

SINGAPORE AIRSHOW 2012

\$7.95 FEBRUARY 6, 2012

AVIATIONWEEK

& SPACE TECHNOLOGY

ASIA-PACIFIC
The Sweet Spot
For Aircraft Makers



NASA's Drive For
Carbon-Neutral
Airliners



THE POWER
OF FLIGHT

AS RARE AS A CFM SHOP VISIT.

In March 2010, the Australian town of Lajamanu experienced a freak downpour of spangled perch. An event almost as rare as a CFM[®] shop visit. CFM reliability is legendary. 70% of all CFM56-5B and CFM56-7B engines in the world are yet to make their first shop visit. Over the life of the engine a CFM56 will undergo just three shop visits. In fact, it can be up to 10 years before it is removed for servicing. For a long range forecast on airline profitability, visit www.cfm56.com/reliability-metrics. You'll see how bright the outlook could be.

[®]CFM, CFM56 and the CFM logo are all trademarks of CFM International, a 50/50 joint company of Snecma (Airbus Group) and GE.

AVIATION WEEK & SPACE TECHNOLOGY

Editor-In-Chief Anthony L. Velocci, Jr.
Executive Editor James R. Asker
Managing Editors Joseph C. Anselmo,
 Michael Bruno, Lee Ann Tegtmeyer
Assistant Managing Editor Michael Stearns
Art Director Lisa Caputo

International Editor Robert Wall
Senior Editors Amy Butler, Jens Flottau, David A. Fulghum,
 Michael Mechem, Frank Morring, Jr., Guy Norris,
 Adrian Schofield, Graham Warwick
Congressional Editor Jen DiMascio

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, David A. Fulghum,
 Paul McLeary, Sean Meade, Frank Morring, Jr., Andy Nativi, Bill Sweetman

CIVIL AVIATION/MAINTENANCE, REPAIR AND OVERHAUL

Editors Lee Ann Tegtmeyer (Managing Editor), Frank
 Jackman (Associate Managing Editor), Andrew Compant,
 Jens Flottau, Leithen Francis, William Garvey,
 Fred George, Rupa Haria, Kerry Lynch, Kristin Majcher,
 Bradley Perrett, Jessica Salerno, Adrian Schofield,
 Darren Shannon, 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, NY 10121
 Phone: +1 (212) 904-2000, Fax: +1 (212) 904-6068
Editorial Administrator Norma Maynard

BUREAUS

BEIJING

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

FRANKFURT

Am Muhlberg 39, 61348 Bad Homburg, Germany
 Phone: +49 (6172) 671-9817 Fax: +49 (6172) 671-9791
International Air Transport Editor Jens Flottau

GENOA

Via Martiri Libertazione 79/3, 16043 Chiavari (Ge), Italy
 Phone: +39 (185) 308-606, Fax: +39 (185) 309-063
Contributing Editor Andy Nativi

LONDON

20 Canada Square, 7th floor
 Canary Wharf, London E14 5LH, England
 Phone: +44 (20) 7176-7000
Bureau Chief Robert Wall

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 Mechem

SINGAPORE

30 Cecil Street, Prudential Tower #13-01
 Singapore 049712
 Phone: +65 6530-6532
Bureau Chief Leithen Francis

WASHINGTON

1200 G St., NW, Suite 922, Washington, D.C. 20005
 Phone: +1 (202) 383-2300, Fax: +1 (202) 383-2347
Bureau Chief James R. Asker
Administrator of Bureaus Angela Smith

Art Department Gregory Lewis, Scott Marshall

Copy Editors Andrea Hollowell, Patricia Parmalee, Nora Titterington

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



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

JECasia

COMPOSITES SHOW & CONFERENCES

SINGAPORE JUNE 26, 27, 28, 2012

SUNTEC CENTER



CONNECTING THE WHOLE COMPOSITES VALUE CHAIN IN ASIA PACIFIC AND MIDDLE EAST



AERONAUTICS

MACHINES & TOOLS



AUTOMOTIVE



RAW MATERIALS



CARBON



WATER SOLUTIONS



WORLDWIDE MARKET TREND



NATURAL FIBERS



- ▶ TRADE SHOW & DEMO ZONE
- ▶ I.C.S. / FORUMS & CONFERENCES
- ▶ BUSINESS MEETINGS
- ▶ INNOVATION AWARDS & SHOWCASE
- ▶ TECHNICAL SALES PRESENTATIONS
- ▶ JOB CENTER

www.JECcomposites.com

March 7, 2012
 Andrew Mellon Auditorium
 Washington, DC

Laureate Awards

Join Aviation Week in recognizing individuals
 and teams for their extraordinary accomplishments.

Reserve your place today.

Visit www.aviationweek.com/laureates to see a complete list of the nominees.
 To reserve a table contact Regan Pickett at +1.540.349.5738 or
 email reganpk@aol.com.

AAG

“Every long-haul flight

380

should be like this!”

Jason, South Africa



AN EADS COMPANY

AVIATION WEEK

& SPACE TECHNOLOGY

DEPARTMENTS

- 12** Feedback
- 14** Who's Where
- 16-18** The World
- 22** The Inside Track
- 23** Inside Business Aviation
- 24** Airline Intel
- 26** In Orbit
- 27** Washington Outlook
- 71** Classified
- 72** Aerospace Calendar
- 73** Contact Us

UP FRONT

- 15 U.S. defense contractor** margins rising as companies cut costs and prepare for leaner times

THE WORLD

- 16 Global aerospace** mergers and acquisitions deals hit a new high in 2011, reaching \$43.7 billion
- 16 First flight** of the European Neuron UCAV demonstrator is planned for mid-2012 after recent rollout
- 18 Financial austerity** has not derailed European efforts to duplicate GPS with the Galileo constellation

EXPERIMENTAL AIRCRAFT

- 28 Multirole, modular** flying-wing UAV to pioneer flutter-control technology for USAF and NASA

PENTAGON BUDGET

- 30 F-35 and classified** programs hit by network intrusions, causing redesign of critical equipment

30

There is consensus among U.S. defense and aerospace industry officials that escalating costs, reduced purchases and production stretch-outs for the F-35 reflect to some degree the need to redesign critical equipment after what is believed to be Chinese cybertheft of technology.



- 31 Airlift and helicopters** trimmed as Pentagon renews focus on strategic forces in \$613 billion budget
- 34 Financial pressure** craters USAF's first attempt to replace a manned aircraft with an unmanned system
- 36 Boeing embraces** aggressive pricing and low margins to hedge against missile budget uncertainty
- 42 Government/industry** consortium releases open systems standard to enable reuse of avionics software
- 44 Showcase example** of Obama's commercial remote-sensing space policy targeted for cuts

DEFENSE

- 46 Dassault named** lowest-cost bidder to supply at least 126 Rafale aircraft to the Indian air force

- 47 U.K. unveils Defense Industrial Plan** but does not promise big investments to sustain critical sectors
- 48 Philippine air force** hopes to sign firm contracts by midsummer to bolster defense capability

SPACE

- 50 ESA's small-class** Vega launcher for science and Earth-observation satellites set for first liftoff Feb. 13

AIR TRANSPORT

- 51 Tighter controls**, coupled with debt crisis, taking their toll on the weakest European airlines
- 53 As several midsize** European national carriers struggle, low-fare airlines ready to profit further

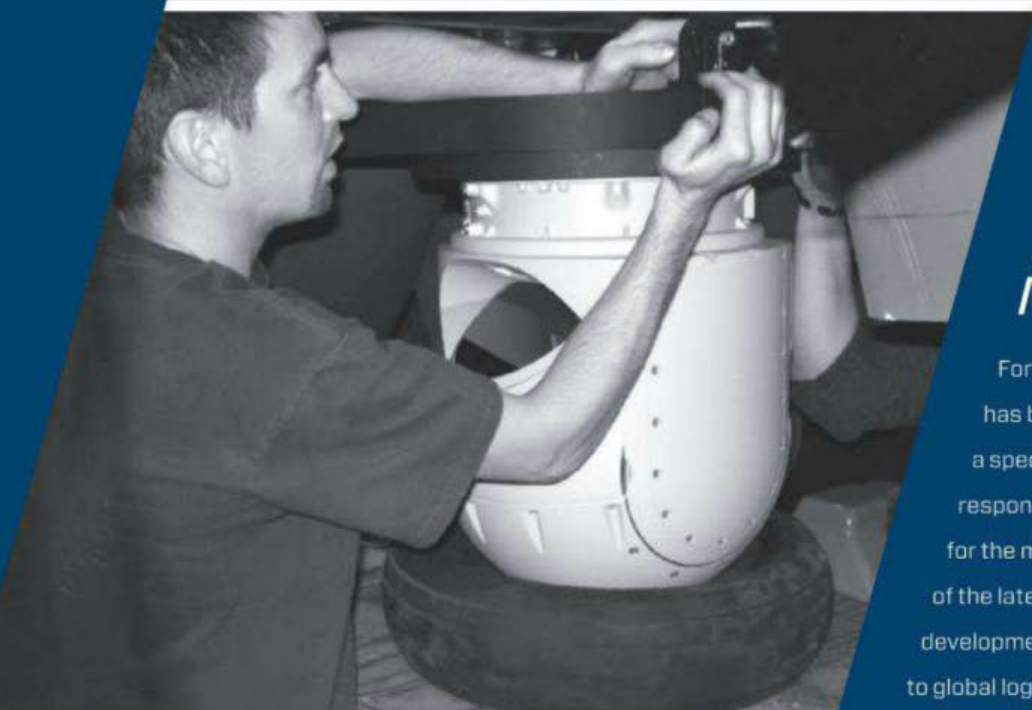
COVER STORIES

- 56 The Asia-Pacific** market has been the backbone of commercial aircraft orders and—even more critically for manufacturers—deliveries. The region's sustained growth is more than offsetting weaker demand from Europe, where economic turmoil still prevails. ATR has seen flurry of Asia-Pacific orders and expects more this year, including from Lion Air's Wings Air. ATR photo.

- 69 To achieve sustainable growth** in air travel, new airliners will not only have to meet unprecedented performance goals, but do so while striving for carbon neutrality.



**THE VALUE OF
TURNING
SPECIAL
OPERATIONS
INTO
SUCCESSFUL
MISSIONS.**



For more than 20 years, Northrop Grumman has been delivering precision ISR systems to a special breed of warfighters. We provide responsive support that's affordable and tailored for the most demanding missions. From insertion of the latest cutting-edge technologies, to innovative development of employment concepts and training, to global logistics support, no one is more qualified to deliver special mission aircraft solutions than we are. Our reliable performance helps warfighters anticipate and succeed in combat operations today and tomorrow. *That's the defining value we bring to the most critical global security missions.*

THE VALUE OF PERFORMANCE.



NORTHROP GRUMMAN



28

54 At least one cargo airline could barely wait to get its 747-8F while others are delaying deliveries

54 Airbus puts in place changes to A380 wing assembly process to address component cracks

SINGAPORE 2012

56 Asia-Pacific's low-cost carriers change the aircraft mix in a region once dominated by widebodies

60 Joint Strike Fighter holds its own in its first overseas battles, at least in the political theater

62 Rolls-Royce may be synonymous with Britain, half of Trent production capacity will be in Singapore

FACE TO FACE

64 Singapore Technologies Aerospace chief discusses P-F aircraft conversions and other MRO activities

UNMANNED AIRCRAFT

66 Civilian market is building, but when demand will emerge and how fast it will grow remain uncertain

AERONAUTICAL ENGINEERING

69 Wind tunnel and structures tests mark next steps for NASA designs for advanced airliners

EDITORIAL

74 Gallois hands off a more robust EADS to successor Enders, who faces long list of difficult issues



60



66

AviationWeek.com

For the complete current issue, archives and more, go to AviationWeek.com/awst Free to subscribers. ✨

DASSAULT'S TRIUMPH

💬💬 **The news of the Dassault Rafale win** over the Eurofighter Typhoon in India's MMRCA fighter competition (see p. 46) generated a lot of online conversation. On three posts on our **Ares** blog over two days, readers weighed in with dozens of comments on the capabilities of the two aircraft, the selection criteria and more. The posts can be found at: tinyurl.com/6ozqukg, tinyurl.com/6uvygox, and tinyurl.com/6w8onuh



DASSAULT AVIATION

WEIRD AND WONDERFUL

💬💬 **A Finnish flight crew** breaks into a Bollywood-inspired dance; a cat escapes and delays an Air Canada flight; a passenger forces an emergency landing by not putting out his (illegal) cigarette. Catch up on the weird—and wonderful—in the weekly **Strange But True** feature on our **Things With Wings** blog.

AviationWeek.com/wings

MOON SHOTS

📷 **Beginning next month**, middle school students will begin receiving images they have ordered directly

from the Moon. NASA's twin Grail satellites will map the Moon's gravity and provide images of the surface as part of an outreach program headed by astronaut Sally Ride. Read more about the mission at: tinyurl.com/75l43r9



NASA/JPL-CALTECH

FOCUS ON ASIA

✨ **A new online feature** from one of our sister publications, *Business & Commercial Aviation*, shines a spotlight on three key Asian business centers: Singapore, Shanghai and Tokyo. tinyurl.com/qduh7y

PREMIUM CONTENT

✨ **Subscribers** to the **Aviation Week Intelligence Network** can access information on suppliers, systems specs and archived articles for more than 150 key programs.

AviationWeek.com/awin

CLEARED FOR TAKEOFF



Planes that fly lighter, look better, and offer a flying experience that really transports us.

No surprise, but airlines are as interested in reducing fuel costs and carbon emissions as they are in branding the planes in their fleet. At PPG, our lighter coatings and sealants significantly cut the weight of each aircraft—saving real money each time the plane flies. Our new electrochromic ALTEOS™ interactive window systems reduce cabin-cooling requirements while enhancing passenger comfort. PPG's cockpit windows help improve safety by dramatically reducing glare and repelling rainwater. And, our advanced coating technologies offer proven gloss and color retention along with the ability to create custom color matches and special topcoat effects.

We even supply fiber glass for lightweight composite parts, eco-friendly paint removal and cleaning products, and chemical management services. From aerospace to automotive, consumer products, building materials and industrial applications, we're bringing innovation to the surface. Visit ppg.com to learn more.

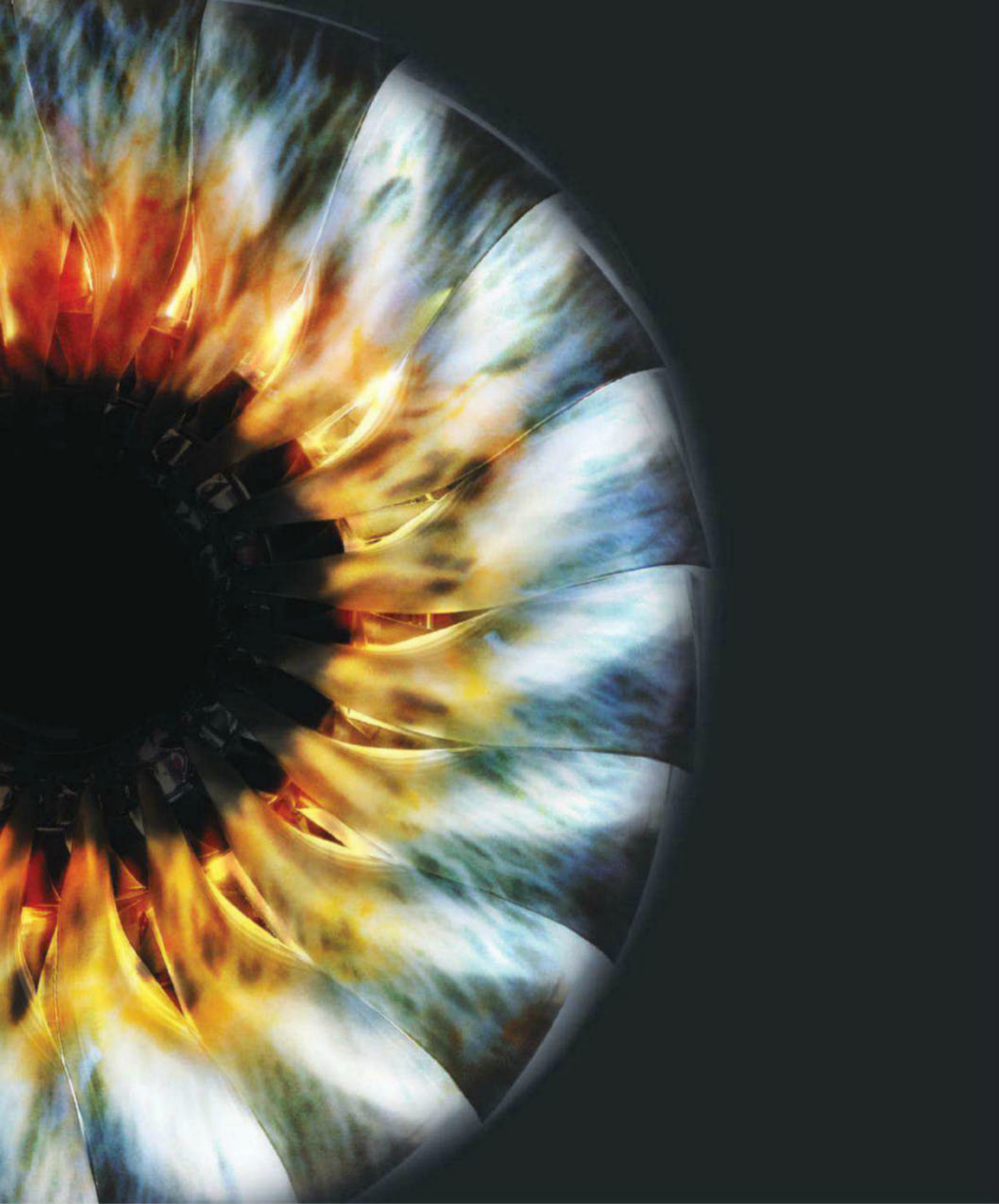


PPG Industries

Bringing innovation to the surface.™

PAINTS - COATINGS - OPTICAL PRODUCTS - SILICAS - CHEMICALS - GLASS - FIBER GLASS

"Bringing innovation to the surface." is a trademark of PPG Industries Ohio, Inc.



Every day we monitor 25,000 hours of engine data in real time.

Because reliability is at the heart of all we do, it may not surprise you to learn this figure equates to half a billion reports being streamed back to our Operations Centre annually. This unique insight into the entire Trent fleet enables us to predict how an engine is going to act in the future thereby reducing disruption, saving money and keeping the aircraft operational.

Making the extraordinary, ordinary.

Trusted to deliver excellence.



Rolls-Royce



FROM THE WEB

Comments from readers
on AviationWeek.com



Bill Sweetman's "Chinese Stealth Fighter J-20 Advances" (Jan. 31) is drawing a chain of reactions. Here are portions of a few:

X-Planes writes:

Based on the photos of the platform and location of the landing gear . . . it appears that this will not be a dog-fighter. The center of gravity is too far forward on the main wing, meaning the canard is a lifting surface, not just an elevator. It might be an inherently stable design—therefore not a dogfighter in the modern sense. It would be good for high-speed cruising or intercepting.

Andrei says:

One day they'll drop this and clone the PAK FA.

Gerardo0009 opines:

It looks more like a modern version of the MiG-25. If so, it must have a very good radar for long distance . . . China's enemies are far away!

In our aftermarket blog *Turnaround Time*, Managing Editor for Civil Aviation/MRO Lee Ann Tegtmeyer sends this from the AW MRO Middle East Conference:

Tegtmeyer:

Middle East MROs face the same retention problems when it comes to aviation technicians/engineers/C-level managers. The region turns to countries such as India, Indonesia and Malaysia for talent, but finds it hard to keep them. One discussion item is that Middle East MROs should "be willing to invest in your people and make their development/retention part of a company's increased productivity and financial plan."

JasonL responds:

It's interesting how truly global workforce retention issues are for MRO companies. Sound advice, no matter where you are.



Join the discussion at :

www.aviationweek.com/avweek

FEEDBACK

UNANSWERED QUERY

In Burt Rutan's Stratolaunch design detailed in "The Big Drop" (AW&ST Dec 19-26, 2011, p. 26), are there specific reasons he did not locate the cockpit in the center fuselage for more balanced control; link the two tails together following the P-38 design for rigidity; or use propjets instead of pure jet for this straight-wing design? After all, the lifter is intended only for low air speed.

Lester H. Lee

SARATOGA, CALIF.

(No additional design details were offered on the Stratolaunch—Ed.)

MISPLACED APPROBATION?

You accord jeers to the European Union for its emissions trading system (AW&ST Dec. 19/26, 2011, p. 74), but surely it's the International Civil Aviation Organization that deserves them. ICAO, which had more than a decade since the Kyoto Protocols were set to devise a plan to combat aviation emissions, failed so badly that the EU was forced to do something. You may not agree with the EU's approach, but offer an alternative before you jeer too loudly.

Robin Stanier

TORRENS, AUSTRALIA

DECLINING HEALTH ALL AROUND

The article "Refining Tactics" (AW&ST Dec. 5, 2011, p. 38) illustrates an endemic issue with Defense Department acquisition approach in general, and that is a lack of appreciation for the A&D industry's fundamental challenge of maintaining a viable business. Using competition as a "big hammer" is valid given a robust industry base. Unfortunately, defense budget pressures and acquisition strategies of the past are eroding our industry base, so the number of viable bidders is dropping.

And, from a business perspective, the desire to "buy more data rights . . . upfront" is in conflict with the movement within the government's R&D community of increased industry R&D investment. What industry leader would invest in new technology if the knowledge gleaned cannot be retained for a competitive advantage?

The Defense Department must consider the industry's health as it develops and implements acquisition strategies. Likewise, industry must stop attempting to conduct business as usual.

Tom Kaemming

ST. LOUIS, MO.

Aviation Week & Space Technology welcomes the opinions of its readers on issues raised in the magazine. Address letters to the Managing 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.

THUMBS UP, AND DOWN

Congratulations on another great photo/art issue! The cover is superb, as is the brilliant first-place commercial photo (AW&ST Dec. 19/26, 2011, p. 40).

But I do have a complaint about the "From the Web" portion of the Feedback page. I find that the brief, shoot-from-the-hip barbs included in this sidebar add no value to the information content of the magazine. The space would be better utilized by running well-thought-out, well-written traditional letters.

Hank Caruso

CALIFORNIA, MD.

PARSING PAA

"Looking East" (AW&ST Jan. 9, p. 21) implies that improved missile defenses based on the Phased Adaptive Approach (PAA) would be suitable for an anti-access environment, but that idea falls short on closer examination. Most of the primary PAA components require a passive air and surface environment for their sensors and launchers, and a significant logistical operation to establish them in theater. PAA deployments designed to provide shoot-assess-shoot opportunities require sensors and launchers located well forward of the areas intended for defense—something an enemy is not likely to passively allow. Any claims that these systems could meet future defense needs in a contested theater should be examined very closely.

The Airborne Weapons Layer, however, could work there and was recently singled out by a Center for Strategic and Budgetary Assessments report as a key development initiative to support an anti-access-enabling operational concept. But, despite this and multiple joint studies with USAF, the Missile Defense Agency continues to defer any development, even after the Defense Science Board exposed significant flaws in MDA's early-intercept concept.

USAF Col (ret.) Mike Corbett

WASHINGTON, D.C.

On paper, engine technology can promise virtually anything for tomorrow.

ABSTRACT

To meet today's increasing practical, regulatory and operational challenges of commercial air travel, engine manufacturers are exploring new avenues toward developing engines.

Aviation Operating Costs



Position
Insurance
Engine
Crew
Maintenance
Fuel
Other


PurePower® PW1000G
This Changes Everything™

In reality, the PurePower® Engine delivers today.

Get the free app at
<http://gettag.mobi>



With 20 years of development and hundreds of hours of testing, Pratt & Whitney PurePower Engines are more than just a leap of faith. These proven, dependable engines are tested and flying today, providing next-generation benefits. With up to 20% lower operating costs, half the noise and dramatically reduced emissions, these engines can save operators up to \$1.5 million per aircraft per year. Discover real engines that are Flight Years Ahead™. At PurePowerEngines.com.



It's in our power.™



Pratt & Whitney
A United Technologies Company



Abdoulaye N'Diaye



Michele Arcamone



Jennifer Michels



Andreas Jahnke



Kary Morihara



Thomas C. Hutton



Pat Camacho

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.

Dinesh Keskar has been promoted to senior VP-Asia-Pacific and India, from president of Boeing India for Seattle-based *Boeing Commercial Airplanes*. He became president of Boeing India in March 2009.

Abdoulaye N'Diaye (see photo) has been named secretary general of the *European Organization for Civil Aviation*, based in Malakoff, France, succeeding **Gilbert Amato**, who will act as adviser until his retirement. N'Diaye has held senior management positions at the Thales Group and Rockwell Collins Co.

Lauri Curtis has been appointed VP-onboard services at *American Airlines*. She was VP-diversity and leadership strategies.

Robin Hayes, JetBlue's executive VP and chief commercial officer, has been appointed a member of the Washington-based *U.S. Travel and Tourism Advisory Board*.

Michele Arcamone (see photo) has been appointed president of Toronto-based *Bombardier Commercial Aircraft*. He succeeds **Gary R. Scott**, who has retired. Arcamone was president and CEO of GM Korea.

Mike Cosentino has become senior VP-operations of *EADS North America* in a leadership restructuring of the Herndon, Va.-based company. He was senior VP-strategy and business development, a role now assigned to **Sam Adcock**, who was senior VP-government relations. **Guy Hicks** will add the responsibility for government relations to his duties as VP-corporate communications and public relations. **Paul Pastorek** has been named chief administrative officer and will remain chief counsel and corporate secretary. **Xavier Tardy** will take over **Philippe Balducci's** role as senior VP-finance for both EADS North America and Airbus Americas on March 1. **David Fink** will be chief human resources officer, and **David Oliver** strategic adviser for mergers and acquisitions.

Jennifer Michels (see photo) has become communications director of the Washington-based *Transportation Trades Department* of the AFL-CIO, as communications director. She was editor of Aviation Week group's *Aviation Daily*.

Tarek Ragheb has been appointed senior adviser-international sales for Europe, the Middle East and Africa at Savannah, Ga.-based *Gulfstream Aerospace Corp.* With the new role, Ragheb takes on added responsibilities for the group he has headed for 18 years.

Johanna O'Toole has been promoted to comptroller from director of administration and financial services of the Alexandria, Va.-based *National Air Transportation Association*. She was an account manager at Degnon and Associates.

Norman Ramirez has been named general manager at Houston-based *Landmark Aviation's* Oakland (Calif.) International Airport location. He has held management roles at Signature Flight Support, Atlantic Aviation and American Airlines.

Andreas Jahnke (see photo) has become managing director of *Lufthansa Consulting*, Cologne, Germany, succeeding **Werner Schuessler**, who has retired. Jahnke was VP-handling at Frankfurt for Lufthansa Cargo.

Marchelle Franklin has been named deputy aviation director for community development and government relations at *Phoenix Sky Harbor International Airport*. She was senior assistant to the mayor, deputy chief of staff and co-chief of staff.

John LaValle has become CEO of *Row 44*, Westlake Village, Calif. He was chief operating officer and CFO.

Michael A. Young has been named VP of *Arinc Aerospace*, Annapolis, Md. He was VP of Arinc's former Aerospace Systems Engineering & Support unit.

Kary Morihara (see photo) has been named director of training and development for *Aloha Air Cargo*. She was a business program developer for the Sullivan Family of Companies.

Thomas Kreidler has joined *Gen-*

eral Dynamics C4 Systems, Scottsdale, Ariz., as VP-worldwide product sales. He has held similar positions at Lumeta Corp., Juniper Networks and Sun Microsystems.

Kevin McSweeney has been named chief operating officer of *Telephonics*, Farmingdale, N.Y. He headed the Radar Systems Div.

Thomas C. Hutton (see photo) has been named CEO of *PAS Technologies*, North Kansas City, Mo. He was VP of Pratt & Whitney's Global Service Partners.

Christophe Tourne has been appointed global marketing manager of aerospace for the Process Systems business unit at *Saint-Gobain Performance Plastics*, Aurora, Ohio. He was key account manager and sales engineer at Kappa Optronics GmbH.

Pat Camacho (see photo) has been appointed VP-integrated command, control communications and intelligence systems for *Northrop Grumman Corp.'s* Defense Systems Div. in the company's Information Systems Sector. He was director of the critical infrastructure and force protection unit.

Greg Setter has joined *BDN Aerospace Marketing*, Mesa, Ariz., as account manager. He comes from Honeywell Aerospace, where he was marketing communications strategy manager for the commercial aviation business.

Hooman Yazhari has been named general counsel for Los Angeles-based *International Lease Finance Corp.* He was Gategroup's senior VP and general counsel. ☐



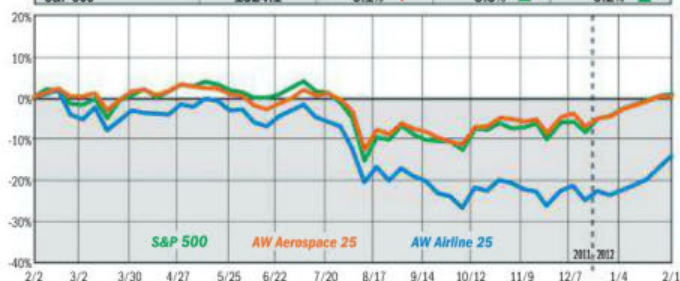
Follow Senior Business Editor
Joseph C. Anselmo on Twitter at:
twitter.com/AvWeekJoe

AW&ST/S&P Market Indices

(as of 2/1/2012)

PERCENT CHANGE

MARKETS	INDEX VALUE	WEEK AGO	YEAR-TO-DATE	YEAR AGO
AW Aerospace 25	1437.0	0.5% ▲	5.4% ▲	0.1% ▲
AW Airline 25	879.0	4.0% ▲	14.4% ▲	-15.9% ▼
S&P 500	1324.1	-0.1% ▼	5.3% ▲	0.2% ▲



COMMENTARY

Defense Disconnect:
Lean Times, Fat Profits

Are defense contractors earning too much money in an era of budget austerity? That question is being asked at the Pentagon after earnings results showed the industry managed to maintain and in many cases bolster profit margins in 2011, even as growth evaporated.

General Dynamics's Combat Systems unit raised its operating margin to 14.5% on a 1% sales decline. **Raytheon's** Integrated Defense Systems—which generates fat profits from foreign military sales—turned in a 16.9% margin for the year despite a 9% sales dip. **Lockheed Martin's** Space Systems, which has a lot of low-risk, cost-plus contracts, reported a 12.2% margin on 1% lower sales. And **Northrop Grumman's** Aerospace Systems and Electronic Systems raised margins to 12.1% and 14.5%, respectively, shrugging off sales declines of 3-4%. “The pattern continues—defense revenues light, defense margins strong,” says RBC Capital Markets analyst Robert Stallard. “With volumes heading down and the customer tightening the terms, we shall see how long this situation can last.”

Until a decade ago, the margins of military contractors averaged about 8%, according to James McAleese, a consultant to both defense contractors and the Pentagon. That changed when the war against Al Qaeda and the U.S. invasion of Iraq unleashed a torrent of new spending. (For a little perspective, **Boeing's** Commercial Airplanes unit reported an operating margin of 9.7% in 2011, while **Airbus's** commercial unit generated a 1.5% margin in the first half.) “It's not that defense contractors are gouging the government,” says McAleese. “But it is clear that on previously negotiated contracts, they are cutting costs faster than the revenues are falling.”

Indeed, industry veterans argue that the higher profit margins are the result of aggressive cost reductions and layoffs that companies have made to prepare for leaner days ahead. They predict that margins will come under more pressure as multi-year contracts awarded during boom times run out and are succeeded by new awards with less generous terms.

That already has started. As new programs become scarcer, competition among contractors has grown fiercer. For example, Boeing's winning bid of \$31.5 billion on the U.S. Air Force's tanker contract last year was more than \$10 billion lower than its original bid in 2008. And as the Defense Department grapples with budget cuts that could top \$1 trillion over 10 years, it is demanding that industry absorb a much greater share of the risk in developing new systems. “There is no doubt, based on where the Defense Department is going now, that margins will start coming down,” says McAleese.

It is little wonder then that companies such as Raytheon and **L-3 Communications** are warning Wall Street that profit margins will be slimmer this year. “Companies have had 10-plus years of great times,” says one longtime investor. “They're squirming like fish in a lake that's drying up.” ☹

Source of financial data: Standard & Poor's and Capital IQ Inc. (a Division of Standard & Poor's) U.S. dollars and cents. Forward P/E ratio uses S&P and Capital IQ forecasts of current fiscal year.

Weekly Market Performance

Closing Prices as of Feb. 1, 2012

Company Name	Current Week	Previous Week	Fwd. P/E	Tot. Ret. % 3 Yr.	Tot. Ret. % 1 Yr.
AIR TRANSPORT					
AAR Corp.	22.28	21.01	10.5	26.3	-17.6 ▼
ACE Aviation Holdings	10.63	10.38	-16.8	31.7	-15.1 ▼
AerCap Holdings N.V.	12.56	12.28	6.5	178.5	-17.7 ▼
Air Berlin	3.10	3.05	-1.8	-37.0	-32.6 ▼
Air Canada	1.16	0.97	-2.4	-43.1	-62.2 ▼
Air France - KLM	6.68	6.39		-30.2	-62.3 ▼
Alaska Air Group	77.68	75.44	8.2	187.5	29.5 ▲
All Nippon Airways Co Ltd.	3.11	2.85	22.1	-29.5	-19.6 ▼
Allegiant Travel Co.	56.27	54.64	14.2	63.3	33.2 ▲
Asiana Airlines Inc.	6.89	6.42	7.6	103.0	-29.3 ▼
Atlas Air Worldwide Holdings	49.06	44.38	9.4	276.2	-7.0 ▼
BBA Aviation plc	3.07	2.97	10.0	211.0	-10.8 ▼
B/E Aerospace Inc.	43.92	42.45	15.7	307.0	14.2 ▲
CAE Inc.	11.00	10.91	14.9	62.5	-14.4 ▼
Cathay Pacific Airways	1.97	1.89	9.9	93.2	-19.9 ▼
China Southern Airlines	25.31	26.65		222.8	-1.6 ▼
Copa Holdings SA	69.02	65.80	9.3	181.5	23.6 ▲
Delta Air Lines Inc.	10.90	9.96	4.6	54.2	-4.0 ▼
Deutsche Lufthansa AG	14.49	13.50	13.6	31.4	-25.7 ▼
easyJet plc	7.09	6.29	11.5	50.6	18.1 ▲
FedEx Corp.	92.70	92.59	13.4	92.4	2.7 ▲
GOL SA	7.03	7.32	16.2	70.3	-50.8 ▼
Hawaiian Holdings Inc.	6.31	6.58	5.2	56.6	-9.7 ▼
Heico Corp.	58.06	54.54	29.7	134.5	31.3 ▲
Jet Airways (India) Ltd.	5.33	4.88	-3.6	63.2	-46.0 ▼
JetBlue Airways	6.07	5.57	11.5	8.6	3.8 ▲
Korean Air Lines Co. Ltd.	48.24	41.86	8.6	68.1	-21.6 ▼
Lan Airlines SA	25.53	24.86	18.9	223.7	-6.7 ▼
Qantas Airways Ltd.	1.67	1.67	10.5	-27.3	-31.6 ▼
Republic Airways Holdings Inc.	5.99	4.53	6.1	-24.7	-7.1 ▼
Ryanair Holdings ADS	34.28	31.14	63.9	45.9	11.4 ▲
Singapore Airlines Ltd.	8.77	8.66	20.2	74.1	-8.7 ▼
Skywest Inc.	13.19	12.64		-10.7	-13.9 ▼
Spirit Airlines, Inc.	17.19	16.25	9.7		
Southwest Airlines	9.74	9.51	11.8	45.1	-15.7 ▼
TAM SA	22.06	21.61	12.1	230.6	7.7 ▲
United Continental Holdings, Inc.	23.21	20.41	4.6	155.6	-6.3 ▼
United Parcel Service Inc.	76.78	75.62	15.7	98.9	6.8 ▲
US Airways Group	8.90	7.52	4.0	55.6	-6.5 ▼
WestJet Airlines Ltd.	12.83	12.41	11.4	2.4	-2.2 ▼
Zodiac Aerospace SA	91.93	84.42	13.7	172.5	33.3 ▲

AEROSPACE BUSINESS

Handover Handshake

EADS board of directors has approved a planned management reshuffle after naming former European Central Bank chief Jean-Claude Trichet to the board in a bid to appease the French government. The leadership transition will now unfold as initially planned, with Airbus CEO Tom Enders succeeding retiring EADS CEO Louis Gallois this summer, and Fabrice Bregier moving into the top job at Airbus. Arnaud Lagardere takes over as EADS chairman from Bodo Uebber. The arrangement reflects the complexities of balancing French and Germany interests in the company.

AIR TRANSPORT

Penny Drops

AMR Corp. is looking to shed close to 20% of its workforce under a bankruptcy reorganization plan that includes \$2 billion in annual savings and a further \$1 billion in revenue growth. The company, which owns American Airlines and American Eagle, has only started to reveal details to its unions so specifics are scarce, but it is clear the operator wants to close its widebody maintenance facility in Fort Worth and reduce the size of its Kansas facility, choosing instead to outsource its repair work to reduce operating costs. Maintenance and fleet service workers will account for 8,800 of the roughly 13,000 positions being eliminated. Also gone are four under-

funded defined-benefit pension plans, with responsibility passed to a U.S. agency as part of \$1.25 billion in savings demanded from labor. AMR does, however, plan a 20% rise in departures over the next five years at its five hubs and a boost in international operations.

ERAM Progress

FAA has taken a major step in its much-delayed en route air traffic control upgrade, beginning operational use of the new system at six more FAA centers across the U.S. The En Route Automation Modernization (ERAM) system achieved initial operating capability at the six centers in December and January. ERAM will be the backbone operating system at all FAA en route centers, and is considered a precursor to NextGen.



DASSAULT AVIATION

Neuron First Flight Planned for Mid-Year

First flight of the European Neuron unmanned combat air vehicle (UCAV) demonstrator is planned for mid-2012 at the Istres flight-test center in France, where the air vehicle was assembled and rolled out late last month. The milestone began what is shaping up to be a critical year for UCAVs in Europe. Prime contractor Dassault says software integration is in its final stages, and ground and engine tests will start soon.

Neuron is a cooperative project led by France, with Italy and Sweden playing critical roles. Switzerland, Spain and Greece also are involved. The partners include Saab, Alenia Aeromacchi, EADS CASA, Hellenic Aerospace Industry and RUAG. During the rollout ceremony, Dassault Aviation CEO Charles Edelstenne

urged states "to define what should follow this project and the best way to gain full advantage of the work that has been performed."

During the trial phase, the goals include demonstrating weapons release and validating stealth performance.

Neuron is not Europe's only UCAV effort. Also due this year is first flight of the BAE Systems Taranis UCAV demonstrator for the U.K.

In addition, 2012 should see the U.K. and France finalize terms of cooperation in the medium-altitude, long-endurance (MALE) unmanned aircraft segment. That also is critical for UCAVs, because success in cooperating on the MALE system (with Dassault and BAE

Systems expected to be in charge) could lead to the two countries to work together in the unmanned combat aircraft segment.

Aerospace M&A Post Record-Setting Year

Deals for mergers and acquisitions in global aerospace and defense hit a new high in 2011, reaching \$43.7 billion, according to a new study by PricewaterhouseCoopers (PwC).

The industry saw 341 deals worth \$50 million or more announced during the year, topped by United Technologies Corp.'s \$18.4 billion agreement to buy Goodrich Corp. A distant second was the \$4.72 billion joint venture between Daimler and Rolls-Royce for German engine builder Tognum AG. Defense deals were dominated by a pair of \$2-billion spinoffs: shipbuilder Huntington Ingalls, which was separated from Northrop Grumman; and ITT Exelis, which split off from ITT.

The \$43.7 billion total was double the value of A&D deals in 2010 and surpassed the previous record of \$42 billion in 2007. European buyers were much more active in 2011 over 2010 as consolidation accelerated there and companies continued to acquire U.S. businesses.

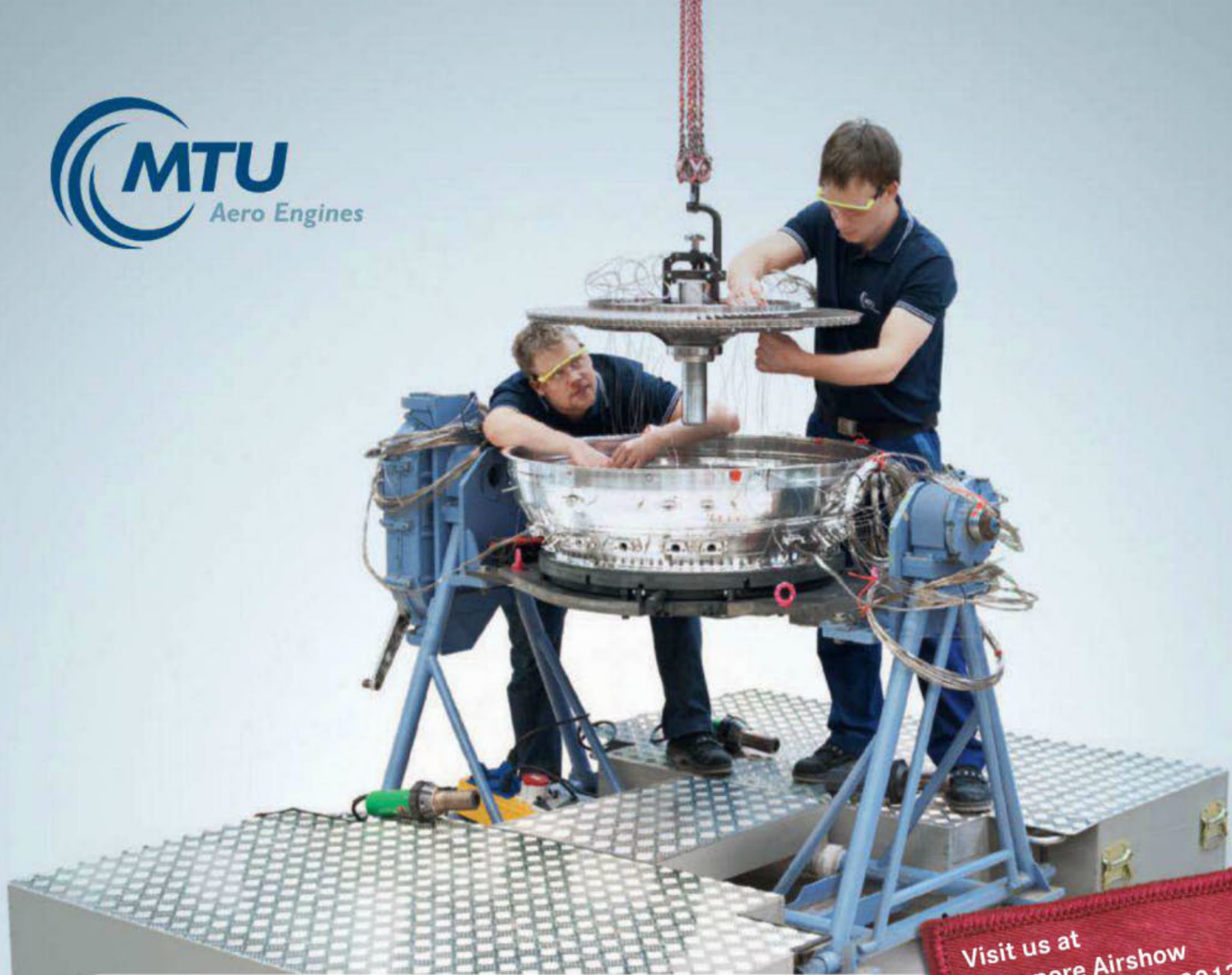
Looking ahead, PwC forecasts above-average deal activity in 2012, underpinned by a strong outlook for commercial aircraft production, supply chain consolidation, and moves by defense contractors to spin off underperforming units while continuing to make acquisitions in smaller, growth-oriented niches such as cybersecurity.

Additional Airbuses

Cathay Pacific and AviancaTaca are bolstering their commitment to Airbus. Cathay Pacific is adding six A350-900s to its backlog that already lists 30 of the Rolls-Royce-powered aircraft ordered in 2010. Those 30 were to be delivered in 2016-19; the additional six are to be handed over in 2016-17. Meanwhile, AviancaTaca has finalized a previous commitment for 33 A320NEOs and 18 classic A320s. Deliveries of the NEOs are due to begin in 2017.

Market Dominance

Qatar Airways has selected Engine Alliance GP7200 turbofans to power its Airbus A380s. The win for the General Electric/Pratt & Whitney joint venture continues its success in the Middle East, where Emirates and Etihad Air-

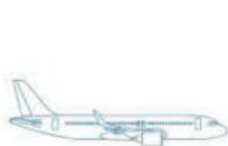


Visit us at
Singapore Airshow
February 14 - 19, 2012
Booth J65

It's quiet, it's clean, it's MTU.

15% less fuel, 15% less CO₂ emissions and noise levels cut in half – the geared turbofan is the aircraft engine technology of the future. And of course it features MTU's unique high-speed low-pressure turbine. Just some of the reasons why the game-changing GTF will also be powering the A320neo.

www.mtu.de



ways have also opted for the turbofan. It adds to the group's lead over rival Rolls-Royce with its Trent 900.

DEFENSE

Stuck in Their Seats

Fifteen new F-35 aircraft are grounded owing to the backward loading of parachutes in their Martin Baker ejection seats. Included in the grounding are six aircraft at Edwards AFB, Calif., used in the flight-test program, which is critical to keeping the program moving forward, and nine at Eglin AFB, Fla.

Talon Tests

A Hawker-Beechcraft AT-6 light attack demonstrator late last month fired a Raytheon Talon 2.75-in., laser-guided missile on the Eglin AFB, Fla., test ranges. It was the initial phase of the missile's testing on fixed-wing aircraft. A second, week-long test session at Eglin will begin Feb. 9.

Hungary for More

The Hungarian government has decided to extend its lease of 14 Saab JAS Gripen fighters until at least 2026. The move comes as the Czech Republic, another Gripen user, mulls its course of action, with air force officials suggesting they also would like to remain committed to Saab's single-engine fighter.

South Korea Race

South Korea has formally launched its F-X fighter competition, with the goal of having bids in hand on June 18. The program is expected to be for around 60 aircraft. The competition is expected to pit a version of the Boeing F-15, which South Korea has bought in recent procurements, against the Lockheed Martin F-35, recently acquired by Japan.

SPACE

Soyuz Capsule Scrapped

Russian space officials will scrap the next Soyuz crew carrier bound for the International Space Station (ISS) after it was damaged in a testing mishap at RSC Energia last month. Mike Suffredini, NASA's ISS program manager, says the descent and propulsion modules developed cracks and leaks after the spacecraft was overpressurized during a test of its flight-worthiness. As a result, the planned April 1 docking of Soyuz TMA-04M/30S to ISS will slip until

ESA Eyes What Comes Next For Galileo Spacecraft

Europe may be mired in financial austerity, but that has not derailed the region's effort to duplicate GPS with the Galileo satellite navigation and timing constellation. Instead, it is changing the economic equation underpinning the program.

Even as the European Space Agency contracts for the satellites to complete the initial operational system, which is due to come on-line in 2014, ESA is starting discussions with users on what the future Galileo spacecraft should look like. One of the topics is likely to be whether a follow-on generation of satellites can yield total system cost-reductions.

The technical debate, which also will include discussions of signal power, is just beginning but anticipation of user demands could start crystallizing by year-end, says ESA's Galileo program director Didier Faivre.

The Galileo program has been under increased pressure to cut costs after a mid-year review in 2011 determined it would cost €1.9 billion (\$2.49 billion) to put the initial constellation in place. Progress has been made since then, says European Commissioner for Enterprise Antonio Tajani, with the estimate now down to €1.4-1.5 billion. Long-term, the EU is looking for around €7 billion from member states for full implementation and renewal of Galileo post-2014.

Industry officials suggest that figure leaves little profit for suppliers, in particular OHB Technologies, which last week won a key contract to build eight more Galileo satellites, adding to its backlog that includes the first 14 full-operational capability (FOC) spacecraft.

The award is a big blow to Astrium, the losing bidder and the winner of the initial four in-orbit verification satellites—the first two were launched last year. ESA had committed to assuring a dual-sourcing capability and, having lost the first round, Astrium was seen as having the edge this time. The bids were “very close” Faivre says, and he remains confident Astrium will retain its technical expertise to bid when another satellite contract is up for competition around 2014. But Astrium has not lost out entirely. The company's Surrey Satellite Technologies unit is a key supplier to OHB on the 22 identical FOC spacecraft. The new deal for eight more is valued at €255 million. The satellite configuration passed its critical design review in December and now the integration phase is underway, says OHB Technologies Chairman and CEO Marco Fuchs.

“the middle of May,” he says. The first planned flight of the Space Exploration Technologies (SpaceX) Dragon cargo capsule to ISS is tentatively scheduled for launch no earlier than March 30, but given the work remaining to clear that mission, Suffredini says he doesn't expect it to go until early in April.

Engine Testing Progresses

Rocket-engine testing for U.S. human spaceflight is getting off to a roaring start in 2012, with SpaceX announcing the first hot-fire test of its SuperDraco hypergolic engine, and NASA preparing to begin testing the powerpack of the J-2X cryogenic upper-stage engine for its planned Space Launch System heavy lifter. Meanwhile, engineers at Stennis Space Center, Miss., are getting ready for the first in a series of J-2X powerpack tests at the NASA testing center's A-1 test stand. Plans call for about a dozen tests running through the summer.

Two Milestones for Atlas V

United Launch Alliance engineers have taken the company's Atlas V launcher through two more milestones on the way

to human-rating the Russian-powered rocket for human spaceflight. Working with NASA's Commercial Crew Program, the company completed a Tailored System Requirements Review intended to demonstrate how the vehicle meets the intent of NASA's requirements for human-rating certification, and a Probabilistic Safety Analysis Review of potential failure modes.

Correction: The Pilatus PC-12 aircraft mentioned in the Inside Business Aviation column in the Jan. 16 edition (p. 14) is outfitted with a door that can accommodate cargo up to 4 ft. square.

Correction: An article on 747-8 certification in the Jan. 23/30 issue (p. 12) misidentifies the Boeing 747-8 variant with range of 4,390 nm. That aircraft is the 747-8 Freighter.

Correction: A graph in the Jan. 23/30 edition (p. 40) on ATR deliveries contained transposed delivery figures for 2010 and 2011. ATR delivered 51 aircraft in 2010 and 54 last year.



To reduce
COSTS,
you have
to think
outside
the OEM.

PW4000 1st Stg. Blade



BELAC high pressure turbine blades can save your airline 35-45% versus the OEM. Every blade is authorized by the FAA and EASA, following a rigorous testing and certification process. And with over 50,000 BELAC blades currently in operation, their performance is proven.

Visit belac.com





chang
changes
everyth



e
ing

The *CSeries* aircraft delivers a **20%** fuel burn advantage — the first all-new aircraft in decades to reach this level. An achievement that gives today's airlines a **15%** cash operating cost advantage and **20%** less CO₂ emissions*. A new choice for a changed world.

CSERIES BOMBARDIER

www.cseries.com

Bombardier, CSeries and CS300 are Trademark(s) of Bombardier Inc. or its subsidiaries.

* 20% fuel burn advantage, 20% less CO₂ emissions and 15% cash operating cost advantage vs. average in-production aircraft of 110-seat & 130-seat categories @ 500 NM.

The CSeries aircraft program is currently in development phase and as such is subject to changes in family strategy, branding, capacity, performance, design and / or systems. All specifications and data are approximate, may change without notice and are subject to certain operating rules, assumptions and other conditions. The actual aircraft and configuration may differ from the image shown.

© 2012 Bombardier Inc. All rights reserved.



BY MICHAEL MECHAM

Northern California
Bureau Chief Michael Mecham
blogs at: AviationWeek.com
mecham@aviationweek.com

COMMENTARY

Finding the Pulse

Air Force GPS contract solidifies Boeing's drive for lean satellite manufacturing

It may seem a stretch to look for similarities between a C-17 or 737 assembly line and a satellite factory. The atmosphere in the two places is so different—literally. Airplane hangar doors are opened when it gets hot and machinists wear T-shirts and jeans. A satellite factory's temperatures are carefully controlled and particulate contamination is a big deal, so assemblers wear hair nets and “bunny suits” over their street clothes.

While not as dramatic as a line of 737s, Boeing's satellite factory is applying the same pulsed production techniques.

Nonetheless, Boeing's drive to gain the efficiencies of lean manufacturing has been part of the strategy at its Space & Intelligence Systems (S&IS) factory in El Segundo, Calif., since the mid-2000s, when Howard Chambers brought over production secrets that won quality awards for the C-17 program. (Chambers, who recently retired, was Boeing's manufacturing guru and later stepped in to help the 787 program.)

While lean principles can be applied to any manufacturing operation, they pay off best in repeatable processes. This is a tall order for satellite makers since so many of their products are custom-ordered. In El Segundo, the U.S. Air Force's GPS Block IIF program provided an opening for pulsed production because 12 identical spacecraft are to be built as part of a \$1.35 billion contract.

“Similar to an aircraft assembly line, the GPS IIF pulse line efficiently moves a satellite from one designated work area to the next at fixed rates,” says GPS program director Jan Heide. The process uses 13 dis-



BOEING

tinuous manufacturing post positions.

The first two spacecraft went through detailed program and design reviews to ensure that the Air Force was satisfied with what it was getting, so manufacturing operations did not really pulse. The factory needs a minimum of four spacecraft for that. The first two—GPS IIF-1 and IIF-2—were launched in May 2010 and July 2011, respectively; since then, the next two completed their acceptance testing and are in storage, awaiting launch on the Air Force's say-so.

Now the pulse line is fully working with the next four GPS IIFs under construction.

“Using this pulse-line approach, we are able to build up to six satellites per year,” says Vice President Craig Cooning, general manager of S&IS and Chambers's successor.

While the IIF program is Boeing's most leveraged pulse-line effort, S&IS's

reliance on its 702 platform for so many other programs, including USAF's Wideband Global Satcom, allows manufacturing to pulse at the system and component level, says WGS program director Mark Spiwak. The result is commercial and military satellites being built alongside each other, “leveraging common parts and process throughout the entire build process.”

RAISING THE ANTE

Alcoa is counter-attacking the rising use of composites in aircraft structures. The global aluminum giant will invest more than \$90 million to build a new plant in Lafayette, Ind., capable of churning out 20,000 metric tons a year of advanced alloys that it says will allow airframers to build lighter and lower-weight aircraft. Production is slated to begin in 2014. The company also will expand output of the patented third-generation aluminum-lithium alloys at facilities in western Pennsylvania and the U.K.

The advanced alloys, unveiled last June, will provide 10% weight savings and cost up to 30% less to manufacture, Alcoa says. The new alloys will require corrosion inspections just once every 12 years, matching one of the benefits of composites. “This will be a game changer and get us back in the envelope with composites,” says Eric Roegner, president of the company's Forgings and Extrusions unit.

Or will it? Composite manufacturing is not standing still. Boeing CEO Jim McNerney says the company is “at the very beginning of the learning curve” in composites with its breakthrough 787 program. “We see all kinds of reformulation to make them lighter, stronger and less costly to manufacture.” Composites are not all bad for Alcoa, either. The company derives \$1 billion a year—one-third of its aerospace sales—from titanium fasteners, which are used to bind composite skins to titanium underneath.

Alcoa is investing another \$100 million to rebuild a 50,000-ton press in Cleveland that forges aircraft parts. While two larger presses are under construction in China, Alcoa's technological prowess—including an advanced hydraulic control system—will enable it to forge aluminum parts with unmatched precision when it begins operating in February.



BY WILLIAM GARVEY

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

COMMENTARY

Hanging On

Light aircraft manufacturers will soon reveal their numbers, but one has none to show

Gulfstream Aerospace's remarkable end-of-year performance in 2011—delivering 35 aircraft, including a dozen G650s, in the fourth quarter—serves to mask the true condition of the business aviation manufacturing industry, which remains unwell.

On Feb. 22, when the General Aviation Manufacturers Association reveals the tally of aircraft its members built last year, the reaction is likely to be pained. Again. It's been that way since the market collapsed in late 2008.

To provide measure: In 2007, GAMA members delivered 4,272 piston airplanes, turboprops and business jets worth \$21.9 billion. Three years later, they turned out fewer than half that number, even though billings only declined to \$19 billion. The downward trend continued in the first nine months of 2011, with deliveries and billings both off by 10% from the same period in 2010.

The seeming disconnect between a 50% drop in units versus the relatively mild decline in billings reflects the disparity in the general aviation market: the most expensive business jets have continued to sell, but the (relatively) inexpensive light planes are taking a beating and account for most of the unit declines. While much attention has been paid to the sales falloff of light and medium business jets, it's the piston engine models that are in free fall.

Manufacturers delivered 2,755 piston-powered aircraft in 2006, and that number dropped to 889 in 2010—a 67% decline.

Nowhere has that market abandonment been more telling than in Kerrville, Texas, longtime home to Mooney Aircraft. In 2007, the privately held company delivered 79 single-engine aircraft, such as the Ovation (see photo), and billed \$42.8 million for them. Last year, it delivered none. Zero. Nada. Zilch. It delivered just two



MOONEY AIRCRAFT

in 2010—both in the first quarter.

In 2006, the company employed 480 workers. Today, there are nine.

Barry Hodkin, Mooney's CFO and one of the nine, says the main task confronting him and his colleagues is to "maintain all FAA accreditation"—Mooney's type and production certifications—"which we have done," he notes, and produce parts and provide tech support for the legacy fleet of 7,000 aircraft.

Those still working include the former heads of engineering, quality control, operations, information technology, finance and the chief test pilot—"a cadre of people to build a company around when we reemerge."

There are eight aircraft in various stages of construction on the assembly line and Hodkin says the search is underway for new investment to get the line going again. Various potential investors have made inquiries, he says, and "all options are open" as to what form of ownership structure could result.

Mooney has weathered economic setbacks before and has had a variety of owners, including Republic Steel and Butler Aviation, since its founding in Wichita by brothers Al and Arthur Mooney in 1929; they moved their company to Kerrville in 1953. Hodkin

declined to identify the current owners, who took control in 2003.

Despite the absence of factory-new aircraft, the Mooney market remains strong, according to Catherine Ahles, senior vice president of marketing and business development at Premier Aircraft Sales, Mooney's sole U.S. dealer. She says her Fort Lauderdale, Fla.-based company sold 36 Mooneys last year and that pricing was holding up. Moreover, she says tight credit, a tough economy and the high prices of new aircraft are causing the market to shift to used from new aircraft.

For example, the last Mooneys to come off the line were priced at \$650,000-700,000, whereas a very well-equipped two-year-old aircraft fetches \$550,000 or much less, depending on the model.

A part of the challenge for any new investors is the 280,000-sq.-ft factory itself. Unlike some highly automated facilities, the Kerrville plant is from another era. "It's like walking into the 1950s," recalls one visitor. Building Mooneys in such a facility is a labor-intensive enterprise, which is to say, expensive.

The offices, assembly plant, paint shop and surrounding acreage sit at Kerrville Municipal/Louis Schreiner Field Airport, from which they are leased. If Mooney fails to revive, there's talk of turning part of the facility into hangars and bulldozing the rest.

Curiously, the loss of hundreds of jobs seems to have had a rather mild impact locally. Unemployment in Kerr County is just 6%, or well below the national average.

Still, all agree that they'd like those jobs to return, and Premier's Ahles says her company would like to again sell some factory-new machines. That could happen.

Asked if there might be an investment announcement coming this year, Hodkin replies, "I would expect so." But there is a caveat. Asked if a rejuvenated Mooney would make airplanes in Kerrville, he responds, "All the potential investors I've spoken with said they would keep a presence in Kerrville."

But what kind and size of presence? A manufacturer that is going on two years of building nothing has few answers to give. ☹



*International Air Transport
Editor Jens Flottau can be
reached at: Jens@flottau.com*

COMMENTARY

SPANAIR'S PROLONGED FINISH

The demise of struggling carriers can take years—as the history of many of the failed airlines has shown—and all too often their executives are very creative in finding yet another investor who is courageous enough (or is ill-informed about the industry) to extend an ailing enterprise a lifeline. Bankruptcies are therefore rare and spectacular. But the case of Spanair is particularly interesting: The carrier stopped flying because the Catalan regional government—in the midst of the near-European-wide financial crisis—stated it can no longer support it, and Qatar Airways astutely ceased its takeover talks.

The bankruptcy underscores that national governments have remained deeply involved with the airline industry. This is true to a lesser extent with the megacarriers, although governments do play some part within that

realm, given that France still owns part of Air France-KLM.

Governments are, however, more connected to the medium-sized and smaller airlines that they believe are of strategic importance to their regions or countries. From the airlines' perspective, it is nice to know that European governments appear to acknowledge that these enterprises are an important trigger for economic development. But there are more intelligent ways to support the industry than by propping up nonviable carriers based on questionable business models.

In Spanair's case, the airline became notorious among its competitors for offering aggressively low fares, far below what could reasonably be the airline's own break-even threshold. Keeping Spanair artificially afloat kept other, more viable, airlines from moving into the Barcelona market at a faster pace.

The capital of Catalonia is a center

for both business and leisure travelers and it boasts a very good, large airport. Plus, an airline is already based in the city; Iberia's low-fare affiliate Vueling Airlines' headquarters is nearly adjacent to Barcelona airport.

This most recent grounding serves as a reminder of just how intense competition is in the Spanish market. Spanair is the third local airline to go out of business in five years, following Air Madrid and Air Comet.

Competition comes from outside of the country, for the most part, with nearly all of Europe's low-fare airlines serving several destinations in Spain. Even Vueling, which has a far lower cost base than Spanair had, was trying to avoid competing directly with outside competitors. And Iberia is in the process of outsourcing part of its routes within Europe to a new subsidiary. The Madrid-based flag carrier has accepted that it is losing too much money in trying to handle all the flights on its own. ☹

European Union emission allowance (EUA) prices rebounded in January, taking support from colder weather in Europe, which boosted demand for domestic heating, driving up CO₂ emissions and the demand for allowances.

EUAs for delivery in December 2012 rallied to €8.04 per metric ton (\$10.56 per metric ton) on Jan. 31, up from an all-time low of €6.60 on Jan. 3.

As well as colder weather in Europe, cautiously bullish sentiment prevailed in the market amid moves by EU lawmakers to propose increasing the ambition of CO₂ reduction targets in the region.

The European Parliament's environment committee voted Jan. 31 in favor of an increase in the EU's 2020 CO₂ emissions reduction target to 25% from 1990 levels, up from the current 20% target.

The environment committee in December voted on a proposal to set aside allowances to help reduce a surplus of credits that has caused the carbon price to collapse.

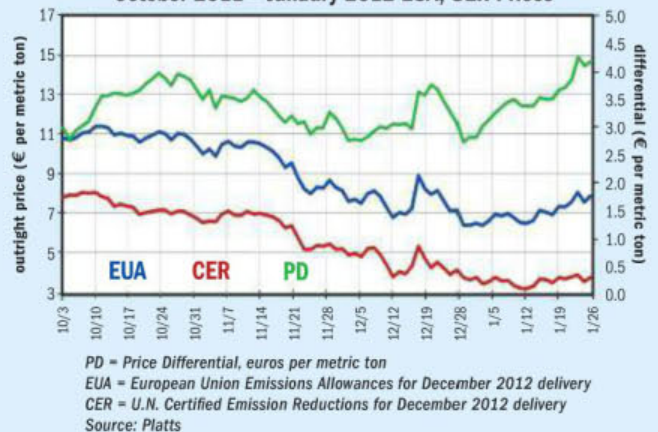
Elsewhere, the system's regulator—the European Commission—stated on Jan. 30 that it had partially opened its central CO₂ emissions trading hub, the "Union registry," to airline operators.

The registry tracks ownership of allowances held by the operators of power plants and factories regulated by the EU's emissions trading system. The decision to open the registry to airlines means they can now open accounts on the system, and receive free allocation of EU Aviation Allowances (EUAA) from the EC—scheduled to take place before Feb. 28.

Airlines will not be able to buy or sell EUAAs until the registry becomes fully operational in the second half of 2012.

However, airlines that expect their 2012 CO₂ emissions to

Daily Emissions Price Assessments
October 2011 – January 2012 EUA, CER Prices



exceed their level of free allowance allocation can already purchase regular EUAs or United Nation carbon offset credits for delivery into an account on an EU national registry.

In further signs that the aviation sector is gearing up for carbon trading, Air France joined Paris-based environmental exchange BlueNext Jan. 12, and New York-headquartered Green Exchange said it is mulling the launch of derivative products for aviation carbon allowances, in response to demand from the industry. ☹

—Frank Watson/Platts/London

For further information, please visit:
platts.com/ElectricPower/Resources/NewsFeatures/emission/index.html

Anyone who's flown lately knows that air travel could be more efficient. As the world's premier aerospace university, Embry-Riddle is doing something to achieve this. At the Florida NextGen Test Bed, we and our partners are advancing the next generation of flight by testing some exciting new technologies. These innovations will lead to shorter, more direct routes, reduced noise and fuel emissions, and a smarter air system for everyone, from the smallest plane to the commercial space vehicles of tomorrow. Yes, at Embry-Riddle we aim for the stars. But we always keep home close to our hearts.

EMBRY-RIDDLE
Aeronautical University.
FLORIDA | ARIZONA | WORLDWIDE

We have an infinite amount of string for the truly inquisitive.



scan to see us in action

www.embryriddle.edu



Senior Editor Frank Moring, Jr., blogs at: AviationWeek.com/onspace
moring@aviationweek.com

COMMENTARY

Techno Fix

Engineers may replace lobbyists in spectrum management

It's amazing how much can be packed into a single, seemingly throwaway line when the context is a president's State of the Union address. President Barack Obama didn't even devote a full sentence to rural broadband service in his Jan. 24 speech, but his few words covered a lot of ground.

"So much of America needs to be rebuilt," Obama said. "We've got crumbling roads and bridges. A power grid that wastes too much energy. An incomplete high-speed broadband network that prevents a small business owner in rural America from selling her products all over the world."

Sen. Jay Rockefeller (D-W.Va.), who chairs the Senate Commerce Committee which oversees communications policy, heard the president's "call for national broadband connectivity."

"I have pushed for affordable, high-speed and wireless Internet to be available to communities all across our country, and believe it's crucial that we close the digital divide in rural America," Rockefeller says.

That little bit of political dialog represents decades of wrangling over how the U.S. government can best manage radio frequency spectrum for the benefit of the American people, who own it. Spectrum is considered a national resource, like the public lands out West. In the 21st century, it's undergoing some changes, as new technologies for using that resource come online.

The stakes are huge and go far beyond making sure the benefits of broadband are available out in the country. One way the government has managed spectrum is by selling it at auction, and the results of recent bidding show just how valuable it can be to the U.S. Treasury. Deficit-reduction legislation enacted in 2005 required the Federal Communications Commission (FCC) to deposit \$7.4 billion from the sale of spectrum released in the transition from analog to digital television broadcasting. The amount was

based on a Congressional Budget Office estimate that was doubled when the bids were in. The treasury reaped more than \$15 billion from the sale.

That wasn't a fluke. In 2006, the National Telecommunications and Information Administration received \$13.9 billion in bids for government advanced wireless services spectrum it controlled. Of that amount, \$936 million will pay the cost of shifting government wireless communications to new frequencies. The rest will go to the treasury.

Those figures come from a Congressional Research Service (CRS) report on broadband policy issues facing lawmakers this year. With deficit reduction a hot-button issue, a lot of pending legislation aims at using spectrum auctions to restock the nation's coffers, including more shifting of government-controlled wavelengths to companies willing to pay for it.

Some of those proposals are sure to produce fireworks. LightSquared, which is trying to build a 4G-LTE broadband wireless terrestrial/satellite network, hasn't ruled out a court fight over continued government refusal to grant it a waiver to operate. A government panel concludes the company's signal "would cause harmful interference to many GPS receivers," including those incorporated in aircraft safety-of-flight navigation systems.

The CRS report notes that many of the bills "actively under consideration would require that additional frequencies be reallocated from federal to commercial use," with a range of approaches to using any funds generated in the process. It also suggests that

"pooling resources, one of the concepts that powers the Internet now, is likely to become the dominant principle for spectrum management in the future."

When Rockefeller's committee is marking up legislation, the marble hallways outside the panel's meeting room are packed with lobbyists trying to protect their clients' interests, usually at the expense of another lobbyist's client or federal agencies such as those fighting LightSquared over GPS interference. Maybe it's time to call in the software engineers instead. ☼

DATA DUMP

The Japan Aerospace Exploration Agency (JAXA) plans to distribute some of the minute samples its Hayabusa probe returned from the asteroid Itakawa. The spacecraft, which imaged its shadow against the type-S asteroid as it approached in the fall of 2005 (see photo), returned more than 1,000 asteroid particles measuring about 10 micrometers (0.0004 in.) despite control problems at its target (AW&ST Nov. 22, 2010, p. 18). The tiny samples



ISAS/JAXA

have been analyzed by Japanese scientists and now will be available in a peer-reviewed opportunity. Research proposals will be accepted until March 7, and selections will be announced in mid-May, JAXA says. ☼

SPECIAL DELIVERY

The first of the retired space shuttle orbiters to go on display will arrive at its final destination April 17. Discovery is due to land at Washington Dulles International Airport atop a shuttle carrier aircraft and then be delivered to the National Air and Space Museum's Steven F. Udvar-Hazy Center there two days later. NASA's workhorse shuttle will replace the atmospheric test article Enterprise in the museum display. ☼



BY JAMES R. ASKER

Executive Editor
James R. Asker blogs at:
AviationWeek.com
jim_asker@aviationweek.com

COMMENTARY

Spirited Debates

Rows over airfare transparency, lunar colonies

Tis it nobler to add or to subtract? That is the question. And the slings and arrows of outrage are flying, as airlines, the Transportation Department and consumer and trade groups argue in the courts of law and public opinion about the fairness and impact of new rules on ticket price transparency and refunds. Effective Jan. 26, airlines must show consumers total fares, including taxes, from the get-go. If carriers wish, they can later show exactly what they get and how much is taxes—often a lot.

Many airline advertisements and websites had been doing it the other way around, offering only a partial price initially, while merely noting that ticket taxes will be added later—a practice that consumer groups say had passengers chasing the total fare in airlines' games of hide-and-seek. Florida-based low-cost carrier Spirit Airlines, Allegiant Air and Southwest Airlines have filed suit here to reverse the rules. But Spirit is going even further. CEO Ben Baldanza is calling the new rule "disingenuous" and "sneaky," and Spirit's website features a prominent "WARNING!" telling fare prospectors, "New government regulations require us to HIDE taxes in your fares." Another new DOT rule means consumers now have 24 hr. after making a reservation in which to cancel and get a full refund, as long the flight is at least a week away. Estimating that the full-refund rule will cost it \$1.50-2.25 per customer, Spirit announced a \$2 "DOTUC" fee; the UC stands for unintended consequences. The moves have drawn rebukes from Sen. Barbara Boxer (D-Calif.) and DOT General Counsel Robert Rivkin. But Rep. Tom Graves (R-Ga.) has introduced a bill to overturn the fare advertising rule.

REUTERS/LANDOV



'It may be a big idea, but it's not a good idea.'

MITT ROMNEY

Meanwhile, Finnair managed to draw a \$35,000 fine for violating the old rule. It ran a ticket price excluding taxes on its website, which used to be OK, but the note about extra taxes appeared only in tiny print at the bottom of an extensively long web page, a no-no even then. ☹

BAYING AT THE MOON

A week that included a rare debate on space policy among presidential candidates finished with some notable space hands endorsing former Massachusetts Gov. Mitt Romney. Campaigning along Florida's "Space Coast," Former House Speaker Newt Gingrich had proffered an admittedly "grandiose" idea of colonizing the Moon, mainly via incentives to private industry. Opponents said the idea is

unrealistic and pandering. Gingrich even envisioned statehood for the Moon. "It may be a big idea, but it's not a good idea," Romney retorted in a debate televised from Jacksonville. Romney's space cadre ignored Republican internecine warfare and swung their light sabers at Democrat Barack Obama. They castigated the president for fostering "a space program unworthy of a great nation." The group—which includes former NASA Administrator Michael Griffin; Mark Albrecht, executive secretary of the National Space Council under President George H.W. Bush; Peter Marquez, National Security Council space policy director under President George W. Bush; and ex-astronauts Robert Crippen and Gene Cernan—says Romney "will ensure that NASA returns its focus to the project of manned space exploration that uniquely affirms American strength and values around the globe." Scott Pace, an academic who was a space policy wonk at NASA and the White House Office of Science and Technology Policy, heads the "Romney Space Policy Advisory Group." ☹

FINALLY, ON THE 24TH ATTEMPT

The NextGen air traffic modernization system and the makers of unmanned aircraft for the civilian market were two big winners in the deal reached last week on a version of a bill to authorize \$63.6 billion over the next four years. Although negotiations to pass a reauthorization of long-term spending for the FAA—which endured an astounding 23 short-term extensions—bogged down chiefly on matters rife with political ramifications, lawmakers had quietly agreed to modernization policies. The bill, which is still awaiting a final stamp of approval in Congress, sets deadlines for the FAA in modernizing NextGen and allows the FAA to seek loan guarantees and public-private partnerships to buy equipment upgrades. The bill also smooths the flight path for UAVs in civilian airspace, requiring the FAA to create a plan that would integrate UAVs into the National Airspace System by Sept. 30, 2015. And it calls for an expansion of UAVs in the Arctic (see p. 66). ☹

Breaking the Flu

Multirole, modular UAV will pioneer flutter-control technology for USAF and NASA

GUY NORRIS/EDWARDS AFB, CALIF.

Research suggests that the ambitious performance goals of future long-endurance reconnaissance aircraft and highly efficient commercial transports may only be achievable by using very light structures and long, slender wings.

However, as any freshman aerodynamics student knows, such designs are potentially prone to the phenomenon of flutter—the catastrophic dynamic coupling that can occur between the elastic motion of the wing and the aerodynamic loads acting on it. Unless developers can overcome this looming threat, the benefits of such advanced design concepts may never be realized.



Spurred by this challenge, and the need to develop stable wing-mounted sensors for future high-altitude, long-endurance (HALE) reconnaissance aircraft, the U.S. Air Force Research Laboratory (AFRL) is planning to test technologies for mitigating flutter using a new X-plane, designated X-56A. Supported by NASA, which plans to use the testbed for a long-term research asset after the AFRL work is completed, the X-56A is a flying wing unmanned air vehicle (UAV) designed by Lockheed Martin's Skunk Works. The vehicle's first task will be to test active flutter-suppression and gust load alleviation technology.

Formerly dubbed the Multi-Use Technology Testbed, the UAV will test to the edge of the flight envelope where flutter occurs. If a test goes too far and a wing fails in flight, the X-56A is fitted with a fuselage-mounted ballistic parachute based on the recovery system installed on the Cirrus SR22 light aircraft. Powered by twin JetCat P240 turbojets, and configured for easy wing replacement,

the aircraft will be tested with stiff wings as well as multiple sets of flexible wings. The design also includes a hard point on the center upper deck of the aft fuselage, which can either be adapted to house a third engine or the boom for a joined wing, thereby enabling testing of more advanced aerodynamic concepts.

The 28-ft.-span vehicle is the key test asset for the AFRL-led Multi-utility Aeroelastic Demonstration Program (MAD). This endeavor is contributing to follow-on work to SensorCraft, a class of HALE vehicles intended for surveillance as well as telecommunication relay and environmental sensing. Following Air Force flight tests, the X-56A is expected to be used by NASA's Dryden Flight Research Center for further work, which also will benefit lightweight structures and advanced technology for future low-emissions transport aircraft.

For the initial phase, NASA is providing labor to oversee safety and the conduct of the flight tests, as well as overseeing Lockheed Martin's op-

eration of flights on behalf of AFRL. NASA adds that "in addition, AFRL will provide about \$300,000 in procurement to pay range and related operations costs." As for future work beyond the Air Force research, NASA expects a "commitment from the Subsonic Fixed Wing [program] to support flights on the X-56A in fiscal 2013-15 within the next 90 days."

"The intent is to reduce the operating empty weight of transport aircraft through lighter structures and one of the approaches to do that is to allow them to be more flexible and thus lighter. But to do that you need gust load alleviation and flutter suppression. We're now in the process of putting together a road map for technology demonstrations on the ground and in flight over the next 15 years," says Gary Martin, deputy project manager for the Subsonic Fixed Wing project at Dryden.

The NASA flights will help to develop guidelines and methodology for active dynamic structural con-

Flutter Barrier

The X-56A will fly first with a stiff wing set.

trol as well as provide flight-validated aircraft models for academia. The aeroelastic and lightweight structures research will also contribute toward long-range planning for the proposed X-54 low-boom supersonic demonstrator program.

Displaying clear design heritage from Lockheed SensorCraft concepts as well as flying-wing designs including the P-175 Polecat, RQ-170 and DarkStar UAVs, the X-56A is charac-

NASA, which has a similar interest in pursuing configurations for future aircraft."

Originally AFRL planned to build a large-scale SensorCraft demonstrator that would incorporate as many of the enabling technologies in one testbed as possible. However, the lab later determined the plan was too expensive and opted instead for a scaled-down testbed focused on active aeroelastic control. "The original plan was to build one aircraft that was a scaled version of one of contender concepts. But we continued to look at additional configurations,

to install a fiber-optic shape-sensing array," he adds.

The stiff wing allows for future research, so it provides plenty of flutter margin for additional test capability. "Once the baseline wing is tested out they will put on the flexible wings," says Burnett. Data from leading edge stagnation point sensors and embedded accelerometers will be fed into control laws which will control flight surfaces and a body flap on the trailing edge to control flutter.

The team plans to test the vehicle "at parts of the envelope below the first flutter mode and do a series of control surface sweeps to understand and validate the models. Once we've done that, we'll push further and further into flutter speeds. We're planning on going up to where flutter starts, or just to the point where we tickle the dragon, as it were," says Burnett.

Exactly where this takes place is predicted to be at 95 kt., where the first body torsion flutter mode will be encountered, followed by symmetric body torsion flutter at 116 kt. and axisymmetric torsion bending at 118 kt. Total envelope, with flutter suppression on, will be tested out to 150 kt.

The X-56A is in final assembly at GFMI Aerospace and Defense, a Fountain Valley, Calif.-based engineering company specializing in prototype and mock-up development. The aircraft is currently due to be delivered to Lockheed Martin in late April and transported to Edwards AFB in June. Flights with the 452nd Flight Test Sqdn., part of the 412th Test Wing, will begin at the North Base in July and continue through September. Following an approximately 25-hr.-long flight-test effort, the X-56A is expected to be transferred to NASA by year-end. ☐

terized by a blended-wing-body planform. Under its X-56A contract, Lockheed will supply a ground control station as well as two identical center bodies, each 7.5 ft. long, and four sets of constant chord wings. One set will be stiff for baseline flight tests, as well as follow-on research, while the remaining three will be identical flexible wings for flutter testing.

Pete Flick, AFRL MAD program manager, says the SensorCraft studies "led us to very different configurations that are inherently more flexible with high-aspect-ratio wings. Gust load alleviation and flutter suppression are two key technologies we needed to pursue and there was no testbed out there where we could test active flutter suppression without a lot of risk. So we went out to develop a vehicle specifically for that purpose. So that's what motivated AFRL, and to work with

so we designed it to host other configurations such as the joined wing," says Flick.

With a takeoff gross weight of 480 lb., the X-56A was designed "to a specific stiffness as opposed to a specific strength. Usually you make sure it's designed for a certain strength," says Lockheed Martin program manager Ed Burnett. This was achieved by changing the material selection for the different sets of wing skins. "The substructure for all the wings is identical. The only area where we changed materials is the skins. The stiff wings are a very detailed layup of carbon fiber plies with foam core, while the flexible skins are made from fiberglass and foam. For the flexible wing, NASA also asked us



Budget Cyber Threat

F-35 and classified programs victimized by network intrusions

DAVID FULGHUM, BILL SWEETMAN and AMY BUTLER/WASHINGTON

How much of the F-35 Joint Strike Fighter's spiraling cost in recent years can be traced to China's cybertheft of technology and the subsequent need to reduce the fifth-generation aircraft's vulnerability to detection and electronic attack?

That is a central question that budget planners are asking, and their queries appear to have validity. Moreover, senior Pentagon and industry officials say other classified weapon programs are suffering from the same problem. Before the intrusions were discovered nearly three years ago, Chinese hackers actually sat in on what were supposed to have been secure, online program-progress conferences, the officials say.

The full extent of the connection is still being assessed, but there is consensus that escalating costs, reduced annual purchases and production stretch-outs are a reflection to some degree of the need for redesign of critical equipment. Examples include specialized communications and antenna arrays for stealth aircraft, as well as significant rewriting of software to protect systems vulnerable to hacking.

It is only recently that U.S. officials have started talking openly about how

data losses are driving up the cost of military programs and creating operational vulnerabilities, although claims of a large impact on the Lockheed Martin JSF are drawing mixed responses from senior leaders. All the same, no one is saying there has been no impact.

While claiming ignorance of details about effects on the stealth strike aircraft program, James Clapper, director of national intelligence, says that Internet technology has "led to egregious pilfering of intellectual capital and property. The F-35 was clearly a target," he confirms. "Clearly the attacks... whether from individuals or nation-states are a serious challenge and we need to do something about it."

The F-35 issue was ducked as well by David Shedd, deputy director of the Defense Intelligence Agency, but not the impact of cybertheft on defense spending and operational security.

"I am not going to talk about the F-35, Shedd says. "I'd be sitting with the secretary having a counseling session. The answer is absolutely yes. The leaks have hurt our efforts in that it gives the adversary an advantage in having insights into what we're doing. It should be clear that whether there are leaks on the technol-

ogy side or that affect preemptive decision-making, they are very damaging to the intelligence community."

Those closer to the program are less equivocal about the damage that cyberintrusions are causing the JSF program.

"You are on to something," says a veteran combat pilot with insight into both the F-35 and the intelligence communities "There are both operational and schedule problems with the program related to the cyber data thefts. In addition, there are the costs of redressing weaknesses in the original system design and lots of software fixes."

The subject also was addressed during Pentagon briefings about President Barack Obama's budget for 2013.

"We are very attentive... to cybervulnerabilities in weapon systems, ours and those of others," says Deputy Defense Secretary Ashton Carter. "It's part of the modern world. It's a highly computerized airplane. Like all our other computer systems, we have to be attentive to it."

In July 2011, then-Deputy Defense Secretary William Lynn pointed out that a foreign intelligence agency had victimized a major defense contractor and extracted 24,000 files concerning a developmental system. That is important because a decision to redesign a compromised system depends on whether the lost information would help the intruder develop similar systems and generate methods of attack and defense. Some U.S. officials have pegged the costs at tens of billions of dollars.

There is some empirical evidence to



This new Chinese UAV with a joint wing and tail resembles Boeing's Sensor Craft design. It is estimated to have a 60,000-ft. cruising altitude and a 300-mi. radar surveillance range and the potential for a reduced radar cross section.

CHINESE INTERNET

support this concern. China has made a habit in recent years of regularly rolling out new aircraft designs, including the J-20 stealth prototype strike fighter and a series of new unmanned aircraft that look like U.S. designs such as the Global Hawk and Sensor Craft.

Nonetheless, the Pentagon's ardor for the strike fighter has not dampened.

"We want the airplane," Carter declares. "We want all three variants. At the same time, there is the issue of cost and the performance of the program in this difficult time when we are trying to reach full-rate production. That's still a concern. We'll ride up that curve to full-rate production when it's economically and managerially prudent to do it."

Despite the proclamation of support for the program, the Pentagon is expected to reduce by 179 aircraft the U.S. buy of F-35s through 2017 in the forthcoming fiscal 2013 defense spending request, according to a Reuters report. If approved by Congress, this would dash the hopes of Lockheed Martin to swiftly ramp up production and lower per-unit prices, a goal tied to the company's campaign to sell the aircraft abroad. The Pentagon's reasoning for slowing production is to reduce the impact of yet-unknown problems that could still arise from the flight-test program. In addition, the Block II software package is late. It was slated for release to the flight-testing fleet by the end of last year.

An early concern about a possible avenue for hacking into stealth aircraft, the F-35's Multifunction Advanced Data Link (MADL), is no longer suspect. It was dropped as an add-on to the F-22 and B-2 that would allow stealth aircraft to communicate without being detected. Program insiders say MADL was scrubbed as a "pure money issue." MADL was designed for high throughput, frequency-hopping and anti-jamming capabilities with phased-array antenna assemblies that send and receive tightly directed radio signals.

The F-35 program may have been vulnerable because of its lengthy development. Defense analysts note that the JSF's information system was not designed with cyberespionage, now called advanced persistent threat, in mind. Lockheed Martin officials now admit that subcontractors (6-8 in 2009 alone, according to company officials) were hacked and "totally compromised." In fact, the stealth fighter program probably has the biggest "attack surface" or points that can be attacked owing to

the vast number of international subcontractors.

There also is the issue of unintended consequences. The 2009 hacking was apparently not aimed at the F-35 but rather at a classified program. However, those accidental results were spectacular. Not only could intruders extract data, but they became invisible witnesses to online meetings and technical discussions, say veteran U.S. aerospace industry analysts. After the break-in was discovered, the classified program was halted and not restarted until a completely new, costly and cumbersome security system was in place.

There is another view of what is affecting JSF and why. A former senior staffer for the U.S. Senate contends that the F-35 program's problems reflect diminishing interest in manned aircraft whose performance is limited primarily by its aircrew.

"I think the biggest issue facing the JSF is that there has been a profound shift in the military's perception of the value of manned aircraft compared to unmanned aircraft," he says. "I've had long conversations with a Marine Corps forward air controller who has just returned from Afghanistan. He pointed out that an F/A-18 can be kept on call for 15 minutes, but an unmanned Reaper is there for eight hours. The day of the fighter pilot is over. There has been a seismic shift in the military's value judgment of manned and unmanned aircraft."

However, that is a disputed analysis.

The JSF and its mission of penetrating integrated air defense systems will not be threatened by unmanned aircraft despite cost issues, says a retired aerospace official who has been involved with the F-35 throughout its life. ☐

Looking East

Airlift, helicopters trimmed as Pentagon renews focus on strategic forces

AMY BUTLER and DAVID FULGHUM/WASHINGTON

The Pentagon's forthcoming \$613.4 billion funding request for next year outlines a series of significant cuts—and hints at operational sacrifices—but several questions remain unanswered about what is ahead as defense spending flattens.

This budget request is designed not only to slice \$487 billion over 10 years, as required by the Budget Control Act, but to shift the Pentagon's focus to the Asia-Pacific region while reducing the U.S. presence in Europe, in accordance with the White House's new military strategy.

The U.S. Navy plans to procure its first afloat staging base, a massive sea-based platform capable of housing special operations forces, intelligence-collection systems (such as unmanned air systems), short-takeoff-and-vertical-landing fighters and rotary-wing aircraft. Though this concept has been on the table for a decade, it appears to have gotten traction recently as the Pentagon turns its focus east.

To support a renewed emphasis on defeating anti-access challenges, the

Pentagon will continue a second year of funding for a new bomber, a longtime goal of the U.S. Air Force, though a figure has not been provided. The existing force structure of 20 stealthy B-2s, 68 B-1s and 94 B-52s will also stay intact. In addition, the Navy plans to boost the capability of its submarines to launch advanced cruise missiles and design a conventional strike missile deployable from submarines originally proposed by the George W. Bush administration, that met with congressional resistance.

These details were provided by Defense Secretary Leon Panetta and other senior Pentagon leaders during a rare budget request preview last month; the actual proposal will be sent to Congress Feb. 13.

In contrast to the focus on strategic forces, the Air Force's tactical aircraft and airlifters are being trimmed. The service plans to shutter six of 60 tactical aircraft squadrons—123 fighters, including 102 A-10s and 21 old F-16s—as well as an additional training squadron. This will leave 246 A-10s in the fleet. "None of that will impact our ability

to dominate the skies," Panetta says, though Air Force leaders have warned that retiring fighters, especially after a previous cut of 250 airframes, does jeopardize the capability to quickly execute some missions.

Panetta also proposes reducing the U.S. Army and Marine Corps end strengths following the conclusion of combat operations in Iraq and as activities in Afghanistan wind down. This is prompting planners to cut back on their airlift fleet.

The Air Force plans to mothball \$1.04 billion worth of brand new L-3 Communications/Alenia North America C-27Js and instead provide the time-sensitive, direct airlift support to ground troops using USAF C-130s. The Pentagon's justification is that the C-27J, a small aircraft desired largely by the Army as a Sherpa replacement, was not required. "We did not experience the anticipated airfield constraints for C-130 operations in Afghanistan and expect these constraints to be marginal in future scenarios," a Pentagon white paper states. Thirteen of the 38 of the aircraft that have been delivered could be eligible for sale to an ally but will likely be put into storage in the near term; the cost of this has not been released.

Army officials are disappointed by the storing of the C-27Js and have complained of lackluster support for their urgent needs in Afghanistan. Gens. Ray Odierno and Norton Schwartz, chiefs of staff for the Army and Air Force, respectively, signed a memorandum of understanding late last month outlining how the direct-support airlift mission would be handled in the future. Odierno was the commander of forces in Iraq when the Air Force led an experiment to compare use of the C-27J and C-130. "I thought it was a very successful test. So . . . I'm comfortable with that," he says. "We'll mitigate the loss of the C-27. I'm not sure we'll be able to completely mitigate it, but that will help at least, as we're deployed, to mitigate that problem."

Sixty-five older Lockheed Martin C-130s will be retired, leaving a fleet of 318 of the aircraft; another 27 of the company's C-5As will be retired as well. This will leave the Air Force with 52 modified C-5Ms, and 222 Boeing C-17s capable of handling strategic airlift missions.

Meanwhile, the Army and Air Force are putting off some helicopter modernization plans. The Army remains committed to its purchases of Boe-

ing Chinooks and Apaches as well as EADS Lakotas. Though details are not yet out, these efforts are slowing. "We're very comfortable with that because of the reset that we're doing with all our aviation assets as they come out of the war zones in Iraq and Afghanistan," Odierno says. "We are still continuing to modernize our fleet, but it'll be at a bit of a slower pace."

Still unclear is whether the Army will set aside money to move ahead with an armed scout helicopter. The service is awaiting approval from acting Pentagon procurement czar Frank Kendall to move forward with a demo of candidate

U.S. AIR FORCE



Older U.S. Air Force F-16s are among the aircraft slated for retirement, drawing the ire of some lawmakers.

aircraft this spring, but there is no clear path for a follow-on procurement.

The Air Force has shelved plans in the near term for a Common Vertical Lift Support Program helo, which was being eyed as a replacement for aging Hueys used for executive lift and missile field support work.

The Air Force's space programs, many of which had a decade of problematic progress, largely got a pass. The exception is Northrop Grumman's \$427 million Defense Weather Satellite System (DWSS), which the Pentagon is terminating; a stop-work order has already been issued owing to a cut in the fiscal 2012 budget. The Pentagon says DWSS is "premature to need," although some may argue a new weather satellite could be needed as soon as 2018. It is unclear whether the Navy's Mobile User Objective System, a project to develop a new UHF satellite constellation, will move forward in light of problems with a new payload.

The Pentagon plans to continue funding for the European Phased Adaptive Approach missile defense architecture, though it will "accept some risk in deployable regional missile defenses" while

relying more on allies to provide such a capability. This could point to additional sales of both the PAC-3 and Terminal High-Altitude Air Defense (Thaad) systems abroad. Some questions for missile defense are whether the Missile Defense Agency plans to move forward with the Persistent Tracking Space System satellite constellation optimized for cold-target tracking as warheads travel through space and the so-called SM-3 IIB, designed for early intercept of ballistic missiles.

Though they are in high demand, intelligence assets will not go unscathed. The Global Hawk Block 30 is proposed for mothballing and termination (see p. 34), 11 RC-26s will be retired and a battle-damaged E8-C will not be repaired, says Air Force Secretary Michael Donley. And the Raytheon-led Joint Land-Attack Cruise Missile Defense Elevated Netted Defense System (J-Lens), one of multiple Pentagon blimp-type intelligence-collection efforts, will be curtailed.

Air-launched weapons, which are often cut to pay for higher-priority needs, are included in the white paper as key requirements. Singled out are the upgraded 250-lb. Small-Diameter Bomb II, which is being designed by Raytheon to attack moving targets regardless of weather. Also outlined is a need for improved air-to-air missiles, though it is unclear whether this is simply a nod to further upgrades to the AIM-120 and AIM-9 series produced by Raytheon, or perhaps a move to a new capability. The Air Force has sought support for a next-generation missile that could combine the air-to-air capability of the Amraam with the air defense attack mission of the High-speed Anti-Radiation Missile (HARM) in a platform small enough to fit into the stealthy F-22 and F-35 weapons bays, but its development is uncertain.

Panetta is encouraging Congress to accept the forthcoming budget proposal as delivered, noting that it reflects a delicately balanced approach between reducing force numbers and maintaining readiness. In asking for a new round of Base Realignment and Closure (BRAC) facilities restructurings—which could impact the Air Force—Panetta says further savings could be identified by shedding unneeded facilities.

"The savings we are proposing will impact on all 50 states," Panetta says. "This will be a test . . . of whether reducing the deficit is about talk or about action." ☉



THIS IS HOW

LOCKHEED MARTIN RADAR SYSTEMS

Lockheed Martin's radar systems have provided a clear picture of air and missile threats for more than 65 years across every terrain, from the Green Zone to the Arctic Circle. We've designed and delivered ground-based, sea-based and airborne radars for every armed service and operational environment. And our latest generation of digital radar systems is setting the standard for the future: applying revolutionary technology developments to deliver affordable radar solutions. Leading the way in next-generation radar is all a question of how. And it is the how that Lockheed Martin delivers.

Anatomy of a Kill

USAF's first attempt to replace manned aircraft with UAS craters under financial pressure

AMY BUTLER/WASHINGTON

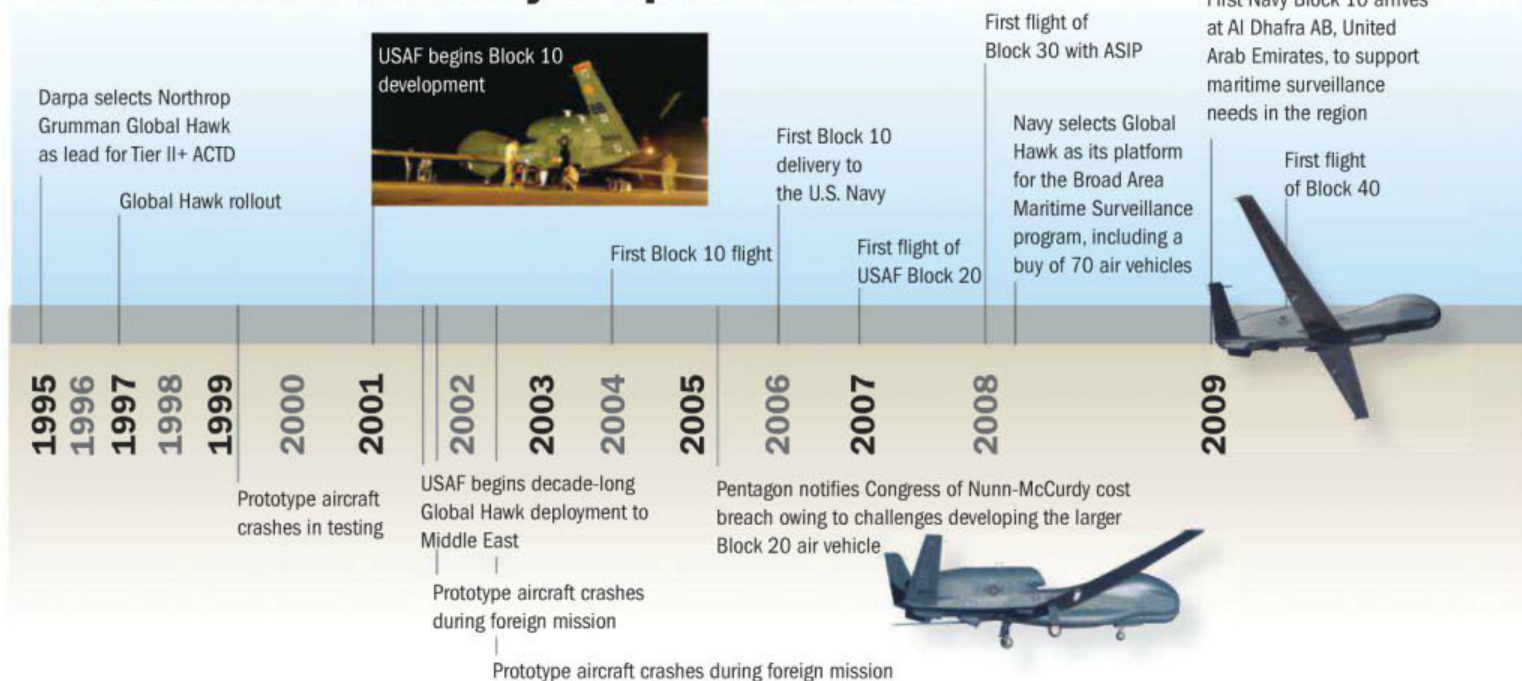
In 2001, the U.S. Air Force officially took over the Northrop Grumman Global Hawk unmanned air system (UAS) project, now estimated to cost \$12.4 billion for 55 aircraft, and embarked on its development. Within months, the momentum behind the high-flying spy aircraft grew. The young UAS was rushed into operation in the Middle East after

in Iraq and Afghanistan. But, at that time, this notion was highly controversial within the Air Force, and for years the Global Hawk and U-2 communities fought for resources and favor among Pentagon leadership.

Now, 10 years later, the ambitious plan to retire the U-2, which is limited by the 10-12 hr. a pilot can spend in the cock-

But, in parallel with these challenges, the UAS accrued a record of service alongside the venerable U-2 it was slated to replace. This included a decade of missions at Al Dhafra AB in the United Arab Emirates, flights over Haiti after the earthquake in 2010 and Japan after the tsunami compromised a nuclear power plant last March, aiding NATO strikes in

GLOBAL HAWK: A History of Ups and Downs



the terrorist attacks of Sept. 11, 2001, and service officials began crafting plans for a larger, more capable design, dubbed the Block 20/30, that was intended to take over the role long held by the U-2.

Thus, the Global Hawk became the first UAS that the Air Force developed to take over an entire mission—high-altitude intelligence, surveillance and reconnaissance—handled by an existing piloted aircraft. UAS have become more prevalent in the Pentagon's arsenal since then, especially because of the wars

in Iraq and Afghanistan. But, at that time, this notion was highly controversial within the Air Force, and for years the Global Hawk and U-2 communities fought for resources and favor among Pentagon leadership. But the history of this program is far too complex for such a simple answer.

The Global Hawk had a troubled upbringing—with two massive Nunn-McCurdy cost overruns, multiple aircraft crashes and inconsistent support from its sponsor service and Capitol Hill.

Libya last year and supporting surveillance requirements in South America.

"If we had to do it all over again, we would do it differently," says Gen. (ret.) John Jumper, Air Force chief of staff when Global Hawk demonstration aircraft, crafted under the Defense Advanced Research Projects Agency's Tier II+ program, were quickly deployed by USAF to the Middle East.

Despite being the epitome of so-called spiral acquisition—designed to field new technologies rapidly through

incremental capability improvements—the program became a victim of the Air Force's overly ambitious appetite, Jumper says. "We did not do a good job of controlling the requirements of making the Global Hawk a plug-and-play platform," he acknowledges, and eventually, "Global Hawk priced itself out of the market."

Jumper concedes that the Air Force's decision not to retire the U-2 in favor of the Block 30 Global Hawk is a setback for a service that prides itself on leading technology at the Pentagon. The UAS carries the Raytheon Enhanced Integrated Sensor Suite (EISS) and Northrop's Airborne Signals Intelligence Payload (ASIP), the multiple "ints" required for it to take over the U-2's mis-

(Syers). "The reality is that the Global Hawk system has proven not to be less expensive to operate than the U-2, and in many respects the Global Hawk Block 30 system is not as capable—from a sensor perspective—as is the U-2."

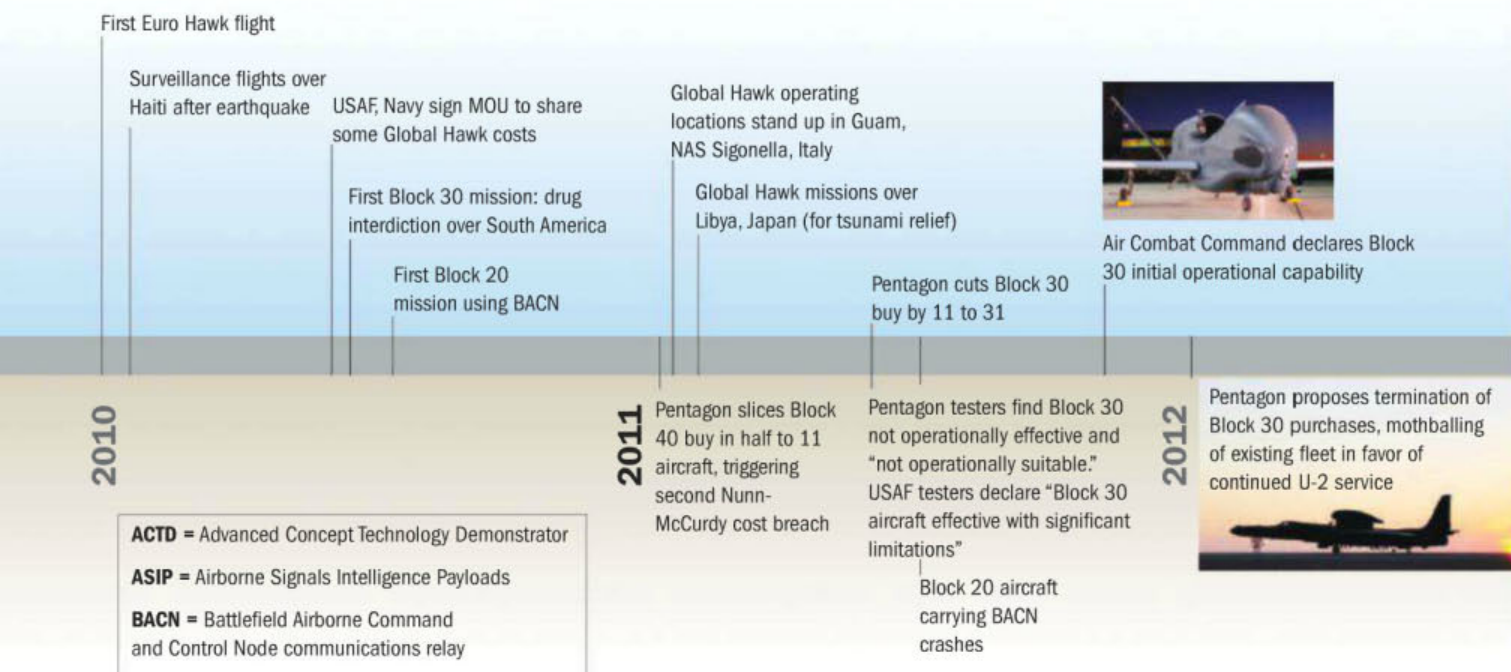
Though lawmakers seem at least willing to accept a production termination, the idea of storing 18 aircraft, the product of \$3.4 billion in spending, is being met with criticism. "They are going to take a shot to the head on that one," says a congressional aide. "I hope it is worth it." At issue is the savings of not operating the Global Hawks as well as the added cost of ensuring that the U-2 fleet has appropriate support to pick up most of the slack.

Lawmakers are skeptical of the rationale, as the Air Force said in a memo to

globe at one time using high-altitude assets, says a Pentagon official.

The service has yet to say how much in annual savings can be garnered by not operating the Block 30s. The Air Force planned to buy 31 Block 30s; 18 are on contract.

The Pentagon declared the Global Hawk critical to national security just last year, when it certified the program in this memo after its second cost overrun. The Air Force also seemed to accept what shortcomings were inherent in the EISS. The service declared initial operational capability for the Block 30, despite reservations from the testing community. EISS Infrared detection performance at range was troublesome, though it was sufficient when the air-



Sources: Northrop Grumman, AW&ST

sion. "Eventually that mission will be an unmanned mission," he says. "It is just going to take 20 years longer to do it."

Gen. Norton Schwartz, Air Force chief of staff, says the decision to end production of the Block 30s and mothball those already produced was twofold. First, the UAS did not eclipse the high-flying U-2 as expected by achieving a lower operating cost. Second, it fell short of expectations compared to the performance of the U-2's Goodrich Senior Year Electro-Optical Reconnaissance System

Congress that, "while the U-2 is less expensive to operate on a per-hour basis, its limited endurance requires multiple aircraft in order to maintain 24-hour continuous coverage of a particular location. When analyzed in the context of the Global Hawk mission, the U-2 costs \$220 million per year more than the Global Hawk."

The reality, however, is that in the scramble to reduce spending, the Pentagon is choosing to jeopardize its ability to surveil a number of places around the

craft was directly over target. So-called slant ranges, however, are important for aircraft surveilling across borders.

Additionally, ASIP, designed to spy on communications and air defense systems, was "very limited," according to the tester's report. Though ASIP detected a large number of signals, it had trouble geolocating them, which is important to cue other aircraft or weapons onto a target. At the time, Northrop Grumman outlined a series of fixes to address these issues.

"I don't necessarily agree with that assessment," says George Guerra, Northrop's Global Hawk vice president. The imagery products are "extremely high-quality. I honestly don't think people are aware of the sensor performance." But Northrop officials investigated complaints about EISS performance and, "we started to realize we were sort of exonerating the sensor," he says.

Fixes are being made to improve ASIP, which is also flying on the U-2 along with the legacy RAS 1R signals-intelligence collection system.

However, Jumper suggests that the marriage of the Global Hawk and its sensor packages was flawed from the outset. "These were the contractual relationships that came along when the aircraft was handed over to the Air Force," he says, noting that the service would have preferred to have managed its own sensor competitions.

Cost is a thorny issue. The Global Hawk experienced two major development overruns, but in 2005 and 2011, the Pentagon opted to keep the program going when it had a chance to kill it. The first overrun was largely based on misjudgments by the Air Force and Northrop about the complexities of expanding the size of the Global Hawk from the Block 10 RQ-4A version, carrying 1,000 lb., to the Block 20/30 RQ-4B, carrying 3,000 lb. The Block 20/30 was needed to enable the UAS to carry ASIP as well as the EISS, coming closer to the multi-intelligence collection capabilities of the U-2, which can haul 5,000 lb. of sensors.

The promise of the Global Hawk, though, was premised on balancing sensor performance—including possible degradation compared to U-2 sensors—against the benefits of longer endurance.

Northrop objects to the notion that the UAS costs more to operate. "Decisions [were] made that are sort of skewing the data," Guerra says. "In my mind, you would want to go to an apples-to-apples comparison, [and] when you do that, you will see that [the Global Hawk] is more effective."

An example, he says, is that costs shared between the two programs because they are collocated—such as security and infrastructure—are not equally split, tipping the cost in favor of the U-2. In fiscal 2011, the Air Force charged the U-2 program \$400,000 for security, while the Global Hawk shouldered \$7.5 million of the bill. Also that year, the U-2 program paid for \$2 million worth of base infrastructure support, while the Global

Hawk was charged six times that amount.

Air Force officials did not provide flying-hour data, but removing these unbalanced charges results in Global Hawk flying hours costing \$1,500 less than the U-2's, says Mike Isherwood, a Northrop analyst working on the program.

The reversal on the Global Hawk is clearly abrupt, given the Pentagon's supportive moves last year and the agreement by the Air Force and Navy to collocate the aircraft and share parts and supplies where possible to reduce the cost for both their fleets. The Navy is buying 70 Block 40 variants optimized for maritime surveillance, with the last delivery slated for 2028.

Navy officials say savings are possible, despite the potential loss of the Block 30. The two services "still plan to jointly base [the Broad Area Maritime Surveillance] UAS and Global Hawk at overseas locations to eliminate redundant efforts," says Capt. Jim Hoke, Navy BAMS program manager. Basing options in the U.S. will be reviewed soon; Air Force Global Hawks are now based at Beale AFB, Calif., and Grand Forks AFB, N.D. "Additional synergy initiatives continue to be reviewed . . . which will generate cost

savings for both programs," Hoke adds.

Northrop is "disappointed" at the decision, Guerra says. It is continuing to produce Fire Scout unmanned rotorcraft, though the baseline platform is outsourced, and work on the Air Force's B-2 fleet and Joint Surveillance Target Attack Radar Systems. But aircraft production opportunities are waning.

With the Block 40 aircraft, designed to carry the Multi-Platform Technology Insertion Program (MP-RTIP) ground surveillance radar, having been delivered to the Air Force, there will be "a little bit of a gap shaping up" on the already low-rate production line, Guerra says. He hopes to fill that with orders from South Korea or Germany. Berlin's first Euro Hawk is scheduled for delivery this year, with another four potential sales. Seoul is considering four aircraft.

Meanwhile, Northrop is mounting a campaign to save the Block 30.

"We tend to compare the [Global Hawk] to the U-2 based on what the U-2 can do," says Ed Walby, a business development executive for Northrop. He suggests asking: "What is it that the U-2 can do that the Global Hawk does today?" noting that the endurance of the Global Hawk is a game-changer. ☐

Priced To Win

On two big defense awards in 2011, Boeing's bids stun rivals

AMY BUTLER/WASHINGTON

The strategy employed by Boeing to win \$3.5 billion worth of missile defense work late last year reveals a willingness on the part of the aerospace giant to embrace highly aggressive pricing and low margins to hedge against the uncertainty ahead with waning Pentagon spending.

And, the company's rivals are taking notice.

A Lockheed Martin/Raytheon team opted not to protest its loss of the massive Ground-Based Midcourse Defense (GMD) program to a Boeing/Northrop Grumman team.

One likely reason behind the no-protest decision was Boeing's intensely aggressive approach on pricing its proposal. One missile defense official says that Boeing's figures for the new GMD

development and sustainment contract are 35% lower than MDA is paying today for this hit-to-kill defense system. This is likely owing to "innovations that only an incumbent could get," this official says; Boeing has headed the program since 2001. Additionally, the company opted to forgo opportunities for fat incentive fees and instead expect only marginal awards, if offered, during various work periods.

"You can choose to do that if you can afford it," the official says. Multiple industry sources, who requested anonymity owing to a discussion of source-selection-sensitive information, noted that Boeing's advantage in this competition was its ability to take financial risks. This strategy won in the end despite the contractor's, at times,

Europe's most efficient business platform

All-in-one aerospace trade show

125,000 trade visitors



The focal point of aerospace

September 11–16, 2012
Berlin ExpoCenter Airport
www.ila-berlin.com

**THE VALUE OF
GETTING
UP CLOSE
AND PERSONAL
FROM
60,000 FEET.**

From using advanced sensors to monitor
damage following Japan's earthquake
and tsunami, to providing ground troops
with critical real-time data in Iraq and
Afghanistan, Northrop Grumman's
Global Hawk allows countries
around the world to act decisively in
conflict and crisis. *That's why we've
become a leader in Unmanned Systems,
Cybersecurity, C4ISR, and Logistics.*

THE VALUE OF PERFORMANCE.

NORTHROP GRUMMAN

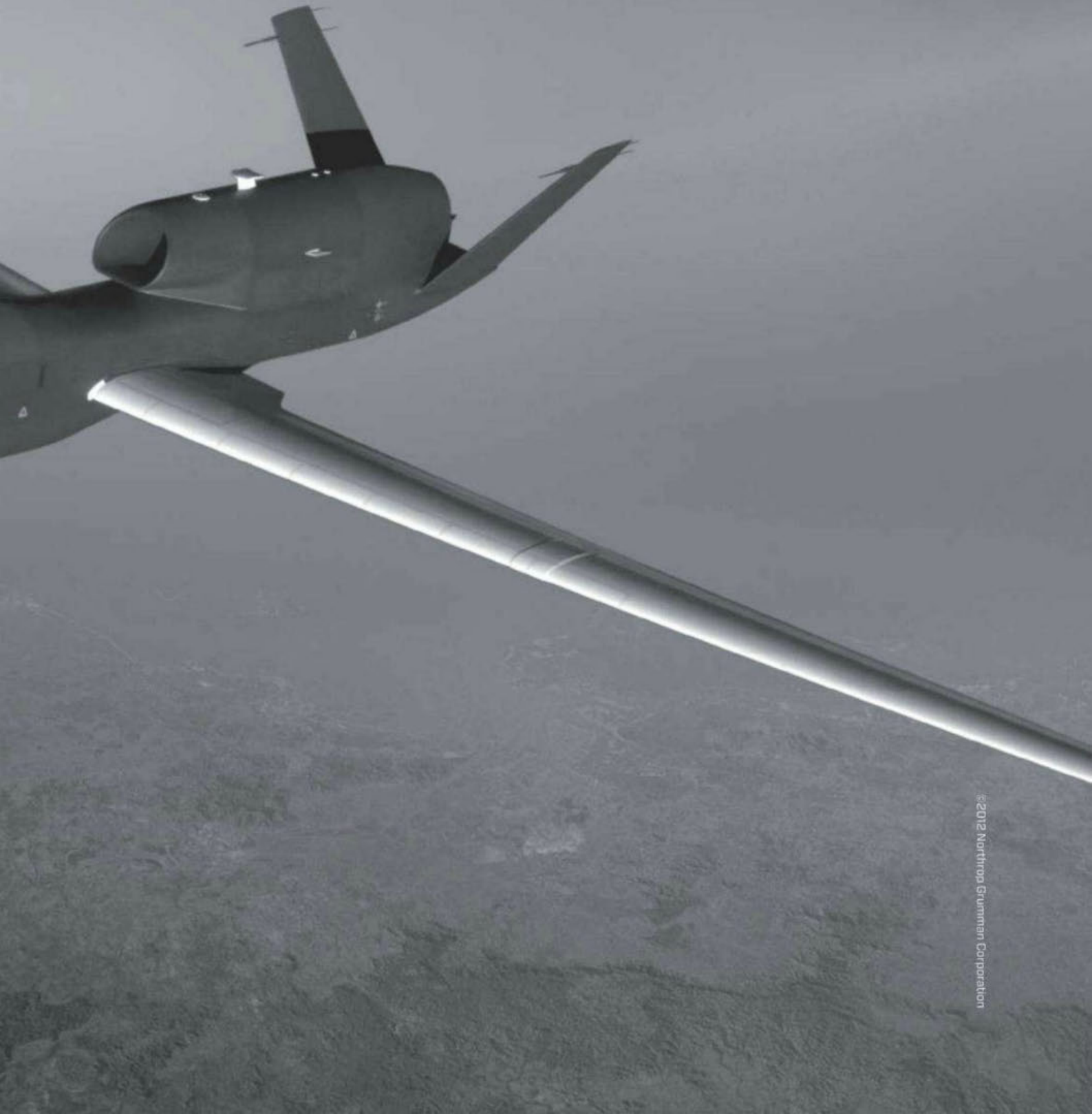
www.northropgrumman.com/performance

UNMANNED SYSTEMS •

CYBERSECURITY •

C4ISR •

LOGISTICS •



poor record of performance on earlier GMD work.

Company officials declined to comment on their pricing and fee strategy on the GMD bid. They simply contend that the proposal was a responsible one and reflected shareholder expectations. Following MDA's selection, each of the GMD contenders said they would not discuss details of the proposals, citing competitive concerns. However, Dennis Muilenburg, president/CEO of Boeing Defense, Space and Security, noted in a press release that the award is a result of "delivering innovative solutions and a cost-effective approach to program management and execution."

Rival bidders Lockheed Martin and Raytheon lack the ability to take such financial risks, owing largely to their reliance on the Pentagon for the majority of their revenue.

Boeing, by contrast, is in the enviable position of being able to balance risk in one area against another. In this case, it is the weaker defense unit against its robust commercial business, which is bolstered by a hearty backlog—especially now that many problems with the 787 development have been addressed. Although one sector cannot pull from the other's cash pool to underwrite a particular bid, if risk on a specific defense program is high, it can be balanced overall for the shareholder by the anticipated performance of the company's extensive commercial aircraft programs.

The backlog for Boeing Commercial Airplanes is \$296 billion for 3,700 air-

craft, while the defense sector's backlog is about \$60 billion. During a briefing on the company's 2011 results, CEO James McNerney, spoke of a "relentless effort to maximize efficiencies and reduce infrastructure costs in support of the Defense Department's affordability initiatives."

"If Lockheed Martin did this, it would be viewed by shareholders with more alarm because it is not clear what in Lockheed's portfolio could offset that type of investment," says Byron Callan, director at Capital Alpha Partners.

Lockheed is "never going to be characterized as a commercially aggressive firm," says Richard Aboulafia, vice president of analysis at the Teal Group. "Quite the opposite, they are very conservative."

Boeing's assertive pricing strategy on GMD echoes its approach to winning the long-fought competition to build the 179 U.S. Air Force KC-46A refueling tankers. The company shocked its tanker rival, EADS North America, by underbidding the European manufacturer—offering an Airbus A330-based tanker—by about 10% with its 767-based design. Shortly after winning the contract nearly a year ago, the Air Force acknowledged that the company was underwriting some of the development cost, reported at the time to be more than \$300 million.

Though both wins reflect an aggressive bid approach, there are notable differences. In the case of tanker, any upfront losses for Boeing paying for some development work could be gained back with a sizable U.S. buy of at least 179

tankers and, likely, orders from foreign nations eager to follow in Washington's footsteps. Also with the KC-46A win, Boeing had an overarching strategic desire to deny EADS the opportunity to have government support in building a domestic final assembly facility for commercial aircraft.

With GMD, however, there is no international market for Boeing's win, as this capability is applicable only to the U.S. So, any reduced-fee opportunities or losses would not necessarily be paid for within the program at a later time. With its 747-400F Airborne Laser shelved late last year, however, a GMD loss would have forced Boeing out of this sector of the Pentagon's business.

Lockheed Martin did not "appreciate just how aggressive they can be" on GMD, said one official. "This was an important strategic play for [Boeing]. They were not willing to give up that market position."

Both businesses do, however, reflect legacy lines of work for Boeing that, if lost, would mean a virtual departure from a major market space. Callan notes that Boeing's defense business has "some holes to plug in the outyears" as orders for the F-15, F/A-18E/F and C-17 are coming to an end in the relatively near term. Securing both GMD and tanker now are potential hedges against the uncertainty on the horizon as the Pentagon pulls its financial belt even tighter. ☐

With Michael Mecham in San Francisco.



The 2010 test of a Ground-Based Midcourse Defense interceptor launched from Vandenberg AFB, Calif., against a complex target from the Pacific was one of multiple failures for the program since 2008.

**YOUR TARGET IS
NIMBLE, ADAPTIVE AND ELUSIVE.
BUT IT CAN'T ESCAPE SPYDR.**



Trust the Accuracy and Agility of SPYDR.

L-3 Mission Integration unleashes SPYDR — the most versatile and capable leading-edge small manned airborne ISR platform in the world.

Ready now for deployment of proven ISR systems, SPYDR is agile. Its modular, spiral approach enables it to react quickly and adapt effortlessly to meet changing mission requirements. It casts an inescapable web that captures and delivers actionable intelligence in real time. Entrust your mission to an integrator with a proven record of performance. For more information, visit L-3com.com/SPYDR.

Mission Integration

L-3com.com

This advertising material consists of L-3 Communications Corporation general capabilities information that does not contain controlled technical data as defined within the International Traffic in Arms Regulations (ITAR) Part 120.10.

Enabling Apps

U.S. services and industry clear a way for cost-saving software reuse across Pentagon's fleets

GRAHAM WARWICK/WASHINGTON

With fortuitous timing, as the U.S. Defense Department unveils plans for budget cuts, a government/industry consortium has released an open systems standard that promises to save money by enabling reuse of avionics software across Pentagon platforms.

The Future Airborne Capability Environment (FACE) technical standard was

embedded in products.

"We want to reduce cost and get capabilities out faster, and portability of software across platforms is the best way to accomplish that," says Mike Williamson, deputy program manager for mission systems in Naval Air Systems Command's (Navair) program office for air combat electronics.

While the Pentagon requires open-

tricky waters of negotiating licenses and protecting intellectual property in an environment where software is developed once and reused many times.

"It does not make financial sense for the government to fund software development and come away with only a small piece of proprietary data," says Ike Song, Northrop Grumman vice president for situational awareness systems. "The FACE technical standard and its guidance documentation represent a balance between the government's approach to procuring software and systems, its rights to maintain and distribute appropriate data, the competitive forces in the marketplace and the ability of defense contractors to generate revenue."

The Navy kicked off the effort, and was joined by the Army. Now talks are under way to bring the Air Force into the consortium. Already the standard is cited in four Defense Department requests for information and one request for proposals—for the Navy's C-130T avionics obsolescence upgrade, which could field the first FACE-compliant software within a couple of years. "From formation to procurement in 18 months is pretty quick," says Dave Lounsbury, The Open Group's chief technical officer.

An avionics upgrade for the Navy's C-130Ts will likely establish the FACE library of software.

The Army has proposed FACE for safety-critical applications within its new Common Operating Environment plan to modernize around a single set of information-technology standards. "For the current force, the FACE standard will allow more efficient fielding of software," says Scott Dennis, director of the Army Aviation Systems Integration Facility's software engineering directorate. "For the future force, FACE is key to the open-systems architecture for the Joint Multi-Role [family of rotorcraft]."

From the outset, equally as important as the technical standard was the "absolute need" to address the business aspects on which software portability would stand or fall, says Lockheed Martin's Dennis Stevens, chair of the consortium's business working group. Already published, the business guide is intended to help government and industry understand how FACE affects avionics acquisitions and how to encourage suppliers to develop portable software.

A contracting guide will ensure intellectual property is protected when



released on Jan. 30, after just 18 months of work by a 39-member consortium managed by open-systems standards organization The Open Group.

FACE is focused on ensuring avionics software is portable between platforms, so an application developed for one aircraft type can be reused in another, reducing the cost and time to field a new capability across different fleets.

If adopted as envisioned, the reuse enabled by FACE will change the way government acquires software and industry generates revenue. The common operating environment should, like Android on smartphones, create a market for software applications that the Pentagon can deploy across services and industry can

system architectures in new procurements, past efforts have not produced software that can be ported between different manufacturers' platforms, Williamson says. "Open architecture is a set of principles companies follow, but in reality we do not get a lot of portability because the architectures are still different enough to preclude reuse."

FACE takes commercial software standards and specifies how to implement them to get portability. "It is a compilation of different standards we are all agreeing to use," says Capt. Tracy Barkhimer, Navair program manager.

To boost the standard's adoption, the consortium is issuing guides enabling government and industry to navigate the

SECURING THE SKY

LOCK ON TO MBDA SOLUTIONS



AIR DOMINANCE by MBDA

STORM SHADOW/SCALP
DUAL MODE BRIMSTONE

ASRAAM
METEOR
TAURUS
MICA



www.mbda-systems.com

MBDA
MISSILE SYSTEMS

acquiring software that can be reused, Stevens says. A conformance guide will detail how operating environments and software applications are to be certified as compliant with the FACE standard, to ensure their portability. The registry and repository guide will define how software in the FACE library is labeled, so that “users can ascertain enough information to select the appropriate application [for reuse],” he says.

Industry will be drawn to the FACE standard by the business logic, believes Jeff Howington, government systems business development manager at

Rockwell Collins—along with Lockheed a founding industry member of the consortium. “Standardize the interfaces and industry can put more IP into capabilities,” he says. “This will expand the market for industry. The customer can take an application and distribute it across the services; manufacturers can bring best-of-breed software into their offerings and capture cost reductions.

“The business guide recognizes different possibilities for licensing products developed under FACE, which will allow commercial firms to protect their IP so they are less hesitant to en-

ter the military market,” Howington says. “FACE opens up the opportunity for any company big or small to compete,” says Barkhimer.

“Properly supported by [government and industry], this standard is a true opportunity to realize significant reductions in procurement and life-cycle costs, while offering the first real possibility of reduced time to field new capabilities,” says Song. When the Navy’s C-130T cockpit upgrade establishes the initial FACE software library, Barkhimer says, “We’ll be able to say ‘We have an app for that.’”

High-Value Target

NGA’s largest program is put in line for the chopping block as budget cuts loom

AMY SVITAK/PARIS

A multibillion-dollar commercial satellite imagery program and a showcase example of the Obama administration’s forward-looking commercial remote-sensing space policy has been targeted for cuts that could impact U.S. military and allied operations and potentially lead to industry consolidation in the U.S. sector.

Bearing the mark of three consecutive presidential administrations, the National Geospatial-Intelligence Agency’s largest program, the \$7.3 billion EnhancedView, was a landmark event for the commercial satellite imagery industry. The 10-year program is unparalleled in scope and could have wide-ranging implications at home and abroad as the implementation of long-standing U.S. policy goals strengthens the U.S. position in the global Earth-observation market.

Like other high-dollar programs, however, EnhancedView presents an attractive target for budget hawks in Congress and the administration as they seek to pare back defense spending in line with a massive drawdown in U.S. military might around the world.

In the near-term, NGA could be forced to renegotiate elements of the two EnhancedView contracts with U.S.-based DigitalGlobe and GeoEye in August 2010, as the agency absorbs a \$50-million cut to its fiscal 2012 budget appropriation and braces for even more substantial spend-

ing reductions in fiscal 2013 and beyond.

For now, the initial funding cut of \$50 million represents a roughly 10% reduction to the program total this year, though NGA has some discretion in determining how cuts are allocated. Internal deliberations are ongoing, and NGA is expected to make a decision in the coming weeks.

“You’re going to have to find a way to probably restructure the current service-level agreements with both companies, if they’re going to take \$50 million out,” says a geospatial-intelligence industry official familiar with EnhancedView. “Any reduction in the budget on the service-level agreement means you’re changing the scope of the contract and you have to renegotiate.”

But the Pentagon hinted at even larger cuts to NGA’s commercial satellite imagery purchasing power last month, when U.S. Defense Secretary Leon Panetta outlined his department’s strategic spending priorities for fiscal 2013-17. Specifically, the reductions would target purchases of commercial satellite imagery in excess of requirements over the next five years, opening the door to renegotiation of service-level agreements with DigitalGlobe and GeoEye.

In the meantime, NGA is awaiting the expected mid-April outcome of a White House-directed study evaluating EnhancedView requirements. Led by the office of the director of national intelli-

gence and the under secretary of defense for intelligence, the findings will come too late to lessen the impact of the fiscal 2012 spending cut, though they could inform the budget debate in Congress this year and potentially stave off further reductions to commercial satellite imagery purchases in fiscal 2014 and beyond.

Unlike intelligence satellite imagery, commercial imagery is unclassified and can be shared quickly with coalition forces. And this remote-sensing data is used so frequently by the military—from operations in Iraq and Afghanistan to monitoring political unrest in Egypt or Libya to supporting international disaster relief—that end users rarely think about it.

“Under the EnhancedView license that NGA uses to procure imagery, they have very broad sharing permission within the context of that license,” the geospatial-intelligence industry official says. “If cuts are made to the current level of service provided, the amount of imagery available to support military and other efforts would be reduced. This could hinder coalition efforts.”

Although NGA officials have declined to comment on cuts to the agency’s budget, which is classified, a representative says the agency “supports commercial imagery as a vital part of geospatial intelligence, and EnhancedView as part of the commercial imagery program.”

DigitalGlobe did not respond to a request for comment, but GeoEye CEO Matt O’Connell says cuts to commercial satellite imagery funding are inconsistent with the Pentagon’s strategic and budgetary priorities and “counter to presidential policy on commercial remote-sensing.” He notes that the cuts would undermine a goal of that policy: “to advance U.S. leadership in space-based Earth observation and geospatial technology.”

AVIATION WEEK Event Advantage

Essential Singapore Insights



Scan this code
to sign up
for your **FREE**
digital editions.

- For ongoing Singapore Event Coverage, visit Aviationweek.com/Singapore
- For mobile viewing, visit: m.aviationweek.com
- Stay tuned for AW&ST's Singapore Wrap-Up Issue, February 20th!

Vive la MMRCA

While contract details still must be finalized, the Rafale finds an export customer



Competitors will watch closely to see if the Rafale loses its prime position.

ASIA-PACIFIC STAFF/NEW DELHI

The British might have once ruled the Indian subcontinent, but the French are taking over its skies.

The Indian government late last month named Dassault Aviation's Rafale the lowest-cost bidder against the rival Eurofighter consortium's Typhoon in the long-running and fiercely contested competition to supply at least 126 Medium Multi-Role Combat Aircraft (MMRCA) to the Indian air force (IAF).

The deal is believed to be worth \$11-12 billion, but could reach \$20 billion as options allow for 63 more aircraft easily, with fleet growth seen around 200 total by the end. The Rafales, which will replace the aging Indian MiG-21 fleet, are likely to be inducted into the IAF starting in 2014 and would remain in service for more than three decades.

Coming on the heels of tentative disappointments in the United Arab Emirates and Switzerland, and slowed decision-making in Brazil, Dassault could not have wished for a more emphatic beginning to selling the Rafale beyond the French air force and navy (AW&ST Nov. 21, 2011, p. 30). Indeed, the Rafale has been the only current-generation Western fighter not to have secured an export order.

Apart from this enormous affirmation, India's decision rewards Dassault's patience: What had begun in 1998 as an IAF proposal to simply buy more Mirage 2000 jets from the French company transformed, to Dassault's great disappointment, into a global competition. Then, after a unique procurement pro-

cess that has spanned 56 months, Dassault still came out on top, albeit with some panicky moments along the way. In April 2009, rumors emerged of the Rafale being dropped from the MMRCA as a result of a noncompliant technical bid. While the IAF formally denied the elimination, Indian sources say IAF headquarters had to intervene to ensure that no aircraft was eliminated purely on its paper bid.

In a nightmarish development in March 2011, Dassault's Indian representative, Posina Rao, was temporarily blacklisted by the IAF after he formally complained of an IAF officer who demanded bribes for prime placement at the Aero India show the month before.

Beyond Dassault—and French President Nicolas Sarkozy, who made securing a Rafale order a priority—MBDA also is a big industrial winner, since it will provide much of the weapons package for the Rafales, as is Thales.

Still, all of this assumes that India and Dassault finalize the contract, which—as the French have learned elsewhere—is not guaranteed. While Indian Defense Minister A.K. Antony says a deal was unlikely before the end of March, his senior ministry colleagues believe negotiations between New Delhi and Dassault could actually stretch 8-12 months. India requires that deliveries begin 36 months after contract signature, but the execution of offset obligations—50% of order value, or at least \$6 billion—will be an enormous challenge, considering that India's offset practices remain a work in progress.

What's more, Indian analysts warn that to derive the maximum benefit from the offsets, Indian industry must be ready, diverse and large enough to absorb major technology infusions. Benefits could be lessened if the Indian government focuses only on state-run defense units like Hindustan Aeronautics Ltd. (HAL) and ignores the private sector. While the first 18 aircraft will be bought off the shelf in flyaway condition, the remaining 108 will be manufactured in partnership with HAL.

"The only thing worse than losing in India could be winning in India," quipped one industry executive whose company bid for the MMRCA.

Meanwhile, it is the second big setback for Eurofighter in as many months, having lost to the Lockheed Martin F-35 in Japan. The Eurofighter consortium comprises Italy's Finmeccanica, U.K.-based BAE Systems and EADS (which nonetheless has a 46.3% stake in Dassault). The German side of EADS led the Typhoon campaign in India.

Bank of America analysts say that, for BAE, the loss hurts. "We believe consensus expectations in recent weeks have assumed the Eurofighter consortium was ahead on the Indian fighter jet contract, therefore suggesting this news is a negative surprise for BAE."

An EADS representative says the Indian Typhoon team was looking at all options, including contesting the Indian decision, but they admit the outcome is a big blow and first they want to learn more about what happened. EADS has requested and is likely to receive a detailed debrief on the final selection process.

"It's puzzling that the Rafale hasn't been judged a better fighter than the Eurofighter anywhere else in the world either in capability or price," one representative says. "Also, there is always the possibility that Dassault will be unable to follow through with the commitments it has made in its commercial bid," this source adds.

"They have not yet awarded the contract," echoes British Prime Minister

David Cameron, who lobbied heavily for the Typhoon. "I will do everything I can, as I have already, to encourage the Indians to look at Typhoon."

Indeed, since April 2011 executives at the other eliminated vendors have stayed watchful amid persistent speculation that the downselect to the Rafale and Typhoon, choosing the two most expensive contenders, could only doom the MMRCA effort. As it stands, a deal with the Rafale is expected to overshoot the \$10.4 billion that the Indian government has formally budgeted for the acquisition. While the IAF and defense ministry have said that escalated costs have been taken into account, any final contract will still need to be vetted by India's famously finicky finance ministry, currently headed by Pranab Mukherjee, who served as defense minister when the MMRCA gathered momentum in 2004-06.

But in a country that notoriously spent 18 years deciding on procurement of Hawk advanced jet trainers, no one—Indian or European—can predict timeframes or dramatic delays.

Moreover, some defense analysts question the rationale of handing yet another large defense contract to France, especially considering that India already has signed lucrative deals with French companies for six Scorpene submarines and pricey Mirage 2000 upgrades.

But while it is up for debate whether India would have gained more strategically if it chose U.S. fighters, for instance, a Rafale deal at the least consolidates an old and important relationship. "The decision will definitely strengthen France's relations with India," says Ajey Lele, who works with the New Delhi-based Institute for Defense Studies and Analyses.

"It would be wise for American OEMs to tone down their typical pitch of technological superiority, which the Indian buyers are already aware of and respect," says Gunjan Bagla, head of defense and aerospace at California-based management advisory company Amritt. "Hammering it further can be perceived in India as 'American arrogance' and does not help to win sales. India's ministry of defense is not always dazzled with the 'best' technology; rather, it wants to specify a certain minimum threshold of performance. Exceeding the technical minimum does not confer advantage." ■

With Jay Menon in New Delhi, Robert Wall in London and Michael Bruno in Washington.

Distilling Intent

U.K. provides muted signals regarding its defense industrial ambitions

ROBERT WALL/LONDON

Actions may speak louder than words. So even though the U.K.'s new defense industrial strategy (DIS) says a lot about more competition and off-the-shelf procurement and little about support for its guided weapons and military aircraft sector, recent sole-source awards signal that London still has an active hand in backing its industry.

Defense industry leaders have been waiting for months for guidance from the government on its industrial priorities, in part to help managers decide what businesses to rationalize and where they should continue to invest. But the DIS white paper, released on Feb. 1, goes only a small way to clearly articulating the priorities; it is the first time the government has tried to comprehensively address its industrial plans in the wake of severe budget cuts and program adjustments put in place in the 2010

Strategic Defense and Security Review.

But ambiguity remains. The white paper states that only a review of the Defense Ministry's 10-year procurement plan, due later this year, "will enable U.K.-based industry to focus its investment in technology and . . . manufacturing infrastructure, thereby reducing costs and overheads and making its products more competitive."

This is a blow to industry, which had hoped for certainty much earlier.

The 63-page white paper spells out several areas where the government plans to closely protect defense industrial skills, and also underpins a commitment not to further erode science and technology spending, which it says will not slip below 1.2% of total defense outlays. However, as signaled last year, the government is making a commitment to rely more on competition and off-the-shelf procurement. "We are concerned about the proportion of noncompetitive contracts that have been let by the [Defense Ministry]," the report says, noting that 68% awarded in 2010-11 were not competed.

The document in many areas leaves vague what the actual funding implications may be and stops short of promising major investments to sustain critical sectors, unlike what the prior 2005 defense industrial strategy unveiled. However, Peter Luff, defense minister for equipment, support and technology, and James Brokenshire, minister for crime and security—the co-sponsors of the document—write in the report that "at a time of constrained budgets and unpredictability of threat, we believe it is more appropriate to set out our understanding of what operational advantages and freedom of action we need to protect, and what steps we will take to preserve the minimum elements necessary to protect our national security."

A few priority areas have been spotlighted, though, including electronic warfare and cyber-related technologies.

The document stops short of promising big investments to sustain critical sectors

The previous DIS put great emphasis on the U.K. sustaining its precision guided-weapons sector. That area also was strengthened in the strategic partnering framework forged by the U.K. and France. The emphasis is less clearly articulated in the new report.

But this does not suggest that the government is turning its back on the guided-weapons sector. On the eve of the white paper's release, the Defense Ministry awarded MBDA a £483 million (\$763 million), five-year development contract for the Sea Ceptor ship-based short-range air defense system. Sea Ceptor is intended to equip the future Type 26 Global Combat Ship and also modernize the in-service Type 23 frigates starting in 2016. The system is supposed to destroy aircraft and supersonic anti-ship missiles.

The Common Anti-Air Missile is the centerpiece of Sea Ceptor and uses a radar seeker. CAMM is expected to weigh 99 kg (218 lb.), have a length of 3.2 meters, diameter of 0.16 meters (0.5 ft.), and a range well in excess of 25 km (15.5 mi.).

Top speed is expected to be Mach 3. The missile can be fired using a soft-vertical-launch technique. The Defense Ministry puts the defended area of the system at 500 sq. mi.

Sea Ceptor also is intended for land applications, to replace Rapier in the U.K., and an air-launch concept has been discussed by MBDA.

Even though the white paper does

not address air vehicle technologies, the government awarded BAE Systems a £40 million contract in late December to sustain research efforts in this area.

Industry had grown frustrated by repeated delays in unveiling the road map; however, Rees Ward, CEO of the British Aerospace, Defense and Security industry lobby group, now declares that "contrary to general opinion, the delay

in the white paper's release would appear to have been beneficial, resulting in deeper understanding of industries' concerns within the government."

A key issue, he says, will be to ensure that the government implements commitments it has spelled out, such as to provide stronger support to defense exports and also to back small and medium-size enterprises. ☐

Race Against Time

Philippine air force hopes to sign firm deals by midsummer to bolster defense capability

LEITHEN FRANCIS/CAMP GEN. EMILIO AGUINALDO, PHILIPPINES



REUTERS/NEWSCOM FILE PHOTO

The South China Sea dispute has suddenly led the Philippines to move to strengthen its military and try to do it quickly.

Discussing the upgrade program on Jan. 27, Defense Secretary Voltaire Gazmin said the Philippines is in a race against time to improve its military air capability. "Without a deterrent force, we can be easily pushed around, our territories will be violated," he declared.

Previously, Philippine military procurement was mostly about improving internal security in the fight against Muslim insurgents. But the South China Sea is now the overarching security concern because of increased Chinese assertiveness. China is claiming most of the area, including some waters within the Philippines' 200-nm exclusive economic zone.

There have been incidents that have raised tensions over the issue. In May 2011, two Chinese fighters allegedly entered Philippine airspace, an intrusion related to the disputed Spratly Islands. In addition, the Philippine navy found

wooden posts erected on Amy Douglas Bank, Reed Bank and Boxall Reef—all within Philippine-claimed waters. These alleged incursions have exposed the weakness of the Philippine military.

A top priority is maritime patrol aircraft. The country aims to sign a firm contract by July 31 for the purchase of two long-range maritime patrol aircraft, and the hope is that both can be delivered within 24 months of contract signing, senior Philippine air force (PAF) officials told Aviation Week in a meeting at Philippine Defense Force headquarters here. The platform must be a new twin-engine aircraft with at least 8 hr. of endurance, say the officials. Used aircraft have been excluded, because the PAF needs the aircraft for the next 20-30 years.

The U.S., meanwhile, has offered to deploy U.S. Navy Lockheed P-3Cs in the Philippines on a temporary, rotating basis to guard disputed areas in the South China Sea, says Gazmin.

Another procurement due to be concluded by July 31 is the air force's re-

quirement for new advanced jet trainers that double as light attack aircraft. The Alenia Aermacchi M-346 and the Korea Aerospace Industries T-50 are in the running, but the PAF officials say they want to avoid giving the impression these are the only contenders.

Gazmin disclosed last June that the Philippines planned to order six and these will replace Aermacchi S-211s. The PAF's 2012-16 procurement plan, endorsed by the defense ministry, shows that four advanced jet trainers are to be purchased and delivered in this period.

A Philippine air force F-5 taxis past some OV-10 Broncos. The PAF phased out its F-5s in 2005.

The Philippines has no fighters, so the S-211s are used as trainers and light attack aircraft. But the S-211 is only a basic jet trainer that is old and no longer produced. "We have to admit it is difficult maintaining [them]," says one PAF official. He declines to say how many it has operational, citing national security reasons.

While the PAF has spent months evaluating advanced jet trainers, President Benigno S. Aquino, 3rd, has reignited the debate over whether the Philippines should acquire fighters. Aquino knows that the U.S. is giving 24 used F-16s to Indonesia for free, so he is now asking the U.S. to offer the Philippines a similar deal.

Aquino plans to visit the U.S. this year to push for F-16s, says Assistant Secretary of Defense Patrick Velez, and Gazmin will visit the U.S. in March. However, there is no certainty the Philippines will buy F-16s because these have yet to be included in the defense capability plan.

Moreover, nothing in life is free. The U.S. is giving the F-16s on the condition that Indonesia pay for the upgrades, which will cost hundreds of millions of dollars.

The PAF recognizes that getting Phil-

ippine government funding for such a project will be a challenge. "We would be upgrading the aircraft at significant cost, so we would need these funds. Everything is still fluid," says one of the senior PAF officials. Every military pilot would want to have Block 52, he adds; but due to the fiscal situation, the PAF may have to settle for Block 25 or 32.

The Indonesian F-16 upgrade includes a "Falcon STAR" improvement to ensure the airframe meets the flight-hours target. The air force's intent is to acquire fighters that can be operated for the next 20-30 years, says one official. "We have to look at the limitations of what America can offer," he adds.

Another issue is that the PAF is having trouble sourcing two-seat F-16s from the U.S., says Velez, noting that it is important that the service have some two-seaters for training purposes.

Aquino says the country wants to initially acquire 12 F-16s. Velez says they have been advised that it would be best to have half at one air base and the rest at another. Six aircraft, however, falls well short of a squadron. "If we get an initial batch, logistics would suggest that we would get more batches of the same

type of fighter later on, so we can form squadrons," one of the PAF officials says.

Radar is the other procurement that is a response to the South China Sea problem. "We really need to buy six radars," says one official. The service plans to order one by July 31, he adds.

While building up airpower to protect the country's territorial integrity is the main priority, the government also wants to boost disaster-relief capabilities. It also recognizes the need to transport troops and supplies to the southern Philippines in the fight against insurgents.

The PAF already has three C-130s and plans to buy two second-hand ones this year. One of the C-130Hs is likely to be purchased by the end of July, says Velez. "We're still doing assessments and looking into it. We've had a lot of offers from countries such as Israel and the U.S. We're also supposed to go to the U.K. to look at their C-130Ks."

Other military transports that the PAF has in significant numbers are the twin-turboprop GAF Nomads. "We intend to restore a couple of the Nomads, but we've also come to the conclusion that this aircraft is hard and expensive to maintain," says a PAF official. The

service plans to order two small military transports by the end of July and buy others later, so the Nomads can eventually be phased out. The aircraft need to be a quick-change variant that can transport either cargo or 19 troops, says the official. A rear-ramp door may be critical in the selection, but there is no firm decision on that yet, he adds.

The PAF also uses its North American Rockwell OV-10 Broncos in its fight against insurgents. But the Bronco is an old out-of-production aircraft. According to the 2012-16 procurement plan, the PAF will order six light attack aircraft by the end of July, and these will be delivered during the five-year period.

The PAF also needs combat helicopters. "We still have a request for helicopters, and it is one of the procurements we hope to sign by July 31. We're looking . . . for the most cost-effective and fastest in terms of delivery slots," says one of the PAF officials. The service has eight PZL W-3 Sokol utility helicopters on order. Velez says the first four were due to arrive in December, "but the latest information is that these four will be delivered on Feb. 19 and the other four before year-end." ☛

AVIATION WEEK EVENTS

engine MRO FORUM

April 2-3, 2012

Dallas, TX • Dallas Convention Center • Dallas, TX

At 36%, engine MRO is already the largest part of the maintenance/repair spend, and is expected to continue to grow 2.5% per annum in the next decade.

Attendees of this event will:

- Develop cost management strategies through effective engine maintenance planning.
- Learn the pros and cons of working directly with OEMs in aftermarket activities.
- Discover new ways to manage increasing.
- Analyze shifts in the engine industry.
- Measure the risk/benefit of maintaining older engines, while preparing for new ones.

Co-located with
MRO Americas
Free access to the
exhibition!



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

Validating Vega

New European small launcher set to debut Feb. 13

AMY SVITAK/PARIS

The Vega launch vehicle is the first European rocket to be developed in nearly two decades. But in a departure from Europe's recent past, the small-class Vega was not designed with the commercial launch market in mind.

Unlike Ariane 5 and European-modified Soyuz rockets, the business model for Vega, which after repeated delays is now set to debut Feb. 13, was developed to fly once or twice a year for a core market of European governments led by the 19-nation European Space Agency. ESA has committed to loft a handful of science and Earth-observation satellites atop the new rocket.

For now, Vega's viability seems stable over the long term, especially since the vehicle's direct competitors pose a lesser threat today than when ESA first proposed a small-class launcher in the mid-1990s.

Vega's managers have said that assuming a successful first flight, they will ask ESA ministers in November to approve modifications to the launcher that would anchor it more solidly in Europe by replacing the rocket's Ukrainian-built upper stage with European hardware, preferably from Germany.

An inaugural flight failure likely would scrap those plans in favor of a Vega salvage effort since European governments in general—and Italy in particular, as Vega's principal sponsor—can ill afford to make unplanned new investments.

Italy is financing nearly 60% of Vega's development, an unusual arrangement for an ESA program. Although Italy struggled to win French support for the rocket early in its development, France now pays 25% of the vehicle's cost. Germany has thus far maintained a skeptic's distance from the program. But Antonio Fabrizio, ESA's director of launchers, says that could change.

"If the Vega launcher is as successful as we hope, and we can look ahead into a more robust exploitation in the coming years, we don't exclude that we can reopen the discussion with Germany to see if there is potential for their activity in the upper part of the launcher."

Led by Italy, ESA governments have invested about €700 million (\$922 million) in Vega. In addition to the development costs

they have also committed €400 million for the Vega validation program, which includes five ESA-financed Vega launches of government payloads between 2013-15.

First proposed in the mid-1990s, Vega was envisioned as a small-class rocket capable of lofting 1,000 kg (2,200 lb.) to low Earth orbit for around \$20 million, a price that was set 15% below other Western launchers in operation at that time. But disagreements over ESA member participation and launch vehicle configuration delayed the start of Vega's development until 2003 and led to substantial performance modifications.

More recent events have given the program new impetus. Competing Western launchers in development since Vega was first envisioned have either been shelved—in the case of the Space Exploration Technologies' Falcon 1e—or plagued by technical problems, such as the Orbital Sciences Corp. Taurus XL, which has suffered two launch failures in the past three years.

Fabrizi says the rocket slated to launch this week is capable

of delivering a 1,500-kg satellite into a 700-km (435-mi.) low Earth orbit for about €32 million, and that given the rising cost of Russian Rockot and Dnepr launchers, "it's quite compatible with the market."

Operated by Europe's commercial launch consortium Ariane-space, Vega costs will be kept low through synergies with the heavy-lift Ariane 5 rocket and the recently introduced European version of the Russian Soyuz launch vehicle. Three of Vega's four stages use solid rocket fuel almost identical to that used for Ariane 5's strap-on boosters. Vega will also share the same range safety, telemetry and other infrastructure already in place for Ariane 5 and Soyuz at Europe's Guiana Space Center.

Arianespace Chairman and Chief Executive Jean-Yves Le Gall says the addition of Vega will allow the company to spread the spaceport's fixed costs over three vehicles, helping to keep prices down. So, Vega managers view any additional market share beyond two launches per year as icing on the cake. But for now, their focus is on Vega's inaugural flight and the five ESA-financed launches expected to follow.

Italy's ELV SpA, a joint venture between Italian rocket-propulsion manufacturer Avio and the Italian space agency ASI, is Vega's prime contractor for development, quali-

fication and production of the launcher. Standing 30 meters (98 ft.) tall, Vega's launch configuration comprises three solid propellant stages and a Ukrainian-built restartable liquid propellant upper stage.

Following its first five ESA-backed missions, Vega is slated to launch its first two commercial missions, lofting Europe's Sentinel satellites for the Global Monitoring for Environment and Security (GMES) program between 2014 and 2016. ☼



The new Vega small launcher is designed to complement Europe's medium-class Soyuz and heavy-lift Ariane 5 rockets at the Guiana Space Center in Kourou.

Game Over

Europe's weakest airlines begin to go under as several governments withdraw or curtail support

JENS FLOTTAU/**FRANKFURT** and ROBERT WALL/**LONDON**

European governments have been notorious for their open or hidden subsidies to support national carriers. But tighter controls imposed by the European Commission, coupled with the effects of the sovereign debt crisis, are taking their toll on the weakest airlines—as witnessed by the recent demise of Spanair and the de facto collapse of Malev.

In theory, the principles of how the industry should or should not be supported have been around for years. Technically, governments and private investors are held accountable to the same rules, which means that they can bail out airlines only once. But governments have become very creative when it comes to circumventing state aid regulations, leading to the survival of airlines that would have been long out of business under private control. The EC has been watching and investigating this situation for awhile.

Now it looks as if some serious industry restructuring could begin in earnest. With many governments depending on financial support from European Union rescue agendas—and stricter budget

control being one of the main consequences of the continent's sovereign debt crisis—the EC actually has the power to force member states, regions and communities to comply.

"We were notified by the regional government that it could not finance our operations any more," Spanair Chairman Ferran Soriano said on Spanish television, explaining why the airline grounded its aircraft on Jan. 27. Spanair had hoped to convince Qatar Airways to become a large minority shareholder and save the airline from bankruptcy, much along the lines of last December's agreement between Etihad Airways and Air Berlin that ensures that the latter remains in business, at least for now. But Qatar pulled out of the talks, which Soriano described as being at a "very advanced stage."

In light of that blow, Spanair immediately ceased operations. Three days later, the carrier filed for bankruptcy in a Barcelona high court. The airline's debt exceeds €300 million (\$393 million).

The Star Alliance member has been in a crisis mode for years. The airline used to be owned by SAS Group. But in 2009, SAS decided to focus on its

core market in Scandinavia. One important reason behind that move was the prospect of having to invest large sums into renewing Spanair's aging fleet of MD-80s. In 2008, a Spanair MD-80 crashed on takeoff from Madrid, killing all 154 onboard. The accident further tarnished the airline's bad image. SAS still had to write off €190 million in its 2011 fiscal year for the 11% stake it retained in Spanair. This means SAS will no longer be able to post a pre-tax profit for the year, contrary to its earlier guidance.

Spanair—which does not operate long-haul flights—was fully exposed to low-cost carrier competition and the weak European market. It is following in the wake of the now defunct Air Madrid and Air Comet.

A combined 80% stake in Spanair was assumed by a group of local investors and the Catalan government in 2009. The government again had to provide an emergency loan in January 2011 to keep the airline flying.

The exit of Spanair is viewed as a boon to Iberia's low-fare affiliate, Vueling, which, like Spanair, is based in Barcelona and has been very vocal about

Spanair, faced with no money and no hope of a bailout from the government or Qatar Airways, grounded its fleet Jan. 27.



KEITH CASSELL

Spanair's state-backed fare dumping practices. Vueling already announced that it will boost summer capacity by 50% in Barcelona and by 25% system-wide as it prepares to enter some ex-Spanair markets. Analysts expect both Ryanair and EasyJet to add capacity; Ryanair already has plans to expand its Barcelona presence.

On the other hand, Star Alliance loses one of its smaller European members. Spanair is the third Star member after Ansett Australia and Varig to cease operations.

The loss of Spanair makes it all the more important for Star to at least keep TAP Portugal in the alliance. TAP will be privatized this year and could end up in a different camp altogether.

State-owned Hungarian carrier Malev last week looked like it could follow Spanair very soon. The Hungarian airline's board of directors convened an emergency meeting and stated that the company's finances would no longer be viable by late January, although terms such as bankruptcy, insolvency or collapse were assiduously avoided. The board urged management to devise a "liquidity plan" by the end of last week. It also called upon the government to do its utmost to save Malev. But at the same time, the body admitted that Hungary's options to support its flag carrier are "extremely limited." The EC ordered Malev to pay back millions in illegal state aid in early January and the country vowed it would comply.

Early in the week, the government placed Malev under a special status and declared it a "business of prime strategic significance." The new status makes it impossible for creditors to launch bankruptcy proceedings. Then, the court appointed a bankruptcy trustee and placed the airline under an extraordinary moratorium to protect it from actual bankruptcy. All of this means Malev will continue flying, at least in the short term. But it does not ensure that the airline won't run out of money very soon.

Unless some last-minute miracle happens, a collapse appears to be only a question of time given that any potential private investors have already ceased talks and numerous attempts to privatize the airline have failed. Hungarian media reported on overtures being made to low-fare airline Vueling, but this link is a long-shot, at best. At least International Lease Finance Corp. (ILFC)

agreed to refrain from impounding Malev's Boeing 737s.

Air Malta could be the next victim, albeit probably not in the near term. However, the EC opened an in-depth investigation into €130 million worth of restructuring funds for the carrier. There are "doubts whether the restructuring plan complies" with Europe's admissible state-aid guidelines. The EC is "concerned that the forecasts regarding long-term viability may not be realistic enough and that the proposed capacity reduction may not be appropriate to compensate for the distortions of competition created by state support." Also, it has concerns about Air Malta's own contribution to the restructuring effort being sufficient.

The small, state-owned airline received a €52 million loan that was approved as rescue aid in November 2010.

“ We were notified by the regional government that it could not finance our operations any more ”

Six months later, Air Malta notified the commission of the €130 million capital increase that comes on top of a 2004 capital increase from the government.

The EC is also extending a closer look into public funding of Europe's air transport industry to airports. That, in turn, could have serious ramifications for low-cost carriers that have made marketing support and other help granted by regional airports a key part of their business models—particularly Ryanair.

Three separate investigations into public financing of regional airports in Germany and Sweden have been opened as the EC examines whether the facilities in question have contravened the market economy investor principle. States or communities are allowed to support companies they own, but only to the extent that a private investor would. In the aviation sector, subsidies can be allowed if they are "necessary, proportionate, pursue an objective of general interest, ensure non-discriminatory access for all users and do not unduly affect trade in the internal market."

The EC has looked into support agencies for Weeze and Altenburg-Nobitz airports in Germany and Vasteras in Swe-

den. Weeze has "received over the last 10 years several loans or grants on terms that differ from market conditions," the commission states. It found that the airport is experiencing financing difficulties and "its operations appear to be dependent on public support."

In the case of Altenburg-Nobitz, the commission has doubts that the airport could operate under market conditions. It also questions whether "rebates or marketing arrangements concluded between the airport and low-cost Ryanair could procure the latter an undue economic advantage over its competitors." Vasteras is being scrutinized for the same reasons.

In a separate initiative, the EC is investigating the SkyTeam alliance to assess whether Air France-KLM, Delta Air Lines and Alitalia have breached European antitrust rules with their transatlantic joint venture. The move comes even as the commission closes a prior review of the alliance, which focused more broadly on behavior of alliance members. The EC says the decision to end that review "was taken as part of the priority-setting process in light of significant changes in the circumstances on the relevant markets. The closure of proceedings does not, however, relieve the SkyTeam members from assessing their behavior and ensuring that they comply with EU competition law."

Also on the agenda for the commission this year "is a comprehensive review of our external aviation policy during the first half of 2012," says an EU representative. "Our goal is to evaluate and measure the achievements and benefits obtained over the past seven years from the common EU external aviation policy" since that policy came into force in 2006. Underpinning that review will be a Booz & Co. study that will be conducted over three months. The goal is to work with industrial stakeholders and member states to help define what direction the commission should take.

Passenger rights legislation is another topic the EC plans to revisit. Existing aviation passenger rights rules, codified in EC regulation 261, came into sharp criticism from airlines for the open-ended financial liability in the case of severe disruptions caused by natural phenomena such as violent weather or volcanic ash. While the airlines' concerns are now better understood, an official warns that a roll-back of passenger rights will lack political support. ☉

Opportunity Knocks

Europe's low-cost airlines weigh new fleet offerings

ROBERT WALL/LONDON

Norwegian's large narrowbody order, including 100 A320NEOs, has raised eyebrows.

AIRBUS CONCEPT

Moreover, O'Leary argues that with strong order intake for Airbus and Boeing aircraft, prices are at an "all-time high," adding that "at the moment anybody ordering aircraft is nuts." Ryanair has been eager to place another fleet order, but is unable to secure the discounts from manufacturers it is looking for.

EasyJet sees the situation differently. Although it still has 42 options and 32 purchase rights for Airbus A320s left, Chris Essex, head of central and fleet procurement at EasyJet, says "we are now actively evaluating the reengined Airbus [A320] NEO and Boeing [737] MAX families, as well as the Bombardier CSeries." The CS300, Boeing 737-7/8, Airbus A319/A320NEOs

Aviation may not be a zero-sum game, but in Europe it may seem that way. As several midsize national carriers struggle, low-fare airlines are ready to profit further. But exuberance about the short-term opportunities is dampened by new competitive pressures on the horizon.

With Spanair having ceased flying because of financial problems and Hungarian flag carrier Malev on the brink of insolvency, low-cost carriers such as Ryanair and EasyJet see opportunities to improve their own business.

Spanair's situation is "very good for us," acknowledges Ryanair CEO Michael O'Leary, noting his team has already begun discussions with the El Prat airport in Barcelona, Spain to place additional aircraft there. Similarly, EasyJet sees opportunities not just in Barcelona, but also in Madrid. In addition to reducing overcapacity in those markets, the Spanair demise also makes it possible to secure better slot positions, says Alan McIntyre, EasyJet's head of network and scheduling. Further underpinning the dichotomy of the European airline market is that both low-fare airlines delivered better-than-expected financial figures in recent days. Ryanair has increased its full-year profit guidance, to €480 million (\$631.7 million) for the full year, on the heels of a strong third-quarter performance, and EasyJet also recorded stronger-than-expected revenue in the last financial period, putting the carrier on a pace to beat profit expectations.

Still, there are ample headwinds for the low-fare airlines. O'Leary warns that

the positive results just delivered should not lead to euphoria. Fuel is the biggest headwind. Ryanair notes that despite a robust fuel-hedging portfolio, it faces a €350 million increase in fuel costs in the 2013 financial year.

Another potential hurdle could be expanded competition, with Norwegian Air Shuttle's large fleet-expansion plan having caused a stir among other European low-fare carriers. On Jan. 26, Norwegian placed orders for 222 Boeing 737NGs, 100 737MAXs and 100 Airbus A320NEOs and reserved rights for 150 more. The deal "certainly makes us think," says EasyJet CEO Carolyn McCall. "We're really working out what they're doing and why they're doing it." EasyJet is grappling with "what does it mean for us," she acknowledges.

O'Leary argues that the deal is "a very strange one," especially because, for now, Norwegian has "quite a decent niche" and could further benefit from the demise of Scandinavian Airlines—another European legacy carrier long on the brink of bankruptcy. McCall wonders, "Does this mean they're going to try and be a pan-European player or not?"

Norwegian may just be creating problems for itself, though. O'Leary, who is quick to dismiss rivals, says Norwegian's strategy "has all the smell of an Air Berlin Mk. 2," in reference to the struggling German airline that began as a low-fare carrier but then diversified operations, including pursuing long-haul business. Both the German and Scandinavian carriers are now Boeing 787 customers.

and even the larger models are being looked at. A type decision is expected toward year's end.

Although Airbus has secured more than 1,200 firm NEO orders and Boeing has commitments for around 1,000 MAXs, Essex is not worried about slot availability. "Our reading of the situation, though, is that manufacturers are not selling out their delivery slots consecutively," he says, adding that "we still feel there is plenty of time and opportunity to place an order."

One issue under review is how to bridge the period between 2014 and when the new aircraft will be available around 2017 or 2018. That could affect the airline's decision on whether to exercise 42 A320 options under a previous contract, which come up in September.

Ryanair, too, at some point needs new capacity. In a seeming effort to apply negotiating pressure on Boeing, O'Leary has been talking up the A320NEO and also Comac's C919, saying he is urging the company to develop a 200-seat version. But with little sign that the Chinese company will follow the advice on a timeline that may match Ryanair's needs, O'Leary says he has been "impressed" by the Airbus A320NEO but "unimpressed" by the 737 MAX. Airbus is reluctant to negotiate with Ryanair, believing O'Leary is seeking a stalking horse to extract a better price from Boeing. On the MAX, O'Leary complains that any cost savings tied to lower fuel burn will be eaten up by high landing fees linked to the reengined narrowbody's higher weight to accommodate the CFM Leap-1B turbofans. ☐

Mixed Signals

Though some are deferring 747-8F orders, Russia's ABC is good to go

GUY NORRIS/SEATTLE

It's a sign of the times in the topsy-turvy air cargo market that while one eager operator can't wait to get its hands on the latest Boeing 747-8F freighter, others are negotiating deferrals.

Such was the confusing picture at Boeing's Everett, Wash., site on Jan. 26 as burgeoning Russian operator AirBridge Cargo (ABC) celebrated the hand-over of its first 747-8F. Meanwhile, not far away, other factory-fresh freighters temporarily sat idle, swaddled against the winter weather in protective covers.

For ABC, part of the Volga-Dnepr group, inauguration of services with a state-of-the-art technology freighter means more efficiency, lower fuel burn and—it hopes—dramatically improved reliability. Boeing says initial performance figures from the first nine 747-8Fs in service show a creditable 97% dispatch reliability rate during the 6,000 flight hours already accumulated since Cargolux began flying them in October.

The aircraft's 16%-greater revenue cargo volume will also be key as ABC looks to expand in 2013, when it takes the final pair of five 747-8s it has on firm order. But for now, it is banking on the reliability and efficiency of the new freighter, which will replace aging 747F "Classics," which are becoming a maintenance-intensive burden.

But for operators such as Cathay Pacific Airways, the extra capacity is the last thing it needs at the moment. Hong Kong, the world's busiest air cargo hub, saw a 4.5% drop in air freight in 2011 and Cathay was forced to cut its cargo growth capacity by 7% for 2012 from the original 17%. As a result, the airline is stretching out the deliveries of 10 747-8Fs over three years instead of two, and will receive the final pair in 2013. Cathay's move came just months after another major cargo operator, Atlas Air, canceled three of the original 12 747-8Fs it had ordered. Boeing is seeking other operators for the aircraft.

Hong Kong's air cargo market is feeling the repercussions of the deepening economic uncertainty that has plagued the U.S. and Europe. The outlook for the market, and therefore the industry supporting it, is unclear as consumers remain wary. In the near term—and by that they means the first half of the year—forecasters at Boeing do not see much change to the slight, but steady market decline of 2011.

"However, if Europe negotiates the Eurozone debt, we are fairly confident that economic activity will accelerate on a global basis in the second half of 2012," says Boeing's cargo market forecaster, Tom Crabtree. "It all depends on Europe, and on how Iran reacts to the oil embargo," he adds.

Boeing's forecast indicates world air cargo traffic will expand at an average annual rate of 5.6% for the next two decades, down 0.3% from earlier projections but still triple the 2009 levels,

when the market was in the second year of an unprecedented two-year slump. In the next 20 years, the freighter fleet is forecast to expand by more than two-thirds—from 1,760 in 2010 to around 3,500 aircraft by 2030. Despite the short- to mid-term uncertainty, "we're fairly bullish," says Crabtree.

Part of this confidence is derived from the keen observation of trends he's seeing in the waxing and waning fortunes of the huge container ships passing through the Puget Sound, close to the Everett site. "We're watching the container ship industry a lot closer," says Crabtree, who adds that "one reason we saw a 19% spike in traffic in 2010 was that lot of shipping was idle, and aircraft could be reactivated far more quickly." Around 10% of the world's container fleet sat out the worst of the 2008-09 downturn. Now 4% is in mothballs, and is forecast to grow to around 6% by late March.

Although this may not sound like grounds for optimism,

Boeing finds comfort from the underlying trend of ships traveling slower to conserve fuel. Average speed has dropped to 14-17 kt. from 21-22 kt., resulting in 20-25% longer transit times than in the 2000s. The trend to slower sea speeds is "here to stay," says Crabtree, who cites container giant Maersk's recent order for 20 new Triple

E-class ships, designed to steam at 19 kt.

ABC aims to capitalize on speed and shorter routes to help it grow later this year as it starts the first regular transpolar cargo service between the U.S. and Russia in mid-February. Flights will begin with 747-400Fs but transition in September to 747-8Fs. The inauguration of the 747-8F will help drive down the average age of the fleet from eight years to just two, says ABC marketing director Varvara Britaeva. "The average age of the current Classic fleet is 22 years, so by replacing them we will be able to significantly increase reliability and on-time performance." ☛



ABC expects to operate five 747-8Fs by the end of 2013, and holds options on a further five.

Load Alleviation

Airbus and airlines expect little disruption for A380 wing repairs

ROBERT WALL/LONDON and
JENS FLOTTAU/DUBAI, UNITED ARAB EMIRATES

The high profile Airbus has given the A380 magnifies any of its problems in the public eye. The mega-transport's latest setback, cracks in a wing component that must be repaired in much of the fleet worldwide, may end up as little more than a footnote, however.

Airbus has put in place changes to its A380 wing assembly process to address the occurrence of component cracks as it becomes apparent that most A380s already built require fixes to deal with the issue.

Twenty of the more than 60 Airbus A380s in service worldwide are affected by the European Aviation Safety Agency's (EASA) airworthiness directive (AD) to inspect the aircraft

for potential cracks of wing rib-feet. The findings by the airline inspections having unfolded in recent days are "in line with the expectations," says Airbus executive vice president for programs, Tom Williams.

Singapore Airlines has the most A380s affected; it found cracks on all six aircraft inspected initially. No major service disruptions resulted, although some flights had to be shifted to Boeing 777-300ERs while the A380 wing repairs were underway.

Similarly, Lufthansa's A380 introduction director, Dean Rainieri, says he does not expect any major disruptions. Lufthansa operates eight A380s, but they are not yet affected due to their low number of flight hours.

The Jan. 20 AD requires A380s with 1,800 flight cycles or more to undergo a detailed visual inspection within four days or 14 flight cycles, whichever occurs first. For aircraft with 1,300-1,800 flight cycles, the inspection must occur within six weeks or 84 flight cycles, according to EASA. Aircraft not yet affected by the directive will undergo the process once they reach the flight cycle threshold, or even earlier, Williams notes.

There are enough replacement wing rib-feet available to avoid parts shortages that could impact aircraft return to service.

At issue is an L-shaped bracket that attaches the wing skin to the ribs. Each wing has about 2,000 L-shaped brackets (30-40 per rib, with 60 ribs per wing), so the failure of one bracket is not seen as a safety issue. However, EASA says that "this condition, if not detected and corrected, could potentially affect structural integrity of the aeroplane."

To avoid the problem on new-build aircraft, Airbus is using shimming to reduce the strain applied when the wing skins are assembled, which will reduce the loads on the wing rib-feet. Rather than a 0.5-mm gap when skins were pulled down in the assembly process, it was 1.5-2 mm in the lower wing area around Rib 26 and Stringer 21, causing an unexpected load on the wing rib-feet.

Airbus also is changing the material of the part from an

Aluminum 7449 alloy to a stronger component. The overall effect will be to add 89 kg (196 lb.) to the aircraft, Williams says.

Furthermore, Airbus is altering the interference fit fasteners because it deems the current configuration complicit in the damage seen.

The inspection regime airlines are undertaking involves draining the wing tanks and opening an access panel. Depending on local rules, the process takes a day or more. If a repair action is required, it can take several days.

Airbus stresses that the issue is not a flight safety concern.

As part of the root-cause analysis, Airbus instrumented one of its own aircraft to determine if its wing-load estimate had been erroneous. The testing indicated that was not the case.

EASA notes that this AD "is considered to be an interim action to immediately address this condition." But, it adds, "further mandatory actions might be considered" as a result of the ongoing investigation.

Wing changes being introduced on the A380 to boost the maximum take-off weight to 574 from 569 metric tons should not create a new problem in this area, Airbus says.

But that is not the only in-service issue the aircraft maker is dealing with on its flagship product. Fleet-wide dispatch reliability of the A380 is now at 98%. "We were not at the levels of reliability that we had hoped for," concedes Paul Oliver, head of customer support for the Middle East, Africa and India during Aviation Week's MRO Middle East conference in Dubai last week.

However, he emphasizes that the trend lines are in the right direction and that more than half of A380 operators have a 99% dispatch reliability rate. Lufthansa has a 99.2% rate, according to Rainieri. The airline operated four of the aircraft at 100% for four months before encountering some glitches.

Separately, the Qantas A380 severely damaged as a result of the Nov. 4, 2010, uncontained Rolls-Royce Trent 900 engine failure is now "back in flying condition," Oliver says. The aircraft is on the ground again, though, undergoing wing-crack repairs in Singapore. ☉

“We were not at the levels of [fleet-wide dispatch] reliability that we had hoped for”

Integrated Cockpit Solutions

- Open architecture
- Off-the-shelf technology
- Trainers, helicopters and transport aircraft

Esterline

CMC Electronics

MONTREAL • OTTAWA • CHICAGO • www.cmcelectronics.ca



Growth Story

Asia-Pacific's low-cost carriers change the aircraft mix in a region once dominated by widebodies

MICHAEL MECHAM/SAN FRANCISCO, ROBERT WALL/LONDON and LEITHEN FRANCIS/SINGAPORE

Once known as the home of big airplanes, the Asia-Pacific region's growth now spans so many commercial jet market segments that even manufacturers of regional aircraft are beginning to find ways to keep from being squeezed out by the big guys.

Airplane programs for seating 300 or more passengers still must prove themselves prosperous in Asia or have no hope of prospering at all. While that imperative is not strictly true for smaller aircraft, their fortunes are increasingly tied to how flexibly they can serve the needs of legacy and low-cost carriers alike in the Asia-Pacific region.

As the industry gathers for the biennial Singapore Airshow Feb. 14-19, Boeing's Current Market Outlook is a good place to gauge who is doing what and where in the region. The CMO offers the industry's broadest 20-year forecast of demand because it considers aircraft types seating fewer than 90 passengers—regionals that Boeing does not make—to 450 seats and more. In its 2011 report, Boeing forecasts that the Asia-Pacific region will account for 11,450 of the 33,500 new aircraft the world's airlines will need through 2030. Broken down, 80% of Asia-Pacific orders will be for fleet expansion and only 20% for replacement. A split like that is the epitome of a growth market.

The region has 10 of the world's 20 largest country markets. It is the biggest market for single-aisle, twin-aisle and very large airplanes, and is expected to provide 35% of commercial aviation's demand and 30% of its orders, by value, over the next 20 years.

The growth in the region's airline industry is largely being driven by air ser-

vices liberalization, dynamic economies and higher incomes. Regional operators, especially low-cost carriers, are the biggest beneficiaries of deregulation. "There are so many LCC markets now," says Randy Tinseth, Boeing vice president of marketing. "LCC growth in general has been 25% a year over the past 5-6 years."

One of the region's biggest LCC markets is Indonesia, where Boeing has benefited from Lion Air's orders for 737-900ERs. Indonesia—an archipelago with a population of 230 million—is the largest market in Southeast Asia, a region that is forecast to have an annual growth rate of 6.8% over the next 20 years, creating an uptick in intra-regional traffic of 7.4%.

LCCs are also starting to emerge in Northeast Asia, a region that Boeing has forecast will account for 1,250 new airplanes through 2030. All Nippon Airways is behind two LCCs—Peach and AirAsia Japan—while rival Japan Airlines (JAL) has joined with Qantas to establish Jetstar Japan. Meanwhile, five small LCCs have emerged in neighboring South Korea.

Tinseth warns there will be some losers among Asia's LCCs. If the region follows the model set in the West, the LCC market will see dynamic growth in the first two years, then a shake-out as some carriers that set uneconomic fares experience cash-flow problems.

Tinseth is impressed by how well Asia's network carriers have reduced their costs and cut apron strings to their governments. One winning strategy is to spin off LCCs as separate operating units, as Qantas has.

LCCs, with the exception of Spring Airlines in Shanghai, have yet to establish bases in China, however. Boeing's regional rundown of the market outlook

notes that China's meteoric rise is beginning to flatten out. Its GDP is forecast to have an average 7% growth rate, while demand for air travel will average 7.6%. Those rates are below the 10%-plus expansion seen over the previous 15 years, but still ahead of Europe and the U.S.

China will need 5,000 new airplanes valued at \$600 billion by 2030, says Boeing. That is the biggest national share in the region.



The other big Asia-Pacific market is in South Asia, where annual growth is forecast to be 8.1%. South Asian nations such as India have rapidly expanding economies and a young population, which is good for air travel. But the region has poor airport infrastructure, and many carriers weakened themselves by expanding too quickly.

Oceania, led by Australia and New Zealand, is the least populated sub-region—just 40 million people—but accounts for 3.2% of global traffic. Air travel is expected to grow 5.5% per year, largely due to flights into Southeast Asia, but also because of new routes to North America, the Middle East and China. The new routes will

benefit from longer-range, twin-aisle transports.

Airbus is just as focused on Asia, and for good reason. The European manufacturer expects the region to receive 32% of the roughly 570 aircraft it will make this year. At home, Europe will account for only 17% of Airbus's deliveries, so it is understandable why CEO Tom Enders



Booming economies, deregulation and rising income levels in the Asia-Pacific region are driving up use of single-aisle airplanes such as the Airbus A321.

says he watches Asia closely for any signs of a slowdown, and he has seen none.

John Leahy, chief commercial officer, expects to build on last year's success for Airbus's newest product, the A320NEO. Already, the region has accounted for 2011's largest NEO order—200 airplanes for AirAsia.

But in widebody placements, Airbus has not matched Boeing's success, particularly against the 777. So far, Asiana is the only Asia-Pacific customer for the A350-1000, the 777's most direct competition. But Leahy says he is in talks with three carriers that are looking at the -1000.

Airbus also is marketing the A380, both with new and existing customers; but its delivery rates remain slow. Malaysia Airlines (MAS) and Thai Airways International will be the only two new A380 operators this year. More than 50% of the A380 customer base is in the Asia-Pacific region.

While Airbus and Boeing have benefited from the region's booming airline industries, high passenger growth can actually spell bad news for manufacturers of smaller jets. The big jumps

in passenger volumes characteristic of booming markets prompt carriers to use larger aircraft. So, ironically, Bombardier and Embraer often find greater success in mature markets where their airplanes can be applied selectively to low-volume routes. Full-service carriers may also turn to regional jets when they

The LCC market will see dynamic growth in the first two years, then a shake-out

want to distinguish themselves against low-cost competitors flying one-size-fits-all single-aisle jets. Regional jets allow carriers to offer higher frequencies that the larger single-aisles cannot do economically. MAS, which competes against low-cost AirAsia, has been considering smaller jets for this very reason, although it has not yet committed to the strategy. In Japan's mature market, JAL has already chosen Embraer's E-Jets to

"right size" routes it previously flew using 737-800s.

Alex Glock, Embraer vice president for the Asia-Pacific airline market, says growth is happening throughout the region but "you are starting to see some markets getting more pressurized." India's airline industry, for example, is suffering from overcapacity, he notes.

According to Embraer's business model, there is no point for new entrants to fly on the same routes as everyone else, and with the same aircraft. Glock says the best new growth opportunities come from targeting relatively underserved secondary markets. "You look at the trunk routes in

India between the metro cities. The yields are suffering tremendously." E-Jets offer airlines the opportunity to branch out and reach the secondary markets where competition is less and yields are higher, says Glock. These secondary routes will continue to grow owing to the rising middle classes, he adds.

Besides India, other countries with sizable domestic markets include Australia, Indonesia and China. In fact,



AMSTERDAM RAI
6-8 MARCH
www.atcglobalhub.com

ATC GLOBAL 2012 EXHIBITION & CONFERENCE
6-8 MARCH, AMSTERDAM RAI

CONNECT WITH OVER 5,400 INDUSTRY PROFESSIONALS
AT THE WORLD'S DEFINITIVE ATM EVENT

- Discover new ATM products and services offered by 200 leading suppliers
- Access 40+ free educational sessions
- Discuss key industry issues with ATM leaders at the prestigious two-day conference

Register to visit or book your conference place online at
www.atcglobalhub.com/aviationweek

Organised by



Conference endorsed by



Conference sponsored by



Supported by



Lead media partner



Media partners



Bombardier sees China becoming a larger market than Europe and the Commonwealth of Independent States (CIS) combined. In its 20-year forecast for 20-149-seat airplanes, the company lists China as the world's second-largest market after North America.

Philippe Poutissou, Bombardier Commercial Aircraft vice president of marketing, says China and the rest of the region is a dynamic market with many opportunities for his company. To capitalize on this, Bombardier has beefed up its presence by appointing Anders Solem, as China sales vice president based in Beijing, and Torbjorn Karlsson, as Singapore-based vice president of Asia-Pacific sales. Bombardier has had China-based representatives for many years, but sales for the rest of the region were previously handled out of Canada.

In its 20-year forecast, Bombardier predicts that the Asia-Pacific region, excluding China, will account for 1,700 aircraft deliveries.

Poutissou says the demand for smaller aircraft will partly be driven by the liberalization of air services. Southeast Asian nations in particular have been quick to liberalize routes between major capital cities, fueling demand for A320s and 737s. Bombardier is hoping the next round of liberalization will focus on secondary routes, which should benefit smaller aircraft.

The mining boom in Australia, Papua New Guinea, Indonesia and Mongolia is creating demand for air services. Second-hand Fokker 100s are popular because they are cheap. Embraer's Glock says some of them are flown only 400-600 hr. a year. New aircraft need to fly more often to cover their higher capital costs while exploiting the benefits of lower fuel and maintenance costs. Eventually, the Fokker 100s will become impractical and E-Jets will have an opening, says Glock.

Turboprops play a small but key role in the region. ATR CEO Filippo Bagnato says that after a strong showing last year, 2012 should see more activities in Asia. Of ATR's 157 firm orders booked in 2011, 50 were from Asia-Pacific operators, including Lion Air, Virgin Australia, Air New Zealand, Uni Air and Firefly. All were for ATR 72s, 11 for the -500 and the rest for the -600. Some of the undisclosed four customers and 41 aircraft booked in 2011 also are expected to be linked to the Asia-Pacific region. Lion Air, a large ATR customer, is expected to order more ATR 72s. ☼

Dual Snap®

Pressure, Temperature & Liquid Flow Switches & Sensors

Time-Tested.
Innovative, Next Generation Solutions.



CCS introduces a new multi-function Pressure Switch & Temperature Sensor RTD product line.

8GRTD100 SHOWN



Visit us at the Singapore Air Show in Booth T-77

CCS

CustomControlSensors

www.ccsdualsnap.com

Singapore Airshow 2012

Attend the Singapore Airshow 2012 to tap into unprecedented business opportunities in Asia Pacific's fastest growing market!



OPEN FOR REGISTRATION: www.singaporeairshow.com

- Over 900 exhibiting companies from 50 countries displaying the state-of-art aerospace and defence technology
- Green Pavilion showcasing successful green initiatives, best practices and innovative business ideas
- Business Forums providing insights on opportunities in key markets such as China, India and South East Asia

Also check out our special "LOVE IS IN THE AIR" spouse program and bring your Valentine along to Singapore. For more details, please visit www.singaporeairshow.com

To start building your show marketing plan:

Iain Blackhall
Managing Director, Civil Aviation
Tel: + 44 (20) 7176 6231
iain_blackhall@aviationweek.com

For inquiries on Singapore Airshow:

Danny Soong
Senior Sales and Project Manager
Tel: + 65 6542 8660 ext 133
dannysoong@experiaevents.com

For more information: www.singaporeairshow.com

OFFICIAL MEDIA PARTNER
AVIATION WEEK

Collective Action

Netherlands, U.K. set to receive JSFs this year

ROBERT WALL/LONDON

Entry-into-service is years off, but that has not stopped the F-35 Joint Strike Fighter from facing its first overseas battles where—at least in the political theater and competitive skirmishes—it has held its own.

Critics will say the day of reckoning still looms. To some extent, that is probably true. Italian and British buys are likely to fall far short of initial plans. But for all the schedule and cost uncertainty that has shadowed the program, and the opposition from political factions in several parliaments, the F-35 has escaped remarkably unscathed.

Although the spotlight in recent months has been on U.S. JSF issues, the overseas elements are beginning to come into sharper focus. Complicating matters are several thorny issues that still need to be addressed, such as low-observable maintenance and electronic-warfare reprogrammability. But on the positive side, 2012 will be the year the non-U.S. elements will

F-35C being acquired as part of the sixth lot of low-rate initial production (LRIP) aircraft. The U.S. Congress OK'd the deal as part of the fiscal 2012 budget approval.

In addition to working out the details of international involvement in operational testing, efforts are under way to lock in a site for joint training. Luke AFB, Ariz., seems likely, but USAF is awaiting results of an environmental impact study. Partner countries will pool aircraft there to gain efficiencies, Hartnett notes.

Also, a home for the electronic-warfare (EW) reprogramming laboratory is being sought. An independent assessment will be performed to gauge just how large the facility—which will generate mission data files—needs to be.

One key consideration is that the F-35 collects far more data than needed for self-protection purposes. The study is geared to help delineate what parts of the information collected by the digital receiver suite should be considered self-protection relevant versus intelligence-focused. Those findings will help determine the extent and expense of the EW facility.

Because each nation is likely to have its own ability to manipulate EW information without sharing country-sensitive jamming techniques with other JSF buyers, managing that setup

within U.S. security disclosure rules is a highly complex undertaking. The goal is to have the matter resolved in time for first aircraft delivery to partners in 2015.

A similarly sensitive issue has been

The U.K. will be the first non-U.S. buyer to receive an F-35—a Stovl version. The handover is set for the summer.

low-observable maintenance. A two-tier set-up is likely, with some repairs going to operators and more extensive work being performed at depot facilities. Where the demarcation lies also is still under review.

Running in parallel are studies into country-specific F-35 modifications that one or several nations are interested in. The program supports both common and unique studies as well as partially common work. One of the latter is for a drag-chute, which interests northern partners such as Norway and Canada because of potential icy runway conditions. Conceptually, the drag-chute would be pod-mounted to avoid degrading the aircraft's stealth performance.

Similarly, the U.K. is looking into how to add a buddy refueling capability to the F-35C to provide operational flexibility for carrier deployments, particularly if recovery operations are disrupted. Results of the study are due next month. Peter Luff, U.K. minister for defense equipment and support, says "work is under way to assess the most cost-effective means of providing an embarked air-to-air refueling capability in support of the department's future Carrier Strike capability."

Also under discussion is the potential integration of Kongsberg's stealthy Joint Strike Missile (JSM) into the aircraft. In the coming year, partners from participating countries will narrow down the weapons that should be part of the Block 4 configuration. JSM, if it makes the cut, would be a common item.

In parallel with the technical discussions, the international community's attention is focusing on securing production orders. Italy and Australia are expected to place LRIP-6 orders



more clearly start to emerge. "This is a big year for JSF from an international perspective," says U.S. Air Force Col. Robert Hartnett, who oversees the program's global ambitions.

The agenda includes completion of acquisition plans as well as securing new deals. One candidate is South Korea, which late last month released its request for proposals under the F-X competition. Singapore, also, may cement its plan for the F-35 by year-end; the country has been a security cooperation participant in the project, as has Israel.

But perhaps the most high-profile events will be delivery of the first aircraft to European buyers. The U.K. is set to receive its first two F-35s (BK-1/BK-2) this summer; the Netherlands is also down for two test aircraft, with the first to be handed over this year. Pilots and maintenance personnel will use it to prepare for operational test training. The second Dutch aircraft—equipped with test instrumentation—is due next year.

The four aircraft will be based at Eglin AFB, Fla. Details of how the two partners will participate in the operational test phase are still being worked out.

The U.K. is receiving two short-takeoff-and-vertical-landing (Stovl) aircraft because that is what the country was looking to buy when it placed the order. It has since decided on the F-35C and, as part of that change, struck an agreement with the Pentagon to swap a third F-35B, which was due next year, for an



GAIN THE RAFAEL EDGE

SUPERIOR PERFORMANCE FOR ALL
YOUR AIRBORNE MISSIONS



RECELITE
TACTICAL
RECONNAISSANCE
SYSTEM



DERBY
BEYOND VISUAL
RANGE AA MISSILE



SPICE-1000
AUTONOMOUS STAND-OFF
GUIDANCE KIT



RECCE-U
TACTICAL
RECONNAISSANCE
FOR UAV'S



PYTHON-5
SHORT RANGE
AA MISSILE



TOPLITE
SURVEILLANCE &
TARGETING SYSTEM



LITENING
TARGETING AND
NAVIGATION SYSTEM



IRON DOME
AIR DEFENSE
AGAINST SHORT
RANGE ARTILLERY
ROCKETS



IMILITE
IMINT FOR AIRBORNE
MISSIONS

Gain the edge that only high-precision impact can deliver. With stand-off airborne precision weapons, real-time data delivery and advanced EW protection, Rafael gives you the power to gain a critical edge in tomorrow's fiercest encounters.

RAFAEL 
SMART AND TO THE POINT ●

E-Mail: intl-mkt@rafael.co.il
www.rafael.co.il

for aircraft delivery in 2014. Italy plans for its aircraft to come off the final assembly and check-out (FACO) facility the government has funded at Cameri air base. The facility should be completed by early next year to allow for 2014 deliveries. Rome is buying four F-35As the first year; purchases of F-35Bs are set for later, although Italy's entire F-35 procurement plan, including the total number of aircraft to be acquired, is subject to an ongoing defense review.

The Australian purchase, as part of LRIP-5, would be for two F-35As. The country has indicated it might be willing to take at least some of its aircraft from the Italian FACO, although they would need some assurance that those aircraft would cost no more than those assembled in Fort Worth, which will be operating at a higher production rate.

The initial deliveries are expected to be in the Block 3I software configuration, which provides an updated technology backbone to the aircraft.

The U.K. is likely to make its first procurement purchases in LRIP-7, although long-lead funding should begin to flow this year. An initial buy of seven aircraft is expected, although those plans are still in flux. "We will not set a firm in-service date until after our next Main Gate decision in 2013," says Luff. Main Gate is the milestone at which the formal procurement phase begins.

The U.K. initially is looking to deploy 12 fighters on the carrier, but that number is due to rise even if it falls short of the more than 130 fighters the country once said it would acquire.

Turkey also recently committed to its first purchases, although it trimmed the buy to two aircraft from six, which would be acquired in LRIP-7. Even though Ankara has scaled back its near-term purchase plans, the total inventory objective remains approximately 100 fighters. One reason Turkey cut its up-front buy is to gain a better understanding of what in-country opportunities may exist, for instance in aircraft maintenance, repair and overhaul as well as upgrades and engine final assembly.

Japan is eying aircraft purchased in LRIP-8, to ensure first deliveries in 2016. The first of 42 aircraft would come off Lockheed Martin's Fort Worth production line, but Tokyo wants the rest to come from a Japanese FACO facility.

Also slated to start in 2016 are purchases by Israel. The country committed to the program in 2010, but has seen the start of its procurement of 19 aircraft slip to LRIP-8 and running through LRIP-10, with deliveries of five, seven and seven aircraft in 2016-18. Details are being worked out, including an amendment for the Israeli systems design and development phase.

The Israeli program adds the component of a development program to cover the country's desire for its own command, control, communications, computers and intelligence infrastructure and tactical video data link. One question is how much of this custom design can be covered by available funding. Israel and Lockheed Martin are still sparring over cost. "If we have to cut content, we have to, but our hope is not," Harnett notes.

Countries buying into the F-35 will be part of an extensive support network, aimed at minimizing operating costs. "Everyone who buys the aircraft buys into the global sustainment" package, Harnett notes. Having each country manage those issues on their own would be simply too expensive. Regional support centers and pooling spare parts could be part of the global sustainment policy, which is now in draft form.

Dutch Defense Minister Hans Hillen, for instance, sees

The first of Japan's 42 F-35As will come out of Fort Worth. The rest will be assembled in Japan.



an opportunity for the Netherlands, Norway and potential F-35-buyer Denmark to work together, just as the countries have done with their F-16 force. "We can hopefully continue to achieve higher levels of cooperation in the fields of acquisition, maintenance, and perhaps even in the field of operations," he told the Atlantic Council during a recent visit to Washington.

While JSF program officials acknowledge the program has experienced some difficulties, Harnett takes heart from the fact that "every partner remains committed to the program, even in light of the turbulence we have seen." ☒

Rolling On

Rolls-Royce expects productivity surge from new factory

LEITHEN FRANCIS/SINGAPORE

Rolls-Royce is a brand that is synonymous with Britain, but from 2012 on, half of the engine-maker's Trent engine production capacity will be in Singapore.

The manufacturer has built an assembly plant, a wide-chord hollow titanium fan-blade factory, and a training center and research laboratory at Singapore's Seletar Aerospace Park. It is the company's first such fan-blade factory outside Britain and its first engine assembly plant outside Europe.

The plant will make the Trent 900, Trent 1000 and Trent WXB and account for half of Rolls's global production capacity for these engines—the largest and most important in the company's commercial product lineup. They power Airbus A380s, Boeing 787s and Airbus A350s, respectively.

Rolls-Royce Singapore is due to complete assembly of its first production engine—a Trent 900—in mid-2012. The first Trent 1000 is due to be completed by early 2013. Production will be steadily increased until it reaches its maximum capacity of 250 units per annum within five years, says Rolls's regional director for Southeast Asia, Jonathan Asherson.

The purpose-built facility comprises 75,000 sq. meters of floor space with 40-ft.-plus-high ceilings. The height is needed to enable Trent engines to be lifted up and over other engines mounted on build-stands, says Asherson.

Electric cranes, suspended from the ceiling, lift engines off one build-stand and onto the next. In addition, there are electric-powered skid conveyers—large moving plat-

forms—that transport engines down the production line.

Once an engine is assembled, it is hoisted onto a ceiling-mounted monorail crane that transports it into the test cell facility. This large room has an augments tunnel that can handle the full blast of the engine's exhaust. Above the test cell is a control room where technicians vet an engine's acceleration and deceleration, fuel consumption and vibration footprint. They also ensure there are no fuel leaks and check the engine's performance at different thrust settings. The facility can test 150,000-lb.-thrust powerplants with fan-blade diameters of up to 140 in.

From the test cell, the engine goes to the customer delivery center for bore-scope inspection. It is then packaged for delivery. Rolls-Royce Singapore operations director, Tin Ho, says initially all engines will be transported by air, onboard Boeing 747-400 freighters, to either Airbus or Boeing. But longer-term cost-saving plans include transporting the finished products by sea to the aircraft factories.

Singapore has some of the highest wages in Asia, but Rolls-Royce plans to generate profits via higher productivity, not cheaper labor. Ho says it takes "20-something days" to assemble a Trent engine in Derby, England, but the Singapore plant aims to do the same job in 14 days.

To accomplish this, the workflow will be altered. In the U.K., engines being assembled pass through five different buildings. Singapore has the advantage of a purpose-built building that can handle all phases of production.

Also in the U.K., the technicians have a larger scope of work to do, but technicians here will focus on a few specific tasks in the assembly process. By specializing, the technicians get better at their jobs and can work faster, says Ho.

The same goes for the wide-chord hollow titanium fan-blade factory. Rolls-Royce says that while it takes 4-6 weeks to manufacture a fan blade at Barnoldswick, England, it will only take 15 days here.

The Singapore factory will have capacity to manufacture 6,000 blades per annum for Trent 900s, 1000s and XWBs, according to Rolls. There is also a na-

scant plan to increase capacity to 7,600 blades per year.

By comparison, Barnoldswick only has capacity to produce 4,000 blades per year for the three Trent types mentioned above. (It also makes blades for older Trent models.) The Singapore facility is slated to start manufacturing its first two sets of fan blades—for the Trent 900—in October, and have these completed toward the end of 2012. The first fan blades completed in Singapore for the Trent 1000 are scheduled for 2013.

Most of technicians have been culled from Singapore's aircraft maintenance, repair and overhaul industry; a few have roots in the electronics industry. All new recruits will take vocational courses—geared toward specific tasks for Rolls-Royce—via Singapore's Institute of Technical Education.

Rolls-Royce has also established a regional training center next to the assembly plant. It is multi-purposed to teach technicians engine and wide-chord fan-blade work, but also to train airline maintenance personnel, as well as staff for other divisions such as Rolls's marine engineering business.

The "life-management planning" research center shares the training center's facilities. This unit mostly deals with non-destructive testing of engine parts in service with various airlines to ensure that parts and materials are performing as they were designed to. Predicting the future wear and tear of engine parts—and the related maintenance costs—is vital if Rolls-Royce is to profit from its power-by-the-hour maintenance programs.

The engine-maker's business model has evolved beyond new engines sales and into the maintenance realm. Asherson says Rolls derives about 52% of its revenues from power-by-the-hour and other maintenance support programs. New engine sales come with a maintenance-support package. This approach ensures that the aerospace division has more steady revenues. The sale of new engines is generally pro-cyclical. But when the economy dips, airlines usually opt to make-do with their existing, older aircraft, which can require more maintenance. ☐



Rolls-Royce technicians examine a Trent engine in the company's training center at Seletar Aerospace Park in Singapore.



Chang Cheow Teck

Age: 52

Education: National University of Singapore, top honors in mechanical engineering. Harvard Business School program for management development.

Career: In 1985, became air engineering officer with the Singapore air force.

- Joined ST Aero in 1990 and rose from production manager to senior vice president of the commercial business group in 1998.

- In 1999, transferred to ST Aero's U.S. operation as chairman of Mobile Aerospace and DalFort Aerospace, responsible for establishing Vision Technologies Systems.

- Appointed president of the automotive and military ordnance arm of ST Aero's parent in Singapore in 2002.

- In 2008, became president of ST Marine.

- In 2010, named president of ST Aero.

You recently bought U.S. firm DRB Aviation Consultants. What was the rationale for this?

DRB is an organizational designee under the FAA's Organization Designation Authorization program. DRB has already certified some supplemental type certificates. This is particularly useful for our aircraft interiors and modification business. Interior retrofits is a growing segment for ST Aero.

ST Aero has reached agreement to buy 50.1% of Pratt & Whitney's EcoServices business. What's the rationale behind this?

We hope to conclude that deal mid-year. The EcoServices business complements our on-wing services business and gives us access into various airports. EcoServices is at 32 airports.

Last year, you established Total Engine Asset Management, a Singapore-based engine leasing business with Japan's Marubeni Corp. What was the rationale behind this?

We're already an engine service provider for CFM56 engines. We've built up a parts repair and power-by-the-hour scheme. In terms of the engine leasing business, we're focused on the CFM56. We can offer engine lessees on-wing services to overhaul. We also have an engine part-out business. Moving into engine leasing is about moving up the value chain. We're interested in other asset management businesses.

In light of the fact that wages for MRO workers in China are increasing, when do you think China will lose its advantage in terms of lower wage rates?

To access China's airframe market, you have to be there—and be there with one of the big three Chinese carriers. If wage rates go up in China, then it means the Chinese airlines will have to pay more. Chinese facilities, though, are maturing in terms of safety and quality. In time, they will be able to command better rates. We are starting to see Chinese MROs gaining stature.

What do you think will be the next low-cost nation that can foster a large MRO industry? What about India and Vietnam?

Vietnam is not really that cheap. India is not a low-cost locale either, because a lot of the Indian talent is in the Middle East. To attract them back to India, you don't need to pay them as much as the Middle East, but it is not going to be low-cost. ☺

Looking Long Term

Singapore Technologies Aerospace Ltd. (ST Aero) President Chang Cheow Teck spoke to AW&ST Asia Editor Leithen Francis at the company's corporate headquarters in Singapore.

AW&ST: Is there a danger that demand for passenger-to-freighter (PTF) conversions will fall in 2012? I notice China's Jade Cargo has grounded its fleet.

Chang: With cargo, I look at the long term. I believe in the long run. Demand for time-sensitive shipments will continue to grow, thanks to lean manufacturing, and the development of urban centers also helps because it puts pressure on road networks.

What do you see as the potential for future Boeing 767 PTF conversions?

Boeing has contracted us to convert 17 767-300s to freighters, and so far we have completed and delivered seven. More feedstock will come through in 2013. The [Boeing] 787 is only just starting to enter service. As 787s are delivered in higher quantities, more 767s will be made available for conversion. Beyond 2013, there should be stable work for a few years.

What's the latest in terms of your interest in getting into Airbus A330 PTF conversions?

Airbus is engaging industry, and we are one of the players with capabilities. Airbus is talking to us, as well as to two or

three other players. We would be very interested to extend our capabilities to include A330 passenger-to-freighter conversions. We have 500 design and development engineers who could assist.

What do you see as the right time for an A330 PTF program to be available?

The residual value of A330s will become attractive after we start seeing delivery of new A350s. Once the A330 freighter conversion program starts, it will take some years before a steady state of production is achieved. For the A330 program, I think that [milestone] will be achieved in 2019.

What about a Boeing 777 PTF conversion program? Boeing has already done studies and spoken to potential customers.

Boeing has done sufficient work itself. We see 2018 or 2019 as years when steady state production could be achieved. But 777 residual values are still high.

Boeing has said it is likely to choose between ST Aero, Taeco and Boeing Shanghai for 777 PTF conversions. What's your unique selling point?

Our selling point is that we have always been able to produce best in class in terms of turnaround times, reliability and consistent quality. There's also no ruling out we will do passenger-to-freighter conversions at our new maintenance, repair and overhaul (MRO) firm in Guangzhou.



FARNBOROUGH INTERNATIONAL AIRSHOW 2012

FIRST FOR UAS

An incredible \$47 billion of business was announced at the Farnborough International Airshow in 2010. After a performance like that everyone's flying in for 9-15 July 2012.



CIVIL



DEFENCE



SPACE



UAS



SECURITY



FUTURES

Book your space:
www.farnborough.com
+44 (0) 1252 532 800



Farnborough
INTERNATIONAL
AIRSHOW

9-15 JULY 2012

On Deck

Industry cautious about growth for civilian UAVs in U.S. market

JEN DIMASCIO/WASHINGTON

A civilian market for unmanned aircraft is building in everything from local law enforcement to environmental conservation, but exactly when demand will emerge and how fast it will grow remain uncertain.

Orders for military UAVs have jumped notably in the last decade, and the platforms now make up 41% of the U.S. forces' fleet, according to a Congressional Research Service report. The question then arises: Will the civilian market follow suit, one day eclipsing military sales? That does not appear

likely in the next decade. The Teal Group's 2011 report on the UAV market estimates that the demand for civil unmanned aircraft will grow to \$355 million in 2020, compared with \$65 million in 2011, a figure that pales in comparison to predicted Pentagon spending. The Defense Department would spend \$4.3 billion on UAVs in 2011, growing to \$7.8 billion per year by 2020, according to the Teal report.



AeroVironment Qube Specifications

PAYLOAD	Dual high-resolution color and thermal cameras
RANGE	0.62 mi. line of sight
ENDURANCE	40 min. (with payload)
OPERATING ALTITUDE	100-150 ft.
LENGTH	3 ft.
WEIGHT	5.5 lb.
GROUND CONTROL STATION	Rugged touchscreen tablet with digital data link module

At this point, industry officials are taking a conservative approach to business development for the civil market. The entry of UAVs into civilian airspace is likely to start first with small unmanned aircraft gradually entering first through law enforcement and other state and local government agencies. Eventually, in-

dustry trade groups see cargo carriers pursuing fleets of unmanned aircraft to keep airplanes aloft longer than is possible with pilots in the cockpit.

Increased use in the civilian marketplace hinges on the FAA's development of rules for safely integrating UAVs into the National Airspace System. Not only is the process technically complicated but it's potentially disruptive to existing businesses. Those challenges add a layer of difficulty to finding consensus on new guidelines for UAVs.

In addition, with efforts to reduce the federal deficit in full swing, the FAA's resources will be limited.

more than mini-UAVs. The market for larger UAVs also "has to enable them to use their full capability and go beyond line of sight," he declares. That, along with other airspace concerns, may take so much time that the commercial market for unmanned systems could develop first in countries without already crowded airspace and where large petroleum projects may develop. "Think in terms of the Middle East [and] the former Soviet Union," he says.

The gradual ascent of UAVs into the civilian market might not be all that different from the evolution on the military side, where Air Force pilots resisted the move to unmanned vehicles. It took a major push by then-Defense Secretary Robert Gates, who criticized the Air Force for being slow to adopt UAV technology in a 2008 speech at Maxwell AFB, Ala.

Steve Gitlin, vice president of investor relations for AeroVironment, points out that the company developed a hand-launched UAV back in 1987, but it was not until the military saw success with unmanned systems in Afghanistan that demand accelerated. "It's a 25-year overnight success," he quips.

AeroVironment's Qube is small enough to fit in the trunk of a police car. The UAV can stare at a scene for 40 min. while sending live video to a touchscreen tablet.

Just as few would have predicted the boom in military sales during a decade dominated by the wars in Iraq and Afghanistan, the size of the civil market for drones is difficult to pin down.

"You cannot project numbers on something that does not exist," West says. "However, we believe that the civilian market will be much bigger than the military market in the coming years."

Whether the trade association trumpeting UAV development reflects the correct vision for the future or wishful thinking remains unclear. But Congress recently stepped in to spur the process along, mandating the creation of six test sites around the country, aimed at helping to deconflict civilian airspace.

Steve Reid, senior vice president and general manager of Textron Systems' AAI Unmanned Aircraft Systems unit, compares the introduction of drones into the civil market to the use of jet propulsion technology. In the 1950s, 95% of the market for jet propulsion resided



April 3-5, 2012
Dallas Convention Center
Dallas, TX

MRO Americas — The One Stop Shop for All of Your Maintenance Needs!

Find the Answers
Discover the Products
Meet the Buyers!

Featured Presenters:



Robert Isom,
EVP & COO,
US Airways



Gary Kelly,
CEO, Southwest
Airlines



Jon Oberdick,
A4A EMMC
Chairman, and
Managing
Director,
Technical
Services,
US Airways



Co-located
with



**Register today and secure
your place!**
www.aviationweek.com/events
 Free access to the exhibition hall for early
responders!

produced by in association with



gold sponsors



silver sponsors



bronze sponsors



titanium sponsors



in the military and just 5% in the commercial sector. "Now, that's flipped," he says. "I think the sky is the limit for the commercial application provided that they're doing it in a safe manner."

That does not mean Textron is factoring mammoth sales of UAVs in the civil market into its five-year road map. Less than 5% of the company's business plan addresses UAVs in the civilian market, says Reid, but that picture may look different by 2018 or 2020, he adds.

Scott Donnelly, chairman, president and CEO of Textron, says his company's systems will be able to provide a low-cost

versity of North Dakota and the National Oceanic and Atmospheric Administration to film floodwaters of the Red River Valley as well as to monitor forest fires in Alaska. In addition, the Australian government approved a conservation group's use of UAVs to fight whaling.

Particularly for police departments, which are likely to use UAVs in populated areas not controlled by the government, the regulation of airspace is at this point a limiting factor.

The FAA plans to issue a proposed rule governing small unmanned air-

called on the defense secretary and the FAA administrator to establish six test ranges around the country within the next 180 days. Members of Congress already are petitioning the FAA to set up those test sites in their home states.

New Mexico may already have an edge in the competition. New Mexico State University has been working to test unmanned aircraft and fly them alongside manned aircraft for more than a decade. But other states have been clamoring to house test sites as well. Sen. Charles Schumer (D-N.Y.) has been pursuing the issue for some time, attempting to increase the number of test sites to 10 and ensure that one is located at Hancock International Airport in Syracuse. And the University of North Dakota is trying to position Grand Forks as a place ripe for drone demonstrations. Even though lawmakers are jockeying to host the sites, Congress has not yet approved funding for them.

"The FAA is very resource-constrained right now," says Doug Davis, director of global unmanned aircraft systems strategic initiatives at New Mexico State University and the former manager of the FAA's Unmanned Aircraft Program Office. "They've been told what to do but not given additional resources to go do that. That's very much a problem for the FAA."

Similar to the debate over using paint brushes or rollers, any advancement in technology threatens to displace the current workforce. Along with concerns about job cuts, the FAA still must sort out safety concerns. Unmanned aircraft have not adequately perfected sense-and-avoid technology that would help prevent inflight accidents. And that does not begin to address potential privacy concerns that arise from police use of drones.

Organizations such as the Radio Technical Commission for Aeronautics bring all of the stakeholders together to build a consensus on standards for communications, navigation, surveillance and air traffic management. Even though those groups are tackling the issue, agreements are slow to emerge.

"Change is tough," says Mooney, noting that 20 years ago people were naysayers about GPS, which has revolutionized personal navigation. UAVs could be the same, she says, "once people realize [they are] not as hairy or scary as they thought." ☼

With Joseph C. Anselmo in Washington.

Potential Markets for Civil UAVs



LAW ENFORCEMENT Numerous companies have products ready and waiting for the FAA's small-unmanned-aircraft regulations.



AGRICULTURE Universities and startup companies are pursuing aircraft that can improve crop yields through aerial monitoring.



FIRE SAFETY The General Atomics Predator B has already been pressed into service to provide wildfire imagery.



DISASTER RESPONSE Honeywell's T-Hawk Micro-Air Vehicle captured video and photos of the earthquake disaster at Japan's Fukushima Daiichi nuclear facility in March 2011.



OIL AND GAS Textron's Aerosonde flew into the eye of Hurricane Noel in 2007, and the company anticipates the system could be used to monitor miles of oil pipelines.

option for emergency use. But even when FAA regulations for UAVs are smoothed out, he does not foresee a change in the company's plans, which are weighted toward military UAVs.

UAVs of 55 lb. or less are likely the first to arrive on the market, says Rose Mooney, director of UAV airspace integration at Textron's AAI unit. And those will be used primarily by police and fire departments as well as the border patrol for "dull, dangerous and dirty jobs."

Companies are already lining up products and customers. Police can pack AeroVironment's Qube into the trunk of a squad car that can be easily assembled and flown remotely to track suspects. The company is trying to lure police departments with a price tag that is slightly higher than the cost of a fully loaded car.

Insitu has partnered with the Uni-

craft this spring. That release date has already been pushed back several times, and the proposal is just the first step in the process. The final rule is not anticipated for at least another year.

However, the timing of the proposed guideline will not affect the long-term integration of UAVs into U.S. airspace, says FAA spokeswoman Alison Duquette. "The FAA continues to plan the research and development necessary for the FAA to develop civil [unmanned aircraft] standards and policy," she says. "Integration will be an evolutionary process, with access increasing."

Currently UAV operators in the U.S. need to obtain a certificate of authorization (COA) or an experimental certificate. The FAA issued 146 COAs in 2009, 298 in 2010 and 313 in 2011.

In the defense authorization act that took effect early this year, lawmakers

Future Subsonic

Wind tunnel and structures tests mark next steps for NASA's advanced airliners plan

GUY NORRIS/LOS ANGELES

To achieve sustainable growth in air travel, future airliner designers face challenges never seen by their predecessors. New concepts will not only have to meet unprecedented performance goals, but they must do so while striving for carbon neutrality.

NASA's goal to solve this conundrum takes on new significance in coming weeks as researchers across the U.S. begin a series of landmark tests under the next stage of the agency's subsonic fixed-wing program. Wide-ranging work will include refining a glider-like truss-braced wing and integrating it with a hybrid-electric propulsion system, wind tunnel tests of a multirole wing leading edge and evaluation of a protective outer skin that could enable lighter structures.

"Now it is getting exciting," says NASA's subsonic fixed-wing program manager, Ruben Del Rosario. As preparations continue toward more extensive testing, the agency is also poised to review progress made so far by Boeing, Cessna, the Massachusetts Institute of Technology (MIT) and Northrop Grumman on the initial technologies under study for Phase 2 of the program's N+3 vehicles. These are a group of aircraft concepts three generations more advanced than today's airliners.

"Phase 2 is going strong, and we're making the progress we were anticipating," says Del Rosario. Most of the contracts are coming up for the first yearly review following their start early in 2011, he says. Today's work builds on the development of N+3 concepts in Phase 1, completed in 2010, and aims to identify enabling technologies for airliners targeted to enter service in 2030-35. The Boeing-led team is also wrapping up a one-year N+4 study into more advanced

technologies for 2040-45, with the final report due to NASA in April.

To help direct research, the program is divided into six main technical challenges to reduce drag, weight, energy consumption, emissions and noise, as well as the development of revolutionary tools and methods to bring it all together. In addition, strategic thrusts include the development of economically practical approaches to improving energy efficiency and environmental compatibility.

The array of novel N+3 vehicle concepts that emerged in 2010—ranging from the hybrid wing-body and truss-

fuel burn and noise reduction efforts.

To reduce drag, NASA is exploring methods for cutting fuselage skin friction by new surface treatments and flow control. The goal is to reduce fuselage turbulent boundary layer drag by 10%. High-aspect-ratio elastic wing studies, also aimed at the drag reduction challenge, include shaping to reduce interference drag of the external bracing identified in Boeing's Subsonic Ultra-Green Aircraft Research (Sugar) concept, as well as passive and active concepts to reduce wave drag.

Drag reduction work also includes control concepts for flight control of "elastic" aircraft, which can change the shape of the wing to lower cruise drag as part of the elastically shaped aircraft concept. Under this effort, NASA and Boeing are studying a variable-camber continuous trailing edge flap device for wing shaping control. The flap system, combining several movable sections connected by shape memory alloy rods,



Wind tunnel testing of a cruise-efficient short-takeoff-and-landing (Cestol) concept at NASA Ames Research Center paves the way for active flow control research.

braced wings to double-bubble lifting body fuselages—generated seven key subsystem concepts which helped fine-tune research goals. These included special "tailored" fuselage structures, high-aspect-ratio "elastic" wings, new and quiet high-lift systems, high-efficiency but small engines, hybrid electric propulsion, airframe-propulsion integration, and alternative fuels.

Each subsystem concept, in turn, addresses multiple technical challenges. The advanced wing work, for instance, addresses both drag and weight. The efficient, small-engine study involves energy consumption, emissions and noise, while the airframe-propulsion integration incorporates drag, weight,

is aimed at reducing drag with minimal impact on weight.

Circulation control methods, in which high-pressure air is blown over wing and control surfaces to improve low-speed high-lift and transonic cruise, are also being studied under the FAST-MAC (fundamental aerodynamics subsonic transonic modular active control) program. Preliminary results from tests conducted at the NASA Langley National Transonic Facility, Va., showed the feasibility of pneumatic-based maneuver control and increased maximum lift coefficient at low speed by 40%.

Flow control systems are also being tested to enable high-performance, low-noise, high-lift leading- and trailing-edge

slat and flap systems that will be lighter and simpler than current mechanisms. The feature could also be useful for enabling cruise-efficient short-takeoff-and-landing (Cestol) designs, which are Boeing 737-sized airliners that can operate from a short runway. To help build up aerodynamic and acoustic validation data for active flow control on a Cestol, NASA is testing a 10-ft.-span model in its 40 X 80-ft. wind tunnel at Ames Research Center, Calif., built by California Polytechnic State University, San Luis Obispo.

Other high-lift improvements are to be wind-tunnel tested by Northrop Grumman "any day now," says Del Rosario. The multifunctional, or ad-

them is unknown, and preparations are underway for wind tunnel tests of an integrated inlet and fan at the 8 X 6-ft. facility at NASA Glenn Research Center, Ohio. The experiment will use inlet and distortion-tolerant fan hardware designed and fabricated by United Technologies Research Center. "The hardware should be fabricated and delivered in the second quarter of fiscal 2013, and the test is planned for the third quarter of fiscal 2013," says Del Rosario.

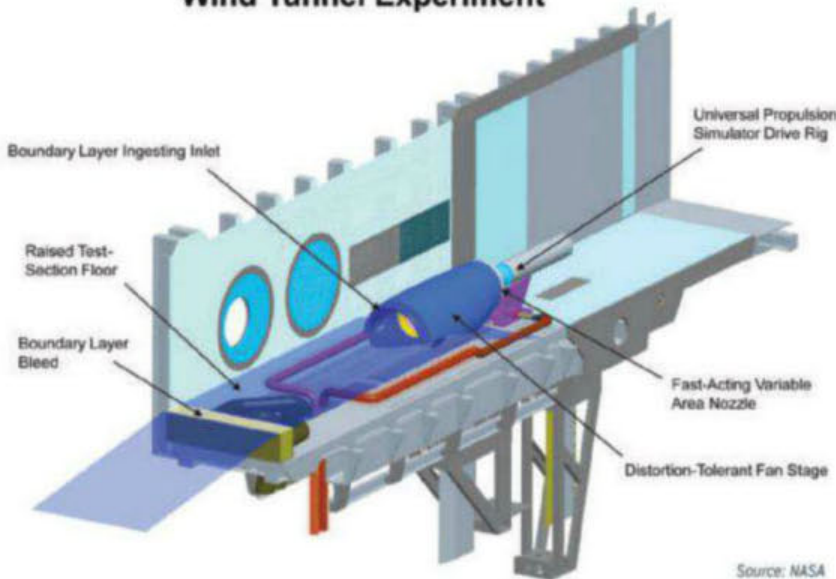
As part of plans to cut operating empty weight by up to 25%, Cessna will begin the first test of a scaled multifunctional fuselage skin and structure panel in March. The STAR-C2 (smoothing, thermal, absorbing, reflective, conduc-

handling localized transverse, shear and in-plane loads. Similarly alloys would be tougher at the base of the stiffeners for better damage tolerance, and transition to metal matrix composites for increased stiffness and acoustic damping.

"The goal is to reduce the weight of the fuselage structure by 25%," says Karen Taminger, lightweight airframe and propulsion systems technical lead. With the increasing trend toward the use of composite materials for primary structure, researchers are also looking at ways to tailor the direction and placement of fiber laminates. Instead of uniform layup of material with additional plies for local strengthening, as done today, the goal would be to "arrange the fibers to be aligned to the axis of the aircraft along the crown and keel, but aligned for shear loads around the fuselage sides," says Taminger.

By steering the individual fiber tow, or bundle of continuous filaments, it is possible to make tighter radii curves and control distribution of the material to better suit the local load require-

Conceptual Integrated Inlet/Fan Wind Tunnel Experiment



Performance of an integrated inlet and buried fan, potentially vital features of future transports, will be tested at NASA Glenn Research Center in 2013.

vanced high-lift leading edge, concept will be evaluated in low-speed tests at a Northrop transonic facility. Few details of the concept have emerged, though NASA says the design is aimed at producing a "smooth edge without the current standard slats."

MIT and teammates Aurora Flight Sciences Corp. and Pratt & Whitney are continuing propulsion airframe integration studies of the D8 double-bubble concept in MIT's Wright Brothers Wind Tunnel. These studies are building toward the first of three planned campaigns in the Langley 14 X 22-ft. wind tunnel in early 2013. The engines are mounted on the tail so that they ingest the boundary layer over the fuselage, reducing drag.

However, the exact performance of such inlets and the fans buried behind

them is unknown, and preparations are underway for wind tunnel tests of an integrated inlet and fan at the 8 X 6-ft. facility at NASA Glenn Research Center, Ohio. The experiment will use inlet and distortion-tolerant fan hardware designed and fabricated by United Technologies Research Center. "The hardware should be fabricated and delivered in the second quarter of fiscal 2013, and the test is planned for the third quarter of fiscal 2013," says Del Rosario.

Other weight-cutting efforts include work with Virginia Polytechnic Institute and State University (Virginia Tech) to develop design optimization tools which can tailor structural designs and combine them with engineered materials. The result would be stiffeners made from new alloys that—unlike present-day straight, uniform units—would be bent and curved to reflect the best shape for

ments. "We have the technology to do that but are looking for the design and analysis tools to help us tailor that, and to steer around the cutouts, windows and doors," she adds.

A two-pronged effort is focused on reducing the weight of the fan in a turbofan by 15% while, at the same time, improving efficiency. Researchers are studying concepts for mission-adaptive fan blades made from polymer composites integrated with shape memory alloys. The aim is to get the blade to automatically alter its twist or camber to suit differing thrust needs. With the right shaping, researchers believe the blade could adapt to a coarse-pitch, low-noise configuration for takeoff and landing, and a fine-pitch, fuel-efficient shape for cruise.

Meanwhile, research is also underway into methods for designing and producing thin, hollow composite blades that are aeroelastically tailored to avoid flutter. The tasks "are not trivial," says Taminger, who expects the two initiatives may eventually come together. NASA believes the technology for both areas could also be applicable for lighter fan containment cases. ☼

CLASSIFIED ADVERTISING

To Place Your Classified Ad Contact: Keith Gregory; (212) 904-4166; e-mail: keith_gregory@aviationweek.com; Fax: (212) 904-2930. 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.

EQUIPMENT

Ultrasonic Inspection C-Scan Systems for your High Performance Structures



- Automated Ultrasonic C-Scan Systems
- Multi-Axis Gantries and Immersion Tanks



(508) 351-3423

sales@matec.com

COURSES

Learn Design from Dan Raymer

Short Courses by the award-winning author of
AIRCRAFT DESIGN: A Conceptual Approach

Aircraft Conceptual Design (April 16-20)

Aircraft Design Layout & Loft (April 23-24)

Spacecraft & Launch Vehicle Design (4/25-27)



In Los Angeles near LAX

For information & registration visit:

www.aircraftdesign.com

Or email to crc@aircraftdesign.com

POLISHING SERVICES

Super Precision Manufacturing

◆ Roughness: Ra1nm

◆ Parallelism: 0.1µm

◆ Flatness: 0.05µm(4"sq)

◆ PRECISE SHIM: +/-0.00002"

TDC www.mirror-polish.com

ADVANCED COMPOSITE TRAINING

Advanced Composite Training



contact us for a complete course catalog

1-800-638-8441 • www.abaris.com

Find **your** dream at **AviationWeek.com**



Whether you're looking for **your** dream job or
building **your** dream team, turn to
AviationWeek.com — the industry's
recruitment marketplace

Job Seekers:

- **Browse:** Scan the most recent job listings from the industry's leading employers
- **Search:** Use our powerful search tools to find the perfect fit for your skills and salary requirements
- **Email Alerts:** Register to have jobs matching your profile emailed to you

Employers:

- **Post:** List your job where it will be seen by the most qualified candidates in the industry
- **Search:** Use our powerful resume search to find your ideal candidate
- **Sponsor:** Take advantage of our Featured Employer, sponsorship and advertising opportunities to maximize your visibility in the marketplace

Start **your** search at
www.aviationweek.com/jobs today



The McGraw-Hill Companies

AEROSPACE CALENDAR



To submit Aerospace Calendar Listings,
Call +1 (212) 904-2421 Fax +1 (212) 904-6068
e-mail: norma_maynard@aviationweek.com

You can now register ONLINE
for Aviation Week Events.
Go to www.aviationweek.com/events
or call Lydia Janow at
+1 (212) 904-3225/+1 (800) 240-7645 ext. 5
(U.S. and Canada Only)

Feb. 13-16—Practical Aeronautics Short Courses: "Introduction to Aeronautics, A Practical Perspective." The Aero Institute, Palmdale, Calif. Also, **March 19-22**—National Institute of Aerospace, Hampton, Va. Call +1 (970) 887-3155 or see www.practicalaero.com
Feb. 14-19—Singapore Airshow. Changi Exhibition Center. Call +65 6542-8660, fax +65 6546-6062 or see www.singaporeairshow.com
Feb. 15-16—FAA's 15th Annual Commercial Space Transportation Conference. Walter E. Washington Convention Center, Washington. See <http://faa.gov/go/ast>
Feb. 22-23—MIU Events/Exhibitions India Group's Indian Business Aviation Expo 2012. Manekshaw Center, New Delhi. See www.miuevents.com/ibae2012
Feb. 23-24—Society of Experimental Test Pilots' Fifth Annual Southeast Symposium. Ramada Plaza Beach Resort, Fort Walton Beach, Fla. See www.setp.org/table/southeast
Feb. 27-29—Defense Maintenance Sustainment Summit. Hilton Torrey Pines, La Jolla, Calif. See www.wbresearch.com/dms/
March 4—Tyabb Airshow 2012. Peninsula Aero Club. Tyabb, Australia. See <http://tyabbairshow.com.au/>
March 5—Southern California Aviation Association's Safety Seminar. Guest Speaker: National Transportation Safety Board member amd fatigue expert Mark Rosekind. Airtel Plaza Hotel, Van Nuys, Calif. See <http://scaa.memberlodge.com/>
March 5—Speednews' Second Annual Aerospace Raw Materials and Manufacturers Supply Chain Conference. Also, **March 5-7**—26th Annual Commercial Aviation Industry Suppliers Conference. Both at Beverly (Hills) Wilshire Hotel, Calif. See www.speednews.com/conferences
March 7-9—Airports Council International's Airport Economics and Finance Conference and Exhibition. Grange Tower Bridge Hotel, London. See <http://aci-economics.com/>
March 7-9—Technology Training Corp.'s Military Cybersecurity. Holiday Inn Rosslyn at Key Bridge, Arlington, Va. Also, **March 13-15**—Unmanned Aircraft Systems Conference. Holiday Inn on the Bay, San Diego. Call +1 (310) 320-8110 or see www.ttcus.com
March 9-11—Valiant Air Command's 2012 Tico Warbird Air Show. Titusville (Fla.) Space Coast Regional Airport. See www.vacwarbirds.org
March 19-21—International Academy of Astronautics/American Astronautical Society's Conference on Dynamics & Control of Space Systems. Hotel Ipanema, Porto, Portugal. See www.astrodynamics.org.pt/
March 21-22—Avionics Europe 2012 Conference and Exhibition. MOC Event Center, Munich. Call +44 (199) 265-6619 or see www.avionics-event.com
March 27-29—Asian Business Aviation Conference and Exhibition. Shanghai Hawker Pacific Business Aviation Service Center. See www.abace.aero/2012
March 27-29—American Astronautical Society's 50th Annual Robert H. Goddard Memorial Symposium. Greenbelt (Md.) Marriott Hotel. See www.astronautical.org

Feb. 14-16—Defense Technology and Affordability Requirements. Arlington, Va.
March 7—55th Annual Laureate Awards. Washington.
March 13-14—Innovation Supply Chain Showcase. Orlando, Fla.
April 3-5—MRO Americas 2012. Dallas.
April 3-5—MRO Military Conference & Exhibition. Dallas.
April 23-25—NextGen Ahead: Air Transportation Modernization. Washington.
May 8-9—Civil Aviation Manufacturing. Charlotte, N.C.
May 23-24—MRO Regional: Eastern Europe, Baltics and Russia. Vilnius, Lithuania.
Sept. 19-21—MRO IT Conference & Showcase. Miami.
Oct. 9-11—MRO Europe. Amsterdam.

PARTNERSHIPS

Feb. 11-14—HeliExpo. Dallas.
Feb. 14-19—Singapore Airshow.
March 27-April 1—Fidac International Air & Space Fair. Santiago, Chile.
April 3-6—Aircraft Electronics Association's 55th Annual International Convention & Trade Show. National Harbor, Md.
June 11-15—Eurosatory. Paris.
July 9-15—Farnborough air show.

ADVERTISERS IN THIS ISSUE

Airbus 4-5
Alenia Aermacchi 45**
ATC Global 58
Aviation Week Events
MRO Asia 3rd Cover
Engine MRO 49*
Laureate Awards 3
MRO Americas 67
Belac 19
Bombardier 20-21
Breitling 4th Cover
CFM International 2nd Cover
CMC Electronics 55
Custom Control Sensors 59
Embry-Riddle Aeronautical University .. 25
Farnborough International Airshow 65
ILA Messe Berlin 37
JEC 3

L-3 Communications 41
Lockheed Martin 33
MBDA 43
MTU Aero Engines 17
Northrop Grumman 7, 38-39
PPG Industries 9
Rafael 61
Rolls-Royce 10-11
Selex Elsag 49**
Show News Digital Edition 45*
Singapore Airshow 59
United Technologies, Pratt & Whitney 13

GLOBAL MILITARY

DEMOGRAPHIC EDITION:

(Between pages 26 & 27):

ITT 26GM1
Elta Systems Ltd. 26GM2
(Between pages 30 & 31):
Bede Aviation 30GM1

DRS Technologies Inc. 30GM2
(Between pages 46 & 47):
Israel Military Industries 46GM1
AeroVironment 46GM2
(Between pages 50 & 51):
Elbit Systems Ltd. 50GM1
Inventory Locator Service 50GM1
ImageSat International 50GM2

CLASSIFIED 71
Abaris Training 71
Aviation Week
AviationWeek.com/jobs 71
Conceptual Research 71
Matec Instruments 71
TDC Corporation 71

*-Domestic edition.

**-International edition.

AviationWeek.com/awst

CONTACT US

AVIATION WEEK

& SPACE TECHNOLOGY

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.

Subscription Information for other AVIATION WEEK Products

Defense Technology International and Overhaul & Maintenance, Business & Commercial Aviation: (800) 525-5003 or +1 (515) 237-3682

Show News: (914) 933-7613

Business Intelligence Services, including AWIN:
(866) 857-0148 or outside the U.S.: +1 (515) 237-3682.

Online

Aviation Week Intelligence Network (AWIN):

www.aviationweek.com/awin

Email: aw_intelligence@aviationweek.com

U.S.: (866) 857-0148; Fax: (888) 385-1428

Outside the U.S.: +1 (515) 237-3682; Fax: +1 (712) 755-7423

Advertising: (202) 383-2313

Dow Jones Interactive: (800) 369-7466

Lexis-Nexis: (800) 227-4908, Dialog: (800) 334-2564

Single Copy Sales

Toll-free (U.S. only): (800) 525-5003

Outside the U.S.: +1 (515) 237-3682

Fax: +1 (712) 755-7423

SPECIAL PRODUCTS & SERVICES

Conferences/Exhibitions

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

Director: Lydia Janow, CMP;

(212) 904-3225; ljanow@aviationweek.com

To Exhibit: Beth Eddy;

(561) 862-0005; betheddy@aviationexhibits.com

To Register: Virginia Gongora;

(212) 904-4682; virginia_gongora@aviationweek.com

AW&ST Mailing List Rental

Inside North America: Edith Roman Associates, Inc.;

(800) 223-2194; Fax: (845) 620-9035

Outside North America: RSA Direct

+44 (0) 20 8434 3596; richard.gibson@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

Copying without the express permission of the Copyright Clearance Center or The McGraw-Hill Companies, Inc. is prohibited.

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

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 Director, Civil: Matt Holdreith;
(212) 904-2628; matt_holdreith@aviationweek.com

Sales Manager, AviationWeek.com: Keith Gregory
(212) 904-4166; keith_gregory@aviationweek.com

Regional Account Manager: Sean Fitzgerald;
(202) 383-2417; sean_fitzgerald@aviationweek.com

Northeast U.S.: Russell E. Brody;
(732) 832-2977; russell.brody@verizon.net

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

Southwest & Southeast U.S., Mexico, Latin America:
Tom Davis; (972) 731-6763; 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

Sales Director Defense, EMEA, Italy: Andrea Prudente (Italy);
+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

Classified/Marketplace Advertising

U.S., Canada, South America: Keith Gregory;
(212) 904-4166; keith_gregory@aviationweek.com

Europe, Middle East, Africa: See Vittorio Rossi Prudente under International Regional Sales Offices.

United Kingdom, Ireland: See Michael Elmes, Aerospace Media under International Regional Sales Offices.

Aero Products & Services Advertising

See Matt Holdreith under U.S. Sales Offices.

Miguel Omelas; (818) 834-4232; momelas@mindspring.com

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 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

Market Research Manager: John Santospirito, PRC;

(212) 904-3084; santospirito@aviationweek.com

Advertising Operations Manager: Casey Carlson;

(610) 373-2099; casey_carlson@aviationweek.com

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 6, 2012 VOL. 174, NO. 5 (ISSN 0005-2175)

Member of Audit Bureau of Circulations and Magazine Publishers of America. Published weekly except for one issue in January, March, May, July, September, October and December, 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. Copyright © 2010 by The McGraw-Hill Companies Inc., All rights reserved. All rights to these names are reserved by The McGraw-Hill Companies Inc. **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

A Thankless Job Well Done

EADS Chief Executive Louis Gallois recently was asked to reflect on his legacy as he prepares to step down, but the self-effacing aerospace chief took a pass. It is too early, he said, to render a verdict on his impact on the sprawling enterprise he has led since 2007.

When Gallois departs on May 31, Airbus CEO Tom Enders will take over the reins of the parent company. In time, he will put his own thumbprint on what amounts to Europe's aerospace champion. In the meantime, it is worth reflecting on Gallois—the only individual to have been on the board of directors since the formation of EADS in 2000—and his impact on the company.

One of his most notable accomplishments was bringing a sense of calm and stability to the company following a nasty battle for control in the executive ranks and near open warfare between French and German workers and other stakeholders. It is easy to forget how toxic the atmosphere was. But Gallois worked closely with Enders, who agreed to step down as co-CEO at EADS to end the awkward and divisive initial dual-CEO structure. Through his grandfatherly management style, Gallois was able to smooth ruffled feathers.

The second achievement was putting EADS on a more solid financial footing. For much of his time at the top, Gallois was forced to deal with costly program decisions made years earlier. The A400M military airlifter contract and the A380 mega-transport's production problems were just two.

Of course, Gallois cannot take full credit, as he himself would quickly point out. For example, he did not invent the Power 8 cost-savings plan that has been instrumental in improving shareholder returns; credit for that goes to Christian Streiff, who was Airbus CEO briefly. But it was Gallois's political acumen that allowed Enders and Airbus Chief Operating Officer Fabrice Bregier to see the measures through. Gallois also forced other EADS units to focus increasingly on profitability.

In other areas, though, the picture is not nearly as glowing. Gallois devised Vision 2020, a bold plan for what Europe's largest aerospace and defense company should look like by the end of this decade. But he was unable to deliver the key acquisitions needed to support the plan. Gallois says the deals under his watch represent a string of pearls, but conspicuously absent was the diamond that would have made Vision 2020 look more like a genuine growth platform than a pipe dream.

EADS fortunes also remain fundamentally tied to the performance of Airbus. Efforts to better balance the business have failed. In fairness, it is the strong performance of Airbus that helped make it difficult for EADS to achieve the long-range goal. And in that respect, it is a rich man's problem.

More disconcerting was Gallois's failure to tackle some of the key structural issues that have bedeviled EADS, with these areas of the report card highlighted in red ink. EADS remains saddled with two too many centers of power—headquarters in both Munich and Paris, and the home base of Toulouse for Airbus. Such an organizational structure cannot possibly be in EADS's interests



AIRBUS MILITARY

“Gallois brought calm and stability to EADS, but the company remains saddled with too many centers of power and is burdened by meddling outsiders.”

and its efforts to create a spirit of one team. One naturally wonders why such a Byzantine structure was allowed to remain in place as Gallois worked hard to make EADS competitive against U.S. companies, particularly Boeing.

Moreover, Gallois has had to witness governments' stakes in EADS grow rather than shrink. Germany is now a shareholder, and there is little indication the French government is ready to cut ties. Enders, who has long argued for governments to shed all ownership, appears ready to press the point.

Perhaps most disappointing was how unseemly the latest leadership transition became. The succession to Enders was supposed to be smooth. But contentious board members could not agree. Exacerbating the situation was the French government, which was concerned about its influence over the company; it lacked confidence in incoming Chairman Arnaud Lagardere. As a result, Paris sought alternative ways to bring pressure to bear, going so far as to try to oust the successful chief executive of Eurocopter, Lutz Bertling, and to supplant Enders's choice of chief financial officer. Even Gallois's continued membership on the board was thrown into question. In the end, the appointment of another Frenchman to the board, former European Central Bank President Jean-Claude Trichet, broke the logjam. Throughout the whole sordid process, the company's exposure to French politics once again was on garish display.

So what does Gallois actually hand off? No doubt, EADS is a company that is more financially robust and has a clearer sense of direction than before. But its new CEO, Enders, also faces a long to-do list that includes many of the most politically toxic and self-defeating issues. Enders's vulnerability may well be his refusal—or inability—to suffer fools well. That could be a real problem, because sadly there are plenty of outsiders in key positions still itching to meddle in EADS's affairs. ☛



November 13-15, 2012
Marina Bay Sands Hotel
Singapore



SAVE THE DATE

MRO Asia Returns to Singapore in 2012

Best practices, tools and strategies to chart the future of the MRO business in Asia-Pacific

- Educational information and implementable strategies for operational improvements
- Networking events and face-to-face time with your peers
- Opportunities to meet suppliers and get hands-on with innovative products

This event will deliver:

- Strategies to reduce TAT and save revenue
- Insight on the growing role of OEMs in the aftermarket
- Tactics for managing leased aircraft and the return process
- MRO opportunities for Asia's growing regional carriers

**Sponsor and Exhibition Opportunities Available
Contact Us Today.**

Americas/Canada/Asia-Pacific

Beth Eddy
Phone: +1.561.862.0005
betheddy@aviationexhibits.com or

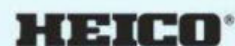
Europe/Africa/CIS/Middle East

Michael Elmes
Phone: +44 1255 871070
mike.elmes@aerospacemedia.co.uk

PRODUCED BY



SILVER SPONSORS



BRONZE SPONSOR



BRONZE SPONSOR



MEDIA SUPPORT



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



Complimentary Download – Trends and Forecast presented by Mike McBride, CFO & EVP, TeamSAI

FOLLOW US



#MROA





PURE PERFORMANCE **PURE BREITLING**

CHRONOMAT

The benchmark in the field of mechanical chronographs, equipped with an ultra-sturdy case that is water-resistant to 500 meters (1,650 ft), and with Manufacture Breitling Caliber 01, the most reliable and high-performance selfwinding chronograph movement, chronometer-certified by the COSC.

\$ 7,710



WWW.BREITLING.COM



INSTRUMENTS FOR PROFESSIONALS™