

FARNBOROUGH WRAP-UP Behind the Show's Muted Tone 

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Skepticism largely defined the 2012 Farnborough International Airshow, fittingly marked by gray clouds and intermittent rain as a Qatar Airways Boeing 787 participated in the flying display.



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- 42** **Indian space** officials expect country's first mission to Mars to win final OK soon, launch in late 2013

COVER STORIES

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- 34** **New streamlined airport approach** system shows how aircraft can flow from one advanced procedure to another.



- 52** **Avic** has now at least received Chinese type certificates for two helicopters this year, but approval for use in other countries will take longer.



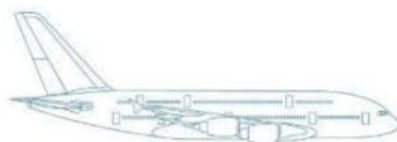


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REACTION ENGINES

**SUPERSONIC TRANSPORT**

📷 **Imagine** flying from Brussels to Sydney in 4 hr. The European Commission has set aside \$6.15 million for a sub-scale flight test of a high-speed transport aircraft. To view artist concepts and more, go to tinyurl.com/cahbm3m

ISS IN 6 HR.

💬 **Speaking** of reduced flight times, Russia is studying ways to reduce the trip to the International Space Station to 6 hr. from launch to docking—down from 50 hr. now. tinyurl.com/837jtw

CUBIC QUESTIONS

💬 **The death** of Cubic Corp.'s 97-year-old founder, Walter J. Zable, has ignited speculation about the future of the company

he founded in 1951. Managing Editor Joseph C. Anselmo explores the question of whether the defense contractor will remain independent, on our Ares blog. tinyurl.com/6rfq3jy

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From the Web

Comments from readers
on **AviationWeek.com**

Senior Editor Graham Warwick's post on the Ares Defense blog about hypersonic gliders reads in part: You have to love optimists.

Despite premature ends to both attempts to fly a hypersonic glider, the U.S. Defense Advanced Research Projects Agency wants to try again. Darpa's new Integrated Hypersonics program looks a lot like its unsuccessful Falcon Hypersonic Test Vehicle 2 (HTV-2) project, with a few tweaks—including the addition of a rocket motor to increase range and maneuverability.



DARPA

sferrin says:

When did anybody ever progress by quitting? If anything, we should be testing more. It's a damn shame HyFly was canned after what, THREE attempts? How will we ever figure out hypersonic flight if we give up after a few failures? Imagine if they'd canceled the X-23A Prime after two failures? Look how much testing the U.S. did before they finally got ramjets working. (Sadly, we seem to have forgotten how to do that.)

Also on the Ares blog, Defense Technology Chief Editor Bill Sweetman writes about collaboration between Sweden and Switzerland on the new JAS 39E/F version of the Saab Gripen.



Hardcore says:

It is interesting to compare the cockpit to that of the F-35. They look nearly identical, but I bet there are differences on the inside. Super cruise has replaced info on max speed. A logical step, of course.

Moissanite opines:

If "if" didn't exist and the Swedes were better at lying, deceiving, bribing and had more political power to influence potential customers, more air forces would be flying around in Gripens.

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

Feedback

AUTOMATED TO A FAULT

In the case of the Air France Flight 447 crash on June 1, 2009, it seems that at the end of the day—after all the discussions concerning the competence of the crew, the instrumentation presentation in the cockpit and the design of the sidesticks—one thing is certain: If either a Boeing 767 or 777 had gone through this same weather and had the same pitot malfunction, both aircraft types would have arrived at their destinations safely.

Why do I make this assertion? Simply because the old-fashioned Boeing control column gives a pilot an instant and important visual clue as to whether there is nose-up or nose-down input, as well as incorporating that very important element of "feel."

The Airbus system is too clever by half.

Mike Jolley
TUCSON, ARIZ.

TITANIUM STRIP—A RED HERRING

While the continuation of litigation associated with the tragic Air France Concorde fatal accident near Paris-Charles de Gaulle Airport (CDG) appears regrettable and may seem pointless, I wish to offer some pertinent information that was not addressed in Pierre Sparaco's commentary "A Concorde Mystery" (AW&ST July 9, p. 26).

French investigators have confirmed that since Concorde entered service in 1976, 57 tire failures (30 Air France and 27 British Airways) occurred prior to the July 25, 2000, crash of Air France Flight 4590. On six of these occasions, Concorde fuel tanks were penetrated by debris. In each case, fire did not occur; however it would seem the potential for loss of airframe should have been obvious. Additionally, other significant failure modes such as upper rudder and elevon separations occurred multiple times before serious (and expensive) corrective action was initiated.

One could surmise that prior investigations which focused on imparting blame for the accident on the Continental DC-10 titanium wear strip may have done so at the expense of a broader systemic examination of the motives behind the lethargic pursuit of effective corrective actions such as those implemented after the AF4590 accident.

Bob Stelmazek
MILLERSVILLE, MD.

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

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

PAYBACK FOR PURLOINED IP

A recent Washington Outlook column states that cybertheft of U.S. intellectual property is estimated at near \$1 trillion and is suspected to largely involve China (AW&ST July 16, p. 23). The U.S. debt to China is now around \$1.2 trillion. While we certainly need to improve our own security, perhaps we should wield some leverage to encourage China toward better recognition of IP rights.

Neil Reuben
LOS ANGELES, CALIF.

ACCURACY VERSUS ACTION

I realize that dramatic cover art is part of the "new look" by which *Aviation Week & Space Technology* seeks to boost readership. But remember—aviation professionals read your magazine.



The July 9 composite cover depicts SpaceShipTwo approaching the runway at the Farnborough air show. The bank angle is more than 45 deg. and the nose is "buried." The spaceship is a couple of hundred feet from the runway edge while the nose is about 80 deg. off runway heading.

This may look great, but given the laws of aerodynamics the machine is seconds away from creating a smoking hole in the English countryside.

Guy Wroble
DENVER, COLO.

(That very point was discussed when choosing that cover. We strive for a balance between an exciting perspective and aviation realism, and trust that our readers understand the difference—Ed.)



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Bob Greene



Amer Hadidi



Arthur Goldman



Woody McClendon



Doug Gill

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Arati Prabhakar has been tapped to become director of the U.S. Defense Advanced Research Projects Agency on July 30. Prabhakar served a seven-year tour with Darpa starting in 1986, first as program manager and then as director of the Microelectronics Technology Office. She later became director of the National Institute of Standards and Technology and joined U.S. Venture Partners.

Mark Smith (see photos) has been promoted to group president from senior VP of Aerostaff Services, Line Maintenance and Engineering Solutions at *STS Aviation Group*, Jensen Beach, Fla. He succeeds **Philip Anson, Jr.**, who was elevated to CEO of the Aviation Group. Former CEO **Bob Greene** is now executive chairman, and **Tom Covella** was promoted to group president of Component Solutions from executive VP and general manager.

Terry A. Ruhl has been appointed president of Denver-based *CH2M Hill's* Transportation Business Group. He has been senior VP and director of consulting and international operations for the group's aviation, highway and bridge, ports and maritime, and transit and rail consulting practices.

Tania Hanna has been named VP-government relations of *Harris Corp.* of Washington and Melbourne, Fla., succeeding **Peter Challan**, who has become VP-industry specific programs for the company's Mission Critical Networks. Hanna was VP-policy and legislative affairs.

Amer Hadidi (see photo) has been tapped to become CEO of *Royal Jordanian Airlines*, succeeding interim CEO **Abdel Rahman Al Khatib**. Hadidi was Jordan's minister of industry and trade.

Michael Rossell has been appointed director of International Civil Aviation Organization relations at Montreal-based *Airports Council International*. As the U.K.'s permanent representative at ICAO, he was first VP of the council from 2011-12.

Jim Gaughan has been promoted to president and CEO from chief operating officer of *Metron Aviation*, Dulles, Va., succeeding **Dave Ellison**.

Arthur "Gene" Goldman (see photo) will join Sacramento, Calif.-based *Aerojet's* Southeast Space Operation as executive director. He has been the acting director of NASA's Marshall Space Flight Center in Huntsville, Ala.

Dennis Probst has been named executive VP of the *Metropolitan Airports Commission*, in Minneapolis. He was VP-planning, development and environment.

Mark Davis has become senior VP-maintenance, repair and overhaul sales at *Timco Aviation Services*, Greensboro, N.C. He has held leadership roles at United Airlines in vendor-provider relationship management.

Dave Franson has been promoted to president from executive director of the *Wichita Aero Club*. New board members are: **John Ek**, publisher of the *Wichita Business Journal*; **Sean Weaver**, executive VP-assurance services at Allen, Gibbs & Houlik; **Rod Wilson**, Goodrich Interiors; **Stephanie Harder**, manager of community affairs and internal communications at Cessna Aircraft Co.; **Kim Nussbaum**, publisher of *The Wichita Eagle* and **David Van der Wee**, VP-marketing, business and general aviation for Pratt & Whitney Canada.

Woody McClendon (see photos) has been appointed sales manager-rotorcraft training at New York-based *FlightSafety International*. He has been senior VP-sales and marketing of PrivatAir, aviation manager for the UCLA MedStar program and an instructor for FlightSafety. **Doug Gill** has been named director of engineering for the company's visual simulation facility in St. Louis.

Dan Bennewitz has become chief operating officer and **Jim Reinhart** head of development and operations at *Quality Technology Services*, Overland Park, Kan. Bennewitz was VP of IBM Sales Model, and Reinhart has held executive roles at Genworth.

Colleen Hartman has been appointed deputy director for science, operations and program performance at NASA's Goddard Space Flight Center, Greenbelt, Md. She has been the assistant associate administrator in the Science Mission directorate at NASA headquarters in Washington.

Joseph P. Doherty has been named CEO and a board member of Clearview Capital company *GCR*, New Orleans. He was executive VP, government sector president and chief operating officer for Affiliated Computer Services.

Jeffery Adams has joined South Bend, Ind.-based *AM General* as executive director-communications and marketing. Adams has held leadership positions at Lockheed Martin.

Etienne Veber has been named chief commercial officer and executive VP of *Precise Biometrics*, Vienna, Va. He has held executive positions at Learning Resources, Merisant, Nutra-Sweet Co. and Monsanto Corp.

Anthony Diaz has become president of *CIT Aerospace Commercial Airlines Group* of New York. He was executive VP.

Sylvain Bedard has joined *Avianor*, Mirabel, Quebec, as president and general manager. He was president of defense contractor L-3 MAS (Canada).

Dave Schmitz has been named chief operating officer of *Cubic Defense Applications* of San Diego. He was VP and general manager of Cobham Sensor Systems' microwave business. **Donald Haring** is the new VP-human resources. He held the same title at Thomas & Betts. ☼

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AW&ST/S&P Market Indices

(as of 7/18/2012)

PERCENT CHANGE



COMMENTARY

A Glass Half-Full, Or Half-Empty?

Budget and political decisions made in Berlin, Brussels and Washington will help shape the global aerospace industry. So it was not surprising that an undercurrent of anxiety ran through the recent Farnborough air show (see p. 43). Uncertainty from a financial crisis in Europe, potentially hefty cuts to U.S. defense spending, and slower economic growth in Asia and Latin America have put buyers and suppliers on edge.

Rainy weather notwithstanding, the show was hardly a washout for the industry's two dominant airframers. **Boeing** announced 370 new orders and **Airbus** 94, adding to backlogs that are the equivalent of more than seven years of production. Though Farnborough's deal flow was down nearly 50% from last year's Paris show—where Airbus's new A320NEO stole the spotlight—it was still the second-highest tally at any air show during the last five years.

But if the commercial side of the industry is embarking on a sustained upturn, the mood at Farnborough did not reflect it. "Our industry has a very high correlation with economic growth," says Frederico Fleury Curado, the CEO of Brazilian aircraft manufacturer **Embraer**. "It's not just Europe—there is general uncertainty in the world. People are refraining from making decisions." Jeff Roberts, group president for civil products at **CAE**, a Canadian supplier of aircraft simulators, says his customers "are scratching their heads." CAE counts on North America and Europe for two-thirds of its sales. "While we've been busy [at the show], it's not hectic like it was in the past," Roberts says. "There is a bit of trepidation on the airline side." And Clay Jones, the CEO of U.S. avionics supplier **Rockwell Collins**, believes anemic economies in the U.S. and Europe and slower growth in emerging economies could pummel some segments of aerospace, particularly business jets and the aftermarket. "The next couple of years are going to be really tough," he predicts.

There is even anxiety about Boeing and Airbus. Skeptical suppliers question whether airlines will be able to pay for all the jets they have ordered. The two airframers in turn worry that their suppliers will not make the investments required to support scheduled increases in aircraft production. "When you see Boeing having to delay programs for lack of rivets and fasteners and things like that, you say, 'Whoa, how can this happen?'" says Allan McArtor, the chairman of Airbus Americas. "We've experienced similar kinds of things."

The good news is that executives are more bullish on the industry's long-term prospects. Jones, whose company derives a little more than half of its sales from military products, predicts that declining U.S. defense budgets will stabilize in 2015. That is about the time that a "raft of new equipment"—the Boeing 787, Airbus A350, **Bombardier** CSeries, **Mitsubishi** Regional Jet and **Comac** ARJ21—should be undergoing production ramp-ups or entering service. "Just get me to 2015," he says. ☺

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

Weekly Market Performance

Closing Prices as of July 18, 2012

Company Name	Current Week	Previous Week	Fwd. P/E	Tot. Ret. % 3 Yr.	Tot. Ret. % 1 Yr.
AIR TRANSPORT					
AAR Corp.	14.15	13.37	8.9	-20.4	-53.3 ▼
ACE Aviation Holdings	2.63	2.68	-2.1	124.2	-5.1 ▼
AerCap Holdings N.V.	11.99	12.58	6.1	63.8	-6.6 ▼
Air Berlin	2.33	2.20	-2.0	-43.5	-39.1 ▼
Air Canada	0.97	0.99	-20.4	-33.3	-58.1 ▼
Air France - KLM	4.75	5.10	-2.4	-55.7	-57.7 ▼
Alaska Air Group	37.35	36.60	7.2	253.4	11.8 ▲
All Nippon Airways Co Ltd.	2.44	2.48	12.7	-28.7	-29.5 ▼
Allegiant Travel Co.	73.84	72.04	14.3	63.7	60.7 ▲
Asiana Airlines Inc.	6.43	6.26	6.4	99.5	-36.6 ▼
Atlas Air Worldwide Holdings	46.54	44.08	8.7	102.3	-15.5 ▼
BBA Aviation plc	2.95	2.92	10.8	79.5	-5.5 ▼
B/E Aerospace Inc.	42.11	41.64	14.4	195.3	3.5 ▲
CAE Inc.	9.94	9.90	12.7	53.6	-18.1 ▼
Cathay Pacific Airways	1.70	1.66	16.6	30.1	-24.6 ▼
China Southern Airlines	24.79	22.62		74.6	-22.3 ▼
Copa Holdings SA	77.16	76.59	9.6	102.7	15.7 ▲
Delta Air Lines Inc.	10.23	11.09	3.9	68.3	23.8 ▲
Deutsche Lufthansa AG	12.01	11.72	15.4	12.5	-28.3 ▼
easyJet plc	8.80	8.36	10.6	98.0	87.1 ▲
FedEx Corp.	92.72	90.61	12.6	56.1	1.7 ▲
GOL SA	4.41	4.10		-36.8	-59.2 ▼
Hawaiian Holdings Inc.	6.53	6.79	4.3	0.9	23.9 ▼
Heico Corp.	39.00	38.75	22.7	100.5	-13.3 ▼
Jet Airways (India) Ltd.	6.47	6.90	-5.5	45.6	-29.9 ▼
JetBlue Airways	5.65	5.74	9.1	22.6	2.0 ▲
Korean Air Lines Co. Ltd.	44.90	44.54	7.9	34.9	-26.8 ▼
Lan Airlines SA	25.25	25.16	24.3	112.8	-12.1 ▼
Qantas Airways Ltd.	1.09	1.07		-48.5	-41.9 ▼
Republic Airways Holdings Inc.	5.26	5.84	6.6	5.6	17.1 ▲
Ryanair Holdings ADS	29.29	29.71	73.3	9.3	12.3 ▲
Singapore Airlines Ltd.	8.50	8.39	27.1	3.5	-19.3 ▼
Skywest Inc.	8.14	7.85	8.9	-25.5	-33.1 ▼
Spirit Airlines, Inc.	21.70	22.15			55.0 ▲
Southwest Airlines	9.42	9.56		35.0	-10.7 ▼
TAM SA	25.91	25.80	56.5	128.6	15.1 ▲
TransDigm Group Inc.	129.64	127.73	17.5	307.9	41.9 ▲
United Continental Holdings, Inc.	22.84	24.79	4.5	573.7	10.7 ▲
United Parcel Service Inc.	80.21	78.88	16.1	68.2	12.6 ▲
US Airways Group	13.42	14.12	4.0	557.8	91.4 ▲
WestJet Airlines Ltd.	16.28	16.02	11.2	69.8	14.7 ▲
Zodiac Aerospace SA	100.40	96.96	13.7	266.2	42.4 ▲

AIR TRANSPORT

Gaping Hole

US Airways CEO Doug Parker, speaking at the National Press Club in Washington to tout the benefits of a merger with American Airlines, focused on the combined airlines' strengths, particularly on the U.S. East Coast. Parker says the merged airline would continue to serve mainly European destinations from its Charlotte, N.C., Philadelphia and New York-JFK hubs and Latin America from Miami. But the new carrier essentially would cede Asia to United Airlines and Delta Air Lines, relying instead on Oneworld partner Japan Airlines for Asia service. "We would never be the size of Delta and United in Asia, which have the old Northwest and Pan Am routes," he says. "Those two route networks can't be replicated."

Hawaiian Branches Out

Hawaiian Airlines is taking steps to launch a regional subsidiary, and has signed a letter of intent to buy an unspecified number of turboprops. The carrier plans to eventually have up to six aircraft in the subsidiary. While the type is not being revealed yet, the carrier is bound by union agreements to restrict turboprop operations to aircraft with no more than 69 seats. Hawaiian says up to 50 seats is the right configuration for the routes it has in mind. The carrier has been looking at a turboprop

operation for at least a couple of years, and had to work out agreements with its pilot and flight attendants unions. No launch date has been set.

Checking Up on Cargo

Southwest Airlines Cargo announced that it will introduce a new tracking service that will allow customers to better monitor their shipments. With Cargo Companion, wireless tracking devices will monitor the location, shock, light, temperature, pressure and humidity of cargo in transit. Email alerts will inform customers when a shipment crosses a checkpoint, when it arrives at its destination, what delays it faces and any temperature issues.

Larger Fuel Tanks

PATS Aircraft Systems has delivered the fourth of 10 Boeing 737-900ER aircraft with PATS' Auxiliary Fuel System to Turkish Airlines. With a two-tank aft configuration, the modifications adds 962 gal. of fuel capability, extending the potential range of the aircraft to more than 3,200 nm and allowing Turkish to expand its routes into Africa. PATS will deliver the remaining six aircraft during the next nine months.

BUSINESS AVIATION

Cessna Buys Textron

Bolstered by increased sales of Cessna

Citation business jets and Bell commercial helicopters, Textron reported second-quarter revenues of \$3 billion, up 10.7% over the same period in 2011. Operating profit from manufacturing businesses was up \$59 million to \$288 million. "The payoff from investing in new products and services is reflected in our double-digit revenue growth during the quarter," Textron Chairman and CEO Scott Donnelly told analysts, "and our focus on operational execution is driving solid results." Cessna delivered 49 Citations during the quarter, up from 38 a year earlier. Sales were up 17% overall, but the backlog value was down \$196 million from the previous quarter. Meanwhile, Bell delivered 47 Model 407 and 429 civil helicopters during the quarter as compared to 22 a year earlier. It also delivered nine V-22 Ospreys and six H-1 military helicopters. Sales were up 21.1%, but Bell's backlog at the quarter's end was down \$394 million from the first quarter. Donnelly notes the second half of the year is clouded by "uncertainty" among potential aircraft buyers over the general economic conditions, tax increases and the outcome of elections in the U.S. He is encouraged by the decline in used aircraft inventory. And while the overall market has improved, conditions remain challenging. "We expect a steady, slow recovery in the market," he says. Asked about the potential \$1.79 billion sale of Hawker

ISS Fully Staffed, Yet Again

Three veteran space travelers are settling in on return visits to the International Space Station, after their Soyuz launch from the Baikonur Cosmodrome in Kazakhstan.

Sunita Williams of NASA, Akihiko Hoshide of the Japan Aerospace Exploration Agency (JAXA) and Yuri Malenchenko of the Russian space agency Roscosmos reached the station July 17, bringing the crew of the orbiting laboratory back up to six. The newcomers and Expedition 32 commander Gennady Padalka, his fellow Russian Sergei Revin and NASA's Joe Acaba have a busy time ahead with the upcoming arrival of Japan's third H-II Transfer Vehicle (HTV-3), which was scheduled to lift off from the JAXA launch site on Tanegashima Island on July 21 for a seven-day transit to the station.

"After docking, the crew really hits the ground running," says Dina Contella, NASA's lead Expedition 32 flight director. In addition to unloading HTV-3, the crew will carry out engineering tests, including undocking and

redocking one unpiloted Russian Progress resupply craft to check out a new antenna, and receiving and unloading a second Progress.

They will conduct two spacewalks—one of them the first NASA outing in more than a year—and replace a faulty U.S. power distribution box, add orbital debris-shielding and make external changes to accommodate the expected arrival of Russia's Multi-Purpose Research Module in 2013.

Williams, 46, holds the world's record for long-duration flight by a woman, 195 days, which was established during a 2006-07 mission to the station. Malenchenko, 50, has logged four previous long-duration missions: two on the ISS, one on Russia's former Mir space station and a 12-day station assembly mission while a space shuttle crewmember. Hoshide, 43, participated in a 2008 14-day assembly mission.

"We have a pretty accomplished crew," says Janet Kavandi, NASA's director of flight crew operations. "They are ready to go; they know what they are up against."



NASA/CARLA COFFI

Beechcraft to a Chinese buyer (see p. 31), he says the sale is “technically not closed to anyone,” but that the stated price is “a pretty high number” and that “we’ll see how this plays out.” Regarding a possible acquisition of Hawker’s military trainer business, Donnelly says, “These are assets in which we have an interest, but they would have to be at a value we think appropriate.”

DEFENSE

Italy, Israel Cement Ties

Italy and Israel have signed a series of defense and space agreements valued together at almost \$2 billion. Under one pact, Alenia Aermacchi will supply 30 M-346 advanced jet trainers to the Israeli air force under a contract worth about \$1 billion, including simulators, maintenance and logistics. Deliveries will begin in 2014. Meanwhile, Israel Aerospace Industries (IAI) will furnish two Gulfstream G550-based compact airborne early warning (CAEW) aircraft to the Italian air force in a deal worth \$750 million, including ground-support systems and logistics. IAI also signed a \$182 million contract to supply an Earth-observation satellite to Italy’s Telespazio, which will deliver high-resolution optical satellite Optsat-3000 to the country’s ministry of defense in 2015 under a contract worth more than \$200 million, including launch and on-orbit commissioning. Finmeccanica says the M-346 sale is worth \$600 million to its Alenia Aermacchi division, while the supply of NATO-standard communications systems for the two CAEWs, through Israel’s Elta Systems, will be worth \$41 million to its Selex Elsat unit.

Contractor Jobs on the Line

While the harsh U.S. budget-cutting enforcement known as sequestration would not take effect until Jan. 2, “jobs are already being lost under the BCA (Budget Control Act),” says Pratt & Whitney President David Hess. “We’re effectively feeling the impact today,” he said last week at a House Aeronautics Caucus luncheon. For his company and the defense industry, that means holding off on hiring and investing decisions. At some companies, it means hoarding cash and for others, deciding to invest research money on commercial instead of defense projects. “Se-

quester is not worst-case. It is the law,” Hess says. “I don’t have the luxury of hoping sequester doesn’t occur.”

Virtual Surge

The U.S. Navy intends to substantially increase the percentage of simulation training for its personnel, especially in aviation. For the Boeing F/A-18E/F Super Hornet, the Navy plans to increase simulated training to 32% of overall instruction by 2020 compared to the current 18%, according to a report by the U.S. Government Accountability Office (GAO). For the Boeing EA-18G Growler, the Navy plans to increase that percentage to 34% from the current 20% in the coming eight years, the GAO says. For Sikorsky MH-60R Seahawk helicopters, the desired level by 2020 is 48%, compared to the current 39%, while MH-60S simulation training should rise to 49% from 41%. Naval Reserve Command officials told congressional auditors that there are no major differences between the anticipated tasks that active and reserve component forces practice when using simulators.

MAINTENANCE

Tahiti Picks Technics

Air Tahiti Nui has selected SR Technics of the Mubadala Aerospace MRO network to complete three cabin modifications on Airbus A340-300s along with C-checks. The technical aircraft services company will replace the current three-class cabin configuration with two business and economy classes, and install an inflight entertainment system. All work will be completed at SR Technics’ Centers for Excellence in Zurich and Dublin, with planned completion dates beginning in May 2013.

Gearing Up for Alliance

ST Aerospace’s Scandinavian facility, ST Aerospace Solutions, and its joint venture company, Madrid Aerospace Services, are partnering to provide landing gear maintenance service for the Airbus A320 family, A330s and A340, along with Boeing 737NGs, MD-80s and MD-90s. Under the alliance agreement, the two companies will market their landing gear maintenance and engineering services together, drawing on customer bases of their

respective parent companies, ST Aerospace and Iberia Maintenance.

CF34 Backbone

Lufthansa Technik AERO Alzey celebrated servicing its 1,000th General Electric CF34-series engine on July 16. The company, which specializes in the maintenance of regional and business aircraft engines, serviced its first CF34 in 1991.

Under New Warranty

GE Aviation has upgraded its repair warranty programs for CF6-80C, CF6-80E and CFM International CFM56 engine parts. Under the extended programs, warranty hours for CF-6 engine parts tripled to 6,000 from 2,000 hr. and doubled to 4,000 from 2,000 hr. for CFM56s.

Landing Gear Title

With a new service contract covering 15 additional 737NGs, Norwegian Air Shuttle has become Boeing’s largest landing gear exchange customer. Under the program, Boeing offers customers fully overhauled and certified landing gear shipsets as alternatives to buying new landing gear. Norwegian has already undergone three landing gear exchanges with Boeing, and the next is scheduled for October 2013. Norwegian has ordered 100 737 MAX airplanes and 22 737-800 aircraft.

Maintenance Milestone

MTU Maintenance Hanover has announced the repair of its 3,000th International Aero Engines V2500. The V2500, which powers the Airbus A320 family, was delivered to International Lease Finance Corp.

Corrections: An article on Spain’s S-80 submarine program (July 2, p. DT24) misidentified the legacy platform that was supposed to rationalize Europe’s shipyards. It was the *Scorpene* sub.

An article in the July 16 issue (page 34) incorrectly stated the Franco-German cost estimate for a next-generation European launcher, which is \$5-8 billion. In addition, the article should have indicated that the U.K. investment in a national space technology program is funded at £10 million (\$15.5 million).



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COMMENTARY

Advancing Eco

Boeing plans to blaze environmental trail with a series of EcoDemonstrators

When major manufacturers invest in a technology demonstrator, they are not on a fishing expedition, hoping a far-out idea will prove to be a winner. They are looking for near-term benefits from preparing technology for a smooth transition to product development.

So it is with Boeing, as it begins modifying a newly built 737-800 with a range of experimental fuel-saving technology features. The aircraft, on loan from American Airlines, flew in June and is the company's first EcoDemonstrator, flight-testing a series of aerodynamic, propulsion and systems technologies aimed at efficiency gains.

The specially modified 737 (see photo) is also the first of a series of testbeds. "We have a plan to roll out EcoDemonstrators on a yearly basis," says Jeanne Yu, environmental performance director for Boeing Commercial Airplanes. The next demonstrator, due to be modified in 2013, will be an original Boeing 787 development aircraft.

The 737 will feature a modified wing with an adaptive trailing edge. This will be manipulated in flight to optimize the wing profile during different stages of the mission. The changed profile is designed to move lift further outboard to improve efficiency.

Configurations chosen for the adaptive trailing-edge flight test include a fixed mini split flap for the inboard sections out to around mid-span and a drooped aileron tab. The outboard fixed trailing edge will also be modified to test both a mini plain and mini split flap. "They are all looking at better ways to make the trailing edge move without causing more drag," says Mike Carriker, Boeing's new airplane product development chief pilot.



Other features to be tested include a proton-exchange membrane regenerative fuel cell, developed in conjunction with IHI of Japan, which will be used for an experimental galley application. "It will help us learn how to downsize this technology," says Yu.

An active engine-vibration cancellation system developed by Hutchinson Aerospace will also be tested. The system is designed to counter a natural vibration in the cabin which emanates from the CFM56 turbofan. This is currently countered by increasing engine power settings at specific times in the descent and, by canceling the vibration, designers hope to save fuel by reducing required thrust.

The 737 demonstrator will also feature a variable-area nozzle (VAN) on the CFM56. It will be in a fixed position for tests, expanding the fan outlet area by 10%. This will lower jet velocities on takeoff and thus reduce noise. The VAN also offers further performance benefits to future high-bypass engines and, though not applicable to the CFM56, could be applied to future engines.

Unlike the "gapped" VAN adopted by Bombardier for the Pratt & Whitney geared turbofan (GTF)-powered CSeries, which increases the effective nozzle area by simply translating aft for takeoff, the EcoDemonstrator configuration will more closely resemble the sealed VAN to be flown on the GTF-powered A320NEO.

The VAN design will be flight-tested in the fixed open position, "like a constant-speed prop," says Carriker. As the device will be fixed in the takeoff position, CFM has set altitude limits to provide adequate flutter margin for the fan. Tests of the VAN-configured CFM56-7B will therefore be restricted to relatively low altitudes of around 10,000 ft. As a result, the VAN will be fitted at Boeing's test site in Glasgow, Mont., after the 737 has crossed the Cascade Mountains on its way from Seattle.

Flight-deck technology to be tested on the EcoDemonstrator includes a flight trajectory optimization system designed to fly more fuel-efficient routes. "We want to prevent the large rerouting you have to do in areas like the U.S.," says Yu. "We want to be smarter about how we plan our flight."

During the roughly 45-day test phase starting in August, the modified 737 will fly between Glasgow and Reno, Nev., to demonstrate low-emissions flights with biofuel. Following the completion of flight tests in September, the aircraft will be refurbished and delivered to American Airlines in November.

The second EcoDemonstrator, an early development 787-8, will fly in the third quarter of 2013. The principal technology to be tested is a ceramic-matrix-composite engine nozzle, integrated with embedded acoustic treatment, which will be fitted to one of the aircraft's Rolls-Royce Trent 1000s. The likely flight-test aircraft will be either ZA004 or ZA005 says Carriker, both currently fitted with the rival General Electric GENx-1B engine.

Developed by ATK affiliate COI Ceramics and Albany Engineered Composites, the nozzle unit will include a 92-in.-long centerbody and is aimed at handling the higher exhaust temperatures of new-generation engines, as well as tighter noise rules. ☐



By Pierre Sparaco

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

COMMENTARY

Henri Pitot's Legacy

High-tech, nearly fully automated cockpits can lead to a lethal erosion of airmanship skills

It seems inconceivable that a small device with no movable parts—and roots back to the 18th century—could initiate a catastrophic sequence of events that would result in the demise of a long-haul commercial transport and all on onboard. Yet this device—invented by French scientist Henri Pitot to measure rivers' rate of flow—is implicated in the fatal crash June 1, 2009, of an Air France Airbus A330-200 operating the Rio de Janeiro-Paris route as Flight 447.

Investigators determined in the early part of their analysis that the twinjet's Thales speed sensors, or "pitot tubes" (see photo), were obstructed by ice crystals and could no longer calculate and transmit correct inputs to onboard electronic



systems. This failure disconnected the automatic pilot, requiring the flight crew to return to manual controls. In other words, Pitot's 200-year-old invention was the initiating cause that led to the disaster, although better training of the pilots in question could have prevented the tragic outcome.

Momentarily putting aside the BEA French aircraft accident bureau's exhaustive investigation, the ill-fated Flight 447 produced more than a wake-up call. It also injected a bit of humility to engineers and operators alike—that a tiny piece of equipment with no high-technology content can challenge the world's flight-safety community. The BEA and others do not have the luxury of time to stage philosophical debates. Every agency seems to be in accord about the sequence. The task at hand is to focus on correcting the chain of errors that resulted in the ghastly accident.

Similarly, the BEA's final report does not question the use of Pitot's

invention in state-of-the-art cockpits, a genuine paradox. Lessons learned rather show that aircraft manufacturers, airline technicians and pilots blindly trust electronics and, in so doing, sometimes tend to forget that human beings can have a hard time dealing with unexpected situations. It has been confirmed that Flight 447's three pilots suffered from "a profound loss of understanding" of ongoing events and, in the absence of solid airmanship, acted in a state of great confusion. For example, they didn't respond to stall warnings because they did not realize that the A330 had entered a deep stall fall.

BEA investigators have done their best to dispassionately assess the situation. The final report, released this month, cites the surprising state of confusion in the cockpit and weak crew resource management, but does not elaborate on the pilots' obvious loss of situational awareness. Investigators are extremely cautious. Says BEA head

Jean-Paul Troadec: "Another [flight] crew could have faced the same problems," which is a diplomatic shorthand for saying inadequate training was at the heart of the crews' inability to recognize a stall and remedy the situation.

Pitot can rest in peace. Although his sensors are out of date and desperately waiting for an inventor to offer a replacement, the crash resulted from inappropriate control inputs that destabilized the aircraft's flight path. Investigators are crystal clear about this: The crew failed to identify the approaching stall, did not respond in time and exceeded the flight envelope's limits. Moreover, no action was initiated that would have made recovery possible.

The BEA sent up to 41 safety recommendations to DGAC French civil aviation authorities, the European Aviation Safety Agency, the International Civil Aviation Organization and the FAA. They focus on the need for enhanced training, reporting procedures, better oversight of airlines and fine-tuning of onboard electronics. Recommendations also suggest the addition of an angle-of-attack indicator to the flight panel, and advanced training that addresses stall recovery at high flight levels.

In addition, the BEA believes commercial transports should regularly transmit to air traffic management key information such as altitude, speed, heading and position. They also recommend equipping aircraft with a cockpit video recording system of the flight panel, which would be protected as strongly as digital flight data recorders and provide critical information to accident investigators. In the past, pilots rejected the idea of video recorders, claiming they would not significantly contribute to investigations but would compromise privacy in cockpits.

A BEA recommendation also stressed the need for strict rules applying to task-sharing on long-duration flights when the crew comprises more than two pilots.

"This is the end of the investigation work," says Troadec. But he is fully aware that this is only the beginning of a long-term effort to better use and control automation in cockpits. In the meantime, we much patiently wait for a successor to Pitot's device. ☛



COMMENTARY

Short-Haul Widebodies

Asian carriers are finding new uses for the A330

Limited landing slots and traffic rights at a number of Asia's capital-city airports will see some airlines switching to widebodies on select short-haul routes, a trend that has caught the attention of aircraft lessors, particularly those that have Airbus A330s (see photo).

Japan's Skymark has been operating 27 Boeing 737-800s domestically, but has signed a lease deal with Intrepid Aviation for seven A330-300s. These will be delivered from the beginning of 2014 through 2015. Skymark plans to operate these aircraft from Tokyo Haneda International Airport to Sapporo, Fukuoka and Okinawa.

The move to A330s is significant and comes at a time when Skymark faces increased competition from new low-cost carriers Jetstar Japan and AirAsia Japan, which fly narrowbodies based at Tokyo Narita International Airport. Tokyo Haneda, however, is more convenient than Narita, although landing slots there are relatively hard to come by, hence the need for Skymark to boost capacity and cater to market demand at Haneda using larger aircraft.

Limited landing slots are also an issue at Jakarta Soekarno-Hatta International Airport, which experienced a 19% increase last year in passenger numbers to 51 million. But Jakarta airport's three terminals were built to handle only 38 million passengers per year, so the authorities are no longer granting new slots for peak times.

Garuda Indonesia operates 737-800s domestically, but has Rolls-Royce-powered A330-300s on order and plans to use some of these on the busier domestic trunk routes, say industry executives. Many of Indonesia's domestic airports are closed at night, so it is likely that Garuda will opt to fly the A330s within the country during the day and then deploy them on international routes overnight. This is something Skymark may also try out in Japan.

The push among airlines to start operating A330s on shorter routes is a boon for Rolls-Royce. Airbus's head of A330 marketing, Crawford Hamilton, says 60% of the A330s in operation today use Rolls engines.

This trend toward A330s on short-haul service is also a boon for aircraft lessors such as Intrepid Aviation, Guggenheim and Ireland's Lease Corp. International, which have generally steered clear of narrowbodies and focused on widebodies, particularly the A330-300. These relatively new lessors took this path because they wanted to avoid the severe price competition that has engulfed the narrowbody lease market, as a consequence of Airbus ramping up production of A320s.

By Leithen Francis



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For airlines, the main benefit of operating widebodies is that it allows them to boost capacity without the need for additional airport slots. The downside is that twin-aisle aircraft are designed to operate on medium and long-haul routes, so the airframe has additional structural weight. A widebody, for example, has stronger, heavier wings and center wing-box. This is because it must carry extra fuel for the longer distances. If the aircraft is used only for short-haul, however, then it is carrying that extra structural weight unnecessarily.

The use of widebodies on short-haul flights also increases maintenance costs. Engines and airframes often come due for heavy maintenance checks based on the number of cycles or flights. Whether it flew for 7 hr. or just 2 hr., it still counts as one flight. If the aircraft does short sectors each day, then it is running through the cycles and coming due for maintenance checks quicker.

However, if an airline needs to transport more people to a popular destination, and airport slot constraints mean the only way this can be done is to use larger aircraft, then that is what the carrier will do.

The trend toward larger aircraft also benefits widebody low-cost operators such as AirAsia X and Singapore Airlines' Scoot. They originally were launched as medium, long-haul low-cost carriers, but in the future they might increasingly be serving short-haul sectors.

Scoot CEO Campbell Wilson says the carrier looked earlier this year at operating nonstop from Singapore to Jakarta and Manila, but was unable to obtain the traffic rights. However, the inference is that if they had the traffic rights, they would be serving these two short-haul routes with Scoot's 777-200s. Almost half of Scoot's routes at the moment are in fact short-haul: Singapore-Bangkok, Singapore-Taipei and Taipei-Tokyo Narita.

If major airports in Asia—such as Jakarta, Manila, Bangkok, Singapore and Tokyo Haneda—continue to be hampered by limited traffic rights or too few landing slots, then the trend will continue to be toward bigger, rather than smaller, aircraft. ☼

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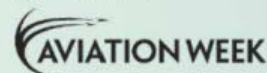


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COMMENTARY

Big Boosters

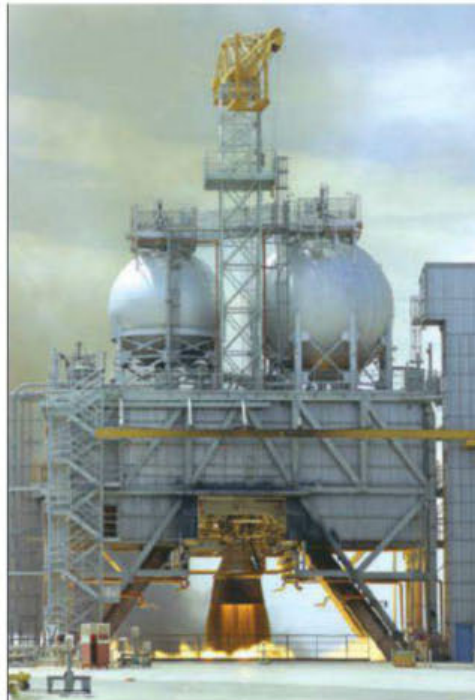
Main Saturn V engine may fly again

The powerful rocket engine developed in the 1960s to launch the first men to the Moon could be reprised in the 2020s as the powerplant for strap-on boosters that NASA hopes to use in heavy-lift human missions to Mars. Under a new NASA risk-reduction project, Dynetics Inc., a relative newcomer to space launch, will explore the idea for the U.S. agency in partnership with Pratt & Whitney Rocketdyne.

Rocketdyne built the 1.5-million-lb.-thrust F-1 engine for NASA, which mounted five of the kerosene-fueled behemoths in the Saturn V first stage to propel the massive Saturn/Apollo stack off the launch pad. The F-1—19 ft. tall, with a nozzle 12.5 ft. across—epitomized the scale of the flight hardware and ground infrastructure NASA used to beat the Soviet Union to the Moon. If NASA decides to fly it again, it probably will be tested in the same stands built for the F-1 at the agency's Marshall and Stennis field centers, stacked in the same 40-story Vehicle Assembly Building at the Kennedy Space Center used for Apollo and the space shuttle, and launched from one of the pads built for the Moon program.

Dynetics scored big in a \$200 million NASA effort to reduce the risk on advanced boosters for the planned Space Launch System (SLS) that Congress ordered as a government-owned deep-space alternative to the commercial vehicles the agency wants to use for transport to the International Space Station. Last week NASA selected the company to negotiate for three of six 30-month study contracts designed to reduce risk on the twin boosters that will be needed to raise the SLS capability from an initial 70 metric tons to the 130 metric tons the agency believes will be needed for human missions beyond low Earth orbit.

"With an F-1-based approach, we get significant performance enhancement beyond the 130 [tons], on the order of 20 metric tons," Steve Cook, Dynetics' director of space technologies and NASA's



NASA MARSHALL SPACE FLIGHT CENTER

former Ares program manager, tells Aviation Week's Jefferson Morris.

Headquartered in Huntsville, Ala., near the World War II-vintage U.S. Army arsenal where Wernher von Braun's team developed the Saturn V and its engines, Dynetics was selected for its risk-reduction proposals covering the F-1 engine itself, the main propulsion system for a strap-on booster and the booster structure. For the F-1, Cook says, risk-reduction tasks would include gas generator and powerpack evaluations. The company's main propulsion system proposal would involve cryogenic valve and line-in valve demonstrations, and the structures proposal

would demonstrate low-cost cryogenic tank-manufacturing approaches.

"Those risk reductions are focused heavily around affordability . . . because a big deal on the Space Launch System is affordability, while also giving NASA additional performance margin above their 130-metric-ton requirement," says Cook.

NASA also selected a booster-tank proposal offered by Northrop Grumman's Aerospace Systems unit, which would build a subscale composite tank. Aerojet General Corp. has been working on a larger version of the surplus Soviet NK-33 kerosene-fueled rocket engine it modified for the new Orbital Sciences Corp. Antares, and NASA selected its proposal for a full-scale combustion-stability demonstration. NASA chose ATK Launch Systems—which built the four-segment solid-fuel motors used on the space shuttle and a five-segment version for the defunct Ares I crew launcher—to run an integrated booster static test.

NASA plans to use the five-segment solids with the first version of the SLS, a 70-metric-ton vehicle with a Delta IV upper stage. Later it will add a more powerful upper stage and whatever strap-ons it chooses to begin sending astronauts beyond low Earth orbit.

"We want to build a system that will be upgradable and used for decades," says William Gerstenmaier, associate administrator for human exploration operations.

If the Dynetics proposal to use the F-1 in the boosters is accepted, all of the engines on the SLS will have heritage in earlier human spaceflight missions, and all will already have been used for decades when deep-space human missions begin. The F-1 ran a full 2.5-min. test at Edwards AFB, Calif., in 1960 (see photo), before the A-1 and A-2 test stands at Stennis were built for it. NASA and Rocketdyne are testing the updated J-2X variant of the Saturn V J-2 engine to power the SLS upper stage. And the main SLS engine will be a throw-away version of the reusable RS-25D space shuttle main engine, also built by Rocketdyne, once the 15 surplus shuttle engines are used up. Developed in the 1970s, it will be the newest basic engine design for what may one day be NASA's newest human launchers. ☐



By Michael Bruno

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COMMENTARY

Contested Airspace

Debate about UAVs in U.S. skies heats up

When it comes to UAVs over America, lawmakers have a new boogeyman: hackers. At a congressional hearing July 19, a University of Texas professor described how he and his students hijacked an \$80,000 Adaptive Flight Hornet Mini at the behest of the Homeland Security Department (DHS) during a demonstration last month at White Sands Missile Range, N.M. The Hornet Mini is just the kind of small rotorcraft a local police force might use. The professor, Todd Humphreys, contends that GPS generally is vulnerable to such spoofing attacks—a claim highlighted by Iran's assertion that it downed a U.S. RQ-170 (see photo) by tricking its GPS system—and he says Washington should investigate how it applies to the FAA's NextGen air traffic control system.

Still, lest lawmakers become so jittery that they implement policies that would shut down the nascent industry, Humphreys offers potential solutions. Military-style receivers designed for high-level encryption are likely to be too expensive and bulky to be viable for civilian UAVs. But he outlined a variety of potential defenses, including receivers that use multiple frequencies, single-antenna spoofing detectors and spread-spectrum security codes. And, as a formal recommendation to make GPS navigation systems more resistant to spoofing, Humphreys says DHS should fund development of an authentication signature for one or more civil GPS signals. In the meantime, an industry representative is trying to calm fears by putting it all in context. "Spoofing" is not a new issue," says Michael Toscano, chief executive of the Association for Unmanned Vehicle Systems International. "Spoofing" has implications for any technology that depends on GPS for guidance



and timing, whether it is manned or unmanned aircraft, your cellphone or your car," he tells lawmakers. As for the Hornet Mini's maker, CEO Wayne Pickell says, "Adaptive Flight is proud to be working with Dr. Humphreys and his team in their efforts to address GPS system vulnerabilities due to GPS spoofing." All Adaptive Flight products come equipped with a "patent-pending GPS-denied operational mode," which the company says was turned off for Humphreys' demo. ☺

ARMED TO THE TEETH

Absurdities reign in the capital as pundits and politicians face an almost certain triggering of the Budget Control Act's sequestration cuts come January. First is the notion from the White House that the commander in chief would stand by while automatic budget cuts "devastate" his military—in the words of President Barack Obama's own Defense Department chiefs. If Obama is reelected, would he really

allow a second term to go by and not at least seek to alter the blind salami-slicing approach to budget cuts that could wreak havoc on military capabilities that even Obama appreciates, like Special Forces? Instead of calling his bluff, Republican lawmakers—who are just as responsible for forcing sequestration upon the country—are pitching an absurdity of their own: that they need Obama to lead them out of the dreaded law's effects. That Republicans would follow anything Obama suggests is risible just months before national elections. Yet, why do both sides make such wild claims? Because Americans are already losing jobs over the Budget Control Act they passed last year. Now a study for the Aerospace Industries Association predicts that sequestration, if allowed to be carried out, would push the U.S. back into a recession, cutting 2.14 million jobs, reducing the nation's gross domestic product by \$215 billion and pushing the unemployment rate above 9%. American University's Gordon Adams savages the study, though, saying it does not consider real-world economics. "But," Adams observes, "this debate is not about a theory of economic growth." ☹

LORDS OF WAR

Finally, some Democrats and Republicans are finding one defense issue they can unite behind: trying to outlaw U.S. purchases of military equipment from Russia's Rosoboronexport. In a long-standing relationship, the U.S. is paying the Russian arms exporter to provide Mi-17 helicopters to the Afghan army. But with Rosoboronexport also shipping attack helicopters, sniper rifles, mortars and possibly tactical fighter jets to Syria, these lawmakers want to boycott the Russian weapons exporter—or, at least, boycott future work. Rep. Jim Moran (D-Va.), a powerful defense appropriator, is pushing language in the House that would "simply say no more purchases from this Russian firm." While other lawmakers want U.S. helos provided to Afghanistan, they dodge the reason the Mi-17s were chosen in the first place: Afghan pilots are far more familiar with Soviet-style equipment than American, and the West faces a deadline to stand up Afghan security forces. ☹

Up For Grabs

Competition for foreign military sales heats up

Jen DiMascio, Joseph C. Anselmo and Amy Butler Farnborough and Washington

As bad as the U.S. budget picture seems, 2012 was the best year on record for the sale of U.S. weapons abroad. The administration expects to sell a whopping \$51.6 billion worth of weapons overseas during fiscal 2012, soaring beyond what was a bit above a \$10-billion-a-year business a decade ago. But with an increasing number of countries eyeing the same export pot, nations and companies will have to position themselves for global competitions that are growing more and more intense.

Boeing now anticipates that 30% of its defense sales will come from the international market, and Lockheed Martin is aiming for 20%. With Pentagon belt-tightening underway, U.S. defense contractors were expected to keep a low profile at this month's Farnborough air show. But business was booming at the chalet of defense electronics contractor Raytheon. "This is probably the busiest air show we've ever had," said CEO Bill Swanson.

International customers accounted for 29% of Raytheon's bookings in 2011, and Swanson is relying on such sales to help balance what he believes will be an inflation-adjusted decline in U.S. military spending. "We see our international [sales] growing at high single digits," he says. "If your international grows and your domestic goes down with inflation, then our company should have flat-to-slight growth."

Raytheon has benefitted from its position in the market, capitalizing in sales of intelligence, surveillance and reconnaissance and electronic warfare equipment, and it is building ties abroad in key markets.

"Defense exports from the EU and North America have increased dramatically in recent years to Turkey, Pakistan, Singapore, the Baltic States, the UAE, Qatar, Malaysia and Japan," a report by PwC

states. "In Saudi Arabia, the growth rate of military expenditures and the growth rate of defense spending as a percentage of GDP are the highest in the world."

Indeed, the U.S. weapons export numbers are riding high this year, in large part due to the \$29.4 billion sale to Saudi Arabia of 84 Boeing F-15 aircraft amid rising tensions with Iran.

But with so many tempting deals on the horizon, U.S.-based companies are not the only ones looking beyond their

borders. Swanson sees increased competition for that business—particularly from Russia and China. And close U.S. allies are warning their industrial bases to prepare to go head-to-head with more companies.

At Farnborough, where Russia's Rosboronexport—still under fire from U.S. lawmakers for exporting attack helicopters being used in the Syrian civil war—said it is counting on combat aircraft and airborne munitions to comprise 40% of its exports over the next 10-15 years.

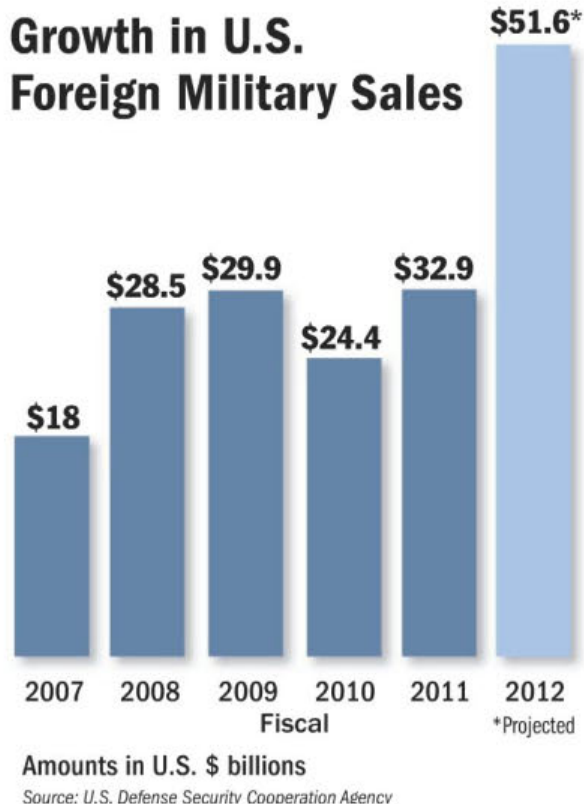
Speaking to a panel at the Farnborough International Airshow, U.K. Defense Secretary Philip Hammond described a rapidly changing export market. Just a few years ago, many nations were happy being customers, but now those same importers want to be partners. In a few years, former customers may see themselves as first-tier competitors. "There will be huge pressure on all of you in the industry to revisit business models, to build partnerships that reflect the new reality," Hammond said.

A study by the Stockholm International Peace Research Institute (Sipri) charts an increase in Asian demand for weapons—accounting for 44% of global imports. But those nations are gradually trying to build their own industries, following the lead of China, which is already making the transition from weapons importer to global arms broker. From 2002-06, China was the largest weapons importer. Between 2007-11, China's rank fell to fourth place and is now the sixth-largest supplier of weapons in the world.

"While the volume of China's arms exports is increasing, this is largely a result of Pakistan importing more arms from China," said Paul Holtom, director of the Sipri Arms Transfers Program. "China has not yet achieved a major breakthrough in any other significant market."

To maintain their edge in the future, U.S. companies will need to continue to innovate, and the U.S. government should work to improve the environment for exports, according to several industry and government officials.

"What does give us the



The U.S.'s record-setting year for foreign military sales was bolstered by the blockbuster sale of 84 Boeing F-15 fighter jets to Saudi Arabia.



Recent Big-Ticket U.S. Foreign Military Sales

Qatar	24	Boeing AH-64D Apache Block 3	\$3B notified July '12
Qatar	22	Sikorsky MH-60R/S Seahawk	\$2.5B notified June '12
Qatar	12	Sikorsky UH-60M Black Hawk	\$1.1B notified June '12
Japan	42	Lockheed Martin F-35A	\$10B notified May '12*
Saudi Arabia	84	Boeing F-15S	\$29.4B signed Dec. '11
India	6	Lockheed Martin C-130J	\$1.2B notified Oct. '11
Iraq	18	Lockheed Martin F-16IQ	\$2.3B signed Sept. '11

*contract for first four to be signed soon

Source: U.S. Defense Security Cooperation Agency

leading edge is technology. It's innovation. It's R&D," says Marion Blakey, president of the Aerospace Industries Association. "The key thing of course is to try to move forward in terms of composite technology, the propulsion technologies—all of the kinds of innovation that I think our companies are showing."

But in addition to making sure its products are competitive, the U.S. needs to be smart about positioning products, particularly UAVs, an industry in which the country has built an expertise but is bound by Missile Technology Control Regime rules, Blakey says. Other nations were displaying their latest developments in UAV technology, which can be sold without the same barriers to export, she says. "It'll go the way of commercial satellites if we don't address it," Blakey warns.

The U.S. also needs to move forward with its export control reform effort.

In a July 17 speech to the Export Control Reform (ECR) Conference,

Andrew Shapiro, assistant secretary of state for political-military affairs, pushed back against skepticism about the administration's ability to streamline the nation's Byzantine export controls. The administration has been working to rewrite the U.S. Munitions List, to ensure that the most sensitive technologies are protected and that the least sensitive items can be traded more freely with allies.

"Let me be very clear: any speculation that ECR is stalled is absolutely false," Shapiro said. "This has been a long tough slog, but we can now see the goal line. So to suggest or infer that we are somehow losing momentum when we are this close, is just wrong. By January of next year we will have either crossed the goal line, or we will be so close, that whoever is in these jobs will just need to dive into the end zone and do a touchdown dance."

And acting Commerce Secretary Rebecca Blank says the administration expects to notify Congress of its

changes to the export control list in the fall.

Another complication is what happens on the backend of a deal. While foreign sales for the U.S. are a money-making venture, they are also a diplomatic tool to deepen ties between nations. And foreign governments have long used the deals as a way to bolster local economies.

The practice has been around for ages. To sell F/A-18s to Spain, Boeing's predecessor, McDonnell Douglas, helped establish a Domino's Pizza franchise in Barcelona.

But the practice is growing. Between 2005-16, governments will have imposed \$500 billion in such agreements on foreign companies, according to a study conducted by data-analysis company Avascent and Fleishman Hillard.

Despite their importance on the frontend of the deal, most companies pay little attention to offsets at a high level, says Avascent partner Jon Barney. But with increasing global compe-

tion, foreign customers are becoming more sophisticated about their offset policies. And with the possible public-perception downsides to offsets, companies should pay more attention, Barney says.

Companies can set themselves apart from the competition by making offsets a strategic priority for senior executives, building internal support for offsets, increasing their visibility and planning for them financially. "With sellers expected to incur an estimated \$500 billion in offset obligations through 2016, government officials in purchasing countries have an unprecedented opportunity to create jobs, attract investment and promote sustainable growth at no extra cost to the treasury," states a white paper on the study.

A strategic plan could help address growing concerns among second- and third-tier suppliers that often don't have the resources to produce offsets for their primes. One supplier said this is a concern moving forward; he fears that his company will be at a disadvantage because it lacks the global reach to produce offsets on a large scale for a prime contractor.

In some cases, a prime will forgo a U.S. supplier in order to meet offset requirements. "The primes are actively looking for foreign supply partners for offsets instead of us," said one U.S. contractor. "It's going to get messy."

In other cases, U.S. companies establish joint-venture relationships to fulfill foreign sales requirements. "There will be a transfer of technology that leads to a one-time gain for us," the contractor said. "If [foreign officials are] buying a product, they are expecting more than just the product. They want a lasting relationship that supports their indigenous industry."

Just finding direct jobs in-country is not always an option, even for a large prime contractor. "It is not a sustainable business," says Chris Chadwick, president of Boeing Military Aircraft, who says that Boeing's approach is to establish long-term business relationships with partners abroad. "It is not just about the sales, but being part of the fabric of that industry."

That is especially true in places such as Saudi Arabia, where Boeing will now be filling the order for 84 F-15s, as well as the upgrade of 70 others. "Our intention now is to ensure we are immersed in the Saudi industry," Chadwick says. ☐

Navy Jam

Sailors and Marines drive U.S. EW investment

Michael Fabey Washington

The U.S. Navy and Marine Corps are expected to outspend each of their sister services roughly two-to-one on electronic warfare (EW) programs during the next decade.

In a 10-year period from fiscal 2008-17, the Navy and Marines have spent or are set to spend a cumulative total of about \$21.9 billion, based on analysis and data provided by Avascent 050, an online market analysis toolkit for global defense programs.

Combined, all of the services will have spent or are slated to spend a cumulative total of about \$44.2 billion during that time, the analysis shows.

The U.S. Air Force will have spent or is budgeted to spend a total of \$12.3 billion in that time frame, while the Army's total is expected to be about \$9.1 billion, the analysis shows.

Joint Pentagon-wide programs are expected to total about \$829.3 million, according to the analysis.

"For the last 30 years, the Air Force has emphasized stealth in its aircraft modernization plans while the Navy has stressed electronic attack," says Loren Thompson, defense analyst for the Lexington Institute. "The Air Force hasn't paid much attention to jamming and the Navy hasn't paid much attention to low-observables."

While that likely will change as the Navy acquires a carrier-based version of the stealthy F-35 fighter aircraft, Thompson says, "The Navy is the main repository of electronic warfare expertise in the joint force, and that inclines it to assign less importance to low-observables." For aircraft launched from carriers or other vessels, jamming and EW are often more valuable and effective than stealthiness.

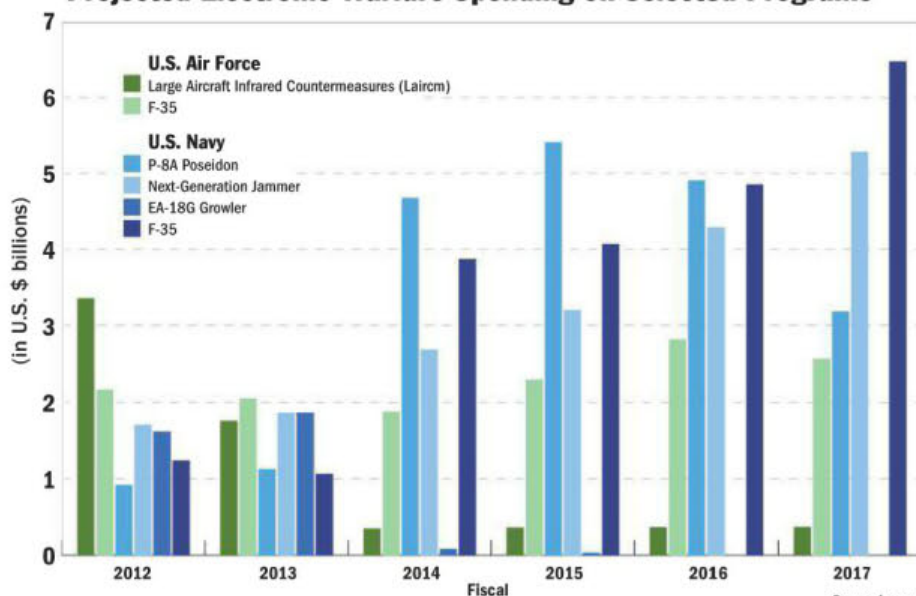
But the rest of the military is starting to focus more on EW.

"The Department of Defense is increasingly dependent on access to the electromagnetic spectrum—the full range of all possible frequencies of electromagnetic radiation, including frequency ranges such as radio, microwave, infrared, visible, ultraviolet, X-rays and gamma rays—for a variety of military uses, such as communicating, navigating, information-gathering and sensing, and targeting," notes the U.S. Government Accountability Office in a report released this month.

Overall, the Pentagon will be steadily increasing its investment in EW programs in the coming five years, growing to about \$5.6 billion in fiscal 2017 from about \$3.6 billion in fiscal 2013, based on the analysis of Avascent data.

That is a reversal of a trend in the

Projected Electronic Warfare Spending on Selected Programs



The latest U.S. Navy P-8 Poseidon is set to receive about \$2.3 billion in fiscal 2008-17, the highest amount for any single EW platform.

latter half of the previous decade, which showed Defense Department spending for electronic warfare reaching about \$3.9 billion in fiscal 2008 and spiking to about \$4.5 billion in fiscal 2010 before dropping off to about \$3.3 billion in fiscal 2012, the Avascent data and analysis show.

The single-largest type of expense—about \$28.1 billion—in the coming years will be the actual production of the electronic warfare equipment and platforms, the Avascent analysis indicates, with EW development running a distant second with \$11.2 billion. Program management support is ranked third with \$1.5 billion.

The projected expenses for production really ramp-up in fiscal 2016-17, the analysis indicates, with the Pentagon scheduled to spend at least \$3.8 billion during each of those years.

The biggest single electronic warfare platform and program highlighted by the Avascent analysis is the Navy's P-8A Poseidon with about \$2.3 billion in

spent funds or expected spending during the 10-year period, the Avascent analysis shows.

The aircraft, based on a Boeing 737 platform, will replace the Lockheed P-3 Orion, with initial operational capability expected in 2013.

The second-largest EW program for the 10-year period is the Navy's proposed Next-Generation Jammer with about \$2.1 billion in spent funds or expected funding. The Jammer is slated to replace the ALQ-99 jamming pods on EA-18G Growler aircraft.

USAF's Large Aircraft Infrared Countermeasures (Laircm) is the third-

largest EW program for the 10-year period, according to Avascent data.

Laircm, which has received or is set to receive about \$1.7 billion in funding during that period, is used to detect missile launches, determine the threat level and, if warranted, activate a high-intensity laser-based countermeasure to track and defeat the projectile.

The next two leading EW platforms are aircraft—the F-35 Joint Strike Fighter, which is listed under the Air Force's account and the Navy's Growlers—both totaling about \$1.5 billion each in the 10-year period, the analysis shows. ☐



BOEING

Globalization Limits

Irkut opts to forgo USAF T-X competition to focus on trainer upgrades and deliveries to Russia

Maxim Pyadushkin and Amy Butler Farnborough

The Yak-130 was flown at Farnborough in hopes of garnering international interest in Irkut's fast trainer.



NIGEL HOWARTH/AVIATION

Though Russia's Irkut is working to expand the Yakovlev 130's role from a fast-jet trainer to an attack aircraft, a senior company official acknowledges that the aircraft will not be vying for the largest trainer competition.

The Pentagon is planning to buy at least 350 T-38C replacements beginning in fiscal 2013 or 2014, and the list of competitors is long. But, Konstantin Popovich, head of Yakovlev's engineering center, acknowledges that the Yak-130 is unlikely to be on it.

"Everything is possible [but] we are trying to be realistic. We understand that [the M-346] is the Western option of the aircraft. So, of course it most probably is the . . . M-346" that will compete, he said through a translator at a Farnborough air show briefing.

Irkut and Alenia Aermacchi teamed to design the aircraft and Alenia's version, the M-346, is a sure contender for the U.S. program. It is likely to compete against versions of the BAE Hawk and Korea Aerospace Industries/Lockheed Martin T-50. Boeing is also leaning toward designing an aircraft from the ground up (AW&ST July 16, p. 14).

Russia's military is purchasing 55 Yak-130s through 2015 and has a contract option for 10 more. The basic Yak-130 variant completed government evaluation trials in 2009. The Russian air force now operates 12 aircraft from the initial production batch. Fifteen are slated to be handed over this year; all deliveries should be complete by 2012. Last year Irkut also shipped 16 aircraft to Algeria.

The Russian air force selected the Yak-130 in 2002 as its new jet aircraft for basic and advanced pilot training to replace the aging fleet of Soviet-era Czech L-39 trainers. It is equipped with a glass cockpit and a reprogrammed fly-by-wire system that can replicate the characteristics of various Russian fighters, fourth-generation and higher.

But, as the company delivers more aircraft, officials are also focused on

upgrades. The first stage of modernization includes the installation of an inflight refueling system and electro-optical pod, Popovich said. This work should be completed in 2013, he added.

In the next stage, designers plan to equip the aircraft with radar. Three options are being evaluated, said Popovich. The first is from Phazotron-NIIR. Earlier, Phazotron's chief designer, Yury Guskov, told Aviation Week that his company had started developing a slot array antenna radar, dubbed FK-130, for this aircraft.

The other options are an onboard radar from Tikhomirov-NIIP or a radar pod from St. Petersburg's Leninetz plant. According to Popovich, the radar designer and supplier is to be selected by year-end; development efforts are planned for 2013-14.

Popovich said the radar installation

will provide the Yak-130 with target detection for air-to-ground missiles such as the Kh-31 (AS-17 Krypton), Kh-38 and Kh-29 (AS-14 Kedge). "We understand now that the aircraft's stability allows us to use such heavy missiles," he said, adding that all these improvements are company-initiated.

The aircraft can currently carry up to 6,600 lb. of combat payload, including the short-range R-73 (AA-11 Archer) air-to-air missile with infrared seeker, KAB-500 guided bombs, free-falling bombs, unguided rockets or a pod with 23-mm GSh-23L twin-barreled cannon. The weapons can be fixed at nine external hard points: six underwing, two wingtips and one under the fuselage.

Irkut suggests that the Yak-130 attack version could be used in low-intensity conflicts to engage point-surface targets and low-speed air targets. ☼

Regaining Lost Ground

Russia tries to shore up its position in the Indian defense market

Jay Menon **New Delhi**



New Delhi has been increasingly turning to the U.S. or Europe for its military purchases, including the selection in February of Dassault's Rafale to replace its aging MiG-21 fighters.

Russia used to be the biggest arms supplier to India, and a reliable one at that. But overpricing, among other issues, led to a sharp drop in its share of the lucrative market. Now Russia intends to claw its way back to the top over formidable U.S. and European competitors.

India was the world's largest buyer of arms from outside its borders in 2011, accounting for 10% of global arms imports.

Russian Deputy Prime Minister Dmitry Rogozin made a pitch for the joint development with India of defense equipment that could be sold to other countries during a visit to New Delhi last week.

"We want to move from basic trade to joint development projects with India in defense," Rogozin says.

In talks with Indian authorities, Rogozin expressed keen interest in joint ventures for the production of cargo and passenger aircraft.

"The BrahMos missile system is a shining example of this type of co-operation," says an Indian defense ministry official. "Joint development of the Fifth-Generation Fighter Aircraft and the Multi Transport Aircraft, as well as the licensed production in India of Su-30 aircraft and T-90 tanks, are other examples of flagship cooperation programs that are presently underway in this area."

India has also asked Russia to start inducting the 290-km-range

(180-mi.) BrahMos supersonic cruise missiles into its naval fleet. The two sides formed a joint venture to produce the supersonic cruise missile in 1998 and since then, all three wings of the Indian armed forces have ordered BrahMos for their inventory. But the Russians have ordered none as yet.

"Several issues continue to affect the India-Russia defense relationship," the Indian official says. "There have been repeated delays in Russia implementing major weapon orders, including for the aircraft carrier, Admiral Gorshkov. Russia has also tended to raise costs midway through the execution of agreed-upon commitments. Roadblocks have also emerged for the transfer of technology and the uninterrupted supply of defense spares."

In the past 12 months, Russian arms manufacturing has faced a string of setbacks in India. Last year, its MiG-35

"There have been repeated delays in Russia implementing weapons orders"

fighter lost the Medium Multirole Combat Aircraft competition to Dassault's Rafale. The \$15 billion program is replacing the Indian air force's aging Russian MiG-21 fighter jets.

After the award to Dassault, Defense Minister A.K. Antony said the country's defense acquisition policy is guided by professional and not political considerations. "India's defense purchases are not propelled by political considerations and all vendors will get a level playing field," he said.

The Russian Mil Mi-28N Night Hunter also lost a tender for 22 attack helicopters for the Indian military to Boeing's AH-64D Apache.

Nonetheless, analysts say Russia will remain India's major defense partner for the foreseeable future, given the legacy of defense cooperation and ongoing projects between the two. With increased competition for the Indian defense market, though, joint development and production of new weapon systems is likely to become a crucial factor in sustaining Indo-Russian cooperation in the coming years. ☐



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Now Hear This

Beijing pushes for accelerated reforms to civil aviation, notably in airspace management

Bradley Perrett Beijing

You can tell when the top leadership of China is not satisfied with an economic sector. It fires off a public memo addressed to the provinces, certain major cities and central government departments. It lists its gripes, sets out its objectives and states what it wants done. Then it hopes they will listen.

Such a memo, better called a policy guideline, has just emerged with the stamp of the state council, China's equivalent of the national cabinet. Its subject is aviation.

"The lack of balance and coordination in civil aviation development is increasingly evident," the state council says. "Sustainable development of the industry is restricted by unreasonable allocation of airspace, slow infrastructure development, skills shortages, a lack of competitiveness and a management system that still awaits rationalization."

Listing airspace allocation first among this range of problems is notable. The central government seems to be renewing its push for improved civil access to the nation's skies, indirectly calling on the air force to cooperate with other departments in opening new airways, straightening routes and modernizing the control system.

The state council says it wants civil aviation traffic to grow at an annual average of 12.2% for the rest of the decade, suggesting that a moderation in economic growth will not greatly affect airline expansion.

By 2020, Chinese people should be taking an average of 0.5 flights a year, it says. That compares with 2.0 in the U.S. now and implies about 690 million trips a year. Passengers took 633 million trips on U.S. carriers in 2011.

General aviation should grow 19% a year through 2020 and 89% of the population should have access to air transportation.

The growth target for traffic—covering passenger and freight business and measured in ton-kilometers—is "quite bullish," says an industry executive with a business interest in the development

of the market. Growth rates of about 15% a year were common last decade, but many economists expect the Chinese economy to enter a more moderate phase of expansion, if it has not already done so. Gross domestic product grew 7.6% in the year ended in June, compared with the annual average of around 10% in the past three decades.



Chinese aviation policy objectives through 2020

Air transport traffic annual growth	12.2%
General aviation annual growth	19%
Nationwide air transport access	89%



"Supporting the passenger element of that growth rate will be a challenge," says independent airline consultant David Li, adding that further international expansion of Chinese airlines, also backed in the policy guideline, will help.

While policy guidelines from the state council—euphemistically called "suggestions"—indicate what the top of the Chinese government wants, their content is often far from what it

will get. In a bureaucracy of tens of millions of officials, many opposed to reform because of personal connections or financial interests, the resistance to change can be enormous. On top of that, civil aviation faces the special problem of resistance from a military that is inclined to see the country as under threat and is therefore reluctant to loosen its control of airspace.

Still, at least the state council is ac-



Shanghai Pudong Airport is designated as one of China's three big international gateways.

state that compete with each other in a regulated market. It is those three, and perhaps also Hainan Airlines, that the state council must have in mind when it calls for the evolution of "international carrier that are capable of providing global service." That is a reference to the difficulty they now have in competing with foreign carriers.

Instead of letting demand and competition play the main role in determining the structure of air routes, Chinese officials fancy that they should plan it as part of their concept of "scientific development." To that end, the state council is confirming the primacy of three cities as the country's global hubs: Beijing, Shanghai and Guangzhou.

The roles of Beijing's Capital Airport and Shanghai's Pudong Airport hardly need emphasizing. But the listing of Guangzhou is pertinent because, for all the traditional economic importance of that city, its Baiyun Airport is greatly overshadowed by Capital and Pudong. With the globally important

hub Hong Kong International only 135 km (85 mi.) away, Baiyun struggles to attract intercontinental business.

The state council names Kunming, the closest to Southeast Asia of China's big cities, and Urumqi, near Central Asia, as additional gateways. The central government has therefore ignored appeals from Chengdu, Chongqing and Xian, all huge cities, for designation as western or southwestern national gateways. And yet that is unlikely to stop them. Illustrating the difficulty of coordinating policy through many levels of government, Chengdu, Chongqing and Xian will surely keep wooing foreign airlines.

The policy guideline calls for strengthening the airports of those cities as regional hubs, along with the facilities at Shenyang, Hangzhou, Zhengzhou, Wuhan and Changsha, and adds that aviation facilities should be integrated with other transport modes.

China must "energetically develop general aviation" as "new economic growth activity," the state council says, reiterating a goal of the current five-year plan and specifically mentioning business aviation. ☐

tively pursuing reform. It is calling for more, straighter and duplicated air routes and less wasted flight time. Reforms should include the establishment of high-capacity domestic airways, promotion of parallel airways on busy routes, and more paths for arrivals and departures at busy airports, it says.

There should also be additional international airways near the coasts—a particularly sensitive issue, because the military is naturally inclined to see threats from the sea. For example, the domestic airway between Beijing and Shanghai is bent inland, adding to flight time but keeping airliners away from the coast. Acknowledging this year that the route was saturated, the authorities opened a parallel airway—but it is bent even further inland.

Construction of a modern air traffic control system should be stepped up, the state council says.

In a key phrase, it calls for "strengthened civil-military coordination in perfecting a flexible system of airspace use." Since the civil aviation authorities are all too eager to achieve that objective, the state council is clearly calling on the air force to make concessions.

The military is already under pressure to cooperate, and to some extent it is doing so, most notably in agreeing to open low-altitude airspace and in progressively yielding more high-altitude airspace to civil flying.

The state council is also critical of management in the Chinese aviation industry. One of its answers is to encourage foreign investment and private involvement in the industry. Its three airlines, China Southern, Air China and China Eastern, have private shareholders but are treated as arms of the

Buying an Industry

China's capital finds a way to join the national craze for aircraft building

Bradley Perrett **Beijing**

If Superior Aviation Beijing snares Hawker Beechcraft, the little-known private company and its municipal backers will have utterly trumped Avic.

The state aircraft group has worked for decades to accumulate the skills to compete internationally in selling complete aircraft in rich Western markets. Except for some small general aviation types that are certified by the FAA, it is still not there. Now a company it can only regard as a nobody and a city that has never been on the aeronautics map are poised to bring a big box of know-how home to China, a box full of the skills and intellectual property to design, integrate, build, market and support business jets and other general aviation aircraft.

To executives familiar with the Chinese industry, it is clear that the point of

the exercise is not only to bring Hawker Beechcraft's knowledge home—but some of its production lines, too. Indeed, the U.S. company said last year that it was looking at assembling one of its types in China.

Hawker Beechcraft says it is negotiating "a strategic combination" exclusively with Superior Aviation Beijing, which proposes to pay \$1.79 billion for the bankrupt U.S. aircraft-builder, without taking over its defense business. The buyer is 40% owned by the Beijing city government. Although Superior Aviation is 60% privately held, the involvement of the Beijing government and the considerable sale price are signs of a strategic economic move by an arm of the Chinese state.

Beijing is, in effect, buying an industry. In doing so, it is joining a national craze

among municipalities to become involved in aircraft manufacturing.

In its announcement, the U.S. company stresses that Superior Aviation would keep production in Wichita and Little Rock, Ark. From the point of view of Chinese officials, however, doing so can only be an inconvenient necessity. Entities funded by the Chinese state do not, in general, buy foreign manufacturers for profit, as a Western private equity investor might. They buy them to obtain knowledge and start up production at home.

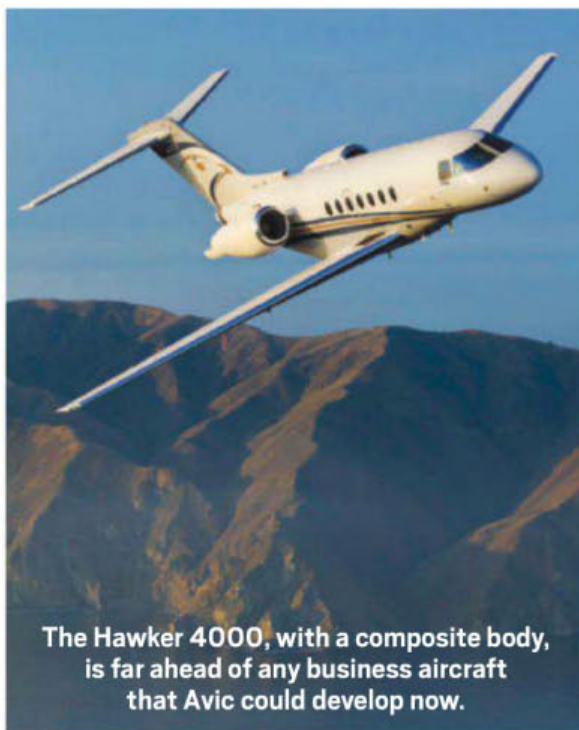
Two of Hawker Beechcraft's rivals, Cessna and Embraer, are cooperating with different arms of Avic, each aiming to begin operating a business jet final assembly line in China by the end of next year. But unlike Avic's deals with Cessna and Embraer, Superior Aviation's acquisition would be of Hawker Beechcraft's complete civil operations, including its designs.

This presents the prospect of complete aircraft built to those designs rolling out of factory doors within the city limits of Beijing—just as late next year Embraer 600s and 650s should begin emerging from a plant in Harbin and Cessna Citation Sovereigns from one in Chengdu.

That does not mean that doing so makes good business sense, however. One executive who has closely studied the relative costs of Western and Chinese business-jet manufacturing sees no strong economic reason to shift Hawker Beechcraft production, at least in the short term. "You don't necessarily get lower costs, especially in the beginning" by moving production to China, he says.

But that is hardly the point. Whether production in China is cheap or costly, it is bound to happen if the deal goes through, the executive says. Indeed, he is quite sure that Beijing will not be satisfied with making detail components, which he notes would be the logical part of the production process for it to begin with. "The Chinese side will want to start with [final] assembly, for face," he says.

And, it could be added, for political prestige. The sight of pretty Hawker Beechcrafts stamped "Made in Beijing"—even if at first they are only assembled in Beijing—can only enhance the popularity of city leaders among the people of Beijing, and those leaders' standing in the Communist Party.



The Hawker 4000, with a composite body, is far ahead of any business aircraft that Avic could develop now.

HAWKER BEECHCRAFT

When Beijing assembly of a Hawker Beechcraft model could begin is another issue. Since Avic so far seems not to be involved in the deal, the great bulk of aircraft-building expertise in the combined company will remain with Hawker Beechcraft's managers. That, industry executives point out, must be a major reason for Superior Aviation saying it wants to keep them. Again, for the buyer's state backers, this can only be an inconvenient necessity, since Chinese governments of all levels prefer to deal with foreigners as advisers rather than as decision-makers. Foreigners are, in any case, expensive when employed in China, as they would be in opening and supervising a local factory.

So finding Chinese managers and skilled workers for local manufacturing will be one challenge—one that could be alleviated by bringing Avic into the deal, as another Chinese general aviation manufacturing aspirant, Chengdu Helicopter, hopes to do (see p. 52). Indeed, Avic itself probably wanted to buy Hawker Beechcraft. The U.S. company told Aviation Week last year that the state group was one of its potential partners in China.

Another challenge will be establishing the facilities and infrastructure in China, says a second executive, who has experience in those activities. "There are many elements," the executive says. "You need the plant, all its equipment, the workforce, the training. And what about a runway? Where can a facility be located? Beijing's air traffic is so congested. Will the air traffic authorities cooperate?"

Yet if land is needed for development, a Chinese city government can provide it, leveling a bunch of villages if need be. There are small airfields in rural areas attached to Beijing, and a new major airport is planned for the south of the city.

Perhaps a bigger issue will be obtaining FAA certification for manufacturing in China. Cessna is facing this as it seeks to finalize its deal in Chengdu.

The potential for business aviation in China was talked about for many years but came to nothing until late last decade, when sales to Chinese customers finally began rising fast, partly in response to relaxed restrictions on the use of private aircraft. Hard on the heels of that, the air force, which largely controls China's skies, accepted that low-altitude airspace could be opened progressively for private use, making helicopters and small private airplanes more attractive.

China likes to make what it uses, so the result has been a surge of interest in building general aviation aircraft, including business jets and helicopters. "There are so many proposals here that we could make all the aircraft we wanted in China," says an executive with a Western general aviation manufacturer.

Tianjin has demonstrated how a city considered an aerospace nobody could muscle its way into the industry; it now assembles Avicopter helicopters and Airbus aircraft and will soon be turning out big space launchers. Zhuhai has since snagged the headquarters of Avic's general aviation subsidiary, Caiga, while Chongqing is backing ambitious Chongqing Helicopter. Beijing's gambit to join their ranks is not its first. Last year, it backed the establishment of a general aviation manufacturing joint venture between the Beijing Automotive Group and Beijing University of Aeronautics and Astronautics.

Eventual Avic involvement in Hawker Beechcraft, especially through Caiga, cannot be ruled out. Caiga aims to build business aircraft of the size that Hawker Beechcraft produces. And Beijing's money is a lure for Avic, keen to secure municipal funding for its new facilities.

Still, Superior Aviation, its government backers and Hawker Beechcraft's experienced managers could go it alone. There is no rule in China that says only Avic can make aircraft. ☉

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Seamless Transition

New system allows aircraft to flow from one advanced procedure to another

Adrian Schofield

The benefits of satellite-based approaches, precision landing systems and autoland capability have all been recognized for years. But new initiatives to seamlessly link these technologies promise even greater gains in streamlining air traffic and improving low-visibility operations.



GE Aviation and LAN Peru are on the cutting edge of these efforts, and are proving that the potential benefits can be achieved in an operational environment. On July 16, they completed the first flight into Lima using a required navigation performance-authorization required (RNP-AR) approach that transitions directly to an instrument landing system (ILS) and autoland procedure.

While RNP-to-ILS approaches have been demonstrated before, GE says this is the first time the combination with autoland has been used with a scheduled passenger flight. “We’re moving from data collection to something that has real value and will be used regularly by operators,” GE Aviation Technical Fellow Steve Fulton tells Aviation Week.

Linking these phases means the onboard computers can guide aircraft,

with minimal pilot input, from the RNP portion of the flight all the way through to landing. This has obvious advantages when poor visibility restricts operations—such as when fog affects Lima during the winter.

The flight was part of the broader Green Skies of Peru initiative, through which GE and LAN are installing performance-based navigation (PBN) procedures at Lima’s Jorge Chavez International and other Peruvian airports. They are also working with regulators to push the boundaries of PBN capabilities, such as the RNP-to-ILS flights and, earlier this year, the region’s first end-to-end flights using PBN.

During Lima’s first RNP-ILS-autoland flight, the aircraft flew a curved, continuous-descent RNP-AR approach, connecting to the ILS glide-slope. Fulton says the key part of the

flight was the transition to ILS autoland, since it uses a different aircraft-guidance system than RNP. GE engineers helped LAN install the avionics coding required for the transition.

There was potential for “wing-waggle” and other flight anomalies during this transition, but Fulton says it occurred seamlessly. Aside from the instrument displays showing the flight mode had changed, “you wouldn’t have known it had happened,” he says.

The combination of the three elements allows landings when visibility is down to 100 ft., using Category II ILS. However, Lima is soon expected to gain authorization for Cat. III ILS operations, allowing the minima for landings with the new procedures to be reduced to 50 ft.

These procedures effectively “extend RNP into the autoland phase” of flight, says Fulton. Currently, RNP-AR approaches are only allowed down to 250 ft. While RNP “delivers efficiency

This RNP-AR approach (blue) links directly to Lima’s Category II ILS. The curved, continuous descent uses less busy airspace to the east of the airport.

and predictability,” as currently defined it is “an approach capability, not a landing capability,” says Fulton.

Lima has 14 PBN procedures in its airspace, and so far two of these can transition directly to the ILS. LAN pilots can use the RNP-ILS transitions whenever they choose, although they are most operationally useful during poor visibility conditions. The system will be extended to more RNP approaches at Lima and elsewhere in Peru.

So far, LAN is the only carrier using the RNP approaches that are being installed in Peruvian airspace. However, the intention is to make them public-use when more experience is gained.

Other operators are keen to participate, says Fulton.

The Green Skies of Peru project involves LAN, GE Aviation, air navigation service provider Corpac and Peruvian regulator DGAC. As part of this program, LAN and GE in February introduced PBN procedures that cover the entire flight from Cusco to Lima, from takeoff to landing. This was the first time this had been done in Latin America, and was also the first time for such a busy route.

GE deployed RNP approaches at Cusco in 2009 to improve access to the airport, which is in the Andes. These procedures have dramatically cut delays and diversions caused by poor visibility in mountainous terrain. GE was selected in 2010 to provide RNP approaches at five other airports, including Lima.

Countries like Peru are well-suited to the introduction of PBN, says Fulton. It does not have a lot of older ground-based infrastructure, so au-

thorities can bypass investment in ground systems and go straight to more advanced procedures. In Latin America and other regions, there is "such a gap between what's actually in place with existing infrastructure and what's possible" with new cockpit technology.

Another factor is that the aviation sector is growing rapidly in Latin America, and since fleets are relatively young, aircraft have a lot of avionics capability.

Perhaps the most important factor is that Peru has a group of stakeholders who are willing to work collaboratively and "are interested in going beyond the status quo," says Fulton. For example, "LAN recognizes it has aircraft with advanced capabilities, giving it the opportunity to apply new technology to reduce costs and improve efficiency," he says.

LAN Peru is a subsidiary of Chile-based LAN Airlines. LAN is also working on PBN applications in Chile. ☛

Waiting for Godot

Alenia wants to develop turboprops but EADS is preoccupied with jets

Leithen Francis Singapore

With an eye on fuel efficiency, some airlines are turning to turboprop aircraft instead of jets. The new 90-seat model from French-Italian manufacturer ATR looks especially promising in this market, which makes it all the more perplexing that ATR has been unable to persuade its shareholder EADS to commit to investing in a more modern family of turboprops.

Rusdi Kirana, president director of Indonesia's Lion

Lion's Wings Air is benefiting from the ATR 72-500's fuel efficiency.

Air group, ATR's biggest customer globally, says his airline would be interested in ordering ATR's new 90-seater. Fuel prices have become so high that jet operations on some routes are becoming unviable, he notes. One way to deal with this situation is to replace jet aircraft with more fuel-efficient turboprops, he says.

ATR executives say Lion has already been using some ATR 72-500s to replace its MD-82s, a type that is older and less fuel efficient than Lion's ATR 72s and Boeing 737-900ERs. Rusdi has also been using ATR 72-500s to develop new routes that feed into his main hubs.

ATR's New Generation Turboprop (NGTP), as it is known internally, is designed to seat up to 98 passengers. Since it will be a bigger aircraft and have newer engines, its cost per available seat kilometer (ASK) will be lower than the ATR 72-500/600. Pratt & Whitney Canada, which provides

The latter company is considered to have credibility because it helped to develop the large turboprop engine for the Airbus Military A400M.

ATR's 90-seater could also be of interest to airlines that want to differentiate themselves. Nick Gitsis, the cofounder of Filipino carrier Seair, says he and his partners are establishing Seair International this year; it will operate 30-seat turboprops. Seair International has no plans to fly 50- or 70-seat turboprops because that would involve competing in the same "saturated market" segment as Airphil Express and Cebu Pacific Air; but it would be interested in turboprops



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PW100-family engines that power current ATR aircraft, is understood to be developing a new turboprop engine with the 90-seat market in mind. ATR also has been speaking to General Electric, which is working on a civil variant of its GE38 military turboprop engine, as well as to Snecma.

with more than 70 seats, says Gitsis.

The new ATR concept is also of interest to Malaysia Airlines' turboprop operator Firefly. Ignatius Ong, Firefly's CEO, says his carrier has been talking to ATR about the 98-seat NGTP and is interested in its 30% capacity increase over the ATR 72-500 and projected

20-30% lower fuel burn per ASK. The NGTP's extra capacity will be useful for popular routes such as Kuala Lumpur Subang-Singapore, where the traffic could easily fill a larger turboprop, says Ong. ATR also tells Firefly that the NGTP will "have some upgrades in terms of passenger comfort, such as a stronger and more efficient air-conditioning system," notes Ong, adding that Firefly would like to have the NGTP join its fleet in 2017 or 2018.

It is unclear, however, when ATR will be able to deliver the NGTP. The problem is that ATR's 50% shareholder EADS has not committed to the new program. The other shareholder, Alenia Aeronautica, is more bullish. Even though Alenia's parent Finmeccanica posted a loss last year, Alenia gave EADS a public ultimatum by saying that if EADS fails to commit to the NGTP, then Alenia may build its own 90-seater.

In March, EADS's then-CFO, Hans-

Peter Ring, told Aviation Week it was unlikely EADS would approve the NGTP in 2012. The main reason is a scarcity of engineering resources, he said. ATR contributes significant profits to Alenia, but the joint venture holds less influence at EADS. The problem is that EADS's other commercial passenger aircraft division, Airbus, captures more of EADS's attention, investment dollars and engineering resources. Much of these engineering resources are now devoted to developing Airbus's A320NEO and A350.

To bolster its case, some ATR executives have been claiming the NGTP will help Airbus to squeeze the Bombardier CSeries at the lower end. The smaller model CSeries, the CS100, is due to have its first flight at the end of this year and achieve certification by the end of 2013. The CS100 seats 110 in a standard single-class configuration, which means it has more seats

than the 98-seat NGTP. But the turbo-prop aircraft promises to have a much lower fuel burn. Bombardier's jet aircraft, however, has greater range and speed.

If ATR fails to gain shareholder approval for the NGTP, there is also the possibility that others may fill the void. Bombardier is evaluating a stretch to its Q400 turboprop to make it a 90-seater. Lim Kim Hai, chairman of Australia's Regional Express (Rex), tells Aviation Week that he has had preliminary discussions with Saab regarding a new turboprop family the Swedish manufacturer hopes to develop. The new line includes the 90-seater RA90. Rex is a large operator of 34-seat Saab 340s. Lim says experience in Australia has shown there are some routes where 90-seaters work best. He cites, as an example, Virgin Australia's decision last year to phase out its 70-seat regional jets but retain its 90-seat RJs. ☐

MOVING TARGET

Jens Flottau **Frankfurt**

If industry officials were right, a common travel experience at European airports may soon have looked like this: Very long queues—in the worst cases, five times as long as the current average—slow security checks, confusion about what passengers are allowed to bring on board and what is forbidden. And spending up to €50 million (\$62 million) per terminal would have been required to facilitate upgrades.

Luckily, for airports, airlines and passengers, all of this will not happen because—in what is one of the most embarrassing aviation policy U-turns in recent years—the European Commission (EC) has dropped its target for allowing liquids back on board aircraft in early 2013.

"The Commission's assessment indicates that the removal of the LAG (liquids, aerosols and gels) restrictions in April 2013, as currently envisaged in EU law, could present a considerable operational risk mainly due to the scale of the change," the EC said last week. It left open a new timetable for the planned relaxation.

Airports have lobbied against the legislation for years. They argued that it would have been impossible to implement all of the changes needed in the short period of time envisioned. In their view, the currently available equipment for screening has not been sufficiently tested, is not reliable and is too big for current airport layouts.

The EC's new proposal is remarkable because it now has to

ask the European Parliament to amend the European law for which it has been pushing.

Mainly owing to the same concerns, a first step of the relaxation process had to be dropped in April 2011. Back then, passengers should have been allowed to keep liquids when transferring to connecting flights at a EU airport, having arrived from a non-EU destination.

The new plan is now open-ended. The EC recommends that

by January 2014 passengers should be allowed to keep their duty-free items—including liquids—when connecting, provided they are checked again before boarding the connecting flight and only if the liquids are kept in a secured bag. That is almost three years later than expected.

According to industry sources, the EC had planned three steps in 2014, 2015 and 2016, but the second step (allowing clear liquids) has been dropped following serious opposition in the Aviation Security Committee last week. And the official communication does not identify any firm date for the final step, which will be allowing liquids back on board without restrictions.

Airport officials say that 2016 could be a realistic date for implementing that change, which would again mean a three-year delay.

Passengers have been kept from taking liquids on board since 2006; they are allowed to use small plastic bags for items such as toothpaste. ☐

**The EC does not identify
any firm date for the final step,
which will be allowing liquids
back on board without restrictions**

Growth Hazard

Inadequate airport infrastructure, lack of skilled personnel threaten Indonesian airlines

Leithen Francis **Jakarta, Indonesia**

Lion Air and Boeing conducted RNP trials at Ambon and Manado airports as part of an initiative to introduce RNP procedures to Indonesia.



Next year, Indonesia's Lion Air group will receive a Boeing 737-900ER every 15 days, and an ATR 72-600 every 30 days, expanding its fleet by a third in 12 months. Garuda Indonesia plans to double its fleet within the next 3.5 years. Taking delivery will be the easy part. For every new narrowbody, an airline needs to employ at least six pilots, and to do a Boeing 737 line-maintenance check requires four maintenance technicians. The difficult part will be finding enough of these maintenance technicians and pilots to support the fleet growth.

Boeing forecasts that Southeast Asian carriers over the next 20 years will need to employ 42,000 new pilots and 40,000 new maintenance engineers. The Aviation Week Intelligence Network database shows that Indonesia already accounts for a third of the commercial aircraft in Southeast Asia. Indonesia is also the fastest-growing airline market in Southeast Asia, so more than a third of the new pilots and new maintenance engineers will need to be in this country.

The Indonesian airline industry will

continue to grow, but perhaps not as quickly as it would like to if it does not find a way to rapidly train more pilots, maintenance technicians and air traffic controllers, says Neil Planzer, Boeing Flight Services' vice president for air traffic management.

Training is important to Boeing because local carriers, such as Lion Air and Garuda Indonesia, are big customers for the company. Lion and its subsidiary Wings Air have 97 aircraft in operation. Audy Punuh, principal of the airline group's pilot training institution, Wings Flying School, says Lion and Wings have about 580 pilots. It will need to employ 600 at year-end, he says, and the group expects it will need 840 in 2013, 1,080 in 2014, 1,325 in 2015 and 1,433 in 2016. Audy concedes that the Wings Flying School, which is responsible for recruiting all of Lion Air and Wings Air pilots, may have to take graduates from other flight-training schools to meet the airline's demands.

Meanwhile, national carrier Garuda Indonesia and its subsidiary Citilink plan to double their combined fleet to 194 aircraft in 2015 from 97

currently. Garuda sources pilots from two flight schools: Bali International Flight Academy and the Indonesian Civil Aviation Institute in Curug. However, Garuda CEO Emirsyah Satar says the numbers are insufficient, so the airline plans to take over a flight school in Indonesia and find a foreign one to help manage it.

Indonesia's 13 flight schools have the capacity to produce only a few more than 300 commercial pilots a year, says the head of the ministry of transport's human resource development agency, Bobby Mamahit. Meanwhile, the director general of Indonesia's Directorate General of Civil Aviation (DGCA), Herry Bakti, says his agency estimates Indonesia's airlines need to add at least 500 pilots per year to keep pace with market growth. The DGCA has 7,428 commercial pilots on its books but only about 4,000 of these are active in Indonesia, says Bakti.

The country requires another 1,000 maintenance technicians each year, he says; it has 6,401 licensed maintenance engineers now. The DGCA has approved 10 technician training schools, five of which are in-house with airlines.

The concern among aircraft-makers is that if Indonesia cannot find sufficient numbers of skilled personnel, the airlines or the government may resort to delaying aircraft on order. In an effort to help Indonesia's aviation industry, Boeing Flight Services has signed a memorandum of understanding with the transportation ministry to work on training and improved procedures in the air.

Indonesia needs more flight schools, so it is likely that Boeing Flight Services will help Indonesia establish more, Vice President Sherry Carbary tells Aviation Week. Boeing Flight Services—and in particular its business unit Jeppesen—will assist Indonesian flight schools with course materials and setting standards and procedures, she adds. She stops short of saying that Boeing will be willing to be a shareholder in Indonesian flight schools, saying, "we don't know yet."

Boeing owns and manages flight simulator centers around the globe. In the Asia-Pacific region, it has simulator centers in China, South Korea, Japan, Singapore and Australia. "I wouldn't say we will not establish a simulator center in Indonesia. If cus-

tomers want it, we will look at it," says Carbary.

Instead of establishing a stand-alone simulator center in Indonesia, Boeing could install simulators in existing centers in the country and help manage those simulators, she adds. Boeing also plans to assist maintenance training organizations. "Everyone talks about pilots, but maintenance personnel are just as important. It takes four to five years to create a quality certified mechanic," says Carbary.

Indonesia also is looking to Boeing to assist with the introduction of required navigation performance (RNP) procedures. Boeing Flight Services and Lion Air have completed RNP trials at Ambon and Manado airports and are now waiting for the DGCA to implement these procedures at the two airports, says Carbary.

Air traffic control in Indonesia has come under increased scrutiny since the May crash of a Sukhoi Superjet 100 into a mountain outside Jakarta.

the airport's passenger traffic grew last year by 19%, to 51 million travelers, making it the fastest-growing of the world's major international airports. Its ability to process this many

Passenger traffic at Jakarta's Soekarno-Hatta International Airport grew last year by 19%, to 51 million travelers

passengers is an achievement, considering its three terminals were built to handle only 38 million people.

From Garuda Indonesia's corporate headquarters, overlooking one of Soekarno-Hatta's two runways, Garuda's executive vice president for marketing and sales, Elisa Lumbantoruan, pointed out to Aviation Week the long queue of aircraft waiting

he advocates that priority be given to international facilities serving large numbers of international passengers.

Satar says Angkasa Pura II does have a plan to boost passenger throughput at Soekarno-Hatta and improve the quality of the terminals. "It's not just capacity that's the issue but what sort of service and customer experience the airport provides to passengers," he says. "With the terminals, for example, just basic things like when you

go to immigration—it's very narrow and small. Someone who arrives in Jakarta for the first time might get lost because of that. I think Soekarno-Hatta really needs to be rejuvenated or rebuilt again soon, which they are doing."

Satar says the airport operator's Aerotropolis plan includes upgrading Terminals 1 and 2 and expanding Terminal 3. To boost capacity further, Angkasa Pura II aims to construct a new building between the first two terminals to house customs, immigration and quarantine. A ground-

Indonesia's shortages of maintenance engineers means the country's carriers often must send aircraft overseas for heavy maintenance checks.

breaking ceremony is due to occur this month, according to Satar.

Runway capacity also needs to be increased. Satar says Angkasa Pura II is considering building a third runway, but this would involve expansion to the north and require acquiring land from residential owners. The government has the right of eminent domain, but "it's still not so easy," Satar says.

"From the airline perspective, I am looking at how they can invest in more equipment . . . so the existing two runways can operate more efficiently," says Satar. He suggests reducing aircraft separation: "If you look at Los Angeles International Airport or Heathrow Airport, the separation between aircraft is less than eight miles." Jakarta airport can reduce aircraft separation, he says, "provided it has the right equipment and the air traffic controllers are well-trained. That's what we need to do." ☐



A transcript from the cockpit voice recorder reveals the controller granted the Superjet pilot approval to descend to 6,000 ft. moments before the aircraft crashed into a 7,000-ft. mountain. The Indonesia Air Traffic Controllers Association says a shortage of controllers is putting its members "under severe psychological pressure as they" strive to handle increasing numbers of aircraft.

Besides helping to ensure safety, air traffic management can help boost throughput at busy airports. The most congested in Indonesia is Jakarta Soekarno-Hatta International Airport, the nation's main international gateway. Angkasa Pura II, the entity which manages Soekarno-Hatta, says

for ATC clearance to take off. He acknowledges that such lines increase the airline's fuel bills, as does the growing use of holding patterns as aircraft approach the airport. Parking is also an issue, says Elisa, noting that Garuda has resorted to parking 17-23 aircraft in front of the maintenance hangars of GMF AeroAsia, its maintenance company, each night. If more parking is not provided, Garuda will increasingly base aircraft at other airports, Elisa says, even if this adds costs and complexity to operations.

Overseeing the country's many airports is a major challenge for the Indonesian authorities. Elisa says that while the government cannot afford to upgrade all 220 commercial airports,

Disappearing Duopoly

SkyWest's MRJ commitment signals market structure change in the regional jet segment

Jens Flottau **Farnborough** and Andrew Compart **Washington**

Mitsubishi leaders were ready to face a tough Farnborough air show this month. After all, the company had to delay its Mitsubishi Regional Jet (MRJ) program by more than a year. But they emerged much reaffirmed, thanks to a huge new order from a key player in the biggest regional jet market—the U.S.

U.S. regional carrier SkyWest signed a preliminary agreement for 100 MRJs to be delivered from 2017. The decision is not only a major blow for both Embraer and Bombardier because of the size of the order and the lost business. It also greatly solidifies Mitsubishi's standing as an RJ manufacturer and signals that the long-anticipated change in the established market structure is becoming a reality.

In the narrowbody field, Airbus and Boeing are growing accustomed to the idea that they will have more competitors in the medium term: China's Comac and Russia's United Aircraft Corp. are both developing narrowbodies—the C919 and MS-21, respectively. The incumbents are already competing with Bombardier and its CSeries. Some of these contests have been lost, as in the case of Air Baltic ordering CS300s instead of Airbus A319s.

But it is not only there that the duopoly is a concept of the past. Bombardier and Embraer are now also in the uncomfortable position of having to compete in a much less stable environment when it comes to selling their large RJs. For example, Mitsubishi's market entry is injecting enormous price pressure into the important U.S. RJ replacement tenders and, as the SkyWest order shows, there is a real danger that some of them will be lost.

And if the Canadian and Brazilian framers ever hoped the MRJ was going to be a niche product for niche players such as Trans States Holdings, then they are now proven wrong. The previous market structure has disappeared. And it is almost unnecessary to say that Trans States confirmed that it will stick to its order in spite of the delay.

The MRJ is the second new entrant

in the large RJ segment following the Sukhoi Superjet 100, which entered revenue service last year with Armavia and is now also flying with Aeroflot. But the Superjet has yet to gain full credibility with Western operators in spite of a small follow-on order by Mexico's Interjet, announced at Farnborough.

Clearly, Mitsubishi's clout is growing—and that is in spite of the fact that the first MRJ delivery to All Nippon

SkyWest's 100-aircraft tentative order is for the MRJ90, the larger of the two versions; but the deal also gives the U.S. regional carrier the flexibility to convert all or part of the order to the smaller MRJ70, SkyWest CFO Michael Kraupp tells Aviation Week.

The eventual type, or mix of types, will depend on what happens with scope clauses at the major U.S. carriers that contract SkyWest to feed their networks. Kraupp says he be-



MITSUBISHI CONCEPT

The Mitsubishi Regional Jet is slated to enter service in 2015, following a delay of more than a year.

Airways had to be slipped a year to 2015. Mitsubishi Aircraft Corp. President Hideo Egawa cites two reasons for the delay: Mitsubishi Heavy Industries "went against internal procedures" when it produced initial components. "We cannot use the parts that were manufactured against the rules." Also, the general development work took longer than expected.

Final assembly is now due to start early next year, with first flight in the third quarter and the first delivery in the second half of 2015. The flight-test campaign will involve five aircraft plus two for the static and fatigue tests.

Egawa says Mitsubishi is still studying the stretched 100-seat MRJ100X for which potential customers such as Air Lease Corp. CEO Steven Udvar-Hazy have been asking. But a decision on launching the third variant of the MRJ family will not be made until after the MRJ90 has started flight tests.

lieves SkyWest, the parent of SkyWest Airlines and ExpressJet Airlines, can make that decision as late as one year before the first MRJ is delivered.

Currently, Delta Air Lines and United Airlines—the carriers for which SkyWest operates most of its aircraft—have scope-clause limits that restrict regional feed to 76- and 70-seat aircraft, respectively. Delta recently reached a new agreement with its pilots union that sustains its cap, but United Airlines is pushing for a higher limit in negotiations on a joint contract with pilots for United and the former Continental Airlines.

American Airlines, a potential future SkyWest customer, also is pushing for a higher cap, using the leverage created by its Chapter 11 bankruptcy proceedings, and US Airways already is able to outsource some flying to aircraft with as many as 86 seats.

The MRJ90 and MRJ70 are de-

signed to seat up to 92 and 78 passengers, respectively, in a single class with 29-in. pitch, but can provide fewer seats with larger pitch or in a two-class configuration. The MRJ70 is expected to be delivered around one year after the MRJ90.

"We'll see where scope clauses shake out," says Kraupp. The tentative MRJ deal, with the first delivery targeted for 2017, constitutes only a part of the fleet replacement planned by SkyWest. Its subsidiaries currently operate 725 aircraft.

The fleet includes roughly 430 Bombardier CRJ200s, 700s and 900s, and

about 290 Embraer 120s, ERJ-135s and ERJ-145s. Kraupp says SkyWest is having "ongoing discussions" with aircraft manufacturers about fleet replacement.

Another agreement, or agreements, might not happen for 12-18 months, but could be reached earlier "if other parties can come to the table in a similar fashion [as Mitsubishi] and offer attractive deals," says Kraupp.

The tentative Mitsubishi deal, as well as an agreement for 200 Pratt & Whitney PW1200G engines to power them, underscores the discounts that SkyWest can negotiate that other regional carriers

cannot because their fleets are not large enough to accommodate large orders, Kraupp asserts. "We don't think there are others in the market that can drive volume pricing," he adds.

Kraupp also indicated some flexibility in the maintenance terms for the MRJ aircraft and engines, which are still being worked out as part of a package deal. Financing also is still being discussed, but some adaptability is available there as well, depending on the length of the contracts that SkyWest's major airline partners want to sign regarding the operation of the aircraft. ☐



ROCKWELL COLLINS

BOEING 767 OPERATORS GET BOOST FROM TANKER SYNERGY

Rockwell Collins has joined forces with Boeing to develop a flight-deck upgrade for the 767 and 757 using 787 technology. Supplemental type certification is expected in the second quarter of 2014. This coincides with the start of deliveries of 46 new-build 767-300 Freighters to FedEx Express, the unidentified launch customer for the cockpit upgrade.

Sparked by the decision to fit the U.S. Air Force's new 767-based KC-46A aerial-refueling tanker with a

787-technology flight deck, the retrofit will offer operators of more than 1,600 757s and 767s increased efficiency, reliability and enhanced crew situational awareness, says Jeff Standerski, Rockwell Collins vice president and general manager of air transport systems.

The upgrade will replace six cathode ray-tube displays with three large, landscape-format liquid-crystal displays, each providing two independently controlled display windows. ☐



Fabulous Opportunity

Boeing's poor performance on FAB-T satcom terminal contract opens door for Raytheon

The U.S. Air Force's AEHF satellites will enter service three years before Boeing's FAB-T terminals reach initial operational capability in 2017.

LOCKHEED MARTIN CONCEPT

Amy Svitak Farnborough and Amy Butler Paris

Nearly 10 years have passed since Raytheon lost a contract to Boeing for the U.S. Air Force's next generation of satcom terminals. Known as FAB-T (Family of Advanced Beyond-line-of-sight Terminals), the program, estimated at \$4.7 billion, will facilitate communications between military aircraft and the Pentagon's new Advanced Extremely High Frequency (AEHF) satellite constellation.

Boeing, which beat out Raytheon for the initial development contract awarded in September 2002, insists FAB-T development is all but complete. But after a decade of cost overruns and schedule delays that more than once led the Air Force to restructure the contract, Raytheon may get another shot at FAB-T.

In June, the Waltham, Mass.-based company submitted proposals to the Air Force under the service's FAB-T alternate program, which aims to provide a backup to the program of record, while pressuring Boeing to keep development on track for initial

operational capability by 2017—three years after AEHF is scheduled to enter initial operational capability.

The bid was submitted last month on the heels of Air Force negotiations with Boeing that will allow the company to continue FAB-T under a fixed-price agreement aimed at curbing development cost increases. Since the initial development contract was awarded to Boeing in September 2002, FAB-T costs have ballooned from an estimated \$1.5 billion to \$2.3 billion last year, an increase of 52%, according to the Government Accountability Office. During that same period, procurement costs grew from \$1.6 billion to \$2.4 billion while total program costs, including development and manufacturing, which jumped from \$3 billion to \$4.7 billion in 2011.

Under the terms of Boeing's rebaselined contract, the company is expected to complete remaining development work on the next-gen communications capability, with some additional enhancements, by spring 2013.

Roger Krone, president of Boeing Network and Space Systems, admits the Boeing-led industry team did not properly manage its supply base and manufacturing processes, and that the company failed to fully grasp the scope of work required for the program.

"I'm not sure anyone in the community really understood what it was going to take to duplicate things that we'd always done in hardware and firmware," he says. "We all made a big mistake and we all drank from the same pitcher of Kool-Aid and we thought this would be simple."

Like the Joint Strike Fighter and Space-Based Infrared System (Sbirs), FAB-T is viewed as a casualty of the Pentagon's failed procurement practice of turning major developments over to lead systems integrators, an acquisition reform initiated during the Clinton administration.

"We found coordinating a lot of work content amongst a disparate supply base was more difficult than we anticipated," Krone notes. As a result, Boeing

moved the system integration laboratory to Huntington Beach, Calif., to put software and hardware testing, evaluation and integration under one roof.

"We asked Rockwell Collins and ViaSat to bring their engineers and their software to our facility so we were all together in one place, not trying to do this long-distance by telephone," Krone says, referring to two of Boeing's principal industrial teammates on FAB-T.

Poor management on the part of Boeing also added to cost and schedule delays. "We probably were too slow in evolving our own leadership on the program and going from people who are

good at the early development [to those] driving to what really was a production schedule," he says. Air Force changes to the AEHF satellites also drove up terminal costs. "The satellite was late, the satellite configuration evolved. With those changes we got cost increases."

With FAB-T development now expected to be complete early next year, Krone anticipates a tender for production will follow. "We should be at a point where the customers can make a decision whether we're delivering against the program of record in the spring of 2013," Krone says, adding that Boeing is currently meeting its schedule

commitments to the Air Force under FAB-T. "Then there will be some kind of production competition."

Krone says the big milestone under FAB-T is delivery of terminals for integration by the summer of 2015, with initial operational capability to come two years later, a schedule he is confident Boeing can maintain.

"We are 100% done with the hardware fully qualified, and 95% with the software fully qualified," he says, adding that to date Boeing has met 49 of 52 hardware and software development milestones.

Raytheon, which unsuccessfully protested the Air Force's FAB-T award to Boeing, and which appears to be the only bidder for the alternative program work, currently produces three AEHF military terminals that already meet 80% of the Air Force's satcom terminal requirements.

Andy Zogg, vice president for business development at Raytheon, says Raytheon hardware that supports U.S. Army and Navy operations on Milstar satellites has been tested with the Air Force's lone on-orbit AEHF spacecraft and has demonstrated interoperable communications. He says the company is hopeful its June bid will result in an alternate FAB-T development contract by the end of September.

"It's really reusing what we've already developed in terms of the qualification tests, the satellite tests, which are very expensive, very time-consuming," Zogg says. "Once you are qualified, you really want to leverage that capability into the future."

Zogg says development risk for Raytheon's work on the contract would be minimal, noting that the Air Force intends to order 10 units for proof-of-concept testing in incremental milestones, with a plan to initiate production of 84 terminals.

If Raytheon wins the alternative contract, it is unclear whether the Pentagon ultimately will award production to a single contractor or split manufacturing between the two. But Zogg says with the program broken down into incremental pieces, Raytheon is well-positioned to bid for the work.

"We're taking those pieces where we have platform presence and mature technology—that's our approach to this marketplace," he says. "But we'll get an opportunity to compete for the production, whether it's a blend or winner-take-all." ☐

More to Mars

India's mission would launch on a Polar Satellite Launch Vehicle

Jay Menon **New Delhi**

Indian space officials expect the country's first mission to Mars to receive final government approval soon, with a launch planned for November 2013.

"The project has reached the last phase of approval. Many studies relating to the mission have been completed, and an announcement can be expected soon," Indian Space Research Organization (ISRO) Chairman K. Radhakrishnan says.

The U.S. government is expected to give its final approval after NASA's Mars Science Laboratory lands there on Aug. 6 (EDT), though India's orbiter mission will not be on the same scale as that undertaken by NASA's car-sized rover.

India's Mars orbiter is expected to be launched from Sriharikota in the southern state of Andhra Pradesh. The project received a boost in the federal budget for the current fiscal year, which ends March 31, with the government allocating 1.25 billion rupees (\$22.6 million).

The mission involves nine scientific experiments. But according to ISRO scientists, the number could be reduced by weight considerations. The mission would launch on a Polar Satellite Launch Vehicle (PSLV-XL), which also was used for India's Moon mission,

Chandrayaan-1. The orbit will be 500 X 80,000 km around Mars, and the mission will carry nearly 25 kg (55 lb.) of scientific payloads.

"The tentative scientific objective for the Mars mission will be to focus on life, climate, geology, origin, evolution and sustainability of life on the planet," according to ISRO.

ISRO officials say a significant amount of work on the mission has been completed and scientific payloads have been shortlisted. The project report for the mission has been submitted for government approval.

"And I am sure that, maybe soon, we will be hearing an announcement on the Mars mission," Radhakrishnan says.

India has achieved some success in space with its lunar orbiter, Chandrayaan-1, which was the first to discover the presence of water molecules on the Moon. A follow-up, Chandrayaan-2, is expected to use a Geosynchronous Launch Vehicle (GSLV). But ISRO is investigating recent GSLV failures and plans to launch two other satellites using GSLV Mk. II prior to lofting Chandrayaan-2, Radhakrishnan says. The space agency is working to improve the rocket's cryogenic engine, and associated tests should be completed by November, he adds. ☐

Queasy Markets

Anxieties ran high at the 2012 Farnborough International Airshow

Anthony L. Velocci, Jr. **Farnborough**

Many industries would gladly change places with commercial aerospace—huge backlogs, customers eager to take ownership of multimillion-dollar products, macro forces that virtually assure a demand for continuous innovation and product evolution and a guaranteed revenue stream that will last for years.

Despite what should be the best of times, however, many suppliers are anxious. They are worried that industry bellwethers Boeing and Airbus will be unable to sustain the high production rates needed to fulfill delivery promises to airline customers. More unsettling, they simply do not believe what the two airframe manufacturers are telling them, and they are not shy about sharing how they feel.

Reasonable people can debate how deep the skepticism runs or how much of a problem it might be down the road, but this much is certain: It largely defined the 2012 Farnborough air show, fittingly marked by gray clouds and intermittent rain throughout the July 9-13 event. So unmistakable was the muted tone that Airbus Americas Chairman T. Allan McArtor said it felt like “a general malaise.” Others expressed similar sentiments. Acknowledging the credibility gap that Airbus and its archrival are facing, McArtor said, “OEMs have got to do a better job of making a high-confidence argument that there is a market globally.” (See other notable quotes on p. 44).

One of the many suppliers that will be essential to both Airbus and Boeing outlined a short list of factors that could interrupt the OEMs’ best-laid plans: The deepening crisis in the eurozone; the slowdown in the global economy, especially in the Asia-Pacific region; imposition of higher taxes on airlines; the financial difficulty many carriers are having, including some who have placed orders for hundreds of new airplanes, and airlines’ access to financing. “[Suppliers] can’t ignore all these things, yet there may be too much caution,”

the company’s president said. “At some level, it can become a self-fulfilling prophecy.”

Their concern is that they could be left holding millions of dollars of inventory if a significant number of orders for new airplanes were to evaporate in response, say, to the global economy tanking. Airbus and Boeing could absorb the financial blow, but smaller suppliers could find themselves struggling mightily. “If our customers and our customers’ customers would guarantee they will buy our product no matter what, then we will invest whatever it takes to ensure a reliable flow of parts; otherwise, we are not going to put ourselves in a position where we could be left holding the bag. We experienced that once before, and we are not going to let it happen again.” Other suppliers share this concern.

Whether such a hard-line approach by suppliers winds up hampering the current “up” cycle remains to be seen. Many industry veterans actually were relieved that Farnborough 2012 was so subdued, at least in terms of new aircraft orders. The net tally was down 45% from the frenzied buying at Paris last year—but it was up 17% from Farnborough 2010. Altogether, Boeing and Airbus raked in 464 orders, with 370 belonging to Boeing. Leasing companies dominated, comprising 52% of the large aircraft announcements.

Striking a much lower profile at Farnborough were defense contractors from around the world. What they lacked in visibility and “buzz” though was more than offset by frenetic activity in their chalets, especially among larger companies.

Conspicuous by its absence was Northrop Grumman, which decided months ago to forgo Farnborough and book the savings. It is too soon to tell if this decision was courageous or short-sighted, but the company did what every other major defense contractor has threatened for years: resist the competitive pressure to attend at a cost of millions of dollars.

Whether it is shaving costs or managing inflated expectations for order activity, it is all part of the psychology that goes with the international jamborees known as Farnborough and Paris—and quite possibly, a new normal that seems to have settled across aerospace. All segments are operating in a business climate marked by higher risk and uncertainty. ☐



KEITH GASKELL

"The aircraft goes beyond 2g—which is well within what it is designed to take. I can't say the same thing about the passengers."

—Boeing Commercial Airplanes chief test pilot Mike Carriker on the 787's flying display

"LauncherOne will go around the world in 80 min. It's actually 90 min., but I thought that sounded better."

—Virgin Galactic founder Richard Branson, unveiling the new LauncherOne smallsat system

"We were expecting a Chinese buyer, but not this one."

—Embraer CEO Frederico Fleury Curado on Superior Aviation Beijing's move to acquire Hawker Beechcraft

"There will be a 319NEO for all those people that don't want to buy the CSeries."

—John Leahy, Airbus's chief salesman



NICEL HOWARTH/AVIATION WEEK

"It was designed a little bit like Russian roulette—except they put a bullet in every chamber."

—Raytheon CEO Bill Swanson on "sequestration"—the across-the-board budget cuts that will occur if the U.S. Congress cannot agree on a new deficit reduction package.

"If it were not for (Airbus President and CEO) Tom Enders, we would still be giving PowerPoint presentations about what we could do."

—Airbus Americas Chairman T. Allan McArtor

"I barely escaped with my life."

—Boeing CEO Jim McNerney on meeting with Emirates President Tim Clark, who is pushing for a next-generation 777

"The U.K. said that it was open to competition, but so far we have not seen any."

—Raytheon's Missile Systems President Taylor Lawrence on the U.K.'s sole-source awards of several weapons contracts.

"I made some skeptical comments about the 737 MAX, but in the last six months there have been some very significant changes made by Boeing and CFM."

—Air Lease Corp. CEO Steven Udvar-Hazy

Air Show Videos

Check out these and other videos in the digital edition of Aviation Week on leading tablets and smartphones or go to AviationWeek.com/Farnborough.



Engine problems forced Airbus Military to pull its A400M from the flying display for the second year in a row. But Europrop insists issues with its TP400 will not threaten the airlifter's scheduled 2013 entry-into-service. Watch the A400M in action.



Malaysia Airlines carried the flag for the massive A380 at this year's show, but Airbus failed to book any significant orders for its double-decker. Get close up to the A380.



Commercial airplane builders announced relatively few orders at the air show, but that did not stop airframers from showing off their metal in the skies. See highlights from the flying displays.

Soft Landing

U.S. states eye commercial sales to offset defense cuts

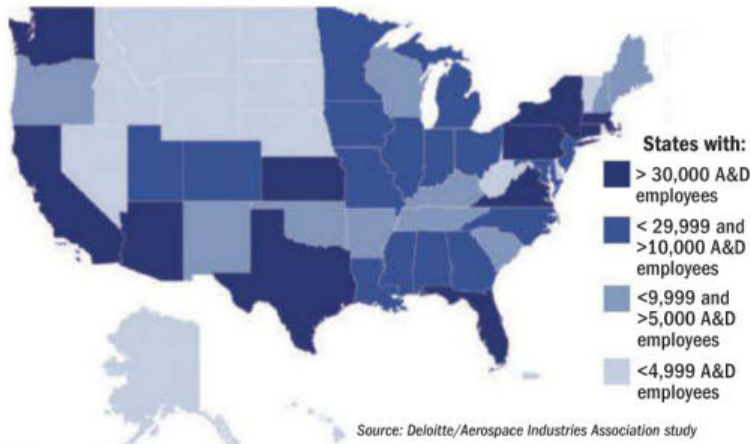
Jen DiMascio **Farnborough**

The delegation of U.S. politicians at the Farnborough International Airshow was so large they could scarcely fit on the same stage. "Don't push me over the edge, Cornyn," Sen. Barbara Mikulski (D-Md.) quipped to fellow Sen. John Cornyn (R-Texas) at an event marking the start of the week-long gathering.

The U.S. delegation boasted eight senators and eight state governors, all on hand trying to promote U.S. aerospace while at the same time elbowing each other for pieces of it. Politicians are not yet close to reaching a deal that would avert an automatic \$1 trillion reduction in government spending at the start of next year—about half of that targeted at defense. Eyeing budget reductions on the defense side, state and local officials are aggressively courting the commercial and supply chain sectors, where the outlook is much brighter.

Boeing anticipates demand for \$4.5 trillion in aircraft sales over the next 20 years. Airbus Americas Chairman Allan

Concentration of A&D Employment in the U.S.



McArtor is looking to double the company's \$12 billion investment in the U.S. over the same timeframe. And states are vying to be designated by the FAA as one of the six sites to develop procedures for flying UAVs in civil airspace.

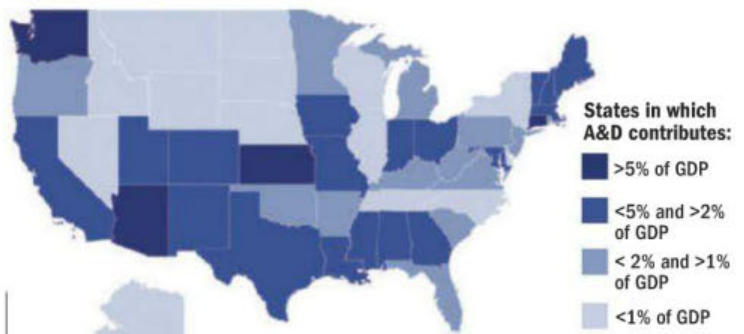
"We see tremendous growth," says Alex Pietsch, director of Washington state Gov. Chris Gregoire's office of aerospace. "With Boeing foreseeing demand for 34,000 aircraft over the next 20 years, someone is going to build those airplanes."

But in Washington, the business may not be all about Boeing in the future. The state's trade mission planned three meetings with Airbus during the show, including one between Gregoire and McArtor, to discuss how Washington's supply chain can also feed Boeing's top international competitor.

Kansas, another state historically focused on Boeing, has seen an even more dramatic shift in the makeup of its aerospace presence.

"It's a market in transition. It used to be [general aviation] and Boeing were Wichita. We had 60% of the GA market and Boeing," Gov. Sam Brownback (R) says. "Now you've got

A&D Industry Contribution to State Economies (Percentage of GDP)



Source: Deloitte/Aerospace Industries Association study

GA, a huge supplier chain that's in it and the presence of all three of the big guys—Airbus, Bombardier and Boeing. It's a broader, deeper marketplace today."

Brownback does not sugarcoat that the loss of Boeing, which had a strong presence in Kansas for 80 years, was a blow. But in a global marketplace, losing a headquarters does not mean the end of all business. In fact, Boeing will increase its supply enterprise in the state. The company spends \$3.2 billion now but within two to three years expects to generate close to \$5 billion there due to the increase in 737 production.

"Ironically, we'll have the Airbus and Bombardier nameplates in Wichita but not Boeing's," and the latter will be "the biggest player in aviation in the states," Brownback says.

Boeing and Airbus are both now establishing a presence in the Southeast, drawn by the promise of union-free labor. South Carolina Gov. Nikki Haley (R) is trying to attract more business with a personal touch. Businesses love that "it's Team South Carolina," Haley says. "South Carolina wraps its arms around you, and you are a big fish in a small pond. [Executives] get my personal cellphone number."

Haley touts the fact that she reduced income taxes for some small businesses to 3% from 5%. And she is easing some regulations. "I pretty much just wiped out my entire permitting board and replaced it." The board chairman is president of a construction company, Haley says. "We get that time is money."

In neighboring North Carolina, officials are pitching the motorsports' mecca aspect as a draw for the aerospace supply chain. The state is home to world-class NASCAR racetracks such as Charlotte Motor Speedway and boasts racing legends Dale Earnhardt and Richard Petty as local citizens. The precision that goes into designing top-dollar performance cars, along with a strong presence in medical devices and the nation's lowest rate of unionized workers, makes it an attractive site for aerospace suppliers.

In racing, "they don't want a 50-cent [component] to take out a \$2 million race car," says Christopher Plate, executive director of economic development and aviation for Monroe, N.C.

But can the largesse extend to all parts of the country? California, long the nation's leader in aerospace jobs, experienced a dramatic drop-off in employment in 2008. And while the state remains problematic for businesses—in terms of the high cost of living, taxes, fees and regulations—the lure for settling there remains the same, says John Summit, chairman of Advanced Machine Stretchform International in Gardena, Calif. The climate allows companies to do work outside year-round. It's a nice place to live. Costly infrastructure is in place, as is an educated workforce, he explains.

And in Arizona, where much of that state's aerospace business is tied to the defense industry, officials have 11 sites in mind to pitch as potential UAV test centers. ☐

Private Eyes

Corporate and personal aircraft are the basis of an expanding ISR segment

Bill Sweetman **Farnborough**

Drones may grab the headlines, but when it comes down to business, it's becoming increasingly clear that they face serious competition from intelligence, surveillance and reconnaissance (ISR) platforms based on small commercial aircraft—from small regional aircraft down to personal airplanes. The Farnborough venue highlighted that trend, with a battery of new-program announcements and show debuts.

There are several reasons for this shift in the market. Probably the most basic is that commercial platforms, even with pilots, are no more expensive to operate than large UAVs and may sometimes cost less (a U.S. House of Representatives intelligence committee report found that the U.S. Air Force's King Air-based Project Liberty is cheaper per hour than the Reaper). The aircraft also raise no issues when it comes to flying in national or international airspace, and many operators do not face an air threat or operate over disputed or hostile territory. Also, on-board operators make the system less dependent on a high-bandwidth data link—which is in itself a significant cost item on a UAV.

The biggest surprise at Farnborough was the revelation of a United Arab Emirates-backed program to develop a small, high-performance ISR platform.

Piaggio is teaming with Saab on the project, based on a highly modified version of its P.180 Avanti II. The first version will be a maritime patrol aircraft, but Piaggio says it is being designed so it can also be equipped for ground surveillance, tactical ISR or communications/signals intelligence (sigint).

Piaggio has signed a firm contract with Abu Dhabi Autonomous System Investments (Adasi), a subsidiary of Tawazun, covering development of the aircraft and construction of two prototypes, with the first to fly in 2014.

Adasi acts as program manager for several of the UAE armed forces' major programs, including the Al Sabr pro-

gram, based in the Schiebel Camcopter S-100 vertical takeoff UAV. Adasi's involvement and the scale of the program likely indicate that the P.180 MPA is to be adopted by the UAE air force.

The Piaggio MPA project is the first major modification of an existing light commercial design for ISR. The MPA platform will have a bigger wing than a standard P.180, a greater takeoff weight and more fuel capacity. It will have a maximum range of 3,300 nm and an endurance of 10 hr. (6 hr. at low altitude) while retaining the 350-kt. cruise speed and 41,000-ft. service ceiling of the basic aircraft—both desirable features for sigint or optical reconnaissance.

Saab's mission system will be similar to the package developed for the company's own 340 MPA, which made its air show debut at the Royal International Air Tattoo and Farnborough. The 340 MPA consoles, processors and software are intended to be platform- and sensor-agnostic. Saab's demonstrator has a Telephonics APS-143 radar and Flir Systems electro-optical turret.

Two other announcements the week of the show suggest that many users—not just military—are interested in the kind of wide-area surveillance system deployed by the U.S. in Iraq and Afghanistan. Sierra Nevada Corp. and ITT Exelis are teaming to develop and deploy a wide-area airborne surveillance (WAAS) system based on the Gorgon Stare Increment II that the two companies are producing for USAF.

The new version, Vigilant Stare, will be carried on a Twin Otter rather than a Reaper UAV, and Sierra Nevada and Exelis plan to operate the aircraft themselves and provide surveillance to customers on a fee-for-service basis.

Piaggio's maritime patrol version of the P.180 Avanti II features an enlarged wing and increased takeoff weight, and can be fitted with satcoms and search radar.

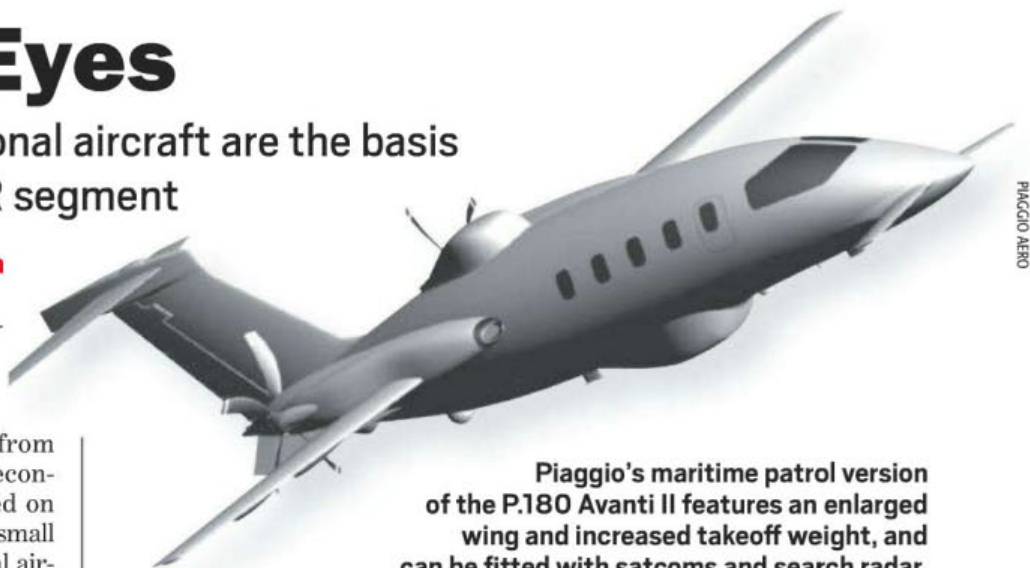
Like other WAAS, Vigilant Stare will provide continuous, full-area surveillance of an area the size of a small town, with enough resolution to track walking individuals.

Northrop Grumman, a non-attendee at Farnborough, unveiled its own civilian-based wide-area sensor demonstrator at the Airborne Law Enforcement Association conference in Reno, Nev., on July 11. The Air Claw is based on the Quest Aircraft Kodiak single-engine utility aircraft, and the demonstrator includes a Persistent Surveillance Systems Hawkeye WAAS.

At the lower end of the size scale, Austria's Airborne Technologies' multi-mission aircraft version of the Italian-built Tecnam P2006T light twin was highlighted. The display aircraft is to be delivered to AeroGB, which specializes in providing surveillance services to civilian and non-military government customers, on a fee-for-service basis, and will enter service under contract to an unspecified U.K. police organization.

AeroGB promotes the P2006T as a lower-cost, more flexible alternative to a light helicopter. Similar in size to a Cessna 172 or a Cirrus SR22, its two Rotax 912S3 engines are certificated to run on automotive fuel, reducing operational costs. It only needs about 400 meters (1,312 ft.) of runway and is almost inaudible at normal patrol altitude.

It has lower vibration levels than a helicopter, which improves sensor performance. AeroGB director Graham James, a former police officer, says an important part of the company's sales campaign is to "help customers understand the available technology. Many companies don't believe radar can do anything for them, but it can do a lot. ☺



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Speakers include:



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Program Director, Business
& IT Strategy, Air Canada



Brian Hint
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Branch, FAA



Scott Johnson
Sr Director, M&E
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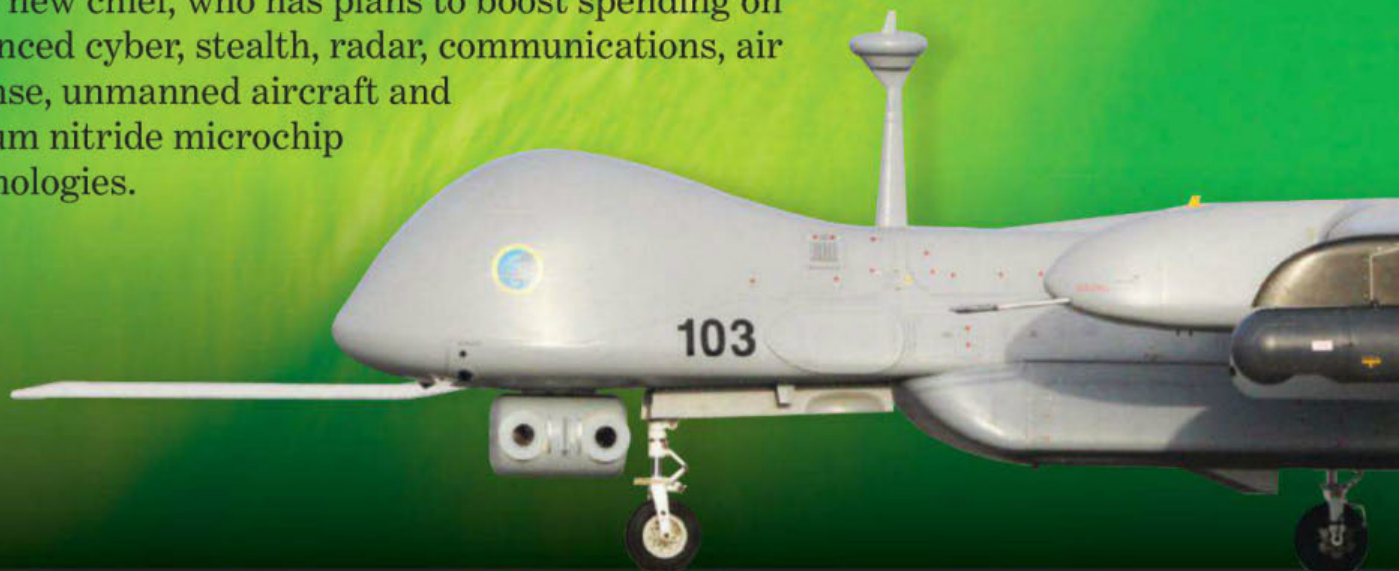
Revving The Tec

IAI boosts spending on R&D and advanced technologies to

David Fulghum Tel Aviv

There are ominous converging trends in the defense world. New technologies, in particular cyberdevelopments and advanced electronics, are growing exponentially in cost. At the same time, military budgets are falling rapidly and will continue to do so. The survivors of the coming turmoil will be those who embrace the formula of faster, smaller, better and cheaper.

Molded in that model is Israel Aerospace Industries' (IAI) new chief, who has plans to boost spending on advanced cyber, stealth, radar, communications, air defense, unmanned aircraft and gallium nitride microchip technologies.



On the commercial side, the emphasis will be on exploring opportunities for producing longer-range executive jets.

Military officials in both Israel and the U.S. say there is an operational need for lower-cost, stealthy, unmanned aircraft designs—perhaps like Lockheed Martin's RQ-170—that can serve as a persistent, network node that uses easily interchangeable intelligence, surveillance and reconnaissance (ISR) payloads. These platforms are seen as filling a different role from the more expensive and stealthier X-47-like aircraft that would conduct the unmanned strike mission. However, the lower-cost, stealth designs will eventually carry weapons as well, these officials say.

Moreover, defense planners in both countries have accepted the fact that stealth is a perishable product with today's designs good for 5-10 years, while the airframes themselves will operate for 30-40 years; this will drive them to adopt advanced cyber and electronic warfare options to protect their aircraft as they mature.

"Those are delicate things, I cannot discuss them, but IAI through the years has done everything it can to keep the technological and operational edge," says new IAI President and CEO Joseph Weiss. A mechanical engineer with an MBA degree, Weiss led a program to develop Dolphin submarines for the defense ministry and became general manager of all space-related activities for IAI's MBT space division in 2003.

"We will have to deal deeply with cyber-issues and with all aspects and types of low signatures," says the 61-year-old Weiss. "I think IAI has to enlarge the percentage invested in its own R&D to keep its technological edge over competitors and to support the state of Israel. We have to improve the affordability of state-of-the-art technology to compete in international markets. And we have to increase our hold on the space domain."

IAI revenues were \$894 million in the first quarter of 2012. The company employs 16,000 people.

A key to IAI's plans is development of the next generation of gallium nitride microchips. GaN has been commonly used in light-emitting diodes. It offers special properties for improving

Technology Engine

win foreign customers

IAI's Eitan (Heron TP) unmanned aircraft is carrying a Rafael Reccelite pod in addition to its nose-mounted multi-sensor pod and conformal electronic and communications intelligence arrays.



ISRAEL AEROSPACE INDUSTRIES

electro-optic, high-power and high-frequency devices. It also is suitable for solar-cell arrays for satellites since they remain stable in high-radiation environments. GaN also operates at hotter temperatures and higher voltages than other transistors, so the devices make excellent power amplifiers at microwave frequencies.

Other IAI interests include advanced communications of all types and phased array radars.

"At the systems level, we will see how to position ourselves more strongly in the air defense field, with optical and radar seekers, and in electronic warfare," says Weiss. "With potential partners, we will exchange views about future long-duration executive jet markets."

Cybertechnologies are yet another area that IAI intends to target. Weiss points out that it is a new field that no one really understands yet. Moreover, the level of investment increases as the research becomes more sophisticated.

On the other hand, he notes, "you can't discuss any system without taking into account potential cybereffects. Inherently, cyber is a mandatory building block. To understand the nuts and bolts of cyber, we have a ways to go. At IAI, we have focus teams dealing with the technology.

"Trying to differentiate what is cyber and what is the rest of a system is becoming more and more problematic," says Weiss. "In defining a system, what are the basic requirements and what are the cyber-requirements?"

Sometimes it is the very essence of the requirement, sometimes it is just the outer envelope. While doing practical things to our own systems, we are looking and mapping the areas of real interest to IAI and how much money to invest in that and what revenue can result from such activity.

"I'm coming to my new appointment in very foggy weather," he says. "We can see the crisis in Europe, the depression in the U.S., and we are totally aware of the huge cut in U.S. and Israeli defense budgets. Even in the markets of the Far East—China and India—the growth is lower than expected. For a company whose business is 80% export, the environment is very tough, so we have to be aggressive and creative. We need ideas

to solve the customers' problems with reasonable cost."

Weiss's initial weeks in office will be spent crafting IAI's strategy with Chairman Dov Baharav. Despite slowing markets in the U.S. and Asia, the prospects for growth are good. Weiss will be working on a number of large contracts that were initiated in the last three years regarding UAVs, missiles and electronics systems.

One involves developing airport robotics—in particular, the Taxibot aircraft tug, a joint project with Airbus. A second with Spacecom Satellite Communications involves building the Amos-6 communications satellite and ground station. A third contract with Italy concerns a high-resolution reconnaissance satellite program and purchase of advanced jet trainers to replace the Israeli air force's flight-training fleet; two early warning aircraft and a reconnaissance satellite are also included in the contract. Dassault is involved in the fourth big initiative, which could result in IAI manufacturing the Heron TP unmanned aircraft for the French air force and other European customers.

In the meantime, IAI is in negotiations with Spacecom and anticipates the boost that development of Amos-6 will give to all of the company's space activities.

"After a long two-and-a-half-year process we have won the contract to be the lead company and, in doing so, have introduced a lot of new cutting-edge technology," says Weiss.

Amos-3 is still in orbit, Amos-4 will be lofted in 2013, and Amos-6 is planned for launch in the first quarter of 2015 with an anticipated life of at least 16 years.

"We are making a real technology leap with Amos-6," he says. "We've doubled the [signal output] capacity from 4.5 kilowatts to 9 kilowatts. And we've almost doubled the number of transponders. We learned from [losing the contract to ISS Reshetnev for] Amos-5 to be creative and cost-effective in competing against the best companies in the satellite world. It's about a \$200 million contract—which is a huge deal for IAI and the space industry in Israel. About 100 IAI employees, some of them new, will be working on the project."

Some of the payload integration will be done at IAI, which is another technological leap for the company that



ISRAEL AEROSPACE INDUSTRIES

Joseph Weiss, Israel Aerospace Industries' new president and CEO.

positions it at the center of the commercial satellite business. The satellite to follow Amos-6 has no specific design yet.

In addition, Weiss says IAI will be enlarging its "indigenous capabilities" to enhance its competitive edge. "We intend the platform to compete in the international market. Its heritage is from Amos-4. It is one of the most sophisticated payloads that was ever built by IAI [and] it will be a good starting point."

Business with Italy also looks promising, with agreements that Israel will buy 30 Alenia Aermacchi M-346 advanced trainer aircraft for roughly \$1 billion. This acquisition would be offset by an Italian purchase of two IAI-built Gulfstream G550-based Conformal Airborne Early Warning (CAEW) aircraft, worth about \$760 million, and an Ofeq high-resolution, electro-optical reconnaissance satellite priced at around \$200 million. The Italian-operated satellite could be lofted as early as 2015.

The M-346s are to replace Israel's 1960s-vintage Fouga Magisters and older F-16A/Bs used in flight training. IAI and Elbit are to partner on the program as part of a deal with the Israeli defense ministry.

As for the CAEW aircraft, they are expected to have active electronic warfare and intelligence-gathering capabilities based on IAI technology.

"We are defining the requirements," says Weiss. "We expect the mainte-

nance to be conducted in Israel. It could be that there will be interest in enhanced-capability aircraft in the future."

Because the special-mission aircraft is built around a U.S. Gulfstream airframe, Israeli officials believe the design could be of interest to the U.S. as the Air Force replaces its much-larger C-135-based special-mission aircraft such as the E-3 AWACS and Joint Stars. Gen. Norton Schwartz, USAF chief of staff, says the service needs replacement aircraft the size of business jets and not the larger Boeing 737.

Dassault—the longtime manufacturer of France's high-performance fighters and strike aircraft—is negotiating with IAI to market the next-generation Heron TP to the French air force and European customers. The French are already operating IAI UAVs in Afghanistan, and France's military leaders are considering their UAV road map.

"We think Heron TP is one of the most capable unmanned aircraft in the world and that it can be certified to fly in France," says Weiss. "The decision should come soon. Dassault is a leading aircraft manufacturer and very good partner. If you look strategically over the next 30 years, the role of manned aircraft will be declining and that of unmanned aircraft will be growing. So we think Dassault will be there because they are thinking strategically [about new markets]."

As for robotics, IAI's leaders believe it is an area that could be a more integrated and well-funded element of its product line. The Taxibot, which was shown at the Farnborough air show, is a semi-autonomous tractor for moving large aircraft quickly and efficiently around airfields. It is designed to improve safety and save aviation fuel as airliners wait in long queues before takeoff. Use of Taxibot also reduces wear and tear on aircraft landing gear.

"We're in the middle of testing," says Weiss. "We're hoping this will be a bonanza for IAI and Airbus."

Bankers Capital Transportation Leasing Group is planning to purchase dozens of narrowbody and widebody TaxiBot systems that will be operated in North America. A letter of intent regarding the \$97 million deal was signed at Farnborough. It is the launch contract for providing TaxiBot services to airlines and airports. Delivery is planned for late 2013. ☐

Helo War

After earlier salvos, the Indian MRH competition could be decided soon

Asia-Pacific Staff New Delhi

Following a hostile, acrimonious procurement effort, the Indian navy now appears set to decide on a winner in its delayed multi-role helicopter (MRH) competition. Commercial bids by the two contenders, NHIndustries and Sikorsky, are expected to be opened in the next two weeks by the Indian defense ministry, with a roughly \$1 billion contract to follow for 16 of either the NH90 or the S-70B Seahawk.

The winning helicopters will progressively replace the navy's 19 aging Westland Sea Kings. They will be used primarily for anti-submarine and anti-surface warfare, with secondary roles including search and rescue, utility transport and casualty evacuation.

The navy has spent many weeks this year responding to official allegations made by one of the contenders, but now hopes the matter has been settled. Starting in December 2011, shortly

after field trials of both helicopters, AgustaWestland (which leads NHIndustries' campaign in India) wrote to the defense minister charging that certain performance and configuration requirements had been unfairly relaxed to favor Sikorsky's Seahawk.

The letters to the ministry—by NHIndustries Managing Director Domenico Vaccari and AgustaWestland Senior Vice President Giacomo Saponaro—also alleged that Sikorsky had misrepresented the capabilities and configuration of the S-70B to pass field trials. They accused rival Sikorsky of fudging the S-70B's capabilities, especially in regards to redundant flight controls, the amount of reserve fuel expected at the end of a nominal anti-submarine mission, and the helo's ability to feature both internal and external fuel tanks. Indeed, the letters note the S-70B would not be able to deploy weapons if it carried external tanks.

Moreover, questions reportedly have been raised about the S-70B's stabilator control system and whether it had satisfactorily demonstrated a dunking sonar operation.

In return, the navy accused NHIndustries of "twisting" and misrepresenting the requirements by raising "baseless and unreasonable" queries, and said the company was "attempting to mislead higher authorities and cause delays." The navy says that both the S-70B and NH90 were found to be compliant, and its final choice will now depend wholly on the commercial bids.

With the complaints, AgustaWestland appears to have given back to Sikorsky what it received in 2010. That year, Sikorsky had complained in a series of letters to defense officials that the AgustaWestland AW101 helicopter did not comply with Indian air force requirements. The AW101, offered for very important passenger (VIP) transport, went on to win the \$700 million contract for 12 helicopters, with deliveries scheduled to begin this October. That contract recently gained negative press attention in Italy when it was reported that investigations into Finmeccanica's dealings touched on possible corruption in the Indian deal.

Indian Defense Minister A.K.

The Indian navy says both the S-70B and NH90 (below) were found to be compliant with its requirements.



NH INDUSTRIES

Antony sought reports from the Indian Embassy in Rome and clarified to his parliament that the Indian deal was clean. While that seems to have stemmed the controversy for now, Indian defense contracting is haunted by a reputation of shady deal-making. And with the navy already ruffled by the complaints, NHIndustries will hope that the procurement process is every bit as objective and fair as the government says it is.

Sikorsky declined to comment publicly on the proceedings, but an official at the company told Aviation Week that "the navy has made it clear that

this is a competition, and it cannot be a single-vendor contract, no matter how badly any of the contenders may want that."

But that is an ironic comment considering that the Lockheed Martin/Sikorsky MH-60R was rejected in the MRH competition specifically because the navy wanted a competition and not a U.S. foreign military sale. Nevertheless, a separate follow-on tender confusingly titled the N-MRH—even though both pertain to the navy—is set to be floated later this year for more than 70 similar helicopters. Navy sources say the service is hoping to see

the MH-60R in play. The navy's interest in the MH-60R is expected to be seen by Sikorsky as an advantage for the S-70B in the MRH, considering the platforms' commonality.

While AgustaWestland has supplied equipment to India before, a win for Sikorsky will be its first real business with the Indian military. The only other Sikorsky helos in Indian service are six SH-3 Sea Kings that accompanied the ex-USS Trenton Austin-class amphibious transport dock ship that was transferred to India in 2007 under a government-to-government accord.

New Choppers, Limited Market

China's helicopter builder is developing aircraft it cannot sell in the West

Bradley Perrett **Beijing**

Avicopter sees itself becoming one of the world's great helicopter makers, alongside the likes of Eurocopter. A rather large obstacle stands in its way, however: Western countries, the world's largest helicopter markets, do not recognize Chinese rotorcraft certifications.

Undeterred, the rotary-wing subsidiary of Avic has now at least received Civil Aviation Administration of China (CAAC) type certificates for two helicopters this year. The latest is the AC311, a key product in the company's strategy. That aircraft and the other newly certified type, the three-engine AC313, are both heavily modified versions of French helicopters.

Certification of the AC311 came at least six months later than Avicopter expected last year. No reason for the delay has been given.

The development plan for the AC313 includes U.S. or European certification, says Xu Zhaoliang, the chief designer of the 13.8-metric-ton aircraft. Yet the difficulty in doing that illustrates the size of the obstacle in Avicopter's path.

A foreign authority could eventually recognize a Chinese helicopter certification, but only after reviewing and confirming the CAAC's expertise in airworthiness assessments. Certifications issued by the CAAC prior to that, including the AC313's, would not be recognized.

Reviewing and confirming an old foreign certification, issued under different standards, would be nearly impossible, says one Western industry official closely involved in airworthiness assessments. There is a way around the problem—redesigning the aircraft and putting it through a

second certification process—but such a costly effort would be hard to justify if aimed only at widening a type's market.

Still, it is an effort that Avicopter has recently undergone for the AC313—and only for local approval. That may be a measure of the company's determination.

Avic's various units stress time and again that one of their biggest challenges is achieving airworthiness certification, including from the CAAC. The basic problem, says Yin Shijun, CAAC deputy director general for airworthiness, is that its engineers do not have enough opportunities to accumulate airworthiness knowledge—though judging from the many projects proposed by Avic companies, that may not be a problem for long.

In conjunction with the June certification of the AC311, Avicopter announced orders for 62 of the single-engine, 2.2-ton aircraft from state enterprises, some linked with the manufacturer. The order figure is remarkably large for the nascent local market, but it is unclear whether the contracts are binding, since "orders" announced by Chinese manufacturers sometimes do not represent binding contracts, especially when the customer is a state firm.

Avicopter sees the AC311 as crucial for its goal of developing a lineup of helicopters in the 1-13-ton range. "According to a domestic and international research and analysis, light helicopters in the 2-ton class account for more than 40% of the civil market and the prospects for their employment are vast," the company says.

The AC311 can carry six people and has a 900-kg (2,000-lb.) maximum load capacity, 620-km (385-mi.) range, 4-hr. endur-



India's interest in the MH-60R could be a good omen for Sikorsky's S-70B (left).

Regardless of the provider, the Indian navy desperately needs new sea-going helicopters for anti-submarine and anti-surface warfare, especially since its Westland Sea Kings are frequently out of service. The navy is also evaluating a limited upgrade of its 19 Sea King Mk. 42s, with offers in from AgustaWestland pitted against an Israel Aerospace Industries-led consortium. ☛

ance and 242-kph (150-mph.) maximum cruise speed. "The tips of the main rotor blades are elliptical, improving aerodynamic efficiency and reducing aerodynamic noise," the manufacturer says.

The rotorcraft is similar to and follows the configuration of the Eurocopter AS350 Squirrel, an unauthorized copy of which Avicopter builds as the AC301. The Chinese company says it has independently developed the AC311 using three-dimensional digital techniques and that it has been designed in accordance with international airworthiness standards. Industry officials say Eurocopter did not help. Honeywell has supplied its LTS101-700D-2 engine for the program, but Turbomeca signed an agreement with Avic unit China South Aviation Industry last year to cooperate on the Arriel 2B1A for the AC311.

Despite the unexpectedly late certification, development of the helicopter appears to have been quick and was presumably aided by familiarity with the Squirrel. Preliminary design was completed in 2009 and detail design and engineering development in March 2010. First flight occurred the following November. In 2011, the company said it would be certified by the end of that year, while a third new helicopter, the 1-ton AC310, would be approved by May 2012. The AC310 has yet to achieve certification, though.

Another key challenge for Avicopter is to develop dynamic components that need overhauling only after long intervals. Even in China, buyers cite the need for frequent overhauls of Avicopter aircraft as a reason for buying more expensive imported helicopters. Avicopter says the AC311's dynamic components are designed to be long-lasting, but it gives no figures.

The type is also important because it will provide work for Avicopter's new base at Tianjin. The company, owned jointly by the Tianjin city government and Avic, also encompasses long-established Chinese helicopter plants such as Harbin Aircraft and Changhe Aircraft, in Jingdezhen. The AC311 was originally a project of Changhe.

The plant remains the builder of the AC313, developed from the military Z-8, itself a license-built version of the French Super Frelon. The rotorcraft has already been redesigned once to conform to updated certification standards—the CAAC refused the manufacturer's application

to certify the Z-8 for civil use in 2004, the agency's Yin tells *International Aviation*, the Chinese partner of Aviation Week. The CAAC determined then that an aircraft certified to military standards in China in the 1970s was not a candidate for civil use now. That appears to have sent the design authority, the China Helicopter Research and Development Institute, back to the drawing board to develop the considerably revised AC313.

The aircraft has new main and tail rotors, Pratt & Whitney Canada PT6B-67A turboshafts and a fuselage using composite material. Like other Chinese aircraft, it has high-altitude operations as a key objective, so that it can fly from bases on the Tibet-Qinghai plateau. The CAAC has certified it to operate from fields as high as 4,500 meters (14,800 ft.).

Avic is trying hard to lift its efficiency, but Western executives . . . express frustration at the slow decision-making and management infighting of the state group

A faster way for China to make its way in helicopter manufacturing is to build foreign types in facilities supervised and approved by foreign airworthiness authorities. While license production or assembly may no longer hold much interest for Avicopter, a private company in Chengdu wants to do just that. Talks between Chongqing Helicopter Investment and AgustaWestland have been suspended, however, says Fulvio Maurogiovanni, the Italian company's senior vice president for China.

AgustaWestland and Chongqing Helicopter last year proposed joint assembly of an unnamed helicopter at the site that the Chinese company had acquired for its planned manufacturing base.

But Maurogiovanni says AgustaWestland is unable to meet the ambitions of the Chongqing company. Chongqing Helicopter wants to assemble an AgustaWestland type to market

domestically and internationally, and it wants to assemble or build helicopters for other manufacturers, too.

Apart from those sticking points, a deal was quite close when the two parties stopped discussions, he says, adding that he is impressed by the Chinese company's determination to get into the helicopter business.

"We are not closing the door because we think Chongqing is a market that allows good penetration [of the national market] and Chongqing is itself growing," says Maurogiovanni. "But we cannot compromise on those two points."

Chongqing Helicopter was set up in January 2011 with registered assets of 3.3 billion yuan (\$528 million), 130 hectares (320 acres) of development land and backing from the government of Chongqing, which is nominally a city but actually a small province with a big urban area and a population of 30 million. AgustaWestland has envisaged an operation there that would at first assemble major modules and gradually move to more complex manufacturing processes.

The proposal is remarkable because it might turn out the largest aircraft to be privately assembled in China—that is, without the involvement of Avic.

"I would just love to do something in China without Avic," says a Western industry executive who has long experience in working with the group and thinks a private partner would be much more efficient, providing it could find skilled staff. Avic and state commercial aircraft builder Comac employ the great majority of Chinese aircraft manufacturing personnel.

The opportunity to try manufacturing or assembly of aircraft in China without Avic may not be available at Chongqing, however. Two industry executives say Avic may become

involved in Chongqing Helicopter. According to one, Chongqing Helicopter has always wanted some association with the state group, presumably to gain access to skilled workers and managers and political clout.

Avic is trying hard to improve its efficiency, but Western executives—many from enormous companies that are hardly free of bureaucracy—express frustration at the slow decision-making and management infighting of the state group. Officials in Western companies are also sure that a private partner would use labor and capital much more efficiently, driving down costs.

While the Chongqing talks are suspended, AgustaWestland is turning its attention to an obvious opportunity in training more of the pilots and other specialists that will be needed if it and other manufacturers are to fully exploit the market.

Aircraft makers and operators say the shortage of trained people will restrict growth even as the Chinese air force loosens its grip on low-altitude airspace, opening up a great potential market for rotorcraft. Since China has few civil helicopter pilot schools, the industry has to send students abroad, notably to the U.S. That restricts the supply further, because the students must have adequate English.

"AgustaWestland thinks that having a training center in China with Chinese instructors is a must," says Maurogiovanni. "We want to build a network of service centers and a training center."

Not just pilots and ground technicians are needed; rescue helicopters must have skilled operators for their equipment, such as winches. Again, in China the supply of personnel with such training is tight. ☛

Avicopter believes it has learned valuable lessons in developing and testing the AC313, including in cold and high environments.



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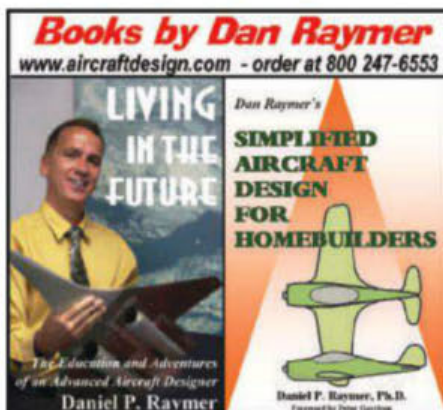
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July 31-Aug. 9—Fatigue Concepts. Aircraft Structures for Safety Inspectors and Engineers. Larkspur Landing, Sacramento, Calif. See www.fatcon.com
Aug. 7-10—Association of Unmanned Systems North America 2012 Exhibition. Mandalay Bay Hotel. Las Vegas. See www.auvsi.org/auvsi2012
Aug. 13-14—Bombardier 2012 Safety Standdown Latin America. Grand Hyatt Sao Paulo Hotel. See www.safetystanddown.com
Aug. 13-16—American Institute of Aeronautical and Astronautics/American Astronautical Society's Astrodynamics Specialist Conference. Hyatt Regency Minneapolis. See www.aiaa.org
Aug. 15-17—Ninth Annual Latin American Business Association Conference & Exhibition. Congonhas Airport, Sao Paulo. See www.abag.org.br/labace2012/
Aug. 27-31—International Society of Air Safety Investigators' 2012 Annual Seminar. Baltimore Marriott Waterfront Hotel. See www.isasi.org/isasi2012.html
Aug. 28-30—2012 AOPA Shanghai International General Aviation Show. Shanghai World Expo Exhibition and Convention Center. See www.sh-aero.com/en/
Sept. 4-5—Association of Aerospace Industries' Human Factors and Error Management Short Course. Nah Wah Building, Singapore. See www.aais.org.sg/human_factors
Sept. 4-7—Netherlands Association of Aeronautical Engineers' 38th Annual European Rotorcraft Forum. Amsterdam Marriott. See <http://erf2012.nl>

PARTNERSHIPS

Aug. 6-9—Association for Unmanned Vehicle Systems International. Las Vegas.
Oct. 1-5—63rd International Astronautical Congress. Naples, Italy.
Oct. 9-14—Japan Aerospace. Nagoya.
Nov. 13-18—Airshow China. Zhuhai.
Dec. 11-13—Middle East Business Aviation. Dubai, United Arab Emirates.

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How To Link Profit To Sustainability

Despite all the talk about doing well by doing good, sustainability remains by and large disassociated from core business for most companies, leaving sustainability reports to often look like an assemblage of feel-good stories disconnected from corporate strategies. But change is coming from what many readers may consider an unlikely proponent of next-generation sustainability practices—the U.S. Defense Department.

In its Strategic Sustainability Performance Plan issued last year, the department set very ambitious targets for itself and its suppliers. One of them is to make sure that 95% of its “off-the-shelf” procurement is conducted sustainably; another is to design and acquire weapon systems and platforms that are both more sustainable and have a reduced total cost of ownership (TCO), for example, through lower fuel use. The stakes are huge. In 2010, the Pentagon issued more than 3.6 million contracts amounting to \$366 billion in resource obligations.

Meanwhile in Europe, the Clean Sky and Single European Sky research initiatives are providing the foundations for a greener approach to air transport. Clean Sky’s aim is to develop breakthrough clean technologies, focusing on “green” design and production, maintenance, withdrawal and recycling of aircraft.

Yet, for all these major stakeholder driven-initiatives, aerospace and defense (A&D) companies have so far had limited tools to help link sustainability with TCO and translate environmental initiatives into a competitive advantage. Generally, sustainability and financial considerations are treated separately. At most, the two are brought together to estimate in-house savings, for example when valuing the bottom-line impact of internal energy reduction initiatives.

The Pentagon is about to change this by tying sustainability and financial considerations across the whole life cycle of a product and across all sustainability issues, not just energy efficiency. Specifically, it is testing a new military standard that would help the defense industry and program managers better understand both the sustainability and TCO of various alternatives—from production through eventual disposal. For example, hexavalent chromium (a known carcinogen) is still being used in coatings due to its corrosion-inhibiting properties. However, corrosion-preventative maintenance costs more than \$1 billion per year, mostly for regulatory compliance such as reducing health hazards. When the life-cycle impacts and related TCO of potential substitutes are taken into account, greener environmental and financial choices become apparent.

Observers familiar with sustainability know this is a seminal moment. Environmentalists and pundits have tried for decades to make the case that companies will do better financially if they make more sustainable choices. Too often, however, this remains a pie-in-the-sky claim that is difficult to substantiate for the decision-maker on the ground. By combining sustainability and TCO in the acquisition process, the Defense Department is making the former an explicit competitiveness tool.

Forward-looking companies such as Lockheed Martin and Boeing are early movers in linking sustainability and financial consider-

ations. For these players, the broader opportunity is to set the same objectives for their own procurements, with a strong ripple effect throughout the supply chain. In addition to reduced environmental damages, these efforts result in stronger sales, improved profitability and more competitive supply chains.

However, these are isolated cases, and too often there is a disconnect between business managers pressured to improve financial performance and sustainability departments eager to prove they can be more than cost centers and compliance offices.

To bridge this chasm, A&D companies will need to do three things:

- Leverage environmental and financial analytics to rapidly assess both impacts and costs throughout a product’s life cycle.

“So far, companies have had very limited tools to link sustainability with total cost of ownership and translate sustainability into a competitive advantage.”

- Focus on identifying hidden and contingent costs not apparent in the traditional acquisition or business-modeling process, such as the cost of health hazards and safety equipment when using hexavalent chromium.

- Use metrics that acquisition officers and procurement managers can understand. Thanks to recent analytic developments merging environmental and financial assessments, A&D companies and their customers can now achieve this synthesis, helping break the silos between sustainability and customer TCO.

The stakes are large for both the environment and companies. With the air transport business essentially doubling every 15 years, and defense budgets being reduced in most countries, A&D companies have no choice but to become more proactive in managing their customers’ environmental footprints and associated costs, and to engage their supply chain in a way that will make what is still too often a compliance issue into a truly differentiating competitiveness tool—call it the Sustainability Financial Advantage.

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