further reduce it 787 commitment as it tries to survive.

U.K. carrier Thomson Airways was expected to receive its first 787 at the end of February, four by May and another four by May 2015. The airline, which is part of the integrated tourism conglomerate TUI Travel, had planned to put the aircraft in commercial operations as of May 1 on long-haul flights from London Gatwick Airport, Manchester, East Midlands and Glasgow to Sanford, Fla., and Cancun, Mexico.

Thomson Airways is now implementing contingency plans, in case the aircraft do not arrive by the end of March. It has a fleet of 48 aircraft, including 19 757-200s and 10 767-300ERs, according to the Aviation Week Fleet Intelligence Network database. "Once we have more information from Boeing regarding delivery dates, we'll be able to look at which 767s we have available to use in our fleet," the airline tells Aviation Week.

TUI Travel has 13 787s on order for its carriers in addition to Thomson: TUIfly Nordic, Arkefly and Jetairfly.

Ethiopian Airways was the first African airline to deploy the 787. It was operating its four 787s in alternation with its 777-200LR on routes to Johannesburg; Washington; Toronto; Frankfurt; Beijing; Lusaka, Zambia; and Harare, Zimbabwe. Ethiopian anticipated receiving its fifth 787 in March. The remaining five were scheduled to be phased in 2014.

For Chinese customers, the 787's current woes just add to another. Completed 787s for China Southern Airlines and Hainan Airlines—three each as of December—have been sitting idle, awaiting a type certificate that the Civil Aviation Administration of China (CAAC) was not expected to issue until March.

The Chinese were ready to issue the type certificate some years ago but, because of the 787's development delays, the results of its preparatory work expired before the aircraft could go into service, industry sources say. The grounding can only further delay CAAC approval of an aircraft that has considerable value in China for opening long, thin routes across the Pacific, to Europe and, supporting an emerging trend, to Africa.

Next Steps

Boeing 'feeling good' about possible fix, but will scrutinized regulators agree to it?

Guy Norris Los Angeles

As the Boeing 787 enters the second month of its fleet-wide grounding, the manufacturer is poring over data collected on a series of flight and ground tests and says it is making "good progress" toward a solution.

The fix, at least in the short term, continues to be focused on strengthening the containment of the aircraft's two existing lithium-ion batteries as well as adding additional temperature monitors to provide earlier warning of abnormal battery performance via the engine indicating and crew alerting system (*AW&ST* Feb. 4, p. 20). Program insiders say initial test data have reinforced the company's confidence in its baseline redesign package and that it "feels good" about the revised configuration.

Boeing test Capts. Mike Bryan and Randy Neville together with a crew of 11 flight-evaluation personnel completed a second battery-monitoring flight on Feb. 11 onboard 787 test aircraft ZA005. The uneventful 1-hr. 29-min. flight followed the first one on Feb. 9, which lasted 2 hr. 19 min. The flights assessed the performance of the main and auxiliary power unit batteries over a matrix of altitudes and speeds. Further ground tests of the batteries were conducted on ZA005 on Feb. 13, and on Feb. 12, on units in an aircraft destined for Polish carrier LOT.

However, beyond the technical challenge is the billion-dollar question of whether the short-term, containment-based option being studied by the company will pass muster with the FAA. Specifically, can it comply with the Jan. 16 edict that "operators of U.S.-registered, Boeing 787 aircraft must demonstrate to the Federal Aviation Administration that these batteries are safe"? With the spotlight fixed firmly on the FAA and its administrator, Michael Huerta, promising to "restore the highest level of safety and create the best methods and best procedures," Boeing is steeling itself for a dialogue that could be as much political as technical.

Adding to the intensity are questions on the FAA's original certification for the battery that were posed on Feb. 7 by U.S. National Transportation Safety Board Chairman Deborah Hersman. In lockstep with its ongoing investigation into the cause of the first battery fire, on a Japan Airlines 787 in Boston on Jan. 7, the NTSB is evaluating the validation methods used for certification of the battery as well as testing of field-replacement batteries. The board found that a short circuit in a single cell can propagate to adjacent cells, resulting in smoke and fire. "The assumptions used in the certification of the battery must be reconsidered," says Hersman.

Above all, as the investigation continues to narrow the apparent cause to the internal workings of the battery rather than the associated charging or control systems, there is the growing question of whether the FAA can accept an interim configuration designed to mitigate and contain a failure condition that may well recur in service. Confirmation that the focus is shifting on internal failures came last week when the NTSB acknowledged it is investigating whether the issues could be linked to the formation of small build-ups known as dendrites. Late in January, battery experts informed Aviation Week that NTSB testing includes examination for signs of dendrite-caused short-circuiting.

Suppliers also see Boeing's decision not to slow 787 production or development of the stretched 787-9 as "a bullish indication" the company remains confident of working through the issues. Parker Hannifin and Eaton, two major 787 suppliers, say they have seen no signs of a slowdown. "We have weekly interactions at all the right levels, and right now it's full steam ahead in terms of production," Parker Aerospace President Roger Sherrard tells Aviation Week. "We don't see any near-term impact at this point."

Craig Arnold, the chief operating officer of Eaton's Industrial Sector, says: "They have a very long backlog of 787s, and to the extent that they take their foot off the accelerator it's tough to catch up. Right now, it's business as usual. They're building airplanes and we're shipping to their lines and they're confident they're going to work through this."

As 787s roll off the Everett, Wash., and North Charleston, S.C., lines at a combined rate of around one per week, Boeing is, however, considering contingency plans for freeing up extra storage space at its Everett site. By mid-February, there were expected to be 22 aircraft awaiting delivery, of which 16 were at Everett. A further 20 were either waiting for or undergoing change incorporation.

—With Joseph C. Anselmo in Cleveland

JOE WALKER

After collecting almost 4 hr. of battery operation data, ZA005's next flights could include tests of a revised configuration.

ERIK SIMONSEN

Southwest Airlines and Alaska Airlines experienced thrust instabilities in their CFM56-7B-powered fleets.

Fueling Fears

Contamination of fuel is primary suspect in 737NG incidents

John Croft Washington

Boeing and CFM International are scrutinizing fuel supplies and the Honeywell-built fuel-control system in the CFM56-7B following a series of thrust-instability events on Boeing 737NG aircraft.

Their findings could have broader implications for the Jet A supply chain and fuel-testing regimen if contamination is behind the incidents. "We're doing a root-cause analysis, looking at the fuel-control unit and the entire fuel supply chain," says Boeing. "The problem might be fuel-based."

The instabilities, described as a fluctuation in N1 (low-pressure spool) and N2 (high-pressure spool) speeds, are occurring at high power settings, for example in climbing to cruise altitude, after which "engine operation typically returns to normal," says Boeing.

There have been 32 thrust-instability events since the first was reported in January 2008, with 17 of the events in the Alaska Airlines fleet, according to Boeing. At least one incident has occurred at Southwest Airlines, based on a memo circulated to its pilots. However, two dual-engine instabilities occurred as recently as August and November 2012. "In one case [in 2012], both engines regained normal control and performance, and the airplane safely returned to base," says Boeing. "In the other case, one engine's thrust did not respond properly, but the other engine fully recovered, and the airplane returned to base without further incident."

Boeing further clarifies that in one of the dual-engine instabilities, both engines experienced a simultaneous "momentary oscillation," while in the other, the engines experienced instabilities at different times during the flight.

"These events are rare and brief, and the level of overspeed is well within the demonstrated capability of the engine," the company says. Boeing has not disclosed other airlines involved or geographical regions where the incidents have occurred. Mechanics in each case changed out the fuel control units of the engines, says Boeing.

The root-cause analysis has narrowed the issue down to fuel flow in Honeywell's hydromechanical unit (HMU), which regulates the amount of fuel delivered to the engine and is designed to handle a specified level of fuel contamination. Investigators are likely checking to see if contamination levels from a particular refinery are exceeding allowable limits. Sources of contamination can include water, particulates or biodegradation (which forms a gummy residue in the fuel), bacterial growth or overuse of biocide used to control bacterial growth.

Components in the engine-mounted HMU box include an electrohydraulic servo valve (EHSV) driving a fuel-metering valve (FMV). Fuel flow to the engine is computed by the full-authority digital engine controller's (Fadec) electronic engine control unit, which sends a command to the HMU and receives feedback from the EHSV actuator, closing the control loop on desired fuel flow. Boeing says the events are "characterized" by a momentary oscillation of the FMV, which may indicate a control-loop malfunction caused by a contaminated fuel valve.

CFM has issued a change to the Fadec software through a service bulletin that Boeing says "reduces the duration and degree of thrust-instability events" by cycling the FMV and EHSV during engine shutdown to clean the EHSV spool. Boeing says the software change also slows the FMV response when the engine control logic detects a "poorly responding" FMV. The company says that no thrust instabilities have occurred since the new software was uploaded to the engines, though it does not see the fix as the final solution.

The airframer in January also issued a Flight Operations Bulletin to airlines advising pilots to use the existing quick-reference handbook procedures for engine surge or compressor stall events. The handbook instructs pilots to disengage the autothrottles and decrease the thrust levers until abnormal engine noises or engine performance indications (rpm and exhaust gas temperatures) return to normal levels. If the problem persists, they are instructed to shut down the engine and land "at the nearest suitable airport" using the single-engine checklist.

Problems with the HMU are not new to the CFM56. Installed on the aft-left side of the engine's accessory gearbox, the HMU controls the fuel sent to the combustor but also houses other control valves that operate the variable stator vanes, variable intercompressor bleed valve, turbine active-clearance-control system and fuel-nozzle staging.

Issues first cropped up early in 1998, shortly after the initial versions of the 737NG entered service. In at least two cases, the problems led to uncommanded acceleration to full power in flight and flame-outs on the ground. One of the uncommanded accelerations was due to contamination in the HMU and the other was triggered by a problem with the FMV resolver. The issues were corrected by a software change and manufacturing improvements.

Problems encountered by early operators, such as launch customer Southwest Airlines, which has the largest 737NG fleet in the U.S., included excessive fuel feed to the engines at start-up and associated low-frequency fluctuations in fuel pressure to the combustor.

With Guy Norris in Los Angeles.

Better Burn

Rolls readies for building higher-thrust XWBs and introduction on A350-900

Guy Norris Los Angeles

With fuel burn a critical performance discriminator for Airbus in its challenge to Boeing with the A350, the European manufacturer has some encouraging signs from engine supplier Rolls-Royce as it heads toward flight tests later this year.

Rolls says initial results from testing of the Trent XWB-84s delivered to Toulouse for installation on the first A350-900 show fuel-burn performance meets specification and is slightly improved over that seen on earlier flight-test units. Rolls Trent XWB program director Chris Young says, "We are well on track to meet our targets for entry into service. So it is looking good on fuel consumption."

Rolls declines to give specific numbers, but Airbus projects the largest variant of the family, the A350-1000, will have up to a 600-nm-range improvement and 25% fuel-burn-per-passenger advantage over the current Boeing 777-300ER, and up to an 8% operating cost advantage for the other versions over the initial Boeing 787. The bulk of this advantage is expected to come from what Rolls describes as the "most efficient engine flying in the world today."

However, despite encouraging results from ground runs and flight tests on the Airbus A380 flying testbed, the true acid test is approaching with the start of flights of MSN1, the first A350-900, around mid-year. Rolls delivered the first shipset of flight-compliant XWB-84s in December and has completed assembly of a further pair. In addition, Young says three more XWB-84s are in build and parts are "kitted" for an additional four. The baseline engine received certification from the European Aviation Safety Agency (EASA) on Feb. 7. Certification covers the XWB-75 and -79 variants for the A350-800 and -84 for the A350-900, effectively encompassing the 75,000-84,000-lb.-thrust range required for both versions.

"The focus now is much more on the test program so we are ready for entry into service in the second half of 2014," adds Young. From an engine perspective, this means a shift from the test and certification effort that has so far involved 11 engines and 3,100 test hours, to amassing hours and cycles on endurance units and flight-test-compliance engines. "You'll see that start to accelerate," says Young.

While build-up of the first XWB-84s takes place at United Technologies Aerospace Systems' facility in Toulouse, Rolls is preparing to begin a prototype version of the Trent XWB-97 for the Airbus A350-1000, the most powerful production turbofan it has developed. The engine will help prove out several of the design features of the higher-rated variant, the first development unit of which is due to make its initial run in mid-2014. The Trent XWB-97 is on track to power the first A350-1000 in mid-2016 and enter service a year later.

Rolls completed the preliminary design review (PDR) for the 97,000-lb.-thrust Trent XWB-97 in January. "This is a key milestone for us as it takes us into detailed design and the making of individual components of engines, the pouring of castings and the creating of forgings. It also enables us to get ready to begin machining," says Young. Although the XWB-97 is sized for considerably greater thrust, Young says a success from the PDR was confirmation that 80% of the line-replaceable units will be common among the engine variants. The only exceptions will be fuel pumps and fuel-metering units, which will need larger capacity for the 97,000-lb.-thrust version.

Development of the XWB-97 follows the 2011 decision by Rolls and Airbus to increase the A350-1000 thrust requirement from 93,000 lb. To maximize commonality with the baseline XWB and avoid changing the outer mold line with an expensive increase in fan diameter, Rolls sought to meet the higher power need by scaling up the core and boosting the flow. The fan will spin 5% faster, and the annulus at the base of the fan blades has also been redesigned with an inflection to boost the flow capacity around the spinner.

UTAS

The first flight-compliant Rolls-Royce Trent XWB-84 for the A350-900 is prepared for aircraft installation in Toulouse.

"We will get more power out of the core by making it bigger and improve the turbine's capabilities to run the engine hotter," says Young, who adds the focus is on putting new technology into the turbine. Changes for the XWB-97 include the use of next-generation CMS-X4 single-crystal materials and anti-oxidation coatings in the high-pressure turbine which, for the first time on a Trent, will be shroudless.

The turbine disc will also be forged from a dual microstructure disc that will provide greater stress capability toward the center of the hub while at the same time exhibiting better creep resistance toward the tips. The blades will also have an advanced tip-cooling treatment. Other improvements designed to help the XWB-97 maintain the same relative fuel-burn improvement as the basic XWBs, despite the thrust jump, include a more sophisticated adaptive bleed system that is designed to turn off cooling air bleed during cruise when not required.

The intermediate (IP) compressor features a "rising line" or inner annulus line that increases in radius, thereby increasing the tip speed of the aft stages. The high-pressure compressor is derived from the European New Aero Engine Core Concept program and is connected to the IP by a swan-neck duct. The engine will also include an impingement effusion combustor design that uses a combination of metallic tiles and film cooling to reduce the cooling air required, thereby boosting efficiency.

"We will be testing one of the 84,000-lb.-thrust (XWB-84) development engines and putting a selection of '97K' new turbine technology into the engine so we can run it as close as possible to XWB conditions," says Young. The prototype XWB-97 engine is expected to start first runs around the middle of the year, he adds.

Third Time Is Not the Charm

EU regulators likely to block another Ryanair bid to acquire Aer Lingus

Ryanair vows to bring its Aer Lingus takeover proposal to the EU court.

KEITH GASKELL

Cathy Buyck Brussels

The European Commission (EC) has indicated it will object to Ryanair's third attempt to take over rival Aer Lingus, despite the need for airline consolidation in Europe. Ryanair has offered a package to address competition concerns, but Europe's regulators doubt that would effectively mitigate the merged company's dominance on many routes serving Ireland.

Inhibiting this kind of consolidation threatens the long-term health and sustainability of the European industry, given its poor track record in recent years. Airlines in Europe are predicted to post a meager 0.6% margin in earnings before interest and taxes for 2012 and 2013, according to the International Air Transport Association.

The EC rarely blocks European airline mergers, though it did reject Ryanair's first attempt to buy Aer Lingus and the proposed combination of Olympic Air and Aegean Airlines in 2011. The commission's Directorate General for Competition is less opposed to cross-border mergers than link-ups of two airlines in the same country. It was almost 10 years before KLM was finally able to convince the EC to let it purchase 50% of Amsterdam-based cargo and leisure carrier Martinair in 2008. However, last year, British Airways was permitted to buy fellow U.K. airline BMI British Midland.

A verdict on Ryanair's proposed takeover of Aer Lingus is not expected for a couple of weeks, even though the Irish carrier has announced that the EC intends to prohibit the deal. Ryanair says it was told of the rejection at a "state of play" meeting here with the directorate on Feb. 12. The directorate is not commenting on Ryanair's statement. "The EC will take a decision at the end of February or in the beginning of March, and will formally announce its decision by the legal deadline of March 6," a spokesman tells Aviation Week.

Ryanair currently owns 30% of Aer Lingus, which carried 10.8 million passengers in 2012. Its first bid was rejected by the EC in 2007, and it withdrew a second takeover offer in 2009 after failing to win the support of the Irish government, which holds a 25% stake in Aer Lingus.

According to Europe's largest low-cost carrier, the EC's latest decision is not based on competition law but on political grounds to "meet the narrow, vested interests of the Irish government." Commenting on Ryanair's statement, Ireland's transport minister, Leo Varadkar, reiterated that the "Ryanair remedies package as reported has not satisfied the government's concerns about connectivity, competition or employment."

Conversely, Ryanair points out that the series of concessions it offered the EC "clearly addresses every issue raised in the EU's Statement of Objections" from October 2012. They go beyond anything offered in the past to win EU clearance for an airline deal and include commitments from the two carriers to eliminate all competitive overlaps between them. BA parent International Airlines Group (IAG) agreed to take over both airlines' operations at London Gatwick Airport, and U.K. operator Flybe committed to taking over 43 Aer Lingus routes.

"Given that the EU recently approved IAG's acquisition of BMI at London Heathrow on the basis of three-year commitments, the EU's claim that it could not be satisfied with IAG's and Flybe's commitments to these Irish routes after three years is another example of the EU holding Ryanair to a much higher standard than any other EU airline," Ryanair asserts. It concludes "that no matter what remedies Ryanair offered, we were not going to get a fair hearing and were going to be prohibited regardless of competition rules."

Ryanair's assessment echoes the rumors of EC lobbyists that "when Ryanair asks, the answer is 'no.'" Much to the envy of Europe's legacy carriers, the LCC has grown into Europe's largest single operator by passenger numbers, carrying 79.6 million in 2012. In Spain, Ryanair now transports more passengers than Iberia, and in Italy, it carries more than any other airline on international routes. This also does not sit well with most national governments that are still protective of their ailing flag carriers.

The Aer Lingus-Ryanair merger review is officially closed, and Ryanair can no longer alter its remedy package. The competition directorate general's conclusion will be discussed by the college of 27 commissioners (one from each EU country), which meets here once a week. This is standard practice for Phase 2 merger reviews, although the commissioners have no vote. The outcome of the review rests with the competition directorate general.

Ryanair has vowed to appeal a merger rejection in the European courts. Aer Lingus, whose management has vehemently opposed all three takeover attempts by Ryanair, restated its position that "the offer should never have been made."

Fresh Approach

IATA says streamlining should be forced on Europe's airspace blocks

Adrian Schofield Madrid

Increasing frustration at the lack of progress in reorganizing European airspace has led airlines to call for the effort to be refocused on more ambitious changes.

The International Air Transport Association—echoing many other stakeholders—says the initiative to consolidate Europe's patchwork of national airspace territories into so-called functional airspace blocks (FABs) has failed to produce the efficiency gains that were intended. This view is hardly new, but IATA has upped the ante by unveiling a proposal that would require the FABs to cut more than a third of Europe's air traffic control centers.

The airline group's latest salvo against the FAB process follows equally harsh condemnation by the European Commission. The commission is initiating legal action against states for failing to deliver FABs that meet goals established by regulation.

FABs are a key element of the Single European Sky plan, which was launched a decade ago and also includes a program to upgrade and harmonize air traffic management systems.

States were given a deadline of Dec. 4, 2012, to form the FABs, with the aim of replacing national airspaces with larger multinational blocks based on traffic flows. This would allow air traffic services to be streamlined within the FABs.

While states have coalesced into nine FABs, these are still organized around geographic borders rather than traffic flows. There has also been little action to consolidate services within the FABs. Air navigation service providers (ANSPs) generally do not have the authority needed for true cross-border reform.

The FABs were supposed to reduce cost and increase efficiency, but so far they have done neither, IATA Director General Tony Tyler said at the World ATM Congress on Feb. 12. He says there is no sign of near-term improvement, despite the efforts of the European Commission.

IATA has released a blueprint proposing a new approach for the Single Sky effort. FABs would initially be required to centralize operational management, training, procurement and support functions, which would cut unit costs by 10% and save €700 million ($941.6 million) a year. In a subsequent step, the 63 air traffic control centers in Europe would be trimmed to no more than 40, which would help save another 10% in unit costs. Other moves are geared to bringing further increases to productivity and efficiency.

As a result of its analysis, IATA found that there are "no insurmountable technical barriers" standing in the way of the Single Sky vision. "The reality is that the Single Sky is a political challenge, not a [technical] one," says Tyler. He notes that airlines are either directly or indirectly paying for a large proportion of the European ATM reform. However, IATA "cannot recommend sustaining investment in [Single Sky] if the approach is putting new technology into old [regulatory and institutional] structures."

The other major aviation industry groups, along with the European Commission and Eurocontrol, are receptive to discussing IATA's vision for the Single Sky process, Tyler says. "We don't mind if ours is not the one that is decided on, but we need a blueprint."

The European Commission also has concerns about the pace and direction of the FAB initiative. There has been a lot of work done on the institutional framework and less on reforms within the FABs, says Matthew Baldwin, the commission's director for aviation and international transport policy. "So far, the [FABs] have not lived up to their billing."

European states have formed nine functional airspace blocks, but few have rationalized services within the blocks.

It is this perceived failure that prompted commission Vice President Siim Kallas in December to criticize the states and begin infringement procedures.

Baldwin admits that some people believe this step means the commission is "writing FABs off," although he says "nothing could be further from the truth." The commission still views the FABs as "elemental to the future" of the Single Sky program, and is helping states develop FABs.

The states have not conceded that they have failed to meet the FAB requirements, so a tough fight is likely if the commission brings the legal action to the European Court of Justice. An industry source notes that even if it does proceed, there is no guarantee that the commission would prevail, as the court may decide that the states met the letter of the law, if not its spirit.

The commission is also working on a third Single Sky legislative package, to be released this spring. It is not clear what changes this will bring for FABs. However, one thing the commission wants is a measure ensuring that ANSPs are not impeded from collaborating with those in other FABs.

AVIATION WEEK
& SPACE TECHNOLOGY

ENHANCED DIGITAL EXPERIENCE

Aviation Week & Space Technology is your one powerful source of information with an even greater focus on technology, and expanded coverage that now includes Defense Technology and MRO Editions. Instant access to enhanced digital content delivered the Friday before the publication date and available on all Tablet and Smartphone devices across all mobile platforms. Stay connected and get engaged with links to deeper content and interact with editors, advertisers and community.

To Subscribe:
Contact us at 1-800-525-5003 (in the U.S.)
or at +1-515-237-3682 (outside the U.S.)
or via Email at: avwcustserv@cdsfulfillment.com

AviationWeek.com/awstdigital

All paid subscribers will receive expanded content sections in digital format. Selected subscribers will also receive either the MRO or Defense Technology section insert in their printed copy of *AW&ST*.

Warfare has always been dependent on intelligence, surveillance and reconnaissance. Good ISR is a force multiplier; a force with inferior ISR is trusting to luck. Military operations today are even more reliant on ISR and this trend will continue. The reason? Ubiquitous and more precise guided weapons shift more targets from the "easy to find, hard to kill" category (a Soviet tank army crashing through the Fulda Gap was the Cold War exemplar) into the "hard to find, easy to kill" column. Osama bin Laden typifies the last category.

What the following pages show us, however, is that ISR is as difficult as ever. One problem today is that everything about ISR is in a process of flux, a continuous interaction of new threats, new technology and field experience of how well or badly the technology meets the user's needs. At the same time, designing and building a new combination of platform and sensor can still take many years. That mismatch can be seen in the fates of some of the programs we discuss below.

Three years ago, the technologists and industry were excited about the prospect of ultra-long-endurance unmanned air vehicles. Unlike their predecessors, which used manned aircraft

Wait and See

After a boom decade for ISR, U.S. refocuses needs for Pacific scenario

Amy Butler Washington

A massive U.S. troop withdrawal from Afghanistan next year will trigger a shift in Pentagon priorities and force structure, but do not expect any major changes for the Air Force's intelligence collection fleet.

At least, not for now.

After more than a decade of feverishly pressing experimental systems —such as the Global Hawk unmanned air system (UAS), various wide-area surveillance technologies and new sensors—into service to address immediate threats, the service is taking a "wait-and-see" approach as it begins to posture for a renewed emphasis on the Pacific region.

The so-called Pacific pivot is a White House priority, and the strategy will have to deal with the thorny anti-access problem, where would-be adversaries such as Beijing possess sophisticated air defenses and cyber capabilities. This is a far cry from the challenges in Iraq and Afghanistan, where the Air Force controlled the skies and could fly UAS, airships and other craft with a relatively low risk.

The Air Force is studying a variety of options for its future intelligence, surveillance and reconnaissance (ISR) force structure. But, funding is unlikely to reflect any major shifts in the near term, says Lt. Gen. Larry James, deputy Air Force chief of staff for ISR. "We have maintained a fairly capable presence in the Pacific [and] we will obviously look at how do you do that transition," James tells Aviation Week. "The '15 budget will be the time we start to really assess and understand programmatically how do we start to make those changes [but] we don't see a lot of new starts out there."

After coming off of a round of cuts handed down by then-Defense Secretary Robert Gates, the Pentagon is now poised for another set of reductions, including the specter of a mandatory $50 billion cut over 10 years if sequestration takes effect in March. This reality, which is unlikely to change without a major move by Congress to address the national debt, is forcing Pentagon officials to take on a "do-more-with- less" mentality. This is a major change, as the wars in Iraq and Afghanistan prompted the government to pour hundreds of billions of dollars into urgent needs, such as up-armored vehicles and sensors and electronics needed to defeat improvised explosive devices (IEDs).

Against this backdrop, the Air Force is exploring what its future ISR fleet must look like. "We've become very adept and very robust at the airborne medium-altitude ISR capability in Afghanistan, but that doesn't necessarily translate into a non-permissive or contested environment very well," James says. "We have to have some mix of [Predators and Reapers] but as you look at that anti-access environment, it is all about putting all sources of intelligence together, from the space layer, airborne layer, the penetrating layer, the standoff layer, the cyber layer."

The experience in Iraq and Afghanistan has driven the Air Force to become more "sensor and platform agnostic," James says. "It is more about the data and being able to . . . fuse the data."

James was unwilling to take a position on whether the Air Force needs a dedicated penetrating ISR collection capability or a stealthy reconnaissance aircraft. The service reluctantly acknowledged the existence of the experimental RQ-170 Sentinel, a previously secret stealthy aircraft thought to carry intelligence sensors; one was lost over Iran in December 2011. However, it is unclear how many of these are in operation and whether more would be built.

The F-22 and forthcoming F-35 are capable of penetrating hostile airspace and collecting intelligence behind enemy lines with their sensor arrays. But, they are not dedicated ISR assets. Air Combat Command is studying how to pull data from these aircraft into the intelligence arena; officials are calling this "operational reconnaissance."

"We are not going to spend tremendous amounts of money to make that happen, but over time we want to gradually increase those capabilities from an ISR perspective either with [tactics, techniques and procedures] or . . . to continue to improve the technology to get the data off and into the ISR arena," James says.

F-22s and F-35s will not be used for preparing the battlefield; once an F-22 is in hostile airspace, a war has begun. So, the Air Force is also studying the

aerodynamics, materials, engines and fuels, they would use solar and hydrogen power and slender, ultralight wing structures, or would return to the age of the airship.

There have been better prophecies. Out of eight U.S. long-endurance programs, there are two survivors running on shoestring budgets. If there has been any boom in ISR platforms, it has been in the modification of commercial aircraft into sensor platforms.

Meanwhile, the U-2—which flew its first operational mission weeks after Gogi Grant's "The Wayward Wind" broke the eight-week spell at No. 1 of Elvis Presley's "Heartbreak Hotel"—is resisting the Global Hawk's 17-years-and-counting campaign to send it to Davis-Monthan AFB, Ariz.

That is not to say that there are not new and revolutionary ISR tools out there. Some are backpack-carried and hand-launched (see page 46). Others do not fly at all, like the U.K.'s geo-intelligence effort (see page 44). So far, too, they seem to represent a bigger return on investment, in terms of getting timely information to the user, than many more grandiose projects.

suitability of its current standoff ISR collection fleet in light of advancing air defense threats. Standoff assets include the Boeing 707-based Joint Stars fleet for tracking moving ground targets, the RC-135 Rivet Joint fleet that intercepts communications, and the U-2 fleet, which provides high-fidelity imagery, radar and signals intelligence capabilities, among others.

"We can do less standoff in terms of our intelligence capability," because of air defense advances, James acknowledges. Accordingly, the Air Force is looking at improved sensors for the fleet, including a bevy of options for the U-2. After the Air Force last year decided to shelve the Global Hawk Block 30 UAS, which was to eventually replace U-2, the service has begun to turn back to the high-flying workhorse as its premier standoff collection asset.

The service is looking at improving the synthetic-aperture-radar range and fidelity for the U-2 as well as the addition of more spectral bands over the six now offered today on the Senior Year Electro-Optical Reconnaissance System.

However, more exotic capabilities are potentially on the way, too. The peculiar requirement of finding IEDs and weapons facilities in Iraq and Afghanistan drove the Pentagon to press hyperspectral sensors—which collect data on hundreds of spectral bands—into early service. The art of using hyperspectral sensors is to "tune" them in on the particular spectral source you are seeking, such as a particular type of metal or a chemical plume. That translates to the development of sophisticated algorithms designed to isolate specific signatures out of the "noise" of other collected data.

"We've learned a lot over the last decade about how you can use those and how you have to tune them. . . . They can be very useful if you know what you are looking for," James says. "I think hyperspectral has a bright future. . . . There was a lot of rocket science that went into this."

Maj. Matthew Hasson, an Air Force spokesman, says, "In 2012, our detection capabilities contributed to the identification and seizure of over 600,000 pounds of homemade explosives, adversely affecting the enemy's ability to produce IEDs."

Similarly, the service pressed Lidar, or light detection and ranging technologies that use light waves to collect exact measurements of a target, into service. "We didn't necessarily have a lot of good maps" in the early days in Afghanistan, James says. "They give you a good mapping capability. They give you broad looks with very accurate—down to centimeter level—accuracies from a mapping perspective. Now the question is how do you translate that to a more contested environment, giving them potentially increased range so that you can do standoff."

Though these capabilities show promise, the service has not yet assessed whether it will "normalize" them in the fleet or make them a regularly funded program with

Tap here in the tablet edition of *AW&ST* for more information on Pentagon ISR spending and oversight of assets, or go to AviationWeek.com/isr

U.S. AIR FORCE

USAF plans to add four more collection bands to the U-2's spectral sensor, one of several upgrades as the aircraft will see frequent future use.

proper support and maintenance for enduring operations. With the funding crunch, the only option may be to simply keep flying the experimental systems.

NORTHROP GRUMMAN/ALAN RADECKI

"We need to let these kind of play out over the next couple of years in terms of their capability and their capacity and what they bring to the fight and then start to do the assessment in '15 to see what becomes a program of record," James says.

Wide-area surveillance technology also benefitted greatly from the demands of commanders in Iraq and Afghanistan. The services fielded such systems as Constant Hawk and Blue Devil, and the Air Force is now developing the Gorgon Stare system for use on the Reaper UAS. Though these systems, which collect video with a wide field of view, must necessarily fly over a target for a "synoptic" view, James says the technology will move forward even as the Air Force postures for anti-access activities.

James was less committal on "normalizing" the Operationally Responsive Space (ORS)-1 satellite capability, in which a single spacecraft is quickly deployed to field U-2 electro-optical systems from space. ORS-1 was designed to feed information directly to ground commanders in U.S. Central Command, bypassing the often time-consuming stateside intelligence apparatus. Though officials will not confirm its mission, ORS-1 is capable of collecting imagery inside Iran, Syria and other hot spots in the region. James says the one-of-a-kind satellite has been "very successful," exceeding its design life for continued operations, but there are no plans to build a follow-on. "I think this is part of the menu of things that you want to have available," he says.

USAF is planning to shelve the Global Hawk Block 30 in favor of continued U-2 operations.

Air Force officials will begin early work on the fiscal 2015 budget late this year, with formal activities going into full swing next summer.

Going Nowhere Slowly

Long-endurance platforms stumped by challenges

Bill Sweetman and Graham Warwick Washington

BOEING

Boeing's Phantom Eye was damaged on landing during its first flight in June 2012.

Last June, Boeing's Phantom Eye unmanned air vehicle lifted off its takeoff trolley at Edwards AFB, Calif., under the power of two modified Ford automotive engines burning hydrogen fuel. After a first flight, the UAV returned to a lake-bed landing using a lightweight skid under its belly. Its landing skid dug into the landing surface and the UAV was damaged. It is now being prepared for a second flight attempt.

The mishap followed the April 2011 loss at Edwards of AeroVironment's Global Observer, also hydrogen-powered but using a single generator serving eight electrically powered propellers. A second demonstrator had been nearly completed, but funding for further tests had run out.

First-flight blues likewise afflicted Lockheed Martin's High-Altitude Long Endurance Demonstrator (HALE-D), a prototype for a solar-powered high-altitude airship. Its inaugural sortie from Akron, Ohio, in June 2011 ended up with the limp envelope tangled in Pennsylvania treetops, 3 hr. into a planned two-week mission.

As recently as 2010, the U.S. was funding eight ultra-long-endurance UAV projects through flight-testing and, in many cases, operational evaluation. Two have been canceled outright, two have no funding, two have been cut back to technology demonstrations and two more survive on minimal money.

The Phantom Eye demonstrator, built using company funds, performed a 40-kt taxi test Feb. 6 in preparation for another flight attempt "later this year." The trolley and skid landing gear have been modified. One timing issue, Boeing says, is the variability of conditions at Edwards, particularly for lake-bed operations, and pressure on the flight schedule there, where major U.S. Air Force programs take precedence over an experimental program.

Tap here in the tablet edition of *AW&ST* for more on U.S. aerostat and airship efforts and funding, or go to **AviationWeek.com/isr**

Even though the demonstrator has a 150-ft. wingspan, it is not considered large enough for operational use: The baseline operational vehicle discussed before the accident would have spanned 250 ft. and carried twice as much fuel, offering a 10-day endurance with a 1,000-2,000-lb. payload, and the company had talked about a 350-ft.-span monster with a payload up to 10,000 lb.

Distantly related to Phantom Eye is Aurora Flight Sciences' Orion. Aurora was a subcontractor to Boeing and the aerodynamic and structural designs are similar. However, Orion has an entirely conventional propulsion system—two commercial Austro diesel engines that, like its flight-control system, it shares with Aurora's Centaur optionally piloted vehicle. Unlike most ultra-long-endurance types, it is designed to operate at medium altitude, and it was funded under a Joint Capabilities Technology Demonstration (JCTD) program as a carrier for the Gorgon Stare wide area surveillance system. The vehicle was completed but had not flown before funding was exhausted, and the USAF has asked the contractor not to talk about it.

AeroVironment's Global Observer was being developed as a JCTD, funded by no fewer than six U.S. government agencies, and was to fly with the Air Force's Joint Aerial Layer Network (JALN) payload, designed to allow multiple tactical communications systems to talk to one another and connect to distant command centers. AeroVironment says it is still talking to its customers.

The U.K.'s solar-powered Qinetiq Zephyr was developed through a series of larger and more ambitious prototypes, and set a number of flight-endurance records in 2010—including a 336-hr. flight—after which nothing more was announced publicly. Qinetiq says it has no further progress or plans to report.

A much more ambitious solar-electric program, the Defense Advanced Research Projects Agency's (Darpa) Vulture, was cut back last April from a flight demonstration to research into critical technologies, 18 months after an $89 million contract award to a Boeing team. Vulture was designed to demonstrate a five-year operational endurance: one of the original competitors envisaged a vehicle that would be carried to altitude by an aerostat and recovered by parachute after a single mission, with its components being recycled as possible. However, the program is now focusing on solar-cell materials and fuel-cell technology.

Lighter-than-air craft have been faring no better, as contractors fail to deliver on their promises because of technical problems, schedule delays and cost overruns.

Of four Pentagon programs launched to develop and demonstrate long-endurance surveillance airships, one has crashed, one has been terminated, one scaled back substantially and one survives on only a trickle of funding.

All have come to grief in the process of developing the air vehicle itself.

The first of the four airship programs to spring a leak was HALE-D, begun by the Missile Defense Agency in 2003 and taken over by Army Space & Missile Defense Command (SMDC) in 2008. At 232 ft. long, HALE-D was a subscale demonstrator for an unmanned airship designed to stay aloft at 65,000 ft. for more than 30 days. But after the prototype's crash, there was no more money, and the program ended.

Another stratospheric airship brought down to Earth is Darpa's Integrated Sensor Is Structure (ISIS), an ambitious program to integrate a dual-band active-array radar into a 1,000-ft.-long solar-electric airship capable of staying aloft for 10 years, tracking hundreds of air and ground targets from 70,000 ft. Started in 2004, ISIS encountered problems with the radar array and regenerative power system, and plans for Lockheed Martin to build a 510-ft.-long demonstrator capable of flying for a year were put on hold. For now, the program is focusing on radar and airship risk-reduction while Darpa reassesses the plan with the Air Force, says the Government Accountability Office (GAO).

NORTHROP GRUMMAN

Next to be punctured was the Air Force's Blue Devil 2 program, launched in 2010 to meet an urgent requirement to provide persistent multisensor surveillance in Afghanistan. The goal was to take a commercial airship, make it unmanned and install multiple video, radar and signals-intelligence sensors, communications links and onboard processing to create an ISR "fusion node." The 370-ft.-long Blue Devil 2 was intended to fly for up to four days at 20,000 ft. with a payload up to 2,500 lb.

The Air Force set an aggressive schedule and awarded the integration contract to virtually unknown Mav6. Then the problems began. Based on a TCOM Polar 1000 airship, the program had problems with the envelope, overweight tail fins that failed structural testing, and flight-control software that did not scale up from a smaller version of the craft. The Air Force canceled Blue Devil 2 in June 2012, before the airship could fly, to avoid further delays and increasing costs, says the GAO.

Not yet canceled but cut back is the U.S. Army's Long-Endurance Multi-intelligence Vehicle (LEMV) program, also launched in 2010 to meet surveillance needs in Afghanistan. The system was based on promising but unproven hybrid airship technology. This combines buoyant, aerodynamic and propulsive lift for greater payload and endurance and easier ground-handling.

With Northrop Grumman as the integrator and the U.K.'s Hybrid Air Vehicles as airframe supplier, the 302-ft.-long LEMV is designed to fly for up to 21 days at 20,000 ft. carrying a 2,500-lb. payload. But the first airship is 12,000 lb. overweight, says the GAO, reducing its endurance and altitude capability to 16 days at 16,000 ft. Development was supposed to be completed in December 2011, but the LEMV did not fly until August 2012—and has yet to fly again.

Work continues but funding has been sliced. The core LEMV team is waiting while Army leadership debates where to spend money as the defense budget is cut. Even if funding is forthcoming, both manned and unmanned flight-testing has yet to be done and deployment looks unlikely without demand for Afghan operations.

And therein lies a cause of the halting progress of ultra-long-endurance UAVs: a lack of strong, consistent customer support. To a great degree, this is because user requirements for ISR and other functions have evolved in directions that make ultra-long-endurance platforms less attractive.

In the last half decade, many ISR users have called for sensor suites that provide situational awareness rather than just a video image of a small spot on the ground. One approach is to use electro-optical (EO) wide-area surveillance systems such as the U.S. Gorgon Stare and Vigilant Stare, and Israeli equivalents, and the other is multisensor, multisource integration using radar, communications-intelligence sensors and databases.

Wide-aperture EO systems need to operate at low-to-medium altitudes; radar requires rapidly increasing power with altitude and range; and multisensor systems add weight and drag, to which ultra-long-endurance vehicles are sensitive. Operators are looking for affordable, reliable medium-altitude sensor trucks. Most UAV procurement and export activity today is centered on the class of the GA-ASI Predator, IAI Heron and Elbit Hermes 900.

The largest hybrid airship built so far, Northrop Grumman's LEMV has made only one flight.

There are some missions for which high altitude, long range and endurance may be valuable even with a small payload, including communications relay (one target mission for both Global Observer and Zephyr) and carrying an EO sensor for ballistic missile defense operations (which involves forward operations close to launch sites). Both could be important for the USAF/Navy Air-Sea Battle concept, but those planners have higher funding priorities.

Finally, it was revealed last year that Sandia and Northrop Grumman had completed studies of a UAV propulsion system that would offer longer endurance and lower operating cost than with hydrogen or hydrocarbon fuel. According to an earlier study for the Pentagon's Office of Net Assessments, Sandia said its development "would not be an R&D project, but rather an engineering development effort that could culminate in a flight test within a decade." However, the project was terminated (and practically buried) because its power source would be a nuclear reactor.

Sensing Needs

Darpa pushes sensor and comms technology for future ISR

Graham Warwick Washington

For an idea of where intelligence, surveillance and reconnaissance could be headed in the future, a good place to start is the U.S. Defense Advanced Research Projects Agency (Darpa), which prides itself in looking well beyond even the most far-sighted of its service customers.

Just a few years ago, there would have been several airborne platforms on the agency's list of programs, aiming for breakthroughs in long endurance, stratospheric altitude, rapid deployment or miniaturization. Today, the program list is populated with advanced sensors, communications links, space systems and tools for analyzing vast quantities of collected data.

Darpa programs often seem to lead nowhere, quietly fading from view after the initial splash. But frequently the technologies pioneered resurface several years later in operational systems, and the research targets of the agency that enabled breakthroughs in unmanned aircraft, wide-area surveillance and synthetic-aperture radar are a hint of things to come.

Electro-optical/infrared (EO/IR) full-motion video has become a primary product of ISR, but has limitations in resolution, field of view (FOV) and performance in weather that Darpa is tackling across several programs.

Synthetic-aperture radar can see through clouds and dust, but existing systems cannot generate ground images fast enough to target individuals and vehicles on the move. Darpa has launched the Video Synthetic Aperture Radar (ViSAR) program to develop a millimeter-wave imaging sensor capable of at least 5 frames per sec.

Operating in the extremely high-frequency band at 231.5-235 GHz, the ViSAR is to be small enough to fit inside a 15- or 20-in. EO/IR sensor gimbal, allowing use of real estate already carved out on existing platforms. The target for flight-test and transition to initial operational use is the U.S. Air Force's Lockheed Martin AC-130J gunship.

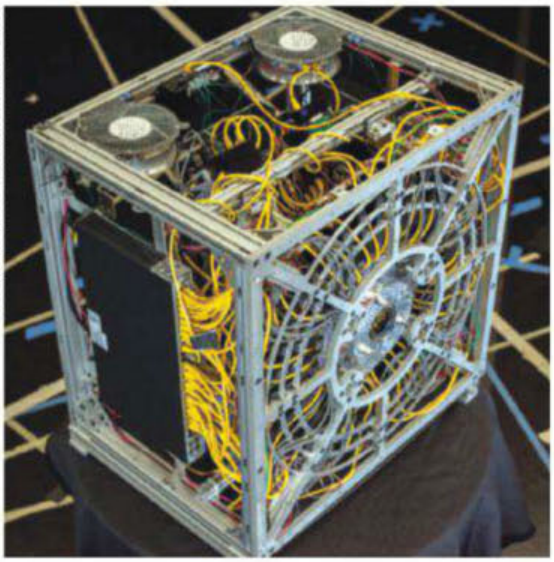
The Military Imaging and Surveillance Technology (MIST) program, meanwhile, is investigating "a fundamentally new optical ISR capability that can provide high-resolution 3-D images" to locate and identify targets at much longer ranges, says Darpa. Techniques being explored include multistatic laser radar, synthetic-aperture imaging via distributed sensors and computational imaging.

With the goal of enabling wide-angle, high-resolution, multiband imaging of an entire landscape, the Advanced Wide FOV Architectures for Image Reconstruction and Exploitation (Aware) program is developing a new class of "gigapixel" sensor by combining hundreds of individually controlled megapixel microcameras.

With a resolution approaching 1.5 gigapixels, and FOV of 120-deg. horizontally, the initial, bulky Aware-2 sensor has up to 150 microcameras packed around a hemispherical objective lens. The next target is to boost resolution to 20 gigapixels while dramatically reducing size and weight. Darpa's ultimate goal is a 30-gigapixel sensor.

The Adaptive Focal Plane Array (AFPA) project aims to develop what the agency calls "multispectral imaging on a chip"—an electro-optical sensor that is electronically tunable, pixel-by-pixel, across short- , mid- and long-wave IR to help find stationary targets in cluttered environments.

AFPA will have the characteristics of both hyperspectral and IR sensors without the weight of the former and poor signal-to-clutter performance of the latter. An active filtering mechanism at each pixel will allow the sensor to be reconfigured in real time for either spectral coverage or spatial resolution.



DEFENSE ADVANCED RESEARCH PROJECTS AGENCY

Darpa and Duke University's Aware-2 prototype has almost 1.5-gigapixel resolution, but fills a box 0.75 meters square.

While pursuing these highly specialized sensors, Darpa also is looking to tap into commercial "smartphone" technology to enable the rapid development of low-cost distributed systems. The goal of the Adaptable Sensor System (Adapt) program is to demonstrate that a new system can be developed and delivered within 12 months using core hardware and software adapted from commercial manufacturing.

The trend toward higher resolutions, wider fields of view and networked sensor systems will place severe strains on existing data links, so Darpa has launched the "100G" program to develop a 100-Gbps radio-frequency (RF) backbone to connect ISR platforms. The system would provide the capacity of a fiber-optic cable over a radio link.

Darpa has already demonstrated a 100 Gbps free-space optical (FSO) link that would enable aircraft operating above the weather to exchange data via laser beam, but this would not work through clouds when talking to the ground or other aircraft at lower altitude. As an interim step, the agency has tested and transitioned a hybrid FSO/RF network combining 10 Gbps laser and 274 Mbps radio links.

The 100G program aims to develop a millimeter-wave data link using high-order modulation and spatial multiplexing—separate and independent data streams between multiple, distributed transmitters and receivers—to provide air-to-air and air-to-ground communications out to 100 km (62 mi.) at a capacity equivalent to fiber optics. Darpa plans to flight-test a prototype weighing less than 200 lb.

Tap here in the tablet edition of *AW&ST* to see a map of major U.S. Air Force, Army and Navy unmanned air system training sites, or go to **AviationWeek.com/isr**

ISR On The Map

Geospatial backbone for intel is U.K. goal

Angus Batey London

Turning raw information into useful intelligence for commanders and operators is one of the biggest challenges in intelligence, surveillance, target acquisition and reconnaissance (Istar). The process involves managing the collected data and fusing it into comprehensive products, which has become more complex as better sensors gather more information and new sources are exploited.

British military Istar organizations appear to be attempting to solve this problem by building their operations around a geospatial intelligence (GeoInt) backbone. This means that actions and decisions at all levels—from drafting doctrinal documents to organizing and basing the force—are centered on delivering products that have a place on a single digital map.

In a series of presentations to the Defense Geospatial Intelligence conference here last month, key figures in the U.K. military's Istar and GeoInt communities explained how the country intends to deliver a geocentric intelligence capability over the coming years. Key drivers appear to have been the successful deployment of the pioneering Dataman system to Afghanistan; lessons learned from the relative paucity of GeoInt during the 2011 Libya operation; and the growing need to make coherent, fused sense of the ever-expanding range of data being collected. That has expanded to include sources as varied as aerial sensors and satellites, signals intelligence equipment, human assets and open public sources such as social media and news outlets.

"GeoInt is a really useful baseplate to lay your operational and intelligence data on," says Air Vice Marshal Jon Rigby, director of cyber, intelligence and information integration at the British military's newly established Joint Forces Command. (It was created in response to Lord Levene's defense reform report of June 2011.) "I think if you look back six years, I2 [information integration] analysts then thought linking people together was important, and of course that still remains important. But layering that onto a GeoInt baseline lends people a vision—it helps people to understand what on Earth is going on. Whether it's operational data—layering a red, white and blue picture so that you actually get an understanding of the consequences of your activity—or whether it's an intelligence fusion to see how sigint [signals intelligence] relates to GeoInt, it all starts with GeoInt."

CROWN COPYRIGHT/LEADING AIRMAN GUY POOL

GeoInt teams on board HMS Ocean backed Apache missions during the 2011 Libya conflict.

The Dataman system has taken GeoInt out of the realm of a small cadre of specialists and put it in the hands of users at all levels of the command chain. Personnel can access the Dataman servers on laptops from forward locations, and use a map-based interface to call up intelligence relevant to their mission, which is displayed on the map in a series of user-defined layers.

For example, a logistician planning a resupply convoy can check for recent insurgent activity along the proposed route, assess sets of aerial surveillance imagery to identify areas of recently disturbed ground that could show where bombs are buried, gauge from news reports on local incidents or posts on social media whether certain restive areas were best avoided, or be able to tell whether the route crosses from one tribal district to another. Forward-deployed operators only call on the data they request, rather than having to wait for the entire database to update and download, which makes it possible to deliver relevant intelligence quickly to austere and bandwidth-constrained locations.

"What we've been doing in Afghanistan is using these very important skills to fill the gap in our understanding that—partly out of hubris—saw us going into situations that we frankly did not completely understand to the degree and granularity that we need to make a success of this campaign," acknowledges Gen. Sir Peter Wall, the chief of the general staff.

Afghanistan, Wall explains, "is not a modern society in Western parlance, but it is a very sophisticated and complex society when you get into tribal dynamics. And I think that with that understanding—of which geo-activity has been a very significant part—we have learned the hard way to be more circumspect and a little bit more humble. But it has created a dependency on the same sort of clarity of data and analysis the next time we go on operations. And that's any time now."

"As we go from something that is relatively well-defined in Herrick" (the British code name for Afghan operations), Rigby says, "into something

where we really don't know what's going to happen tomorrow—and Mali's a prime example of that scenario—then GeoInt's ability to get us into that space is absolutely key. But having come from a rich environment in Afghanistan and Iraq, and having top-end services, we found ourselves in the Libya operation less well-placed to do GeoInt. As we roll forward to the end of Op Herrick, and into the contingency era, there are far more lessons to be learned from Libya than there are from anything else."

The main problems moving GeoInt around the Libya battlespace were "bandwidth, networks, [and] connectivity," according to Lt. Col. Neil Marks, chief geospatial officer at NATO's joint force command in Naples, Italy, during the operation. "Passage of information and data certainly took place, but it was often quite difficult."

"As the operation progressed, information came in from a range of sensors, and was put together as a package further up the chain of command," explains Col. Mark Burrows, commander of the British military's Joint Aeronautical and Geospatial Organization, describing the part played by GeoInt officers supporting Apache helicopter operations on board HMS Ocean during the Libya mission.

"Again, the limiting factor on board [the] ship was bandwidth. They used to get a feed at a certain time, and they made sure that was just before dawn, when the helicopters went up; or, conversely, if it was a night flight, they got the latest picture as of the evening."

This experience will be key in helping define the requirement for the British military GeoInt-centric Istar backbone of the future. The bar has been set high, both in Afghanistan and in the key role military GeoInt played in delivering the Olympic security operation in the U.K. last year, so the next generation of GeoInt support has to provide unprecedented capability.

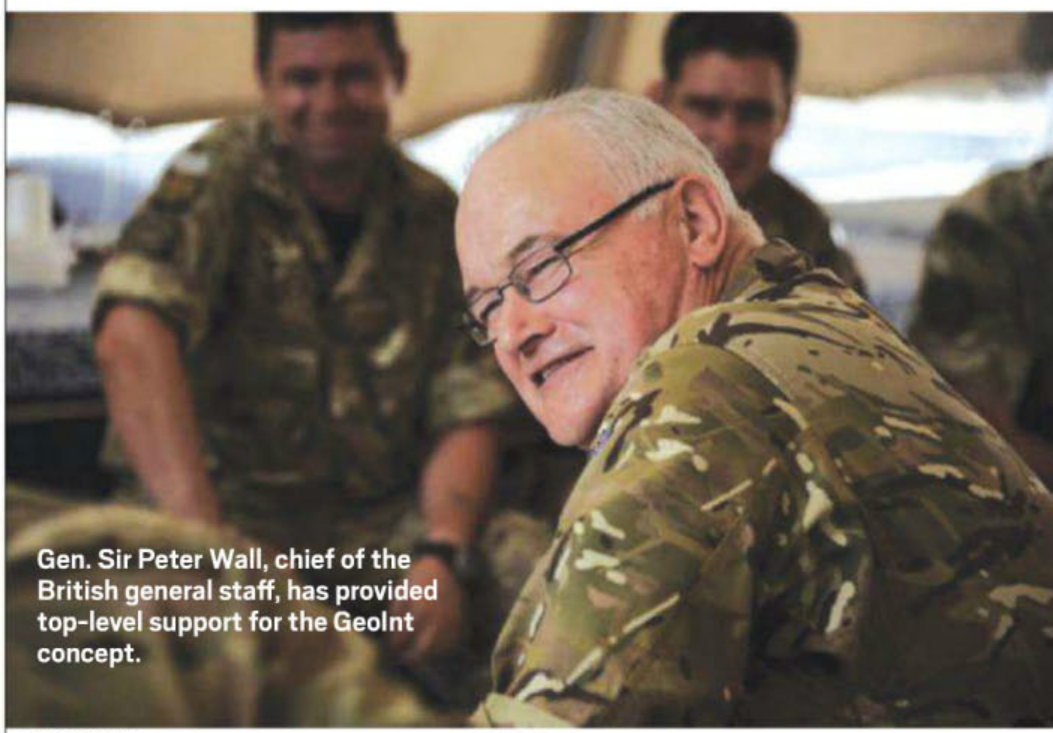
"There is now an expectation that we can deliver this sort of sophistication," says Wall. "In our next contingency deployment we are not going to be in the sort of space where we've got guaranteed reliable power, a solid and stable network, and hot and cold running bandwidth. You just cannot deliver, during the early days of a campaign—which of course is the most critical [stage] for understanding and planning and analysis—the sort of sophistication you can plumb in over a period of years. So one of the challenges is how now to service this appetite that's growing. We've set a new expectation: people are not going to readily dismiss that opportunity just because we're in the early days of a campaign rather than at a mature point."

The solution the defense ministry is pursuing is the establishment of a U.K. Spatial Data Infrastructure (SDI) system. "Fundamentally, an SDI is a framework that provides a basis to ensure that what's being done is consistent across the enterprise," explains Colin Gorton, desk officer for the defense ministry's Joint GeoInt SDI program. Key elements of the SDI include mandating interoperable open standards, to enable data types to be used across defense, an education and training program, and a legal and policy framework. "The main challenge I see for myself and others in my area is to ensure that all those engaged in production and procurement are policy-compliant," Gorton adds. "This isn't fighting a battle; it's a lifetime's work, I suspect."

The SDI, and the GeoInt "spine" to Istar, will do more than guide operations in the physical realm. Dataman has shown how intangible intelligence products, such as signals intelligence or human geography analysis, can be layered onto map-based services to better inform combat forces. GeoInt can augment cyberdefense and cybersecurity in many ways, even if models of cyber as a domain seem to emphasize its separation from air, land, sea and space.

"Geography still matters to us," says David Ferbrache, the ministry's head of cyberspace policy and plans, "because ultimately cyber is supported by physical devices, physical networks, physical connections. So I care about submarine and terrestrial cable routes, although they're often difficult to map exactly. Those cables run through a number of chokepoints, and they get damaged quite frequently; they're very vulnerable. Internet exchanges and major telephone links [show] there is a lot of critical infrastructure underneath the Internet which is important to understand, to map and to know about. And satellite ground stations are another vulnerability in the global information infrastructure."

The future, as far as the U.K. is concerned, is geo-enabled. "I think that the role of geospatial activity will be cast in ever-sharper relief," said Wall. "There is going to be a need to contain the inexorable, exponential rise in appetite for bandwidth, but this is a fundamental capability, it's not a niche specialization which is optional. And it's one where U.K., in a cross-government, multiagency context, has to be a field leader and a first-division player on the global scene."



Gen. Sir Peter Wall, chief of the British general staff, has provided top-level support for the GeoInt concept.

CROWN COPYRIGHT

Dodging the Ax

TONY OSBORNE/AW&ST

Raytheon's Cold War-era Sentinel R1 is now Europe's only specialized airborne ground-surveillance radar system.

RAF's Sentinel fights for its future

Tony Osborne London

With insurgent-hunting missions in Mali underway, the U.K.'s Sentinel radar reconnaissance aircraft might be making friends in high places, but it still remains on the chopping block after 2015.

Three weeks into the deployment, the single Sentinel R1 operating out of Dakar, Senegal, has been flying a series of missions that has helped to counter threats from improvised explosive devices and indirect fire from the Al-Qaeda-linked rebels retreating into the desert from the rapidly advancing French and Malian government forces.

But under the coalition government's Strategic Defense and Security Review of 2010, the Sentinel's Airborne Stand-Off ground surveillance Radar (Astor)—carried on a highly modified Global Express business jet and considered to be a high-priority program in the 1980s and '90s—will be scrapped. Officials are studying options to retain the aircraft, but its replacement is a so-far-undefined unmanned platform, to be acquired via the Scavenger program.

The venerable Sentinal has demonstrated a capability that has been unique in Europe since the retirement of the French helicopter-borne Horizon system. Indeed it won't be until 2017, when NATO finally takes delivery of its Alliance Ground Surveillance system based on the RQ-4 Global Hawk, that Europe will have an alternate means to perform this increasingly important role.

Operations over Afghanistan and later Libya showed the Sentinel was able to seek out fleeting targets and speed up engagement times for coalition aircraft. Personnel of 5(AC) Sqdn.—the unit flying Sentinel—are optimistic that, with this background, the system could be given a reprieve.

Close-Up View

Israel adapts small UAVs for big missions

David Eshel Tel Aviv

Hand-launched, electrically powered small unmanned air vehicles (SUAV) are usually attached to small formations and in special operations units. However, the Israel Defense Forces (IDF) Ground Forces Command (GFC) has been looking at their use at division level, as sensor performance and networking technology improve.

The IDF originally assigned SUAVs to artillery formations that required deep vision for target acquisition and fire direction. The service wanted its Sky Rider SUAV teams (as the IDF calls Skylark) to deploy with forward elements, including dismounted units, yet provide the high-quality imagery they were accustomed to seeing from much larger UAVs.

To meet these requirements, Controp Precision Systems developed a miniature payload later known as Stamp, while Elbit Systems was selected to provide the Skylark vehicle. The Stamp payload was designed to be highly stable and accurate in pointing, and was to be automated so that the user could operate the payload independently of the platform's heading or attitude. It shares operating modes used by larger systems, including inertial target tracking and the ability to point to a coordinate or hold it in sight.

The current IDF version, Skylark 1LE, is configured to carry 1.1-kg (2.4-lb.) payloads and the data link has a built-in relay capability so that a second Skylark can be used to provide non-line-of-sight (NLOS) communication.

The IDF uses Sky Rider at the battalion level. The video is delivered directly to the battalion tactical operations command or to an advanced command party via remote video terminals. Since its first deployment, Sky Rider has done much more than support artillery fires. One of the capabilities that surprised designers and users alike was the system's effectiveness in bad weather. The small drone worked well under the cloudbase and in rain. Cloud cover prevents other drones from using electro-optical payloads, but the smaller drone flying below the clouds can still gather high-quality imagery. It also could be launched and recovered in rain and gusty winds that would prevent other drones from landing.

The GFC is evaluating a new rail launcher and a more accurate landing system to reduce losses and to further improve its ability to operate under limiting weather conditions.

One recognized need is to remove limitations associated with the narrow field of view that current payloads provide, according to Maj. Menachem Landau, Sky Rider project manager in the aeronautics division of the Directorate of Defense Research & Development. The high performance of the Stamp camera provided detailed target imagery, but the "soda straw" view militates against situational awareness (SA), especially for untrained users. The current payload and ground station can use capabilities such as mosaic and tiling to help with SA, but further improvements could include staring cameras to provide a constant, wider field of view. In the longer term, radar-based sensors could also be used.

Future enhancements could include means for target ac-

They point out that if funded, the aircraft could provide a low-risk, cost-effective alternative to buying the same capabilities on another manned aircraft or a UAV, operations of which are still strictly limited in U.K. airspace.

Media coverage about the overwater capabilities of the Astor may have hindered the argument when claims emerged that the radar was only effective up to Sea State 1. Raytheon and Royal Air Force (RAF) officials aver, saying that the capability is better and can be further improved to the point where the radar could detect submarine periscopes over a wide search area. But there are still some in the air force who view the Sentinel as a "one-trick pony," too specialized to justify its cost.

In its decade-long equipment plan, revealed in late January, the defense ministry has set aside £8 billion ($12.5 billion) for priorities that have yet to be decided. This could be a road to a reprieve for Sentinel, but that list is likely to be quite long, particularly if commanders decide they want to keep several items—such as the MQ-9 Reaper—purchased through the urgent operational requirements system during the conflicts in Iraq and Afghanistan.

More secure is the ongoing program to acquire a trio of Boeing RC-135W Rivet Joint signals-intelligence aircraft under Project Airseeker. The first aircraft, converted from a KC-135R, is now in the final stages of its conversion by L-3 Communications at Greenville, Texas, and is due to roll out later this year. According to the Defense Equipment and Support agency (DE&S), the RAF will declare initial operating capability with a single Airseeker in October 2014. Aircraft will be delivered every two years, with full operating capability expected in December 2017.

RAF crews have been training on the aircraft with their counterparts from the U.S. Air Force's 55th Wing, based at Offutt AFB, Neb. The Airseeker will be more specialized than its predecessor, the Nimrod R1. The latter handled the electronic-intelligence (elint) role, gathering intelligence on radar signals, while Airseeker places significantly more emphasis on communications intelligence (comint) with just three operators working the elint systems.

Purchasing Airseeker will bring the U.K. and U.S.'s airborne intelligence gathering into closer harmony than ever before. Like USAF Rivet Joints, the British aircraft will undergo updates every few years to receive the latest baseline of equipment. According to DE&S, the first aircraft will be fitted with baseline 10.2, while the second and third will feature baselines 11 and 12, respectively.

With a hand in the program, the British will also have a say in the development of future upgrades and baselines. Work is underway to update the RAF Waddington, England, site, where the U.K.'s Airseekers will be based. New combined operations, training and engineering facilities, along with equipment, are being built or refurbished.

The biggest hurdle for Airseeker will be to pass the Military Aviation Authority certification process, which aims to match European Aviation Safety Agency Part 21 standards for design and airworthiness—something that could be a challenge in the case of a U.S. military design that will be 60 years old at full operational capability.

quisition, supporting rapid "sensor-to-shooter" for artillery and precision-guided weapons, the Skylark's original mission. Today, the UAS can spot artillery impacts by monitoring the target zone. With higher position and pointing accuracy, the drone will be able to provide artillery fire corrections.

All these capabilities would require platforms carrying heavier payloads. One approach to that need is Skylark 1LE Block 10 (marketed in the U.S. as Block II). This drone is designed to carry a maximum payload of 1.6 kg with a mission range of 20 km (12.4 mi), extendable to 40 km using a directional ground segment, and with NLOS relay integrated into the avionics. Mission endurance will be supported by keeping several drones airborne simultaneously, using a "hot-swap" technique to maintain continuous coverage of the area.

Controp already offers the dual-band M-Stamp with continuous-zoom daylight and infrared sensors—and a laser pointer. The IDF plan would also consider an embedded target tracker and integral communications-intelligence sensors.

Recent upgrades integrate Sky Rider into the army-wide Digital Army Program (DAP), making the video, images and metadata obtained by the drones readily available to any user connected to the army C4I system. According to Lt. Col. Uri Gonen, Sky Rider battalion commander, integration with DAP will allow higher-level commanders to pinpoint the UAS location on their screens and determine the area it is observing.

Gonen is confident his unit could come up with a Sky Rider-based solution for the brigade in 18 months. The drone Gonen calls Sky Galloper will be about 1.5 the size of the current Skylark in the weight class, and the size of Skylark 1LE Block 10.

Elbit Systems does not share Gonen's enthusiasm and considers a Skylark-based brigade UAS a Band-Aid solution. In fact, a larger version—Skylark II—has already been tested and rejected by the IDF. The company recommends using a much bigger and more capable platform.

Elbit favors the Hermes 90, improved and refined after it failed to win the U.S. Marine Corps Stuas II competition. With a takeoff weight of 115 kg, the Hermes 90 would carry bigger payloads—laser designation, communications-intelligence and wide-area sensors, for example—on 15-hr. missions.

ELBIT

More sophisticated than many hand-launched small UAVs, Skylark can be integrated into the IDF's digital army system, all the way down to handheld video displays.

Clearing the Deck

Canberra needs to attend to air force requirements before focusing on the navy's

Bradley Perrett Beijing

Australian defense procurement is in a strongly aviation-centered phase. In the next few years, the government is due to approve acquisitions of around 60 combat aircraft, a fleet of maritime surveillance drones and complementary force of manned patrol aircraft.

Apart from having to replace old aircraft that are wearing out, the government needs to clear the deck of air force requirements before turning its budgetary attention next decade to the navy, whose forthcoming submarine program could cost more than even the reequipping of the fighter force. The navy will want to begin replacing its frigates next decade, too.

The order of battle of the Royal Australian Air Force (RAAF) for the next few decades should be largely set by 2018. To some extent it is already set. The main questions are whether Australia buys more Boeing F/A-18E/F Super Hornets at the expense of some Lockheed Martin F-35A Lightnings, and which pilotless aircraft it chooses for maritime surveillance. Those questions will be a focus at the Australian International Airshow to be held near Melbourne Feb. 26-March 1.

The air force has lost its campaign to consolidate its air combat force on a single type, the F-35A. That was the plan from 2002 until December of last year, when Defense Minister Stephen Smith announced what by then was widely expected: Australia would keep the 24 F/A-18Fs it had decided in 2006 to order as a stop-gap. Smith's move probably became inevitable when the government decided four months earlier to have 12 of the Boeing fighters fitted as EA-18G Growler electronic-attack aircraft. Since there is no electronic-attack version of the F-35, consolidating on the Lockheed Martin fighter would have meant losing a newly acquired and valuable capability.

The decision six years ago to buy the first batch of Super Hornets reflected Canberra's worries that the F-35 would not get into Australian service in 2013, as then planned, leaving a gap in capability. The Australians were right to worry. Initial operational capability for their F-35s is now seen between mid-2019 and mid-2023, a notably imprecise interval for an aircraft that is urgently needed.

Since the aircraft that the F-35s are to replace, F/A-18A/B Hornets built in the 1980s, will run out of life around 2020, any further delays in the Joint Strike Fighter program would leave Australia with far less than a full fighter force for awhile. So the government has asked the U.S. for the price of 24 more Super Hornets, with a view to deciding this year whether to buy them.

Australia is already committed to buying 14 F-35As. The next batch, if there is no further Super Hornet order, should amount to at least 58 aircraft at a cost the defense department puts no more precisely than "more than A$10 billion" ($10.3 billion). The decision is due between mid-2014 and mid-2016 and would take the fighter force to at least 96 aircraft, meeting the long-stated total requirement for about 100.

If 24 more Super Hornets are bought, then the Lightning order will presumably fall by a corresponding number. It could also be somewhat delayed. Rapid delivery of more Super Hornets and intensive use of them in training would allow Australia to fly its Hornets less, thereby stretching out their lives, and relieving pressure to get F-35s into service sooner. Moreover, the air force might not be inordinately bothered if heavy use of Super Hornets over the next decade reduces the life of those units fitted for air combat instead of electronic attack. The sooner they wear out, the sooner it could ask for their replacement by more F-35s.

Adapting some of Australia's existing Super Hornets to Growler configuration would cost A$1-2 billion, the department says. But the electronic-attack aircraft could instead be delivered new as part of the second Super Hornet batch, if there is one, says analyst Andrew Davies of the Australian Strategic Policy Institute. Australia wants Growlers initially operational between mid-2018 and mid-2020.

Unlike other air forces of its size, the RAAF has never managed to consolidate on a single type of combat jet. Alongside its fighters, it flew Canberra light bombers from the 1950s, and then F-111 strike aircraft from the 1970s until 2010. The F-35 offered it a chance finally to simplify maintenance and training—until that type's chances were spoiled by its lateness and the availability of electronic attack in a competing aircraft. So Lockheed Martin has at least lost its immediate opportunity to fill all of Australia's requirements. But if the F-35 stays in production long enough, it might yet replace the Super Hornets in the 2020s or 2030s. Australia's geography may make the internal fuel volume of the U.S. Navy's catapult-launch version, the F-35C, particularly attractive.

While hoping for homogeneity in

Australia has 24 Super Hornets. Its next aircraft procurement decision is whether to order 24 more.

ROYAL AUSTRALIAN AIR FORCE

its fighter force, the air force wants to follow the U.S. Navy into mixing two types, one manned and one unmanned, in maritime patrol, antisubmarine and anti-shipping operations. Australia selected one of the two types in the U.S. Navy's Broad Area Maritime Surveillance (BAMS) program, the manned Boeing P-8 Poseidon, in 2007, but the country has not yet chosen its drone. The requirement for a "high-altitude, long-endurance" drone points clearly to the Northrop Grumman MQ-4C Triton, the other part of BAMS, but the General Atomics Mariner is also considered to be a contender. Australia successfully tested the Mariner in 2006.

The temptation to buy both of the BAMS types, minimizing risk, must be strong. Indeed, the RAAF has operated the same maritime patrol aircraft as the U.S. Navy, with differences in onboard equipment, since the 1950s.

Australia has planned acquisition of surveillance drones since the beginning of the century. The program dates repeatedly slipped, but last year the government suddenly brought them forward by 3-4 years. First-pass approval is now due in the two fiscal years from July 1 this year and initial operational capability between mid-2019 and mid-2012. The government has not said why this program has been advanced while so many others have been delayed, but the project's political value, uniquely strong among defense acquisitions, is obvious. The arrival of uninvited migrants by boat, usually claiming to be refugees, annoys many Australians. A go-ahead for robotic surveillance of Australia's maritime approaches, perhaps announced before the election scheduled for September, could help garner votes.

Whatever the government's priorities, the air force appears to be keenest on Poseidons. The current plan is for eight, but Davies says the air force is pushing for 12. They would work with seven drones, according to plans described last decade. Australia needs to replace 18 P-3C Orions, updated to a standard called AP-3C. Although the number of replacement aircraft would be comparable, the sensors and communications capacity of the new aircraft, not to mention their speed and altitude, should transform Australia's ocean surveillance capacity.

Because Australia has in the past few years ordered helicopters and transport airplanes to almost completely renew its fleets of those types, and in some cases adding capabilities, it will need to buy few aircraft in the decade or so after the decisions on fighters and maritime patrollers are settled. An order for a new primary training system, including basic trainer aircraft, is due by mid-2016, and replacement of the RAAF's Hawk jet trainers is likely in the second half of next decade. But as far as major spending is concerned, by then it will be the navy's turn.

Not Lucky Forever

In defense, as in so much else, Australia has been fortunate, but times are changing

Bradley Perrett **Beijing**

A simple graph explains Australia's declining strategic position. Relative to the two countries that its defense planners must consider most carefully, Australia will by 2017 have just a quarter of the economic clout it enjoyed 25 years before.

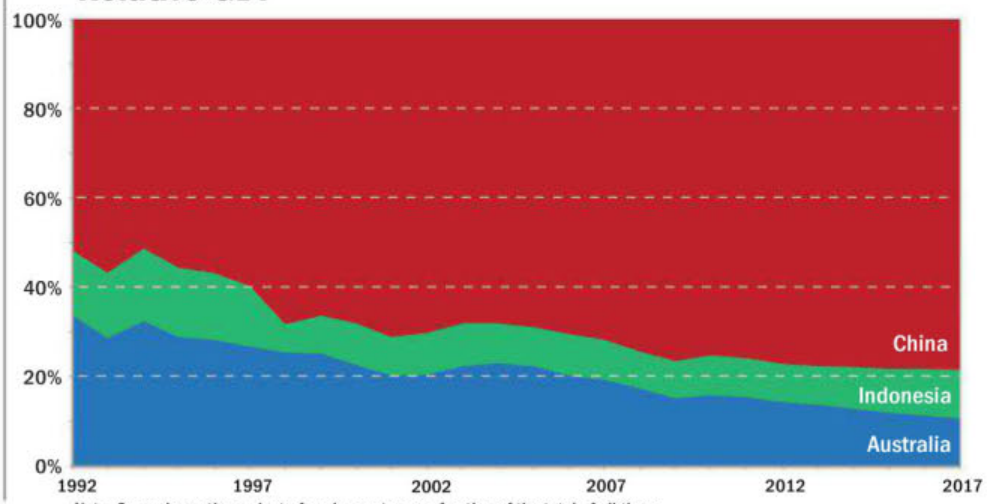
In 1992, Australia's gross domestic product was about half the total of those of China and Indonesia (see graph). In 2017, it will be about one-eighth. Australia's decline relative to China has been fastest, but Indonesia—for decades the main, unmentioned focus of Canberra's defense policy—has galloped along economically in the past few years.

Economic trends usually become strategic trends, but only after quite a few more years have passed. For the moment, few doubt that Australia's defense forces can perform their key mission, denying the use of its northern maritime approaches to an attacker. Distance from China makes all the difference, for now. In the words of the country's 2009 defense white paper, "Australia will most likely remain, by virtue of our geostrategic location, a secure country over the period to 2030."

Strategic decline, therefore, has barely entered the popular consciousness. While defense policy makers and analysts cannot avoid worrying about how to secure the country later this century, the average Australian, used to seeing his or her homeland as far from the world's problems, still barely thinks about the issue. An election is due in September. Even though another white paper is due this year, probably neither the Labor government nor the Liberal-National opposition, which is likely to win, will campaign on defense. A bigger priority is the budget, which is in deficit but, by current Western and Japanese standards, not by much.

The strange result is that even as Australia's strategic outlook seems ever more doubtful, especially when Asia's

Relative GDP



Note: Gross domestic product of each country as a fraction of the total of all three.
Source: International Monetary Fund historical data and forecasts.

GDP figures are projected out another two or three decades, the country of just 23 million people in a region of billions is spending less of its national income on defense than at any time since 1938.

Economic comparisons both over- and understate the country's strategic decline. On the one hand, Australian military sophistication, especially when compared with Indonesia's slow force modernization, means it gets a lot of defense for its money. On the other hand, Australia has been steadily losing that edge, especially in comparison with China.

True, China may evolve into a stable actor in the international system, as defense policy makers in Australia and elsewhere fervently hope. But hopes cannot guarantee security as the authoritarian, highly nationalist Asian giant climbs toward the top of the global economy.

For Australia, one answer may have to be prioritizing key defense capabilities, says Andrew Davies, an analyst with the Australian Strategic Policy Institute in Canberra. Since World War II, the country has maintained a broad military force mix, as a sort of scale model of such countries as the U.S., Britain or France: it has kept defensive and strike airpower, a multipurpose navy and a small but well-rounded army. "In the time when no one else in the region had anything in the way of capability, that was absolutely fine," Davies says. "But when you are getting behind the curve, in both quantity and quality, then it becomes unaffordable." According to this line of thinking, some capabilities need to be sacrificed to pay for what is really needed to control the maritime approaches, and perhaps to threaten retaliation.

While backing the ongoing reequipment of the Royal Australian Air Force with 100 new fighters, Davies thinks changes to the Royal Australian Navy would improve self-defense. Fewer powerful and expensive surface combatants are needed, for example, he says. Sam Roggeveen, an analyst with the Lowy Institute, a Sydney think tank, has similar views. He believes amphibious warfare capability, now growing strongly, should be a low priority. The analysts, each with a background in the Australian intelligence community, agree the country needs more submarines, classic naval weapons of the weak against the strong.

And in that area Australia has already begun making its choices. The 2009 white paper set out plans to double the submarine force, making it outnumber the surface combatant fleet, an unusual balance of capabilities for a modern Western navy. The white paper did not, however, declare offsetting savings equal to the program to build those 12 large diesel submarines for more than A$10 billion ($10.3 billion) from late in the decade. Instead, it promised spending increases—which turned to cuts barely before the ink was dry on the document.

China is 4,000 km (2,485 mi.) from northwestern Australia, but its territorial claim in the South China Sea is 2,700 km away, closer than southeastern Australia.

Analyst Tim Huxley of the International Institute of Strategic Studies in Singapore doubts that sacrificing capabilities is a good idea. If needed again, they would be hard to revive, he says.

Davies raises an alternative approach to force structure: Australia could maintain forces that could be usefully added to those of the U.S. in Asia, helping and thereby encouraging the U.S. to stay involved in the region—but also relying on it to do so. But will the U.S. stay? The 2009 white paper briefly raised the nightmarish possibility of U.S. withdrawal. Since then, Washington has announced its military pivot to Asia, underlining its commitment to the area. And yet its fiscal problems continue, making Australians and East Asians wonder how long it can afford to stay.

More than a few analysts urge Australia to deal with its strategic problem diplomatically, by turning Southeast Asian countries it has seen as possible threats, however remotely, into friends against the common threat, China. "We have to start asking ourselves how we can secure ourselves with Southeast Asia instead of against Southeast Asia," says Davies. According to this line of thinking, Australia should encourage rather than discourage the introduction of advanced weaponry in Southeast Asia.

Above all, it means working with Indonesia, with which Australia has frustratingly failed to develop a close relationship, even as the giant neighbor, the world's most populous Muslim country, has turned into a so-far promising democracy. Indonesia's rising strength could add to Australia's problems, writes Hugh White, one of Australia's best-known defense scholars. "But it could also be good news because it will increase Indonesia's weight as an ally."

Roggeveen thinks that Australia had better get moving on such a diplomatic effort while it still has enough strategic weight to influence its neighbors. But even if Australia moved now, would it or any country have enough strategic weight to persuade Southeast Asian nations to cooperate in defense? For the most part, they do not get along. Crucially, they have not decided to take a strongly defensive stance as China rises—unlike Australia, which, thanks to its geography and current strength, has felt comfortable in reaffirming its allegiance to the U.S. Indonesia, more than others in Southeast Asia, seems comfortable with China's ascent.

And any step toward Southeast Asian collective security will be seen in Beijing as encirclement—though it should be noted that it is in China's interests to appear angered as neighbors respond to its rising strength.

Huxley is not sure Australia can afford to tie itself to Indonesia, anyway, because Canberra still needs to consider its decades-old worry that its neighbor could become unstable. For Australia, like others, the best policy is still to encourage the U.S. to stay in Asia, he says.

CLASSIFIED ADVERTISING

To Place Your Classified Ad Contact: Arlene Braithwaite; (410) 772-0820; e-mail: arlenetbg@comcast.net; Fax: (703) 938-5910. **In Europe, Asia and Africa:** Michael Elmes; + 44 (1255) 871070; e-mail: mike.elmes@aerospacemedia.co.uk; Fax: + 44 (1255) 871071 or David Harrison; +44 (0) 1689 837 447; e-mail: david@aerospacemedia.co.uk.

COURSES

EQUIPMENT

ADVANCED COMPOSITE TRAINING

CONTACT US

AVIATION WEEK & SPACE TECHNOLOGY

ADVERTISING

President/Publisher: Gregory D. Hamilton;
(212) 904-3259; hamilton@aviationweek.com

Publisher Defense: Katie Taplett
(202) 383-2335; katie_taplett@aviationweek.com

Managing Director, Civil: Iain Blackhall (U.K.);
+44 (20) 7176 6231; iain_blackhall@aviationweek.com

U.S. Sales Offices

Sales, Southeast U.S.: Sean Fitzgerald;
(202) 383-2417; sean_fitzgerald@aviationweek.com

Northeast U.S.: Chasie Powell;
(202) 383-2391; chasie_powell@aviationweek.com

Mid-Atlantic U.S.: Beth Wagner;
(202) 383-2467; beth_wagner@aviationweek.com

Southwest U.S., Mexico, Latin America:
Tom Davis; (469) 854-6717; tom_davis@aviationweek.com

Midwest U.S.: John Specht;
(513) 459-6451; john_specht@aviationweek.com

Western U.S.: Tim Reed;
(949) 650-5383; tim_r_reed@aviationweek.com

Western U.S.: Leah Vickers;
(949) 481-4519; leah_vickers@aviationweek.com

Canada: Richard Brown;
(416) 259-9631; r.brown@vicbrownmedia.com

International Regional Sales Offices

Associate Publisher, Defense, Space & Security: Andrea Prudente; +39 0(49) 723548;
andrea_prudente@aviationweek.com

Germany, Switzerland: Robert Rottmeier (Switzerland);
+41 (21) 617-44-12; robert_rottmeier@aviationweek.com

France, Portugal, Spain, Benelux: Romaine Meyer (France);
+33 (1) 40-75-2501; romaine_meyer@aviationweek.com

Eastern Europe, India, Pakistan, Russia and the CIS, Middle East, Scandinavia, Africa, Mediterranean, Turkey and Asia
Vittorio Rossi Prudente (Italy): +39 0(49) 723548;
prudente@aviationweek.com

United Kingdom, Ireland: Michael Elmes, Aerospace Media (U.K.);
+44 (125) 587-1070; mike.elmes@aerospacemedia.co.uk

Israel: Tamir Eshel, Eshel Dramit Ltd. (Israel);
+972 (9) 8911792; eshel_tamir@yahoo.com

Japan: Shigeru Kobayashi, Japan Advertising Communications (Japan); +81 (3) 3261 4591; jac@media-jac.co.jp

Business/Production

Production Director: Laura Hoffman;
(212) 904-3489; laura_hoffman@aviationweek.com

Senior Production Manager: Anna Dariotis;
(212) 904-4360; anna_dariotis@aviationweek.com

Production Manager: Melissa Menelly;
(212) 904-4917; melissa_menelly@aviationweek.com

Advertising/Marketing Services

For Media Kits and Promotions:
www.aviationweek.com/mediakits
or e-mail: elizabeth_sisk@aviationweek.com

For Custom Media: Joseph D'Andrea;
(212) 904-3780; joseph_dandrea@aviationweek.com

Advertising Operations Manager: Casey Carlson;
(610) 373-2099; casey_carlson@aviationweek.com

SUBSCRIPTIONS & CUSTOMER SERVICE

Subscriber Service:

U.S.: (800) 525-5003; Fax: (888) 385-1428
Outside the U.S.: +1 (515) 237-3682;
Fax: +1 (712) 755-7423
Email: awcustserv@cdsfulfillment.com

Subscription Inquiries: Address all inquiries and requests to Aviation Week & Space Technology, P.O. Box 5724, Harlan, IA 51593-1224. Include address label from recent issue when writing. Allow three to six weeks for address change. Include both old and new address and zip or postal codes.

Manage your Subscription (and claim Digital Edition) at:
www.aviationweek.com/awstcustomers

Register & claim access to AWST Online at:
www.aviationweek.com/awstregister

Digital Editions

Support Service: (888) 946-4666
Email: Support@zinio.com
Web: www.zinio.com/help
Subscribe at: www.aviationweek.com/awstdigitalsub
Order single copies at: www.aviationweek.com/awstdigitalsingle
Manage your Subscription (and claim Digital Edition) at:
www.aviationweek.com/awstcustomers

Single Copy Sales

Toll-free (U.S. only): (800) 525-5003
Outside the U.S.: +1 (515) 237-3682
Fax: +1 (712) 755-7423

Subscription Information for other Aviation Week Products

Aviation Week Intelligence Network, MRO Prospector and Fleet Data:
(866) 857-0148 or outside the U.S.: +1 (515) 237-3682.

Fax: (888) 385-1428 or outside the U.S. +1 (712) 755-7423

Web: www.aviationweek.com/awin

Email: aw_intelligence@aviationweek.com

Business & Commercial Aviation: (800) 525-5003 or +1 (515) 237-3682

SPECIAL PRODUCTS & SERVICES

Conferences/Exhibitions

www.aviationweek.com/conferences: (800) 240-7645

Director: Lydia Janow, CMP;
(212) 904-3225; ljanow@aviationweek.com

To Sponsor/Exhibit: Beth Eddy;
(561) 862-0005; betheddy@aviationexhibits.com

To Register: Alexander Zacharias
(212) 904 4682; Alexander_zacharias@aviationweek.com

AW&ST Mailing List Rental

Inside North America: Infogroup, Inc;
Maggy Pizzuto maggy.pizzuto@infogroup.com
(800) 223-2194; Fax (845) 620-9035

Outside North America: RSA Direct
+44 (0) 20 8434 3596; Trish.Dominy@rsadirect.com

Reprints, Photocopies and Permissions

Custom Reprints: Mike Shober;
aviationweek@theygsgroup.com
North America: (800) 360-5549 x129
All others: (717) 505-9701 x129

Black and White Photocopies: Copyright Clearance Center;
(978) 750-8400; www.copyright.com

Requests for other rights and permissions: Michael Stearns at Aviation Week Permissions Department, stearns@aviationweek.com

Social Media

Join the conversation! Follow us at:

Facebook: www.facebook.com/AvWeek

You Tube: www.youtube.com/AviationWeek

Linked In: www.linkedin.com/groups?gid=2104198

Twitter: www.twitter.com/AviationWeek

AVIATION WEEK & SPACE TECHNOLOGY

For more information visit us on line at
www.aviationweek.com/awst

The McGraw-Hill Companies

Aviation Week & Space Technology
February 18, 2013 VOL. 175, NO. 6 (ISSN 0005-2175)

Member of Audit Bureau of Circulations and Magazine Publishers of America. Published weekly except for one issue in January, March, April, May, August, October and November, by The McGraw-Hill Companies Inc., 1221 Avenue of the Americas, New York, NY 10020-1095. Founder: James H. McGraw (1860-1948). **Executive, Editorial, Circulation and Advertising Offices: Two Penn Plaza, New York, N.Y. 10121-2298. Publication office:** Two Penn Plaza, New York, N.Y. 10121-2298 (USA). Periodicals postage paid at New York, N.Y., and additional mailing offices. Canada Post International Publications Mail Product Sales Agreement No. 40012501. Registered for GST as The McGraw Hill Companies, GST # R123075673. Title reg.® in U.S. Patent Office. **Officers of The McGraw-Hill Companies Inc.:** Harold McGraw, III, Chairman, President and Chief Executive Officer; Kenneth M. Vittor, Executive Vice President and General Counsel; Jack F. Callahan, Executive Vice President and Chief Financial Officer; Elizabeth Omelia, Senior Vice President, Treasury Operations; **Postmaster:** Send address changes to Aviation Week & Space Technology, Attention: Subscription Services, P.O. Box 5724, Harlan, IA 51593-1224

Aerospace Calendar

To submit Aerospace Calendar Listings
Call +1 (202) 383-2350
Fax +1 (202) 383-2347
e-mail: kyla_clark@aviationweek.com

Feb. 26-March 2—Australian International Airshow and Aerospace and Defense Exposition. Avalon Geelong Airport. See www.airshow.com.au/airshow2013
March 7—Aviation Week Laureate Awards. National Building Museum. Washington. See www.aviationweek.com/current/lau/index.htm
March 12-14—ATC Global Amsterdam 2013. RAI Exhibition & Congress Center. See www.atcglobalhub.com/events
March 13-14—ALTA Technical Committee with Embraer. Buenos Aires. See www.alta.aero/2010/?q=altanode/594
March 14—Royal Aeronautical Society and American Institute of Aeronautics and Astronautics (AIAA) joint meeting: "GPS—The Opportunity & Vulnerability for Navigation & Precise Timing." British Embassy, Washington. Call +1 (202) 957-3019.
March 18-21—Ground System Architectures Workshop, "Doing More with Less," Sheraton Gateway Hotel. Los Angeles. See www.cvent.com/d/kcqcwd
March 19-21—Composites Manufacturing 2013. Long Beach (Calif.) Convention Center. Seewww.aerodefevent.com
March 19-21—American Astronautical Society's 51st Robert H. Goddard Memorial Symposium: "Success Through Interdependence." Greenbelt (Md.) Marriott Hotel. See www.astronautical.org.
March 25-28—22nd AIAA Aerodynamic Decelerator Systems Technology Conference and Seminar. Daytona Beach, Fla. See www.aiaa.org/ADS2013/
March 26-28—Spacecraft Thermal Control Workshop. The Aerospace Corp., El Segundo, Calif. See www.cvent.com/d/4cqd8g
April 8-11—29th National Space Symposium-Space Foundation. The Broadmoor Hotel, Colorado Springs. See www.nationalspacesymposium.org/

ADVERTISERS IN THIS ISSUE

*-Domestic edition.
**-International edition.

Bigger Is Not Always Better

BY GEORGE HAMLIN

Hamlin is president of Hamlin Transportation Consulting in Fairfax, Va. He has more than 40 years' experience in airline and airframe management and consulting.

Is the merger of American Airlines and US Airways a good idea? It would certainly seem so if you listen to the upbeat reaction from the financial community, labor unions representing the two airlines' employees and assorted pundits (see p. 24). The link-up, which will create the world's largest carrier, is being touted as providing critical mass to compete against Delta Air Lines and United Airlines while promoting capacity discipline that will enhance profitability across the U.S. airline industry.

But are such arguments really compelling, or do they simply promote the individual agendas of various stakeholders? Size for its own sake is hardly a guarantor of economic success in the airline business. Southwest Airlines has been the industry's profit leader for the last 40 years, but it was only of moderate size for much of that time and even now is smaller than Delta, United or the un-merged American. And unlike the legacy carriers that needed bankruptcy court protection to right their fortunes, Southwest has its equity intact, which should matter to investors.

> "Are the arguments for airline mergers really compelling or do they simply promote the individual agendas of various stakeholders?"

The notion that big is not necessarily better should have a familiar ring to Aviation Week readers. One of the headlines from last year's Aviation Week Top-Performing Airlines analysis (*AW&ST* July 2, 2012, p. 42) makes that point concisely: "Rankings show that smaller airlines are more likely to be peak performers."

In addition to size not being an guarantor of success, the American-US Airways combination will have to overcome a number of hurdles. First is melding different operations and work cultures. US Airways merged with America West in 2005, yet still has not managed to fully integrate its pilot workforce.

Then, there is the issue of labor economics. It appears that a significant reason for union support for this merger is that workers expect to receive higher wages. But that could render substantial portions of the present U.S. airline system less competitive. A key example of this situation is the Phoenix hub operated by US Airways. Today, it has a lower cost structure—when examined on a stage-length adjusted basis—than American, Delta and United. However, Southwest, which competes vigorously with US Airways at Phoenix, has an even lower cost structure. Following the expected post-merger wage increases, the larger American Airlines may not be able to compete economically at Phoenix.

Phoenix would also find itself in competition with American's hub at Dallas/Fort Worth International (DFW) for connecting traffic across the southern tier of the U.S. If the combined carrier hopes to improve its profitability, it will likely want to emphasize only one of the two hubs, and that is almost certainly DFW, considering the higher post-merger operating costs at Phoenix. Don't believe it? Ask the airport directors in Cincinnati and Memphis, Tenn., about what happened to their traffic following the Delta-Northwest merger.

Another example of what probably will result in significant service reductions is shown with the two carriers' East Coast transatlantic hubs, at New York's JFK airport and Philadelphia. They are only about 100 mi. apart and compete for the same flow traffic. US Airways found that operating domestic hubs within 300 mi. of each other—in Philadelphia and Pittsburgh—did not work and chose the larger city. It is very likely that this will occur again now that American and US Airways are merging, with Philadelphia being reduced essentially to a domestic operation.

It could have been useful to consider whether selective asset acquisition might have been a better proposition than outright merger. US Airways' Charlotte, N.C., hub would have fleshed out American's geography in the east, and it is likely that American's Latin American route system would have been of interest to US Airways. However, it is also doubtful that either carrier would have entertained this type of proposal, even though it might have produced a better long-term financial result than simply pasting everything together and shedding the excess later.

In short, there needs to be a balance, from a policy perspective, between structuring an airline system that can be economically viable and the consumer benefits generated by vigorous competition. Merging simply for the sake of size is at best a ham-fisted attempt to accomplish the former, with little or no regard for the latter. Smart people run today's airlines. There should be a way to achieve both policy objectives, but merger for the sake of size alone will not produce the desired result.

Your Intelligence Advantage

Expand your organizational intelligence with the most trusted, authoritative industry news, insight, analytics and data on the global marketplace.

The Aviation Week Intelligence Network (AWIN) provides industry professionals with unmatched resources to:

- Follow developments in programs and budgets
- Identify and target new business opportunities
- Monitor competitors, customers and prospects
- Streamline access to vital industry intelligence

See how AWIN can make you and your entire organization smarter and more successful. Register for a free, personalized demonstration today.

Call 866.857.0148 (within N. America) or +1.515.238.3682 (outside N. America)
or visit us at www.aviationweek.com/awin today

AVIATION WEEK
INTELLIGENCE NETWORK


Chronospace
Selfwinding chronograph
Officially chronometer-certified
Slide-rule
Water-resistant to 200 m/660 ft
$ 6,820
YOUR FLIGHT IS OUR MISSION™
BREITLING
1884
INSTRUMENTS FOR PROFESSIONALS™