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AVIATIONWEEK

& SPACE TECHNOLOGY

A biplane is shown in silhouette, flying diagonally across the frame from the bottom left towards the top right. It is surrounded by a large, dense cloud of bright, golden-yellow sparks or fireworks that trail behind it, creating a dramatic, high-contrast scene against the deep black background of the night sky. The sparks are concentrated around the plane, particularly behind the wings and fuselage, suggesting a high-speed maneuver or a special event.

2012
Photography
& Art Issue



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AVIATION WEEK
 & SPACE TECHNOLOGY

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LAG



It seems that the 747 has had its day. The latest version, the 747-8, is the 48th derivative of a 1969 certificated aircraft and still produced without the latest full fly-by-wire technologies common to all modern aircraft.

For airlines this means limited cockpit commonality with other wide-bodies.

The 747-8 has no choice of engines. Its constrained performance means it produces more noise, has significantly less range, a higher approach speed and needs longer runways for both take-off and landing.

The fuselage is based on 1960's comfort standards, with only 17 inch wide seats and narrow aisles. It is enough to make a passenger twist and shout!

The 747-8. Based on a 1960's design. A true case of jet lag!

JET



There are some very good reasons why the A380 is leading the very large jet market.

Having been designed for 21st century growth, it carries 30% more passengers while burning significantly less fuel per seat than the 747-8.

The A380's performance is unbeatable in its class, offering the most modern technology with 25% advanced composite materials. It flies further, needs shorter runways and climbs faster, all while being an aircraft awarded for its quietness.

In the wide-body market, the A380 has by far the lowest seat-mile costs and advanced fly-by-wire technology with renowned commonality across all Airbus types.

It also offers passengers 21st century comfort. The cabin is the quietest and most spacious in the sky, with more floorspace for wide aisles and wider seats, even in economy.

Passengers will opt for the A380 when given the choice. For airlines this means increasing market share and more revenue.

It's no surprise that the A380 has an 86% share of the very large passenger aircraft market.

It takes an A380 to compete with an A380.



AVIATION WEEK

& SPACE TECHNOLOGY

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JASON PINEAU



HISTORIC FILTON CLOSES

✎ **The storied Filton Airfield**, outside Bristol, England, closed last week. The airport was home to the Bristol Aeroplane Co. and where the U.K.'s supersonic Concorde fleet was assembled and tested. Read more about Filton's place in aviation history in our Things With Wings blog (tinyurl.com/c53z6ym).

AviationWeek.com/thingswithwings

PROGRESS REPORT

✎ **Bombardier** is putting the wings on the CSeries. The composite wings

are being mated to the first fuselage, we report on our Things With Wings blog. Structural tests begin early next month.

AviationWeek.com/thingswithwings

UCAS DECK TRIALS

✎ **Northrop Grumman's X-47B**

NORTHROP GRUMMAN



PHOTO CONTEST

✎ **Registered subscribers** can view more than 150 finalists from this year's Aviation Week Photo Contest, in special galleries on our iPad edition. Selected finalists also will be available at AviationWeek.com/awst

UCAS-D is back on land. The UAV completed deck trials on the USS Truman. To see pictures and read more, check out Ares, our defense technology blog.

AviationWeek.com/ares

PREMIUM CONTENT

✎ **Subscribers** to the Aviation Week Intelligence Network can view summaries, photos, supplier information and recent articles on dozens of aircraft, engine, satellite, UAV and other programs.

AviationWeek.com/awin

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LETTER FROM THE EDITOR

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Jin Nakashima of Ardmore, Okla., took this time-lapse image of the space shuttle Discovery taking off from Shuttle Landing Facility Runway 15 at the Kennedy Space Center for the final time atop the Boeing 747 Shuttle Carrier Aircraft. Discovery was headed for the Smithsonian National Air and Space Museum Steven F. Udvar-Hazy Center near Washington.



From the Web

Comments from readers
on **AviationWeek.com**

Aviation Week's Dec. 10 cover story featured a pilot report and a program review on Boeing's 787 by Senior Editors Fred George and Guy Norris, respectively. Norris also shot the video of the flight and has posted several pre-/during/post-flight photos on our Things With Wings blog. In the photo below, Fred George is in the left seat, 787 Assistant Chief Pilot Mike Bryan is in the right.

JumboJetPilot notes:

Those are some really big glass displays! I wonder if that lower EICAS [engine-indicating and crew-alerting system] is a touchscreen the way it is in some corporate jets these days.

Carl Mohr says:

It would interest me to see an up-to-date cockpit of the new Boeings. I started my career on Douglas DC-7Cs in 1957, then onto 707s and 747s in 1971. If I'm out your way again, I just might ask for a ride. Thanks for such an interesting article.



GUY NORRIS/AW&ST

Simon Wirth ponders:

A small detail, but if I'm not mistaken, the right engine was throttled all the way back . . . not the left.

Carnot asks:

Thanks for a very informative video. What was on the center of the glare shield?

AW&ST's Rupa Haria responds:

That's a GoPro camera.

Boeing787Tech says:

LOL! GoPro cameras are *everywhere*! Way to go captain! Now, join me with your GoPro on the motocross track and let's see whose video is better! Good stuff sir!



Comment on articles, blogs and
photos at: **AviationWeek.com**

Feedback

LOOKING BACKWARD AND FORWARD

This has been quite a year. Neil Armstrong has passed on, but Curiosity is alive on Mars. One of the most amazing sights that I have seen was in October 1957 when I witnessed the first visible pass of Sputnik over California. I was a medical intern at Los Angeles County Hospital at that time. I, along with numerous others, went to the athletic field at CalTech to observe this event. Someone called out "There it is!" And there it was. All of us gathered there knew in an instant that the world had changed.

I have always wondered in what aerospace exploits the students and faculty on the field that night went on to participate. I would like to express my appreciation to the numerous individuals, both in space and on the ground, who have contributed to the incredible advances in technology and knowledge over the past 55 years. You have tremendously enriched my life and that of millions of others around the world. On the assumption that some of the viewers on the field read Aviation Week, I would be interested to know where their pursuits in aerospace have taken them.

Dr. Gilbert H. Lang

ROSEVILLE, CALIF.

PARTISAN PARRYING AND THE DOD

Joseph C. Anselmo's "Decline and Opportunity" commentary (AW&ST Dec. 3, p. 14) is an overly simplistic assessment of the "negotiations" within the government surrounding the pending fiscal cliff. To assert that Congress lacks the maturity of a six-year-old is nonsensical. Congress is not a single entity intent on doing what is best for the country. It is a collection of 535 Big Egos, each beholden to some group or ideology that elects them.

The reality is that, for years, rank-and-file Democrat voters strongly support government social welfare programs and heavily taxing "the rich." And Republicans have been beating the drum of fiscal doom-and-gloom and that economic collapse is just around the corner unless we change our irresponsible ways.

Most Republican voters see clearly the need for a strong Defense Department. However, they also understand the enormous danger to the economy of continued fiscal irresponsibility at the federal level.

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

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

It is apparent that Republican politicians are realizing they can't maintain both a strong defense and a strong economy, so they are doing the adult thing and making a choice, opting for increased economic prosperity over enhanced security.

Anselmo seems to believe that A&D investors matter a lot and for that reason Congress should overlook the polarization underpinning the problem and save the Pentagon. In the larger scheme of things, A&D investors are insignificant.

Rick Cunningham

ORO VALLEY, ARIZ.

SLOWER, BUT SAFER

Regarding "Pyrology for Cargo" (AW&ST Dec. 17, p. MRO22), I believe a common element as to the possible causes of each of the fire-related accidents cited was certain lithium-ion batteries.

That the cargo airlines involved and the FAA have not banned carriage of these batteries is another case of moral turpitude, trading assets and human lives for some miniscule gain in profit margin.

Transporting these batteries by ships more capable of fighting such fires would result in the delay of only a few weeks for the cargo to reach its destination; the pipeline would be empty for only the difference in time between airplane and ship transit. When the ship pipeline was refilled, normal income would resume. Any delay is certainly less costly than the lives and assets that were squandered.

Allan Sweeney

LOUISVILLE, KY.

DISTAFF STRIDES NOT REFLECTED

I was disappointed to see that of all the Aviation Week Program Excellence Awards (AW&ST Dec. 3, p. S1) only one woman is among the featured winners.

James Sakauye

SACRAMENTO, CALIF.



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Karim Hijazi



Todd Witchall

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Jeff Smisek has been appointed chairman of Chicago-based *United Continental Holdings Inc.*, effective Dec. 31. He will remain president/CEO. Smisek succeeds **Glenn Tilton**, who also was chairman/CEO of UAL Corp. before it merged with Continental. Tilton will remain on the board of directors. Other appointments are: **Jim Compton**, vice chairman/chief revenue officer; and **Jeff Foland**, executive vice president-marketing, technology and strategy.

Grace Lieblein has been named to the board of directors of *Honeywell*, Morris Township, N.J. She is president/managing director of GM Brazil and vice president of board of directors of the American Chamber of Commerce Mexico.

Mark Shaw (see photo) has become VP-general counsel at Dallas-based *Southwest Airlines*, succeeding **Madeleine Johnson**, who plans to retire Feb. 1. Shaw was associate general counsel for corporate transactions.

Pratyush Kumar has been appointed president of *Boeing India*, based in New Delhi. He succeeds **Dinesh Keskar**, who returned to Boeing Commercial Airplanes. Kumar was New Delhi-based president and CEO of GE Transportation for South Asia.

Robert H. Lewis has been named VP and general manager of Montreal-based *CAE's* Business Aviation, Helicopter and Maintenance Training business unit. He was CEO and president of Pentastar Aviation.

Matt Christiansen has joined Westerly, R.I.-based *Ametek SCP* as senior design engineer. He was engineering manager at Seacon Advanced Products.

Ahmad Abdulkarim Julfar (see photo) has become chairman of Dubai-based *Thuraya Telecommunications Co.* He is CEO of Etisalat Group. Also elected to the board was **Daniel Ritz**, group chief strategy and mergers and acquisitions officer of Etisalat.

Shereen Hanafi (see photo) has been appointed director of communications. She has held corporate communications roles at SES, Xantic, Fenestrae and KPN. **Joseph R. Francis** has been named director for North America.

Edgar Maimon has been appointed-general manager of Haifa, Israel-based *Elbit Systems Electronic Warfare* and

Sigint-Elisra Div., effective Feb. 1. He will succeed **Itzhak Gat**, who has announced his retirement. Maimon is VP-marketing and business development.

Yehuda (Udi) Vered will become general manager of *Elbit Systems Land and C4I Div.*, succeeding **Bezhalet (Butzi) Machlis**, effective Jan. 1. He is executive VP-service solutions, and VP-marketing for the Land and C4I Division.

Allan Stanton has become VP for international sales in the Middle East for Savannah, Ga.-based *Gulfstream Aerospace Corp.* He was sales director for Hawker Beechcraft in the Middle East, Africa and Turkey.

USN Rear Adm. (lower half) **Randolph L. Mahr** has been nominated for promotion to rear admiral. He is deputy director of the Joint Strike Fighter Program in the Office of the Under Secretary of Defense for Acquisition, Technology and Logistics at the Pentagon.

Constantine Karayannopoulos has been named interim president and CEO of Greenwood, Colo.-based *MolyCorp*, succeeding **Mark A. Smith**, who has left the company. Karayannopoulos was president and CEO of Neo Material Technologies.

Annette Verschuren has been appointed to the board of Montreal-based *Air Canada*. She is the past president of The Home Depot Canada.

Karim Hijazi (see photo) has joined Monaco-based *Boutsen Aviation* as sales representative for Dubai. He was managing director for sales, audits and training at Air Synapsis Aircraft.

John L. Berizzi has been named to the Technical Sales Group of Greenville, S.C.-based *Stevens Aviation*. He was a charter sales representative at Hop-A Jet.

Jamie Ryan has become VP and chief information officer at Chelmsford, Mass.-based *Mercury Systems*. He was CIO at Aspect Software.

Todd Witchall (see photo) has been appointed VP-finance and CFO of Redmond, Wash.-based *Crane Aerospace*

and Electronics. He was senior business operations manager at Lockheed Martin.

USAF Lt. Gen. Stanley E. Clarke, 3rd, has been named director of the Air National Guard in the National Guard Bureau at the Pentagon. He has been commander of the First Air Force (Air Force North) and the Continental U.S. North American Aerospace Defense Command Region, Tyndall AFB, Fla. Maj. Gen. **Garrett Harencak** has been appointed assistant chief of staff for strategic deterrence and nuclear integration at USAF Headquarters. He has been commander of the Air Force Nuclear Weapons Center of Air Force Materiel Command, Kirtland AFB, N.M. Harencak will be succeeded by Brig. Gen. **Sandra E. Finan**, who has been principal assistant deputy administrator for military application in the Office of Defense Programmes of the En-

ergy Department's National Nuclear Security Administration. Brig. Gen. **Charles Q. Brown, Jr.**, has been selected for promotion to major general and appointed to deputy commander of U.S. Air Forces Central Command/deputy combined force air component commander of U.S. Central Command in Southwest Asia. He has been deputy director of operations at U.S. Central Command Headquarters, MacDill AFB, Fla. Brown will be followed by Brig. Gen. **Jeffrey L. Harrigian**, who has been assistant deputy commander of U.S. Air Forces Central Command/assistant vice commander of the 9th Air Expeditionary Task Force of Air Combat Command (ACC), Shaw AFB, S.C. Harrigian will be succeeded by Brig. Gen. **Scott L. Dennis**, who has been special assistant to the commander of the ACC 9th Air Force. ☐

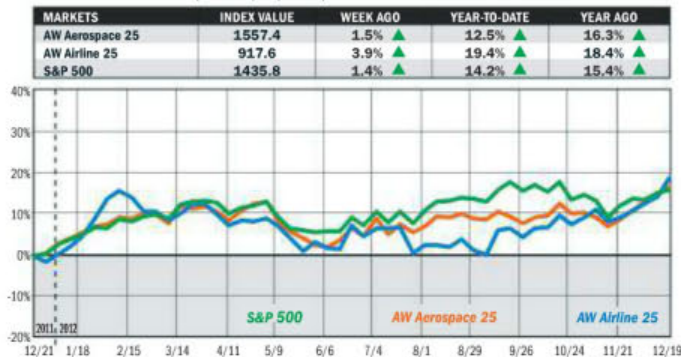


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AW&ST/S&P Market Indices

(as of 12/19/2012)

PERCENT CHANGE



Weekly Market Performance

Closing Prices as of December 19, 2012

Company Name	Current Week	Previous Week	Fwd. P/E	Tot. Ret. % 3 Yr.	Tot. Ret. % 1 Yr.
AEROSPACE & DEFENSE					
AeroVironment Inc.	22.05	22.81	15.8	-22.4	-29.5 ▼
Allegheny Technologies Inc.	29.62	28.04	18.4	-24.0	-33.8 ▼
Alliant Techsystems Inc.	62.70	62.05	9.1	-26.7	13.1 ▲
BAE Systems plc	5.56	5.47	8.5	17.8	31.1 ▲
Boeing Co.	75.51	75.47	14.9	52.0	6.8 ▲
Bombardier Inc. 'B'	3.62	3.44	8.3	-19.4	1.4 ▲
Cobham plc	3.60	3.46	10.7	0.8	35.6 ▲
Curtiss-Wright Corp.	32.71	31.53	11.9	11.9	-6.0 ▼
DigitalGlobe Inc.	24.81	25.81	20.1	3.3	54.1 ▲
EADS NV	39.77	38.36	12.7	136.9	29.3 ▲
Eaton Corp.	54.12	52.04	13.2	86.9	28.2 ▲
Elbit Systems Ltd.	40.41	39.82	11.0	-27.7	-3.1 ▼
Embraer-Empresa Brasil ADR	26.65	25.81	10.0	36.3	11.3 ▲
Esterline Technologies Corp.	64.40	64.11	11.6	60.0	17.8 ▲
Exelis, Inc.	11.58	11.56	7.0		37.3 ▲
Finmeccanica SpA.	5.69	5.30	7.4	-58.1	55.7 ▲
FLIR Systems Inc.	21.56	20.45	13.9	-27.4	-14.7 ▼
General Dynamics Corp.	69.52	68.90	9.6	11.3	11.2 ▲
General Electric Co.	21.01	21.78	13.1	48.0	25.9 ▲
GKN plc	3.69	3.64	9.0	115.8	33.4 ▲
Harris Corp.	50.10	49.06	9.6	20.2	47.0 ▲
Hexcel Corp.	27.21	25.62	16.5	115.1	10.7 ▲
Honeywell International Inc.	63.77	61.10	13.5	76.4	20.4 ▲
Huntington Ingalls Industries Inc.	42.28	41.93	11.8		31.7 ▲
L-3 Communications Hldgs. Inc.	76.33	76.14	9.6	1.5	24.5 ▲
Lockheed Martin Corp.	92.91	91.81	11.7	37.8	24.0 ▲
Moog 'A'	38.96	37.87	10.9	35.5	-9.7 ▼
Northrop Grumman Corp.	68.70	68.15	9.9	50.0	25.3 ▲
Orbital Sciences Corp.	13.46	13.19	12.6	-7.2	-7.0 ▼
Parker-Hannifin Corp.	86.21	83.12	12.8	68.4	15.0 ▲
Precision Castparts Corp.	187.56	184.51	17.3	67.3	15.3 ▲
QinetiQ Group plc	3.09	3.06	12.2	22.9	43.4 ▲
Raytheon Co.	58.75	58.14	11.1	23.8	29.7 ▲
Rockwell Collins Inc.	58.47	56.96	13.2	10.3	8.2 ▲
Rolls-Royce Group plc	14.37	14.13	14.8	84.1	22.9 ▲
Safran SA	43.27	42.35	14.9	172.1	50.3 ▲
SAIC Inc.	11.66	11.45	8.1	-36.2	-1.7 ▼
SIFCO Industries Inc.	16.88	15.93		19.2	-10.5 ▼
Singapore Technologies Eng.	3.18	3.15	21.0	39.8	52.7 ▲
Spirit Aerosystems Holdings	16.22	16.14	7.8	-17.0	-19.9 ▼
Textron Inc.	24.62	24.00	11.3	33.3	34.4 ▲
Thales	36.18	35.76	9.3	-15.0	23.0 ▲
Triumph Group Inc.	66.05	64.71	10.4	176.8	11.4 ▲
United Technologies Corp.	83.03	81.00	15.3	28.6	14.5 ▲

COMMENTARY

Shattering The Last Glass Ceiling

In November 2008, the year Wanda Austin became CEO of **The Aerospace Corp.**, *Aviation Week & Space Technology* featured her on the cover with a three-page profile inside. "The fact that Austin is a woman and an African-American is impossible to miss," the magazine wrote.

In the four years since then, dozens of female senior executives have made their mark in aerospace and defense, an industry not historically known for its diversity or inclusiveness. And the last glass ceiling will shatter on Jan. 1 at two of the Pentagon's largest contractors. Marilyn Hewson will become CEO of **Lockheed Martin** after rising for nearly 30 years through the company's management ranks, and Phebe Novakovic will take over as CEO of **General Dynamics**. The fact that both are women is an afterthought.

Hewson dismisses the notion that her gender sets her apart from the retiring CEO she is replacing, Robert J. Stevens. She has held 19 different leadership positions since joining the old Lockheed Corp. in 1983 as a senior industrial engineer, most recently running its largest business, Electronic Systems. "Professionals are getting experience, performing, moving up and competing for jobs," she says when asked about the role of women in A&D's top ranks. "I competed for my job, as did my colleagues. It's not about gender."

But women are unmistakably changing the face of an industry whose upper ranks were once dominated by middle-aged, mostly white men. Three of Lockheed Martin's four business areas are run by women, including Hewson, and one in four employees at the company is female. An analysis by Aviation Week editors finds that the ranks of many major A&D companies in the U.S. and Europe are populated with senior women executives. They include, to name a few, **Aerojet**, **BAE Systems**, **Boeing**, **Eutelsat**, **HE Engineering**, **Hispasat**, **Honeywell**, **Intelsat**, **L-3 Communications**, **Northrop Grumman**, **Raytheon**, **Rockwell Collins**, **SAIC**, **Safran**, **Sierra Nevada Corp.**, **SpaceX**, **Thales** and **United Technologies Corp. (UTC)**. Linda Hudson has served as CEO of BAE's critical North American unit for several years. And women lead the U.S. Defense Advanced Research Projects Agency, the European Defense Agency and the U.S. Aerospace Industries Association.

That is not to say that women hold anywhere near the proportion of senior posts across the industry that they do at Lockheed Martin. UTC, for example, has just one woman on its 14-member leadership team, and only five of the 42 senior executives listed on Boeing's website are female. While women now comprise 23% of the U.S. A&D workforce, they account for just 12% of its engineers, according to data from Aviation Week's 2012 A&D Workforce Study. And only two major corporations—Rockwell Collins and SAIC—have women as the senior executive responsible for technology and engineering.

As for Austin, she still runs The Aerospace Corp., and probably will be featured again in this magazine. It's a good bet when that happens her gender won't even come up. ☺

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

DEFENSE

Indian AWACS

India is likely to buy two additional Airborne Warning and Control System (AWACS) aircraft to strengthen its air defense, according to Defense Minister A.K. Anthony. The air force currently has three Israel Aerospace Industries/Elta Phalcon radar systems mounted on Ilyushin Il-76 aircraft, under a \$1.1 billion deal with Israel and Russia signed in 2004. Anthony did not say whether India will proceed with a follow-on option for the Phalcon or release fresh tenders.

India Gets Its First P-8I

India officially took delivery of the first of eight P-8I maritime patrol aircraft last week, although it has not yet left Boeing's Seattle factory. The navy is to receive two more in 2013 and the fourth and fifth aircraft are now in assembly.

AIR TRANSPORT

Fifty More for Boeing

In its last web order update for the

year, Boeing added 50 to its total for 2012, raising its net for the year to 1,115. The biggest boost came from 777s, one for Iraq and 30 that are unidentified. FedEx may be suffering from weakened demand—it said last week that quarterly profits dropped 12%—but it has ordered four 767-300Fs, bringing its total order count for the type to 50. The new deliveries are to start in 2014. But FedEx also deferred two 777F deliveries from 2015 to 2016 “in order to better match capacity timing to global demand.” Separately, Boeing said in its Dec. 19 order report that it lost one for a 777 and one for a 787. It also diverted one 747-8 destined for Lufthansa as a developmental test aircraft. But Boeing added 15 737NGs, bringing its total for the year to a net 1,047, easily eclipsing the previous record of 846 set in 2007.

Chinese 787s Await Local OK

Six completed Boeing 787s are idle, awaiting a type certificate that the Civil Aviation Administration of China (CAAC) will probably not issue until

Boeing and Embraer Unveil Runway Safety Plan

As part of Boeing and Embraer's recent pact to cooperate on commercial aircraft features designed to enhance safety and efficiency, the two airframers are planning an initiative to reduce runway excursions. These have resulted in more than 780 fatalities in 15 accidents from 2002-11.

The plan includes new pilot procedures, training aids and flight-deck technology, and will apply to both Boeing and Embraer families of commercial aircraft. Boeing Commercial Airplanes' director-aviation safety, Corky Townsend, says the plan initially involves development of a “shared set of tools to improve situation awareness,” the first elements of which provide for development of new pilot procedures and the making of a new training video on landing performance. Longer term, the initiative includes development of new joint technology and systems for flight decks.

Mauro Kern, executive vice president of engineering and technology at Embraer, says the initiative is a “very important development within the context of the broader agreement” and is a “perfect project for the two teams to collaborate on.” The manufacturers are “working on finalizing the procedures that will be improved in each company's flight manuals,” he adds. The revised procedures, and training video will be distributed in 2013, with modified manuals being issued for some of the Boeing and Embraer models “within the next six months,” says Townsend.

Procedural changes will be written to ensure that, prior to landing, pilots repeat the same runway calculations made during flight planning. In addition, on landing there will be a callout for speed brakes, which shorten rollout distance by cutting lift and adding more weight on the wheels and brakes. The revised manuals will remind crews that thrust reversers can continue to be used at speeds below the 60-kt cutoff normally recommended to prevent foreign object damage to engines.

The longer-term plan for upgraded situational awareness will package several tools, including some existing features such as Honeywell's runway alert and advisory system, or SmartRunway. However, the new effort “is inclusive of this, but goes beyond it and includes features that would give greater situational awareness such as a head-up-display—with a runway depiction with stopping distance and projected markers on the runway—to give some perspective. The visual cues would also be down on the primary flight display,” Townsend adds.

CFIT Accidents on the Rise

The final report on the May 9, 2012, crash of a Sukhoi Superjet 100 prototype on a demonstration flight near Jakarta, Indonesia, highlights a growing trend in fatal airline accidents: the reemergence of controlled flight into terrain (CFIT) as a major contributor to airline fatalities.

“[The Superjet accident] is in keeping with the rising trend in CFIT accidents over the past two years,” says Jim Burin, director of technical programs at the Flight Safety Foundation (FSF). “We had hoped we were getting rid of them.”

The Superjet crash killed 41 passengers and four crewmembers when the twinjet hit a ridge of Mount Salak at the 6,000-ft. level, well below the area minimum altitude of 13,200 ft., the minimum prescribed for “off-airway” flights when using instrument flight rules (IFR), according to the Indonesian National Transportation Safety Committee's final report, issued Dec. 18.

The pilots initially began their IFR flight plan at 10,000 ft., but asked for and received air traffic control approval to descend to 6,000 ft. to fly a right-handed orbit in a training area that was largely clear of terrain, with the exception of several mountains which were noted on charts that the crew did not have. The controller had been led to believe that the aircraft was a Sukhoi Su-30 fighter jet and would be familiar with the military training area.

Although the mountain was obscured by clouds, the aircraft's ACSS-built terrain awareness and warning system (TAWS) was working and had alerted the crew 38 sec. before the crash to “pull up.” The pilot-in-command inhibited the warning system (eliminating both aural and visual terrain warnings), assuming there was a problem with the database. At 7 sec. before the crash, a “landing gear not down” warning was activated based on the approaching terrain. A potential airline customer was in the jumpseat during the flight, and cockpit voice recorder data showed non-pertinent conversations underway.

Recommendations centered on ensuring that flight crews receive the training needed to “respond properly to aircraft system warnings,” that IFR flights abide by published minimum safe flight altitudes and that ground radar systems compute terrain clearance predictions. In the Superjet accident, air traffic control systems sounded alerts when the aircraft entered the training area, but functions that would have told controllers that the aircraft was headed for high terrain had not been installed, even though the equipment was capable.

Burin says the FSF will highlight this accident trend in its yearly report.

March. Hainan Airlines, owner of three of the aircraft, is particularly anxious to take delivery, because it needs the aircraft to open planned routes, say industry sources. China Southern owns the other three, and it will put the type into Chinese service first. The CAAC's target is March.

Australian Approval

Australia's competition watchdog says a proposed Qantas-Emirates partnership should be allowed to proceed, although the Australian Competition and Consumer Commission has also signaled its intention to impose capacity conditions on routes between Australia and New Zealand. The commission has issued a draft approval for the Qantas and Emirates plan to cooperate closely, particularly on routes from Australia to Europe via Dubai.

BUSINESS AVIATION

G650 Deliveries Begin

Gulfstream has begun deliveries of outfitted G650 ultra-long-range, ultra-large-cabin business jets, with the first two aircraft going to U.S. customers Wynn Resorts and Exxon Mobil. The all-new G650 was certified in early September, and Gulfstream has a backlog of five years' production.

AEROSPACE BUSINESS

New CEO at Thales

French arms maker Thales has chosen former Vivendi Chief Executive Jean-Bernard Levy to pursue continued recovery of the group and its future development. Levy, 57, replaces outgoing CEO Luc Vigneron, who, after three years as head of Thales, had lost the support of the company's majority shareholders, the French state and Dassault Aviation. The change came two days after Dassault announced Eric Trappier would succeed Charles Edelstenne as chairman and chief executive of the French aircraft maker, effective Jan. 9. Edelstenne, who turns 75 on that date, will step

CORRECTION: "On the Covers" on the Table of Contents in the Dec. 17 issue (page 6) misidentified the aircraft on the cover of the MRO Edition. It is an Air Canada Embraer 190.

down to comply with the company's age restrictions.

UAC Revenue Up

The revenue of Russia's United Aircraft Corp. in 2012 is expected to reach 180 billion rubles (about \$5.8 billion), CEO Mikhail Pogosyan said last week. By the end of 2012, UAC is expected to have delivered 20 commercial aircraft, and 35 military aircraft to the Russian defense ministry. For the first time the deliveries to the Russian military will outnumber the exported combat aircraft, said Pogosyan. The corporation delivered 102 combat and civil aircraft last year.

Russian Exports

Russia has set another record in foreign arms trade. According to President Vladimir Putin, the value of Russian weapons delivered to foreign customers in 2012 exceeded \$14 billion—6% more than in 2011 (\$13.2 billion) and more than twice the \$6.5 billion reached in 2006. Although no regional breakdown of the defense exports has been officially revealed, India is likely to remain the largest importer of Russian weapons.

SPACE

Six-Person Crew Restored

A three-man multinational crew that includes veteran astronaut Chris Hadfield, who is scheduled to become the first Canadian to command the International Space Station in mid-March, was on track late last week to dock with the orbiting laboratory Dec. 21. The Soyuz TMA-07M capsule carried cosmonaut Roman Romanenko, NASA astronaut Tom Marshburn and Hadfield. The newcomers are expected to restore the ISS's crew to its full complement of six members for the first time since Nov. 19.

Grail Impact

NASA's fuel-depleted Gravity Recovery and Interior Laboratory (Grail) A and B lunar mission probes slammed into a mountain near Goldschmidt crater at the Moon's North Pole late Dec. 17, ending a one-year mission. The carefully targeted impact of the two washing machine-sized spacecraft, renamed Ebb and Flow, occurred on schedule, with Ebb striking first at 5:28 p.m. EST, and Flow striking 32 sec. later. The spacecraft impacted the Moon at 3,800 mph.

Pinnacle's Pilot Deal Could Reverberate

A Pinnacle Airlines contract with its pilots, if ratified in mid-January, will provide Delta Air Lines with its path to reducing the number of 50-seat jets operated by its regional airline partners to 125 or fewer by the end of 2015. That will be down from more than 300 now, which Delta says will save \$400-500 million over the next three years by avoiding heavy maintenance checks.

At Pinnacle, the cost-cutting contract could save the carrier, albeit with a much smaller workforce, under long-term assignments to operate 76-seat Bombardier CRJ700s for Delta while phasing out its 50-seater operations for the carrier. What has not been answered is how Delta plans to dispose of the 181 CRJ200s now slated to land back on its doorstep: 140 from Pinnacle and 41 under a separate deal with another regional partner, SkyWest. Delta also has 10 CRJ200s and 34 CRJ100s previously operated by its now-defunct subsidiary Comair, in storage. SkyWest, concurrently, has 24 CRJ200s of its own to reassign or decommission by the end of 2015.

Already, counting the Comair aircraft, there are 68 CRJ200s in storage worldwide. Delta has only disclosed plans for 60 of its CRJ200s; they will be returned to Bombardier in exchange for the acquisition of 40 new CRJ900s, which are slated for operation by Pinnacle. Bombardier says it is confident in its ability to find a home for those CRJ200s in places such as Africa and Russia, although parting out also will be among its options.

The Pinnacle deals also will have implications for the rest of the U.S. regional airline industry and the pilots who work in it, depending on how much the labor contract lowers Pinnacle's pilot costs. The deal could set a new lower cost bar for the operation of 76 seaters for Delta—apparently one of its aims in providing debtor-in-possession financing to Pinnacle with conditions on labor costs—as well as for 76-seater operations for other carriers.

RL10 To Help Launch WGS

The U.S. Air Force is planning to use the RL10B-2 engine for a late February flight of the fifth Wideband Global Satcom satellite on a Delta IV rocket, according to the Air Force's military satellite communications system program office. The Delta IV, which uses the RL10B-2 to power the upper stage, malfunctioned during an Oct. 8 GPS IIF launch.

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COMMENTARY

Small World

Can very small imaging satellites replace unmanned aircraft?

It's a classic chicken or egg dilemma. Small satellites are not being built because there is no cheap way to launch them, and small launchers are not being built because there are no satellites to launch on them. So the U.S. Defense Advanced Research Projects Agency (Darpa) is attacking the problem from both directions simultaneously, with dual programs to develop \$500,000 imaging satellites of less than 100 lb. and air-launched boosters to place them in low Earth orbit for \$1 million a flight.

Darpa's goal is to "prove the military utility of very small satellites by attacking the problem from a system perspective, to show that if you have both [small satellites and small launchers] you can get useful data," says Randy Gricius, program manager for space applications at Raytheon Missile Systems.

Under Phase 1 of Darpa's Space Enabled Effects for Military Engagements (SeeMe) program, Raytheon has received a nine-month, \$1.5 million contract to design a small imaging satellite that can be produced and launched on demand, to provide imagery on request direct to the hand-held devices of individual soldiers.

Darpa's intent is to show that a constellation of 24 such satellites can be launched at a fraction of the cost of acquiring additional unmanned aircraft to provide the same electro-optical (EO) imagery to small units. The Airborne Launch Assist Space Access (Alasa) program is developing the booster needed to launch the SeeMe satellites quickly and affordably.

While Darpa says other SeeMe contracts will be awarded, Raytheon's plan is to "bring a different perspec-



RAYTHEON

tive" to the program by applying its tactical-missile manufacturing and exoatmospheric kill-vehicle technology to designing and building a satellite providing 1-meter-resolution visible imagery, says Gricius.

At no more than 100 lb.—Raytheon's design weighs in at less than 44 lb.—the SeeMe satellite is a fraction of the size of existing quick-reaction "operationally responsive spacecraft" (ORS) concepts. "ORS-class is around 400 lb., which is still a fairly good size," he says. "We are a missile house—7-in.-dia. is pretty big for us."

Another difference is that SeeMe spacecraft are intended to be produced on demand—90 days from placing an order to launching a satellite. "The idea with ORS is to stockpile. That gets expensive. SeeMe will take the inventory cost out by building on demand, very quickly," Gricius says.

Launched into LEO, each satellite will orbit the Earth every 90 min., requiring a constellation of at least 24 spacecraft for persistent coverage. By pressing the "SeeMe" button on a

smartphone, a soldier on the ground will request imagery of his surroundings. A satellite will hear the request, re-orient its sensor to the soldier's location, take the image and transmit it back within minutes.

Notionally, each satellite will be launched into a 350-km (218-mi.) orbit for 45 days, but there are several variables to be studied during the first phase. Lower altitude would increase imaging resolution, but atmospheric drag would shorten satellite life, requiring propulsion as well as more spacecraft for persistent coverage. Higher altitude would extend life, but reduce resolution and make it harder for the satellites to hear requests for imagery from individual smartphones.

Darpa is looking at deployable antennas and membrane optics to increase sensitivity and resolution, which add weight and cost. Raytheon's design has deployable solar arrays to provide power for 45 days, but its camera uses more traditional optics derived from sensors on its missile-defense kinetic-energy interceptors. "We looked at deployable optics, but they are too expensive," says Gricius.

Darpa is interested also in crosslinks, so an image request received by a satellite just as it descends below the horizon can be passed to another still in view, but there is a cost. "We have no crosslinks. Each is a free-flyer. The satellite in view takes the image," he says. Raytheon is looking at a smartphone app to let the soldier know when a satellite is in view.

A major challenge of the SeeMe program will be enabling affordable "non-continuous" production to meet the \$500,000 unit-cost target for satellites ordered on demand, in batches. Darpa urges contractors to look at the automotive, cell phone and medical industries for technology, while Raytheon plans to leverage its high-volume missile manufacturing culture, says Gricius.

The launch vehicle will also be a critical part. Although SeeMe satellites could be launched in batches on larger boosters, "we need an Alasa-class vehicle to be affordable," he says. Alasa aims to develop a small booster that can be air-launched at short notice from a tactical fighter or business jet with minimal aircraft modification. ☐



By Pierre Sparaco

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Pierre Sparaco has covered
aviation and aerospace
since the 1960s.

COMMENTARY

Crystal Balls

Some industry experts see eightfold growth in commercial air passenger numbers by 2150

One day in the distant future, air traffic will certainly stop growing. The current annual growth rate of 5% per year cannot be sustained forever. If it were, the world's population would eventually spend more time in the air than on the ground.

But what's the limit, if any? What does the "foreseeable" future look like? ID Aero, a noted French aviation consultancy, answers: Air transportation is likely to reach a plateau around 2150, when airlines will carry about 25 billion passengers per year. The prediction looks plausible, but the choices and assumptions on which it is based require some explanation.

"Scrutinizing very long-term traffic predictions, our ultimate goal, means to switch from a magnifying glass to a telescope," says Jacques Delys, who heads ID Aero. "This is not a purely theoretical view. We can draw on a robust database."

Airline industry experts and forecasters, with the help of trade groups, the International Air Transport Association, Airbus, Boeing and engine manufacturers—which all frequently update their outlooks—say that commercial air traffic, currently approaching 3 billion passengers per year, will continue to grow at the same pace in the next 20 years and then begin slowing down. However, critical to seeing beyond the horizon is having an accurate picture of how the world's population will evolve. And that picture is not easy to compose.

The United Nations has a range of population scenarios for 2150. ID Aero's economists favor the U.N.'s "high-medium" forecast, which predicts there will be 16 billion people on Earth 140 years from now. To that forecast ID Aero adds an in-depth analysis of air transportation in the

LONDON HEATHROW AIRPORT



U.S., a "mature" market that helps create predictions about the future in other regions. Today, 40% of U.S. citizens travel by air, making three roundtrip voyages on average per year, the stage length of which averages 1,800 km (1,120 mi.).

ID Aero then took into account additional inputs to formulate its forecast for 2150. If the world's air transportation does gradually catch up to the U.S. level, despite a slowly decreasing growth rate, the 25-billion-passenger head count will become a reality by 2150, it asserts. In 1970, no airline executive or trade group president was ready to bet traffic would grow by a factor of 10 in 40 years. Even 10 years later, in 1980, no one seriously expected traffic to triple within 30 years.

Of course, the unknowns must be

kept in mind in making projections about the next 40 years. By 2050, airline fleets will not be significantly different from those today, in the absence of technological breakthroughs. Commercial transports will be more efficient, powered by engines with lower specific fuel consumption. But "next-generation" aircraft such as the Boeing 737 MAX and Airbus A320NEO, which are derivatives of twinjets that have been in service for decades, are expected to remain in production for another 30 years. Air traffic management will be much improved, while expanded airports will provide additional takeoff and landing slots needed to accommodate more aircraft movements. ID Aero has little to say about the availability of aviation fuel, though, in the absence of reliable information on the oil peak and synthetic kerosene.

By 2050, the world's airlines are expected to operate 42,000 aircraft, says Hal Calamvokis, a former EasyJet executive who now manages an

Major hubs, such as London's Heathrow Airport, will require additional runway capacity to accommodate continuing airline traffic growth.

independent consulting team. Seating capacity will gradually increase by an estimated 25%, but there is unlikely to be a need for 1,000-seat aircraft, Calamvokis told a professional audience in Toulouse recently.

Do we really need to know what air transportation will look like so far into the future? Delys acknowledges that ID Aero is reluctant to release its recently completed in-house study, which primarily aims to make projections about the next 20 years and, incidentally, the next 50 years. Nothing should be taken for granted but, let's face it, looking at the very long term is a fascinating experience. The lessons to be learned from such an exercise also could support and enhance studies covering multiple disciplines, as long as one remains aware of the airline industry's very long cycles, for example in planning additional airports.

The bad news is that none of us will be around in 2150 to listen to historians' comments, respectful or ironic. ☛



By Adrian Schofield

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COMMENTARY

Momentum Shift

While things are looking up for airlines, the rebound will not be dramatic

First the good news: The latest slump in the financial health of the airline industry appears to have bottomed out. Any celebration will be muted, however, since the recovery could be so gradual that it may not be noticeable in many major markets.

That is one of the main themes that emerges from new assessments by industry experts. They use different methodologies, but there is general agreement that the industry's last peak was in 2010, and was followed by a decline. While there is some difference on timing, the evidence seems to point to a slow rebound, with the improvement particularly noticeable in the U.S.

In the latest version of its global financial outlook, the International Air Transport Association predicts that the airline industry collectively will earn \$6.7 billion in profits this year. That is worse than the \$8.8 billion profit in 2011, but the fall is far less than in the previous year. IATA sees the decline reversing in 2013, with a modest increase to \$8.4 billion. This would still only equate to a profit margin of 1.3%, and IATA Director General Tony Tyler defines this as an industry just keeping its head above water.

Despite 2012 looking like the trough of the current cycle, it is actually shaping up better than IATA had earlier predicted. Improved financial performance in the second and third quarters prompted IATA to upgrade the forecast. Next year's profit estimate has also been lifted a little, but

the increase from 2012 to 2013 is now slightly flatter.

A new update of Aviation Week's Top-Performing Airlines (TPA) study suggests that the industry decline from the previous peak in 2010 has leveled off.

The TPA study calculates scores from 1-99 for publicly traded airlines, using a wide range of financial and operational data. In 2011 the median score for all airlines dropped by six points to 51. However, for the 12 months through June 30, 2012, the median score rose by one point to 52. This is essentially flat, with perhaps the first signs of an upward trend. (Full TPA studies are conducted annually using calendar-year results, and released in July; a mid-term update is completed in December using results for the 12 months through June. For much more on the TPA study, Aviation Week Intelligence Network subscribers can go to AviationWeek.com/awin/tpa).

In the IATA and TPA studies, airlines in some regions are faring better than others. IATA sees a significant decline in Asia-Pacific profits in 2012, in what was by far the strongest growth region in 2010. The TPA study also reveals that even some of the tra-

ditionally best-performing Asia-Pacific airlines are struggling this year.

The improvement of carriers in North America is a major highlight. IATA reports that airline profits for this region will rise from \$1.7 billion in 2011 to \$2.4 billion in 2012 and \$3.4 billion in 2013. The consolidation trend has helped globally, but has been particularly evident in the U.S., IATA says.

Of the 16 carriers from the North American region tracked in the TPA update, only three saw declines in total scores versus the 2011 results. TPA project manager Michael Lowry notes that U.S. airline management teams "continue to be on their best behavior, with excellent capacity constraint relative to passenger demand."

Boeing's market research, meanwhile, aligns with the same broad trends. The airline industry will be "modestly profitable in 2012, with 2013 looking very similar," says Randy Tinseth, Boeing Commercial Airplanes vice president for marketing. He says the industry will only see real improvement once the global economy stops "bouncing along" at 2-2.5% growth. Boeing estimates the economic recovery could occur in late 2013 or early 2014.

This echoes another of IATA's findings—that gross domestic product (GDP) growth remains close to the "stall speed" of 2%, which is about half the growth rate that fueled the airlines' 2010 expansion. According to IATA research, in the past 40 years the 2% GDP growth rate has been an inflexion point where airline industry profitability has turned into loss.

Tinseth says the airline industry has actually been performing relatively well, considering the state of the world economy for the past couple of years. Airlines are managing their businesses better and making more rational decisions, he says. Passenger demand has grown, although the cargo market has not recovered as much as expected.

The performance of U.S. airlines—and their increasing profitability—has been one of the most pleasing trends this year, says Tinseth. The bankruptcy process and consolidations served to make them more efficient, and they are now managing capacity well, he says. ☐

US Airways was one of the most-improved in the latest Top-Performing Airlines update.





By Frank Moring, Jr.

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COMMENTARY

Slow Start

The new Casis board has a lot of work to do

After a year of bureaucratic dithering by others, a core group of scientists and engineers has agreed to spearhead utilization of the U.S. National Laboratory on the International Space Station. The permanent board of the Center for the Advancement of Science in Space (Casis) has a steep learning curve, but its members appear willing to spend some serious time putting out the word that there's a unique microgravity research facility available in orbit to anyone with a good idea for using it, free of charge.

Meeting for the first time Dec. 13, the diverse group set some critical priorities and vowed to convene by teleconference weekly to get the ball rolling. It's about time someone showed that kind of urgency about non-governmental ISS utilization. Given the uncertainty surrounding any space operation, the delays in making the most of the \$100 billion facility have been inexcusable.

Since the summer of 2011, when NASA picked Space Florida to establish the non-profit organization Congress wanted to run the National Lab, there has been only intermittent progress in setting it up. The first director appointed by Space Florida, the state's aerospace industrial-development agency, soon resigned after complaining of meddling by NASA headquarters, congressional staffers and a consultant the state agency hired to help draft its proposal (*AW&ST* June 25, p. 45).

At its first meeting, the permanent board set as its top priority selecting a full-time executive director. It has been operating with an acting chief executive since the original director quit.

"We are deeply, deeply aware of the time sensitivity," say board member France Cordova, an astrophysicist who served as NASA's chief scientist in the 1990s.

Under an interim director, James

NASA JOHNSON SPACE CENTER



Royston, and an interim board, Casis has hired a staff and issued some low-dollar drug-research grants that continue the kind of work that started decades ago on the space shuttle. But the new board members concede that many researchers don't know that fully half of the space station's U.S.-controlled facilities are available (see photo).

Members say they spent most of their first meeting in briefings about station operations from William Gerstenmaier, NASA associate administrator for human exploration and operations; representatives of the space station program office at Johnson Space Center; and members of the staff assembled by Royston. Board member Lewis Duncan, the president of Rollins College, says when the telecons begin, another item high on the agenda will be expanding the number of scientists on the board.

Only three of the current seven board members are considered "scientific

members"—Dr. Bess Dawson-Hughes, director of the Bone Metabolism Laboratory at Tufts University; Andrei Ruckenstein, vice president of research and associate provost at Boston University; and Gordana Vunjak-Novakovic, professor and vice chair of biomedical engineering at Columbia University.

In addition to Cordova and Duncan, the other "managing members" of the Casis board are Dr. Leroy Hood, president of the Institute for Systems Biology; and Dr. Howard Zucker, professor of clinical anesthesiology at Albert Einstein College of Medicine. Both were picked as much for their experience managing large organizations as for their technical backgrounds, says Cordova, who has been president of Pursue University and the University of California-Riverside.

By boosting the scientific representation on the board, Casis should be able to expand its presence in the larger community of scientists and engineers who could benefit from the unique environment on the ISS. That quality extends beyond microgravity and the extremely low vacuum outside the station's pressurized modules to the serendipitous discoveries that are possible when humans attempt to survive outside the ecology where they evolved.

The issue came up at a congressional hearing this month on "the future of NASA." Addressing the inevitable humans-vs.-robots question, Scott Pace—director of the Space Policy Institute at George Washington University—cited advances in space-based vaccine development made possible by unanticipated changes in bacterial virulence as evidence that "by putting people in unusual or alien situations, you learn things that you wouldn't learn if you stayed at home."

Pace added, "Human spaceflight is probably the most interdisciplinary scientific and technical activity that this country can engage in."

"This is a time of convergence of science, and the integration of different disciplines," says board member Vunjak-Novakovic. ☐



By Jen DiMascio

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

COMMENTARY

Leadership Shuffle

Mikulski to control Senate's purse strings

Sen. Barbara Mikulski (D-Md.), currently the longest-serving woman in Congress, will now become the first woman to lead one of what is perhaps its most powerful panels, the Senate Appropriations Committee. Mikulski takes control of the committee after the recent death of Sen. Daniel Inouye (D-Hawaii), who had chaired the full committee since 2009 and led Democrats on the defense subcommittee since 1989. And she will serve alongside Sen. Richard Shelby (Ala.), who will lead Republicans on the panel.

"It's going to be a new day in Appropriations, but we're going to follow old-school values," Mikulski says. She currently leads the subcommittee on Commerce, Justice and Science, where she has been both fierce advocate and critic of NASA's James Webb space telescope, which is being developed at the Goddard Space Center in her home state.

Sen. Patrick Leahy (D-Vt.) had the seniority to replace Inouye but opted to maintain control over the Judiciary Committee. Now it will be Mikulski's challenge to shepherd a spending bill through Congress to replace the current continuing resolution that funds the government through the end of March. ☐

RULES OF THE SKY

Teeing up an issue for Congress in 2013, Rep. Edward Markey (D-Mass.) and Rep. Joe Barton (R-Texas), have introduced a bill that would push the FAA to begin setting privacy rules for the use of UAVs in civilian airspace. UAVs can carry "infrared thermal imagers, radar and wireless network 'sniffers,' with the capability to collect sensitive detailed information while operating in the skies above," according to Markey. As such, he is seeking to regulate their use.

Specifically, the bill would amend the FAA Modernization and Reform Act to

UPI/LANDOV FILE PHOTO



'It's going to be a new day in Appropriations, but we're going to follow old-school values.'

BARBARA MIKULSKI

require applicants for a UAV license to provide information on who will operate it, where it will be flown, what kind of data will be collected, how the data will be used, whether the information will be sold to third parties and how long the information will be kept. In addition, law enforcement agencies must explain how they will minimize the collection of data that is not related to a crime investigation. Law enforcement surveillance would require a warrant "or extreme exigent circumstances." The bill, the Drone Aircraft Privacy Transparency Act, would further direct the FAA to create a public website listing approved licenses with information about use of the UAV and any security breaches. ☐

DATING GAME

A year-end deadline for the Air Force and Navy to disclose the target initial

operational capability (IOC) dates for the Lockheed Martin F-35 Joint Strike Fighter was extended until June 1, 2013, in the last days of congressional conference negotiations over the 2013 defense budget. Programs are considered to have reached the benchmark once they complete initial operational test and evaluation. For JSF, there has been no published initial operating date since 2011, when the previous target of 2016 for the Block 3 configuration (the Air Force and Navy IOC standard) was abandoned, but government sources say that the dates are included in the program's current master schedule. The most recent Selected Acquisition Report predicts that initial operational test and evaluation will not be complete before February 2019. ☐

BALANCING ACT

Lawmakers are constantly caught between balancing the needs of the federal government while staying true to the voters at home. Such is the case in this year's fight to maintain the Air National Guard (ANG) and Reserve, which lends a hand to the active duty military while also standing ready to serve all 50 states. Congress balked at the Air Force's initial proposal to cut 287 aircraft and 11,600 personnel, ordering a freeze on retiring or transferring aircraft.

Lawmakers ultimately agreed to a compromise floated by Defense Secretary Leon Panetta with the caveat that the Air Force maintain another 32 Lockheed Martin C-130 or C-27J aircraft to meet Army airlift requirements. Compared with the Air Force's original request, the bill's final draft requires the service to restore 106 aircraft and about 5,400 personnel to the ANG and the Air Force Reserve.

Now, a fight for the 32 aircraft is on. To that end, Sen. Carl Levin (D-Mich.), the chairman of the Senate Armed Services Committee who had a hand in crafting the bill, has saved the federal government money and is looking to protect his state. To that end, Levin is coaching Michigan Gov. Richard Snyder (R) through the process of making the case for some of the 32 additional aircraft—either C-130s or C-27Js, to be based in Battle Creek. ☐

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BEST OF THE BEST

Jim Koepnick

Oshkosh, Wis.

Michael Araldi pilots his Cabin Waco over ground fog near Bartow, Fla.



Scores of photographers from around the world submitted  hundreds of photos to *AW&ST's* annual Photography and Art Issue. To see all of the finalist photos, tap on the  on the following pages.

An aerial photograph of a dense forest with a winding road. The trees are dark green and the road is a light greyish-brown. The overall tone is muted and atmospheric.

AVIATIONWEEK

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THIRD PLACE GENERAL

Evan Peers
San Carlos, Calif.

Double amputee parachutist brings in the flag at the 2012 Reno (Nev.) Air Races at Stead Field.

 **Vintage Aircraft**

FIRST PLACE GENERAL

Andreas Zeitler

Ingolstadt, Germany

The once popular sport of wingwalking is again becoming a huge attraction on the airshow circuit, as demonstrated by the two women on top of Boeing Stearmans at the La Ferte-Alais (France) Airshow in May.



Air Shows

SECOND PLACE GENERAL

Jessica Ambats

Santa Monica, Calif.

L-39 Albatros (piloted by Adam Grosser and Paul Strickland) and Falcon 2000 (piloted by Alan Rockey and Randy Howell) over the Golden Gate Bridge.



At Work and Leisure



FIRST PLACE DEFENSE

Aldo Wicki

Kerzers, Switzerland

A Swiss air force F/A-18C shoots self-defense flares against a dramatic late afternoon sky in Norway.

 **Fighters I**

 **Fighters II**





Alain Ernoult
Bagneux, France

French navy diver rescues an injured person east of Toulon, France.

SECOND PLACE DEFENSE

 **Multirole, Tankers and Reconnaissance Aircraft**



THIRD PLACE DEFENSE

Ted Carlson
Mission Viejo, Calif.

A U.S. Marine Corps Bell Boeing MV-22B Osprey of VMM-166 "Sea Elk" cruises over a California lake at sunset.

 **Rotorcraft/Tiltrotors**



FIRST PLACE SPACE

Stephane Corvaja

Paris, France

Soyuz VS01 undergoes a test before launch on its first flight, at the European Spaceport in French Guiana.



SECOND PLACE SPACE

Stephane Corvaja

Soyuz VS01 lifts off from the European Spaceport on its first flight, carrying IOV FM1 and 2 satellites.



THIRD PLACE SPACE

Dennis Underwood

Waco, Texas

The last single-engine test of a Falcon 9 first-stage engine takes place at the SpaceX rocket development facility in McGregor, Texas.

FIRST PLACE COMMERCIAL

Tom Pawlesh

Jefferson Hills, Pa.

An American Airlines Boeing 737-823, N830AN, is on approach to Runway 25L at Los Angeles International Airport.

 **Commercial Aircraft I**

SECOND PLACE COMMERCIAL



Ben Wang
Cupertino, Calif.

A Polar Air Cargo Boeing 747-400F departs Anchorage, Alaska, as storm clouds loom over the Chugach Mountains.

THIRD PLACE COMMERCIAL

**Ryohei
Tsugami**
Osaka, Japan

An All Nippon Airways
Boeing 787 overflies
downtown Osaka
on approach to
Osaka-Itami Airport.



 **Commercial Aircraft II**

THE JUDGES

SCOTT MARSHALL/AW&ST



(L to R): Photographer, author and archivist **DANA BELL** has retired after a 30-year career with the U.S. government. Starting as a photo researcher with the Air Force in 1976, he moved to the Smithsonian Institution's National Air and Space Museum in Washington in 1982. Bell has written 32 books on aviation history, and is now a full-time author. This year marked his 16th as a photo contest judge.

MITCHELL KOPPELMAN has been a professional news photographer and editor for almost 40 years. After beginning his career at United Press International, he was the founding director of photography for *USA Today*, which began publication in 1982. Two years later, Koppelman joined Reuters as assistant news pictures editor for North America to help launch Western Hemisphere operations for its global news pictures service. He has been with Reuters ever since, helping to develop its first Web-based online global general news pictures service and archive, and directing the development and deployment of the first digital broadcast satellite delivery of still photos in the Americas. Koppelman now is vice president for broadcast services for the Americas, managing media sales of all

THE WINNERS



BEST OF THE BEST Jim Koepnick

Jim Koepnick is a Midwest-U.S.-based freelance photographer specializing in aviation subjects. His current clients include *Flying* magazine, *Plane & Pilot* magazine, *Flight Journal*, *General Aviation News*, *AOPA Pilot* and *Air and Space Smithsonian*. Local clients include Mirror Image Teleprompters, *The Oshkosh Scene Magazine*, Fusion Creative and Ripon College. Koepnick was chief photographer at the Experimental Aviation Association for 28 years.



2nd PLACE DEFENSE Alain Ernoult

Alain Ernoult is the author of many books on civil and military aviation worldwide. His photos have been published in *LIFE*, *Paris-Match*, *Stern*, *Time*, and *National Geographic*. Ernoult's work also can be seen at www.ernoult.com and www.aeropictures.com



3rd PLACE DEFENSE Ted Carlson

Ted Carlson is a professional aviation photojournalist/videographer and runs Southern California-based Fotodynamics.com. He specializes in aerial photography and high-definition video of military and other aircraft. He also has had hundreds of his articles published worldwide. Carlson's work can be seen in the majority of previous AW&ST photo contest issues and in the magazine. He has had more than 375 of his images on the covers of various publications and has shot photos for many large aerospace corporations. More of his work and information can be seen at www.fotodynamics.com



1st PLACE DEFENSE Aldo Wicki

Aldo Wicki has been flying with the Swiss air force as a qualified WSO on F/A-18D Hornets since 1998 and as an aerial photographer. He is also an instructor pilot at the F/A-18 Simulator Training Center in Payerne, Switzerland. Wicki has written photography books illustrating the beauty of landscapes and aeroplanes and is a contributing editor to aviation magazines.



1st and 2nd PLACE SPACE Stephane Corvaja

Stephane Corvaja has been head of photo production and distribution in the European Space Agency Communications Dept. in Paris since 1997. He oversees the photography for ESA for all satellite, launcher and astronaut activity at space complexes around the world, including the European Spaceport at Kourou, French Guiana; Baikonur Cosmodrome in Kazakhstan; Star City near Moscow, and NASA Johnson Space Center in Houston. Corvaja previously held similar positions at the French space agency CNES and Matra Marconi Space.

Reuters news services to broadcasters and of Reuters News Pictures. This year was his third as a photo contest judge.

KEITH FERRIS and wife **PEGGY** (far right) have worked together as a team in support of his artistic and photographic efforts for almost 60 years. She is responsible for the organization of Keith's reference files, library and collection of more than 50,000 35-mm slides. Peggy has traveled extensively with Keith in support of his work for the aerospace industry and U.S. Air Force. Keith created the 25 X 75-ft. B-17 and Jet Aviation murals in the Smithsonian Institution National Air and Space Museum in Washington. During his 65 years as an aviation artist, he has served the advertising, editorial, public relations and historic documentation needs of the aerospace industry and U.S. military. His career includes 50 years of flying in military jet aircraft, using his camera in support of his 62 major paintings that document Air Force history in the U.S. Air Force Art Collection. In 2012, Keith was enshrined in the National Aviation Hall of Fame and received the annual National Aeronautic Association Wesley B. McDonald Distinguished Statesman of Aviation Award. His aviation art can be seen at www.keithferrisart.com

With a passion for unique images in aviation, **CHRIS SORENSEN** became a professional photographer, honing lighting, composition and movement skills that have led to his work being featured in more than 100 publications, including *Aviation Week & Space Technology*, *Forbes*, *Newsweek* and *Business Week*. His assignments have ranged from a day in the life of United Airlines for its official history, to a five-stop papal tour, to the hand-construction of a business jet. Sorensen's eye for special aerospace imagery is what has prompted AW&ST to enlist him as a judge in its annual photo competition for the past 14 years. Among his many citations, Sorensen has won the Aviation Journalist of the Year Award from the National Air Transportation Association. He is currently shooting photos with the theme "IT at Work" for the Information Technology Group of Los Angeles World Airports, photographing virtually every aspect of an airport's operation. He can be contacted at cs@chrissorensen.com, and samples of his work can be viewed at www.chrissorensenphotography.com

BARBARA BAKER BURROWS is the director of photography for *LIFE* books and has had

an association with the magazine for more than 45 years. During that time, she has assigned and coordinated the photography for major events from *LIFE*'s coverage of the Apollo space program to political conventions and the Olympics. Along the way, Burrows worked in Time Inc.'s magazine development group and was part of the team that created *People*. Among the books she has edited are *The New York Times* No. 1 best-seller: *One Nation, America Remembers September 11, 2001*, photographic biographies (*The American Journey of Barack Obama*; *Bob Dylan, Forever Young*; and *The Rolling Stones*), *The Great LIFE Photographers*, and, a century after its sinking, *Titanic*. She is also the co-author of the *National Geographic* book, *The Kennedy Mystique*. Her most recent books, *The Beatles* by their personal photographer and *50 Years of James Bond*, were published this fall. Burrows has curated numerous photography exhibits, judged many national and international contests, and occasionally writes about photography. She is on the boards of directors of the Lennart Nilsson Science Awards and the Eddie Adams Photography Workshop and the advisory board of the Gordon Parks Foundation.



3rd PLACE SPACE Dennis Underwood

Dennis Underwood is a 2007 graduate of Texas A&M University who is a test engineer and labview developer and site photographer at the SpaceX Rocket Development Facility in McGregor, Texas. When not testing rocket engines, he enjoys wildlife and airshow photography.



3rd PLACE COMMERCIAL Ryohei Tsugami

Ryohei Tsugami is a freelance photographer based in Osaka, Japan. His images have been published in aviation magazines and books published by Ikaros in Japan. His photos have been used for public relations by All Nippon Airways, Japan Airlines, UPS and FedEx. He won prizes in the AW&ST photo contests of 2002, 2003, 2005, 2007 and 2008.



1st PLACE COMMERCIAL Tom Pawlesh

Tom Pawlesh is a wildlife and nature photographer who recently turned his lens to aviation subjects. A 1977 graduate of Embry-Riddle Aeronautical University, He has been flying for US Airways for 26 years.



1st PLACE GENERAL Andreas Zeitler

Andreas Zeitler has been shooting aviation photos since his teenage years. He is an aeronautical engineer for a major aerospace company in Bavaria. Zeitler won a first prize in the 2010 AW&ST photo contest.



2nd PLACE COMMERCIAL Ben Wang

Ben Wang is a systems engineer at Lockheed Martin. A freelance photographer and writer covering air and space, he is also a photo screener, contributor at www.airliners.net and a feature writer for *Airliners* magazine. This is Wang's second prize in the AW&ST photo contest. His blog is benairblog.blogspot.com



2nd PLACE GENERAL Jessica Ambats

Jessica Ambats is editor of *Plane & Pilot* magazine, and was senior editor of *Pilot Getaways* magazine. Based in Santa Monica, Calif., Ambats is a Harvard University graduate and an instrument-rated private pilot. Her work can be viewed at www.jessicaambats.com and www.facebook.com/jessica.ambats



3rd PLACE GENERAL Evan Peers

Evan Peers followed his lifelong passion for aerospace and photography to establish Airspace Photography (www.airspacephoto.com). His images are in the personal collections of several aviation luminaries and have been published in *Smithsonian Air and Space Magazine* online, *National Geographic* and *World Airshow News*.

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AEROSPACE ART AWARDS IN COOPERATION WITH THE AMERICAN SOCIETY OF AVIATION ARTISTS



BEST OF THE BEST

Cher Pruys

"Yankee Lady" 9.25 x 14" Watercolor

This is a portrait of the magnificent B-17. The bright patriotic colors of the "Yankee Lady" dance across the airplane's metal finish.



The American Society of Aviation Artists joins Aviation Week & Space Technology for the 13th year in presenting art from ASAA's 2012 International Aerospace Exhibition in this special year-end issue. AW&ST has selected its "Best of the Best" award winner from the exhibition and



top choices for honors in the categories of Military, Space, Commercial and General Aviation. ASAA's prize winners were selected by an ASAA-invited judge. To see all of the ASAA prize winners, check out the AW&ST digital edition on leading tablets. Tap on the camera to view the winners gallery.



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FIRST PLACE GENERAL

Norm Siegel

"The Lost Pilot"

24 x 18"

Oil

In 1927, Paul Rinaldo Redfern set out to fly to Rio de Janeiro from Port of Brunswick, Ga. He was last seen over Venezuela, trailing smoke from his Stinson "Detroiter." Neither he nor his aircraft has been found.

FIRST PLACE COMMERCIAL

Ross Buckland

"The Spirit of TWA"

20 x 30"

Oil

A Lockheed 12A of TWA cruises over Sedona, Ariz. This aircraft is still flying today and is under the guardianship of Ruth Richter, daughter of one of TWA's founders, Paul Richter.





FIRST PLACE DEFENSE

Paul Rendel

"Dover Departure"

35 x 53"

Oil

A U.S. Air Force C-17 Globemaster III departs Dover AFB, Del., for the 2011 Air Mobility Rodeo held at Joint Base Lewis-McChord near Tacoma, Wash., where Team Dover demonstrated its tactical mission capabilities.

FIRST PLACE SPACE

Mark Bray

"Yes—It Comes in a Bottle"

17 x 11"

Watercolor

The artist's tribute to all that is rocket science, which inspired him as a child in the 1960s. A bottle of Rocket Science wine is paired with a scale version of the mighty Saturn IV.



Mining the Gap

Could mining social media have prevented Benghazi attacks?

Sharon Weinberger **Washington**

With the September attack on the U.S. consulate in Benghazi, Libya, that resulted in the death of U.S. Ambassador Christopher Stevens and three other Americans, Obama administration officials have fought a slew of accusations blaming them for not foreseeing the attack, or not acting in time to protect personnel.

One counter-argument has focused on the basic assertion that there were no clear indications that an attack would occur, a point reiterated recently by the U.S. government's intelligence czar. "If people do not emit or discuss their behavior, it's hard to find out what they are going to do," Director of National Intelligence Jim Clapper said at the U.S. Geospatial Intelligence Foundation's annual forum in Orlando, Fla., in October.

Yet at the same conference where Clapper made his remarks, companies selling software to the defense and intelligence community were trying to do just that: help anticipate attacks such as the one that took place in Benghazi. "There were indications that there would be a protest in front of the U.S. [Consulate] in Libya at 4 p.m. the day before it took place," claims Andrew Doumitt, the vice president of business development for TerraGo Technologies, a company that makes software that allows users to sift through multiple data sources, including social media, based on specific geographic areas.

In fact, TerraGo's software is, in many ways, custom-suited to looking at something like a potential attack on a U.S. base or embassy because it can trawl through millions of social media postings and flag information based on a specific location. "Let's say that we wanted to do a buffer zone around the U.S. Embassy in Sana'a, [Yemen]" says Doumitt. "We can set up an alert; we can start by seeing what's being written about in this area."

The software may not indicate exactly which events may spiral out of control, such as what was alleged at one point in Benghazi, but it can pro-

vide a red flag. "You essentially have a way to monitor a place against social media, news and blogs; you can much more specifically react and monitor a whole lot more sources for trigger terms," says Doumitt.

More than just a novelty, such software is part of a growing government and private sector market for data-mining that combines open-source information with more traditional data collection. The defense and intelligence community is increasingly using such tools, and In-Q-Tel, the CIA's venture capital arm, has invested in a number of companies working on these tools, including TerraGo.

While such software may have once been seen as a niche area, the wars in Afghanistan and Iraq, where the U.S. military is trying to disrupt insurgent networks and locate roadside bombs, has moved this work into high demand. It has also sparked a public battle over the Pentagon's investment in the Distributed Common Ground System-Army (DCGS-A), the military system used for combining and sorting through intelligence collected in the field.

At the center of the battle is Palantir, a Palo Alto, Calif.-based company that has built software programs that look for hidden connections in data. Palantir, which also received financial backing from In-Q-Tel, has quickly moved into a marketplace once dominated by traditional defense companies.

While the U.S. Army has provided Palantir software to a limited number of analysts in the field to help track improvised explosive device (IED) networks, it has favored sticking with its homegrown system, the DCGS-A. Supporters of the Silicon Valley-based

Palantir have argued its software offers superior capabilities.

Jonathan Percy, vice president for homeland security and cyber at Overwatch, an operating unit of Textron Systems, calls claims of Palantir's capabilities "nonsense," arguing that Palantir can only do "5%" of the total mission performed by DCGS-A. Overwatch, which builds the data analysis tools for DCGS-A, has been ramping up for its own battle with Palantir, including a recent move into homeland security and law enforcement markets.

"What they're trying to do is set themselves up," says Percy of Palantir. "They're trying to force the Army to buy Palantir and just get rid of the investment."

But Palantir has also found allies in Congress; Rep. Duncan Hunter (R-Calif.) has accused the Army of altering a test report that gave a positive

The U.S. Army's incumbent DCGS-A software is at the center of a heated battle with proponents of a competitor software called Palantir.



review of Palantir's software compared with DCGS-A. Congress over the summer launched an investigation into the Army's handling of Palantir.

These sorts of data-mining tools are moving well beyond the current war in Afghanistan and are of interest in areas like Africa, where the U.S. military is tracking terrorist and insurgent networks. There, too, social media is

a central focus, particularly in areas where traditional sources of intelligence, such as airborne sensors, may be in short supply or prohibited.

"Our sensors are a scarce resource," says Tony Frazier, a senior vice president at GeoEye, a commercial satellite company, which also has an analytics unit. "If you want to take eyes off of Afghanistan, Iran or wherever the key hot spot is, then you need to be able to tap into a broader source of content."

Frazier says GeoEye already is working on an Africa-focused project that is culling social media data to help get information that might otherwise only be collected through traditional signals intelligence. He declined to offer further details.

Of course, such analytic work is drawing on far more than social media: Agencies, whether military or law enforcement, can use their own propri-

a geospatial analysis of Al Shabaab, the Somalia-based wing of Al Qaeda. Using the company's Signature Analyst program, GeoEye says it was able to identify areas not previously recognized as high-threat where Al Shabaab might emerge.

The ability to use analytics to make predictions—whether about IED production sites or locations of future terrorist attacks—may sound attractive, particularly when looking at a catastrophic event like Benghazi, but the reality is that this sort of forecasting still falls far short of being a crystal ball. GeoEye claims it had 66% accuracy for predicting attacks for one government client.

In that case, the benefit is really in helping someone know where to look rather than in predicting a discrete event, according to James Anderson of GeoEye's analytics division. "Sixty-

six percent by itself sounds not-that-much-better than a coin toss, but when you are eliminating 98% of your terrain that's a very significant reduction," he says.

Lockheed Martin is also offering its own program for analyzing social media, called LM Wisdom, which it touts as "transforming Internet chatter into usable intelligence." Lockheed started Wisdom about five years ago, but at the time was collecting information primarily from news sources. The company has more recently moved into collecting from social media, according to Ollie Luba,

Lockheed principal for open-source intelligence integration.

Meantime, private companies increasingly are also concerned about what social media postings on Twitter, Facebook or LinkedIn might mean. "We have some commercial clients where we're looking at their security postures," says Luba. "We're looking at when organizations are starting to

protest against them. You can pick up some of those early protests right away. We start watching that and looking at the trends to see if it could be something or not."

Lockheed Martin is also the prime contractor for a program sponsored by the Defense Advanced Research Projects Agency called the Integrated Crisis Early Warning System, which uses news media to forecast specific events, such as revolutions or political instability. "Probably our next step in rolling out some of those analytics will be taking in social media," says Luba.

How much precision can these sort of analytic capabilities provide the defense and intelligence community? One problem of any software program is that it is only as good as the data it is being fed, a lesson learned from an October Senate report that blasted the Homeland Security Department's fusion centers, which are supposed to collect and analyze domestic intelligence to help identify potential terrorist plots. The report said those centers had "not produced useful intelligence to support federal counterterrorism efforts," quoting one official as saying it produced "a bunch of crap."

Indeed, when it comes to fusing data, whether in the U.S. or abroad, the ultimate question is whether millions of daily Tweets and Facebook postings can be transformed into useful intelligence. "Posting something on Facebook is not in and of itself evidence," Secretary of State Hillary Clinton said in response to revelations that a militant group took credit for Benghazi just hours after the attack. "It just underscores how fluid the reporting was at the time and continued for some time to be."

In the end, it could be that the work of companies like TerraGo may prove that the truth lies somewhere in the middle. While Facebook and other forms of social media would not have predicted the Benghazi attack, it could have—if monitored and analyzed in real-time—provided early warnings that something was brewing and that perhaps more resources were needed in the area.

Doumitt, for his part, avoids extravagant claims. He says that data, like the Facebook posting linked to the U.S. Consulate prior to the Benghazi attack, would simply have indicated plans for a large demonstration. "It's not magic." ☐



U.S. ARMY PROGRAM EXECUTIVE OFFICE FOR INTELLIGENCE, ELECTRONIC WARFARE AND SENSORS

etary databases, news articles, or even data from classified sources. While much of GeoEye's analytics work for Special Operations Forces and the intelligence community is classified, the company does openly discuss some aspects of its simulations, such as looking abroad at production sites for IEDs, or in the U.S. for methamphetamine labs.

The company also recently released

Pushing Ahead

Defense bill reverses commercial satellite restrictions

Jen DiMascio **Washington**

Five years ago, the idea of easing export controls on commercial satellites was politically unthinkable. That mindset has changed during the last half decade, as the idea that those restrictions are harming both national security and the U.S. industry base has gradually gained traction.

And during a year in which the U.S. Congress barely passed even routine bills, lawmakers came together to shed long-standing restrictions on the export of commercial satellites.

"This evolution on satellite export regulations means that major U.S. satellite manufacturers will be more able to collaborate with international partners and finally places U.S. component makers on a more even footing in the global marketplace," says Patricia Cooper, president of the Satellite Industries Association.



Lawmakers signed off on a fiscal 2013 defense authorization bill that allows the president to remove commercial satellites and components from the U.S. Munitions List (USML) and allows him to decide which satellite technologies are the most important to protect. The bill still restricts the export and transfer of technology to China, Cuba, Iran, North Korea, Sudan and Syria.

Satellites and related items were placed under regulations in 1999, because of fears about dual-use satellite technology helping China develop its own launch and missile technologies. At that time, a congressional commission found that satellite companies knowingly transferred technical information to China. The debate began to shift very gradually. In 2008, a report by the Center for Strategic and International Studies laid out the unintended consequences of the restrictions. It described how important it was to defense and intelligence

efforts for the U.S. to retain its technical edge, and the report drew a strong link between the industry's competitiveness and the nation's security. Afterward, industry sources say, the conversation began to shift in favor of lifting the regulations.

By 2010, Congress formally asked for an assessment of the national security risks of removing satellites and components from the USML. The study, known as the 1248 report, was finally delivered last April.

Remy Nathan, vice president of international affairs for the Aerospace Industries Association (AIA), calls it "the right report at the right time." It made the case that restrictions could be lifted, that lifting them was necessary to preserve national security and provided a Congress with enough detail to direct legislative change.

"It answered the uncertainty about whether it was time to make such a big step," Nathan says.

Along the way, AIA was issuing reports stressing the negative impact of restrictions to industry. The U.S.'s share of satellite manufacturing dropped from 65% to as low as 30% since Congress imposed export restrictions. That added up to a \$21 billion loss in revenue from 1999 to 2009 and 9,000 jobs, AIA estimates.

In 2011, Rep. Howard Berman (Calif.), the top Democrat on the House Foreign Affairs Committee, introduced the bill with a long list of co-sponsors. It passed in the House but stalled in the Senate. This year, the bill was included in a package of amendments to the defense authorization bill with two key co-sponsors—Rep. Buck McKeon (R-Calif.) and Rep. Adam Smith (D-Wash.), who lead the House Armed Services Committee.

"This agreement will help restore America's global competitiveness in high-tech satellite technology, while also protecting vital U.S. national security interests," says Berman, who lost re-election

The third Boeing 702MP satellite is scheduled for launch in January.

in November. "Treating commercial satellites and components as if they were lethal weapons, regardless of whether they're going to friend or foe, has gravely harmed U.S. space manufacturers. U.S. national security depends upon these manufacturers for our own defense needs; if they can't compete in the international marketplace due to onerous restrictions, they can't innovate and cannot survive."

In addition to easing the restrictions on commercial satellite exports, lawmakers also handed the Obama administration a big win over its larger export control reform effort. The final version of the bill nixed a provision dealing with how the administration notifies Congress of which goods are moving from the State Department's U.S. Munitions List to lists managed by the Commerce Department.

Despite the key support for easing the restrictions on commercial satellites, lawmakers remain concerned about the export of sensitive technology to China. That includes Rep. Norm Dicks (D-Wash.), the top Democrat on the House Appropriations Committee, who retires at the end of this term and was on the select committee that recommended restrictions on satellite exports many years ago. "It's one thing to be able to export them, we've just got to be sure who we're exporting them to," Dicks says. "You have got to have some control." ☛

New Deal

New production contract forces Lockheed, Pentagon to share in 'concurrency' retrofit costs

The U.S. Air Force's hope of flying the stealthy F-22 and F-35 (shown) together operationally is not likely to be possible for another decade as F-35 production slowly ramps up at Lockheed Martin's plant.

Amy Butler Washington

The Pentagon and Lockheed Martin have met two major milestones for the F-35 this year just under the wire—establishing a contract for the next production lot that targets an incremental cost decrease and laying the foundation to start training pilots in January.

Both are major steps forward for the \$400 billion Joint Strike Fighter program managed by Lockheed Martin. But both came only after months of wrangling.

The two parties announced their agreement to reduce target pricing for the fifth low-rate, initial production (LRIP) lot of aircraft by 4% Dec. 14 after a year of cantankerous negotiations. The terms also introduce measures to shift some risk from the government to Lockheed Martin, according to government officials.

This was the rub in the negotiations. As Lockheed's cost and schedule slipped in the past 11 years, the Pentagon has become more aggressive in shifting financial liability to the company. Late last year, this came to a head as Lockheed Martin CEO Bob Stevens,

who is retiring at the end of the year, publicly argued that the Pentagon was pressing for unprecedented terms that threatened the company's bottom line. By contrast, government officials kept the pressure on to insulate the Pentagon from ballooning fees and encourage the company to improve performance.

Air Force Lt. Gen. Christopher Bogdan, the new program executive officer for the F-35, said in September that the relationship between Lockheed and the government was the "worst I've ever seen" in his acquisition career. "It should not take more than a year to negotiate a contract when you have been doing business together for 11 years," he said.

Target LRIP 5 per-unit airframe costs are \$105 million for the conventional-takeoff-and-landing F-35A, \$113 million for the short-takeoff-and-vertical-landing F-35B and \$125 million for the carrier suitable F-35C, according to Joe Dellavedova, a spokesman for the JSF program office. Low-rate, initial production (LRIP) Lot 5 includes 32 aircraft: 22 F-35As, three F-35Bs and seven F-35Cs, all for the U.S.

F135 propulsion system pricing for the single-engine fighter has not yet been established as negotiations are underway between the Pentagon and Pratt & Whitney. The Pentagon's most recently released engine pricing is from LRIP 3. In that lot, each conventional engine cost about \$16 million and each short-takeoff-and-vertical-landing engine for the F-35B was priced at \$38 million. Pratt & Whitney vowed to reduce the engine price by 10% in LRIP 4, but actual cost data was not available.

The new LRIP 5 contract with Lockheed Martin decreases the government's exposure to potential cost overruns in building the aircraft. The company must absorb 55% of any overruns up to a ceiling of 112% of the target cost, with the government picking up the remainder, Dellavedova says. Overruns were evenly split in LRIP 4 up to a cost ceiling of 120%.

Aircraft in LRIPs 1-3 exceeded their targets by up to 15%. LRIP 4 aircraft are projected to overrun the target by up to 9%, Dellavedova says. Lockheed Martin officials note that the target

price for LRIP 5 aircraft is about 50% less than the cost of the two F-35As in LRIP 1. And labor costs for LRIP 5 aircraft are 14% of that for LRIP 4, the company says.

Prior to LRIP 4, the Pentagon bore the burden of overruns to producing the aircraft. Last year, the Pentagon said that totaled \$771 million for those lots, averaging at \$27.5 million per aircraft (including the "concurrency costs").

Perhaps a more significant shift in LRIP 5, however, is an agreement on dealing with concurrency costs associated with the aircraft. This refers to the price of retrofits to already produced aircraft that would be needed as a result of discoveries made during the ongoing F-35 testing program. One example is fixing the bulkhead in F-35As and Bs that was found to be susceptible to cracking. The Pentagon embraced the concept of concurrently developing

and producing the F-35 when it signed the contract with Lockheed Martin in 2001, but has since worked to shift the financial risk for the strategy to the contractor as a result of cost overruns and missed delivery deadlines. The financial risk of more costs associated with concurrency will continue until at least 2015, when the flight-testing program begins to wrap up and officials have accomplished the majority of durability testing to ensure parts meet their expected service lives, according to the outgoing program executive officer, Navy Vice Adm. David Venlet.

The Pentagon has paid \$136 million in concurrency costs for LRIPs 1-3, or about \$4.86 million per aircraft. The LRIP 4 build is about 88% complete, with the last of those 32 aircraft slated to roll off the line in the summer. The Pentagon projects the concurrency cost for LRIP 4 aircraft to be about \$300 million for items that must be ad-

ressed for the aircraft to meet baseline requirements, says Navy Cmdr. Kyra Hawn, an F-35 program office spokeswoman. There are another \$200 million worth of items that would be "nice to have," but are not considered essential for requirements, she adds.

The unlikely benefits of cost underruns in LRIP 5 are equally shared between the Pentagon and Lockheed Martin.

The contract also includes a schedule of progress payments to be dispatched as each aircraft meets production milestones until it is accepted by the Pentagon. This is also a new approach, Dellavedova says.

LRIP 5 deliveries are slated to last from August 2013-May 2014, Dellavedova says. Lockheed Martin has delivered 20 airframes in 2012; its goal is 30. A spokesman says the final 10 are off the production line and awaiting paperwork for the formal delivery. ☐

PILOT PIPELINE

After more than a year-long delay, the U.S. Air Force has begun training its instructor pilots for the F-35 at Eglin AFB, Fla., joining its Marine Corps colleagues who have already started producing pilots.

Gen. Edward Rice, who heads the Air Education and Training Center, gave the long-awaited nod to begin pilot training during a visit last week to the base, where the first F-35 schoolhouse has been established.

The Air Force had slated to begin formal pilot training last fall, but that plan slipped owing to concerns outlined by the Pentagon's chief tester about the single-engine, stealthy jet's readiness for regular operations. The Air Force opted instead to institute a rigorous process to test the training syllabus during a formal operational utility evaluation (OUE), which ended earlier this fall. "We didn't expect any surprises and we didn't have any surprises," Rice tells Aviation Week.

"Today is a significant milestone. We have been flying the aircraft for some time now," Rice says. "We have got enough data to give us [a] level of confidence that we are on the timeline that we set out for ourselves, which was slow, to medium, to fast in terms of how aggressive we are going to be and that we are able to begin a formal pilot training program."

Though the OUE used the syllabus for the F-35A Block 1A version, the first class to go through formal pilot training will use

the Block 1B software, Rice says. Six classes, each with six student pilots, are slated for the next year. The first class in January is slated to include a Dutch student who will participate in flight testing.

That production rate of 36 pilots is likely to hold for the foreseeable future, he says, though when more aircraft are delivered for operational units, an increase will be necessary. "We designed the system to start very slowly," he says.

Eventually, Eglin hopes to produce about 100 F-35A pilots

per year, says Col. Andrew Toth, commander of the 33rd Fighter Wing, which conducts the training at Eglin. The Air Force plans to continue generating instructor pilots until about 2015, when it will start populating the first operational unit. Initial operational capability is now planned

for 2016, Toth says, though this date depends on progress in the F-35 flight-testing program.

The 1A software simply allowed for basic flying and approaches into Eglin. The 1B software includes some data fusion in the cockpit avionics and security features. Weapons capability does not show up, however, until Block 2B.

Maintainer training began earlier this year with the arrival of the first F-35A. Eglin houses nine F-35As owned by the Air Force, 11 F-35Bs owned by the U.S. Marine Corps and two F-35Bs owned by the U.K. A second training center is set to open in 2014 at Luke AFB, Ariz. ☐

Today is a significant milestone.

We have been flying the aircraft for some time now.

— Air Force Gen. Edward Rice



Push for Partnership

Dwindling defense budgets underpin EU call for cross-border collaboration

France expects to take delivery of the first operational A400M military transport aircraft next year.

Amy Svitak **Paris and Istres, France** and Tony Osborne **London**

With belts tightening across Europe, the EU is pushing the case for increased defense cooperation among its 27 member states, particularly when it comes to enhancing military capabilities in support of joint security and defense operations.

EU leaders in December said the continent's economic crisis ultimately could force Euro-skeptics to share planning and development of key defense requirements in an effort to save money and facilitate interoperability on the battlefield.

"The European Council stresses that current financial constraints highlight the urgent necessity to strengthen European cooperation in order to develop military capabilities and fill the critical gaps, including those identified in recent operations," EU leaders said in a Dec. 14 summary issued after a two-day meeting in Brussels.

The language aims to put meat on the bones of Europe's Common Security and Defence Policy (CSDP) and gives key EU bodies a September deadline to offer proposals ahead of a council meeting next December that will set priorities and timelines for increased cross-border collaboration.

Such efforts are being lauded in France, which under new socialist President Francois Hollande is increasingly keen to reflect a more European dimension in its defense posture. With a new national defense strategy due out next month, French lawmakers in a December report urged the administration to leverage the country's budget crisis in support of French-backed multilateral defense programs underway, including

a 10-nation effort under the European Defense Agency (EDA) to develop a common aerial refueling and transport capability and continued work on the Airbus Military A400M.

The 85-page document also urges continued cooperation with Britain on unmanned aerial vehicles, including the Watchkeeper tactical UAV; the potential purchase of U.S.-built General Atomic's MQ-9 Reapers to satisfy France's short-term requirement for a medium-altitude, long-endurance drone; and support for joint development of an unmanned combat air vehicle (UCAV), initiated with an 18-month contract awarded last summer to Britain's BAE Systems and France's Dassault Aviation.

However, the report took issue with the bilateral nature of these projects, all of which fall under the 2010 Lancaster House accords, a package of joint defense initiatives agreed to by U.K. Prime Minister David Cameron and then-French President Nicolas Sarkozy to boost capabilities between British and French forces.

While individual nations might create all manner of bilateral cooperative efforts, the report states, "This is not a sufficient tool with which to build a European defense."

In this context, the lawmakers welcomed a Nov. 15 declaration by the defense and foreign ministers of France, Germany, Italy, Poland and Spain to boost military cooperation while putting European defense companies on more equal footing with competitors. Notably absent from the group was Europe's biggest defense spender, Britain, which tends to prefer bilateral coopera-

tion over pan-European developments, and which has questioned EDA's ability to coordinate defense procurement at the EU level.

In November, however, the U.K. was among 26 member states that signed an EDA code of conduct aimed at pooling and sharing collective capabilities, an agreement that for the first time obligates those countries to systematically consider defense cooperation when planning national requirements.

Peter Ricketts, U.K. ambassador to France, says London is not opposed to European defense, though multilateral collaboration is often more costly and time-consuming than bilateral initiatives. "It's better to start with one or two and add others to the cooperation," he told French lawmakers Nov. 13.

That stance could soften following the inaugural flight in December of the six-nation Neuron UCAV stealth-technology demonstrator led by Dassault.

Britain, meanwhile, is still fiddling with its stealthy Taranis UCAV demonstrator, a low-observable air vehicle that completed radar cross-section tests at BAE Systems' Warton site earlier this year. Initially expected to debut in 2011, the aircraft is now slated to begin flight trials in 2013. Although Neuron is roughly nine months behind schedule, the project has remained within its €405 million (\$535 million) budget since French defense procurement agency DGA awarded the contract in 2006.

"This experience proves that European cooperation is successful," DGA head Laurent Collet-Billon told reporters at the first public demonstration of Neuron at Istres Dec. 19. ☐



The Nimrod will never return, but some U.K. ministers still seek an MPA capability for the country.

Testing the Waters

Two years after Nimrod, the U.K. is looking to readdress the maritime patrol capability gap

Tony Osborne **London**

The U.K. could put maritime patrol back on the agenda, more than two years after the capability was lost through the cancellation of the BAE Systems Nimrod MRA4 program.

Findings of a study carried out by the House of Commons's Defense Committee inquiry into future maritime surveillance will be handed to the Military Capability Board in April and options that "merit further investigation" will be examined prior to the next Strategic Defense and Security Review (SDSR), due to be carried out by the Ministry of Defense in 2015.

The committee did not set out to revisit the decision to cancel the Nimrod program—taken during the 2010 SDSR—but instead looked at the options available to fill the maritime patrol gap. The decision to cancel Nimrod not only left the U.K. without a maritime patrol aircraft but also with significant gaps in anti-submarine warfare (ASW) capability and long-range search-and-rescue (SAR) support. While some of the gaps have been plugged in the interim through the use of helicopters such as the AgustaWestland EH101 Merlin and Royal Navy vessels for ASW, and Lockheed Martin C-130J Hercules and Boeing E-3D Sentry aircraft to support SAR operations, the capability gap has troubled ministers who feel that the U.K.—as an island nation—still needs a maritime patrol capability.

The committee's report, dated Dec. 12 stated: "The department [Defense Ministry] has accepted a capability gap and increased risk by deleting Nimrod. We assess that other assets, used as part of a layered approach, can reduce this risk to some degree, and it remains within tolerable levels."

The committee added that while it commended the Defense Ministry for undertaking studies to inform future decisions on the provision of maritime surveillance, the committee believed it would "have been beneficial if these studies had been undertaken before or as part of the SDSR especially given that the ministry has admitted that the Nimrod MRA4 decision was primarily financially driven, and in the short to medium term a maritime patrol aircraft would be the solution for maritime surveillance requirements."

Interestingly, while the ministry has no defined requirement for an MPA, its own studies into Wide Area Maritime Underwater Search concluded that the most appropriate solution to a potential underwater surveillance requirement was a manned aircraft.

The ministry has attempted to retain at least some maritime patrol skills by sending a small cadre of personnel to other countries

with established maritime patrol capabilities, including New Zealand and Canada. But the committee said that it doubts whether the program, known as Project Seedcorn, will deliver benefits or indeed be sustainable after 2019, given the "continued uncertainty over long-term plans for a fixed-wing MPA."

The committee said it was less sanguine than defense ministers who had previously said that if an urgent need to regenerate the maritime surveillance capability arose, "this could be achieved quickly."

The committee said: "Given the complexities and testing required of [MPA] platforms, we require further evidence that a sufficient level of capability could be regenerated as quickly as the Minister suggests."

The committee also raised concerns about what it called "mixed messages" about the U.K.'s need for an MPA. "On one hand it says that there is no requirement for such an aircraft and that it is not funded or in the program, but on the other hand it acknowledges that its absence is a risk."

"The Defense Ministry must explain why it is satisfactory to wait until 2015 or beyond before deciding how to close the capability gap in maritime surveillance," the committee urged.

Reexamining the Nimrod option would have been pointless. Within weeks of the SDSR decision, the Nimrod MRA4 prototypes as well as the aircraft in production were scrapped.

Should a maritime patrol capability be reestablished, there are a number of options including Boeing's P-8 Poseidon which would give the U.K. increased interoperability with the U.S. Navy. Cambridge-based Marshall Aerospace has offered a conversion program that would give several of the Royal Air Force's C-130J transport aircraft an MPA capability.

The C-130Js are due to be retired from RAF service in around 2022, although a small number maybe kept on Special Forces operations and there is no reason several more could not be converted for MPA duties. Another off-the-shelf option maybe the proven Airbus Military C295-MPA version of the twin-turboprop such as that adopted by the Chilean air force. ☉

Dominance Deferred

Korean Air drops bid as president-elect expresses caution on sale of KAI

Bradley Perrett **Beijing**

BRADLEY PERRETT/AN&ST



Korean Air Lines said last month it aimed to be Asia's strongest aerospace company by 2020. Even by South Korean standards, the assertion seemed a little ambitious, since the company's aircraft and space division is not a fifth of the size of Mitsubishi Heavy Industries' aerospace company, and hardly compares with the sprawling Avic group in China.

A month later, Korean Air's chances of standing at the peak of Asian aerospace look a good deal smaller again. To grow fast, Korean Air really needed to buy rival Korea Aerospace Industries (KAI), which it has wanted for nine years. On Dec. 17 it pulled out of the bidding for KAI, saying the market price of the target's shares was too high.

Hyundai Heavy Industries, evidently intent on following its Japanese rivals into aerospace, is the sole remaining bidder. But even its chances may be somewhat diminished by the cautious attitude to selling KAI of Park Geunhye, elected on Dec. 19 as the next national president.

Meanwhile, the exact size of KAI's future business remains in doubt as the defense ministry defers selection of a fighter for its F-X Phase 3 requirement until 2013. If the ministry opts for the Eurofighter Typhoon or, especially, the Boeing F-15, KAI should be assured of much manufacturing work. But if the Lockheed Martin F-35 is the winner, manufacturing opportunities will prob-

ably be more limited. Similarly, the selection of a new heavy-attack helicopter, almost certainly the Boeing AH-64 Apache, has also been put off until 2013. Either manufacturer could benefit from that deal.

The government's Korea Finance Corp. has been leading four major shareholders in offering a combined 42% stake in KAI, belatedly following the privatization policy of President Lee Myung-bak, who will be out of office in February after five years. The first KAI auction failed when only Korean Air bid. Now the second auction has failed because only Hyundai Heavy is left. Korea Finance says it will consider whether to negotiate with Hyundai Heavy.

Had things began moving a little earlier, the sale of KAI might have been straightforward. But days before the election, Park said the sale of KAI had to be carefully weighed. That might mean she does not want it sold, or only that she does not want it consolidated with Korean Air's Aerospace Div. So Hyundai Heavy may still be in with a chance.

Yoo Seongmin, an influential member of parliament who may become Park's defense minister, has criticized the possible merger as a threat to competition. Ominously for the industry, he is also critical of using equipment projects to promote the defense industry. If he does become defense minister, South Korea may well import more equipment.

Buying KAI has been only part of Korean Air's plan for expanding its Aerospace Div., whose manufacturing operation in Busan will grow from 710,000 sq. meters (7.6 million sq. ft.) to 1 million sq. meters by 2020, according to a strategy announced last month. The expansion will include facilities for assembling aircraft, for making structures and for research and development. The division's revenue should increase from last year's 550 billion won (\$511.9 million) to 1.6 trillion won in 2016 and 3 trillion won in 2020, with an investment of 1.5 trillion won.

KAI's key projects include building major assemblies of the Boeing F-15, an F-X Phase 3 contender.

Korean Air President Ji Chang-hoon says the company wants to build a "mid-sized" aircraft by 2020 and will use its left as a buyer of commercial aircraft to gain contracts from Boeing and Airbus. The "mid-sized" aircraft is probably a turboprop airliner that the government proposed in 2010. Korean Air's other ambitions are to strengthen its position as an aircraft maintenance business and to export unmanned aircraft.

KAI, a specialist in combat aircraft and, increasingly, helicopters, now builds major assemblies for all F-15s and would therefore benefit from the selection of that type for the F-X Phase 3 requirement for 60 fighters. But the Defense Industry Committee says it will not be able to choose between the competing aircraft until the first half of next year. Negotiations are stuck on the point of offsets and other conditions. One reason for the difficulty is the aim to require bidders to provide technology for the proposed KF-X indigenous stealth fighter, industry sources say. The chances of the F-35 winning F-X Phase 3 rose considerably a year ago when Japan chose the type. Keenness for the F-35 cannot help South Korean negotiators in securing generous terms from Lockheed Martin, at least.

But as time passes, the aircraft that South Korea needs to replace, F-4 Phantoms, get closer to the point at which they must be grounded.

The South Korean army's desire for the Apache is well known. Again, the reason for delaying an order involves offset negotiations. With the army so committed to the type, Boeing cannot feel great pressure to move work to South Korea. ☐

Avio's Roots are Deep In Italian Aviation

- 1908** Avio established when Fiat enters aeronautical sector
- 1915** Fiat begins producing complete aircraft
- 1972** Fiat Group sells aircraft unit to Aeritalia (Finmeccanica)
- 1976** Fiat Aviazione SpA established, wins work on PW2037 for 757
- 1980s** Buildup of civil work on PW4000, CF6-80, V2500; military work on RB199 for Tornado, Spey MK807 for AMX, EJ200 for Eurofighter, T700 for helicopters
- 1990s** Now called Fiat Avio, work begins on PW308, PW150 and GE90
- 1994** Acquires BPD Defense and Space, enters space propulsion
- 2000** Established ELV SpA with ASI for European Vega launcher
- 2001** Creates AvioPolska in Poland, begins development of Trent 900 accessory drive trains for A380
- 2003** Leaves Fiat Group, becomes Avio as independent producer. Wins A400M propulsion system work
- 2004** Signs development agreement for GENx for 787, 747-8
- 2006** BCV Investments acquires controlling interest in Avio Group
- 2010** Signs agreement with Pratt & Whitney to supply fan drive gear components for PW1500G for CSeries
- 2011** Acquisitions, joint ventures, lead expansion in Brazil, China
- 2012** Maiden flight of Vega launcher

Feb 21, 2012

Sale to GE to be announced

Turbo Drive

Avio's turbine, transmission strengths will add to GE's portfolio

Michael Mecham San Francisco, **Guy Norris** Los Angeles and **Amy Svitak** Paris

General Electric is pulling more aero engine technology under its roof with the \$4 billion purchase of Avio SpA, the Italian transmission, gearbox and turbine specialist that is simultaneously helping GE and rival Pratt & Whitney develop some of the era's biggest commercial engine programs.

Formal announcement of the deal was expected Dec. 21 in Naples, although it must pass European and U.S. antitrust approval. BCV Investments owns the controlling interest in the Avio Group, which is managed by Cinven and Finmeccanica.

Besides strengthening GE's control over its manufacturing capacity, the Avio purchase also helps ensure the integrity of the Evendale, Ohio-engine maker's intellectual property. When prime contractors bring in risk-sharing partners on new product development, they spread their financial risk. At the same time, they increase the possibility that their intellectual property will drift away. Strict controls of IP are every manufacturer's goal. There is no suggestion in the Avio purchase that IP has been a problem.

But the manufacturing process has become so complex that primes often must share IP with key suppliers—and vice versa—in order to derive all the advantages of including a specialist manufacturer into the fold of design and development.

With demand for its engines higher than ever, GE Aviation is stepping past potential IP problems while increasing the vertical integration of its manufacturing base by capturing the skills sets of suppliers through acquisitions or joint ventures. Its joint venture with Safran Group's Snecma unit that created CFM is its template for industrial cooperation.

The Avio announcement is another in a string of acquisitions and joint ventures GE has made in just the past two months. They include a JV with Parker Aerospace to develop an advanced fuel-nozzle technology center in Clyde, N.Y., and the acquisition of Morris Technolo-

gies and Rapid Quality Management of Cincinnati, to expand GE's use of additive technology and advanced machining for combustion chambers.

More expansion is anticipated. In a matter of weeks, GE is expected to complete the permitting process for two additional engine test cells, one at its main Peebles, Ohio, test and development center and another at an unnamed facility outside the state. The company has ramped up its capacity in composite fan blade production by adding two factories in Mississippi. And in the next few weeks, it is expected to announce a deal that will take it in quite a different direction—a joint venture to produce specialty forgings.

GE's external expansion is a stand-out, but on a smaller scale others have been busy. GKN's purchase of Volvo Aero Engines moves it beyond parts and components into full engine production. Pratt & Whitney and Rolls-Royce are counting on internal development to grow their aero engine programs. However, Pratt will benefit with a closer relationship with Goodrich Aerospace, a long-time industrial partner on nacelles, including for the geared turbofan (GTF) engine series. Having been purchased by Pratt's parent, United Technologies, Goodrich is now part of UTC Propulsion & Aerospace Systems.

With the strength of CFM's control of about 75% of the market for single-aisle transports, due largely to being a sole-source engine on the 737 NG and 737 MAX—plus its own dominance on Boeing's widebody products—GE is claiming its share of the general upsurge in engine sales that is being felt across the industry as airframe production rates rise. Together with CFM,

GE will see engine production increase from 2,270 this year to 2,785 in 2014.

Avio's rise as a supplier started in 1976 with a contact from Pratt for the PW2037. But since the 1980s, starting with T700s for U.S. Army helicopter programs, GE has become Avio's biggest customer, accounting for about 65% of current revenues. The shift became most evident in the 1990s when Avio emerged as a risk-sharing partner on the GE90 for the Boeing 777. It was further strengthened when Avio won the drive train and low-pressure turbine contracts for the GEnx that powers the 787 and 747-8. Already a CFM56 supplier, Avio signed a March 2012 agreement to help develop its successor, the Leap for the Boeing 737 MAX, Airbus A320NEO and Comac C919 programs.

Still, Avio has maintained close relations with Pratt, largely through the International Aero Engine consortium that Pratt helped found to build the V2500 as a competitor to the CFM56 on the A320 and other Airbus products. Specifically for Pratt, Avio supplies components for the Pratt PW4000 and PW2000 engines, the latter now being produced only for the Boeing C-17 military transport. The Italian supplier also works with Pratt & Whitney Canada on the PW150 turboprop that powers the Bombardier Q400, and on a turboshaft version of the PT6.

In 2011, Avio signed a long-term agreement to supply the fan drive gear for the PW1500G GTF engine that will power the Bombardier CSeries regional jet. This strong link with the GTF is expected to be worth more than €4 billion (\$5.3 billion) for Avio over the next 20-plus years. In 2012 Avio expanded its GTF role when it was selected to provide the gear system, transmission and oil tank for the PW1100G engine now starting tests for the NEO.

Besides the fan drive gear system, Avio is producing the accessory drive gearbox and the mid-turbine frame for the PW1500G. One of the main parts of its deal with Pratt includes rights to participate in the engine's maintenance and overhaul network. Avio called its first GTF production contract "the crowning achievement of years of study and investment with Pratt & Whitney," a sentiment amplified by the subsequent deal on the PW1100G. Avio developed prototypes of the gear systems at its plants in Turin and Naples, Italy.

With the Avio purchase, GE be-

comes a supplier of engine programs across Europe. A GE Aviation spokesman noted that such cross ties are not unusual; when GE bought the former Smiths Aerospace, it inherited components contracts with both Pratt and Rolls-Royce.

Avio is heavily involved with Rolls-Royce, notably providing components for the Trent 900 that powers the A380 and producing the afterburner for the Eurofighter Typhoon's EJ200, on which Rolls led the development. Avio also is a partner on the Snecma-led SaM146 engine for the Sukhoi Superjet.

Avio's 2011 revenues topped €2 billion with pre-tax earnings of €348 million, a 13% rise from 2010. The company's orderbook was valued at more than €6 billion. Engines accounted for 83% of its revenues; space propulsion was 15%.

GE is not interested in Avio's space propulsion unit. Safran is regarded as most likely to acquire it through its Snecma motors division. Snecma and Avio are 50:50 shareholders of Paris-based Europropulsion, which develops and commercializes solid rocket motors for European launch vehicles, including the Ariane 5 heavy-lift launcher and Italy's new Vega light launcher, which made its successful inaugural flight in February. Avio also is a 70% shareholder in ELV, the prime contractor for Vega. Italy's ASI space agency owns the rest.

But another option is for Finmeccanica, which owns a 15% stake in Avio, to take over its space unit. This would put the Rome-based company into immediate contention as a major player in developing the Ariane 5's successor. ☐

Europe's Dilemma

Government support to European airlines is on the upswing as losses mount

Cathy Buyck Brussels

The European Commission (EC) is between a rock and a hard place with more European airlines turning to their governments for financial support. It can either strictly apply its state aid rules and risk more bankruptcies, or the EC can compromise its tough stance and help struggling carriers to survive.

The latter is the preferred approach of politicians, who want to preserve national carriers and avoid bankruptcies in a continent battered by economic

contraction, austerity measures and unemployment. But political pressure is often ineffective at the EC's Directorate General (DG) of Competition.

"The European Commission is the only institution in the world that controls state aid. Everywhere in the world, state aid is given but it is not controlled. The European Union (EU) is a bit more disciplined in this respect," notes Serge Durande, a former DG of Competition official and now a counsel at law firm Bird & Bird.

LOT has taken delivery of its first Boeing 787, but its future looks bleak if an aid package from the Polish government is not approved by the EC.



This discipline has increased in importance since the DG of Competition took over state aid to airlines and airports in 2010. Before then, the Commissioner for Transport was in charge of state aid in the transport sector. Now, the DG of Competition is keen to apply the relevant EU competition law consistently throughout the industry and is reviewing the Community guidelines on financing of airports and start-up aid to airlines departing from regional airports. These new guidelines are scheduled to be adopted in the first quarter of 2013.

Meanwhile, the list of state aid cases in the European aviation sector is increasing almost weekly. The EC is dealing with 60 such ongoing cases, of which more than half are in-depth investigations, the DG of Competition tells Aviation Week. Most cases are related to regional airports and their users—largely low-cost carriers—but the number of investigations of state aid to airlines is rising. Many airlines in Western Europe underwent restructuring and received massive government subsidies during the 1990s. Now, the Commission is focusing largely on aid granted to airlines in the new EU member states in Eastern Europe.

Estonian Air and LOT Polish Airlines are the most recent examples of European carriers in need of a bailout. Others that have turned to their governments for a handout include the now-defunct Hungarian flag car-

rier Malev, Czech Airlines, Air Malta, Adria Airways and AirBaltic. In November, Croatia Airlines received a €106 million (\$140.3 million) capital infusion from the government, which hastily approved the injection of funds ahead of Croatia's anticipated European Union accession. SAS, which last month came uncomfortably close to bankruptcy, secured bank loan guarantees from the governments of Sweden, Norway and Denmark, while the Belgian government is working to lower social charges for flight crew personnel employed by airlines in that country.

In Belgium, a €20 million annual subsidy for Brussels Airlines from the federal government followed lobbying by the carrier, which claims it is at a competitive disadvantage with Ryanair because the Irish airline benefits from a low Irish tax rate on its operations at Brussels South Charleroi Airport. Brussels Airlines has reported losses since 2008 and needs to lower its cost structure to unlock a credit line of up to €100 million from its largest single shareholder, the Lufthansa Group. CEO Bernard Gustin stresses that the Belgian government's intervention does not constitute state aid but is a corrective measure to harmonize operating conditions in Belgium.

Jetairfly, Belgium's second-largest passenger airline, welcomed the government intervention but says "We have grown in a paced and profitable way since launching operations in

2004." A TUI Travel subsidiary, Jetairfly operates out of Brussels South Charleroi Airport, where it competes with Ryanair. Brussels Airlines operates solely from Brussels Airport.

On the heels of the Belgian government's initiative came the disclosure by the Polish Treasury Ministry that its national airline had applied for a first tranche of state aid, amounting to PLN400 million (\$130 million). The ministry declined to provide the total amount requested by LOT, which industry sources estimate was PLN1.0 billion.

LOT, which is 93% owned by the Polish government, last month took delivery of a Boeing 787, making it the first European operator of the aircraft. The airline ordered eight 787s, but receiving all of them depends on the EC's verdict about whether the carrier's funding is compatible with EU state aid rules.

EU legislation does allow some forms of state aid (see sidebar). But member states have to notify the DG Competition of any assistance that may not meet the "private investor" principle. EU member state airlines are not able to receive any such aid before obtaining the Commission's approval.

The Commission had not received notification about aid to their aviation sectors from the Belgian or Scandinavian governments as of Dec. 17, the DG of Competition tells Aviation Week. In addition, Durande points out that the Latvian government did not notify the Commission about financial support to AirBaltic, which could have "a significant negative impact" in determining whether the government's financial assistance to the carrier is compatible with EU legislation. If the Commission does not accept the airline's restructuring plan, it is likely to order AirBaltic to return the money.

The consequences such an order may have on the airline are highlighted by the Commission's decision last January to force Malev to repay the illegal state aid it had received from the Hungarian government. This effectively forced the airline into bankruptcy. Also, the legal uncertainty created by the Commission's current in-depth investigation into state aid for AirBaltic could scare off other potential investors. "One would expect that the Estonian government will not make the same mistake when restructuring Estonian Air," Durande concludes. ☐

STATE AID: THE RULES

Cathy Buyck **Brussels**

European Union law does allow "public interventions" for airlines when they are made on terms that a private investor operating under normal market conditions would accept. When the "private investor" principle is not respected, (e.g. shareholders refuse to inject more funds), the support by public authorities constitutes state aid because the beneficiary receives an economic advantage that its competitors do not. Any public support not meeting this "private investor" test must be disclosed to the European Commission, which must rule on its compatibility with the EU Treaty before the company receives any funding.

EU competition law also allows for special rescue and restructuring provisions for industries or companies in difficulty, an important issue given the shaky economic climate. Guidelines for this form of state assistance dictate that restructuring aid has to be accompanied by a turnaround plan and measures to remedy any market distortion caused by the aid. Typically, the EC requires an airline to significantly reduce capacity, give up slots at congested airports, improve cost and revenue management and initiate the sale of assets. Restructuring aid may be granted only once every 10 years. ☐

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Or at www.taosgov.com. Please contact the Purchasing Office to be included in the spec-holder list in order to receive amendments to this request if applicable.

A Pre-Response conference will be held on Monday, January 14, 2013 at 2PM (LT) in Room 109 at Town of Taos Municipal Building, 400 Camino de la Placita, Taos, NM. Attendance at this meeting is strongly recommended.

Sealed Proposals must be received by the Town of Taos Procurement Officer, at the Purchasing Office, Taos Town Hall Room 202, 400 Camino de la Placita, Taos, New Mexico 87571 no later than 4 P.M. Local Time Wednesday, January 23, 2012.

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See www.aiaa.org/asm2013

Jan. 9-10—Fourth Annual China Aerospace
Manufacturing Summit. Post Hotel,
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Jan. 9-11—Army Aviation Symposium and
Exposition. Gaylord National Hotel and
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See www.ausaaviation.org

Jan. 10—Airline Passenger Experience
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Las Vegas Convention Center, North
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Jan. 22-25—National Business Aviation
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Feb. 17-21—Gulf Defense Conference and
Official Conference of IDEX. Abu Dhabi,
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Feb. 26-March 2—Australian International
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Exposition. Avalon Geelong Airport. See
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March 5-6—Defense Technology
and Affordability Requirements. Hilton
Arlington (Va.). See
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March 7—Aviation Week Laureate Awards.
National Building Museum, Washington.
See <http://events.aviationweek.com/current/lau/index.htm>

March 12-14—ATC Global Amsterdam
2013. Amsterdam RAI Exhibition &
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March 18-20—11th Missile Defense
Conference and Exhibition. AIAA,
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Passing The Torch

Aviation Week & Space Technology marks a major transition every eight to 10 years, when the editor-in-chief passes the torch to his successor. The next such milestone will occur on Dec. 31. After months of preparation, I will bring to a close my 24-year career at Aviation Week, though I plan to stay deeply engaged in aerospace.

Following in my footsteps will be Joe Anselmo, who leads Aviation Week's crack technology reporting team. Joe is part of the younger, up-and-coming generation of journalists here. As a team—and working shoulder-to-shoulder with veterans like Executive Editor Jim Asker and Senior Technology Editor Graham Warwick—they will guide this iconic institution through its next evolutionary stage.

Indeed, I believe my most meaningful accomplishment at *Aviation Week & Space Technology* was building the best team, by far, in aerospace journalism. I also take a great deal of pride in how much more

“When will industry leaders recognize the desperate need to rebrand aerospace and bring it more into the public consciousness?”

global Aviation Week became on my watch, with new bureaus in Beijing, Brussels, Singapore, Auckland and New Delhi. Under Joe's leadership, readers can expect to see accelerated digital distribution of market intelligence, expanded apps and links, enhanced data and analytic products, further expansion in Asia, a tighter integration between all our information offerings and services—and even more technology coverage.

My work here has been not so much a livelihood, albeit it a very fulfilling one, as a privilege. I did not aspire to become editor-in-chief of *Aviation Week & Space Technology* when I joined the team in 1989. In fact, I found more than enough challenge and professional satisfaction reporting on and analyzing the convulsive string of mergers and acquisitions that started in the early 1990s; the industry's rapid globalization, and the struggle of all players to adapt to the dramatically altered industry landscape. It was simply my good fortune to be at the right place at

the right time that allowed me to become a part of Aviation Week, and lead the effort to chronicle the transformation of a global industry. With the dawn of the new millennium, my principal focus turned to issues involving the supply chain, innovation and competitiveness.

Aerospace will continue to be shaped by advances in technology and by macroeconomic forces beyond companies' control. There will be good times. But there also will be bad times, as in the case of too many contractors chasing too little business soon after the collapse of the Soviet Union—setting the stage for the industry's painful and protracted consolidation. But as I reflect on where aerospace is today, I find myself deeply concerned. The challenges are far more complex, such as the need to accelerate the rate of innovation and the delivery of new products to market in spite of their growing complexity—as well as the need for breakthroughs in productivity and cost performance.

These imperatives should not come as revelations. Aviation Week has been leading high-level discussions around these “burning-platform” issues and opining on them for some time. In the last few years, we have even turned up the volume to create a greater sense of urgency. But progress to date has been slow; industry can and must do better.

I will leave you with one other thought. As essential as aerospace is to national security—not to mention advances in so many fields that touch the lives of most of the world's population—it strikes me as one of the most under-appreciated science and engineering sectors. Taken largely for granted by society in general and policy-makers in particular, aerospace is treated more like a fungible commodity instead of the national asset that it represents. Which leads me to wonder when industry leaders will recognize the desperate need to rebrand aerospace and bring it more into the public consciousness.

Perceptions matter, and aerospace's lack of appeal to many young math and science students and aspiring engineers is lamentable. Given the proper attention on a sustained basis, industry in time might find that a serious commitment to rebranding just might pay dividends for generations to come. ☪

Tony Velucci

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