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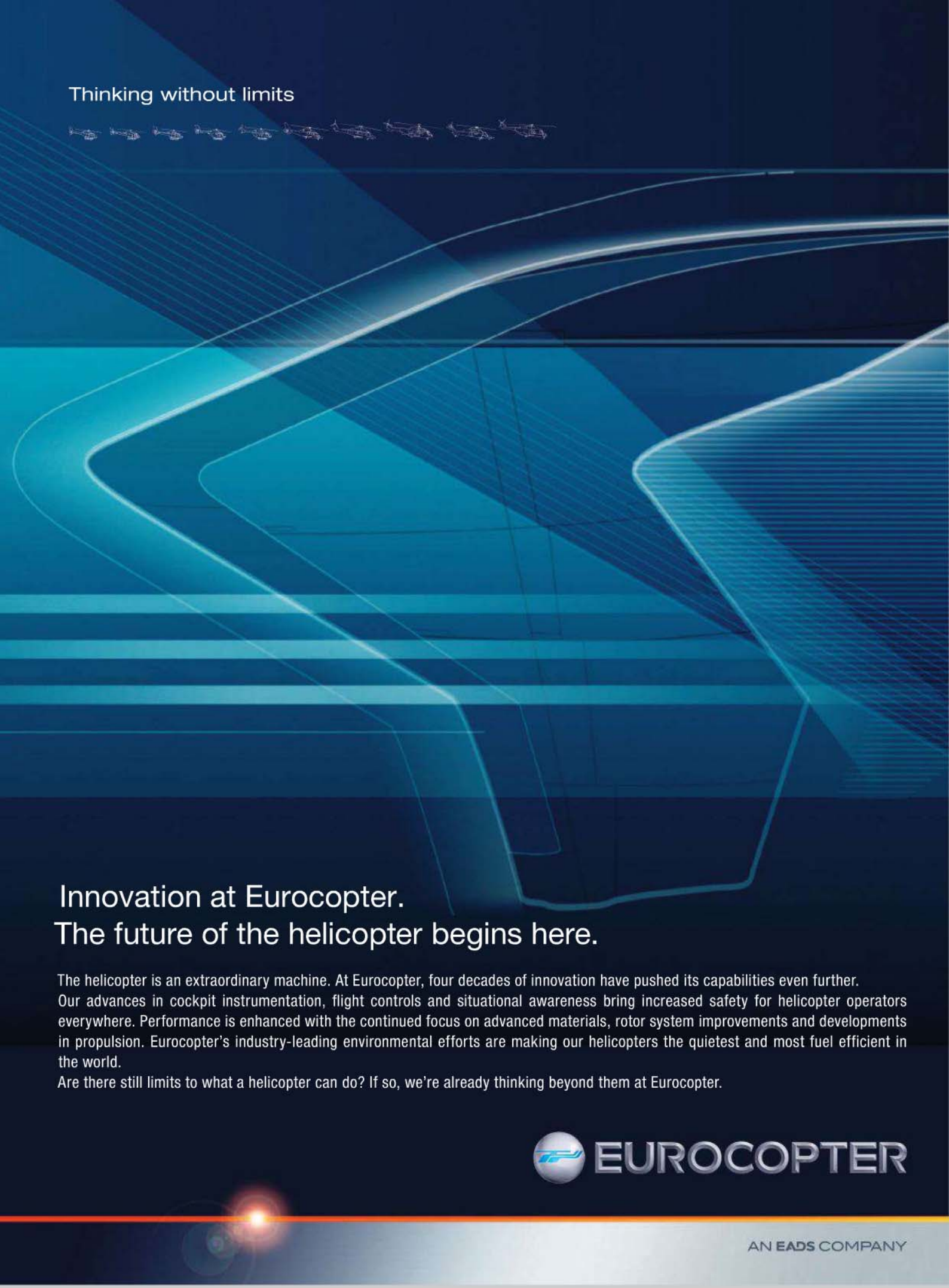
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CONTENTS

Volume 173 Number 8

AVIATION WEEK
& SPACE TECHNOLOGY

30 *Boeing artist's concept shows its winning KC-46A entry in the U.S. Air Force next-generation tanker competition as a B-1 bomber approaches for refueling. The contract is for supplying aircraft to replace 179 of the service's vintage KC-135s.*

COVER STORIES

42 *Sikorsky has begun certification test flights of its improved S-76D commercial helicopter, which is flying over the company's test center in West Palm Beach, Fla. Upgrades include new engines, avionics and a dual-speed rotor for reduced noise. Certification is planned by year-end and when deliveries begin early in 2012, the S-76D will be the first of a wave of new rotorcraft to enter commercial service. Sikorsky Aircraft photo.*

37 *Emirates rivals soon will have a chance to see how much, if any, cheap export credit financing has benefitted the carrier.*

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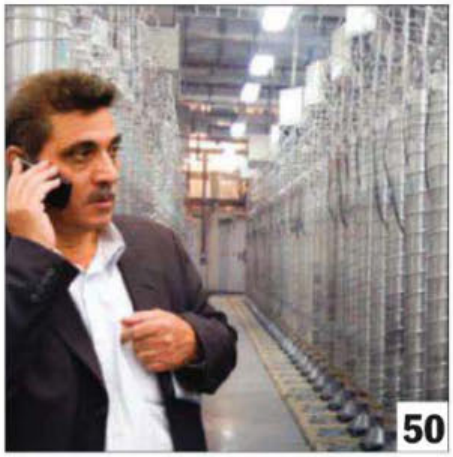

50

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GROWING PAINS

Korean Air has taken delivery of its first Airbus A380s, painted in the carrier's distinctive robin's egg blue livery, and you can see it on our **Things With Wings** blog. The aircraft has a low density of 407 seats, of which 301 are in economy. Meanwhile in India, industry observers wonder whether Kingfisher Airlines will be able to fill the five A380s and five A350s it has on order. The carrier is due to join the Oneworld alliance this year, and that might obviate its need for the long-haul aircraft. Online editor Rupa Haria explores why Airbus may be willing to defer the orders. **AviationWeek.com/wings**

FLYING THROUGH FLAK

When Senior Military Editor David A. Fulghum kicked off an online discussion about the next U.S. Air Force bomber, regular **Ares** defense technology blog readers jumped in with more than 40 comments on what it should—and should not—be (see p. 28). Says contributor RSF, "I have a hard time seeing how stealth bombers flying subsonic can survive the newer SAM systems that are now operational in China/Russia." Join the debate at **AviationWeek.com/ares**

FAMILY PORTRAIT

NASA's Messenger spacecraft team has released the first constructed "portrait" of our Solar System—a mosaic of 34 images taken by its Wide Angle Camera during November 2010—and **On Space** regular contributor Heather Goss provided imagery online. Go to **AviationWeek.com/onspace** and look for Messenger's "Portrait."

LIMBO IN BRAZIL

The unanswered question from Brazil's recent defense cuts, notes International Editor Robert Wall, is whether the F-X2 will merely be delayed or scrapped. Notes self-named contributor Catch22, "Countries in financial crisis find it a hard sell to the general public to buy expensive weapon systems." See Wall's post Feb. 21 at **AviationWeek.com/ares**

PREMIUM CONTENT

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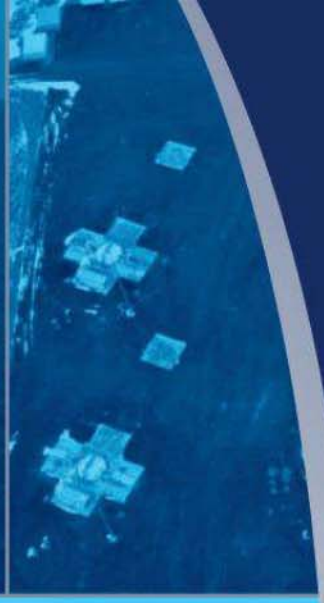

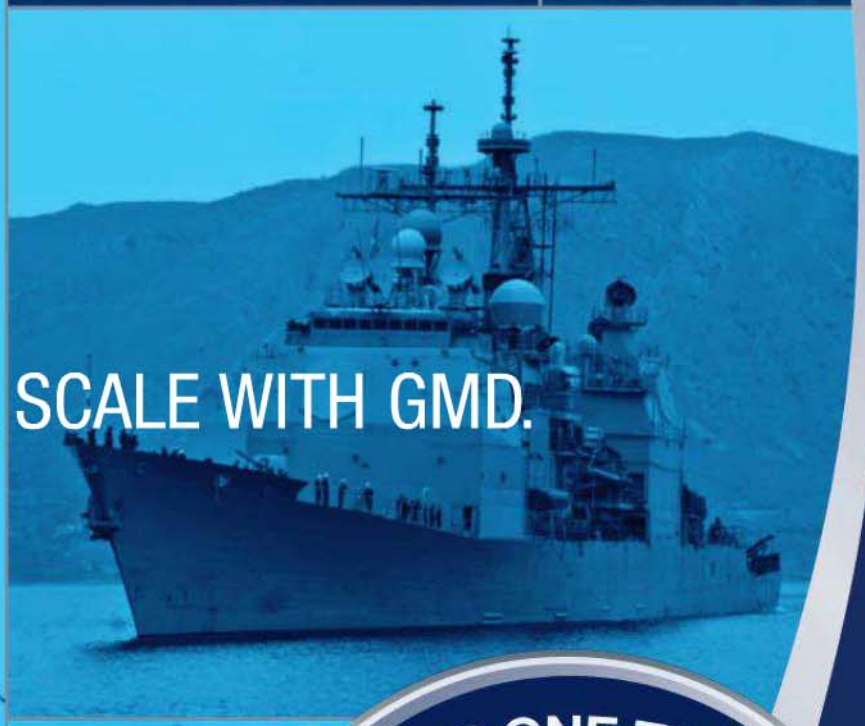

EXPERIENCE ON A SCALE WITH GMD.

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FEEDBACK

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.

MISINTERPRETATION

Your recent editorial (*AW&ST* Feb. 21, p. 66) deplores the idea, supposedly advocated in a speech by me, of consolidation among so-called lower-tier defense companies. But no such idea appears in the speech on industrial policy I gave on Feb. 9 at the Cowen Group or of the speech I gave at Aviation Week's A&D Technology and Requirements conference on Feb. 16.

In fact, they spoke of the central need to preserve and enhance the middle and lower tiers of the defense industry. They also stressed the need to reduce barriers to entry to the defense marketplace to encourage new entrants, creating a conveyor belt of new faces, ideas and technology into defense. So your editorial not only got it wrong, it got it backwards. I am always open to correction—but not of what I didn't say.

Ashton Carter
Undersecretary of Defense for Acquisition, Technology and Logistics
WASHINGTON, D.C.


EDITORIAL

Shrink To Fit Is Not A Good Strategy

"The forces that are bearing down on the industry are not the same ones that set the stage for the massive consolidation of the 1990s."

PERILS OF KEEPING KIOWA ALIVE

Go to the website www.armyaircrews.com/index.html and select Kiowa to see how many of those helicopters were shot down both in Vietnam and Iraq.

As an light-observation helicopter pilot flying the Bell Helicopter's OH-6, we saw numerous OH-58s shot down and aircrews die needlessly due to lack of survivability of this weapon system.

At the time, the threat was pretty much AK-47 assault rifles; the threat is much worse now. A helicopter designed in the late 1960s has no business flying against a threat that was developed in the 21st century. That also applies to the Marine Corps' AH-1Z Cobras and UH-1Ys, also manufactured by Bell. These obsolete weapon platforms provide negligible protection against today's advanced threat.

The OH-6 variant scout helicopter *does* work when it counts.

Capt. Clyde Romero, Jr.
MARIETTA, GA.

AT THE HEART OF HUBBLE

Your history of "The Shuttle Era" (*AW&ST* Dec. 6, 2010, p. 48) was quite thorough, however one item, the description of the "Costar" role in repairing Hubble, bears clarification. Your description, while accurate, is not relevant to the repair of Hubble.

The important point is that the late Jim Westphal's CalTech/JPL Wide Field and Planetary Camera (WFPC) played the leading role in characterizing the misshapened primary mirror so that corrective optics could be made integral with the "WFPC-2," which had already been built as a spare camera.

When the shuttle crew eventually installed WFPC-2 into Hubble, that camera went on to produce almost every fabulous space image published, until it was removed over a decade later in favor of newer-technology cameras. Costar merely improved the optics for the two spectrographs and the European camera and played no role in the establishment of Hubble as a national treasure. That accolade goes to the WFPC-1 and -2 teams. WFPC-2 is destined for the Smithsonian National Air and Space Museum in Washington, and rightly so. Its awesome images of the cosmos turned Hubble into a technology standard of excellence, but the role of WFPC-1 should never be overlooked.

Frank A. Carr
FORT MYERS, FLA.

NASA PUNTS

NASA has concluded that a 2016 crewed first flight of the new heavy-lift launch vehicle is not feasible (*AW&ST* Jan. 17, p. 18). NASA watchers should know by now that they are probably right. The agency is struggling with LV Phase A studies while trying to converge a congressional mandate with a six-year deadline. Although this sounds like a comfortable margin, there is a long way between Phase A and a downselected contractor for heavy lift. Under their current processes, NASA is now more than one year from final contractor selection, making 2016 look dubious. It then becomes a safety trade-off as to how many test flights are necessary to human-rate the vehicle versus achieving 2016.

To achieve that date, NASA is going to have to grapple with doing business differently than it has been. This includes taking more of an oversight role and less of an engineering one. The days of multiple joint NASA/contractor working groups populated with 50 civil servants from different field centers have to end. The agency must allow the contractors more autonomy and flexibility in decision-making and stop forcing "make-better" changes that must be ultimately absorbed by its contractors as overrun. In addition, they might have to consider establishing a government-selected sole-source national industry team from the existing contractors and forgo a lengthy completion for heavy lift. Our country's space program has become a political football instead of a mission-focused national asset.

Tom Megna
LITTLETON, COLO.

LOOK BACK TO PROGRESS

"Fly-by-Feel" (*AW&ST* Feb. 7, p. 16) mentions wing twisting! Shades of Orville and Wilbur Wright. The more things change, the more they stay the same.

John Bell
LARGO, FLA.

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WHO'S WHERE

J. Talamoni

Charles Boschen

Rick Stine

Treg Manning

Don Haloburdo

Jim Holcombe

John Burnum Jr.

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.*

Jean-Pierre Talamoni (see photo) has been appointed director of international development within the Strategy and Marketing Organization of the Paris-based *EADS Group*. He was responsible for Europe, the Middle East and Africa within the same unit, and before that was director of sales and business development at MBDA Missile Systems.

Don Greiman has joined *Ball Aerospace & Technologies Corp.*, Boulder, Colo., as director of systems engineering solutions (SES) for the company's Midwest operations, succeeding **Charles Mark**, who was promoted to director of Ball's SES Strategic Development. Greiman spent 30 years with the USAF and working for the defense industry in the private sector.

Charles Boschen (see photo) has become senior engineering manager in the Philadelphia office of *Parsons Brinckerhoff*. He was director and manager for major construction and operations projects, including work at Philadelphia International Airport.

Ray H. Siegfried is the new director of aerospace services at *The Persimmon Group*, Tulsa, Okla. He was chairman of the Nordam Group and is a lieutenant colonel in the Oklahoma Air National Guard.

Rick Stine (see photo) has been appointed senior vice president of Tempe, Ariz.-based *StandardAero's* Components Sector in Cincinnati. He comes from the Heico Corp., where he was senior vice president of technical operations.

Sharon Pinkerton has been promoted to senior vice president-legislative and regulatory policy and **Tom Hendricks** to senior vice president-safety, security and operations at the *Air Transport Association of America*. Pinkerton was assistant administrator for aviation policy, planning and environment at the FAA; and Hendricks, a retired USAF Reserve colonel, was director of line operations at Delta Air Lines.

Treg Manning (see photo) is the new vice president of sales at *American Eurocopter*, Grand Prairie, Texas. He comes from the Med-Trans Corp., where he was senior vice president of business development.

Roger Franklin has been appointed chief financial officer of Bridgewater, Va.-based *Dynamic Aviation*, succeeding **Merle Zook**, who has been promoted to executive vice president. Franklin was CEO/corporate secretary of the Quest Aircraft Co.

Karl Bowles has become sales manager for the Middle East for the *Signature Flight Support Corp.*, Orlando, Fla. Bowles, who will be based in Bahrain, was director of business development for the Middle East for Jet Support Services.

Elisabeth H. Barrett has been named vice president-human resources of *Triumph Group*, Wayne, Pa. She was vice president-administrative services of the Alco Standard Corp.

Don Haloburdo (see photo) has been appointed vice president and general manager of *Jet Aviation Flight Services*, Teterboro, N.J., succeeding **Bob Seidel**, who left the company. After a career as a U.S. Navy pilot, Haloburdo served as a Gulfstream II and III captain and then was interim director of the New World Jet Corp.

Jeffrey D. Wood has joined *Irving Place Capital* of New York as senior adviser for the firm's industrial practice. He was president of Airfoil Technologies International.

Jim Holcombe (see photo) has been named vice president of the *Hawker Beechcraft Corp.*, Wichita. He was executive vice president of sales and marketing and chief operating officer of Piaggio America.

Dino Koutrouki will lead *EMS Technologies'* new Global Resource Management Business, based in Atlanta. He joined EMS following the company's acquisition of Satamatics Global Ltd., of which he was chief executive officer.

John Burnum, Jr. (see photo) has been named director of business development for *Business Jet Access* of Dallas. He was regional sales manager for King Aerospace.

Ron Soret has joined *King Aerospace*, Addison, Texas, as president. Soret, who was chief operating officer for Gore Design Completions of San Antonio, will be based at King's modification facility in Ardmore, Okla.

HONORS & ELECTIONS

The *Society of Satellite Professionals International* named seven 2011 inductees for its Hall of Fame: **Masanori Akiyama**, president and CEO of Sky Perfect JSAT Corp.; **Robert Bednarek**, president and CEO of SES Worldskies; **Giuliano Berretta**, chairman of Eutelsat Communications; **Ellen Hoff**, president of W.L. Prichard & Co.; **Edward Horowitz**, former CEO of SES Americom and cofounder of U.S. Space, which offers satellite communications to the U.S. government; **Jean-Yves LeGall**, CEO of Arianespace, who presided over the creation of French-Russian joint venture Starsem; and the late **Dean Olmstead**, whose career covered roles at the U.S. State Department and NASA, where he led development of the Advanced Communications Technology Satellite.

George Whitesides, president and CEO of Virgin Galactic, has been named to receive the William F. Shea Distinguished Contribution to Aviation Award, given annually by the *University of Nebraska at Omaha Aviation Institute*. Whitesides was chief of staff to NASA Administrator Charles Bolden.

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(as of 2/23/2011) PERCENT CHANGE

MARKETS	INDEX VALUE	WEEK AGO	YEAR-TO-DATE	YEAR AGO
AW Aerospace 25	1379.0	-3.7% ▼	15.2% ▲	11.1% ▲
AW Airline 25	985.5	-6.7% ▼	12.1% ▲	13.4% ▲
S&P 500	1307.4	-2.2% ▼	17.2% ▲	18.3% ▲

Weekly Market Performance

Closing Prices as of Feb. 23, 2011

Company Name	Current Week	Previous Week	Fwd. P/E	Tot. Ret. % 3 Yr.	Tot. Ret. % 1 Yr.
AEROSPACE & DEFENSE					
AeroVironment Inc.	28.32	29.14	20.6	20.7	12.4 ▲
Allegheny Technologies Inc.	63.52	68.51	20.4	-19.7	49.9 ▲
Alliant Techsystems Inc.	70.49	72.13	8.7	-33.4	-10.8 ▼
BAE Systems plc	5.31	5.71	7.6	-36.1	-3.3 ▼
Boeing Co.	70.23	72.48	17.0	-7.7	13.3 ▲
Bombardier Inc. 'B'	6.14	6.37	14.9	16.6	20.7 ▲
Cobham plc	3.54	3.59	10.9	11.3	-1.8 ▼
Curtiss-Wright Corp.	35.76	37.23	13.8	-14.6	13.0 ▲
DigitalGlobe Inc.	29.60	30.51	98.0	....	36.5 ▲
EADS NV	28.71	30.13	25.4	11.1	43.5 ▲
Elbit Systems Ltd.	50.38	51.56	10.9	-4.4	-17.2 ▼
Embraer-Empresa Brasil ADR	33.02	34.43	16.3	-21.7	53.7 ▲
Esterline Technologies Corp.	69.19	71.73	14.9	53.2	67.1 ▲
Finmeccanica SpA.	12.33	12.94	8.0	-48.4	-0.2 ▼
FLIR Systems Inc.	31.47	32.22	18.2	6.2	17.7 ▲
General Dynamics Corp.	75.45	77.05	10.5	-3.1	6.6 ▲
General Electric Co.	20.37	21.44	15.2	-31.0	30.8 ▲
GKN plc	3.28	3.48	11.2	0.6	107.3 ▲
Goodrich Corp.	86.18	91.40	15.9	50.1	34.8 ▲
Harris Corp.	46.00	48.58	9.8	-8.7	1.9 ▲
Hexcel Corp.	18.76	20.54	19.7	-9.4	69.2 ▲
Honeywell International Inc.	55.64	57.20	14.6	8.2	40.7 ▲
ITT Corp.	57.32	59.09	12.0	7.3	14.2 ▲
Kratos Defense	13.83	13.93	21.6	-27.2	7.7 ▲
L-3 Communications Hldgs. Inc.	79.45	79.70	9.4	-21.9	-11.2 ▼
Lockheed Martin Corp.	80.14	81.28	11.4	-16.9	7.1 ▲
Moog 'A'	44.19	45.38	15.9	6.9	29.4 ▲
Northrop Grumman Corp.	66.92	68.54	9.5	-6.5	12.7 ▲
Orbital Sciences Corp.	17.42	17.11	19.1	-24.1	-8.3 ▼
Parker-Hannifin Corp.	87.23	91.21	13.4	41.9	50.4 ▲
Precision Castparts Corp.	141.57	150.61	17.3	22.6	26.0 ▲
Raytheon Co.	50.83	50.94	10.2	-16.8	-6.7 ▼
Rockwell Collins Inc.	63.55	66.10	15.4	13.3	17.5 ▲
Rolls-Royce Group plc	9.85	10.37	13.8	12.0	18.8 ▲
Safran SA	34.29	35.52	15.7	87.3	70.8 ▲
SAIC Inc.	15.95	16.44	11.7	-16.6	-18.1 ▼
SIFCO Industries Inc.	16.21	16.19	....	27.2	20.1 ▲
Singapore Technologies Eng.	2.52	2.56	17.5	14.3	17.3 ▲
Spirit Aerosystems Holdings	24.95	25.28	13.6	-10.9	33.0 ▲
Textron Inc.	26.57	27.96	22.7	-51.2	36.2 ▲
Thales	36.62	37.36	19.1	-32.5	-5.2 ▼
TransDigm Group Inc.	79.32	81.81	18.6	142.7	60.6 ▲
Triumph Group Inc.	83.45	89.91	11.3	47.0	60.6 ▲
United Technologies Corp.	82.79	85.06	15.4	23.4	23.4 ▲

COMMENTARY

Stuck on the Runway in China

"To get rich is glorious." Three decades after then-leader Deng Xiaoping pointed his nation toward a market-oriented economy, China is growing richer at a breathtaking pace, as evidenced by mile upon mile of new skyscrapers across Shanghai and Beijing. Thirty-four major airports are under construction, and another 63 are planned by 2020. The Civil Aviation Administration of China forecasts that per-capita air travel will increase fivefold during the next 20 years—this in a nation that already has 240 metropolitan areas of at least one million residents.

But a long-awaited explosion in demand for business jets is not going to happen here soon, despite hopes to the contrary and encouraging steps taken by the government to liberalize private air travel. Three years ago, a flight plan had to be filed a week in advance. Now, permission to fly is routinely granted in a day or less. But the industry remains a miniscule part of the nation's fast-growing aviation sector. There are still fewer than 100 business jets registered in China, and **Texton Inc.'s Cessna**—a market leader along with **General Dynamics Corp.'s Gulfstream Aerospace**—sells no more than a handful each year. "The potential is there and everybody sees it," says Daniel Amtmann, Cessna's newly appointed business development director for China. "But it's a question of infrastructure and airspace."

Landing slots are in short supply. While the U.S. is dotted with general aviation fields—sparsely populated Kansas has 141 public-use airports—business jets in China must use crowded city airports. They have to vie with airlines for pilots and mechanics who are in short supply, and for space in a clogged air traffic network. While a business or individual may own an aircraft, they must pay a separate company or person with an operating certificate to fly it. The government often does not distinguish between airlines and business jets when it comes to requiring costly safety equipment, such as flight data recorders. And foreign business jets, including those from Hong Kong, must pay a $4,000 tax every time they enter Chinese airspace.

In 2007, a top executive at **Embraer** predicted that there would be "many, many more business jets in China" within 2-4 years. But the Brazilian aircraft builder has sold just four corporate aircraft here. One challenge is that status-conscious buyers often prefer larger Gulfstream jets even when smaller and less costly ones would suffice. "People in Asia are very concerned about brand," explains Embraer China President Guan Dong Yuan. "They want to have a big name. We still need to build up our image and our brand." But Guan also acknowledges the infrastructure challenges are keeping China's business aviation market from being anywhere close to commensurate with the nation's new role as the world's second-largest economy. "There is a pilot shortage, a mechanic shortage, not enough airports," he says."

China may be building like crazy, but it still has a lot of catching up to do.

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.

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SPACE

Discovery in Orbit

The most experienced crew of astronauts in space shuttle history is in orbit for the final mission of the shuttle Discovery, working through a busy timeline to equip the International Space Station (ISS) with an equipment storage compartment and an external platform securing a spare thermal control system radiator. Also aboard are 5 tons of cargo, including Robonaut 2, an experimental humanoid developed by NASA in partnership with General Motors. Mission commander Steve Lindsey's crew includes pilot Eric Boe and mission specialists Mike Barratt, Nicole Stott, Alvin Drew and Steve Bowen. Drew and Bowen are slated for two spacewalks, the first on Feb. 28 to retrieve and vent a station pump motor that failed in late July, crippling half the cooling system. The second spacewalk is scheduled for a day later. Mission managers may add a day to the nominal 11-day flight so three station crewmembers can board their Soyuz vehicle and back away for an unprecedented portrait of the ISS with a full house of docked vehicles.

XCOR Sells Flights

Southwest Research Institute will use the planned Lynx spaceplane under development by XCOR Aerospace to send its scientific payloads and payload specialists on suborbital missions. Spearheaded by Alan Stern, a former NASA associate administrator for science, SwRI has purchased six Lynx flights for dates to be determined. Stern and two colleagues at SwRI will use the horizontal takeoff and landing flights to conduct biomedical, microgravity and astronomy imaging experiments.

Glory Launch Delayed

NASA is looking for a new launch date for its Glory climate-monitoring spacecraft after a last-minute delay Feb. 22. The vehicle interface control console in a van near the pad at Vandenberg AFB, Calif., gave an incorrect reading that a "hold-fire" command had been sent about 15 min. before the Taurus XL launch vehicle was set to lift off.

AIR TRANSPORT

Wary, Not Worried

Airlines and industry analysts last week remained wary of rising fuel prices but were cautiously optimistic that hedging would, for now, limit the effect on costs. The uprising in Libya and indications that other oil-rich countries could witness the political upheaval that unseated governments in Egypt and Tunisia have pushed oil prices above $100 a barrel and futures close to $140 in a run not seen since 2008. Observers, however, note that the improved economic situation and more astute forecasting should allow for fare increases or surcharges to mitigate any short-term volatility in fuel prices.

EC and State Aid

The European Commission is asking for third-party input as it reviews whether a Czech Airlines restructuring plan violates competition rules. The rescue proposal for the struggling airline includes a 2.5 billion Czech koruna ($140 million) loan from state-owned Osinek under conditions viewed as potentially preferential, as well as other elements. Although the opening of a "formal investigation" does not directly imply the EC believes there are violations, it does note it has concerns

Supplier Selection Close on KC-390

Selection of the major suppliers for the Embraer KC-390 is expected in March, with the joint definition phase for the Brazilian tanker-transport program scheduled to begin in May.

The configuration has been frozen and a full-scale cabin mock-up built, which the Brazilian air force is using for vehicle and troop loading tests.

Embraer has recommended suppliers for the main systems—including avionics, engines, landing gear and cargo handling system—to the air force, which is funding development of the KC-390 and has the final decision on selecting industrial partners and major suppliers.

"Embraer has prepared five or six reports and supplied them to the air force for decisions," says Eduardo Bonini, senior vice president for operations and chief operating officer for the Brazilian manufacturer's recently formed defense and security business. "We need decisions, and hope by mid-next month [March] to have definition of the main systems."

Embraer was awarded a 3 billion real ($1.8 billion) contract to develop the twin-turbofan KC-390 in 2009, and Bonini says the program is on schedule for a first flight in mid-2014 and entry into service with the air force in 2016.

EMBRAER

Government-to-government and industry-to-industry negotiations are under way with countries that have signed letters of intent (LOI) to buy aircraft and participate in the program.

LOIs are in place for 60 aircraft: 28 for Brazil; 12 for Colombia; six each for Argentina, Chile and Portugal; and two for the Czech Republic. Companies in each partner nation will be assigned development and production work packages. "In principle, these six countries will be the partners," says Fernando Ikedo, Embraer's vice president for market intelligence for the defense market. "We most probably will not have other industrial partners."

Supplier reports submitted by Embraer to the air force make recommendations "based on our evaluation of price, risk and delivery, and based on our experience," says Ikedo.

on a range of issues related to the restructuring plan. In another case, the EC has OK'd the Swedish government to provide 120 million kronor ($18.8 million) in funding to Volvo Aero for development activity related to the intermediate compressor case for the Trent XWB engine. The commission determined the government support would not violate state-aid rules. The work is aimed at lowering fuel burn for the Airbus A350XWB.

Tomorrow's Testbed

General Electric will convert a Boeing 747-400 into a new flying testbed as part of plans to upgrade its test facilities in preparation for evaluating Leap-X and other next-generation commercial transport engines from 2013 onward. The aircraft will be modernized and refurbished under a $60 million plan announced by GE on Feb. 24. The 747-400 will replace the current 747-100 testbed.

AEROSPACE BUSINESS

Silence Is Golden

A high-level German government meeting over the future of the EADS shareholder structure has failed to resolve how to deal with Daimler's request to reduce its stake in the European aerospace and defense giant. Daimler wants to again trim its shareholding, now at 15%. But such a move would upset the Franco-German balance in EADS unless a new German stakeholder can be found to maintain national parity. There have been discussions of whether the German government would take the shareholding directly. The French stake is held by the government and the Lagardere industrial group. Discussions in Germany also have examined the possibility of giving the government a "golden share" with special rights.

DEFENSE

Gap Approaching

The U.K. is nearing the start of an airborne signals intelligence gap of more than two years with the planned retirement of the Nimrod R1s on March 31. The replacement three RC-135 Rivet Joints the U.K. is acquiring are not due until late 2013. The U.K. will retain some airborne electronic intelligence collection capability through the continued use of the Sentinel R1, which will be retired once Afghanistan operations wind down. Moreover, the Elta El/L-8300 electronic support measures equipment bought for the Nimrod MRA4, which is being scrapped, will be retained.

BUSINESS AVIATION

Embraer Opens in Florida

Embraer has opened its Florida assembly plant and customer delivery center, a welcome source of jobs on the soon-to-be shuttle-less Space Coast. The $50 million complex at Melbourne International Airport is expected to begin turning out Phenom 100 very light jets later this year. Ultimately, it could employ 200 and turn out eight Phenom 100s and 300s per month.

Shipments Down, Billings Up

Although shipments of business and general aviation aircraft were down—again—for 2010, the $19.7 billion in billings were the third highest, with flight activity and corporate profits climbing. According to the General Aviation Manufacturers Association, its member companies delivered 2,015 business jets, turboprops and piston-engine aircraft in 2010, or 11.4% fewer than the previous year. But the popularity of high-ticket, long-range business jets helped lift total billings 1.2%. Additionally, exports accounted for 65% of billings for aircraft manufactured in the U.S., an 11% increase over 2009 exports.

LaHood To Visit Wichita

Although it once castigated the aircraft built there as symbols of excess, the Obama administration seems to be adjusting its view of Wichita and is sending its transportation chief there to help rally hard-hit general aviation manufacturers and their current and furloughed employees. Transportation Secretary Ray LaHood plans to visit the self-billed "Air Capital of the World" on March 21. LaHood's visit follows one in February by FAA Deputy Administrator Michael Huerta, during which he toured the Cessna Aircraft factory and addressed aviation officials. Cessna similarly plans to host LaHood and hold what's being billed as a "GA jobs rally." In a recent blog posting, LaHood acknowledged the industry's economic woes, but also wrote that some of the jobs lost are starting to return. He also noted the important role general aviation plays in ferrying goods and patients, and praised the sector's safety record.

OBITUARY: Capt. (ret.) James C. Waugh, whose aviation career spanned nearly half a century, from crewing Pan American flying boats to heading all operations for the international carrier, and later serving as chairman of the Flight Safety Foundation, died in Cary, N.C., on Feb. 24 after a long illness. He was 89.

In 1942 Waugh joined Pan Am's Air Ferries Div., which supplemented the air transport activities of both the U.S. Navy and U.S. Army Air Corps during World War II. He earned wings for both services as a result of transporting cargo and wounded soldiers in both the Catalina PB2Y-3R flying boat and C-54 landplane. During his long career with Pan Am Waugh transitioned from the Boeing 314 flying boat, through various piston-engine airliners, and finally into Boeing jetliners. He was one of the first airmen to receive an FAA type rating in the 747. Moving into management in 1973, Waugh ultimately was senior vice president for operations before retiring from the airline. He became Flight Safety Foundation chairman in 1988.

Waugh is credited with introducing or promoting many of the piloting tools considered essential today, from checklists influenced by human factors studies to developing an operations manual noted for its clarity and comprehensiveness. For his contributions to aviation safety, the Flight Safety Foundation presented Waugh with the Aviation Week & Space Technology Distinguished Service Award, and the National Aeronautics Association honored him with its Elder Statesman of Aviation Award.

Correction: *The Aerospace 2011 specifications table for Unmanned Aerial Systems (Jan. 24/31, 2011, p. 102) incorrectly identified the powerplant for the X-47B Unmanned Combat Air System. Its engine is the Pratt & Whitney F100-PW-220U.*

BY GUY NORRIS

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COMMENTARY

Seeing The Light

Lightweight inflight entertainment system targets factory qualifications

BRIAN KUCHERERA/LUMEXIS

Breaking into the tightly contested inflight entertainment (IFE) business is a tough challenge, but gaining qualification so systems can be installed on the aircraft assembly line rather than retrofitted may be even harder.

This is the task facing Lumexis, a start-up California-based IFE developer pioneering a lightweight, high bandwidth fiber-optic system dubbed Fiber To The Screen (FTTS). Having ridden out the market downturn in 2008, Lumexis battled to win an opening with a 2009 launch order for its improved Gen2 FTTS system from Flydubai, a low-cost carrier based in the United Arab Emirates. With the system entering its fourth month in revenue service, and IFE heavyweights Panasonic and Thales beginning to sit up and take notice, Lumexis knows that qualification is as much a key to longer-term success as clinching more orders.

The Gen2 FTTS installation in Flydubai's Boeing 737-800s weighs around 5.68 lb per seat, or close to a third of the per seat weight of typical IFE installations on current twin-aisle aircraft. Most of the savings come from using fiber-optic cables and server switches in place of the copper wiring, video server units and individual bulky seat electronic boxes that comprise alternative configurations. The use of fiber optics also increases bandwidth capacity to a gigabit per second per seat, compared to 5 megabits per second for standard, copper-wire based systems.

Based on the first generation FTTS, trialed by US Airways in 2009 on an Airbus A320 for over 1,000 hr. without a single system reset, the updated Gen2 entered service on the first Flydubai 737 in November 2010. Together with a simpler touchscreen interface that does not include any hand-held devices, the lighter weight and lower maintenance requirements of the Lumexis system mean it should incur roughly one-half the ownership costs of existing IFE systems. "But we still have to prove it," says Lumexis Chief Executive Douglas Cline, who adds that the weight benefit means "we can get an extra revenue passenger and bags aboard."

Most encouragingly, installations are being completed in less than three days. In addition, this is being achieved with the new Boeing 'Sky' 737 cabin interior which was also launched into service by Flydubai. For the conversion, aircraft fly from Boeing Field to Aviation Technical Services at Paine Field, Everett, Wash., where the interior is stripped and wiring installed. Tyco Electronics-provided equipment, along with pre-configured seats from Recaro Aircraft Seating of Fort Worth, are fitted when the interior is reconfigured under a supplemental type certificate developed for Lumexis by Jamco America.

Newly fitted on a 737-800, the Lumexis Gen2 FTTS is scaleable down to regional jets or up to widebodies.

"We have finished six aircraft to date and are now 'buttoning them up' in under three days," says Cline. who adds that 38 737s remaining under the current Flydubai contract will be delivered at around one per month.

But increasingly Lumexis's "objective is to gain qualification with one or both of the majors (Airbus and Boeing) by year-end. The ability to offer installation of the FTTS on the assembly line at both "the Big Guys" as well as Embraer, Bombardier and ". . . in the future, new Asian airframers, is completely central to our marketing strategy and our activities are proceeding aggressively in parallel with all of them," Cline says.

It takes time, money and market demand to make qualification happen, all of which are now coming together Cline says. "Requests from airlines for line-fit of FTTS have skyrocketed since Flydubai's success," he adds. Yet it could have been another story. "We had the ability to ruin the airline, and quite frankly they had the ability to ruin Lumexis. But is has been a very strong endorsement," says Cline. As a result, manufacturers are bringing in their timetables for FTTS qualification and line installation "on both widebody and narrowbody models."

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COMMENTARY

Extra Lift

Program streamlines airline link to charities to use valuable empty seats or cargo space

U.S. airline stocks took a hit on Feb. 22 as jet fuel prices rose in response to ominous headlines from Libya. This particular spike may be an overreaction to political unrest, but the situation in the Middle East is far from settled. Prices likely will continue to fluctuate with current events as we head into summer, when fuel costs typically rise due to seasonal factors.

Such fluctuations add to the pressure on airlines to put every part of their organizations to work, generating revenue if possible in innovative ways. One area airlines may need to rethink in value terms may be excess capacity.

Aviation Week editors spoke last week with an organization that offers a way to make use of that excess capacity—both cargo space and passenger seats—while aiding humanitarian aid missions. The International Society of Transport Aircraft Trading's AirLink program matches airline capacity to non-governmental organizations (NGO) that need to move people or supplies.

AirLink aims to supplement the charitable work that airlines already perform by streamlining their connection to organizations with lift needs. By combining real-time visibility with available capacity, AirLink could help airlines recoup some revenue from excess space they haven't sold.

Operators may donate the capacity or sell it to NGOs at a reduced rate. "Airlines don't have to give it away," points out Robert Crandall, the former American Airlines chief who now serves on AirLink's advisory council. He says airlines can charge a reduced rate or a fee, to cover incremental fuel costs.

AirLink's NGO and airline members log on via Aidmatrix, an independent, web-based platform created by developers who had previously provided technical solutions for ground-transit programs. Airlines post available capacity, NGOs post transportation requests, and the program matches them for free. AirLink aims to fill requests submitted weeks and months in advance as well as accommodating last-minute lift availability slots.

AIRLINK PHOTOS

As part of the AirLink program, this aircraft transported One World Environment's water purification systems to Haiti.

Because AirLink anticipated potential competitive conflicts of interest, says program director, Ty Prettyman, only NGOs can see airline capacity listings and only airlines can see NGO requests. "I emphasize this [confidentiality] when talking to or training airlines, but most seem kind of indifferent," he says. "It's weird, but I'm still glad we have this feature."

These 11 members—Atlas Air, Etihad Airways, FedEx, Hawaiian Airlines, Nippon Cargo Airlines, North American Airlines, Omni Air International, TACA, United Airlines, UPS and World Airways—have signed on to the program since its inception in 2009, with TACA joining in early February. Prettyman wants to at least double the pool of carriers this year. He is "actively pursuing" potential members to bring the total to 25, with a "good mix" of cargo and passenger transport capability spread around the world.

In addition to the member airlines, AirLink also works with partner organizations such as Aerobridge which use corporate aviation services to assist NGOs with lift needs.

Students at the New Horizon school in Port-au-Prince stand next to their new water purification system, transported by the AirLink program.

Movements for the 18 NGO members range from large (such as transporting groups of Afghan children to summer camp in Lake Norman, N.C.) to small (supplying two passenger seats or moving a box of soccer equipment), and range from urgent disaster response to ongoing developmental needs, Prettyman says. For example, UPS helped move about 500 lb. of oxygen-generation equipment and supplies from Ohio to Port-au-Prince, Haiti. In January, AirLink transported two water purification systems from Wilmington, Del., to Port-au-Prince with the help of partner Aerobridge for installation in schools by One World Environment, an NGO which is working to relieve the cholera epidemic.

Prettyman joined AirLink in March 2010, about two months after a massive earthquake shook Haiti. A majority of the organization's movements thus far have been cargo shipments to Haiti, but he aims to keep a wide geographic focus.

"By no means are we concentrating in one area of the world," says Prettyman. "We are trying to cover the world as much as we can here, realizing that you never know where the next disaster is going to take place."

BY FRANK MORRING, JR.

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COMMENTARY

ISS Analog

NASA ponders a simulated trip to Mars—in Earth orbit

As volunteers from Russia, Europe and China practice for the exploration of Mars on the planet's simulated surface at the Institute of Biomedical Problems (IBMP) in Moscow, NASA engineers are considering what it would take to use a portion of the International Space Station for the first phase of a mock Mars mission. Russia's Alexandr Smoleevskiy, Diego Urbina of Italy and Wang Yue of China "landed" on the red planet mockup at the midpoint of the Mars 500 project on Feb. 14.

Here Urbina (left) and Smoleevskiy test tools in the IBMP Mars yard—a sandbox surface like the ones engineers use to prepare rovers for the real thing. Exploration experts have told the NASA Advisory Council that the microgravity and isolation of the ISS could add reality to a future analog mission to Mars. Astronaut John Grunsfeld—a member of the advisory panel with extensive experience at the Hubble Space Telescope—says a pair of station crewmembers could be isolated in a dedicated module for six months to simulate the transit to Mars.

ESA/IBMP

In addition to near weightlessness and the hazards of the low-Earth-orbit environment, delayed communications with a mock mission control center, perhaps limited to text, would exercise operational issues. If something breaks inside the simulated Mars ship, the crew would have to fix it or do without (within reason, of course—there still would be help on the other side of the hatch). And they would have to exercise vigorously to offset the effects of microgravity, in preparation for the simulation's second phase. That would be a variation of the exercises Smoleevskiy, Urbina and Wang are conducting, but in a Mars yard set up near the landing site of the Soyuz capsule or other vehicle that returns them to Earth.

SATELLITE SERVICES

Boeing has created a new entity to market commercial satellite services to the U.S. government and other satellite users. Part of the Boeing Space & Intelligence Systems Div., the new unit—Boeing Commercial Satellite Services—should help the company take advantage of robust government demand, especially for communications, according to Craig Cooning, vice president and general manager of BSIS. The company has sold nine commercial spacecraft in the past 18 months, including four midsize 702MPs to Intelsat, three big 702HPs to Inmarsat and two 702HPs to the Mexican government. Two of the Intelsat satellites and all three of the Inmarsat spacecraft will carry hosted payloads, which will be the focal point of service activity. Other kinds of deals also are possible, including capacity pre-purchase agreements—Boeing concluded an arrangement of that type with Inmarsat for K_a-band capacity as part of the satellite supply deal—and the purchase of capacity on speculation, without a customer at launch, says Steve O'Neil, president of Boeing Satellite Systems International. A follow-on deal with Inmarsat to market L-band capacity to the U.S. government will be signed in the coming weeks. And although the initial focus will be on meeting U.S. Defense Department communications needs, the services unit will also look at the needs of other agencies, international governments and non-communications requirements, including remote-sensing opportunities, says Jim Mitchell, vice president for commercial services. Iridium, for instance, is looking for customers for hosted payloads on some of the satellites on its second-generation network, and recently signed up Orbital Sciences Corp. to market them.

TERMINAL TIE-IN

EADS Astrium, which helped pioneer government satcom services, will supply a new airborne satcom terminal for the United Arab Emirates' Yahsat satcom network under a series of awards that also saw Boeing tapped to provide very-low-profile K_a-band airborne antennas for the network. Astrium also will deliver Yahsat operations and maintenance services to the UAE armed forces, which will share use of the system. The five-year operations/maintenance award, signed at the end of 2010 but revealed only last week, will include training and logistics support. It will be worth "tens of millions of euros," according to Astrium, which is also supplying two satellites and the ground system in partnership with Thales Alenia Space. The first spacecraft is to be launched in March by Arianespace. The Yahsat award was the first for Astrium's airborne terminal, known as AirPatrol. The highly stabilized, 16-kg (35-lb.) unit can provide up to three times the capacity of a conventional antenna and has demonstrated data rates of up to 20 mbps in X-band during trials using a standard 60-cm dish, Astrium says. The terminal was also selected last week by the Canadian defense department for evaluation under the country's RIFL2E (radar and imaging for the land/littoral environment) technology demonstration project.

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COMMENTARY

Collateral Damage

So far, no big threats seen to defense industry

Politicians and diplomats may be struggling to understand the fast-moving events in the Middle East, but those who watch U.S. defense exports expect little change (see p. 22). As Wall Street analysts at RBC Capital Markets put it, look at the buyers and sellers during 2009 and 2010. Over those years, 88% of U.S. defense exports to the Middle East went to Saudi Arabia, Kuwait, Israel, Oman, Qatar, the United Arab Emirates, Turkey and Egypt.

"Excepting Egypt, the rest of these countries are arguably the more secure in the region," say the RBC analysts. "We also note that the strategic rationale driving defense export demand in these countries, principally concern about Iran, remains—and has arguably increased—given the Iranian decision to send naval ships through the Suez Canal." Even for major Middle East provider Raytheon, such sales accounted for only 6% of total sales last year, RBC says. Anthony Cordesman of the Center for Strategic and International Studies notes that Tunisia made no major orders from 1994 to 2009, while Libya invested in equipment and facilities rather than a sound manpower, infrastructure and support base. Says Cordesman: "Its overall ratio of weapons to manpower is militarily absurd."

Brace for political bloodletting as Congress tries to keep the government funded past March 4.

FOREIGN OWNERSHIP

Allowing increased foreign ownership in U.S. airlines and changing the definition of "control" of them is a debate whose time has come—again. The House Transportation and Infrastructure Committee steered clear of any language in the FAA Reauthorization and Reform Act of 2011, now awaiting full House debate. Erstwhile Chairman James Oberstar (D-Minn.) had tried to reduce the amount of foreign ownership allowed but he lost re-election. But neither does the House bill "expand the definition of ownership because it is too politically charged, even though the European Union is going crazy over that. But that's just reality," says Holly Woodruff Lyons, Republican staff director of the aviation subcommittee. Will Ris, government affairs chief at AMR Corp., tells an American Bar Association forum, "The real issue concerns organized labor and what it means for them. I think the dialogue should be with them." He says with changes in leadership at various transportation labor groups, the timing seems right. Gael Sullivan, a Democratic staffer for the Senate Commerce, Science and Transportation Committee, agrees: "It just takes convincing them there are benefits."

BRACE FOR IMPACT

Like everyone else in town, NASA managers are braced for political bloodletting as Congress tries to keep the government funded past March 4. Budget-cutters are in full cry as the expiration for the current continuing funding resolution looms. Going in, NASA has another week operating at its fiscal 2010 rate—$18.7 billion, the same as requested for 2012. But lawmakers have to appropriate funds for the rest of this fiscal year first. The Republican-controlled House has adopted a continuing resolution for the rest of the year that would cut $877 million from the $19 billion NASA sought this year, and $601 million from the fiscal 2010 level, according to calculations by Marcia Smith of SpacePolicyOnline.com. That is part of a $61 billion overall federal spending cut the House already has passed. Senators in general want less of a cut. The first question is whether a divided Capitol can get it together to fund the government through the end of this fiscal year, or punt again with another short-term funding measure.

FACING THE INEVITABLE

The Pentagon may finally be grappling with what happens if and when its forces are hit with a large network attack. A number of recommendations appear in the newly released Defense Science Board study, "Enhancing Adaptability of U.S. Military Forces." Network systems should provide cyber-situational awareness to users and commanders, be able to operate in degraded modes, provide tools for user reconfiguration, have applications that self-evaluate their own behavior and report corrupted data, ensure applications can operate with reduced communications or processing, and perhaps operate from cached information rather than external feeds.

CHECK YOUR FIGURES

Congressional auditors suggest Capitol Hill prod the Air Force for a new analysis of the purported tactical aircraft shortfall. Noting that much has changed since the last tacair gap calculation, the GAO says, "Better information on the [Joint Strike Fighter] restructured program and on the F-16 fleet is expected to become available in 2011; this could enable a more informed analysis, comparing and contrasting the various alternatives for mitigating the projected aircraft shortfalls."

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LINE OF FIRE

Political unrest raises doubts about viability of Middle East arms market

ANDY NATIVI/ABU DHABI, UNITED ARAB EMIRATES

The turmoil shaking the Middle East and North Africa is creating uncertainty about weapon programs. Several competitions are in doubt, and suppliers are anxious about whether they need to step back from the market.

Some of the big traditional arms buyers in the region have been affected by the unrest, including Egypt and Morocco, and commitments to reform could shift spending priorities, observers say (*AW&ST* Feb. 7, p. 22). And even countries that have not been rattled, like Saudi Arabia and the United Arab Emirates, appear to be stretching out decision-making on large purchases, suggesting that defense planners may be waiting for the smoke to clear before signing off on them.

Western governments and defense contractors alike have been taken off guard by events, as evidenced last week when British Prime Minister David Cameron visited Egypt with a trade delegation including weapons manufacturers. "They are difficult judgments at present," says Peter Luff, the U.K. minister for defense equipment, noting that governments have to find a way to avoid adding to the turmoil without jeopardizing long-term ties. In some cases, simply withdrawing from markets is not an option, he says. "Others will fill the vacuum."

Rear Adm. John Roberti, deputy director for strategy and policy for the U.S. Joint Chiefs of Staff, told a Precision Strike Association conference in Fort Walton Beach, Fla., last week that the uprisings may prompt the U.S. to reconsider arms sales in the region. Major Gen. Michael Snodgrass, assistant deputy undersecretary of the Air Force for international affairs, said the protests could lead to a shift in military cooperation away from hardware sales to training, intelligence-sharing and other areas.

Nevertheless, the underlying reasons motivating arms acquisitions, including a perceived threat from Iran, have not changed, and so far there is little indication the unrest has triggered a shift in defense priorities (*AW&ST* Feb. 21, p. 38; Feb. 14, p. 47). The most likely near-term repercussions are expected to be felt in Libya, which has several major deals in discussion with Russia, Italy and France. The most at risk appears to be a long-discussed purchase of Rafale fighters.

That wider effects so far are not being seen was reflected at the latest edition of the International Defense Exhibition & Conference (IDEX) here last week, where representatives from throughout the region—including the Egyptians—maintained a high profile and business was brisk. In a near-ritualistic routine, Maj. Gen. Obaid al Ketbi, the IDEX spokesman, announced a string of contracts valued at around $1 billion, including new hardware for the United Arab Emirates's big new Yahsat satellite communications system (see p. 18). However, the only deal of any size was a $550 million sale of an army command-and-control system by EADS, and progress on the biggest projects failed to materialize.

This included the most closely watched acquisition—the UAE's planned replacement of its Dassault Mirage 2000-9 fleet. France has long courted the country with the Rafale, but political missteps have provided an opening for rivals that were thought to be out of the running—the Boeing F/A-18E/F, Lockheed Martin F-16 and Eurofighter Typhoon—even though Rafale still is widely regarded as the front-runner.

The UAE, which is looking to buy up to 60 fighters, is looking for a range of modifications on the Rafale, including a higher-power engine, that might involve more development spending than the country could absorb. The UAE also wants to return its Mirage 2000s as part of the deal. France would like to resell the aircraft to Brazil, Pakistan or Iraq, but industry sources indicate that France may end up taking the aircraft itself, which could jeopardize future domestic Rafale buys.

Goodrich prevailed over BAE Systems to supply the reconnaissance pod for the UAE's F-16 Block 60s.

LOCKHEED MARTIN

Similarly, talks are still dragging on to finalize a UAE purchase of 48 Alenia Aermacchi M-346 trainer/light attack jets. A source selection was announced in 2009; but since then, progress has largely stalled, partly owing to a demanding offset requirement. For the air force, there has been an upside to the delay: Singapore has since opted for the M-346, clearing some technology-release obstacles. An example is the ability to now acquire an active, electronically scanned array (AESA) radar to replace the Selex Galileo Grifo-M that was to be installed.

Despite recent signals from the UAE that it may be approaching Korea Aerospace Industries about supplanting the M-346 with the purchase of the T-50 Golden Eagle, industry officials now say that this has not happened. The UAE has also bought itself added time to close the advanced jet trainer deal by starting to field Pilatus PC-21 basic trainers, which are taking on some of the tasks of the Hawk fleet.

Another project in stand-by mode is the dual-use-satellite Earth-observation system. Budget concerns have caused Abu Dhabi to scale back its ambitious plans for a state-of-the-art imagery receiving and processing center. There have long been discussions to carry out the program through the Gulf Cooperation Council, but so far little progress has been made. The project would include four satellites (two radar systems and two optical sensors) placed in equatorial orbit to obtain high revisit times on the "area of concern."

Also in flux are UAE plans to field a signals intelligence aircraft. French companies were pushing an Airbus A320-based option. But industry officials suggest the endeavor has stalled because of cost and integration problems; a new approach is being considered, based on a smaller platform, such as a regional or business jet. Several electronics companies might offer mission systems.

The UAE, meanwhile, is not the only country reassessing big program buys. Saudi Arabia has scrapped plans for local assembly of Eurofighter Typhoons. Instead, the Saudis are working with BAE Systems to establish a repair and upgrade facility, with all fighter assembly now to take place in the U.K. As part of the agreement, the Saudis will accept some of their Typhoons in the newest Tranche 3 standard, says BAE Systems CEO Ian King.

Despite the hiccups, progress is being made on some fronts. The UAE expects to take delivery of the first of three Airbus Military A330 tankers this year and also intends to buy a number of Lockheed Martin C-130Js and Boeing C-17s as well as a smaller tactical aircraft—likely the Airbus Military C295 or Alenia C-27J.

Lockheed Martin officials soon hope to complete a long-discussed deal for three Terminal High-Altitude Air Defense systems with nine launchers, complementing nine existing Patriot PAC-3 fire units. A retrofit and upgrade of the current five I-HAWK batteries also is being considered.

Some stop-gap acquisitions are moving forward as well, including the purchase of two Saab SF-340 Erieye airborne early warning aircraft, which will provide an initial AEW capability until a definitive platform is chosen. Industry officials still believe a long-term AEW selection could come this year, with the Erieye pitted against the Boeing Wedgetail and Northrop Grumman E-2D.

A similar situation is unfolding in the maritime patrol domain. Two used Dash-8s converted by Provincial Aerospace and equipped with a Thales Amascos mission system and Elettronica electronic support measures suite will meet the short-term requirement until a final model can be selected.

With Robert Wall in London; Amy Butler in Fort Walton Beach, Fla.; and Michael A. Taverna in Paris.

Israel's latest Arrow-2 ballistic missile defense test represented the 15th success in 18 tries.

U.S. MISSILE DEFENSE AGENCY

Tit for Tat

Iran boosts missile might as Israel bolsters its defenses

ALON BEN-DAVID/TEL AVIV

Even as a political tsunami sweeps over Arab countries in the Middle East, there is little sign of change in the region's primary military fissure: the standoff between Israel and Iran.

Both sides are flexing their military muscle—Israel by successfully testing its Arrow anti-ballistic missile system, and Iran by sending warships to the Mediterranean for the first time in 30 years.

The timing of the Arrow test, conducted at a U.S. Navy firing range off the coast of California, was incidental. It was scheduled more than a year ago after a failure in a previous Arrow-2 trial above the Pacific Ocean in July 2009. Israel is testing Arrow offshore because of range constraints at home. It also enables Israel to test the system against more sophisticated targets developed by the Pentagon's Missile Defense Agency (MDA).

The Feb. 22 test was conducted against a target launched from a mobile platform, representing "potential ballistic missile threats facing Israel," according to the MDA. "We have tested new software upgrades to the Arrow [that are] needed to defend against new and different threats," says Arie Herzog, head of Israel's Ballistic Missile Defense Organization. While Israel and the U.S. would not specify the features of the target, it appears to have simulated an intermediate-range ballistic missile capable of maneuvering and discharging decoys upon re-entry.

During the nighttime test, the Arrow launchers and Green Pine radar deployed 60 mi. apart, simulating an emergency scattered deployment of the system. The radar identified the target and tracked it, and the Citron Tree battle management center prepared an interception plan and launched an advanced version (Block 4) of the Arrow-2. The missile, equipped with a proximity warhead, "hit the target head-on, destroying it completely," says Herzog.

It was the 15th successful trial out of 18 conducted so far of the Arrow system, which has been operational since 2000. Israel and the U.S. are jointly funding an Arrow improvement program that includes both software and hardware upgrades designed to adjust the system to developing threats.

"The success in the test advances Israel toward deploying a multilayered missile defense alignment," says Israeli Defense Minister Ehud Barak. Israel Aerospace Industries is currently developing the next-generation Arrow-3, an exoatmospheric interceptor that will constitute Israel's upper-tier defense. A first flyout test of the Arrow-3 is scheduled for later this year. The Arrow-3 is designed to intercept incoming missiles in greater altitude and distance than the Arrow-2, providing Israel with several interception attempts against any enemy missile.

Israel's lower-tier system—the Iron Dome—also passed a significant milestone on Feb. 15-17—completing a series of tests that set the stage for it to become operational shortly. Designed by Rafael to counter rockets with a range of 4-70 km (2.5-44 mi.), the Iron Dome was tested in five different scenarios against salvos of 122-mm. Grad-type rockets with a 40-km range and 70-km-range Iranian Fajr-5s. The system differentiates between rockets threatening a protected area and those that fall outside. The trial validated the decision algorithms.

As Israel is developing its defensive capabilities and monitoring the dramatic changes in the region, Iranian leaders celebrated the ousting of their longtime Egyptian rival, Hosni Mubarak, by sending two warships through the Suez Canal. Under Mubarak, Egypt did not allow the Iranian navy to use the canal to maneuver in the Mediterranean; but the Egyptian army regime, which took over the country, did not object to the Iranian passage. On Feb. 22, the Iranian Mk. 5 frigate "Alvand," accompanied by the supply ship Kharg, traversed the canal and docked in the Syrian port of Latakia.

The maneuver is viewed as a mere show of force, but what troubles Israeli planners are the advanced capabilities displayed during a test of an anti-ship version of the Iranian short-range ballistic missile, the Fateh-110.

Iranian television presented footage of a round-nosed Fateh-110 fired against a ship in the Persian Gulf, directly hitting and destroying it. The missile appeared as a fourth generation of the 300-km-range Fateh-110.

Western intelligence sources believe the test shows significant technical prowess. "While it appears as an initial capability, the fact that the Iranians are capable of both guiding a missile blindly, relying only on [inertial navigation], and their ability to develop a homing seeker, is a dramatic leap in their technology," an intel source tells Aviation Week. "In the future, this could present a significant threat to ships in the Persian Gulf as well as to the Israeli navy."

Derby Winner

India opts for Israel missile for Tejas fighter

ASIA-PACIFIC STAFF/NEW DELHI

Israel's defense industry is further cementing ties with India, with New Delhi's decision to equip its Tejas Light Combat Aircraft with the Rafael Derby as the baseline beyond-visual-range air-to-air missile (Bvraam).

The choice of the Israeli weapon is supposed to help the Tejas reach its full operational clearance by December 2012. Indian officials last year already gave up on the notion of using the indigenous Astra missile as the main Bvraam, owing to development problems.

But Derby is likely to be more than just a stopgap. Indian officials indicate it will probably become standard on the Tejas Mk.2 as well.

The Tejas program, which achieved initial operational clearance last month, still has a long road of weapon qualification trials ahead before it is declared fully operational. So far, the Tejas has only proven itself in weapons carriage and release.

Sources within the Tejas program office in Bengaluru say Derby was a logical choice for the indigenous fighter since it was fully compatible with the aircraft's sensors and avionics, particularly with its Israel Aerospace Industries multimode radar, the Elta EL/M-2032. The fact that the Derby-EL/M2032 weapon-sensor combination has been proven on the Indian navy's upgraded Sea Harriers contributed to the selection of the Israeli missile.

The announcement that the Derby was chosen to be standard fit on the Tejas surprised some industry watchers, who pointed to a report by India's national auditor last year that sharply criticized the manner in which the Derby had been acquired for the Sea Harrier. The auditor noted that the missile did not meet range requirements set down by the service and that it had no performance guarantees. Both the navy and Rafael have since declined to comment officially on the observations.

Industry officials also raised eyebrows that the weapon was chosen without a proper competition, although a source at the Tejas program office says the deal was well within the Aeronautical Development Agency's terms. A contract is to be signed in March, allowing for deliveries and integration of Derby missiles with Tejas limited series production aircraft to commence toward year-end.

A Sea Harrier pilot, who was involved with the testing of Derby missiles in 2009, says: "We've conducted live firings with primary sensors and network targeting tests with our radars switched off. The missile has been proven in both test types." The Derby is also part of the Israeli Spyder quick-reaction anti-aircraft missile system that the Indian air force is due to receive later this year.

Meanwhile, India is still hoping to turn around its indigenous program. The 80-km-range (49.7-mi.) Astra is expected to be test fired from a Su-30MKI in early 2012. A model of the extended-range Mk.2 of the indigenous missile was unveiled at Aero India earlier this month. It is to deliver a range in excess of 120-km, and feature a two-way data link between

F-X2 Stalls

ROBERT WALL/LONDON

Bidders for Brazil's F-X2 fighter competition will have to wait a little longer to discover who has clinched the much-coveted deal.

The Brazilian government has now officially delayed a source selection decision, citing budget cuts, although the duration of the delay remains uncertain. The long-running competition pits Dassault's Rafale against the Boeing F/A-18E/F and Saab Gripen.

Brazil is looking at a 26.5% cut in defense spending this year as it battles increasing inflation. Defense Minister Nelson Jobim says the defense cut—slightly more than 4 billion reals ($2.3 billion)—will be largely applied to operational and sustainment accounts, and he initially indicated the reduction would not necessarily impact F-X2 because most of the spending would come in the out years. In fact, he notes, even after a source selection is made, it would probably take a year to iron out the contract.

However, days after the spending cut was announced, Jobim confirmed that no near-term decision on F-X2 is imminent. Although the Brazilian government has not formally notified bidders about its plans, industry officials suggest the delay at this point is likely a matter of months, rather than a full deferral. One industry official points out that the country's president, Dilma Rousseff, who came to power in January, wants time to closely review the project before deciding on a course forward.

This comes as a particular setback for Dassault. In 2009, in the midst of the competition, Brazil's president at the time, Luiz Inacio Lula da Silva, came out in favor of the French aircraft. Brazilian air force officials insisted, though, that the competition be allowed to run its course. Industry officials indicate it increasingly looks like Rousseff will be putting her own imprint on the program rather than adhering to preferences of her predecessor and political patron.

Brazilian air force officials are fearful that an extended delay on source selection could result in the competition being scrapped and prolonging the period the service has had to wait for a new combat aircraft. The fighter competition in the country, including several aborted efforts to purchase an aircraft, now date back more than a decade.

Embraer also is closely tracking the development since it stands to play a major role in the offset and technology transfer package the government is requiring.

the missile and aircraft. Sources from the Astra team said the Mk.2 would be compatible with all applicable aircraft in the air force's inventory, as well as the winner of the $12 billion Medium Multi-Role Combat Aircraft competition, alongside offerings from companies like Raytheon and MBDA.

SA Gollakota, Astra program director, says delays are partly caused by the air force's insistence on smokeless propulsion. "We've taken time to identify the materials necessary to make this possible," he notes.

Gollakota contends the Astra Mk.1 would be a superior weapon when compared to contemporary missiles in its class available today.

Four Astra missiles were put through extended captive flight trials on an air force Su-30MKI in late 2009 to test aeromechanical compatibility during high-speed flight and steep dives. The missile completed day-and-night ground launches last year.

SAM Surge

India eyes extended-range Akash missile

DRDO

The Akash surface-to-air missile launcher is due to be fielded next month. A second unit is expected to be equipped with the SAMs by year-end.

ASIA-PACIFIC STAFF/NEW DELHI

The imminent fielding of the first medium-range Akash surface-to-air missile (SAM) unit signifies a milestone for India's decades-old guided-missile development efforts and clears the way for the overdue retirement of obsolete hardware.

Akash represents the first indigenously built air defense weapon system to make it to operational units, with the first of eight planned medium-range squadrons for the Indian air force to formally become operational next month. The squadron is to be deployed in Central India at the Gwalior air base, home to the service's Dassault Mirage 2000 fleet and air combat tactics school.

Air Chief Marshal PV Naik says the induction of Akash comes at a critical juncture for the service as it takes on ever greater air defense responsibilities alongside the army air defense corps.

"The missile had its problems initially. But with time, these have been dealt with, and the weapon system we look forward to receiving next month will be a top-of-the-line missile system. We are eager to exploit its very reassuring capabilities," said an air force vice marshal at the recent Aero India show in Bengaluru, where an Akash system was on static display.

The Akash program team has already spent the last 18 months defining an extended-range Mk.2 version of the interceptor. For the air force, with the Indo-Israeli MR-SAM program unlikely to bear fruit in the near term, the Akash Mk.2 has assumed great significance as a means to plug air defense gaps.

The chief controller for aerospace activities at the Defense Research and Development Organization (DRDO), Dr. Prahlada, a former Akash program director, says the Mk.2 will be a longer, faster and more accurate weapon, with an intercept range of 35 km (22 mi.).

But the near-term focus is on getting the Mk.1 version into user hands. A second squadron will be inducted by the end of the year, with six more anticipated to follow in quick succession.

With inductions finally on the horizon, the air force, for the first time in decades, has the planning flexibility to retire its vintage Pechora missiles, over half of which are too outdated to service.

After exhaustive user trials on India's east coast and desert testing ranges, the air force ordered two squadrons (36 missile batteries) of the 27-km-range ramjet-powered Akash air defense system in May 2008, and six additional squadrons in early 2010. The deliveries are to be split; eight squadrons will go to the air force, and two to the army's air defense corps.

The move makes the Akash India's single most successful missile project to date. Combined orders stand at $5.26 billion, and the army is likely to request more of the weapon.

Some squadrons will be deployed along the country's tense Tibetan border region with China. Indian officials view the airborne threat there as escalating, owing to the suspected deployment of Chinese tactical air assets in the region.

The Indian navy, which was offered the Akash some years ago, has not embraced the technology, though. It is acquiring the Israeli Barak-8/LR-SAM program instead, and is more keenly pursuing acquisition of point defense weapons for its warships.

There is export interest in the system as well, according to representatives from DRDO and India's state-owned Bharat Electronics Ltd., one of the primary manufacturers of Akash. With that in mind, the system is likely to be showcased internationally.

India has never commercially exported indigenously produced weapon systems, largely due to political and regional sensitivities. But industry and government officials say that situation is changing, not least because of the export push linked to the BrahMos supersonic cruise missile. Countries in Southeast Asia and Latin America are said to be interested in the Akash.

Indian AEW Steps Closer

Developer DRDO says India's indigenous AEW&C mission system is ready for integration into Embraer's EMB-145 platform

GRAHAM WARWICK/SAO JOSE DOS CAMPOS, BRAZIL

Embraer has unveiled the first of three EMB-145s ordered by India as testbeds for an indigenously developed airborne early warning and control (AEW&C) system.

The first aircraft—equipped with the antenna structure for the phased-array radar under development by the Indian Defense Research and Development Organization's (DRDO) Bengalaru-based Center for Airborne Systems (CABS)—will be flight-tested at Embraer before its scheduled delivery to India in August.

Once delivered, CABS will begin integration of the AEW&C mission system, which includes the active, electronically scanned array radar, electronic support measures, satellite communications, data links and five operator workstations. The full configuration is expected to fly next year, says V.K. Saraswat, director general of DRDO.

The indigenous AEW&C development program faces tough milestones, but is on schedule, Saraswat says. The building blocks of the mission system are undergoing simulation tests in the laboratory and rooftop trials of the S-band radar are under way at CABS, he says. "The system is ready to take to the aircraft and begin integration."

Although the antenna is mounted above the fuselage in an arrangement similar to that of the Saab Erieye phased-array radar on Embraer's existing EMB-145 AEW&C, the aircraft for India incorporates several improvements. These include an inflight refueling probe, a new electrical generation system with a second auxiliary power unit (APU) and a new cooling system. Mounted in the tail, the second APU runs continuously in flight to power the radar.

On completion of the development program in 2014, the three aircraft are scheduled to become operational with the Indian air force under a two-pronged approach to deploying an AEW&C capability, says Saraswat. This involves the purchase of Beriev A-50s (modified Ilyushin Il-76s) equipped with Elta's Phalcon phased-array radar, now operational with the air force, while the indigenous AEW&C system is developed in parallel.

The EMB-145 AEW&C aircraft are most likely to be used as gap-fillers between the larger, longer-range A-50s, Saraswat suggests.

As a next step, India plans to develop an advanced AEW&C system with active-radar arrays housed in a non-rotating dish mounted above the fuselage. The platform for this system has not been selected, Saraswat says.

Although externally similar to Erieye, the phased-array antenna on India's EMB-145 AEW&C is shorter and deeper as it includes modules for the identification friend or foe system along the bottom of the radar transmit/receive array, says S. Christopher, director of CABS and AEW&C program manager.

The arrays of either side of the antenna each generate beams than can be steered electronically fore and aft through more than 150 deg., says Saraswat. The arrays can generate multiple beams or focus power to extend detection and tracking range, he notes.

EMBRAER

The active, phased-array radar is mounted above the fuselage, with a satellite-communications radome behind the cockpit and electronic surveillance measures mounted on the fuselage side.

Going Deep

Air Force eyes requirements for a new bomber

RAYTHEON

Miniature air-launched decoy missiles populate a launcher on a B-52.

DAVID A. FULGHUM/WASHINGTON

The Pentagon's next bomber will protect itself against enemy aircraft and air- or ground-launched missiles with an electronic attack weapon, probably based on an advanced array whose effects can be moved at the speed of light around the battlespace.

Moreover, that device or a supplemental active, electronically scanned array (AESA) will also likely serve as a long-range, anti-electronic or network-invasion weapon to disable air defense and communication systems. The bomber also could coordinate the use of these capabilities installed on supporting aircraft, unmanned systems or missiles.

"The purpose of this aircraft is to survive in an anti-access area denial [A2AD] environment," says Maj. Gen. David Scott, U.S. Air Force deputy chief of staff for operations, plans and requirements. "Part of the requirements will be self-defense. Do I think AESA is a valid technology that the Air Force will look at on all offensive platforms? I do. Do I think that airborne electronic attack is a valid defensive system that we will need on all future A2AD platforms? You bet."

The bomber segment of the Long-Range Strike (LRS) family of systems has yet to be defined, much less designed, but clues are emerging about what the Air Force is seeking.

Some of the bomber's classified aspects are associated with its sensor capabilities. "They will be key to making it effective in the very intense data link, cyber- and electronic-denial environment of the future," says another senior Air Force official. In addition, the platform must "operate in a distributed network of other systems, as well as in an autonomous mode" when needed. Other attributes are that it needs less than a day's endurance and has to be stealthy.

"If we can do it right, we'll try to figure out how to [build in external hard points without reducing stealth]," Scott says.

High-power microwave devices—often called anti-electronics weapons—are being designed by the Air Force for both cruise missiles and conventional gravity and standoff bomb shapes.

Requirements planners envision 80-100 LRS platforms being among the 155 bombers the Air Force intends to operate in the future. Of these, 96 will be combat-coded. Initial operating capability for the first unit is slated for 2024-26. The aircraft are expected to have a 50-year service life. Its missions will include electronic attack (which means a nonkinetic weapons capability against enemy electronics), strike, and command and control.

Under the LRS program, "you have a platform—the next bomber we're going to build, a standoff missile that we're working on right now, and Conventional Prompt Global Strike that we're still trying to figure out," Scott says. "It includes the [Navy's] conventional Trident missile and things that the Air Force is working very closely with, such as the hypersonic test vehicle.

A key part of the bomber's design—which also is expected to keep costs down—is an "open hardware architecture" that will allow payloads to be slipped in and out of the aircraft to tailor it for various missions.

Moreover, "as technology enables it, we will work the maturity level of the bomber," Scott says. "The [Lockheed

Martin] F-35 has some outstanding capability that we can leverage with this system [including AESA, electronic attack and infrared or electronic surveillance]. We will have trade space available to let us mature this aircraft because it's going to be around for 50 years."

The electronic attack and jamming capability being developed for the new bomber will not be the Navy's Next-Generation Jammer (NGJ), but it will be related to and compatible with it.

"We are working with the Navy on NGJ," says Scott. "That doesn't mean we're going to employ it on our aircraft."

The services will work together to ensure that the electromagnetic spectrum is covered from the high to low ends. So far, the EC-130 Compass Call and some of the pods on the Predator UAVs operate in low-end-conflict environments and counter-IED (improvised explosive device) operations. The next-generation pods will tackle the mid-level to contested regimes.

The Lockheed Martin F-22 and F-35 have AESA capability that can be used for electronic attack, he says. "The miniature air-launched decoy [MALD] and MALD-Jammer are the kinds of things we look at for the high-end [conflict]. We do some pretty neat [defensive electronic attack] things with the B-2, and we'll try to improve that as we work it through [new] survivability issues," Scott says. "We will work distributed electronic attack on this aircraft, and MALD and MALD-J are prime examples of that. We're [already] working through what Increment 2 of MALD-J will be."

The bomber is supposed to use existing technologies, so the odds are that the aircraft will be subsonic. It's also supposed to be optionally manned.

"Today we have remotely manned—Predator and Reaper—and autonomous–Global Hawk," he says. "We're very good in the unmanned world. What we have to figure out is the concept of operations. This is not an aircraft that is going to be persistent for days. We would like it to persist as we currently do with other platforms. It's going to go in, do the mission and come back out."

The Air Force bomber will have an aerial refueling capability, and it's likely that the Navy's unmanned carrier-launched airborne surveillance and strike (Uclass) aircraft will be as well.

Moreover, there are other bomber technologies that Air Force officials say can be used for Uclass. In particular, they want common networks that would allow Aegis air defense ships, F-22s, F-35s and LRS systems to talk to each other.

"We don't want [communications] just among long-range bombers," Scott says. "I would be very happy to launch something off a [USAF] platform and have another service guide it. I think that if we could work some of the waveforms for consistency, it's not too far in the future."

Despite the desire for ease of communications, there are dangers if stealth aircraft are electronically active. The LRS is expected to operate differently in various zones, ranging from very few communications in high-threat areas to large data dumps in permissive environments. Long-range strike platforms such as the F-22 and F-35, satellites and unmanned systems (such as the stealthy RQ-170 aircraft operating in Afghanistan) will provide surveillance of high-threat areas to approaching LRS aircraft.

The next bomber's crew size is another unknown. It may be two, but it's still uncertain.

Access Denied

Boeing's KC-X win is a major roadblock for rival EADS to advance into the U.S. market

AMY BUTLER/WASHINGTON

The question sweeping the U.S. defense establishment is: How low did Boeing go?

Nearly three years after the U.S. Air Force's selection of a Northrop Grumman/EADS A330-based tanker was found by government auditors to be flawed, the service has now chosen a Boeing design to replace its aging KC-135 refuelers. The Air Force based its selection largely on life-cycle price, and Deputy Defense Secretary William Lynn says: "Boeing was a clear winner."

Three years ago, Boeing's price was roughly $8 million more per aircraft than EADS's and its development price was higher, according to sources close to the duel. Right up until the source selection announcement last week, many defense analysts suggested EADS would underbid Boeing in order to establish a final assembly facility for Airbus aircraft in the U.S.

"It is very fortunate for Boeing that they got a second chance because their first bid was not competitive," according to one defense industry analyst. John Young, the Pentagon procurement chief during the last source selection, says, "The delay [in fielding the aircraft] is unfortunate and it clearly led both teams to sharpen their pencils."

The Air Force's decision to select Boeing will likely sidestep a protracted debate with Congress; Boeing supporters on Capitol Hill were poised to fight on the company's behalf, further delaying USAF's ability to field new tankers. Boeing's lobby in Congress is far more substantial than EADS's, which mainly relied on lawmakers from Alabama, where the A330 was to be built, for its political influence.

Dennis Muilenburg, president of Boeing Defense Space and Security, says this KC-X proposal had a "one Boeing" tactic, including a marriage of its culturally diverse defense and commercial businesses. "We worked this as one integrated Boeing company," he says, adding that this approach drove efficiencies and value to for the most recent proposal.

BOEING CONCEPT

The first flight-test of a Boeing KC-46A is slated for 2015.

During the 2008 competition, Boeing was criticized for seeking too much profit, thus allowing for a then-Northrop Grumman/EADS team to underbid. Also, Boeing Commercial Airplanes was seen as uncooperative with government cost estimators who wanted pricing details on the 767 platform.

Boeing protested, leading government auditors to find flaws in the source selection. During this period, company officials were aggressive, publicly taking their top customer to task. Internally, however, Boeing did some soul-searching. "That was always the fear—that [EADS] could underbid again," says one

1957

June – First of 732 KC-135s delivered to USAF; deliveries continue until 1965.

2001

September – After 9/11 attacks, aviation market experiences sharp downturn; talk begins about possible KC-767 lease. Some Boeing customers cancel 767 orders.

2002

March – USAF selects Boeing for lease of KC-767.

2003

December – Boeing tanker lease frozen pending investigation of alleged wrongdoing by former USAF deputy acquisition chief Darleen Druyun, who later became a vice president at Boeing, and Michael Sears, Boeing's chief financial officer.

2004

April – Druyun pleads guilty to illegal job talks with Boeing, admits to unfairly steering contracts to the company while overseeing Air Force procurement.

Nov. 15 – Former Boeing CFO Michael Sears pleads guilty to illegal job negotiations with Druyun.

2005

September – Northrop Grumman announces it will make a KC-X proposal with partner EADS North America.

former Boeing official. "This is the last major USAF acquisition program in the foreseeable future," and this tanker work was viewed by some in the company as a must win.

The Pentagon's decision—if it withstands a possible protest from EADS—could repair the chasm in the Boeing/Air Force relationship. It also shores up not only decades of business with its top defense customer as military budgets begin to flatten but also steady work for the waning 767 production line. Perhaps more critical to the commercial side of Boeing, the win stunts its European commercial rival's efforts to establish a stateside manufacturing facility for airliners.

A win for either company would have been considered strategic—EADS was hoping to substantially boost its U.S. revenue and, perhaps more critical for the future of its commercial business, was its plan to build an A330 final assembly facility in Mobile, Ala. Since establishing its North American arm in 2003, EADS has had a goal of aggressively growing its U.S. business, and winning KC-X was the largest single step in that strategy. EADS is likely to pursue other Pentagon business, including some smaller helicopter programs, but nothing that would bring with it the scale and prestige of U.S. livery on an A330-based tanker.

EADS North America officials were due receive a debriefing Feb. 28 on the loss. Board Chairman Ralph Crosby said his company would not protest the decision unless there is an obvious error on the part of Air Force acquisition. EADS North America officials "expressed disappointment and concern" about the decision. Air Force Chief of Staff Gen. Norton Schwartz says he hopes this decision means people will "stop talking about it" and get on with fielding a tanker on schedule. The original Boeing lease—offered in 2002—called for tankers to be delivered in 2006. Investigations into the deal found a bloated price, a situation that kicked off the more recent competitions for a supplier.

A loss for Boeing would have been a blow, ending its five-decade monopoly on the U.S. refueling business as the Air Force's interest in C-17s continues to be nonexistent. Boeing's other defense hurdles include a downturn in missile defense opportunities and a recent guided weapon loss to Raytheon.

Pressure is now likely to mount for EADS North America to consider a U.S. acquisition to expand its stateside market share. However, uncertainty over the company's shareholding structure and an anticipated management shuffle next year could further hinder efforts to execute its U.S. expansion anytime soon.

Though EADS has beat Boeing in previous competitions in Australia, Saudi Arabia, the U.K. and the United Arab Emirates, other countries may now turn away from the A330-based option in favor of the 767 tanker, now called the KC-46A, to achieve commonality with the U.S. fleet.

And, with 767 business established for at least 13 lots through the U.S. buy, the platform, though older than its A330 rival, could continue to challenge Airbus in the freighter market.

Boeing's $3.5 billion contract covers the development of the system, and purchase of 18 aircraft (including those for test purposes), which will be fielded by 2017. The buy of 179 aircraft is estimated at up to $30 billion, Lynn says. Ashton Carter, the Pentagon procurement chief, says the contract will be signed soon, allowing work to begin smartly. If a protest is launched, a stop-work order will likely be issued immediately in accordance with procurement rules.

AIRBUS MILITARY

Plans for EADS to assemble A330s in Mobile, Ala., are being dashed in light of the company's U.S. tanker loss

The development contract is fixed-price, a shift from the previous competition. However the process does carry risk. Production and flight-testing will be concurrent, says Jean Chamberlin, vice president of Boeing's tanker program; if technical problems arise in flight-test, fixes may have to be retrofitted onto the aircraft. Although a different design, Boeing experienced substantial flight-test problems with its Italian 767-based tanker.

Production is slated to start in 2015, two years ahead of the first delivery. Initial flight test is also slated for 2015, Chamberlin says. The Pentagon has restructured the Joint Strike Fighter program twice in as many years to reduce concurrency. Though this stealthy fighter is more complex than a modified 767, lessons from JSF and many past programs have pointed to the benefits of discovering flaws in flight-test prior to production.

At the suggestion that Boeing bought into the program, risking its ability to make profit, Muilenburg said "We submitted an aggressive but responsible bid."

If the decision manages to withstand scrutiny, and neither Congress or the protest reveal problems in the procurement process, this will be a pivotal step forward for an Air Force procurement corps beleaguered by missteps. They began, largely, with the Air Force/Boeing plan nearly 10 years ago to lease 767-based tankers, and continued with a problem in a competition to buy combat search-and-rescue helicopters among others. Perhaps the KC-X decision could be a fitting end to a decade of paralysis for Air Force weapons buyers.

With Robert Wall in London.

2006

December – First KC-767 would have entered service under 2002 lease plan; initial capability was to include 11 tankers in Fiscal 2006.

2008

Feb. 29– USAF announces Northrop Grumman/EADS wins $1.5 billion development contract, including first four KC-45As.

June 18 – Government Accountability Office (GAO) sustains protest by Boeing.

Aug. 6 – USAF reopens bidding process with amended Request For Proposals (RFP).

Sept. 10 – Defense Secretary Robert Gates halts process, calls for "cooling-off period" between contractors.

2009

Sept. 24 – USAF issues draft RFP for next KC-X competition.

2010

Feb. 24 – USAF issues final RFP for KC-X.

November – USAF inadvertently switches initial evaluation data and releases it to wrong competitors.

Source: AW&ST staff

Overdue Overhaul

British defense leaders set stage for new procurement strategy

ROBERT WALL/LONDON

LOCKHEED MARTIN

The U.K. Defense Ministry is looking at a sweeping reform of how it manages its military programs. But there are already indicators that the wide-ranging proposals on the table will go only partway to stanching the string of cost overruns that have plagued major procurements in recent years.

For industry, the message is mixed. While the measures promise greater program stability in the long term, the transition period will be difficult.

"Industry must also play a role in reducing costs at a time when budgets are constrained by the need to control the deficit we inherited," declares Defense Secretary Liam Fox. Discussions are already under way with industry regarding 130 contracts that need to be adjusted following last year's Strategic Defense and Security Review, with the number to grow to roughly 500. The discussions with industry will likely take 18 months, "releasing significant cost savings," Fox says.

The uncertainty linked to those drawn-out deliberations is spooking investors, though. And there's a broad government consensus that "business as usual" cannot persist.

A new report by Parliament's Committee of Public Accounts argues that some sort of action of is required. Last year alone, major program costs were £3.3 billion ($5.3 billion) higher than they should have been. "Unaffordable decisions taken in the short term lead to inevitable waste of billions of pounds over time," notes Margaret Hodge, the committee leader.

The short-sightedness issue is of particular concern now, since the Defense Ministry still wants to plug a more than £1 billion gap between spending and program paths for Planning Round 11 (PR11), which could lead to further short-term adjustments.

The committee also notes that program decisions made in last year's Strategic Defense and Security Review also failed to fully appreciate long-term cost considerations. A case in point is the move to abandon the Lockheed Martin F-35B short-takeoff-and-vertical-landing Joint Strike Fighter and acquire the U.S. Navy standard F-35C. "The decision to fly a different type of aircraft off the carriers was not based on a full understanding of the costs," the panel argues.

In the wake of the report, Fox unveiled a series of reform steps. One is focused on trying to end the sustained mismatch between financial requirements and the budget. To redress the situation, the Defense Ministry vows to launch only new programs once full funding is established covering the development, procurement and deployment phases.

What's more, "for too many years, projects have been included in the future defense program without proper appreciation of the risks or costs," says Fox, adding that the blame for the "conspiracy of optimism" cuts across stakeholders—from politicians to civil servants, the military and industry.

In addition to applying the new road map to upcoming projects, Fox has ordered senior ministry officials to review the risks and costs of programs already on the books.

That process is due to be completed soon. A thorny issue facing the Defense Ministry, however, is that the analysis could exacerbate the funding gap for PR11 that the government is already struggling to bridge.

British legislators are concerned that a decision was made to buy the F-35C (left) instead of the F-35B without fully understanding the cost implications.

One problem with the reform package is that, so far, it fails to address the growing number of international cooperative endeavors in which the U.K. is involved. In many cases—such as the Airbus Military A400M airlifter and F-35—London is a junior partner with little control over day-to-day project oversight. And deepening the conundrum, partnerships are expected to increase at a time of dwindling defense budgets.

Fox also is setting his sights on industry. Stealing a page from his Australian colleagues—who began their reform of defense acquisition several years ago—he is proposing to establish a "projects of concern" list. To be updated quarterly, the list would aim to focus both the government's and industry's attention. "I want shareholders to see where projects are underperforming so that they can bring market discipline to substandard management where required."

The list will be established by a new entity called the Major Projects Review Board. It will initially scrutinize the 20 largest programs and then expand to the top 50 procurements.

The parliamentary committee also urges the Defense Ministry to revise its approach to project management. Key oversight officials are responsible for too many projects, diluting management attention, it asserts; and the positions are rotated too frequently.

Fox echoes those concerns and promises to make sure that managers are "in [their posts] long enough to deliver, ensuring they have the skills available to make the tough calls where necessary."

Test Priorities

GTF test effort set to intensify as Pratt readies MRJ version for initial evaluations

GUY NORRIS/LOS ANGELES

Pratt & Whitney is reshuffling the order of its PW1524G geared turbofan test engines for Bombardier's CSeries airliner after instrumentation delays, but remains confident the certification schedule is staying on track.

The revised order means Engine 003, originally slated to begin sea-level performance tests earlier in the first quarter, now becomes the second production-configured GTF to go on test. The engine is expected to be delivered to Pratt's West Palm Beach, Fla., test site by Feb. 28. Following initial ground tests, it is due to be fitted with a Bombardier CSeries nacelle in late April prior to the start of flight tests on one of Pratt's two Canadian-based Boeing 747SP flying testbeds in mid-year.

Completion of Engine 002, the high-pressure stress-test unit originally scheduled to be on test in Florida by the end of 2010, has been held up by instrumentation issues. "There have been delays in getting the stress measurement sensors and instrumentation routing set up," says Pratt next-generation products family vice president Bob Saia. "Instrumenting these parts has been a real chore for us, so now it will be the third engine to go to test." Engine 002 is now expected to begin tests around the second week in March.

PRATT & WHITNEY

Following 194 hr. of initial ground tests in Florida, CSeries Engine 001 is being prepared for icing tests in Manitoba.

Despite the juggling of the test assets and some inevitable squeezing of the schedule, Saia says "we're on the same plan as we started with as we go through everything on the critical schedule for the flying testbed. We remain on the test plan sequence for the first four engines including conducting our 747 flight-test program at midyear."

The intensity of Pratt's overall GTF development program, meanwhile continues to mount as the engine maker nears completion of the first PW1200G variants for Mitsubishi's Regional Jet (MRJ). The first MRJ engine is expected to make its first run at West Palm Beach "late next month," says Saia. A second production standard core, without the low-pressure system, is also nearing completion and poised for shipment to begin stress tests at Pratt & Whitney Canada's Longeuil site in Montreal. A total of 16 test engines will be involved in the first two certification programs, which will conclude with entry-into-service on the CSeries in 2013 and on the MRJ in 2014.

Beyond this lie the development and certification efforts for the PW1100G and PW1400G versions for the Airbus A320 NEO and Irkut MC-21, respectively, both of which are targeted for service entry in 2016.

Saia says Pratt is "really pleased" with results from the initial ground test phase on the first engine which wrapped up in early February after 194 hr. and 160 full "cycles." Although originally intended to cover around 75 hr. and run through mid-December, Pratt opted to extend the ground tests to make the most of the facility with a fully instrumented engine. "Engine 001 was running so well we continued to run it to get data," says Saia, who adds that the latter phase included cross-wind and simulated high angle-of-attack inlet distortion tests with instrumented fan blades.

First-phase accomplishments include demonstration of the overall integration of the production configuration GTF architecture; measurements of rotor dynamics; oil, fuel and lube system, as well as stress tests of the low-pressure rotor up to 5% above red line speed. "We also did a full survey of component performance, starting, electronic engine control software, and initial acoustics and emissions testing," Saia says. Measurement of discrete tones from specific modules against predicted values was "almost spot on, and within one-tenth of a decibel for production of noise."

All instrumentation is now being removed from Engine 001 at Pratt's East Hartford, Conn., facility prior to the start of icing tests set to begin later in March at the recently opened Global Aerospace Center for Icing and Environmental Research in Thompson, Manitoba. A fourth engine, designated for endurance runs, is expected to begin tests in early May, adds Saia.

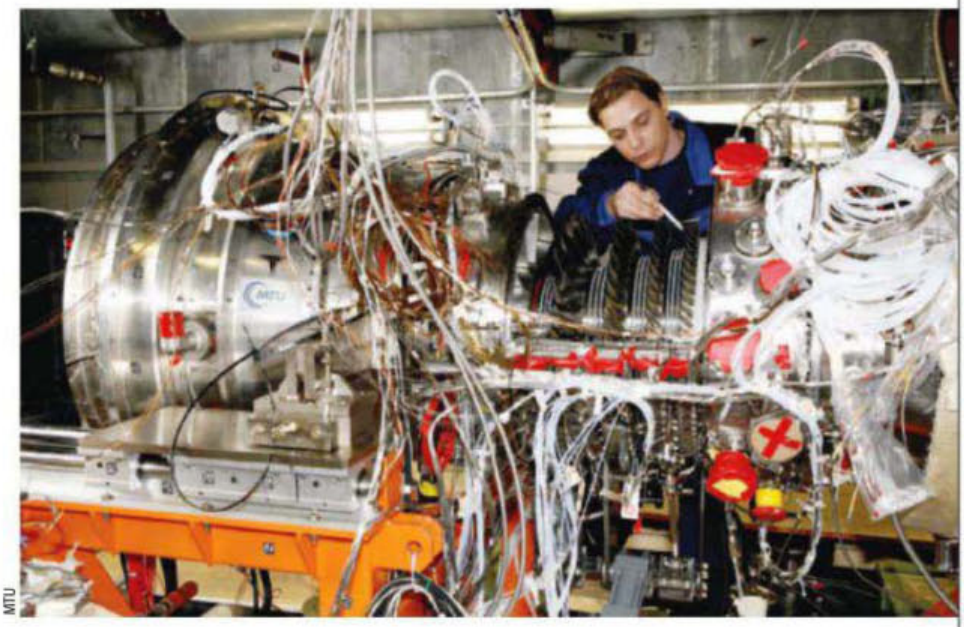
Key component tests, meanwhile, continue on CSeries production-standard specific fan drive gear system and fan blades. Recent tests of the hybrid metallic hollow fan include a series of bird-strike evaluations due to culminate with a 6-lb. large bird test at the end of February. A blade-out release test was also conducted in a fan module in mid-January, while a full blade containment test will be undertaken in March using a horizontal containment ring.

The fan drive gear system rig test is the seventh conducted so far in the development of the GTF, but the first of a production-specific configuration, says Saia. Tests will build confidence in maintenance cost claims for the engine, which is targeted to be 20% lower than for current engines. The gear system is expected to contribute up to 3% of the overall cost but will have no life-limited parts and a goal of 30,000 cycles between overhauls, or refurbishment every second shop visit. Data from the upcoming 500-hr. endurance test may extend this, says Saia.

Geared Toward Growth

MTU Aero Engines expects huge boost in revenues through PW1000G participation

JENS FLOTTAU/MUNICH



MTU

A mechanic works on the high-pressure compressor of a geared turbofan at MTU Aero Engines.

Airbus Military and the Europrop International (EPI) engine consortium appear close to a settlement over claims and counterclaims on cost overruns in the Airbus A400M program.

MTU Aero Engines, a key EPI partner, has dissolved a €45 million ($62 million) provision for possible Airbus claims, the company revealed in its annual results presentation. Such a step is only possible if management believes there is a better than 50% chance it will no longer need the money.

Airbus Military and EPI have been in a bitter conflict over who is responsible for the more than three-year delay and billions in additional costs. Negotiations have been dragging on for more than a year. Industry sources say talks have been much more encouraging recently and a compromise could be reached in the coming weeks. No details about financial arrangements have been released. But MTU's step indicates that EPI members may no longer have much to be concerned about.

This would be welcome news for MTU, which also expects revenues and profits to rise significantly over the next few years, as production of the PW1000G engine ramps up and expenses for research and development decline significantly starting in 2012. In its fiscal year 2010, revenues rose by 4% to €2.7 billion and its net profit remained almost stable at €142 million, slightly exceeding company guidance. Given a €311 million operating profit, MTU reached a 11.5% operating margin. Over the medium term, that margin is expected to improve to 12-14%.

However, investors were disappointed that profits were not higher and sent the shares down more than 4% even though management raised the dividend by 17 cents to €1.10. But CEO Egon Behle did not forecast any short-term improvement. Revenues are to rise by up to 8% this year, but profits will most likely be flat with significant investments due in research and infrastructure and revenues in the defense sector under severe pressure with government budget cuts in key markets.

The geared fan engine is MTU's catalyst for growth. The company expects €12 billion in additional revenues over the life of the PW1000G program. Following the launch of the Airbus A320NEO late last year, the engine is now on the Russian MS-21, the Mitsubishi Regional Jet, Bombardier's CSeries and the new A320. MTU builds the low-pressure turbine and part of the high-pressure compressor. It has a program share of around 15%. While details of the NEO engine workshare have not been finalized, MTU expects them to closely resemble previous arrangements.

MTU and its partners believe Boeing could provide engine makers beyond the CFM consortium with another huge growth opportunity, if it decided to go ahead with an all-new 737 replacement.

The current Boeing 737 NG is exclusively powered by the CFM56 series. The provisions of the agreement between Boeing and CFM are likely to make a decision to re-engine the existing 737 more difficult. The aircraft manufacturer could cut the exclusivity ties if it went for an all-new jet, industry sources say.

Boeing has said publicly it will make a decision on the 737 by mid-year. Senior officials including Boeing Commercial Airplanes President and CEO Jim Albaugh have indicated they don't see a business case for re-engining. Changes to the airframe would likely have to be more significant than in the A320's case, possibly leading to higher development costs. Also, if Boeing manages to bring a much improved 737 successor to the market by around 2019-20, as the company has been suggesting, it could have a product advantage over the A320 for at least several years. Airbus says the proposed A30X—the all-new A320 replacement—will not arrive before 2025.

A new Boeing jet would be a welcome opportunity for Pratt & Whitney and its partners such as MTU Aero Engines that are currently not part of the 737 program. But the aircraft program could also be the last chance in a very long time for Rolls-Royce to return to the single-aisle engine market. Rolls-Royce opted against participating in the Pratt-led geared fan development program, leaving the International Aero Engines (IAE) consortium without a next-generation engine.

With Airbus expecting to sell up to 4,000 NEOs in the next 20 years, even a 50% market share would give any engine maker orders for 4,000 units. An all-new program would likely exceed that number by far.

Another area of growth could be acquisitions. MTU's Behle believes the company could shoulder takeovers of up to €1.5 billion. MTU has shown interest in buying Avio (Italy) or Volvo Aero (Sweden), but has so far not been successful.

Out of the Blocks

Comac, A320NEO deals underscore anticipated return to growth at Safran

MICHAEL A. TAVERNA/PARIS

Safran will create an aircraft wiring joint venture with Comac and supply the engine nacelle for Airbus's A320NEO family in moves that will reinforce the French engine and aero-equipment manufacturer's future narrowbody sales and help position it for the coming market uptick.

The Comac venture, announced during disclosure of 2010 full-year results last week, will be tasked with designing, developing, producing and supporting electrical wiring interconnection systems on Comac's C919 and, presumably, helping shave weight off the aircraft (*AW&ST* Nov. 22, 2010, p. 20). Comac subsidiary Shanghai Aircraft Manufacturing will have a 51% share in the venture, to be located in Shanghai, and Safran's Labinal wiring affiliate, 49%.

The Safran-Comac joint venture will design and manufacture wiring for Comac's new C919 narrowbody jet.

The move follows the selection of the Leap-X, produced by the Safran-General Electric partnership CFM, for the C919 last November, and the creation of an avionics venture between GE and Comac in January (*AW&ST* Jan. 24/31, p. 34). The Chinese airframer has about 55 orders for the C919 and forecasts sales of more than 2,000 units over the next 20 years, although analysts expect the A320NEO, launched early this year, and a likely upgrade to the Boeing 737 family to eat into this market.

However, Safran hedged its bets by revealing that Aircelle, another Safran-GE company, will supply integrated engine nacelle packages for the Leap-X engines that will equip the A320NEO family. Airbus says it expects to have several hundred orders for the A320NEO by the Paris air show in June and expects to sell 4,000 aircraft over the life of the program.

The Paris-based firm also expects to benefit from the new surge in Airbus A380 orders, notably through an agreement in January to supply end-to-end fuselage wiring systems for the life of the program under an Airbus plan to streamline the supply chain for the aircraft and reduce lead times and costs.

In yet another announcement last week, Safran disclosed that its Sagem defense unit will supply three additional Sperwer tactical unmanned aerial vehicles equipped with Euroflir 350+ optronics to the French army, plus five more on option.

The deals underscore previous predictions that sustained defense and security business, coupled with an ongoing rebound in civil original equipment manufacturer sales, will put Safran back on a growth curve after a couple of years of flat activity (*AW&ST* Mar. 1, 2010, p. 39). Chairman/CEO Jean-Paul Herteman predicts revenue will grow at least 5% and operating income 20% or more in 2011 and continue expanding in the years beyond as the company reaps the benefits of a multiyear cost-cutting effort, and favorable currency hedging through 2014. The company intends to add nearly 2,000 jobs this year, after adding 1,500 in 2010.

The credibility of the forecast was underscored by a 20% increase in operating earnings in 2010 to €878 million —higher than anticipated—even though revenues, as predicted, were up only a modest 2% to €10.8 billion. Sales were dragged down by continued delays in the A380 and Boeing 787 ramp-ups and an unexpected 17% drop in CFM aftermarket sales. However, civil aftermarket sales are expected to rebound at double-digit rates starting this year.

There were no new impairments, particularly on the Airbus A400M airlifter, as had been feared, and Herteman said discussions with Airbus "are in the process of being favorably resolved." Profitability improved markedly in the underperforming equipment and defense sectors, suggesting the company is "well on the way" to reaching its target of 10% margin on sales, Herteman said.

Most significant, he said, free cash flow was €934 million in 2010, exceeding operating profits for the second year in a row and giving Safran a net cash balance of €24 million, despite three major 2010 acquisitions. Free cash is expected to be around one-third of operating earnings again this year, putting the company in a favorable position to continue investing in new plant and to make further acquisitions to complement internal growth.

Safran laid out more than €2 billion last year for security company L-1, aircraft equipment maker Harvard and the solid rocket propulsion activities of SNPE, and sunk another €300 million into four new engineering and manufacturing facilities.

Herteman was cagey about future acquisition plans. Efforts to reinforce Safran's defense business appear stalled, so the focus appears to be on expanding the profitable security business and building up electronics expertise to position the company for tomorrow's all-electric airplanes. The company has invested €300 million in a seven-year electric aircraft research program, including a dedicated test bench, and several hundred million euros are expected from a French government stimulus program to be finalized in the first half of this year.

Getting Into Gear

International Space Station gets busy as assembly gives way to utilization

MARK CARREAU/HOUSTON and MICHAEL A. TAVERNA/PARIS

With the lengthy assembly of the International Space Station drawing to a close, NASA is moving to extend use of the orbiting laboratory to other federal agencies, academia and the private sector through a fast-paced competition to select a non-profit manager for oversight of the broad, cutting-edge research agenda envisioned by Congress under a National Laboratory designation.

The selection of an ISS National Lab oversight organization, which NASA intends to announce on May 31, is among the latest signs the six-person orbital outpost is reaching maturity after a dozen years of construction.

The European Space Agency's (ESA) second Automated Transfer Vehicle (ATV-2), a vital part of the station's post-shuttle era supply chain, docked with the ISS on Feb. 24, about 6 hr. before shuttle Discovery lifted off on the first of three final missions to finish the assembly task.

The STS-133 mission, marking Discovery's final flight, will equip the station's U.S. segment with a stowage module primarily for research gear. Endeavour's STS-134 mission to deliver the Alpha Magnetic Spectrometer is set for a late April departure. STS-135, a recently manifested but unfunded supply mission aboard Atlantis, would bring the outfitting phase to a close this summer.

"We are trying to maximize the value to the American public for the investments that have been made in the ISS," says Mark Uhran, assistant associate administrator for the ISS. "We see a potential in science, engineering and commercial development. This will be an important step in making sure that productivity is realized."

More than 100 representatives from prospective management organizations and research groups participated in the NASA ISS National Lab forum in December. Under a Feb. 14 Cooperative Agreement Notice, the agency intends to fund the management organization at $15 million annually.

NASA seeks a non-profit manager prepared to allocate at least some of the funding to expand as well as prioritize research outside of space exploration in human health, biology, physical and materials science, commercial new technologies, Earth observation and science-related education.

The oversight organization will be expected to broker station resources. Applicants will be required to "respond" to hypothetical disruptions grounded in real-world possibilities, including the sudden thermal control system shutdown that hobbled the ISS in August and the prospect of a "major discovery" that merits a sudden diversion of most resources.

"The future productivity of the station will be based on organizations other than NASA." said Uhran. "It's extremely important we get this process right."

The station's National Laboratory designation grew out of the NASA Authorization Act of 2005. That and subsequent legislation sets aside half of the station's U.S. operational segment for use by non-NASA researchers. The segment includes NASA's Destiny lab, half the volumes of the European Columbus and Japanese Kibo labs, as well as external research platforms.

NASA will furnish transportation for national lab experiments, primarily aboard the planned SpaceX Dragon and Orbital Sciences Corp.'s Cygnus commercial spacecraft, plus electricity, thermal control and about 1,000 hr. of astronaut time annually.

The ISS National Lab manager will be expected to ramp up quickly as the Dragon and Cygnus initiate the transportation services over the next 12-15 months, according to Uhran.

Though controversial throughout its costly early development, the ISS has been transformed into a symbol of U.S.-fostered global cooperation.

The White House and Congress, along with NASA's Russian, European, Japanese and Canadian partners, have expressed support for an extension of station operations from 2016 until at least 2020.

President Obama's proposed 2012 budget anticipates a steady increase in funding for station operations, to nearly $3.2 billion in 2016 from $2.3 billion this year.

Meanwhile, ESA and their industry counterparts hope the successful launching of the ATV-2 will encourage member states to provide generous funding for ISS when they meet next month to approve financing for the extension.

Together with Japan's H-II Transfer Vehicle and Russia's Progress, the ATV will shoulder station supply duties until U.S. commercial supply vehicles enter service. Four more ATVs are currently planned.

Germany, Europe's biggest station backer, estimates at least €380 million per year ($521 million) will be needed for the station in the next decade, including money to purchase an additional two ATVs to cover provision of another five years of NASA services, and to bankroll ATV design enhancements.

ESA

Ariane V lifts off with the ATV-2 resupply vehicle, bound for the International Space Station.

Prisoner's Dilemma

Legacy carriers and Emirates face off on aircraft financing, landing rights

MADHU UNNIKRISHNAN/WASHINGTON

During the years in which Emirates has grown from an important regional carrier to a worldwide powerhouse, rivals have often claimed—with modest proof—that the airline merely has benefited from a range of special privileges and circumstances. Soon the accusers will have the opportunity to test their hypothesis as one of those supposed perks—cheap export financing for aircraft—goes by the wayside. And judging from Emirates' reaction, this perk, like most of the others, appears to count for less than meets the eye.

"Export credit agency (ECA) financing accounts for only about 20% of our fleet," says Emirates President Tim Clark. The carrier has raised about $22 billion to purchase aircraft from the commercial markets and is exploring new sources, including Islamic financing. "ECA financing is a last resort for us because it tends to be more expensive," Clark says.

EMIRATES

Emirates' competitors say the airline benefits from subsidized airport fees at its Dubai hub, a charge the carrier denies.

And it became even more expensive as the Organization for Economic Cooperation and Development (OECD) formally adopted new rules on export credit financing on Feb. 25. The new Aircraft Sector Understanding (ASU) will mitigate the so-called "home market rule," which made airlines from the U.S. and the Airbus-producing countries of the U.K., France, Germany and Spain ineligible for financing from the Export-Import Bank of the United States or European export credit support agencies.

Airlines from these countries contend the home-market rule tilted the playing field toward competitors not subject to the rule and allowed successful airlines like Emirates and other Persian Gulf carriers access to ECA financing. "We are at a total disadvantage and have appealed to the OECD, the European Commission and the German government to end this unprecedented advantage for airlines from these countries," says Thomas Kropp, senior vice president for international relations and government affairs at Lufthansa.

To allay some of these concerns, the new ASU does not eliminate the home-market rule but uses a formula based on an airline's credit rating to determine whether it can be eligible for cheaper financing. These new rules will make it considerably more expensive for carriers like Emirates to use ECA support, while preserving access to more favorable financing for airlines from less-affluent countries, explains Scott Scherer, senior vice president for strategic regulatory policy at the Boeing Capital Corp. "The new rules go some way toward leveling the playing field for both airlines and manufacturers," he says.

Although Emirates' Clark dismisses the importance of ECA financing for the airline, he notes European and North American airlines that lobbied their governments to push for the OECD rule change have long been claiming Emirates benefits from unfair advantages. These have included allegations that the carrier gets subsidized fuel from the government of Dubai and does not pay fees at its home airport, charges Lufthansa's Kropp backed away from as "impossible to prove."

"A group of airlines, mainly European, have used every trick in the book to try and contain us," says Clark.

This protectionist impulse is extending to landing rights, particularly in two countries, Germany and Canada. Emirates has sought access to the Berlin market but has been denied. Germany, under the terms of its air service agreement with the United Arab Emirates (UAE), allows each airline from the region to serve four cities in Germany with unlimited frequency or capacity.

Lufthansa says the current agreement meets consumer demand for travel between Germany and the UAE. Emirates currently flies to Frankfurt, Munich, Dusseldorf and Hamburg with a total of 49 flights per week. Lufthansa operates 14 weekly flights to Dubai. "If Emirates requests to exchange one of these four destinations with Berlin, they would find no opposition," says Lufthansa's Kropp. "Qatar Airlines has chosen to cut service to another city in order to serve Berlin," he notes.

In Canada, the situation has escalated to a trade dispute. The bilateral air service agreement between Canada and the UAE allows Etihad Airways and Emirates to operate three flights a week to Canada; both have chosen to serve Toronto. Emirates wants to serve other cities in Canada, including Vancouver and Calgary, without giving up any of its Toronto service.

Negotiations hit a fever pitch last fall when the closure of Camp Mirage, a military base in the UAE used to support Canadian forces in Afghanistan, was linked to the air services talks. "Canada could not accept that a commercial request for landing rights was linked to use of Camp Mirage," says Melissa Lantsman, speaking for Canadian Foreign Minister Lawrence Cannon. "What the UAE was offering in exchange was not in the best interests of Canada."

Canada's transport ministry argues that the Canada-UAE market is well-served by the current agreement. "The rights under the current Canada-UAE air transport agreement meet the market demands of travelers whose origin and destination is either Canada or the UAE," says Transport Canada official Maryse Durette.

And this could be the rub. "Few Canadians actually travel to Dubai as a destination and even fewer residents of Dubai travel to Canada," says Air Canada CEO Calin Rovinescu, adding that further liberalization could result in "the UAE dumping seats into the Canadian market." Even Robert Crandall, former chairman of American Airlines, calls this protection of the market "wise public policy on the part of Canada."

"Canada is worried that it will be little more than a spoke to

Down to the Wire

Controversial amendments predicted in House FAA reauthorization debate

JENNIFER MICHELS/WASHINGTON

As the aviation industry fights for dwindling federal funds to pay for programs crucial to advancing the air traffic control system and improving airport facilities, it finds itself in an unusual situation—one of great uncertainty on how the Republican-controlled House will square its four-year fiscal 2011 FAA reauthorization bill with the two-year Senate bill, or how it will handle the plethora of amendments expected.

As the House prepares to debate the bill (H.R.658) as soon as this week, amendments likely will greatly slow the process because some were not dealt with in the Senate, while major pro-labor provisions that sailed through the Democratically controlled Senate will be hotly contested in the House. For example, the House and Senate are at odds over forcing the FAA to work with the Occupational, Safety and Health Administration (OSHA) to extend protections to flight attendants, and to apply pilot fatigue protections to them as well.

Several amendments on the Essential Air Service (EAS) Program that subsidizes flights to rural communities are in the works, ranging from proposals to kill the program in this fiscal year to keeping it at its current $200 million per year funded level. The House bill currently would phase it out after 2013 for all states except Alaska and Hawaii. If there is one thing that is certain, it is that "EAS is not going to escape reform," Holly Woodruff Lyons, majority staff director and counsel for the House aviation subcommittee, told the American Bar Association Air & Space Law Forum Feb. 23 in Washington.

Another possible amendment—and problem—for the conference session concerns the current battle between airlines and global distribution systems (GDS). The fight started when American Airlines tried to get travel agents to use Direct Connect to sell its tickets, reducing distribution costs by avoiding GDS fees.

Gael Sullivan, staff member of the Senate Commerce, Science and Transportation committee, says the Senate debated inserting language in its bill (S.223) that would have forced new requirements on airlines to participate in GDS under the guise of consumer protections related to ensuring full disclosure of fees and charges on a fare. But in the end, members of the Senate decided that was a contractual relationship between the two. Lyons notes that while this is "inappropriate for Congress to weigh in on, that doesn't mean we won't see amendments on this issue and I think we may."

Also, while the Senate worked late into the night reaching a compromise on opening a limited number of slots at Ronald Reagan Washington National Airport to new entrants and a limited number to incumbents—an issue said to have been the ultimate block to last year's Senate

GEORGE HAMLIN

Adding slots at Ronald Reagan Washington National Airport is still a contentious issue.

hubs in the UAE," says William Swelbar, an economist in the Massachusetts Institute of Technology's Department of Aeronautics and Astronautics. Swelbar likens the challenge posed by Emirates to the battle between network airlines and low-cost carriers in the U.S. in the 1990s. "Emirates is taking advantage of its low costs and geography to force incumbents either to cut costs and get efficient or go out of business," he argues.

Emirates' cost advantage is partly attributable to the lower operating costs of a younger fleet, but also to lower labor costs. Deutsche Bank estimates that personnel costs at Emirates are 16% of total expenses, compared with 33% at Air France-KLM, 24% at British Airways and 22% at Lufthansa. Yet, adjusted operating margins at Emirates are 5.7%, comparing favorably with its European peers, says analyst Michael Linenberg.

But concerns that North American and European carriers could be run out of the sky by Emirates are overblown, according to a report by the Royal Bank of Scotland. Dubai's geography gives it an advantage in traffic to South Asia from North America, as well as between North Asia and Africa. European carriers, however, have the geographical advantage for traffic between Europe and China, and the Europe-India market is well developed, notes RBS analyst Andrew Lobbenberg.

Ultimately, it boils down to fending off competition at all costs, says Clark. "Protecting domestic markets simply does not make sense in the 21st century," he says. "We've been hearing these allegations for the last 18 years, but there's plenty of flying out there for everyone, and we're not going away."

bill—that could unravel in the House.

Lyons notes that there has been a sea change in the House, which is now extremely conservative fiscally. This will also make it difficult to reach consensus on funding levels for key FAA departments. Funding of the facilities and equipment (F&E) account, for example, which "is very important to our bosses" because it will further high-level programs such as the satellite-based Next Generation (NextGen) air traffic management program, will be watched closely, says Sullivan. Lyons agrees it will be "a huge debate." The House is protecting that F&E account she says, and notes that FAA operations only takes a 2% cut.

Thus far the most discussion has surrounded the House limiting the Airport Improvement Program (AIP) to $3 billion over the next three years, whereas the Senate would set that at more than $4 billion. Neither bill allows for a passenger facility charge (PFC) increase either, to the delight of airlines and dismay of airports. But Lyons argues that while the House bill may look extreme, it protects AIP, and she would not be surprised to see a move on the House floor to "do away with the PFC program."

Todd Hauptli, senior executive vice president of the American Association of Airport Executives, says it will be difficult to find any area in which the House will be willing to go above the administration's budget request. There are "87 freshmen in the House who came to cut. They didn't necessarily come to stick around."

Will Ris, senior vice president of government affairs at AMR Corp., says, "the dynamics in this Congress are so unique." On the bright side, he says, a number of measures, some of which have stalled the bill in the past, are not there. But he predicts major "gridlock" is coming.

Dana Gresham, assistant secretary of government affairs at the Transportation Department, remains confident that consensus can be reached on many of the big issues. "Transportation has always been sort of a bipartisan area," he says. His optimism is tempered by Sullivan, who does not know if it is realistic to think this bill can be passed by the March 31 deadline.

And again, funding is a big question. Gresham says the president's budget actually gives more flexibility to larger airports, which can benefit from $50 billion in infrastructure funds for all modes of transportation. But Hauptli counters: "That's one way of looking at it. Another way is that when the president put forward this $50 billion proposal, it hit with a thud in the Democratically controlled Senate. Last time I checked, with House Republicans whacking . . . things, if airports even saw $1 billion of that $50 billion, he would be happy."

Towering Ambitions

U.S. controller training speeds up as simulator systems come online

GUY NORRIS/AW&ST

Airport-specific databases enable the LAX-based simulator to be used for training controllers at satellite fields, such as John Wayne Airport.

GUY NORRIS/LOS ANGELES

FAA is set to accelerate the training of air traffic controllers as the agency nears completion of a nationwide simulator deployment program.

The final four MaxSim training systems, developed by simulation specialists Adacel, will be installed at sites around the U.S. by the end of this year as part of a concerted effort to ramp up controller hiring and training. The FAA currently has 14 systems at its Oklahoma City training academy and 22 others at or near major U.S. airports, including the Hawthorne facility close to Los Angeles International (LAX).

"We are training and hiring new controllers throughout the U.S., and at least 11,000 are being hired over the next 10 years," says William Withycombe, FAA Western-Pacific regional administrator. The MaxSim system—each of which incorporates nine 73-in. high-definition televisions that feature 270-deg. out-the-window views—is "an important new tool for training new and veteran controllers. This device gives us an opportunity to improve safety of operations and efficiency. We can simulate just about anything with this," he adds.

As part of the system's expansion, controllers from airports around the Los Angeles basin will be stepping-up use of the MaxSim system at the FAA's regional office in Hawthorne. Eight controllers from Orange County's John Wayne Airport are among the most recent to start using the Los Angeles simulator. Trainees, experienced controllers in need of a refresher course, and personnel tasked with developing new procedures to deal with changing air traffic scenarios, will take part. From March onward, controllers will be "preparing for new gate assignments and ramp procedures that

> **"We can simulate just about anything with this"**

are scheduled to kick in when the new terminal opens around November and December," says Joe Santoro, a John Wayne Airport tower support specialist.

That airport's new 282,000-sq.-ft. Terminal C, developed under a $195.5 million effort, includes six new gates, security screening checkpoints, concessions and three baggage carousels. The project also includes construction of new permanent commuter terminals at the south end of Terminal C and the north end of Terminal A, replacement of passenger boarding bridges at all 14 existing gates in Terminals A and B, as well as a new baggage-handling system for all three terminals.

The system provides interactive realistic training with a large, wraparound graphic depiction of the airport and the surrounding area. A range of weather and night-and-day conditions can be simulated, along with a variety of scenarios that encompass routine operations up through extreme emergency situations. The simulator provides synthetic voice response and voice recognition that allows the student to talk to the simulator; in other situations, a pseudo pilot responds directly to students.

"Prior to this we would take a trainee from the academy in Oklahoma City for several weeks of classroom work, followed by on-the-job training with ATC instructors," says Santoro. "Now we can finish classroom training and go into the simulator where we can teach phraseology, controller judgment and so on. We can also pause, repeat problems and do all the things we can't do with live traffic."

Significant time savings are being achieved as a result, says Santoro. "We are able to take two trainees to the next level within 40 hr. [about four weeks] versus three months under the old system." Controllers from the Bob Hope Airport in Burbank, and the nearby Long Beach and Van Nuys airports, are expected to start using the LAX-based system later this year.

Shift Starter

Operations and maintenance funding moves into baseline

As the effort to replace the U.S. Air Force Boeing KC-135 drags on, the Eisenhower-era tankers become more costly to maintain.

USAF SSGT. ANGELA RUIZ

KRISTIN MAJCHER/WASHINGTON

As the Pentagon starts to scale back its war funding in 2012, there will undoubtedly be challenges in transitioning equipment reset and maintenance costs back into the baseline for future years.

The Defense Department is requesting $295.2 billion in operations and maintenance (O&M) for 2012, including a baseline budget request of $204.4 billion and an overseas contingency operations (OCO) request of $90.8 billion. Although the total O&M request has increased in 2012 by about $1 billion, the department has shifted about $19 billion from the shrinking OCO account into the baseline budget. But in coming years, the Pentagon must figure out how to transition the remaining O&M war funds back into the baseline, and effects on reset and depot maintenance remain unclear.

Todd Harrison, senior analyst at the Center for Strategic and Budgetary Assessments in Washington, says the $50 billion the department sets aside for OCO from 2013-16 will likely be only half the amount Congress will actually appropriate for war funding. But according to Harrison, maintenance work at depots is expected to lag about two years from the end dates of military operations. He says war-related depot and reset costs are likely safe for now, but may come down by 2015 if the Pentagon sticks with a projected timeline of removing troops from Iraq by the end of 2012 and ending operations in Afghanistan by 2014.

Equipment reset is a cost within the OCO account that has already appeared to take a hit, dropping to $11.9 billion in 2012 from $21.4 billion in 2011. But Harrison notes that this dramatic decrease could either be a nuance or a force to be reckoned with, depending on how the services are utilizing the equipment funding appropriated in previous years.

Some theorize that "we may have already overfunded reset costs in previous budgets, so money might just be lingering for the services to spend so they don't need as much in fiscal 12," says Harrison. He adds, "It may just be that with the drawdown in Iraq we're starting to see some of the dividends budget-wise—we don't have as many vehicles there, they're not operating and getting all the wear and tear, so we don't have as much maintenance to do afterward."

But Robert Hale, the Pentagon's chief financial officer, told Aviation Week the OCO-to-base transition may be challenging as overseas operations subside. "I think there are potential problems. One of them is finding headroom in the base budget to get these OCO expenditures back," Hale says. "But we also need to be honest with ourselves. We may not fully understand what it's going to cost to operate forces when they finally get back from war."

Still, the continuing resolutions (CRs) for 2011 defense appropriations mean uncertainty for maintenance contractors in the coming months. Hale cited the significance of reset expenditures during a Pentagon budget briefing Feb. 14, as well as concerns about immediate maintenance shutdowns due to the CR. "We have about 50 major military construction projects that are delayed beyond the projected award dates," Hale said. "So, for example, we are delaying a vehicle maintenance shop at Fort Leavenworth (Kan.); at Holloman AFB (N.M.), [we are] a maintenance hangar for unmanned air systems. These cause our mission to suffer."

Overall, the Pentagon's projected timeline for troop withdrawals overseas leads to a $41.5 billion decrease in the total expected OCO request in fiscal 2012, compared with the 2011 request. At the same time, the Pentagon says in its budget material that higher-than-expected operating costs from 2012-16 will force the armed services to draw on $28 billion in savings to pay for operations, including depot maintenance and weapons sustainment. The Congressional Budget Office (CBO) calculates in a February 2011 report that O&M base budget costs per active-duty service member will double the historical rate by 2015.

Despite these increased costs, the Pentagon foresees saving about $3 billion in the next five years by improving processes at maintenance depots as part of the efficiencies initiative. Last year Defense Secretary Robert Gates ordered the armed services and defense agencies to find $100 billion in so-called efficiencies, then he said Jan. 6 that they had found even more.

A recent report published for Congress by consulting firm LMI notes that maintenance depots will not only suffer from a decrease in war funding, but also from lack of concurring opinions from Congress and the Pentagon about how government should organize and oversee depot maintenance facilities. As overseas contingency funding drops, LMI predicts that the Army and Marine Corps could be most at risk for depot workloads lower than service projections—by as much as 39 and 46%, respectively.

Rotary Renewal

Civil sales are in the doldrums, but helicopter manufacturers have plenty of new products in the pipeline

GRAHAM WARWICK/WASHINGTON

Hit hard by the recession, the commercial helicopter industry has fallen far from its peak of 2008, but is looking ahead and lining up new products for a predicted recovery beginning in 2012.

Most of the activity is in the middle of the market, centering on medium twins with broad appeal across several high-value markets, including offshore oil and gas, corporate and VIP, emergency medical service (EMS), law enforcement and search-and-rescue (SAR).

In the market for helicopters with gross weights of 4-7 tons, several new or improved designs will enter service from 2012 and onward. These range from AgustaWestland's 4.5-ton, 10-passenger AW169 through Sikorsky's 5.3-ton, 12-passenger S-76D to Eurocopter's 7-ton, 16-passenger EC175.

Eurocopter also is close to launching a replacement for the 4-5-ton AS365/EC155 Dauphin family, while Bell looks likely to develop a new medium twin under its recently disclosed, but closely guarded, Magellan program. And European and U.S. manufacturers are not the only ones making moves.

A resurgent Russian Helicopters is analyzing the market for the 6-ton-class Kamov Ka-62, and studying engine options, but has yet to commit to development. China's Avicopter, meanwhile, is targeting the commercial market with its AC532, built on a common platform shared with the EC175.

With manufacturers reporting initial signs of a recovery beginning late this year, demand for these new helicopters could be boosted by an apparent market shift to regions with challenging environments requiring higher performance. Recent sales of Sikorsky's S-92A, for example, have included offshore operators in Greenland and Azerbaijan, VIP/EMS in Thailand and utility missions in Afghanistan.

Current product development activity

EUROCOPTER

Eurocopter's EC175 is based on a common platform jointly developed with AVIC of China and shared with Avicopter's AC352 commercial helicopter.

AGUSTAWESTLAND

AgustaWestland is pushing to complete development and certification of the Bell Agusta BA609 civil tiltrotor in 2014.

can be attributed largely to the success of one helicopter, the AgustaWestland AW139, which has become the benchmark in the medium twin-turbine market with more than 350 delivered since its first flight in February 2001. The success of the 6.4-ton, 15-passenger AW139 has beaten even AgustaWestland's projections and spurred its competitors to respond.

Announced in 2005, the S-76D is moving out of its protracted development phase and into certification flight-test and low-rate production. Initial certification is expected by year-end, with deliveries to begin in the first quarter of 2012—a four-year delay that means the helicopter may conveniently miss the downturn and be fielded as the market begins its hoped-for recovery.

The D model is a major upgrade to the S-76, more than 800 of which have been delivered since it first flew in 1977. With more-powerful engines, improved rotor and integrated avionics, the S-76D is designed to combine the single-engine performance of the corporate-preferred S-76B with the cruise fuel-efficiency of the offshore-favored S-76C.

"We get the power of the B with the efficiency of the C family, which is attractive from an operating cost perspective," says Tim Fox, S-76 senior program manager. Increased power and rotor-lift improve hot-and-high performance, dual-speed rotors reduce noise and a rotor ice protection system allows the D to operate in more challenging environments.

"We have power, performance, best-in-class fuel burn, and the D is extremely quiet for its size," he says. Priced about the same as a similarly equipped C++, the D can lift 1,000 lb. more and fly 400 nm versus 375. These improvements will allow Sikorsky to offer a single model across markets that previously were segmented, Fox says.

"The D gives us openings into new markets and areas of the world, hotter environments where the C could not operate and the B had the power, but not the specific fuel consumption," says David Franc, S-76 marketing manager. Improved high-altitude performance opens up VIP and EMS markets such as Denver and Mexico City, while "we can go further offshore with greater launch reliability."

Powered by a pair of digitally controlled, 1,050-shp Pratt & Whitney Canada PW210S turboshafts, the D model introduces flaw-tolerant all-composite blades, a Thales cockpit with large-format displays and four-axis autopilot, and optional electrically deiced rotors that allow flight into known icing. Active vibration control and health and usage monitoring systems are standard.

After the delays, caused by unexpected and unspecified discoveries during development, the S-76D is on track to meet its performance targets. "Shakedown tests identified weaknesses, which we have fixed," says Fox, adding "the helicopter is quieter than predicted, rotor lift is slightly greater than predicted and fuel efficiency is on plan."

Two prototypes, D1 and D2, have logged more than 300 hr. since the first flight in February 2009, with certification testing getting under way in November 2010. A third aircraft, D3, will join the 750-hr. flight-test program later this year, tasked with avionics certifica-

tion. D1 is moving into powerplant certification from system development, and D2 into performance testing from avionics and autopilot development.

S-76 airframes are manufactured in the Czech Republic by Aero Vodochody and in China by Changhe Aircraft Industries. Aero delivered the first production S-76D airframe in December 2010 and, with the last S-76C++ to be delivered in December 2011, Sikorsky Changhe is expected to transition to the new model late this year. "We envision dual-sourcing on the D, but this is to be worked out," says Fox.

The second of two prototypes joined Eurocopter's EC175 flight-test program in December 2010, and more than 100 hr. have been accumulated since the helicopter's first flight a year earlier. Meanwhile, European certification is planned for year-end, leading to first deliveries in late 2012. The EC175 is based on a "common standard vehicle" being developed jointly with AVIC subsidiary Avicopter in China.

Eurocopter is the "architect and integrator," and Avicopter the sole source of the airframe, says Laurent Vautherin, head of the EC175 program. But each partner is developing its own version of the common design. Avicopter has yet to fly its version, which will have different engines and is designated the AC532 for the commercial market, but is better known as the Z-15.

AVIC's Harbin Aviation Industry Group (HAIG) delivered the first production airframe to Eurocopter in December. The cooperation is working well, says Richard Dubreuil, EC175 program manager. The partners share a common digital mockup and exchange data in batches each night, allowing work to continue round-the-clock. Eurocopter personnel are located at HAIG to manage the design interfaces and ensure quality, but no technical assistance has been provided to the Chinese, he says.

The airframe and dynamics systems are based on proven technology, says Dubreuil, with the biggest step forward being EC175's cockpit. "We are developing a new human-machine interface, with a full glass cockpit and highly integrated avionics," he says. Eurocopter is responsible for integration, and is not revealing who is providing the avionics hardware.

The EC175 sits between the EC155 and the larger EC225, and is being developed initially for the offshore oil and gas market, which accounts for all current order commitments including the launch customer, Bristow Group. The second prototype is equipped with the offshore mission package, but Eurocopter has started work on other configurations, including SAR, says Vautherin.

Bracketing the AW139 with Sikorsky at the lower end of the medium market and Eurocopter at the upper end—the helicopters are likely to compete most aggressively on operating cost. With the same Pratt Canada PT6A-67E engines as the AW139, but more seats, lower cost of operation drove design of the EC175, says Vautherin. Fox says the S-76D's direct operating costs are predicted to be lower than those of the S-76C++ and "less than the competition."

On paper, the 13-passenger, 5.4-ton Bell 412EP is in the same market sector, but its manufacturer acknowledges the long-running medium twin is a niche product. "The 412 has its own little segment of the market where there is not much competition," says Larry Roberts, senior vice president for Bell's commercial business. "It's rugged and reliable and can operate in climates where new technology has issues."

But in a bid to revitalize a commercial business starved of attention and investment while the company struggled with major military programs, in January Bell formally launched the Magellan new product development program. Studies have begun and timing is not decided, but Roberts says:

SIKORSKY

Sikorsky's improved S-76D is planned for certification by year-end and first deliveries scheduled for early in 2012.

"We would not be considered a viable commercial manufacturer if we did not have a product in the medium range."

AgustaWestland, meanwhile, is not resting on its laurels and in July 2010 unveiled the AW169, a new helicopter to compete most directly with Eurocopter's AS365/EC155 Dauphin. Powered by a pair of Pratt Canada PW210s, the AW169 is scheduled to enter service in 2015. Eurocopter plans to begin development of a replacement for the Dauphin family this year.

CEO Lutz Bertling says Eurocopter and its industrial partners, which include engine supplier Turbomeca, have cleared the launch of the Dauphin replacement, codenamed X4, but are awaiting approval of €250-300 million ($344-413 million) in French government stimulus funding that would al-

RUSSIAN HELICOPTERS

Russian Helicopters plans to begin production of the new Mi-38 at Kazan Helicopters in 2015.

low use of new technologies otherwise too immature for development.

Eurocopter also is nearing a development decision on a high-speed compound helicopter that could replace the EC225. The X3 demonstrator, based on an EC155 airframe with dual RTM322 turboshafts driving both the main rotor and propellers mounted at the tips of short wings, first flew in September 2010. The aircraft has reached 180 kt. in flight tests and is aiming to exceed 220 kt. this year.

An EC225 replacement could compete with Sikorsky's S-92A. Work has begun on a package of upgrades for the "next generation" S-92, but that is "still a few years off," says Brian Young, director of commercial programs. The company, meanwhile, continues to improve the S-92A, focusing on increasing reliability, reducing operating costs and expanding mission capability.

To tackle reliability issues, Sikorsky has begun production of a strengthened "Phase 3" gearbox and plans to retrofit the S-92 fleet within two years. A redesigned, more powerful "improved durability" gearbox is planned for the next-generation aircraft, and will be common with the gearbox developed for Canada's CH-148 Cyclone maritime-helicopter derivative, says Young. Coupled with the same uprated General Electric CT7-8A6 turboshafts powering the Cyclone, the new gearbox will increase the S-92's single-engine performance, allowing a higher gross weight and providing 800-1,000-lb. more of useful load.

It remains to be seen how the commercial market will respond to the offer of greater speed. Completing protracted development of the 275-kt., nine-passenger Bell/Agusta BA609 civil tiltrotor is a priority for AgustaWestland, with certification now targeted for 2014. Sikorsky has talked of being able to develop a 250-kt.-class light commercial helicopter using its X2 coaxial-rotor technology by around 2018. Any X3-based commercial model from Eurocopter would probably be developed in parallel with a conventional design, and take about six years to bring to market. A development decision is expected by mid-2012, but "will not necessarily wait until then," Bertling says.

Control on Demand

New scheme blending stability with agility could spur more rotorcraft to go fly-by-wire

NRC's Bell 412 experimental FBW helicopter has completed 30 hr. of tests of a new control architecture.

CANADIAN NATIONAL RESEARCH COUNCIL

GRAHAM WARWICK/WASHINGTON

Fly-by-wire flight control systems have transformed the capabilities of combat aircraft and commercial airliners but have made few inroads into the rotary-wing market. As a result, the ability to exploit the potential of FBW to improve performance and safety is in its infancy within the rotorcraft industry.

Now Canadian researchers believe they have made a breakthrough in rotary-wing fly-by-wire with the development of a control technique that gives pilots "stability when they need it and agility when they request it," without needing to make a deliberate switch between modes when flying conditions change.

The technique has been developed by the Ottawa-based National Research Council Canada Institute for Aerospace Research (NRC Aerospace) and demonstrated using its Bell 412 research aircraft equipped with an experimental FBW system. NRC Aerospace has led research into rotorcraft handling qualities for decades, using a series of variable-stability FBW helicopters as inflight simulators.

The new control technique could prove a key to wider adoption of fly-by-wire

Compound Concept

Small company has high hopes for hybrid fixed-/rotary-wing design

GRAHAM WARWICK/WASHINGTON

After more than a decade of development, Carter Aerospace Technologies has completed initial flights of a prototype designed to combine the vertical-takeoff-and-landing (VTOL) capability of a rotary-wing aircraft with fixed-wing cruise speed and efficiency.

The proof-of-concept Personal Air Vehicle (PAV) uses the company's slowed rotor/compound (SR/C) technology, which has been licensed to unmanned-aircraft manufacturer AAI Corp. for use in VTOL designs. Carter will build two PAVs for AAI this year, for modification into prototypes of a cargo UAV.

Wichita Falls, Texas-based Carter describes SR/C as a hybrid between fixed- and rotary-wing aircraft. The PAV uses an unpowered rotor for low-speed flight and transitions to a pusher propeller and sailplane-like wing for high-speed flight. Carter is aiming for a cruise speed of 230-250 mph and a lift-to-drag ratio better than a light general aviation aircraft.

In a conventional helicopter the rotor generates lift and thrust, and speed is limited by retreating-blade stall. A compound helicopter adds a wing and propulsion to offload lift and thrust from the rotor, delaying blade stall to fly faster; but it still has the complexity, weight and drag of a rotor drive system.

Carter's SR/C uses the rotor only for takeoff and landing. A simple drive system spins up the unpowered rotor for takeoff, and energy stored in the autorotating rotor is used for landing. With the rotor handling takeoff and landing, the wing can be reduced in size and optimized for cruise efficiency.

Initial flights of the PAV prototype in autogyro mode demonstrated the "jump" takeoff and "zero-roll" landing capability. The wing will now be fitted, and flights to validate the SR/C concept should begin in May, says President Jay Carter, Jr.

To take off, locking the brakes automatically engages a clutch so the engine can spin up the two-blade rotor. At full rotor speed, disengaging the clutch while pushing a button increases collective pitch on the blades, and the aircraft jumps into the air. The pilot then tilts the rotor forward, using energy stored in the high-inertia blades to accelerate.

Above 70 mph, lift begins to transition to the wing from the autorotating rotor, which slows in response, reducing drag and allowing the aircraft to fly faster. The rotor is mounted on a mast that tilts automatically to keep the wing at the angle of attack for lowest lift-to-drag ratio as speed increases.

During cruise, the unpowered rotor aligns with the airflow, reducing drag while maintaining the minimum rpm for blade stability. A three-fold reduction in rotor speed reduces rotational drag by a factor of 27, Carter says. At

technology in helicopters, as it combines the stability required in poor visibility when the pilot needs to make slow control inputs, with the agility demanded in good visibility when the pilot wants to make rapid inputs. The system blends the control response types based on how aggressively the pilot moves the stick.

The new control structure "is a way of splitting the pilot's input into its frequency content," says Bill Gubbels, a researcher at NRC Aerospace's Flight Research Laboratory. In good visibility, when the pilot has ample visual cues to the helicopter's attitude and velocity, moving the stick aggressively channels the control input to a rate command system that provides agility.

When visibility reduces and the cues disappear, the pilot makes slower, more deliberate inputs that are channeled to a translational rate control (TRC) system. When external references are lost suddenly—in a brownout caused by blowing sand or a whiteout from swirling snow—the pilot can release the stick and the aircraft will slow under TRC to a stable hover, by itself.

Rate command, in which moving the stick commands yaw, pitch or roll rate, allows the helicopter to be maneuvered aggressively, but does not provide the stability or fine control needed when flying in the absence of external cues. TRC commands ground speed, which depends on how far the stick is moved; and returning the stick to the center brings the helicopter back to a hover.

The breakthrough claimed by NRC Aerospace is in enabling the stability of a TRC system to be coupled with the performance of a rate command system without requiring discrete mode switching by the pilot.

"Helicopter pilots adapt how they fly to the cues they have. If they don't have external cues, they slow down and look inside the cockpit," says Gubbels. "It's like driving in fog without a speedometer and trying to accelerate to 50 mph. If the fog lifts and you can see more of the world outside, you start to accelerate. When you lose the cues, you slam on the brakes. It's on-demand aggressiveness."

With the new control structure developed by NRC Aerospace, "if the helicopter hits fog, the pilot can freeze the stick and search for cues," he says. Crucially, the pilot does not have to make the decision to select a different control mode; it is done automatically based on stick inputs. "When you have bad cues, workload goes up, and that's not when you want to ask the pilot to hit a button."

The FBW control structure developed and demonstrated by NRC Aerospace filters the pilot's control inputs and sends low frequencies to the translational rate controller for stability, high frequencies to the rate controller for agility and mid frequencies to an attitude controller. This commands nose-up/down attitude and is used in naval helicopters to move in and out of hover, says researcher Kris Ellis.

NRC Aerospace is looking to license its new FBW control architecture to manufacturers. "Manufacturers are still using classic control laws. This is the next generation," says Gubbels.

Only a handful of rotary-wing FBW aircraft are flying—including the NH Industries NH90 and Sikorsky CH-148 Cyclone helicopters, and Bell Boeing V-22 and BellAgusta BA609 tiltrotors—and adoption has been slow. "The big swallow is fly-by-wire," he says. "Next come new inceptors such as sidesticks. Then they invest in innovative and intuitive control laws."

low rpm and lift, drag becomes a function of rotor surface area, which is small compared to the wing.

The rotor slows to around 100 rpm, producing 10% of lift, and the mast tilts to hold speed and maintain sufficient centripetal force to prevent the blades diverging. "The rotor has 10 times the inertia of a helicopter's, so it doesn't change speed fast and it's easy to hold rpm," says Carter. The floating mast isolates the rotor from the fuselage on an air cylinder, "so you fly fast on a two-blade rotor with little vibration."

The wing has 20-25% of the area of a general aviation aircraft of similar weight, reducing profile drag, and the aspect ratio of a sailplane wing, minimizing induced drag. "It's more efficient than [general aviation] fixed-wing aircraft with a big wing, and about the same as a turboprop with a smaller wing, but not as efficient as a commercial jet," Carter says.

To land, the pilot throttles back, and lift transitions from the wing back to the rotor, which speeds up until, at 70 mph, it provides 80-90% of lift. Flying a steep approach, the pilot tilts the mast aft and flares level a few feet above the ground, using energy in the rotor to reduce forward and vertical speed and touch down with zero ground roll.

Carter says the aircraft can withstand engine failure because the high-inertia rotor with its tip-weighted blades acts like a parachute. "You can misjudge a landing and drop from 5-10 ft.," as the landing gear can absorb sink rates up to 24 fps. The aircraft is designed to be easy to fly, with changes in blade pitch between high and slow speed automated. "It takes collective pitch out of the equation," he says.

In addition to two for AAI, Carter plans to build another PAV as a demonstrator and offer a version with smaller rotor and wing as a kitplane. AAI has an exclusive license for military UAVs and is working with Carter on a "fly-drive" vehicle concept for the Defense Advanced Research Projects Agency.

CARTER AEROSPACE TECHNOLOGIES

Carter completed first-phase testing of the PAV prototype, in autogyro mode without wing, between October and January.

GPS in a Fix

Demand for mobile broadband spectrum raises specter of widespread GPS jamming

GRAHAM WARWICK/WASHINGTON and MICHAEL A. TAVERNA/PARIS

Urgent tests are planned to determine if a Federal Communications Commission (FCC) decision to grant LightSquared conditional approval to deploy up to 40,000 terrestrial base stations to augment its mobile satellite service capacity could cause potentially harmful jamming of GPS signals.

LightSquared's terrestrial transmitters will operate in L-band spectrum adjacent to the main L1 frequency used by civil and military GPS receivers. The signals from navigation satellites have very low power, and initial experiments have raised concerns that the high-power cell-phone transmissions will overload some GPS receivers.

Testing of these receivers to determine the potential for interference and identify ways to prevent jamming will begin shortly and must be completed by mid-June, before LightSquared can begin installing terrestrial transmitters in selected markets.

"We are concerned about the possibility of interference with GPS services and looking forward to further testing," says the FAA.

Despite objections from the FAA, Pentagon and GPS community—as well as wireless operators—the FCC on Jan. 26 granted LightSquared a conditional waiver of its ancillary terrestrial component (ATC) "integrated service" rule. This will allow its wholesalers to offer terrestrial- or satellite-only devices in addition to the dual-mode handsets mandated by the rule.

Lightsquared argues it needs the waiver to meet its commitment to the FCC to offer wireless broadband coverage to at least 260 million people by the end of 2015. That commitment was made in March 2010 when the FCC approved the transfer of SkyTerra Communications and its L-band authorizations to Harbinger Capital Partners, the private equity fund that controls Lightsquared.

The waiver is conditional on addressing GPS interference concerns before beginning commercial service. At the FCC's direction, LightSquared has approached the U.S. GPS Industry Council (USGIC) to form a working group to assess the problem. A work plan was slated to be presented last week, followed by monthly updates, with the final report due by June 15. LightSquared wants to run network trials in four markets this year and to roll out commercial service by year-end.

Last week, Lightsquared announced that it had closed on a $586 million additional debt package to help fund the $7 billion project, complementing $2 billion in previous proceeds and commitments (*AW&ST* Oct. 18, 2010, p. 38).

Transmitting high-power terrestrial signals is a fundamental change in the use of L-band frequencies set aside for low-power space-to-Earth services, says Mike Swiek, executive director of the USGIC, which represents manufacturers. Overcoming interference may not be easy. "We are up against some pretty fundamental physics," he says.

Experiments conducted by leading GPS manufacturer Garmin International—using two of its most popular aviation and consumer receivers and simulating LightSquared base-station transmissions—indicated "disastrous interference," according to documentation filed with the FCC. Garmin's FAA-certified GNS 430W receiver began to be jammed at 13.8 mi. from the simulated base station, with total loss of fix at 5.6 mi.

The base station meets previously agreed limits of out-of-band emissions, incorporating a filter that "puts a wall between it and GPS," says Jeff Carlisle, LightSquared's executive vice president for regulatory affairs. But the concern is with

BOEING

Terrestrial base stations will reuse L-band frequencies assigned for mobile communications services provided by LightSquared's SkyTerra-1 satellite.

those GPS receivers that are sensitive to "down-band" transmissions. Testing is needed to find out which subset of receivers is susceptible, he says.

Plans call for both laboratory and field testing with the base station operating at its authorized power. "We will take various receivers and scope which [ones] are susceptible and which are not, so we get some data behind the issue," says Carlisle. The GPS industry will work with LightSquared "as best we can to understand the dimensions of the problem," says Swiek.

The out-of-band emission limits on the base stations were agreed in 2002 with SkyTerra, which planned to use terrestrial transmitters to supplement its satellite service. But Swiek says LightSquared's business plan is a "fundamentally different situation" involving far greater use of its L-band frequencies for high-power terrestrial service.

While Carlisle says LightSquared has spent $9 million developing its base-station filter, Swiek points to the sheer scale of the problem if millions of GPS receivers have to be retrofitted with filters. The size and cost of filters, and their impact on receiver sensitivity, are concerns. "What good is a GPS receiver the size of a credit card if you need a filter the size of shoe box?" he asks.

LightSquared has a vested interest in ensuring GPS remains robust, argues Carlisle. "We need to offer GPS-enabled smartphones. If we are blocking GPS, then we will not have a lot of retail customers."

A major concern is the precedent that LightSquared's waiver could set for terrestrial re-use of frequencies reserved for satellite service. Other providers plan hybrid satellite/terrestrial services, and the pressure is on to find a way to coexist with GPS. "[Mobile satellite service] uses a lot of spectrum, but not all the time and not with high density," Carlisle says. "The FCC forecasts that mobile broadband traffic will increase by 35 times in the next five years, and there is not enough spectrum to support that."

Other companies are watching LightSquared's progress closely. "We look forward to the FCC extending similar flexibility to other MSS providers, including Globalstar," says L. Barbee Ponder, general counsel and vice president for regulatory affairs at Globalstar, whose ATC authority was withdrawn last September after the FCC refused to grant a 16-month extension.

African Dawn

ViaSat, RascomStar-QAF roll out low-cost portable cellular uplink

MICHAEL A. TAVERNA/PARIS

ViaSat and African operator RascomStar-QAF are introducing a low-power portable GSM cellular uplink station that should significantly lower the cost of serving cell-phone customers in rural areas and sharply reduce satellite price disparities with respect to terrestrial networks.

The new system, which was unveiled at the Mobile World Congress in Barcelona on Feb. 14-17, is expected to greatly benefit Africa and other areas with little terrestrial communications infrastructure, and is one of the first big satellite developments in which an African partner has participated.

Harry Stribos, sales director at ViaSat, says the system employs a bottom-up, design-to-requirement approach intended to enable GSM (global system for mobile communications) operators to deliver low-bandwidth voice, messaging and data services in rural areas and other "challenging" environments where average revenue per user (ARPU) is often too low to permit sustainable service on a profitable basis. Features include a distributed software architecture, integrated satellite backhaul unit and low-power solar panels.

Such low costs will permit operators to introduce new services on short notice

Stribos says the system will permit call costs about half those of conventional GSM backhaul and roughly comparable to those of high-density networks—a major step forward in the commercial satellite community's quest to become competitive with terrestrial offerings. The purchase cost of a full-node system is likely to be roughly $30,000, including solar panels, versus $80,000-90,000 for a comparable VSAT terminal.

Among other benefits, such low costs will permit operators to introduce new services on short notice or open green-site locations off their grid with minimal risk, the partners say.

The system was developed as part of a $53 million deal last year intended to enable RascomStar-QAF to support its two main offerings—high-speed intra-African backbone connections and low-density telephone and Internet access. ViaSat also put up additional funding that will give it the right to sell the system to third-party users, subject to RascomStar's approval.

RascomStar launched its first spacecraft into orbit last August, after a helium leak cut short the life of an initial satellite orbited two years earlier. The Mauritius-based company was founded to provide low-cost international connections between African countries without going through Europe, and to ensure affordable service to remote villages and towns across the continent. The Libya Africa Investment Portfolio holds a 63% stake in the company; Rascom, a consortium of 45 African telecom operators, has another 25%. Thales Alenia Space, the manufacturer, owns the rest.

The partners plan to begin trials in four or five African markets toward the end of the first quarter and to begin deployment in mid-year. Once the system's performance has been demonstrated, ViaSat officials believe they will be able to interest operators in other regions, too. Viasat estimates that 10,0000-15,000 units could be sold during the first 12-18 months.

The technology is designed to permit an easy transition to a 3G high-speed Internet version of the system still in development. This version, which will offer speeds up to 1 mbps, is expected to be available toward year-end. ViaSat sees a big market for 3G systems not only in developing areas such as Africa but also in regions such as Australia and the U.S. The company is studying how the technology could work with very-high-throughput K_a-band networks like the one it plans to roll out in North America this year with its ViaSat-1 satellite.

Cyber and EW Prosper

The 2012 budget proposal reveals next-generation defense priorities

DAVID A. FULGHUM/WASHINGTON

Electronic warfare (EW) and cyberoperations remain bright spots in planning for 2012 defense spending.

What's more, funding will actually grow in a number of new areas. Among the modernization procurement programs "that went above the original program of record" in new budget planning are a new bomber for the Air Force that will serve as a surveillance platform, says Defense Secretary Robert Gates. And "we're asking for a half-billion dollars for Darpa [the Defense Advanced Research Projects Agency]. There may not be big procurement dollars, but they are big dollars" for leveraging advanced technologies, he adds.

The electronic attack (EA), EW and cyberoperations pots also include $1.1 billion for the Boeing EA-18G, which will carry the Navy-developed Next-Generation Jammer (NGJ) and $197 million to start development work on the Long-Range Strike program, which senior Air Force officials have described as being focused more on intelligence, surveillance and reconnaissance (ISR) and precision targeting than on the system's strike capabilities. The 2011 request amounts to $1.7 billion for the program.

Darpa's cyberops "plus-up" will include funding to set up a cybertest range so that both offensive and defensive tools can be evaluated. A example of the need for such facilities was demonstrated when an Iranian centrifuge system for enriching uranium was duplicated and then attacked in preparation for planting the Stuxnet virus into additional facilities, according to a new report by Symantec Corp.

Symantec analysts say the Stuxnet worm was launched in a targeted attack on five Iranian organizations, and 12,000 subsequent infections can be traced back to those five. Dates of the initial attacks were June and July 2009; and March, April and May 2010. At least three Stuxnet variants were used. The worm is designed to reprogram industrial control systems.

REUTERS/LANDOV FILE PHOTO

"Attackers would need to set up a mirrored environment that would include the necessary hardware, such as programmable logic controllers, modules and peripherals in order to test their code," the new study says. "The full cycle may have taken six months and 5-10 core developers."

"In cyber [operations], one of our real challenges is situational awareness," says Paul Kaminski, a former Defense undersecretary for acquisition and technology, and now chairman of the Defense Science Board (DSB). "I haven't seen a network yet that can't be penetrated. [The problem then becomes:] How do you know when the network is being penetrated? What is the extent of the penetration? How can you isolate it? How can you develop a 'limp home'

Ship Shopping

Navy shifts funding toward surface ship fleet

MICHAEL FABEY/WASHINGTON

After years of focusing its spending on airplanes and aircraft-related expenses, the Navy now appears to be tacking toward ship programs, with carriers, amphibious assault ships and other aircraft-centric vessels garnering the lion's share.

The Navy's fiscal 2012 budget request and spending priorities over the coming five years show a strong interest in surface and submarine fleets; the service plans to buy another 55 ships by fiscal 2016, five more than initially envisioned during that time.

Moreover, thanks mostly to the Lockheed Martin F-35 Joint Strike Fighter and other aviation program juggling, the service plans to buy 973 airplanes by fiscal 2016 instead of the previously planned 1,004.

That's a bit of a course change for the Navy. It spent more than $62 billion for fixed-wing aircraft and aircraft-related work since 1999, according to an Aviation Week analysis of contracting data provided by the National Institute for Computer-Assisted Reporting. By comparison, the Navy spent slightly more than $15.9 billion for carriers (excluding nuclear components) and amphibious assault ships combined.

The real winners of that surface fleet for the 2012 request are the carriers—the Landing Helicopter Assault (LHA-7) amphibious assault replacement ships and San Antonio LPD-17-class vessels, for which the Navy wants a combined $6 billion for construction and R&D work.

The budget request includes $555 million in construction funding and another $137 million for R&D for the CVN-21 and $530 million for the Refueling Complex Overhaul of the USS Abraham Lincoln CVN-72. The budget also asks for $2 billion for the LHA-7s, compared with $950 million in fiscal 2011, as part of the second increment for the program.

The largest of all amphibious warfare ships, the LHA-7 represents a step up from the Tarawa-class LHAs, which will reach the end of their extended service life by 2015.

An official from Iran's Atomic Energy Organization observes uranium-enriching centrifuges on display at Shahid Beheshti University in Tehran.

mode that allows you to conduct some piece of your operation—a reserve capability. Gaming the situation is a very important piece. That's what we're talking about in terms of exercising and training [on a cybertest range]."

A cyber-range also would allow the Pentagon's current leadership to look at cloud computing with virtualization and greater use of simulations.

"They are thinking about moving over to that during the Pentagon's next four-year [information technology] refresh cycle," Kaminski says.

A DSB task forces will look at the pros and cons of the cloud. Another will try to define meaningful metrics for determining the success of missions that are dependent on supporting IT systems. The metrics will try to judge resilience of the cybersupport and monitor both input and output.

The $500 million is a portion of the Pentagon's 2012 budget request of $2.3 billion to improve cybercapabilities. The broader effort is a "comprehensive cyber-strategy called Cyber 3.0," says Deputy Defense Secretary William Lynn. Other parts of the strategy include "active defenses . . . that detect attacks and probes as they occur." In addition, the Defense Department is designing a collective defense with allies and civilian agencies to monitor computer networks and warn one another of cyberintrusions, he says.

The Navy, meanwhile, is adding money to its NGJ program.

"We actually moved money into that to accelerate it forward in the future-years defense plan," says Rear Adm. Joseph Mulloy, deputy assistant Navy secretary for budget. Another part of the effort is to eventually winnow the competitors to a single team. "Right now the F-35 [Joint Strike Fighter] is proposed as possibly a jamming variant, but that has not been developed," he says.

Navy officials have acknowledged that the NGJ will feature a network-invasion capability. Air Force budget-briefers were unable to confirm whether USAF will participate in the NGJ program.

"I can tell you what has changed from the next-generation bomber two years ago," says Maj. Gen. Alfred Flowers, deputy assistant Air Force secretary for budget. "There has been a further review of options. This is now being approached as a family of systems. The bomber is the centerpiece, but there will be ISR, electronic attack and communications capability."

He also noted that the notional force would consist of 80-100 aircraft and would be funded at a total of $3.7 billion during the five-year defense plan. This force also would be nuclear-capable (which means hardening against electro-magnetic pulses), penetrating (very low observable) and optionally manned, and its initial operating capability would be around 2025.

Conceptually, it will be optionally manned, Flowers says. Just how that will work has to be determined, he adds. "Right now, we're [continuing] the technology-leveraging phase."

Others see a role for separate manned and unmanned aircraft.

Other Pentagon officials described the bomber design as "open architecture hardware" that would allow various payloads to be slipped in and out of the design as required for missions that penetrate heavily defended enemy airspace to attack air defenses with jamming or with data beams designed to exploit networks.

The budget requests $1.9 billion for the LPD-17s, compared with $1.4 million in fiscal 2011 for the 11th and final ship of the class. The funding includes line-shutdown costs for the San Antonio-class ships, which are replacing 41 vessels across four different ship classes.

The Navy was able to make the individual ship-account increases despite the service's $14.9 billion for shipbuilding for the upcoming fiscal year, a slight drop compared to the fiscal 2011 request of $15.7 billion. The Navy says it can afford the additional ships and shipbuilding funding because it will be "saving" about $35 billion over the next five years through contract cancellations and restructurings, better contract procedures and energy initiatives.

The Navy plans to create and maintain a relatively stable fleet, though, by continuing to craft and execute creative and more efficient shipbuilding contracts, says Rear Adm. Joseph Mulloy, deputy assistant Navy secretary for budget.

The Navy is not releasing a 30-year ship-fleet plan, he adds, so it's difficult now to gauge how the planned shipbuilding changes will affect the overall fleet size. In many cases, the Navy plans to "reinvest" this money. For example, the service will fund R&D for a future dock-landing ship, TAO-X, and a large-deck amphibious ship to be procured in 2016.

NORTHROP GRUMMAN CONCEPT

The Navy is spending more on aircraft carriers as it modifies and builds its next class of the service's most expensive and largest surface ship.

Rotor Redo

Unmanned Fire Scout switches to Bell 407 airframe to meet urgent requirements

GRAHAM WARWICK/WASHINGTON

The switch to a larger airframe for the U.S. Navy's MQ-8 Fire Scout unmanned aerial system is the major change in rotorcraft procurement outlined under the Pentagon's fiscal 2012 budget request.

Changing from the Schweizer 333 on which the MQ-8B is based to the larger Bell 407 for the new MQ-8C is required to increase endurance and payload to meet an urgent special-operations requirement for a sea-based medium-range surveillance platform, the Navy says.

In December, Northrop Grumman and Bell flew the company-funded Fire-X demonstrator, based on the commercial 407, to show that a new airframe could be integrated into the unmanned architecture developed for the MQ-8B.

The Navy says it was directed by the Office of the Secretary of Defense to modify the MQ-8 with a larger airframe and new payloads to provide an interim maritime capability to special operations forces (SOF). The Navy plans to acquire more aircraft and modify additional ships to support multiple orbits through fiscal 2018, when the new Medium-Range Maritime Unmanned Aerial System (MRMUAS) is to be fielded to provide the long-term capability for beyond-line-of-sight SOF and Navy missions.

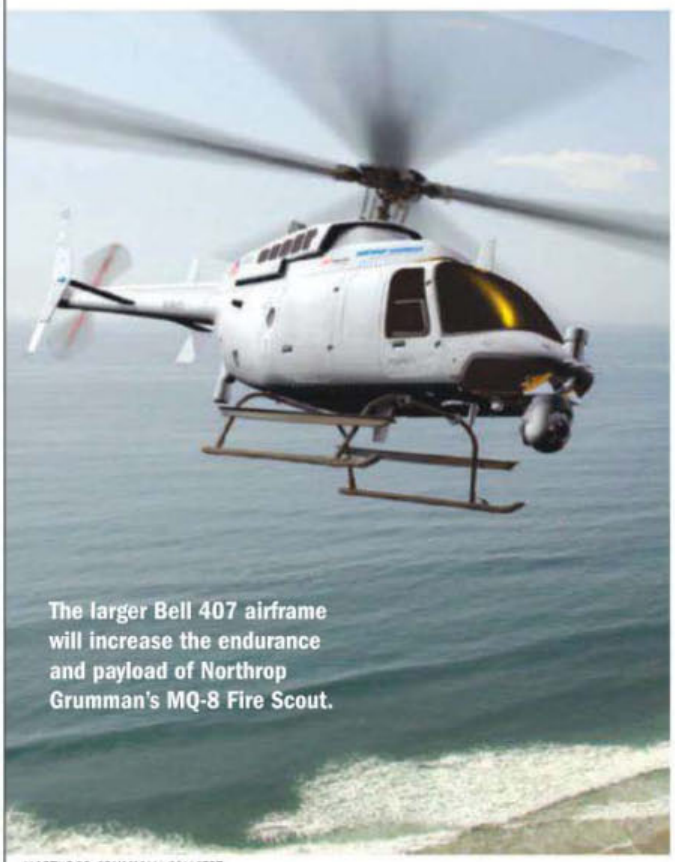
"An urgent operational need was identified to provide additional sea-based intelligence, surveillance and reconnaissance," the Navy says. A Pentagon study determined that the existing Fire Scout configuration could immediately provide a partial capability, the service says, but that a cost-effective measure would be to increase the endurance of the Fire Scout aircraft to provide an interim capability by 2015.

The Navy is seeking $259 million during 2012-14 to develop the larger Fire Scout—and to add a limited weapon capability to the MQ-8B for a quick-reaction assessment in mid-2013—and is requesting $192 million in fiscal 2012 to buy the first 12 MQ-8Cs.

The MQ-8C is planned as an engineering change proposal (ECP) to the existing system, re-using the Fire Scout avionics, payloads, command-and-control links and ground control station. The MQ-8 ECP will "leverage over 85% of the Fire Scout system hardware and 95% of the software," the Navy asserts.

MRMUAS is a new program, meanwhile, with an analysis of alternatives planned to begin soon. Up to five trade studies are to be awarded, with two contractors to be selected for the prototype phase beginning in the first quarter of 2013. Development testing of the winning UAS is to be completed by the fourth quarter of fiscal 2016.

As the planned follow-on to the MQ-8C, the "multi-intelligence, reconfigurable" MRMUAS is to be capable of operating not only within line of sight of the ship, like Fire Scout, but also beyond line of sight in "remote split" mode via satellite communications, the Navy says. This will allow control hand-off to a land-based ground station like that for the Navy's MQ-4C Broad Area Maritime Surveillance version of Northrop Grumman's Global Hawk.



The larger Bell 407 airframe will increase the endurance and payload of Northrop Grumman's MQ-8 Fire Scout.

NORTHROP GRUMMAN CONCEPT

Overall, rotorcraft fare well across the services in the Pentagon's fiscal 2012 budget request. The Army is seeking to increase aircraft procurement by $1 billion over fiscal 2011, largely due to the ramp-up in production of the Boeing AH-64D Apache Block 3. The budget request is for 19 remanufactured Block 3As and the first new-build Block 3B for a total of $1.07 billion. Procurement of the Sikorsky UH-60M Black Hawk at 75 aircraft for $1.6 billion and the Boeing CH-47F Chinook at 47 for $1.36 billion remains steady.

The Army is seeking $145 million in fiscal 21012 for 12 Bell OH-58D Kiowa Warrior wartime replacement aircraft to be built using existing OH-58A/C cabins, plus long-lead funding for the D-to-F cockpit and sensor upgrade to keep the helicopter in service until replaced by the Armed Aerial Scout.

Navy multi-year procurement plans remain largely unchanged at 24 Sikorsky MH-60Rs for $1 billion and 18 MH-60Ss for $483 million. But Marine Corps procurement is adjusted downward to 26 Bell AH-1Z/UH-1Y helicopters for $799 million. Over the future-years defense plan, procurement is cut to 134 from 147 for the H-1 upgrades and to 122 from 125 for the Bell Boeing MV-22B tiltrotor.

The Air Force intends to kick off its 93-aircraft Common Vertical-Lift Support Platform program in fiscal 2012 with procurement of two off-the-shelf helicopters to begin replacing UH-1Ns used for VIP transport and missile-field patrol. The Air Force also plans to buy another four HH-60Ms to offset continuing delays in replacing its HH-60G Pave Hawk combat search-and-rescue fleet.

Danger Zone

Airlift chief points out diplomatic, military and modernization obstacles

DAVID A. FULGHUM/WASHINGTON

Preparing for the worst is a daily task for U.S. Transportation Command, and the worst now includes the loss of short-notice overflight rights, possible anti-aircraft missile proliferation and continued insecurity about the replacement-tanker program.

Spain recently shut down both refueling tracks in its national airspace and some overflight privileges to U.S. military aircraft because Washington had neglected to ask permission for use of Spanish airspace in long-haul flights to the Middle East. Spanish officials called it a renegotiation with a provision that the U.S. must request overflight permits in advance and provide details concerning the flight. All U.S. inflight refueling is prohibited, they said. In June, Spain refused to let British strike aircraft based at Gibraltar use offshore airspace set aside for military exercises.

Persuading one country to agree to overflights is not enough, says the chief of U.S. Transportation Command (Transcom), Air Force Gen. Duncan McNabb. "You have to have a series of countries that all say 'yes'" to keeping open routes into Central Asia and the Middle East, he adds.

In addition, McNabb worries daily that advanced, shoulder-fired anti-aircraft missiles will show up on the battlefield in Afghanistan, or along the routes to fly there, that could threaten strategic airlift.

In particular, classified State Department cables have voiced concerns about Chinese weapons and trainers having connections with the Taliban.

"Today [that threat] could change," says McNabb. "I want us to stay ahead of it, with all of our international partners [being aware that] these things might happen. We don't talk a lot about it, we readjust. Even though it's not a threat today, it could be tonight or tomorrow."

Leaked State Department cables and comments by allied analysts contend that Chinese specialists were seen training Taliban fighters in the use of surface-to-air missiles (*AW&ST* Dec. 13, 2010, p. 25). The most prominent missile mentioned was the QW-1 Vanguard, an all-aspect, 35-lb. launch tube and missile that is reverse-engineered from the U.S. Stinger and the Russian SA-16 Gimlet (9K38 Igla). The QW-1M incorporates technology from the even more advanced SA-18 Grouse (9K38 Igla).

U.S. AIR FORCE

The missile threat to transport aircraft is growing as traffic shifts to the air to avoid terrorist gunmen and buried-bomb attacks on road routes.

"We have 900 sorties a day going sometimes into very dangerous places," McNabb says. "We have a great relationship with the intel community so that if there is something [threatening] that comes up, we can immediately put that airplane on hold . . . until we sort that out.

"If we have to redirect airflow and decide not go into [an] area because there might be something out there, that's what we do," he says. "We see some intel that says those kinds of things [about Chinese advisers and advanced missiles]. And we also see some [intel] that doesn't. If we hear something like that, we will ask the intel folks to go back and take a good hard look to see what it is, in fact."

Other concerns for McNabb include:

- About 90% of U.S. Transcom's command-and-control capabilities are on unclassified networks.
- Some 33,326 computer events were directed at Transcom.
- There were more than 1,100 attacks on supplies coming out of Pakistan by ground, and those choke points in the lines of communications remain easy targets.
- Piracy on shipping is huge and expanding worldwide, with 219 pirate events recorded.
- Shots have been fired at 125 strategic airlift aircraft, with 15 hits recorded.
- Cybernetworks are protected but not secure, and remained the most attacked of combat command assets.

McNabb also cites big savings from adjusting C-17 use in moving supplies to Afghanistan, and he predicts that huge savings will be generated if a replacement tanker become available.

Because of the need to refuel C-17s during longer hops to Afghanistan, Transcom logisticians discovered that it's 45% more efficient to use the new airlifters for only the last leg of the trip. Savings are pegged at $110-116 million per month through a reduction in aerial refuelings, he says.

The savings from modifying inflight refueling to make them more efficient could be further increased by a new tanker. "We pass more fuel than we carry cargo," says McNabb. In fact, tankers fly the majority of Transcom's 900 daily sorties. But since most KC-135s cannot receive fuel in flight, they have to carry it (and its weight) back to their bases. The average amount of fuel returned to base is 35,000-40,000 lb. per aircraft, he notes.

"They are carrying that all the time," he says. "We're talking about 5 million lb. a day." Instead, "if you can leave that fuel in the fight [aboard another tanker], you only carry it one time. [Saving] 20-25% of the fuel bill is a lot." New tanker designs would allow the remaining fuel to be transferred to other tankers in refueling orbits.

U.S. AIR FORCE

A radar had been planned for F-117, but after the aircraft was in operation it was decided there was no need for the expensive sensor.

Too Much, Too Soon

Block upgrade scheme could improve F-35 and streamline new bomber program

DAVID A. FULGHUM/WASHINGTON

The F-35 Joint Strike Fighter program has tried to do too many things too fast, and its problems have been compounded because the development effort was launched without a complete test program.

Paul Kaminski, speaking as a private citizen, singled out three aircraft programs—Lockheed Martin's F-16, F-117 and F-35—as examples of how some programs function smoothly, others become delayed, and yet others are repaired along the way.

Kaminski, CEO of Technovation Inc. and the chairman of the Defense Science Board (DSB), was undersecretary of defense for acquisition and technology and director for low-observable technology.

A DSB research effort is underway that is looking into how acquisition can be speeded up—and made cheaper and better—when aligned with military missions.

"I think we have succumbed on the F-35 program to adding too many things too quickly," Kaminski says in response to a question from Aviation Week.

Another problem involves a lack of coordination between the interrelated demands of acquisition and test and evaluation. A particular issue for F-35 was the undefined nature of the test program that has cost the 10-year-old program five years of delays.

"Not many people think about the fact that if our test-and-evaluation capabilities aren't keeping up in productivity with the rest of what's going on, we have a lot of high-paid engineers sitting on their hands waiting for data," Kaminski says.

Conversely, improved responsiveness and productivity of test and evaluation programs have a high return on investment.

"It's amazing to me how many programs we start and sign contracts for that don't have a test plan," he says. "That's the rule, not the exception."

However, he does see ways to repair the F-35 program, even this far into its development.

"Some of the things that the [Defense] Secretary [Robert Gates] has done of late are helpful, for example putting on probation the pace and nature of the [vertical-landing F-35B], setting standards for performance and breaking it [into distinct] pieces," Kaminski says. "But it's hard to walk this dog back after all the requirements are [signed] and in place."

Another handicap is that such programs are so infrequent and have such long cycles that it is almost impossible to avoid the operational push to put everything in the first version. What Kaminski recommends instead, are programs with block upgrades, like the F-16.

"Where you don't see [the push to add everything at once] is in a block upgrade program where you have a pattern of testing, you know what the upgrades will be and you don't have to test the whole system," he says. Without a signed [test-and-evaluation contract], the whole process hasn't been thought through. We have challenges with what we've committed ourselves to with the F-35."

Nonetheless, there is still room and time for improvements in the F-35 test program, he says, noting that, "It requires discipline because the first tendency is to put everything in the first block. You have to reserve what goes into the first block for what has earned its way onto the system and what is sufficiently mature to be integrated."

The F-117 program, with which Kaminski was involved, dodged delays by proceeding with early development without a radar. In fact, it completed its operational life without that capability being added.

"I was facing a big push from the senior operators who said we need a radar [to make it] an all-weather airplane," he says. "I didn't think we were ready to put it in. We didn't know how to do it [without affecting the stealth signature]. We did a lot of work to convince ourselves that the airplane was going to be usable in a wide variety of circumstances, even though it wasn't all-weather. Had we held the program up for a radar, we'd still be working on the F-117."

For next-generation projects, such as a new bomber for the Air Force, Kaminski is adamant that it be a graduated design with interchangeable, upgradable packages of sensors and weapons. That would skirt today's problems of 20-year development times for new programs.

"If you are trying to align our enterprise to the mission, it's just too long," he says. "We have to look at block buys with planned upgrades for those blocks. The cycle times will depend on the mission. It will be different for strategic bombers than for work in the cyber environment."

Block upgrades also produce a personnel advantage.

"When you're working in a block upgrade environment, people develop trust and relationships. Those on the requirement side learn what happened in Block X as they adjust requirements for Block X-plus 1. We saw the same thing in contracting and testing performance. It becomes a continuous improvement environment. Some of our major aircraft programs—like the F-16—were done that way. The block upgrade approach is a way to manage risk and understand ambiguities in a sequential way."

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VIEWPOINT

Why 787 Slips Were Inevitable

BY YAO ZHAO AND AARON SHENHAR

Yao Zhao and Aaron Shenhar are professors of supply chain and project management at Rutgers Business School in Newark, N.J.

Boeing embarked on two ambitious and innovative experiences in its 787 program. Yet, the company did not appreciate the level of challenge it was taking on, and did not prepare itself for the additional complexity involved.

The assumption was that this program could simply be managed as the previous, more successful 777 program. A careful upfront assessment could have prevented many of the bitter experiences that followed. The innovations included building most of the main fuselage using composite materials and transferring an unprecedented level of development work to its supply chain partners, making it a development chain.

First, composite materials represent a new technology in large-body commercial aircraft. It creates a more efficient aircraft, but it also pushes the effort into a "high-tech program" territory. Typically, when a new technology is used in design, it requires additional design cycles on top of those used for a more mature technology. Such cycles are needed to sort out all uncertainties before the final design can be frozen. Boeing eventually found out that it must add design cycles to its original plans, causing more delay and higher cost than predicted. An upfront assessment of the program's level of new technology would have dictated how many cycles would be needed.

> "Boeing's incentive system is similar to free riders. If a supplier delays his job, everyone is impacted. If he does his job well, he increases his costs but everyone benefits."

Second, the program's development chain is managed under the relatively new "build-to-performance" model, under which Boeing, as a main contractor, designs the system, defines sub-assemblies and interfaces, and outsources detailed design and development to suppliers, before integrating and testing the entire system.

The advantage of build-to-performance is clear: Having reduced its designers' workforce during years of cost-cutting efforts, Boeing planned to use external developers, build subsystems concurrently, and share cost and risk with suppliers. However, that kind of organization pushed the complexity of the program into the "array" or "system of systems" territory. To succeed in this kind of endeavor, a main contractor must first guarantee three components: an incentive system, which ensures full cooperation, coordination and maximum effort by all parties; an assessment and training program for potential subcontractors, which verifies they are capable of doing the work; and detailed policy and guidelines governing the work and interaction of all teams.

Boeing came up with a risk- and revenue-sharing system under which suppliers invest non-recurring development costs, own intellectual property, and are paid after aircraft are successfully integrated and being sold. Suppliers are upgraded from subcontractors to strategic partners that share the fate of the program. However, such a system has one fatal flaw: a phenomenon known in economics as "free riders," where one can enjoy benefits without having to work for them simply by passing one's job to others.

Free riders are inevitable in non-cohesive teams where everyone shares the outcome to which they contribute. The surprisingly simple rationale is that if one is not held solely and immediately responsible for his/her behavior, it is better to do less than more. A famous case of free riders happened in China in the late 1950s. Under the "Big Iron Pot" policy, the government agreed that everyone in a village eats for free and contributes equally to the harvest. It did not take long for farmers to discover that they can get the same food even if they work less hard and shift the work to others. Big Iron Pot quickly collapsed and caused a great famine in China in the 1960s.

Boeing's risk- and revenue-sharing incentive system is, in principle, similar to free riders. If a supplier delays his job, everyone is impacted. If he does his job well, he increases his own costs but benefits everyone else. Once a supplier realizes that he may not lose much if he does less, traveled work follows, leading to subsystems' delays. And because the program cannot proceed even with one subsystem missing, the worst supplier's delay becomes the driver of late deliveries.

A necessary condition for build-to-performance to work is putting in place an incentive system based on free-market principles of rewarding excellence and even encouraging a suppliers' competition. One must link gain to progress, even before the entire system is completed. Paying-for-milestone and partial results (including penalties), followed by the "big prize" at the end, would be a better alternative than buying a failing subcontractor, as Boeing did with Vought.

The other components of evaluating and educating suppliers and clear guidelines on work standards are no less important. But one thing is clear: Free riders never worked; there is no reason it would succeed in a complex aerospace system development program.

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