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AVIATION WEEK & SPACE TECHNOLOGY

TIME TO GROW UP
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FIRST LOOK
A Cruise Missile For Electronic War

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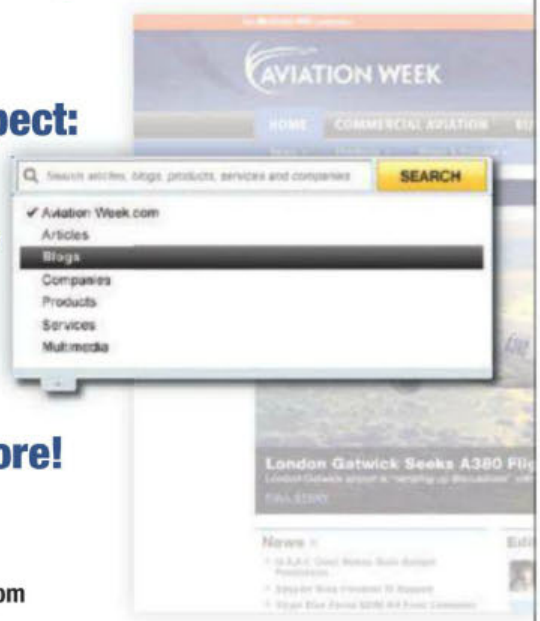

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November 21, 2011

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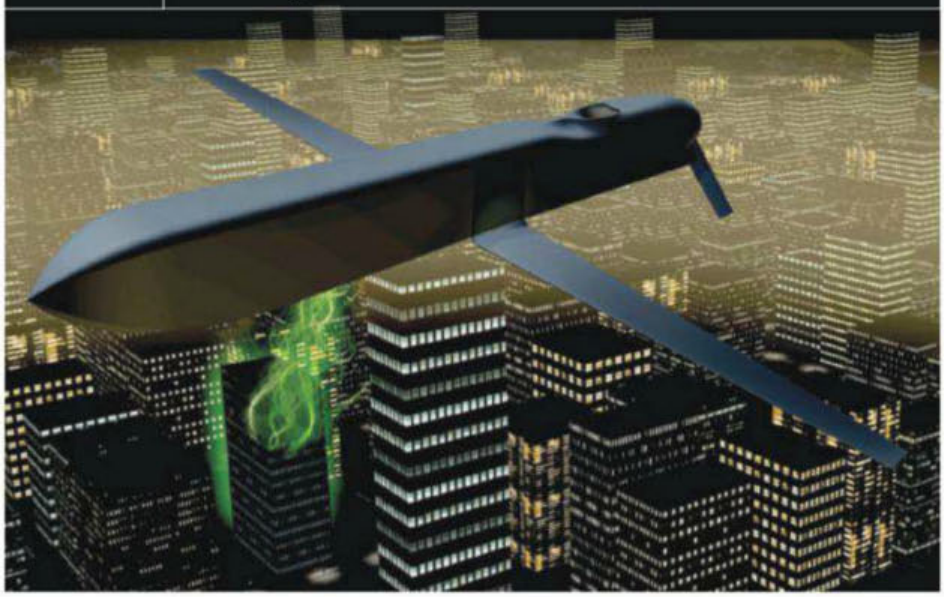
AVIATION WEEK
& SPACE TECHNOLOGY

29 *The U.S. has built, flown, pointed and triggered a missile designed specifically to carry a directed-energy weapon. That payload, expected to be operational soon, will be able to disrupt, shut down, spoof or damage electrical systems.*



COVER STORIES

Ground workers prepare a LAN Airbus A320 for taxiing at Santiago, Chile. LAN and TAM plan to complete their merger to form the Latam Group in early 2012. Latam will be by far the biggest player in the region, which will have important implications for its competitors. Latam is also weighing its alliance options. Coverage of Latin American aviation begins on p. 48. Dietmar Plath photo.

30 *Questions hang over UAE and Saudi Arabian fighter buys as other countries around the world near decisions.*

DEPARTMENTS

UP FRONT

THE WORLD

DUBAI AIR SHOW

ELECTRONIC WARFARE

DEFENSE

SPACE

AIR TRANSPORT

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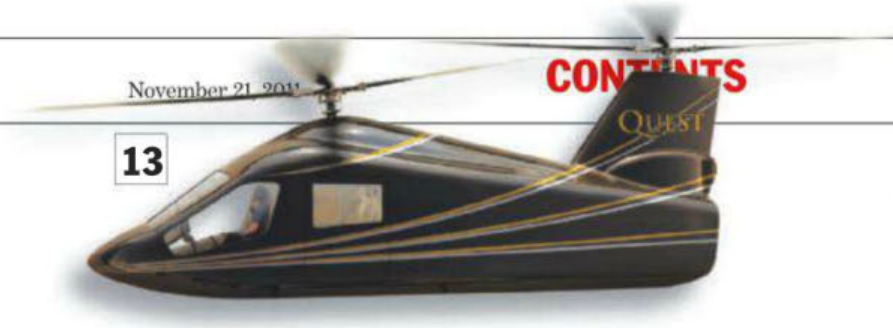

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JIM KOEPNICK

PHOTO OP

View finalists from Aviation Week's 20th Annual Photo Contest and recommend your favorites for the Readers' Choice section in the Dec. 19/26 issue. **AviationWeek.com/photos**

SAND IN THE GEARS

The 2011 Dubai Air Show headlines were dominated by Qatar Airways CEO Akbar al Baker and his public dressing down of Airbus (see p. 22). The aircraft maker "is still learning how to make airplanes," proclaimed the outspoken CEO. Then, hours later, he placed a firm order for five A380s and 50 A320NEOs. Follow the aftermath on our **Things With Wings** blog. For full coverage of the show, go to **AviationWeek.com/dubai**

LOSS OF CONTROL

Moscow-based Aviaconversiya Ltd. makes and sells to anyone who wants to buy jammers for GPS and other navigation satellite signals, no questions asked, Christina Mackenzie reports from the Dubai Air Show (see Nov. 15 post). The company says it is not even under the control of Russia's defense ministry. **AviationWeek.com/Ares**

MRO SOCIAL

The Teardown Report highlights MRO-focused social-media discussions and topics from the week—every week—on our MRO blog, **Turnaround Time**. Check out Report #20 with its look at the power-tweeting Aeronautical Repair Station Association (Nov. 11 post). **AviationWeek.com/mroblog**

FLIGHT DEMOS

Slideshows of the C-27J Spartan, Patrouille de France aerobatic team, Mirage 2000-9 and JF-17 Thunder flying at the Dubai Air Show are on our **Ares** blog (see Nov. 12-13 posts). **AviationWeek.com/Ares**

TAMPA FIRST

AviancaTaca subsidiary Tampa Cargo is expected to be the first Airbus A330-200 freighter operator in Latin America. To read more about the aircraft and to see pictures, go to **AviationWeek.com/mroblog**

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FROM THE WEB

Comments from readers on AviationWeek.com

The article by Frank Morring, Jr., and Jefferson Morris on the J2X rocket engine (AW&ST Nov. 14, p. 39) brought the following:

Downix wrote:

The J-2X has little commonality with the Saturn era J-2 engine. The J-2X involves many interim developments. First, you have the J-2S, which was developed late in the 1970s and nearly ended up being used on the shuttle as a stop-gap. After that, you had the J-2T, which explored new flight envelope technologies. This in turn led to the Lockheed Venturestar proposal, which used an upgraded J-2T in the X-33 program. The J-2X is derived from the X-33's J-2T offshoot engine, called the XRS-2200. They took the improved turbopumps and merged them with the gas generator from the RS-68A and Hot Isostatic Press Combustion Chamber technology used on the RS-68A and soon the RL-10C and RS-25E. There is next to nothing of the J-2 in this design.

On our editorial last week (p. 66):

BananaPeal commented:

How about we skip replacing ICBMs and just use subs and bombers for our deterrent? Or perhaps at least bring the numbers way down. What's the point of 5,000 missiles? Just by counting the missiles on the submarine fleet, there are almost 300 or so Tridents. How many nukes do we need to blow up our enemies, or the world?

Executive Editor James R. Asker replies:

As we point out in our editorial, these questions can become complicated very quickly. I was discussing the nuclear triad with a former defense official who asked rhetorically, "Is having a triad more important if you cut the numbers of weapons way down?" Someone else suggested bombers would be the logical leg to eliminate. Another reader noted we left off one of the perennial questions: Does the U.S. really need 12 aircraft carriers?

Join the discussion at :
www.aviationweek.com/avweek

FEEDBACK

Aviation Week & Space Technology *welcomes the opinions of its readers on issues raised in the magazine. Address letters to the Managing Editor, Aviation Week & Space Technology, 1200 G St., Suite 922, Washington, D.C. 20005. Fax to (202) 383-2346 or send via e-mail to:* **awstletters@aviationweek.com**
Letters should be shorter than 200 words, and you must give a genuine identification, address and daytime telephone number. We will not print anonymous letters, but names will be withheld. We reserve the right to edit letters.

FROM THE ANNALS

A recent letter from reader Norman Kellman regarding pilot training (*AW&ST* Nov. 7, p. 8) referenced a letter from Roger Waldman that ran in the Sept. 6, 1999, issue. I would appreciate it if you could reprint that letter.
Capt. (ret) S.M. Bell
KAILUA, HAWAII

(Waldman's letter follows—Ed.)

PILOT ATTITUDE A SAFETY KEY

The article "Boeing Safety Tool Provides Insight Into Human Factors Errors" (*AW&ST* June 21, [1999] p. 51) points to an element of the human factors equation that has proven to be thorny for airlines.

Though my knowledge of the described "Procedural Event Analysis Tool" is limited, there is an abundance of material that focuses on dealing with human factors in aviation. There is little doubt that flight crews' compliance with established procedures is a key to flight safety. To address this issue, airlines spend millions of dollars and thousands of man-hours annually on initial simulator training, crew resource management training and recurrent training. And yet far too many fatal accidents are attributed to pilot error.

My involvement in flight-crew training for more than 40 years has led me to some conclusions. Pilot attitudes constitute a major issue . . . a component over which trainers have little control until it is often too late.

Lawrence I. Schuman, an advanced airmanship instructor at SimuFlight Training International, wrote a paper for the Flight Safety Foundation's *Accident Prevention* newsletter in August 1991 entitled "The Three Critical Success Factors." He stated: "Flight crewmembers who possess specific attributes that strengthen their ability to excel are less likely to become involved in pilot-preventable accidents." Those attitudes were defined as: an intimate knowledge of the industry; the embracing of institutional awareness and a conservative response to challenge; and the development—and use of—standard operating procedures.

Schuman's thesis is that pilots who demonstrate excellence in training and line operations are likely to repeat it during abnormal/emergency situations. Moreover, the easiest pilots to train are those whose egos are not in the way and who can take constructive advice.

In human factors, pilot attitude is the wild card. Arrogant, complacent and overconfident pilots can create potentially life-threatening situations.
Capt. (ret.) Roger H. Waldman
BELLINGHAM, WASH.

A LOT OF QUESTIONS

I think we will hear more about the LOT Airlines gear-up landing (*AW&ST* Nov. 7, p. 16). I have read the Boeing 767 emergency gear extension procedure and unless gravity was not working that day, the gear should have extended. Is it possible the pilot did not run that procedure? Also, why was the first officer allowed to make the decision to continue to Warsaw?
James D'Agostino
PELHAM MANOR, N.Y.

COMPOUNDING THE PROBLEM

Your editorial "Supply Chain Mismanagement" (*AW&ST* Nov. 7, p. 86) touches only partly on the reasons for underperformance of the supply chain. The problem with a significant number of the medium and small suppliers is they lack the depth of engineering/management skills and experience of the primes. This situation will probably worsen due to the decreasing number of programs on which to gain experience, and the deteriorating performance of our educational system.
Doug Culy
TEMPE, ARIZ.

STILL SLEEK AFTER ALL THESE YEARS

Regarding "Power Play" (*AW&ST* Oct. 24/31, p. 97), F-16s look more like they're grown than manufactured. No other front-line jet looks so sleek, sexy, supersonic, dangerous. At least one writer has described the design as timeless. It's true. I'm pretty sure I saw my first F-16 at Farnborough in 1974. It still looks cool. And scary. We may not be able to launch astronauts into space on our own vehicles anymore, but we can still transfix the Chinese by selling F-16s to Taiwan.
Chris Barr
HOUSTON, TEXAS

WHO'S WHERE

Ruedi Kraft

A. Al-Ghamdi

Jeffrey Wood

David Ufen

Mike Twyman

Graham Evitt

Paul Kirby

To submit information for the Who's Where *column, send Word or attached text files (no PDFs) and photos to:* **awinder@aviationweek.com** *For additional information on companies and individuals listed in this column, please refer to the* Aviation Week Intelligence Network *at* **AviationWeek.com/awin** *For information on ordering, telephone U.S.: +1 (866) 857-0148 or +1 (515) 237-3682 outside the U.S.*

Stephanie Pope has been appointed VP-investor relations of Chicago-based *Boeing*, effective Feb. 1. She will succeed **Scott Fitterer**, who will become VP-financial planning and analysis. Pope is CFO for the Integrated Logistics business of Boeing Defense, Space & Security.

Larry Kellner has joined *Boeing's* board of directors. He is president of private equity firm Emerald Creek Group and was chairman and CEO of Continental Airlines.

Ruedi Kraft (see photos) has been appointed VP-market development and completions sales at *Jet Aviation*, Basel, Switzerland. He comes from Gulfstream Aerospace Corp., where he was VP for the Middle East and North Africa. Company veteran **Abdullah Al-Ghamdi** is the new customer relations manager and sales representative for aircraft management and charter services for Saudi Arabia and the Gulf Cooperation Council.

Don Erickson has been named CEO of the *Security Industry Association*, Alexandria, Va. He was government relations director.

George Puthoff and **Glenn Gray** have joined the maintenance and avionics department of San Diego-based *Jet Source*. Puthoff was parts manager at Air Resorts and Crownair, and Gray, a returning Jet Source employee, held positions in corporate aircraft procurement.

Jeffrey Wood (see photo) has been named senior VP for Tempe, Ariz.-based *StandardAero's* airlines and fleets business, taking over from interim leader **Jennifer McNeill**, who will return to her post as VP-sales, marketing and business development. Wood was senior adviser for Irving Place Capital's aerospace practice.

USMC Maj. Gen. (ret.) **Andrew B. Davis** has been appointed executive director of the Washington-based *Reserve Officers Association*, succeeding U.S. Army Maj. Gen. **David Bockel**, who stepped down in September. Davis's final assignment was as leader of the Marine Corps Mobilization Command.

John M. Urias has joined *Oshkosh Corp.* as executive VP and president of Oshkosh Defense. He was VP-programs for Raytheon Integrated Defense Systems.

John Paskell has been named airport administrator in *Salem, Ore.* He was executive director and chief operating officer of the Mohave County (Ariz.) Airport Authority.

David Ufen (see photo) has been appointed director of avionics for *J.A. Air Center*, Sugar Grove, Ill. His background includes experience with Elliott Aviation, Universal Avionics, AirCell, Rockwell Collins and Honeywell product lines.

Mike Twyman (see photo) has become VP and general manager of *Northrop Grumman's* Defense Systems Div., McLean, Va., succeeding **Barry Rhine**, who is retiring. Twyman was VP for Integrated Command, Control, Communications and Intelligence Systems.

John Caldwell has joined the Advisory Services organization of New York-based *American Express Global Business Travel* as a senior consultant. He was founder of Caldwell Associates.

Graham Evitt (see photo) has become Dallas-based *BBA Aviation's* Rolls-Royce M250 regional sales manager at engine repair and overhaul subsidiary H+S Aviation, Portsmouth, England. He was commercial engineer for the M250.

USAF Brig. Gen. **Martin Whelan** has been promoted to major general and named director of requirements at Air Force Space Command Headquarters, Peterson AFB, Colo. He was director of the Nuclear Support Directorate in the Defense Threat Reduction Agency, Fort Belvoir, Va. Whelan has been succeeded by Brig. Gen. **Michael E. Fortney**, who was chief of the Nuclear Operations Div. at U.S. Strategic Command Headquarters, Offutt AFB, Neb.

HONORS AND ELECTIONS

Caroline Daniels, chairman and CEO of ATP, has been selected chairman of the Washington-based *General Aviation Manufacturers Association* for 2012. Vice chairman will be **Brad Mottier**, VP and general manager of business and general aviation at GE Aviation.

Paul Kirby (see photo) of Cerretani Aviation has been elected 2012 chairman of the *National Aircraft Resale Association*, Grapevine, Texas. Other new board members are: treasurer, **Brad Harris**, Dallas Jet International; secretary, **Herb Knight**, Tempus Jets; **Jay Gantt**, Gantt Aviation; **Nick Schneider**, Global Wings; **Tobias Kleitman**, TVPX 1031 Exchange Co.; and **Louis Seno**, Jet Support Services.

Julie A. Sattler, a VP and general manager of Lockheed Martin Space Systems Co., has been named to receive the 2011 Lifetime Achievement Award from *Women in Aerospace*, Sunnyvale, Calif. Sattler was recognized for leadership and the development of space-based communication systems for warfighters.

Pilot and business aviation executive **Clay Lacy** has been inducted into the *Kansas Aviation Hall of Fame* in Wichita. He also recently received the *National Business Aviation Association's* Meritorious Service to Aviation Award for his dedication to building the business aviation industry.

David Giger, director of Dragon spacecraft development and propulsion for SpaceX, is among three space professionals to receive the 2011 Promise Award from the New York-based *Society of Satellite Professionals International*. The others are: **Bradley Patterson**, senior project manager of Intelsat; and **Rohit Iyer Seshadri**, senior member of the technical staff at Hughes Network Systems. The award recognizes the potential of young satellite professionals to play leadership roles in the industry. **Tom Eaton**, president of Harris CapRock, received *SSPI's* Mentor Award.

BY JOSEPH C. ANSELMO

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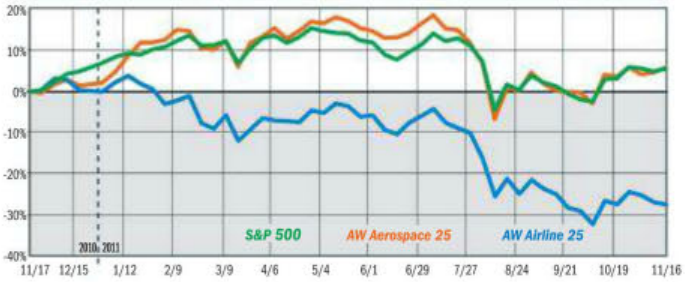
AW&ST/S&P Market Indices

(as of 11/16/2011) PERCENT CHANGE

MARKETS	INDEX VALUE	WEEK AGO	YEAR-TO-DATE	YEAR AGO
AW Aerospace 25	1316.2	1.2% ▲	3.0% ▲	5.3% ▲
AW Airline 25	772.1	-0.8% ▼	-28.4% ▼	-27.8% ▼
S&P 500	1236.9	0.6% ▲	-1.6% ▼	4.9% ▲



Weekly Market Performance

Closing Prices as of Nov. 16, 2011

Company Name	Current Week	Previous Week	Fwd. P/E	Tot. Ret. % 3 Yr.	Tot. Ret. % 1 Yr.	
AIR TRANSPORT						
AAR Corp.	18.33	18.30	8.8	25.5	-17.4	▼
ACE Aviation Holdings	10.67	10.63	-17.3	213.2	-11.4	▼
AerCap Holdings N.V.	10.75	11.22	5.6	165.4	-20.7	▼
Air Berlin	3.58	3.52	-2.6	-10.2	-32.2	▼
Air Canada	1.23	1.31	-3.0	-44.0	-62.9	▼
Air France - KLM	5.48	6.61	-5.2	-60.4	-69.3	▼
Alaska Air Group	66.12	66.87	7.3	164.0	25.0	▲
All Nippon Airways Co Ltd.	3.00	3.01	22.5	-33.9	-21.2	▼
Allegiant Travel Co.	50.25	50.46	13.5	36.4	6.1	▲
AMR Corp.	1.82	2.24	-0.7	-76.4	-77.3	▼
Asiana Airlines Inc.	6.24	6.83	5.1	107.6	-20.3	▼
Atlas Air Worldwide Holdings	38.67	35.88	7.4	155.1	-29.8	▼
BBA Aviation plc	2.80	2.85	9.6	156.4	-5.3	▼
B/E Aerospace Inc.	37.87	38.54	15.1	365.2	8.5	▲
CAE Inc.	9.72	10.28	13.5	59.4	-9.1	▼
Cathay Pacific Airways	1.71	1.78	7.6	76.4	-38.7	▼
China Southern Airlines	26.71	26.13	....	251.4	-19.1	▼
Copa Holdings SA	62.79	66.00	8.4	176.5	19.4	▲
Delta Air Lines Inc.	7.58	8.00	3.1	-3.7	-42.6	▼
Deutsche Lufthansa AG	12.69	13.02	10.7	7.7	-38.6	▼
easyJet plc	5.66	5.52	9.1	29.8	-19.1	▼
FedEx Corp.	81.49	79.35	12.4	32.5	-4.3	▼
GOL SA	7.84	7.88	....	127.5	-52.6	▼
Hawaiian Holdings Inc.	5.82	5.39	4.3	-5.7	-16.4	▼
Heico Corp.	58.58	57.60	31.7	214.3	51.6	▲
Jet Airways (India) Ltd.	4.92	5.17	-6.7	35.5	-71.9	▼
JetBlue Airways	3.85	4.12	9.0	-29.9	-42.1	▼
Korean Air Lines Co. Ltd.	38.87	41.77	....	26.1	-37.9	▼
Lan Airlines SA	24.30	24.25	15.8	180.5	-17.8	▼
Qantas Airways Ltd.	1.73	1.66	10.1	-25.8	-36.7	▼
Republic Airways Holdings Inc.	4.64	4.02	6.2	-64.8	-40.6	▼
Ryanair Holdings ADS	29.19	29.79	61.8	39.4	-1.2	▼
Singapore Airlines Ltd.	8.49	8.71	19.7	74.2	-13.8	▼
Skywest Inc.	12.04	11.70	15.1	-3.7	-22.2	▼
Spirit Airlines, Inc.	16.58	15.45	10.2	....	....	
Southwest Airlines	8.05	8.17	10.7	-18.2	-39.4	▼
TAM SA	20.26	19.80	....	213.1	-13.7	▼
United Continental Holdings, Inc.	16.90	17.85	3.1	58.1	-38.2	▼
United Parcel Service Inc.	69.31	68.99	14.9	42.9	6.1	▲
US Airways Group	4.50	5.05	3.5	-27.2	-57.9	▼
WestJet Airlines Ltd.	11.87	12.40	10.8	29.0	-5.5	▼
Zodiac Aerospace SA	72.23	74.77	11.8	100.0	3.2	▲

COMMENTARY

War In Washington: U.S. Airlines Vs. Boeing

Nicholas E. Calio is not afraid of a fight. As the White House's legislative affairs director under U.S. President George W. Bush, the longtime Washington insider secured a string of victories on Capitol Hill, including congressional authorization for Bush to wage war on Iraq. And when Calio in January became president and CEO of the Air Transport Association (ATA), he was expected to bring some much-needed vigor to the U.S. airline industry's lobbying organization.

Calio has not disappointed. On Nov. 16, ATA declared war on **Boeing,** filing a lawsuit against the Export-Import Bank of the United States to block $3.4 billion in government loan guarantees—a mechanism used to stimulate exports—for a pending sale of 30 jets to **Air India.** The suit, which is pending in U.S. District Court in Washington, argues that underwriting aircraft sales to Air India would provide favorable treatment to a foreign carrier, harming a domestic airline industry that employs five times as many people as Boeing's Commercial Airplanes unit. ATA also claims that Boeing, the nation's largest manufacturing exporter, is not the jobs machine it claims to be because many of the structures and components on its newer jets are sourced overseas.

That may be the case with Boeing's new 787 jet, which notably flies with wings made in Japan. But why wage battle over Air India? ATA charges that aircraft loan guarantees the bank made for the carrier in 2006 created a surplus of seats between New York Kennedy and Mumbai. Underwriting more airplane sales to Air India would only add to the oversupply, it argues. But it's hard to see how a struggling carrier that has lost more than $9 billion since 2007 poses a major threat to U.S. airlines. Certainly the airline jobs at risk do not match the number that would be lost at Boeing and its suppliers if the airframer was unable to compete in India, one of the world's fastest growing aviation markets.

The real reason for the suit, industry observers believe, is to draw a line in the sand. ATA has watched in dismay as European government export credits flowed to Middle Eastern carriers such as **Emirates** to stimulate the sale of new **Airbus** jets. Those jets in turn were used to compete with European legacy carriers, cannibalizing their traffic. "The concern is that Europe is sacrificing its national carriers to help Airbus," says Teal Group analyst Richard Aboulafia. "ATA may be trying to avoid a repeat of what's happening across the ocean."

But in taking on Boeing, ATA also is going up against the Aerospace Industries Association. AIA's president and CEO, Marion C. Blakey, is also a formidable Washington insider, having served as FAA administrator and chairwoman of the National Transportation Safety Board. AIA's initial response to the suit was muted, but it is hard to imagine it will not punch back. Calio versus Blakey? This could get very interesting.

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.

AIR TRANSPORT

Lion Goes For MAX

Boeing has secured an order from Indonesia's Lion Air for 201 Boeing 737 MAX aircraft and 29 737 NG aircraft, says the White House. The deal includes options for 150 more aircraft, it adds. The White House issued its statement to coincide with President Barack Obama's visit to Indonesia. LionAir has the world's largest fleet of 737-900ERs.

CSeries Commitments

Turkey's AtlasJet is buying Bombardier CSeries narrowbodies, providing a much-needed boost to the Canadian manufacturer's flagship commercial airliner program. The deal, not yet firm, is for 10 single-class CS300s and five options, and valued at up to $1.18 billion. It is the first pure low-fare airline order for the CSeries, notes Bombardier Aerospace President Guy Hachey, who notes customers have spoken for 262 CSeries aircraft (133 represent firm orders). AtlasJet deliveries would start in the first quarter 2016 and end in mid-2017.

Separately, Hachey confirms talks with Qatar Airways continue for potential sales of CSeries. (Qatar has ordered six A319NEOs as part of its 50-aircraft deal with Airbus.) "We are still interested in that airplane" and talks with Bombardier will resume once the current fleet purchases are resolved, Qatar CEO Akbar Al Baker says.

PROPULSION

Thanks, But No Thanks

GE Aviation is "not interested" in delivering an engine for Russia's United Aircraft Corp. (UAC) MS-21, GE's president and CEO, David Joyce, told Aviation Week at the Dubai Air Show. He confirmed there have been "some discussions" through the CFM International joint venture as to whether a version of the Leap-X engine could be used. UAC has selected the Pratt & Whitney PW1000G as the only foreign engine to power the aircraft, but industry sources say further negotiations have reached a difficult phase. Joyce says with three applications for the Leap-X—the Boeing 737 MAX, the Airbus A320NEO and the Comac C919—a combination of business case and workload concerns have led GE to conclude that it won't proceed with any further talks about the MS-21 powerplant. Joyce says he is not concerned about Chinese plans for indigenous C919 engines.

72K To Come

Engine Alliance, in combination with Airbus, is adding a 72,000-lb.-thrust rating to the GP7200 engine to the A380 catalogue to offer additional takeoff weight performance on short runways. A software upgrade to the full-authority digital engage control system is due to undergo flight testing in the coming months, with the goal to certify the thrust rating next year. The setting allows 7.5 more metric tons of payload on a 2,500-meter (8,200-ft.) runway or 240 nm more range. The option could aid long-distance operations out of Los Angeles and support Airbus's move to offer a 575-metric-ton, high-gross-weight version of the A380 starting in 2013. The GP7200 already has certified thrust rat-

UAE Company Unveils Safety Helicopter

The United Arab Emirates' insatiable appetite for aerospace industry growth continues with the Quest Group's backing of the development of an unusual helicopter concept that would allow passengers and crew to escape in a pod in case of an accident.

The Dubai-based family-owned business is putting its money and support behind a Ukrainian tandem helicopter program that could lead to a system being certified in around four years. First flight of a prototype is likely in 2013, with initial production starting in 2014.

The AVQ-series helicopter concept was unveiled at the Dubai Air Show, with Quest now starting to take what it calls "serious bookings." The initial 20 helicopters are being sold for $2.95 million each, with Quest seeking $200,000 in refundable deposits, says deputy project director Michael Creed. The primary markets being investigated include VIP transport, emergency medical services and utility work.

The helicopter features a counter-rotating tandem rotor configuration, fly-by-wire system and glass cockpit with three displays. The initial performance figures are for a 155-mph cruise speed, with 183 mph maximum speed and range of 450 nm.

Creed notes the company has unveiled a protoype but says the production concept will be refined to look sleeker than the initial model. Performance figures also could evolve as the program progresses. It is now one year into its anticipated five-year, $50 million development phase.

The testbed is expected to have a maximum takeoff weight of 2,250 kg (5,000 lb.) and carry three passengers and one pilot. The operational configuration would likely differ, with 5-15 passengers depending on the version.

The prototype is being powered by two Motor Sich A1-450 M turbines with full-authority digital engine control, delivering up to 480 shp per engine. A Western supplier eventually may be brought into the program.

QUEST HELICOPTERS

The helicopter will be largely made of aluminum, with some composite parts. The prototype is being built in Kharkov, Ukraine, home to Aero Vortex, the company that devised the concept. Eventual production will take place at Umm Al Quwain, UAE. It will be the first helicopter built in the UAE.

One of the key elements of the system is the gyro-stabilized recovery safety capsule. It attaches to a backbone that connects the rotor system across the fuselage. In case of an accident, a four-booster system can be activated to separate the rotating parts from the capsule. The capsule is equipped with a parachute to assure a soft landing.

Italy Receives First M-346 Master Advanced Jet Trainer

The Italian air force has officially accepted the first Alenia Aermacchi M-346 Master advanced jet trainer.

The aircraft will be assigned to the Reparto Sperimentale Volo test unit in Pratica di Mare near Rome and should be followed before year-end by another aircraft. The M-346 received Italian military qualification in June. Four more trainers and a ground-based training system are to follow in 2012, allowing the start of training operations in the southern Italy-based 61st Wing. The Reparto Sperimentale Volo is due to transfer the first two aircraft to the operational training wing as soon as possible.

These first six aircraft, which have the Italian military designation of T-346A, were ordered under a €220 million ($297 million) contract signed at the end of 2009. At the time, delivery of the first two aircraft was expected by the end of 2010.

The air force has listed a minimum requirement of 15 aircraft, but the economic development ministry has provided funds for just the first six, plus ground facilities and the training system, including full-flight simulators. The air force says it has no money for additional T-346As, but does have a fleet of MB-339CDs that have around 10 years of life.

The M-346 remains a competitor in foreign markets. It has been ordered by the Singapore air force, is still in the race for an eventual United Arab Emirates order, and has been proposed to Poland and Saudi Arabia. Poland is expected to issue a new tender after having canceled an earlier one that put too much emphasis on the combat performance of what was ostensibly an advanced jet trainer, not a light fighter. The M-346 also will be proposed for the U.S. Air Force T-X program. So far, Alenia Aeronautica has not announced a teaming agreement with any major U.S. defense company.

ings of 70,000 and 76,500 lb., the latter developed for the A380 freighter that has since been shelved. Meanwhile, the alliance is working on further lightening the engine, which now weighs about 200 lb. less than initial production turbofans. The latest change came with the introduction of a new turbine exhaust, developed by Volvo Aero, which cut the weight by 54 lb.

BUSINESS AVIATION

Bolstering Bizav

By year-end, Airbus plans to strengthen its corporate jet unit (ACJ), so it "will be able to provide the same packages as our competition," says Airbus Middle East President Habib Fekih. ACJ will include engineering, program management, and sales and service, with Airbus Chief Operating Officer-Customers John Leahy saying it will get "a new level of attentiveness." Airbus sold its first ever ACJ321 to Comlux at the Dubai Air Show last week and now has orders for the corporate versions of all of its passenger aircraft. Fekih says ACJ will also keep the ACJ340 in its portfolio for retrofits of used A340s as new production has ended.

DEFENSE

Anti-Ship Activity

The Eurofighter consortium and MBDA are looking at the feasibility of integrating the Marte-ER air-to-sea missile on the Typhoon fighter, to meet an Indian requirement that is part of the Medium Multirole Combat Aircraft program. The work includes a recent fit-check of missiles on the fighter. A Typhoon would be able to carry three Marte-ERs under each wing. The Marte-ERP, as this version would be called, would not feature the folding fins associated with the helicopter-launched version. It would also shed the booster and allow the use of a 120-kg (265-lb.)warhead, rather than one around 70 kg.

Meads Milestone

The beleaguered Medium Extended Air Defense System (Meads), managed by a Lockheed Martin-led consortium, has executed its first full flight test. The PAC-3 Missile Segment Enhancement interceptor—an upgraded PAC-3—executed a complex "over-the-shoulder" maneuver to simulate attacking an airborne target from behind. Intercept was not a mission goal, and the missile executed a planned self-destruct. Passage of this test was a key goal for Meads development.

CSAR Protection

Elettronica will supply the self-protection system for Italian air force AgustaWestand AW101 combat search-and-rescue-helicopters. The Virgilius system, which will be installed on 11 rotorcraft, includes radar warning receiver/electronic support measure functionality, as well as countermeasures. The latter will only materialize in the second phase of the program, with the addition of a solid-state radar jammer and ELT/ 572 directed infrared countermeasures.

SPACE

Shenzhou 8 Returns to Earth

Chinese officials have declared success for the Shenzhou 8 mission of their manned space program, after the capsule—designed for human transportation but unmanned on this occasion—returned to Earth in western China on Nov. 17. The chief objective of the mission was to show that Shenzhou 8 could dock with the Tiangong 1 orbital laboratory, which was also unmanned. The procedure was executed twice. The next two missions in the manned space program, Shenzhou 9 and 10, are due next year. At least one is likely to be manned.

Space Diplomacy

A State Department official said the U.S. will press for several so-called transparency and confidence-building measures (TCBMs) at next year's Group of Government Experts (GGE) on Outer Space TCBMs established by a United Nations General Assembly resolution. Frank Rose, deputy assistant secretary for the Bureau of Arms Control, Verification and Compliance, told the U.S. Strategic Air Command's Cyber and Space Symposium in Omaha, Neb., that such proposals could include TCBMs "aimed at enhancing the transparency of national security space policies, strategies, activities and experiments or notifications regarding environmental or unintentional hazards to spaceflight safety. International consultations to prevent incidents in outer space and to prevent or minimize the risks of potentially harmful interference could also be a helpful TCBM to consider." Meanwhile, Rose reaffirmed Nov. 17 that U.S. officials still are "actively" considering the EU's proposal for a non-legally binding, international Code of Conduct for Outer Space Activities.

Correction: *The In Orbit column of Nov. 14 (p. 24) incorrectly identified Mike Houts, the project engineer on NASA's nuclear-thermal rocket environmental simulator at Marshall Space Flight Center.*

BY GUY NORRIS

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COMMENTARY

Avoidance App

NASA tests collision-avoidance system using smartphone

A lightweight automatic ground-collision-avoidance system (Auto GCAS) that depends on a terrain database of the entire world housed in a smartphone is being flight tested by NASA.

The flights—which follow initial development of the Auto GCAS for U.S. Air Force F-16, F-22 and F-35 fighters—are aimed at extending use of the safety system to a much broader range of applications, from unmanned air vehicles to general aviation aircraft. The system uses precise navigation, performance and digital terrain data to constantly monitor the aircraft's position relative to known obstacles. Auto GCAS is designed to intervene as a last resort, automatically recovering an aircraft when it senses that a crash is imminent and the pilot is not taking action.

Unlike the original Automatic Collision-Avoidance Technology Auto GCAS project that was tested on an F-16D in 2010, this new test phase is using a radio-controlled hobby Super Flyin' King model aircraft with a 9-ft. 8-in. wingspan. Tests of the Droid (Dryden Remotely Operated Integrated Drone) are being undertaken by NASA Dryden Flight Research Center with support from the Office of the Undersecretary of Defense and the Air Force Flight Test Center.

"We've talked about the modular architecture, which means you can put it on other aircraft, but we'd only flown it on an F-16. So we asked why not try it out on a very different aircraft," says Auto GCAS project manager Mark Skoog. Aside from demonstrating the transition and portability of Auto GCAS to another platform, the project is also designed to develop and explore performance enhancements such as new escape maneuvers beyond the vertical fly-up used by the F-16 system.

Primary objectives include integrating the safety device without increasing the weight of the UAV, demonstrating a system that functions autonomously during a lost link with a ground station, and showing that the GCAS algorithm can be run using a smartphone—in this case, a Motorola Droid X. The phone used the open Android operating system, modified to run the Dryden-developed Auto GCAS.

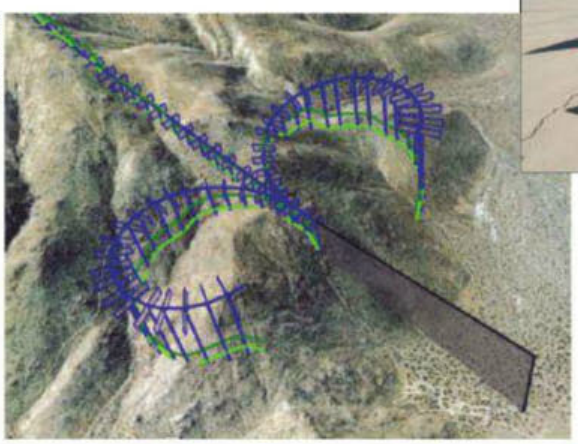
"We're flying with the entire globe modeled on the phone. We can take it anywhere on the planet and it will have collision-avoidance capability," says Skoog. "This shows you can break the paradigm on accessibility to other platforms. You don't have to go through a full-scale Defense Department development cycle, and it opens up many opportunities in the future," he declares.

Pushed by the unique needs of the F-22's avionics architecture to develop data-compression techniques for the fighter's terrain database, the team was able to springboard off this and squeeze a digital version of the entire surface of the planet into an Android. "We were able to go to 2,000:1 compression ratio," says Skoog, who adds that by converting the Earth's surface into a tile-based elevation database, more than 300 gigabytes were compressed to 145 megabytes. "This is the first time we're flying real-time decompression, long before the F-22. They're very interested in our flight-test results."

For the Phase 1 test, the phone was integrated into the ground station rather than the UAV and connected to the aircraft's autopilot through an interface unit via a command-and-control link. The system's capabilities were assessed during an initial set of 10 flights conducted between late September and October in rugged terrain near Edwards AFB, Calif. For each flight, the UAV was flown against a cliff face or up a blind valley by a pilot in the ground station with a safety pilot monitoring from close by.

Aimed at the terrain by the pilot, the vehicle executed automated lateral-escape maneuvers using algorithms modified to reflect turn rates and trajectories based on the performance of an MQ-9 Predator. Following each escape, the safety pilot resumed control.

For the second phase the phone will be integrated directly on board with the autopilot. Tests will focus on system performance, trajectory prediction and, possibly, upgraded scanning logic that will look farther out.



NASA PHOTOS

F-16 and UAV (above) have been used for Auto-GCAS tests. Blue lines (left) mark terrain-avoidance trajectories set against scanned elevations (light green) and flight-test safety buffer height (dark green).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BY PIERRE SPARACO

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

COMMENTARY

Hats Off to the A340

The widebody made Airbus what it is today

Airbus is scheduled to deliver the final A340 soon, bringing to a close a 24-year program that has a special meaning for Europeans. The A340 was intended to enable Airbus, which was still a loose industrial grouping in the mid-1980s, to meet the airline industry's long-haul segment needs, after decades of unsuccessful attempts by airframe designers and producers in Europe.

In the years following the end of World War II, European ventures into long-haul aircraft development did not progress well. British industry struggled through many difficulties with the de Haviland Comet, which could not cross the Atlantic, and the Vickers VC10 that, despite its improvements, could not successfully compete against the Boeing 707-320 and Douglas DC-8. France, meanwhile, focused on the medium-haul Caravelle and in 1962 launched the supersonic Concorde jointly with the U.K. The Concorde was a highly celebrated technical achievement but a bitter marketing failure.

Witnessing the British experience with the VC10, the French were determined to avoid competing against Boeing, Convair, Douglas and Lockheed, four U.S. competitors producing long-haul products. The French even went so far as to try to persuade their British partner to restrict the Concorde to medium-range operations, an astonishing choice rejected out of hand by the British Overseas Aircraft Corp.

But by the 1980s, when Airbus was slowly acquiring a decent share in the market with the A300B and A310, it seemed apt to reevaluate the long-haul market. While the consortium's founders had considered such a long-term option as early as 1969-70, they kept the idea secret "to avoid giving politicians a scare," as Roger Beteille, executive vice president and chief designer, later noted.

"Since Day 1, we had a complete product range in mind but decided not to make such a strategy publicly known," Beteille told me many years later. Needless to say, Airbus required the four participating countries' financial backing after starting from a blank sheet of paper and 0% market share, good reasons to adopt a cautious policy.

Then came the critical turning point. In 1985, the Airbus engineering team evaluated the merits of a 250-seat long-range aircraft, initially dubbed TA 11. It was the consortium's 11th concept, and "TA" stood for "twin aisle." An unusual plan was quickly conceived to simultaneously develop the four-engine A340 and a two-engine sister ship, the TA 9 (which would become the A330). The dual program was aimed at keeping development costs down, from the governments' perspective.

AIR FRANCE/VIRGINIE VALDOIS

Germany strongly supported the plan, and Lufthansa volunteered to become a launch customer, but France was not ready to approve such a financially risky venture. Despite the opposition of Airbus executives, including Chief Executive Jean Pierson, France's transport minister, Jacques Douffiagues, asked Pierson to negotiate with Douglas in an attempt to merge the vaguely similar TA 11 and McDonnell Douglas MD-11 concepts and establish a transatlantic joint venture.

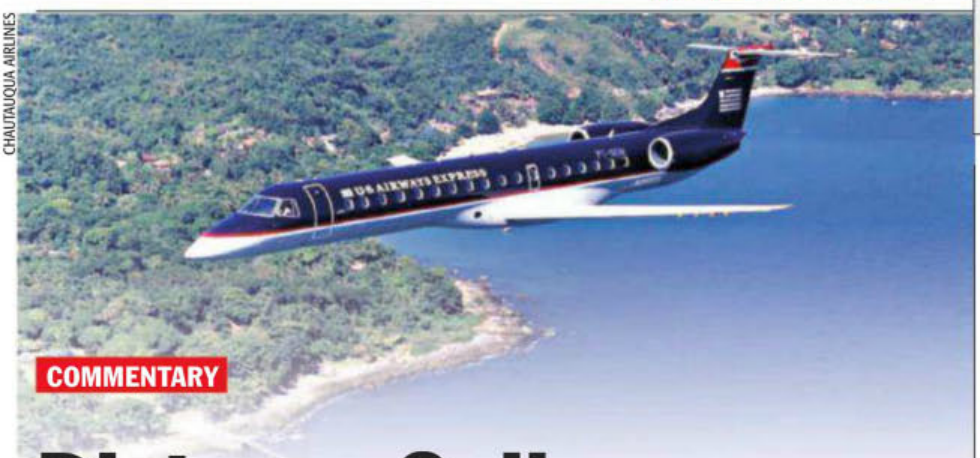
"We have no intention of sacrificing Airbus," Pierson asserted, and in the end no agreement could be achieved.

When the program was eventually launched in June 1987, the TA 11 acquired a symbolic meaning: it represented Europe's return to the long-haul market. Pierson stressed that the revised objective was to achieve a 30% market share, a formidable challenge in those days. In addition, Airbus had to grow dramatically to produce the A330/A340, which led to the establishment of more production facilities at Toulouse airport. Those facilities were named after Clement Ader, an aviation pioneer who allegedly flew his steam-powered Avion in the 1890s.

Eventually, the A340 attained those ambitious goals, which is why it deserves a special tribute. It obtained decent commercial results, with 376 aircraft produced over two decades, while the two-engine version evolved into a robust success. The A330's production rate today is eight aircraft per month.

The A340 won battles and paved the way for the ultra-high-capacity A380, but Airbus did not find success with its very-long-range derivative, the A340-500, which can fly nonstop from Singapore to the U.S. West Coast in 19 hr. That derivative must carry so much fuel that it is too heavy to compete cost-effectively. Similarly, the stretched-fuselage A340-600, probably the longest commercial transport ever put into service, with as many as 419 seats in a two-class cabin configuration, failed to replace the Boeing 747 Classic as anticipated.

Despite its shortcomings, the A340 was essential to Airbus's development into a world player, for which it deserves to be celebrated as its production ends.


CHAUTAUQUA AIRLINES

COMMENTARY

Distress Call

More worries arise for U.S. regional carriers

BY ANDREW COMPART

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For U.S. regional airlines, the booming business and comfortable profits of the previous decade must already seem like ancient history. Recent developments at Republic Airways and American Airlines suggest that the new challenges they face, in this decade of change and potential upheaval for their industry, are not about to get any easier.

Republic has not given up on 50-seat aircraft, but it seems to be moving in that direction, and how the situation is resolved might prove telling for other U.S. regional carriers with significant numbers of 50-seat regional jets in their fleets.

Republic, parent of regional subsidiaries Chautauqua Airlines, Republic Airways and Shuttle America, says capacity purchase agreements with major airline partners will expire on 32 of its 50-seat Embraer ERJ 145 aircraft in the next three years. That is about half of its ERJ 145 fleet, most of which are flown by Chautauqua; as of mid-October, Chautauqua had 50 ERJ 145 aircraft in service and five stored. Of those, 33 are leased and 22 owned; it also was leasing out another eight.

Many regional carriers are having a difficult time with 50-seat aircraft, which have become unsuitable for many markets because of high fuel costs and the limited number of seats over which to spread the higher costs, but Republic appears to be the first to have reached the breaking point.

"It's difficult to see how we can continue to operate these aircraft for our major airline partners unless we significantly reduce the operating costs," says Bryan Bedford, Republic's CEO.

Bedford has blamed some of the problem on escalating maintenance costs, above-market lease rates and uneconomical fixed-fee reimbursement rates. But there also is something else at work, he says: Fixed-fee flying for major airlines is not producing the historical level of returns because automatic rate increases in those fixed-fee contracts are tied to the Consumer Price Index, which has not risen much in recent years—certainly not enough to keep pace with regional airline costs for labor, health care and maintenance.

That makes 50-seater economics even more difficult to overcome, he says. Concurrently, major airline downsizing of their "marginal hubs" has lessened demand for the aircraft. For Republic, even cutting its 50-seat aircraft fleet by nearly half since the end of 2007 has not been enough. Nor is having 11 of the ERJ 145s subleased offshore, as was the case as of Sept. 30.

The tough question is: What can Republic do about it? Republic says it plans to negotiate lower costs with stakeholders, but there is a problem. Not only does Chautauqua own 22 of its ERJ 145s, but 22 of them are leased from General Electric Capital Aviation Services (Gecas). Gecas also is leasing six ERJ 145s to Aeromexico, seven to SkyWest subsidiary ExpressJet and six to Trans States Airlines in the U.S., and nine to Passaredo Transportes Aereos in Brazil. If Gecas lowers lease rates for Republic in mid-contract, you can bet other carriers also will be knocking at its door. That might limit the leasing company's desire to cut a deal.

Other regionals will be paying attention, especially since 50-seat aircraft still accounted for nearly half the U.S. regional airline fleet as of July, and the fuel prices that have made many routes uneconomical for them are not likely to fall. As reported in Aviation Week in May, over the rest of this decade more than 70% of those 50-seaters will reach the end of their capacity purchase contracts.

Earlier this year, SkyWest Airlines COO Chip Childs told me the widely predicted demise of the 50-seater has been overstated because operators will be able to negotiate new, lower-cost rates when their current leases expire. Republic's attempt to do so even earlier could provide an early indication of what is really possible.

As if that worry is not enough, something new could cost U.S. regional airline executives some sleep. American Airlines has made a proposal to its pilots that, if accepted and trend-setting, could return the growing part of the regional airline business back over to the main line—that is, the flying of any regional jet with more than 50 seats. American proposes to do that by creating special rates and work rules for mainline pilots operating aircraft of 125 seats or less, concurrently promising their pilots that all aircraft of more than 50 seats will be flown by them rather than regional airline pilots.

It is premature for regional executives to panic because this is just a proposal—not accepted by the union as of this writing—and it would just be one contract with one airline. But the Allied Pilots Association is not publicly rejecting the idea, perhaps because the failure to reach an agreement with American could push the carrier into bankruptcy. Instead, APA's leadership on Nov. 15 noted their "willingness to adopt contractual solutions that represent departures from long-standing tradition." If American's pilots accept this change, pilots at other mainline carriers are going to take notice.

At this point, the regional carriers have to be rooting for tradition to win out.

BY FRANK MORRING, JR.

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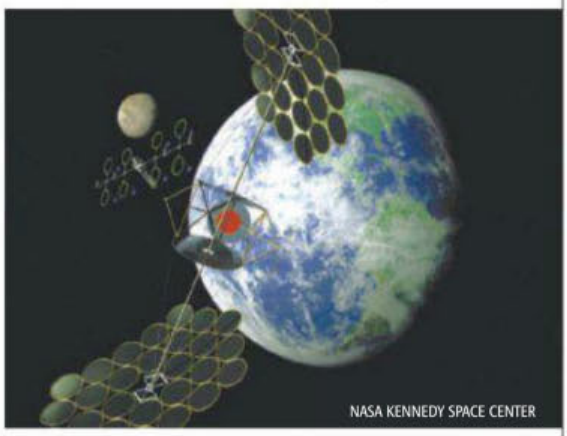
COMMENTARY

Closing The Case

International review finds space solar power economically feasible within 10 to 30 years

Conventional wisdom typically holds that harvesting "free" energy from the Sun with giant collectors in space does not make financial sense, at least until Earth's finite supplies of oil, coal and natural gas become so scarce that there's no other choice.



NASA KENNEDY SPACE CENTER

The conventionally wise usually suggest that it will make more economic sense to rely on wind power and ground-based solar cells for "green" renewable energy. But now a panel of the International Academy of Astronautics (IAA), an elite organization of scientists, engineers and other experts who collectively examine some of the big issues of space exploration, has concluded that space solar power (SSP) could start paying for itself in as little as a decade.

John Mankins, a leading SSP visionary, co-chaired the IAA panel with Nobuyuki Kaya of Japan's Kobe University, where a lot of the technical ground for SSP already is being broken. They presented their findings at the National Press Club in Washington on Nov. 14, after unveiling them at the International Astronautical Congress in Cape Town, South Africa, last month. Examining various SSP approaches and four scenarios for the way global energy needs will influence the world economy, the IAA panel concluded that "premium niche markets" could support SSP profitably in the relative near term, particularly if some new approaches to assembling the big space-based collectors are followed. Technical hurdles that remain to be surmounted include thermal control, either with better space radiators or higher-temperature electronics. But the SSP idea is more attractive now that at any time since it first was conceived in the late 1960s.

"There has been general consensus in every study, both here and abroad, that space solar power is technically feasible, that there are no show-stoppers," says Mark Hopkins, CEO of the National Space Society, which sponsored a panel discussion of the IAA report at the press club. "But this is the first major study which has come out and said there's a good chance it can be economically viable."

Mankins says the study examined three "promising" SSP concepts for positioning in geostationary orbit—a stabilized platform using solar arrays like those on the International Space Station to generate electricity converted to microwaves for transmission to large rectifying antennas (rectennas) on Earth; a modular approach linking solar arrays and lasers beaming down power in near-visible wavelengths, and a modular approach concentrating solar energy with large mirrors before converting it to microwaves.

The stabilized platform was studied in depth in 1979, Mankins says, and is no longer attractive because it is limited to about 100 kw without being "fundamentally rearchitectured." The laser approach runs into efficiency issues in competition with other power-generation systems above 100 mw, according to the IAA, while the modular "sandwich" microwave architecture is the most promising because it is scalable.

"One of the things which appears very promising now is the idea that through these hypermodular architectures, that you can build fairly tractably, with tens of millions of dollars, a prototype of a module," Mankins says. "And for a bit more money you can make a bunch of copies of those modules."

The microwave approach will require more work on thermal control, Mankins said, and any large structure will require advances in on-orbit assembly, in-space propulsion and, ultimately, launch vehicles. But at least initially a 10-mw system costing $10 billion, of the type already considered by the Pentagon for supplying power to forward-deployed bases and disaster areas, probably could be launched with existing or planned vehicles like the Delta IV Heavy and Falcon 9 Heavy, respectively.

The IAA panel concluded that for the rest of the century, growing demand for electricity will call for many new sources of energy. Wind and terrestrial solar power will help, but unlike SSP are subject to local weather conditions. Space-generated power, by contrast, can be beamed to areas where weather is temporarily stilling windmills and blocking sunlight, Mankins says.

The IAA report does not assume that SSP will totally replace other sources of electricity, but finds it can gradually assume a larger role as the global population grows from 7 billion to twice that by century's end. U.S. military strategists have long seen SSP as an alternative to the "energy wars" they fear as fossil fuel supplies dwindle, while development of SSP technology will place the nation or nations that control it in a strong position to shape geopolitics. Another benefit may come with the jobs generated by large-scale SSP production.

"If you think about the skill set that is necessary to build a system like Orbcomm or GPS, it's that same kind of skill set, but a lot of them," Mankins says. "At full scale by mid-century, space solar power is like the automotive industry, meaning you have a very large and high-tech workforce and a set of infrastructure with factories building pieces of solar power satellites. The reasonable number [for SSP generating 100-200 gw] works out to millions of jobs."

BY JAMES R. ASKER

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COMMENTARY

In the Kill Zone

A hit-list warning to stop across-the-board cuts

Look for the rhetoric over deficit reduction to remain red hot. According to Defense Secretary Leon Panetta's most recent salvo, $600 billion in additional across-the-board cuts to defense spending over 10 years would mean no more Joint Strike Fighter, no new bomber, no Littoral Combat Ships and no Ground Combat Vehicle program. A congressional "Super Committee" faces a deadline this week to find at least $1.2 trillion in deficit reduction, or the $600 billion whack job could be set off. Panetta raised the specter that would lead to kills or delays for major programs.

In addition to the F-35, the U.S. could wave goodbye to Army helicopter modernization programs, "major space initiatives," European missile defense, unmanned ISR systems and the missile leg of the nuclear triad. Meanwhile, Sens. John McCain (R-Ariz.) and Lindsey Graham (R-S.C.) plan to sponsor a bill that would remove the threat of automatic cuts. But the Stimson Center's Matthew Leatherman blogs that Panetta's letter is such a time-honored tradition in Washington it has not just one nickname, but two. "This budget tactic is called goldwatching, or the Washington Monument Ploy: If someone threatens your budget, say you're going to cut what nobody wants you to cut and ignore the things that maybe should be cut."

WHITE HOUSE

MISSILE MANIA

Seventeen senators led by Susan Collins (R-Maine) and Jeanne Shaheen (D-N.H.) are asking President Barack Obama to make recovery and destruction of Libya's stockpile of man-portable air defense systems the "utmost" priority. Teams of contractors were sent to Libya to find the Manpads, and last month Army Gen. Carter Ham, chief of Africa Command, said, "There are ringing indicators that some Manpads—type nonspecific—have left the country." Collins told Obama, "Each day that goes by that we don't have all of the remaining anti-aircraft missiles secured increases the threat to Americans." Derrin Smith, an adviser to an inter-agency task force on Manpads, says predictions of large numbers of the weapons being smuggled to Al Qaeda's desert strongholds have not been realized. "It appears at this point that most of the Libyan Manpad stocks continue to be in the hands of Libyan personnel," Smith told reporters while in Algiers, Algeria. "Most" may not mean much, though, if the most dangerous of the missiles in Libya, the state-of-the-art Russian SA-24s, are still on the loose (*AW&ST* Oct. 10, p. 34).

HIRING FOR MARS

NASA again ranks fifth in the nonpartisan Partnership for Public Service's annual tally of best places to work in the government, based on a survey of more than 150,000 executive-branch employees. The ranking could not have been timed better for NASA, as the agency has opened recruitment for the 2013 class of astronauts who will fly to the International Space Station and, possibly, Mars. NASA will accept applications through Jan. 27, 2012, and expects to begin training in the summer of 2013. While Congress may struggle to fund the missions for which those astronauts will be hired (see p. 39), at least the astros can take solace in the fact that NASA knows what it is doing with the money it does get. Alongside the other developments last week, NASA said it received its first clean, independent financial audit opinion in nine years.

WASTE NOT, WANT NOT

Fresh from an Oval Office ceremony where President Barack Obama signed an executive order setting "bold goals for agencies to reduce spending on travel," Deputy NASA Administrator Lori Garver (back row, center, in photo) heads to Antarctica. Obama's order seeks a 20% reduction by 2013 in the cost of travel, printing, devices like smartphones and laptops, and "swag--the unnecessary plaques, clothing and other promotional items that agencies purchase." Garver's task in Antarctica, says NASA, will be "to evaluate activities of the U.S. Antarctic Program and identify efficiencies, improvements and collaborations across the government." Joining Garver are U.S. Geological Survey Director Marcia McNutt and Carl Wieman of the White House Office of Science and Technology Policy. NASA says they will "review McMurdo Station science projects, facilities, operations, environmental projects, the Amundsen-Scott South Pole Station and local area field projects, including NASA's Operation IceBridge," an airborne campaign to gather data on how ice sheets' melting could lead to sea-level rise. The trip, which was not announced in advance, apparently does not contribute to the $17 million reduction in travel costs the White House says NASA is achieving this year "by reducing the number of attendees at meetings and conferences, encouraging rental car sharing and reducing foreign travel." But who knows, maybe Garver and her colleagues plan to share a rental at the South Pole.

HIGH DRAMA

Airbus sweats in glare and heat of Middle East spotlight

JENS FLOTTAU, ROBERT WALL and RUPA HARIA/DUBAI, UNITED ARAB EMIRATES

When manufacturers set out to define a new aircraft, they always say their product decisions are driven by long discussions with airlines. But do the airframers really listen?

As Boeing, Embraer and ATR work on defining new aircraft to enter service toward the end of the decade, Airbus is experiencing how dangerously wrong things can go when key customers differ with product decisions.

The heads of both Qatar Airways and Emirates are infuriated by Airbus's mid-year revision of the A350-1000—which is intended to improve performance but would increase weight—and they are demanding that the aircraft maker reconsider the revision. This disagreement puts at risk 50% of the customer base and more than 50% of the backlog for the aircraft type.

Emirates President Tim Clark is aiming uncharacteristically harsh words at Airbus, saying he does not accept the changes that Airbus and Rolls-Royce chose for the A350-1000.

"We want the original specification," Clark says. "I don't remember that we wanted something new and I really wonder why they did not ask." He asserts that Airbus executives "kind of assumed that we would take it."

Emirates is concerned that the A350-1000 will become a more expensive aircraft than the one it signed for, once operating costs, extra weight and higher maintenance rates in its power-by-the-hour deal with Rolls-Royce are taken into account.

The most recent developments surrounding the largest A350 variant could have serious consequences. Emirates originally ordered 50 -900s and 20 -1000s, then it considered taking 50 -1000s and 20 -900s instead, which would have meant much higher revenues for Airbus. Now Emirates' revised plan is off again.

Even more worrisome for Airbus is that Emirates is clearly losing confidence in the manufacturer's ability to deliver on its promises. The most recent delay for the A350-900, announced just days before the Dubai Air Show, has only worsened the situation. "They told us this [kind of delay] would never happen again and everything is under control," says Clark. He and other executives are alarmed that the slip of as many as six months happened very early, before assembly of the first aircraft has begun. The Boeing 787, which eventually was close to four years late, encountered the first of several delays shortly after its rollout; Airbus officials say they are delaying now to fix problems, rather than letting them grow bigger, as Boeing did.

Clark's sharp words, however, seemed like an understated first act compared to the theatrics Qatar Airways CEO Akbar Al Baker unleashed on Airbus later the same day. First, Al Baker stood up the aircraft maker at what was sup-

Qatar Airways wanted to convert its Airbus A330s to freighters, but the carrier may instead opt for converted Boeing 767s.

posed to be a joint order announcement at the air show. Then, minutes later, he publicly harangued Airbus for the "impasse" in their negotiations for five A380s and 50 A320NEOs. Al Baker, who once accused Boeing of being run by "lawyers" and "bean-counters," said, "I think that Airbus still has to learn how to build aircraft."

The Qatar CEO also echoed Clark's concerns about the A350-1000 and the fact that Airbus is reconsidering the specification for it.

Airbus's chief operating officer for customers, John Leahy, countered that "we are not going to change the -1000 spec." Leahy, who bore the brunt of Al Baker's public criticism, concedes that perhaps Airbus needs to better explain the technical benefits of the configuration change.

Al Baker left open whether Qatar will honor its A350 order, the largest for the type at 80 aircraft (20 -800s, 40 -900s and 20 -1000s).

Before the day was done, though, Al Baker did sign a deal for up to eight A380s (including three options), doubling his orderbook for the type, as well as 50 A320NEOs, taking 30 options for good measure, too. Al Baker attributed the troubles in negotiations to "bloody lawyers" involved in sorting out the terms of the A380 and A320NEO deal. He says pricing was not the issue.

Fleet options for the two fast-growing Middle Eastern carriers will depend in part on Boeing's next steps.

Clark says that if Airbus cannot deliver, Emirates could simply order more

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Family Planning

ROBERT WALL/DUBAI

As Embraer embarks on talks with customers about defining its second generation of E-Jets, the aircraft maker is mulling revisions to its product lineup.

One is whether it will proceed with the upgrade on the smallest member of the family, the E-170. "Now, the -170 is a question mark," says Paulo Cesar de Souza e Silva, president of Embraer Commercial Aviation.

Also up for review is the E-195's exact seat count. Some customers have expressed interest in slightly higher capacity, so Embraer will study that issue as it lays out the plans to reengine the family, add a new wing and landing gear. The high end will remain firmly in the regional aircraft realm, though.

What is not likely to change is range, de Souza indicates. That will be viewed as good news by regional carriers, such as Flybe, which warned Embraer not to design an aircraft with too much performance that would therefore be ill-suited to its operations. The talks with airlines will now intensify and should wrap up toward the end of next year.

Embraer is also keen to preserve pilot type-rating commonality between the current and new generations, which could impact decisions on offering a full fly-by-wire system and other flight deck alterations. De Souza stresses that "commonality with the E-Jets is a must."

The aircraft maker is in broad discussions with engine makers, as well. Although General Electric, the incumbent with the GE34, is seen as the front runner, Embraer is also talking to Pratt & Whitney and CFM International. Whether the engine offering will be a regional jet version of the Passport 20 business-jet engine or a Leap-X offering will depend on the thrust requirement Embraer specifies, notes David Joyce, president of GE Aviation.

De Souza says that even as the work on defining the second-generation E-Jets continues, Embraer will update the current models to keep them market-relevant. That includes introducing a health-monitoring system, further fuel burn improvements and a new interior in about two years.

Despite the decision to stick to its regional jet portfolio, Embraer has not given up on the long-term aspiration of building a narrowbody-sized airliner. For now, it has determined the competitive landscape is too strong to build a business case for another aircraft of that type. However, the narrowbody ambition could reemerge and lead to an aircraft that could enter service in 2022-25, de Souza says.

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Boeing 777s, although the A350-900 is penciled in to replace the 777-300ER.

"We always build in exit clauses in the contracts, but that is a measure of last resort," Clark says. He points out that Emirates could have easily dropped its A380 order, given the delays in that program, but stuck to it and ordered more. To guarantee its growth plans, Emirates ordered 50 additional 777-300ERs at the air show here last week.

Moreover, Emirates is interested to see what Boeing plans for the 777 refresher program, the 777-8X and 777-9X. Clark hoped for an entry into service around 2017 but says he has given up on that, recognizing that Boeing has too much on its plate in the near term to achieve that target.

Boeing Commercial Airplanes President/CEO James Albaugh says, "we are looking at the end of this decade for this airplane." The aircraft maker is assessing the nonrecurring costs of the program and the technologies to feed it. Clark wants the updated 777 to be 12-13% more efficient than current aircraft. And while he would like to be able to carry 360 passengers with a full cargo load between Los Angeles and Dubai, Clark acknowledges that that "is a big ask."

General Electric expects to be able to mature technologies for another 2-3 years before locking in the technical configuration for the GE90X that will power the new 777s.

Meanwhile, Qatar Airways also has issues with Airbus's freight strategy. Al Baker says Airbus is neglecting the A330 passenger-to-freighter (P2F) conversion to sell A330-200 freighters to customers instead. He therefore may dispose of Qatar's A330s and buy converted Boeing 767s.

Leahy says the P2F conversion effort is not a priority, given Airbus's workload with the A320NEO and A350, though he suggests that a joint-venture offering could emerge.

Al Baker says he is waiting to hear if ST Aerospace will offer a modification, which could cause him to stick with the A330. The Singaporean company is coy about its plans, noting only that "we are exploring some new [P2F] capabilities, but as it is still at its infancy stage of explorations, we will only be able to share plans when it becomes firmed."

The situation underlines the weakness of Airbus's freighter portfolio—the A320 P2F program and A380 freighter have been canceled, leaving only the A330-200F to serve the market.

Bulging Backlogs

Airline financing problems could hit industry in late 2012 or 2013

ROBERT WALL and JENS FLOTTAU/DUBAI

Widespread concerns about aircraft-delivery financing are not enough to spur Airbus and Boeing to delay plans to increase output. The huge backlogs that both sport provide one confidence-booster, with Airbus in particular seeing strong growth as it anticipates a record order intake this year.

Still, the situation remains extremely uncertain. Aviation Capital Group CEO Stephen Hannahs says airlines will be facing "a rough road over the next four to six months" when they try to secure financing. "European banks will be sitting on the sidelines," as they are undergoing enormous stress, he warned as the lessor signed up to buy 30 Airbus A320NEOs last week.

Most deliveries through the first half of next year have already been financed, says John Leahy, Airbus chief operating officer for customers, so the concern is about the second half of 2012 and 2013. However, he is "cautiously optimistic that everything is going to be sorted out."

But Hannah says his leasing company, with an investment-grade rating and sufficient access to capital, has already been approached by some airlines for financing assistance.

Boeing Commercial Airplanes President James Albaugh is a bit more sanguine. "We have not seen the issue that

The Beat Goes On

Mideast carriers ignore economic surroundings and continue growth

JENS FLOTTAU/DUBAI

The euro zone may be in turmoil, fuel prices may be skyrocketing and their financial results hurting, but Middle Eastern airlines are continuing to add capacity. By 2030, traffic in the region will have tripled, mirroring that of Europe, Asia or North America today, according to Airbus forecasts.

Emirates has made a fundamental strategy decision to continue growing despite a rather dramatic earnings slump in the first half of 2011. "We have been held back too many times and we have always regretted that we slowed down," says Emirates President Tim Clark.

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The airline is taking delivery of 18 Airbus A380s and Boeing 777s next year. At the Dubai Air Show, it placed an order for 50 more 777-300ERs that brings its total 777 commitment to 184, among them 151 -300ER versions. Over the next five years, the 777-200LR will turn into Emirates' smallest aircraft as the airline is phasing out its A340s and A330s. Further on, the fleet will comprise A350s, 777s and A380s.

Airbus talked about," he declares. In part, this reflects the fact that French banks in particular have been hit as U.S. money markets withhold access to dollars over concerns about the European debt crisis.

Nevertheless, Boeing, too, sees financing as an area that warrants closer attention. Albaugh notes that the company will draw more heavily on Boeing Capital as it tries to secure orders. "Our strategy is going to be that Boeing Capital is much more than a lender of last resort," he says. "When our customers come to us and want help with financing, you will see Boeing Capital to be much more strategic" in helping airlines secure the money they need. For example, the company aided American Airlines in its recent 737 order (the airline also committed to buying A320s).

If the financing situation becomes severe, Leahy adds, Airbus parent EADS could step in to help complete deals.

For now, neither Airbus nor Boeing is scaling back production ramp-up plans. Albaugh is unhappy with the size of the current backlog and wants to shrink it so customers do not have wait for production slots. "It is not about having the best airplanes, but the best airplanes available," he quips.

Leahy says a decision by Airbus to boost production to 44 narrowbodies per month is solely linked to the supply chain's ability to support such a move. A330 output may also be increased to 11 aircraft per month.

The motivation to increase production rates is further reinforced by the fact that Airbus will easily break its full-year aircraft order intake record, set in 2007. Leahy now projects that 1,650-1,700 gross orders will be booked this year, after the airframer secured 135 firm orders during the Dubai Air Show.

Those bookings mean Airbus already has surpassed the upwardly revised gross-order guidance issued by EADS this month. EADS said Airbus would book 1,500 gross orders, and Airbus is now at 1,507 units after last week's $13.7 billion agreement. Net orders also could top the 1,500 level before year-end, and Airbus will deliver a record number of aircraft—520-530. The order intake for the A320NEO now stands at 1,268 firm from 21 customers and another 182 commitments from six others.

However, Leahy cautions that a drop in sales should be expected in 2012. "There is no doubt about that," he says.

At Boeing, the situation is less clear, partly because the manufacturer has not started booking firm orders for the 737 MAX, its answer to the A320NEO. Albaugh says commitments taken for the 737 MAX now stand at more than 700 with nine customers. The company is working to finalize pricing and performance guarantees so it can turn those agreements into firm orders, perhaps by year-end but maybe not until 2012. Albaugh projects that within six months the 737 MAX order intake will be roughly on a par with the A320NEO orderbook.

Demand also has been strong for the Boeing 777, with 184 orders booked so far this year. Talks with multiple customers are under way for more. Albaugh also suggests that one or two deals for 747-8s may still emerge before year-end.

An Emirates Boeing 777-300ER is ready to land. The airline ordered 50 more of the type at the Dubai Air Show.

Emirates is seeing that further growth will be possible from an infrastructure point of view, as Dubai International Airport has found ways to accommodate even more facilities. The new Concourse 3, which will serve the A380, is slated to open in the spring of 2013, freeing up space in Terminal 3, which is now Emirates' main home.

In addition, Dubai Airports will build another concourse to the west of Terminal 1. That facility is expected to be ready toward the end of this decade. It will be linked to the original check-in facility by a people-mover. The new building will be used by international airlines so Emirates can also move back into Terminal 1, which is where its rapid growth started and which it currently shares with other operators. The airport expects to be able to handle in excess of 90 million passengers following the expansion.

Emirates has also looked at ways to use its existing facilities more efficiently and now intends to fill the troughs in between its three daily banks starting next year. The trick is to get aircraft in and out of Dubai between the current peaks so as to not overextend capacity. For passengers, that would also mean much longer transit times of 5-6 hr. and sometimes even an overnight stay in Dubai, at least for some itineraries. Emirates conducted research on whether passengers would accept the longer wait times; the answer is "yes."

At present, 2-3-hr. transits are not unusual in Dubai. "We have a minimum connecting time of one hour and 15 minutes, and that's already difficult given the size of the airport and the distances on the tarmac," says Clark.

Roughly 30-40 of its incoming 777-300ERs have been allocated to the de-peaking exercise, and the A350-900 would also have been used if the program had been on time. Now, everything depends on the true extent of the delay, which Airbus defines as up to six months. The aircraft was due in 2013 and now is expected in the first half of 2014. If the 350-900 slips further, even more 777s could be used for de-peaking and the -900s would later move into flying the banks.

Emirates also remains interested

in the A380-900, the proposed stretch of the A380. Clark says the topic is raised regularly in conversations with Airbus management, but so far he has not detected any serious commitment to such a program. By 2020, the airline plans to expand its fleet to roughly 250 aircraft, or even 280, from 162 aircraft today, according to comments made by its Chairman Sheikh Ahmad bin Saeed al-Makhtoum.

Those ambitions are followed in spite of what Clark observes as a "paradigm shift in confidence" linked to the eurozone debt crisis. But its European network is keeping up, although growth rates slowed during the first half of 2011 in that segment, too. Surprisingly, even the daily 777-300ER flight to Athens is still full, although the near-collapse of Greece's finances has put the country's economy into a deep dive.

Dubai's other airline, low-fare carrier Flydubai, also sees no reason to slow down. The airline has taken delivery of its first 20 Boeing 737-800s that it uses on a network of 46 routes from Dubai International's Terminal 2. Flydubai is one of the few carriers in the region—Etihad Airways is the other significant one—that did not place an order for more jets at the air show. But the outstanding 30 737s will have all arrived by 2015, and CEO Ghaith al Ghaith says he will decide between the Airbus A320NEO and 737 MAX within the next year to have access to more capacity. "We have to quickly review what they are doing," he says. One key factor is delivery dates. The NEO is available sooner than the MAX, so if Flydubai opts to go for the Boeing jet it will have to find interim lift.

If anything, then, Flydubai's growth is held back by "aeropolitics." The airline serves only three points in India and cannot add another one, according to the current bilateral between the United Arab Emirates and India. Similar restrictions apply to Pakistan and Bangladesh. On the other hand, key markets such as Saudi Arabia are opening up slowly.

Al Ghaith says he doubts that Flydubai will ever go beyond the 5-hr.-range circle around Dubai that it initially identified as being its target market, even though that would likely be possible with the NEO or the MAX. However, "the farther you go, the more expensive it gets," he cautions; he also points out that he sees plenty of destinations closer to home that the airline still does not serve.

Also at the show, Oman Air showed up as a new customer for the Boeing 787. The airline arranged a leasing deal with Kuwait-based Alafco in 2007 and the former management, which wanted to have a wave of next-generation widebodies coming in fairly soon. Now, the order for six 787-8s has moved from Alafco to Oman Air directly, and CEO Peter Hill says that all the terms and conditions have been kept unchanged. Deliveries of the aircraft are pushed further out, however, given his view that "a second tide of widebodies would have been a challenge."

Hill has been tasked with relaunching Oman Air following the government's decision to cut ties with Gulf Air and focus on its own carrier. Hill proposed a plan that sees the airline grow significantly over 5-6 years, which is when the company is also due to reach the breakeven point. Given the fact that Oman Air was "the last of the starters, we had to carve our own niche." The result is now a high-end, boutique airline that flies seven A330s featuring first- and business-class cabins. "The idea was to get the A330s into the public eye," but he admits that "it is not as commercial as it should be." Hill says he persuaded the government nonetheless that the investment was "the price to pay for sticking so long with Gulf Air."

Unlike Flydubai, Oman Air is not yet looking at the A320NEO and 737 MAX

In addition to being able to shift 787 deliveries further out, Hill argues it is better for it to own the aircraft, since the airline plans to replicate the high-end product introduced on the A330 on its new aircraft as well. The 787s will be delivered in three batches, two each arrive in 2015, 2017 and 2019. "If you are leasing, you invest in somebody else's aircraft. It was far better to do it with our own aircraft," says Hill.

Further implementation of the strategy will be left to his successor, however. After decades as an airline executive in the region, Hill is retiring in December. A decision on his replacement is slated to be made by the Oman government this week.

Oman Air's new leader is all but certain to be required to explain to the government that the airline's move into profitability will come later than expected. The steep rise in fuel costs has led to fuel being "hugely over-budget," and that will also show in the carrier's annual results, Hill concedes.

Unlike Flydubai, Oman Air is not yet looking at the A320NEO and the 737 MAX, since its 737 fleet is still very young and is in the process of changing the interiors. Oman Air is one of the few Middle East carriers that operates regional jets. It is using its Embraer 175s for off-peak flying and thinner routes that still need to be developed. The aircraft are not used on the carrier's India network, although it would have the range capabilities to do so. But the amount of baggage brought along by passengers on these flights is more than the aircraft can handle.

In Kuwait, the privatization of money-losing Kuwait Airways is taking another turn. Legislation is now being processed that would allow domestic airlines to bid for the stake to be sold. With Wataniya having declared bankruptcy earlier this year, the only candidate left is Jazeera Airways. Jazeera also had been struggling financially, but has made big progress through drastic measures. Under the management of Chairman Marwan Boodai and CEO Stefan Pichler, Jazeera cut its operating fleet in half and placed the surplus A320s with a sister company that has leased out the aircraft. Jazeera's share price has tripled since the beginning of the year, and its profit margin is in excess of 20%. The successful rightsizing exercise has also had a positive effect on yields. The airline is now charging an average $192 per sector on 2-hr. segments.

Now it seems that Jazeera is quietly turning its attention to more ambitious plans again. Industry sources say the airline is developing its new strategy for combining with Kuwait Airways. Under the terms of the privatization, a 35% stake is up for sale, but that would come along with management responsibility.

The government has indicated that it is willing to accompany the "sale" with significant financial support and will also take back surplus staff into public service. Kuwait Airways is considered to be hugely overstaffed and has amassed substantial losses that have so far been covered by the government.

However, the possible combination of Jazeera and Kuwait under one umbrella will not lead to the creation of another Persian Gulf carrier with major growth ambitions. Its network will rather be focused on routes with 80-85% local traffic, industry sources say. A decision on the deal is expected for 2012.

Electronic Attack

Champ missile turns off lights and computers

BOEING CONCEPT

DAVID FULGHUM/ST. LOUIS

The U.S. has built, flown, pointed and triggered a missile designed specifically to carry a directed-energy weapon. That payload, expected to be operational soon, will be able to disrupt, shut down, spoof or damage electrical systems, but little has been revealed about the project.

However, various clues have provided substantive details about the design and concept of operations (conops) for the new missile and its exotic payload. They come from Boeing officials, industry specialists and U.S. Air Force Research Laboratory sponsors who are working on the Counter-electronics High-power Microwave Advanced Missile Project (Champ).

An illustration created by Boeing shows the missile being dropped by a B-52, which means at least some versions of the design are air-launched. However, the directed-energy, high-power microwave (HPM) payload also is designed for integration into land, sea or other air-based platforms for operational flexibility.

As to the warhead's anti-electronics capabilities, "the whole radio frequency spectrum is viable as a target," says Keith Coleman, Boeing's program manager for Champ since 2009. The systems will be tailored to the target defined by the customer. The effects will depend on the frequency and effective radiated power (ERP). There are many options.

Two short video clips produced by the Air Force—without sound or annotation—indicate the conops and effects. An animation shows a cruise missile flying at low altitude firing beams of HPM from side- and downward-pointed apertures at high-rise office buildings in a city. The lights go off as the buildings are attacked. An actual video shows a room with about a half-dozen desktop computers functioning with data on the screens. Suddenly all the computers go black, with one momentarily turning back on and then off again.

That still leaves two unanswered questions—is Champ stealthy and reusable?

The notional airframe shown in Boeing's drawings is relatively small with compressed carriage wings that extend after launch. While Boeing's artist concepts are not exact representations of the missile, they do resemble the company's cruise missile designs that are similarly air-launched and have low-radar-signature designs to penetrate enemy air defenses.

"Any of these systems can be made to be recoverable or otherwise," Coleman says. "There are many proven methods of recovering vehicles from the lightweights to the heavier designs."

A Champ missile with a high-power microwave, directed-energy warhead is shown putting out the lights of a single building in a crowded urban area.

Champ was first flown on May 17 at the Utah Test and Training Range at Hill AFB. The missile was successfully pointed at a series of targets to confirm that it could be controlled and timed to fire a focused beam that would minimize—and perhaps eliminate—collateral damage to nearby electronic devices. The software used in the test was identical to that required to trigger the HPM weapon warhead.

Cruise missiles are valued for their intrinsic low radar cross-section that comes with small size, and they can be shaped and treated with radar-absorbing or reflecting materials. That is why they are the primary tools for breaking down enemy air defenses on the first day of any conflict. A Champ-like design would be sure to have the same operational requirements and need for stealth. Nonetheless, HPM payloads are not restricted to Champ.

"Any unmanned aircraft would be a candidate for these types of systems," Coleman says. However, "Boeing built the Champ system to be easily transitioned to [alternative platforms]. From the start we designed it with as many features as possible so that we would need minimum adjustments."

Program officials will not address the question of whether Champ is associated with the Air Force's Long-Range Strike (LRS) program. Air Force and aerospace industry officials have said that directed-energy weapons support and electronic attack will be supplied to LRS by adjunct, unmanned aircraft.

"Champ is a template for future HPM

programs," Coleman says. "There has never been this type of system with this kind of power out on any vehicle of any sort before."

Coleman contends there would be little difficulty putting the HPM weapons technology on a smaller or larger airframe.

"The HPM system itself is a very flexible integration," he says. If smaller, you get less ERP and if bigger you get more. But if you are smaller, you can probably get closer [to the target without being detected]. I absolutely think there is a desire to go to a bigger airframe. ERP is dependent on the size of the aperture. The bigger the aperture, the more power you can produce and the more standoff you get."

The initial version of Champ is designed for a relatively small, unmanned aircraft, Coleman says, so "that was part of the difficulty of getting everything to fit."

Boeing's Phantom Works built the missile airframe and the weapon pointing system, drawing on its experience with advanced weapons, cruise missiles and unmanned strike aircraft in conjunction with the Air Force Research Laboratory.

Coleman worked on the Calcm and Jassm cruise missiles, the F-15E and F/A-18E/F strike fighters and X-45A/C unmanned combat aircraft projects that prepared him for leading a very specialized team that integrated the sophisticated directed-energy weapon payload into the unmanned platform. There are about 25 core members from the various companies involved in the program providing missile and aircraft program experience.

Raytheon's newly acquired New Mexico-based Ktech division built the HPM warhead. The combination of airframe and warhead are to be demonstrated during a series of flight tests planned to cluster around the end of the current program in July 2012.

Raytheon recently acquired Ktech because it is making plans to build a series of HPM warheads for virtually all the missile models on its various production lines. A few years ago Raytheon planners said they were "betting the farm" on HPM pushing aside lasers as the most tactically useful and least demanding directed-energy weapon for next-generation combat operations. Boeing, in a complementary mode, has been designing its unmanned combat aircraft designs to carry reusable, multi-shot HPM weapons.

Fighter Fracas

MIKE VINES/AW&ST

Questions hang over UAE, Saudi Arabian fighter buys as other countries near decisions

ROBERT WALL/DUBAI and LONDON

The Dassault Rafale may have been flying high at the Dubai air show, but its sales prospects in the UAE are grounded for now.

Fighter procurements are rarely straightforward. Even so, the theatrics playing out in the United Arab Emirates are unusual.

The UAE was seen as poised to make a fighter procurement decision imminently, kicking off what promises to be an unusual flurry of major combat aircraft decisions with Switzerland, Japan, India and Brazil queuing up to spell out what their fighter forces should look like. But in what is becoming a near farcical process, the UAE has once again stepped back from committing to buying 60 Dassault Rafale fighters after extensive talks with the French government.

In an unusual move for a country which rarely says anything on its defense procurement plans, Abu Dhabi Crown Prince Sheikh Mohamed bin Zayed blasted the company for the failure to close the deal. After praising the efforts of French President Nicholas Sarkozy, who has made securing an export deal for Rafale a personal mission, bin Zayed said "Regrettably Dassault seems unaware that all the diplomatic and political will in the world cannot overcome uncompetitive and unworkable commercial terms."

As if to illustrate their point, the UAE asked the U.K. government to provide information on the Eurofighter Typhoon. How serious the UAE's apparent about-face on Rafale is unclear. Several industry officials indicate it may be a mere negotiating ploy to extract more attractive commercial terms. Perhaps underscoring the concern Typhoon is being used as a mere stalking horse is that the actual document sent to London is characterized by one industry official as a "thin" request for proposal.

Still, Eurofighter officials are taking heart from the potential opportunity and are looking to respond quickly. U.S. competitors also see door still open to them. The U.S. government has provided the United Arab Emirates briefings this year on the Boeing F-15 and F/A-18E/F in support of the Persian Gulf state's fighter competition, with flight demonstrations also taking place. "We are pleased to have the opportunity to compete," says Dennis Muilenburg, president and CEO of Boeing Defense, Space and Security. U.S. officials say the F-16 also remains in the running.

One upside for the French is that the UAE did not criticize the fighter, suggesting it is keen to see a deal happen. Paris is likely to ramp up efforts to secure a deal before next year's presidential election.

But that's not the only Middle East fighter buy in limbo. Questions are also arising about the future of Saudi Arabia's plans to place a major order with Boeing through the U.S. government. Riyadh and Washington have been dragging on over a major arms package, including the purchase of 84 F-15SAs and upgrade of 70 F-15Ss to the new standard.

A U.S. Air Force official indicates there is concern the deal is falling apart, in part because of Saudi displeasure

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over U.S. opposition to the Palestinian Authority's bid for United Nations membership. However, he adds it may also merely reflect that the recent turmoil in Saudi Arabia—with Prince Salman bin Abdulaziz named defense minister after his long-serving predecessor died—has created too much uncertainty for the arms package to move forward. Industry officials believe parts of the deal may proceed, but the upgrade portion may be scrapped. However, Muilenburg says that "things are continuing to advance."

While those two long-running purchases remain in limbo, elsewhere things should start to crystallize soon. Switzerland could be the first of several long-running fighter competitions to be concluded. The government is expected to announce the winner of the F-5 replacement program imminently. It is another deal that has been progressing with setbacks, and earlier this year was seen as shelved. But the Swiss decided to move forward, in part to take advantage of their strong currency, effectively making the new fighter cheaper. The competition is between the Dassault Rafale, Eurofighter Typhoon and Saab Gripen.

Also pending is a downselect by the Japanese government, which is considering the Boeing F/A-18E/F, Eurofighter Typhoon and Lockheed Martin F-35 Joint Strike Fighter. That decision is expected around mid-December. The Japanese program could have broader implications, with South Korea also in the midst of a fighter procurement process. A Japanese commitment to the F-35 could bolster the stealth fighter's chances in South Korea.

The biggest prize on the immediate horizon, of course, is India's Medium Multirole Combat Aircraft (MMRCA) competition, where the Dassault Rafale and Eurofighter Typhoon remain in the running. The MMRCA deal is for the largest number of aircraft, with a minimum purchase of 126 expected.

A type selection should still take place this year. However, an official with one of the bid teams notes that the decision could still slip into 2012 because the pricing the two contenders have offered is

Building a Bulwark

United Arab Emirates bolsters defenses and industrial base

ROBERT WALL/DUBAI

With the menace of Iran next door, the need to provide multilayered security is increasingly driving military planning in the United Arab Emirates.

"It will be important to keep threats at bay," says the Commander of the UAE Air Force and Air Defense, Maj. Gen. Mohammed bin Swaidan Saeed Al Gamzi.

That situation has driven a strong interest in air defenses. Although the UAE has previously paid attention to this area, what has changed is the realization that the complex levels of threats emanating from its neighbor requires a similarly sophisticated air defense umbrella. Rather than just focusing on missile defense, Al Gamzi says, the UAE now also is buying equipment to defend against cruise missile attacks and unmanned aircraft infringing on its airspace.

Perhaps underscoring that situation is that the country's ambition to buy the Terminal High-Altitude Area Defense (Thaad) system has been scaled back. Purchasing Thaad remains in the UAE's long-term plans, according to Maj. Gen. Ibrahim Naser Al Alawi, UAE Air Force deputy commander, but an industry official adds that it is no longer expected to be three fire units as discussed in 2008. Still, the Thaad acquisition would give the UAE the most capable missile defense system among the Persian Gulf states.

The country also is looking to upgrade its air operations center, with ThalesRaytheon Systems and Lockheed Martin vying for a deal that could be decided soon. The system will also have links to the navy and ground forces and, potentially, be expanded to civil security organizations.

Abu Dhabi-based Adcom has developed two versions of the Namrod missile (inset) for internal carriage on the United-40 medium-altitude long-endurance unmanned aircraft.

ROBERT WALL/AW&ST PHOTOS

Also tying into the system will be the UAE's eventual airborne early-warning aircraft. The country has fielded two Saab 340 Erieyes as a tool to better understand its requirements, and is holding a competition among the Boeing 737-based AEW&C, Northrop Grumman E-2D and Erieye for the operational system.

Al Alawi also signals interest in fielding a signals intelligence pod, potentially for use on its fighters, and a larger unmanned aircraft fleet. The long-term plan also shows the UAE fielding an unmanned combat air vehicle sometime between 2018 and 2025.

Although much of the equipment is being bought from foreign vendors, the UAE's ambitions to build up its own arms industry are also gaining some traction. For instance, Abu Dhabi-based Adcom Systems unveiled the United 40 medium-altitude, long-endurance unmanned aircraft at the Dubai air show. The 57.53-ft. wingspan, 36.54-ft.-long and 14.37-ft.-high system is designed for an endurance of 25 hr.

A scale model of the United 40 is already flying, says chief

very similar, so the industrial participation package is getting a closer look.

Next on the agenda should be Brazil, where the decision on what fighter to buy has slid to 2012. Lt. Gen. Gilberto Antonio Saboya Burnier, commander-general of air operations for the Brazilian air force, now projects a contract award in the first quarter of next year.

Importantly, he says, further delays could have operational implications since the contract award has been delayed repeatedly. The commander warns that the Brazilian air force needs the new aircraft to enter service in 2017, and if a decision on the FX-2 is delayed further, that timetable could be at risk. The 2017 date is critical because that is when the first remanufactured and modernized F-5s will need to be retired. Embraer is still upgrading some of the air force's F-5s.

One of the new nuances in the contest appears to be a Brazilian interest in ensuring the fighter it acquires will provide proper interoperability with coalition forces, according to an industry official. That could reflect Brazil's observation of the NATO-led air campaign in Libya, where non-NATO states contributed. In the fight for the F-X2 are the F/A-18E/F, Dassault Rafale and Saab Gripen.

Despite an overall decline in defense spending in many markets, a new round of competitions also is just around the corner, even if their scale is smaller. For instance, Czech Republic is due to decide on its long-term fighter plans, with options ranging from extending the current lease of 12 single-seat and two dual-seat Gripens, to buying the aircraft outright, or acquiring a different type. Hungary faces a similar choice.

Bulgaria also has a fighter competition in the offing, say industry officials, as does Denmark, where a recent change in government is expected to see the hard work of selecting an F-16 replacement move forward. One uncertainty in Denmark is if the competitive field will again be thrown open, or whether the competition will remain limited to the F-35, F/A-18E/F and Gripen.

designer Ali Al Dhaheri. The system should complete its final testing early next year to clear the way for production. The first order is still pending.

The operational system could be armed with up to eight internally carried weapons, either the 5.1-in. Namrod 1 or 7.9-in. Namrod 2 missiles, stored on a rotary launcher. Each of the four wings could also be used to carry two more missiles.

The small, turbine-powered missile features a wing that is deployed after launch to provide a range of around 60 km (37 mi.) The weapon can be INS/GPS-guided (or use a different satellite constellation) and can feature an electro-optical, infrared or video seeker; the imagery would be transmitted back to the UAV from where it is relayed to the ground.

Another weapons program with local flavor that is coming to maturity is the Talon laser-guided rocket Raytheon and the Emirates Advanced Research & Technology (Earth) organization have been working on since 2008. Salem Saeed Salem Al Abri, development director at Earth says he expects production for the Talon-LGR to begin next year now that qualification trials are over.

Since 2008, around 30 ground tests were conducted, followed by flight trials on the Bell Kiowa Warrior and 25 helicopter shots from Boeing AH-64 Apaches in the UAE and U.S. The tests included validating the rocket's performance against moving targets, with the final tests wrapping up in October.

During tests the rocket, featuring a digital semi-active laser, showed an accuracy of around 0.9 meters (3 ft.). The weapon has a range of 1.2-6 km.

The Raytheon/Earth team is offering the system as either a retrofit for the large stock of 2.75-in. rockets already in inventory or as new-build. The rocket adds the digital SAL sensor, a guidance section and tail fins to control the roll profile.

The partners are now looking at the first integration of the weapon on a fixed-wing aircraft, taking advantage of an offer to do so by Hawker Beechcraft on the AT-6, says Raytheon's program director Jim Byrne. The company is looking at broader fixed-wing applications, including the Cessna Caravan and Air Tractor AT-802U the UAE air force operates.

Industry officials note that the domestic industrial participation has become a much greater priority for the UAE in recent years, driving U.S. and European manufacturers to ink numerous agreements with local industry. Boeing, for instance, has concluded an agreement with Abu Dhabi's Mubadala Aerospace in a range of areas, including with the Advanced Military Maintenance Repair and Overhaul Center to bolster logistics support to the UAE military for AH-64D Apaches, CH-47 Chinooks and C-17s.

La Dura Vita

Italy's premier A&D company takes a hard look at itself

ANDY NATIVI/GENOA

Italy's emergency government is dealing with a dire financial situation that will force substantial cuts in both the defense procurement budget and investment, and flagship provider Finmeccanica is set to feel the brunt of the fallout.

Details of Finmeccanica's first reactions emerged last week when the company announced third-quarter financial results that show it swung to a loss equaling its profit for the same quarter a year before.

Considering that Finmeccanica receives 72% of the combined defense and economic development ministries' investment budget, the company is realizing it will have to tighten its belt and try to find international contracts and investments to sustain its business.

The defense ministry has said the cuts planned for 2012 will be charged against procurement and research and development spending, for a total of €1.45 billion ($1.96 billion), since the personnel and operations account cannot be trimmed immediately in the absence of an overall defense review. Given cuts at the economic development ministry, which also contributes to defense purchasing, the end result is likely to reduce overall spending from the €5.4 billion allocated in 2011 down to €3.8 billion, according to plans unveiled recently by the Berlusconi government. And the incoming Monti government will have very little room to change them.

Likewise, there is growing uncertainty about Rome's ability to begin increasing A&D investment as soon as 2013, despite the latest three-year financial plan's optimistic assumptions. The plan calls for a combined investment/procurement war chest of €5.1 billion in 2013 and slightly more than €5 billion in 2014. But the discrepancy between the former government's three-year forecast and the EU forecast in terms of debt-to-gross-domestic-product ratio, GDP growth and financial evolution, make it unlikely that the Monti government will be able to endorse these numbers.

Giuseppe Orsi, Finmeccanica's CEO, has just unveiled a very aggressive new industrial plan, while at the same time "cleaning" the company's contracts, which delayed the announcement of third-quarter results. This move has further widened the split with Chairman Pier Francesco Guarguaglini.

First-half results forced the company to downgrade its expectation for the whole year. But in the third quarter, Orsi carried out a number of contract reevaluations, while setting aside money to compensate for potential losses and planning for substantial restructuring costs. The bulk of the measures are one-off shots that will permit Finmeccanica to recover, possibly as soon as 2012, but it will end 2011 in the red by as much as €300 million, while revenues will drop to €17-17.5 billion. Earnings before interest, taxes, depreciation and amortization (EBITDA) will show a loss of €200 million and free operating cash flow will be negative by €400 million, according to the new guidance.

Orsi has announced an aggressive strategy to reduce the company's net financial debts from €4.6 billion as of September 2011 to €2.5 billion by the end of 2012. To achieve this, the company will dispose of assets—mostly non-A&D—worth at least €1 billion during 2012. He has not given details about what is for sale, but a "basket" of businesses, worth over €1 billion, has been identified as expendable. The list also contains A&D assets, including activities in the Technical Services segment of DRS Technologies, worth $600 million in annual revenue, and could involve some other defense electronics activities (e.g., information technology and security) and "minority participations" in other companies. This could even include the 25% stake held in European missile company MBDA.

Finmeccanica will also reduce its investments in R&D: the current 2010-12 plan calls for a total of €3.6 billion. This will go down to €3.4 billion; only €1 billion will be available for 2012.

All group companies are being restructured. Alenia Aeronautica is already proceeding with its own plan, having reached an agreement with unions on the number of "soft layoffs," the closure of three facilities, and the merger of Alenia Aermacchi into Alenia Aeronautica, to become Alenia Aermacchi. The restructuring is to cost €160 million, with EBITDA benefits of €200 million by 2013, increasing to €270 million annually by 2015.

FINMECCANICA

With Rome's dramatic changes as the backdrop, Finmeccanica CEO Giuseppe Orsi is pursuing an aggressive reorganization to get ahead of falling numbers.

The reasons for the restructuring are evident, considering Alenia accounts for €750 million in write-offs out of a total of more than €1.06 billion announced by Finmeccanica. These write-offs are being charged to the Boeing 787 program alone, and include $300 million that Alenia will have to pay Boeing (from 2014, in three installments) as compensation for the horizontal stabilizer problem at the Alenia plant in Foggia.

Orsi says that on the 1,022 787 shipsets that are covered by the Alenia-Boeing WTA (working together agreement), which ended years of tense negotiations and recriminations, the program makes a small profit that hopefully will grow over the life of the program, including its derivative versions.

With the aeronautics sector being restructured and Ansaldo Breda to announce its own plan within a couple of weeks, the third major effort at Finmeccanica is merging the three European defense electronics companies. Selex Sistemi Integrati, Selex Elsag and Selex Galileo will become a single company, simply known as Selex. DRS Technologies will remain independent, but better integration between the new Selex and DRS will be pursued. The merger is due before year-end. By March 2012, Orsi says he will be able to provide more details on the costs and benefits of this long-overdue operation.

The end result, according to the Orsi plan, which has been approved by the company board, will be a leaner, more competitive company, with a tighter focus on core strategic businesses and profitability. The challenge for Orsi now is to execute the plan and hope that it works.

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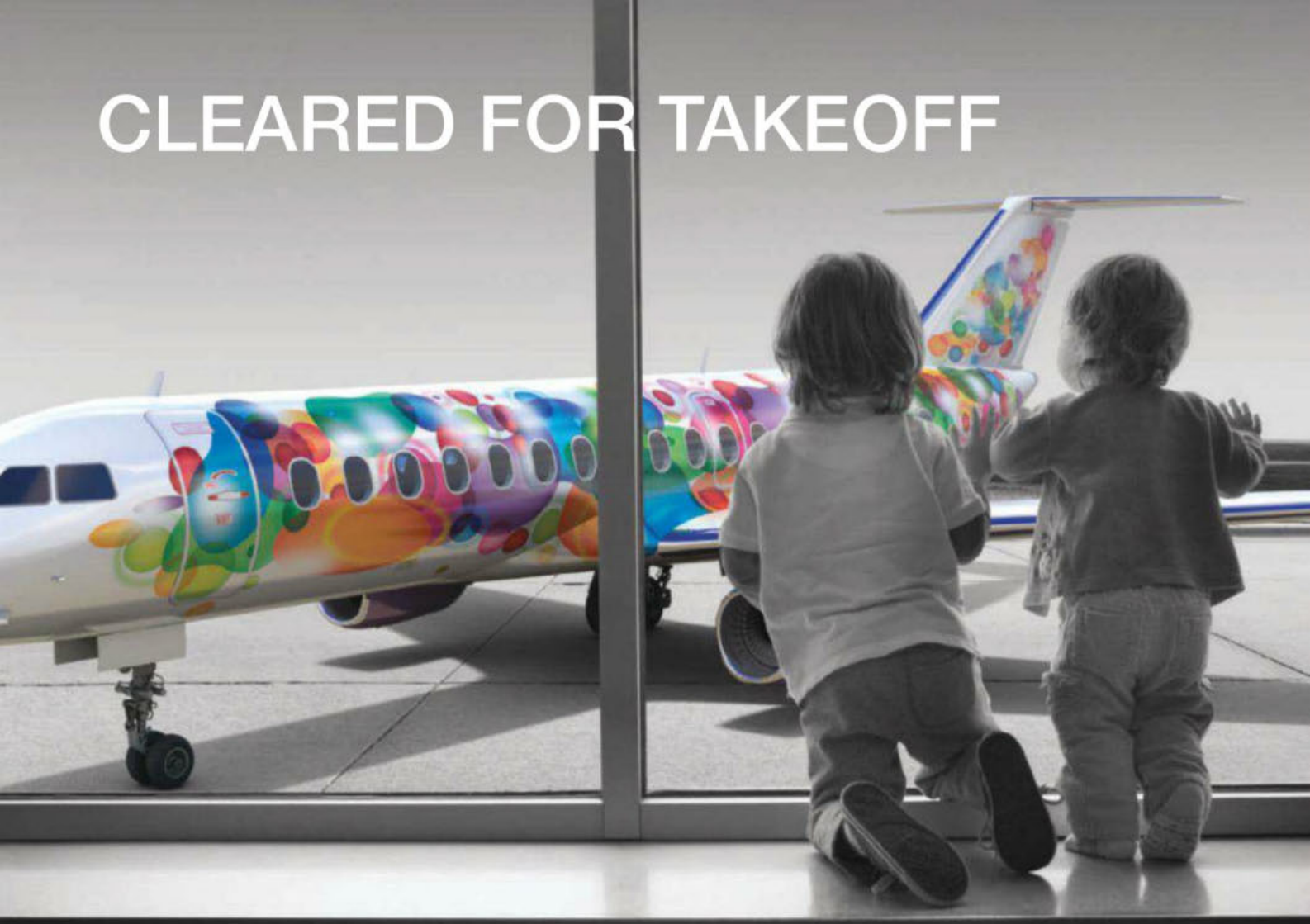

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Mars Mess

White House withholding commitment for long-term robotic Mars exploration

FRANK MORRING, JR./WASHINGTON and AMY SVITAK/PARIS

Space agency chiefs from the U.S., Europe and Russia are setting up talks aimed at finding a way to work toward a Mars sample-return mission in the face of budget uncertainty in the U.S. that threatens to upend the joint effort worked out by NASA and the European Space Agency (ESA).

Although NASA will loft the $5 billion Mars Science Laboratory (MSL) mission as early as Nov. 25 to help find the best place to look for samples, and Congress came close to meeting NASA's full funding request for planetary science in its fiscal 2012 appropriation, the White House Office of Management and Budget (OMB) has so far withheld its endorsement of joint NASA/ESA missions in 2016 and 2018.

As a result, ESA has turned to the Russian space agency Roscosmos for possible launch of its planned Mars orbiter in the 2016 window. Roscosmos chief Vladimir Popovkin says in principle that Russia will be glad to accommodate ESA, but details remain to be hammered out.

ESA spokesman Franco Bonacina says his agency is exploring the possibility of Russian involvement in its ExoMars program, and is considering launching the 2016 mission on a Proton rocket in the absence of a firm commitment from the U.S. In an unusual move, ESA Director General Jean-Jacques Dordain is organizing a trilateral meeting in December with Popovkin and NASA Administrator Charles Bolden solely to discuss Russian participation in the ExoMars program, according to Bonacina.

"So far, things are going in that direction," he says, adding that the agency does not plan to make a decision before early next year. "We are seeking the involvement of the Russians but we are not, for the time being, doing any negotiations with the Russians."

Bonacina says ESA has until the end of January to decide whether to continue with the 2016 leg of the ExoMars mission or scrap it and press on with a joint ESA-NASA mission in 2018.

"The industrial contracts being handled now go to the end of January, so February is really the time where we have to see if we can go ahead with the mission as it is baselined or whether we have to do any kind of reshuffling or rescheduling," he says.

The impasse upsets members of Congress with NASA oversight responsibilities, who fear "NASA will be viewed by our international partners as an unreliable, schizophrenic agency," according to Rep. Steven M. Palazzo (R-Miss.), chairman of the House Science subcommittee on space and aeronautics. Palazzo conducted a Nov. 15 hearing on the subject.

ESA has long experience accommodating its programs to unexpected changes in U.S. space policy, dating back at least to U.S.-initiated redesigns of the International Space Station (ISS) when the orbiting laboratory was designated Space Station Freedom. And it has expensive commitments to future joint efforts, including a planned 2018 Ariane 5 launch of the James Webb Space Telescope (JWST).

"Strategies to instill cost discipline on expensive missions can certainly be put into place, and we must be careful to avoid short-sighted, bureaucratic decisions that can end up dismantling a highly successful program and skilled work-

NASA/KIM SHIFLETT

Mars Science Laboratory is stacked and ready for launch as early as Nov. 25, but budget uncertainty is clouding the fates of follow-on missions.

force, jeopardizing U.S. leadership, and retreating from a carefully constructed international partnership," says Rep. Donna Edwards (D-Md.), a member of Palazzo's space subcommittee.

The subcommittee hearing came as Congress headed toward final passage of a multi-agency appropriation. Under the compromise funding measure hammered out by a House/Senate conference committee, the $17.8 billion top-line figure for NASA is $648 million less than the agency received in fiscal 2011. And NASA will receive only $406 million of the $850 million it sought for commercial spaceflight, which means the agency probably will have to obtain an exemption in anti-proliferation laws to buy more Soyuz seats from Russia for transporting its astronauts to the ISS (*AW&ST* Nov. 7, p. 34).

The conference committee set aside $1.2 billion for the Orion-based multi-purpose crew vehicle, and another $1.860 billion for the heavy-lift Space Launch System (SLS). That is $161.5 million above the administration request. Strong congressional backing for the vehicle critics call the "Senate Launch System" is also reflected in a requirement that $100 million of the funds for commercial spaceflight become available only after the NASA administrator certifies that the SLS development is under contract and under way.

Even so, the conference report funds NASA science at $5.09 billion, up $155 million from fiscal 2011, and stipulates that overruns in JWST be funded with "commensurate reductions in other programs," according to a conference committee press release.

ESA has long experience accommodating its programs to changes in U.S. space policy

At the same time, the compromise legislation sets up a showdown with the White House by holding NASA to "a strict adherence to the recommendation [in the National Academy of Sciences decadal survey of planetary exploration priorities] that NASA include in a balanced program a flagship-class mission, which may be executed in cooperation with one or more international partners, if such mission can be appropriately descoped. . . ."

That "flagship mission" is a reference to the Mars sample-return effort, which was chosen as the top priority by the planetary science community for the decade 2013-22 with the caveat that it be descoped to a U.S. cost of $2.5 billion from the current $3.5 billion estimate.

To prepare for sample return while spreading the expense, Bolden and Dordain had tentatively agreed to joint exploration efforts in 2016 and 2018. But in September NASA told ESA it could not commit to the Atlas launch in 2016 because of the budget uncertainty. That cast confusion over the second part of the joint effort, which involves two rovers lofted in 2018—one European and one U.S.—to find and cache samples for return to Earth on a later mission.

Steven Squyres of Cornell University—the Mars expert who chaired the planetary science decadal survey at the National Academy of Sciences—testified that Sally Ericsson, OMB program associate director for natural resources, energy, and science, said "the administration is not ready to make such a commitment" when he asked her if the U.S. intended to follow through on the Bolden-Dordain agreement on Mars. As is typical for OMB staffers called to testify before Congress, Ericsson declined an invitation to testify before the subcommittee.

Jim Green, director of the Planetary Science Division at NASA headquarters, told the subcommittee that while it has not endorsed the NASA-ESA agreement, OMB also has not canceled it. As a result, NASA's planetary science bureaucracy is proceeding as though it remains in force. The outcome of the internal administration debate will not be revealed until the administration submits its fiscal 2013 NASA budget request in February 2012, says Green.

In an unrelated Senate hearing on Nov. 17, Bolden reminded a skeptical Sen. Kay Bailey Hutchison (R-Tex.) that Congress and White House Budget Director Jacob Lew—Ericsson's boss—agreed in September that NASA's three highest priorities will be developing the SLS and its Orion-based multi-purpose crew vehicle, finishing and launching the JWST, and "advancing" the ISS.

"We are adjusting our budget requests now so as to support those priorities," Boldin testified, assuring Hutchison that the SLS/Orion vehicle development will receive enough funding in the 2013 budget request to support an unpiloted first flight in 2017 and a first flight with a crew in 2021. But he acknowledged that times are tight.

"These are very difficult fiscal times, and we all agree that we have to take difficult measures," Bolden said in response to Hutchison's questioning about future funding for SLS/Orion. "We think we have put forth a budget that will enable us to produce a program for exploration."

The fiscal 2012 congressional appropriations language leaves open the possibility that, in keeping a "strict adherence" to the recommendations of the decadal survey Squyres headed, NASA may fall back to the second decadal priority, a Jupiter Europa Orbiter, provided its estimated $4.7 billion total cost can be lowered significantly, "with the goal of minimizing the size of the budget increase necessary to enable the mission." That possibility gained allure with the publication last week of evidence there are "lakes" of liquid water where life might exist bubbling up to within 3 km. (1.8 mi.) of the Moon's frozen surface.

House space subcommittee members expressed frustration with what Rep. Dana Rohrabacher (R-Calif.) termed the "damn overruns" that threaten to gut NASA's planetary and other space science programs. Just as the JWST is seriously over budget and behind schedule, agency cost estimates for SLS also are considered "optimistic" by outside analysts (*AW&ST* Aug. 29, p. 36).

Alan Stern, a former NASA associate administrator for science, says he believes that to maintain cost control, agency managers need to be willing to shut down programs that run over budget. And to prevent overruns in the first place, he advocates what he calls the "rule of one."

"If you expect to control your cost and your schedule, you're generally allowed to have one miracle, in terms of technology development," he says. "But if you throw half a dozen of them in the air, project management is at the mercy of just too many free parameters to really control it."

That was the case with the Webb telescope, he says, and to some extent with the Mars Science Lab, which combined a large, nuclear-powered rover, the "sky-crane" approach to landing that lowers the rover from a hovering descent module, and a highly precise targeted landing (*AW&ST* Aug. 1, p. 38)

"I'm all for stretching, and I'm all for big breakthroughs, but I believe you can structure the missions a little smarter so you don't get in these boxes," Stern says. "And the agency management has to actually, not just observe costs going up and go find the money, but actually do the control loop feedback which constitutes management."

A Glow in the Dark

Global business aircraft outlook dims, but Middle East remains a bright spot

ROBERT WALL and JENS FLOTTAU/DUBAI

The small impact of global economic turmoil and regional political unrest on business jet sales in the Middle East demonstrates just how insulated buyers in this region are from the rest of the world.

But that is not to say that the upheaval of recent months has passed the corporate and private jet sector by. Europe's economic troubles and the overall slow recovery globally are leading Embraer to give more credence to its "downturn" market forecast for business aviation rather than a rosier projection.

Embraer has long said the market in 2012-21 could see deliveries of 11,275 executive aircraft if a strong rebound occurs, or 9,125 if growth is more anemic. Whereas several months ago, the company put forth a more optimistic forecast, Claudio Camelier, vice president for executive aviation market and product strategy, now says, "given how we see the world economy, the downturn scenario is the most likely one."

Similarly, Dassault Falcon Jet's president/CEO, Jean G. Rosanvallon, says that while 2011 has been somewhat disappointing when it comes to signs of a rebound, there is still hope that next year will be stronger, particularly in the U.S., where companies may start replenishing fleets. "Clearly, the economic uncertainties are penalizing our market," he says.

Sales are also depressed by the large number of relatively young business jets for sale. However, Olivier Villa, senior vice president for civil aircraft at Dassault Aviation, says there are finally signs the secondhand inventory is gradually coming down.

This year will likely be the nadir in the recent decline of business jet deliveries globally, Embraer projects, with 600-700 aircraft handed over, almost half the peak reached in 2008. Under the "downturn scenario," the industry will only be approaching that peak again by 2021.

An uncertainty still hanging over the market is when slowed sales activities in the Middle East and North Africa will pick up after more than a year of political tumult. The markets that were hit will return, but "when, I am not sure," says Colin Steven, Embraer vice president for executive aviation sales in Europe, the Middle East and Africa. That sentiment is echoed by Rosanvallon, who adds that "we need to wait a little longer."

But Gulfstream Aerospace Corp. President Larry Flynn puts a more positive spin on things, saying the effect of the Arab Spring "was not nearly as much as expected," with only a few cancellations and "surprisingly minimal" disruptions.

The situation in Egypt has been the most damaging for business aircraft makers, simply because it is the largest market. Fighting in Libya also derailed some deals.

One reason the Middle East has remained a good market for many aircraft makers, though, is the preference of buyers there for larger business jets, which has held up more robustly than demand for midsize and smaller aircraft. The Middle East is the most important market for Airbus—it has sold more than half of its 170 airliner-based corporate jets in that region since the mid-1980s. "The billionaire is not suffering as much as the millionaire," says Airbus Corporate Jet's (ACJ) head of sales, Francois Chazelle.

The story is similar for other aircraft makers. More than half the 10 Embraer Lineage 1000s ordered to date are being purchased in this region—five in the United Arab Emirates and one in Kuwait. Rosanvallon notes that more than half of Dassault's backlog of 10 aircraft in the Middle East is for the largest model, the Falcon 7X.

Similarly, Gulfstream has seen its Middle East/Africa fleet grow to 148 aircraft last year from 97 in 2006. Worldwide, the market has risen to 7% of the company's activity, up from 6% a decade ago. Although the increase seems small, it is on a much-expanded base of 2,000 aircraft from 1,000, Flynn says.

But Rosanvallon points out that the Middle East is not the only region with increasing sales. This year, China will be the largest market for Dassault for the first time. In fact, sales there surpass those in the U.S. and Europe combined. The focus is also on large aircraft: 75% of orders in China are for the Falcon 7X.

Chazelle points out that the Middle East and China are not the only improving markets. "The Russians are coming back," he notes. "They were absent over the past two years."

More than half of Dassault's business jet backlog in the Middle East consists of orders for its flagship Falcon 7X aircraft.

MIKE VINES/AW&ST

Above the Fray

FAA NextGen programs escape deficit ax

JEN DIMASCIO/WASHINGTON

As the budget battle intensifies in the U.S. Congress, one of the aerospace and defense industry's flagship initiatives is blowing past steep cuts levied on many other government programs: The FAA's Next Generation Air Transportation System.

An FAA spending bill for fiscal 2012 negotiated by Republicans and Democrats and headed for passage in both chambers includes $878 million for core NextGen programs. The "minibus" legislation also includes full-year funding for NASA and the Commerce, Justice and Agriculture departments, as well as a continuing resolution that will keep all other agencies operating through Dec. 16. A previous temporary spending bill for the entire government expired Nov. 18.

"The legislation . . . represents a bipartisan compromise that will prevent a potential government shutdown, support important programs and services that the American people rely on, and make hard but necessary cuts to help rein in the nation's deficit," says Hal Rogers (R-Ky.), chairman of the House Appropriations Committee.

But NextGen will not be sharing the pain, even though the bill contains spending caps handed down by a congressional agreement in August. Some NextGen research programs took slight reductions, but the legislation provides full funding for the Automatic Dependent Surveillance-Broadcast program, the FAA's "satellite-based successor to radar." Among other highlights in the legislation:

- Language accompanying the House's version of the bill takes to task repeated delays and cost overruns on Lockheed Martin's En Route Automation Modernization program, the planned backbone at many air traffic control centers. But rather than pulling funding, a congressional aide says, the final House-Senate conference report—which ironed out differences between the House and Senate versions of the bill—adds money to the Obama administration's request for the program to make up for previous cost increases caused by schedule delays.
- NextGen Data Communications, which allows controllers and pilots to communicate with data rather than speaking over a radio, and System Wide Information Management that enables real-time data exchanges, also received full funding, the aide says. In contrast, the FAA's Joint Planning and Development Office took a $5 million hit.
- On top of NextGen funding, the bill restores the Block Aircraft Registration Request (BARR) program and prohibits future changes to it. The program is used to block general aviation flight information from the public.
- Lawmakers provided full funding for the Essential Air Service program for rural airports, though without reversing a provision in the last extension of an FAA policy bill that would remove subsidies of greater than $1,000 per passenger, a change that shuttered air service at three small airports.

Still, the FAA is not home free. Approval of the agency's fiscal 2012 budget does not prevent another shutdown of the agency because congressional reauthorization will be needed to keep it operating (see p. 70). A dispute over a last-minute change to the Essential Air Service program was the catalyst for a partial shutdown of the FAA in July that lasted for a few weeks. The temporary congressional extension that ended the shutdown runs out Jan. 31, 2012.

To avoid another embarrassing example of inaction, lawmakers are hoping for a deal on an FAA reauthorization bill—rather than a 23rd extension—by year-end. The leaders of the House and Senate Transportation Committees met last week to discuss how a "pre-conference" meeting to resolve outstanding issues between the two versions of the bill should proceed. "We directed our staffs to begin again and come back to us on [November] 30th," says Rep. John Mica (R-Fla.), chairman of the House panel.

Those negotiations would focus on a handful of issues, including the number of takeoff and landing slots at Reagan Washington National Airport. Both Mica and his counterpart in the Senate, Jay Rockefeller (D-W.Va.), indicated that an agreement on slots is possible.

The major roadblock in the FAA reauthorization bill remains a House provision to overturn a National Mediation Board (NMB) rule that makes it easier for airline workers to form unions. Rockefeller and Mica have both said leadership needs to find a way forward on that matter.

Other House members who acted as go-betweens during the FAA's partial shutdown in August are still working on

JOE PRIES AVIATION.NET

NextGen programs that could ease traffic congestion at Los Angeles International and other U.S. airports received support in a spending bill for fiscal 2012.

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the issue, and a potential compromise is being discussed.

Lawmakers might remove the controversial NMB provision from the FAA reauthorization bill and offer a new proposal as a stand-alone measure, confirms Rep. Jerry Costello (Ill.), a leading Democrat on aviation matters.

Mica has called the new change to NMB rules an "equal-in, equal-out" proposal. The change would make it as easy for unions to dissolve as it would for them to form. Senate Majority Leader Harry Reid (D-Nev.) has rejected including that language in the FAA bill, and unions consider it an anathema. So whether offering a stand-alone version would satisfy all of the players is an open question.

Rockefeller is continuing to pressure the airlines to make a deal on the NMB provision. "I want to seem as unoptimistic as possible because I think there's a real chance the whole thing can fall because people will just refuse to give up on NMB," he tells Aviation Week. "If that happens, we will not get an FAA bill."

Tarmac Travail

American Eagle fine reopens war of words over lengthy delays and aircraft diversions

JAMES OTT/CINCINNATI

ZUMA PRESS/NEWSCOM

Passengers hunker down against wind-driven snow, walking toward the Bradley International Airport terminal in Windsor Locks, Conn., during a freak October snowstorm.

Airlines, airports and the government have long been at odds over who is responsible when there is trouble in the air transportation system. Judging from the recent $900,000 fine assessed against American Eagle for violating the so-called tarmac rule, regulators now know where to pin the blame, though.

The judgement almost certainly will reopen the debate among the stakeholders, especially given that there seems to be a trend toward fewer such delays. A recent Government Accountability Office (GAO) report points out that tarmac delays of more than 3 hr. have slipped to less than 0.1% of all flights. Nearly all of these delays occurred during the taxi-out portion. However, the report also notes that flight cancellations have been rising due partly to efforts by airlines to avoid violating the tarmac rule in the first place.

The American Eagle fine is the first since the rule—setting a 3-hr. limit for tarmac delays on domestic flights—was imposed in April 2010. The initial proposed fine by the U.S. Transportation Department was likely a higher amount, reduced by negotiations. It covered alleged breaches on 15 flights from Chicago O'Hare International Airport, where fog and low visibility started the day on May 29 of this year and shifted into thunderstorms that afternoon.

A similar case for increased government scrutiny of a tarmac rule violation occurred late last month when a freak storm dumped more than 2 ft. of snow on New England and surrounding states. One aircraft was reported stranded for up to 8 hr., and JetBlue said five of its aircraft were snowbound at Bradley International Airport in Windsor Locks, Conn. Bradley personnel had their hands full with nearly two dozen diverted aircraft.

To prepare for the winter storm season, the FAA will conduct a forum at its Washington headquarters Nov. 30. An agency official says the agenda is being readied and that targeted participants include airport authorities, air traffic controllers, pilots, dispatchers and officials of other government agencies.

The department's consent order issued Nov. 14 offers details of a difficult day for American Eagle on May 29 at O'Hare. Ground stops, arrival delays and gate holds were in force through the morning. FAA Air Traffic Control closed the ramp three times due to lightning. American Eagle cancelled 126 flights between 6 a.m. and 1 p.m., and the schedule remained disrupted, according to the order authored by Rosalind A. Knapp, the department's deputy general counsel.

American Eagle operations continued into O'Hare after the weather improved at mid-afternoon. Aircraft scheduled for later flights remained at gates while arriving aircraft "were forced to hold at various waiting areas around the airfield," the order says.

Tarmac delays were 183-225 min. long and involved 608 passengers. Departures were delayed because crews were not available to operate flights; some flight personnel were stuck in aircraft parked around the field. American Eagle issued a company ground stop of all arrivals around 4 p.m., but gridlock developed at the ramp. At 8 p.m., according to the consent order, the carrier's tower manager on duty still continued to believe the delay situation was manageable. Steps taken at 8:30 p.m. to alleviate the jam came after the violations had occurred.

In its defense, recounted in the document, American Eagle contends the event was "a single incident that occurred on a single afternoon as a result of a single adverse weather system affecting O'Hare airport." The airline has compensated many of the affected pas-

sengers with travel vouchers and mileage points to the value of $150,000. It argues that the department had no authority to issue a fine on a per-passenger basis and only on a per-flight basis. In the interest of settling the matter, however, the airline agreed to the settlement.

The Air Transport Association (ATA) and individual airline representatives will attend the FAA forum. Air carriers have demonstrated solid compliance with the tarmac rule and other rules to strengthen consumer protection, ATA Vice President Steve Lott says.

To avoid tarmac delays or speed up recovery from an unexpected event, airlines must cooperate with the two other key players, airports and government agencies, says Lott. For example, in the case of a delayed or diverted international flight, he says deplaning passengers of a delayed or diverted flight could very well depend on whether there is adequate staffing of Customs and Border Protection officials to process travelers.

"Each airline is unique, each airport is unique," Lott adds. He notes that facilities, equipment and federal presence differ from airport to airport. As the GAO report states, the aviation system's ability to meet demand is variable and subject to a number of interrelated factors, including the number of runways, terminal gates, types of aircraft and the weather.

Airports Council International-North America President Greg Principato welcomes the FAA forum and also cites the need for coordination as instrumental in avoiding tarmac delays and minimizing the impact on passengers. "We look forward to discussing how we can manage diverted flights more effectively, starting with how the airlines and FAA make decisions regarding where to divert, long before aircraft are stuck on the ground," Principato says. He adds that it is important that stakeholders know how many and which types of diverted aircraft an airport can accommodate and what kinds of equipment are needed.

Flight cancellations peaked in 2007 at 2.16% of all flights, dropped to 1.39% in 2009 and increased to 1.76% in 2010. Cancellations of flights at smaller airports are 3.5 times more frequent than at larger ones, according to the GAO report. It recommends that the Transportation Department collect more comprehensive on-time performance data to ensure that information on most flights to airports of all sizes is included in the Bureau of Transportation Statistics' database.

Russian Roulette

Moscow signals it will back down on hefty Siberian overflight fees

MADHU UNNIKRISHNAN/WASHINGTON

If Russia drops an extra "royalty" imposed on airlines flying across Siberia, it could shave as much as $100 per passenger from round-trip flights between Europe and Asia—and help level the playing field for European airlines vying for passengers with competitors from the Middle East.

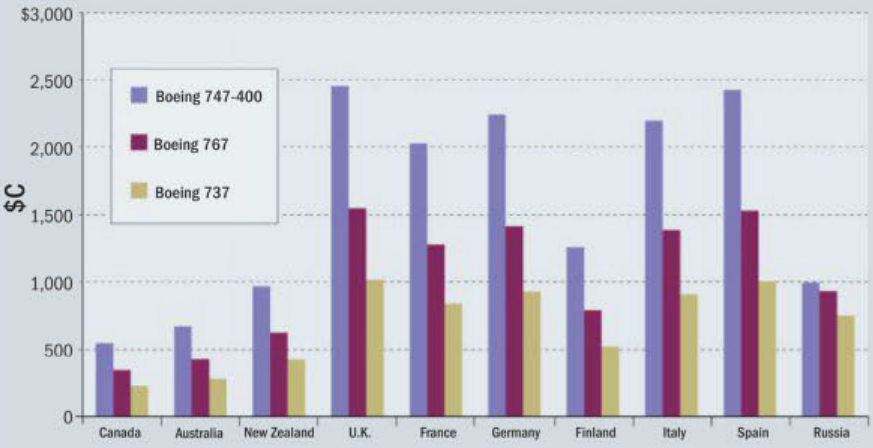
The fee, first imposed in the 1980s during the waning days of the Soviet Union, has long been a point of contention between Russia and Europe. European officials have refused to support Russia's entry into the World Trade Organization until Russia drops the fee, which Europe contends is in violation of a treaty signed in 2006. Under that agreement, Russia pledged to drop the charge by the end of 2013, but until recently it was unclear whether Moscow would stand by that commitment.

But in a letter to the European Union this month that was first reported by *The Wall Street Journal*, Russian Minister of Economic Development Elvira Nabiullina promised to put the 2006 accord into force, which would mean the overflight charges would vanish by Jan. 1, 2014. The Siberian royalty is over and above traditional overflight fees that most countries charge to cover the cost of air traffic services. By that measure, industry analysts say, Russia's fees are in line with or lower than the levies charged by the U.K., France, Germany, Italy, Spain or Finland (see graphic). Whether Russia would bolster those charges to make up for the loss of the Siberian levy remains to be seen.

The Siberian overflight fee was initially a boon for European carriers because it opened the door for them to operate nonstop on Asian routes—most importantly to Tokyo—without having to divert via Anchorage. Craig Jenks, a New York-based airline consultant, notes that this trans-Siberian access cut London-Tokyo mileage by nearly one-third and Copenhagen-Tokyo by more than 40%. "European airlines paid tens of millions of dollars to the then-Soviet Union to save hundreds of millions of dollars in fuel and flying time to fly via Anchorage," he says.

But the fees, which Jenks estimates add up to $50 per passenger on a one-way flight, have become more of an irritant in recent years as European carriers faced new competition from airlines in the Middle East, which offered cheaper but longer flights via hubs such as Dubai. Earlier this year, the EU estimated that European airlines paid more

Air Traffic Services Charges For International Overflight



Note: For 800-km overflight, November 2011. $C 1.00 = $0.98

than $420 million in royalties in 2008, the most recent year for which data are available. Most of that money has been passed on to Aeroflot—meaning European carriers are effectively forced to subsidize a competitor.

The Siberian royalties are not imposed on airlines flying between North America and Asia. Multilateral aviation pacts signed in the late 1990s permit aircraft on those and some other routes to use defined polar "tracks" that traverse a relatively small slice of Siberia.

Exactly how much Russia—and Aeroflot—will lose when the fees are finally eliminated is unclear. Several airlines contacted by Aviation Week declined to discuss the levy or disclose how much they pay to overfly Siberia. The International Air Transport Association also declined to comment.

Black Mark

The FAA is sending a team to examine aviation safety in the Philippines

LEITHEN FRANCIS/SINGAPORE

The Philippines appears set to remain on air safety blacklists for the foreseeable future.

Improvement to aviation infrastructure is one of the biggest challenges the Philippines has to overcome, say industry executives close to the International Civil Aviation Organization (ICAO) and the FAA. The foreign regulators are also not yet convinced that the Civil Aviation Authority of the Philippines (CAAP) has enough trained and qualified personnel to provide proper regulatory oversight, they add.

Being on the European Union blacklist means Filipino carriers are prevented from entering EU airspace and European travel agents are forbidden from booking passengers on Filipino carriers. European residents are also unable to obtain travel insurance for trips on Filipino airlines. The FAA, meanwhile, has the Philippines listed as Category II, which means the nation's carriers are allowed to continue serving the U.S., albeit under heightened surveillance, but are forbidden from expanding or changing the type of aircraft used on the service.

Other countries also take note of the FAA's rulings. Candice Iyog, vice president for marketing and distribution at Cebu Pacific Air, says the airline wants to increase services to Osaka Kansai International Airport and launch flights to Tokyo Narita International, but Japan is using the FAA Category II status to justify barring the Filipino carrier from increasing services there.

Philippine Airlines (PAL) President Jaime Bautista says his airline has two Boeing 777-300ERs it was planning to use for services to the U.S. but which are now employed on flights to Australia and Canada. He says a third 777-300ER will arrive in June. If the Philippines is still on Category II then, PAL will use the widebody for its Australian service. But it is due to receive a fourth 777-300ER in November 2012, and if there is no change, the carrier will have nowhere to fly the aircraft, he asserts.

AGENCE FRANCE-PRESSE/NEWSCOM

A Zest Air MA60 overshot the runway at Caticlan Airport on Jan. 11, 2009.

Bautista says PAL wants the 777-300ERs to serve Los Angeles and San Francisco. It also would like to make use of its fifth-freedom rights to extend its Vancouver service to San Diego, New York and Chicago, he says.

Because PAL has a vested interest, it has paid for a U.S.-based aviation safety consultancy to advise and help the CAAP. Bautista says the CAAP has implemented some, but not all, of the firm's recommendations. He also says the FAA has agreed to send a team in early December to review the CAAP. An FAA spokesman tells Aviation Week that the the agency plans to conduct a technical review of the CAAP to see whether it is complying with applicable ICAO annexes. The spokesman, however, stressed that the FAA is not conducting the assessment as part of its International Aviation Safety Assessments (IASA) program. The FAA conducts an IASA audit only if it is confident the nation will actually pass the audit; hence the need to first complete a technical review.

The FAA team was due to visit earlier this year but postponed the trip after the Philippines government replaced Alfonso Cusi, director general of the CAAP. Industry executives say Cusi's departure was a setback, as he was well regarded by the FAA and ICAO. Cusi refrained from trying to present a rosy picture, says one industry executive, adding that Cusi knew the issues that needed to be resolved and had a clear plan for achieving that goal.

One major problem—and one that ICAO has highlighted—is that the CAAP has too few qualified personnel to provide proper regulatory oversight. The agency has had difficulties with this because public servants in the Philippines earn less than airline industry employees. The CAAP, however, has moved to address the income disparity, say industry executives.

Another step the CAAP has taken is to strike some non-FAA-certified aircraft—such as older-model Let 410s—off the country's registry. But the CAAP has so far refused to remove the Xian Aircraft MA60 from the list, even though this Chinese aircraft type has no Western certification. Philippine carrier Zest Air operates four MA60s and has suffered serious incidents with the aircraft.

Caticlan is one of the Philippines' most accident-prone airports because it has a short runway. But local conglomerate San Miguel Corp. says it intends to extend the 950-meter (3,100-ft.) runway to 2,100 meters. It also plans to build a larger passenger terminal.

With Frank Jackman in Washington.

Rules Refresh

Updating aviation policies is vital for smaller nations like New Zealand

ADRIAN SCHOFIELD/WELLINGTON, NEW ZEALAND

The New Zealand government is planning a wide-ranging overhaul of its aviation policy framework, in an effort to improve access to overseas markets and make its regulatory process more flexible.

The twin reform initiatives reflect the need for small, trade-oriented countries such as New Zealand to ensure they have cutting-edge aviation policies and regulations in place to remain competitive in the global market. For that reason, regulators are looking to push the boundaries as they revise policies for international air service negotiations and streamline the aviation rule-making machinery.

New Zealand's distance from major markets means that developing long-haul air links is crucial to the country's economy. This makes the international air service review particularly important, says Ministry of Economic Development Chief Adviser Ross Clapcott. To help overcome the distance handicap, "New Zealand's [aviation] policies and their implementation have to be not just as good as its competitors, but better," Clapcott said at a meeting of the New Zealand division of the Royal Aeronautical Society.

Aviation officials say the aim of this initiative is to decide what sort of agreements New Zealand should seek. Talks are planned with several countries in Asia and Latin America, but the wider question is how these should be approached.

The Ministry of Transport is reviewing international aviation policies for the first time since 1998, says the ministry's chief executive, Martin Matthews. There will likely be an increased focus on multilateral rather than bilateral deals, and Matthews signals that airline ownership and control restrictions may also be addressed. Proposals will be prepared for the government to consider after national elections later this month.

The traditional approach of bilateral agreements "is simply not sustainable in the long run, and the challenge for governments is how to address that," Matthews says. He notes that the European Union and other regional blocs are taking a multilateral approach, and a major issue for New Zealand will be how it too can take advantage of multilateral alignments.

So far the Ministry of Transport has not published any draft proposals, but it has been consulting with major industry players. Air New Zealand tells Aviation Week that while the initiative is "still in the early stages," the carrier is having "some dialogue with government directly."

New Zealand Airports Association Chief Executive Kevin Ward says that although the current aviation services policy was considered progressive when it was established, "it won't provide the edge we need in the future." He says the government "has got to be quite bold [with its new policy] and look for something that might seem quite radical."

The government should drop its emphasis on gaining reciprocal rights for access it grants to other countries, says Ward. This recognizes the fact that some other countries have carriers that are growing far more quickly than New Zealand's, and they represent opportunities for new service. Ward also believes that "constraining" ownership rules should be relaxed.

Meanwhile, the second initiative sees New Zealand's aviation authorities reforming a cumbersome rulemaking process, and looking to make greater use of industry partnerships as an alternative to introducing new rules.

The aim is to streamline the current process, which can take years to produce a rule and has caused a backlog. Regulators must "find a way to be more responsive," says Civil Aviation Authority (CAA) Chairman Nigel Gould. This will allow them to "quickly adjust to a changing [industry] environment."

Another goal is to "find a way to make regulations less burdensome," says Matthews. This will mean redesigning the way rules are developed. Before any rule is drafted, officials will need to "take a hard look at the regulatory impact," and ensure that benefits outweigh the costs, Matthews says.

There will also be a reduced reliance on rules. "The temptation is to immediately pull the rulemaking lever" to address any problem, but Matthews says there should be an effort to "encourage people to think more laterally about other ways to address issues."

The CAA expects to release options for a new regulatory framework in the first quarter of 2012, says Gould. Industry is being consulted, and any change will depend on "how receptive the industry is to taking more responsibility" for regulation.

The idea is to make the CAA "more of a partner [to the aviation industry] than a regulator or enforcer," says Gould. This means "looking at how things can be done rather than looking at a rulebook and saying they can't be done."

By increasing industry engagement, the CAA should be able to catch and correct problems before they become serious, instead of focusing on enforcement after a rule has been violated, says Gould. He wants the CAA to regard it as a failure if a problem results in litigation.

However, making the CAA more proactive and engaged with industry will require greater resources. A funding review is under way, and Gould anticipates that a "nominal" increase in fees will be needed. The agency is currently "under-resourced" for the new approach it is contemplating, says Gould.

A new approach to negotiations could bring more international service to New Zealand airports.

AUCKLAND AIRPORT

Latin Lia

LAN plans to replace part of its Boeing 767 fleet with 787s. They will initially operate out of Santiago, with other bases to follow.

JENS FLOTTAU/SANTIAGO, CHILE; and LIMA, PERU

With the merger between LAN Airlines and TAM Grupo now in the final stages of approval, Latin American commercial aviation is entering the next stage in its rapid development. The deal has already had a deep impact on competitors in the region and it will shift the balance of power between the global alliances in one of the world's major growth markets.

Latin American airlines have undergone fundamental change in only a few years, with many of the traditional carriers disappearing, the latest of them being Mexicana de Aviacion. At the same time, there are a few financially and operationally stronger carriers emerging, such as AviancaTaca International Airlines, Copa Airlines and the proposed Latam group combined of LAN and TAM.

Traffic in the region increased by 4.6% in the January-August period, according to statistics compiled by the Latin American and Caribbean Air Transport Association (ALTA). The figures are weighed down by the demise of Mexicana. Regional demand was particularly strong, with an increase of 8.1%, while domestic routes also saw growth of 7%. Traffic to destinations outside the region decreased by 0.9%, however.

The most significant strategic development in the region is the Latam merger. It is relevant beyond the region particularly because of its implications for the global airline alliances. One often overlooked point in the ruling on the deal by Chile's Tribunal for the Defense of Free Competition is a clear statement that Latam can "in no case" be a member of the same alliance as

ison

LAN-TAM merger will reset

global airline alliances

JOEPRIESAVIATION.NET

AviancaTaca. AviancaTaca and Copa are in the process of joining the Star Alliance and will likely become full members in May 2012.

LAN is a Oneworld member and TAM joined Star last year. The tribunal stated that the two have a two-year grace period following the completion of their merger to choose one alliance. However, Star Alliance officials indicate that they are pushing for a quick decision ahead of the planned joining of AviancaTaca.

LAN CEO Enrique Cueto says he has made clear to Star Alliance representatives well in advance of any regulatory decisions that his new group is in principle open to Star, SkyTeam or Oneworld, but that being in the same camp as its biggest regional competitor, AviancaTaca, "is strategically not reasonable. I told [Lufthansa CEO] Christoph Franz [at the International Air Transport Association annual general assembly] in Singapore that we are not going to be in the same alliance as AviancaTaca."

So far, all signs are that Oneworld can hope for considerable strengthening in Latin America with the addition of TAM. With Brazil representing 50% of the region's total air transport market, the shift in power would be huge. But so far, nothing is decided. "We will only start working with TAM on alliances once the merger is closed," says Cueto. "Until then, we are still competitors and don't have access to each other's numbers."

Franz, one of the most influential figures in Star, says a quick decision on the alliance's future Latin American partners is needed. That statement appears to be an indication that the group has still not given up on Latam and might even be prepared to make a last-minute 180-deg. turn.

On the one hand, the TAM deal is a continuation of the policy LAN adopted in 2000, when the airline's controlling shareholders, the Cueto family, decided "that we needed to grow outside of Chile," Cueto says. On the other hand, it is also a departure: this time, the family is not building up another operation from scratch in another country—as it did in Peru, Ecuador and Argentina—or buying into a small existing operation (such as Aires in Colombia). It is now trying to combine with an airline that is of a similar size, depending on how both are measured. In terms of market capitalization, LAN is impossible to beat, but TAM has more aircraft and the far bigger home market.

"We needed to have Brazil in our network. When you have the Sao Paulo hub and the TAM network, you are very strong," Cueto says. Latam will have a much better negotiating position vis-a-vis potential international partners, he says. "Even Emirates needs distribution in the region and we can offer that," he notes.

As surprising as the deal may have been to many, it has been in the making for a very long time. And the idea did not come from the Cuetos, but from TAM's former CEO, Rolim Amaro, who died in a helicopter crash in 2001. Amaro and Cueto got to know each other in meetings with other CEOs representing Latin American carriers. As it turned out, all but Cueto were also licensed helicopter pilots. The TAM CEO told his LAN colleague that he would send a helicopter down to Santiago with which Cueto could earn a pilot's license. Cueto has since become a passionate pilot and his private helicopter is often parked on the roof of the LAN headquarters building in Santiago.

Theirs was not only a personal friendship, but also a business relationship. Amaro initially wanted to join forces with struggling Varig, but luckily for TAM that did not happen. Cueto recalls that Amaro told him, "someday we will do something together."

It probably took many more years than the TAM founder anticipated, but the Amaro and Cueto families maintained a close relationship. The key people are Enrique and his brother Ignacio (LAN's chief operating officer)

JENS FLOTTAU/AW&ST

Enrique Cueto, LAN Airlines CEO

and Mauricio Rolim and Maria Claudia Amaro on the TAM side.

The top positions within the Latam group have been allocated. Mauricio Rolim Amaro will be Latam's chairman and Enrique Cueto will be CEO. Ignacio Cueto will become LAN CEO. Maria Claudia Amaro will remain TAM chairman and become a director of Latam. Marco Antonio Bologna will remain TAM CEO and Libano Barroso, currently CEO of TAM Linhas Aereas, will become Latam's chief financial officer. The two Cuetos are retaining their strong roles in daily management, while the two Amaros are focusing on oversight.

Enrique Cueto says the families will continue to play an important role in the airline for the long run, noting that "the family companies are doing a good

job because they bring up good people."

That is not only true for LAN and TAM, but also for the owners of Gol (the Oliveira family) and AviancaTaca (German Efromovich and Roberto Kriete), although in the latter case, it is the two men rather than their families that are primarily involved in running the airlines.

So what will be the keys to Latam's success? First, the smooth integration and growth of subsidiaries in various countries; second, the group-wide roll out of the Cueto-style hands-on management; and third, further development of the already successful cargo business.

Cargo's importance to Latam is not immediately obvious to the outsider, but of the $390 million in annual synergies that Latam now expects to realize in combining the two carriers, more than $100 million comes from the cargo side of the business alone. Freight has been hugely important for LAN at least since the Cuetos bought the company from the government in 1994. The family's first initiative in the aviation world was founding cargo operator Fast Air, which was later folded into LAN Cargo. Today, one third of the LAN group's revenues are derived from the cargo business, far above the average in comparable airline groups globally.

TAM, by contrast, has been focusing on the passenger side. While there is still much potential to be realized, it is not clear how that will be accomplished. "We have not yet decided how we will cooperate with TAM; we don't know the model yet," says LAN Cargo CEO Cristian Ureta. For the carrier, the combination with TAM is a huge asset as it now has access to a much broader domestic and international network from Brazil.

LAN Cargo is also important to Latam as the blueprint for the passenger side's development and future direction. No other airline has such an international setup: less than 10% of LAN Cargo's business touches Chile, its legal home base. Its hub is Miami. To be able to serve important submarkets, the airline has set up ABSA Cargo in Brazil, MAS Air in Mexico and Lanco in Colombia. Only four of its 12 Boeing 767Fs and two 777Fs fly in LAN Cargo livery.

Furthermore, many LAN group executives started their careers in the cargo division, and parts of the cargo strategy have been emulated with the aim of fostering growth.

LAN Airlines' subsidiaries in Peru and Ecuador are flourishing and LAN Argentina would be growing more aggressively if not for government protection of unprofitable Aerolineas Argentinas. In the region's second-biggest market, Colombia, the group acquired low-fare carrier Aires, which it is in the process of turning into LAN Colombia. LAN plans to replace all of the

Changing States

Government policies help and hinder airline industry growth in Latin America

JENS FLOTTAU/QUITO, ECUADOR; and BOGOTA, COLOMBIA

Air traffic is growing fast in most of Latin America, but vastly differing economic policies, ranging from strict state control to open markets, are still a major hurdle for air transport in parts of the region.

Ecuador is the latest country to initiate a state-driven reform of its airline industry. In the past, much support was focused on TAME, the quasi-national carrier that was operated until recently by the military. While the leftist government is not willing to give up on the concept of deep interference with the airline market, it is at least starting to relinquish control of TAME. "We believe that support should not be limited to one airline," says Carlos Jacome Utreras, undersecretary of transport in the transport ministry and president of the national council of civil aviation.

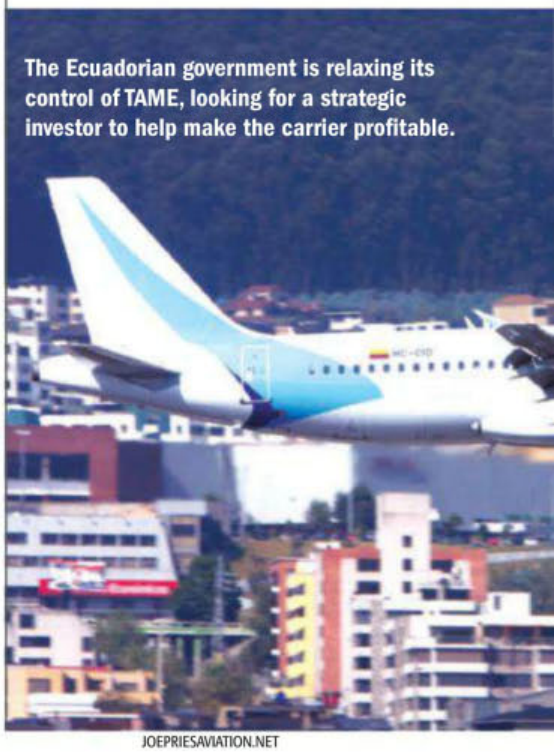
TAME's military ownership status limited its scheduled services—it could not fly to the U.S., for instance—but now a 49% stake in the airline is up for sale and international partners are being sought. The government will retain control of the other 51% of TAME.

Transforming the unprofitable carrier will not be easy—it must put in place information technology systems that will allow it to code-share with other airlines and deep cuts to the workforce are needed, as independent experts consider TAME significantly overstaffed. The list of potential investors is short, as well, because two already operate competing airlines in Ecuador: LAN Ecuador, part of the LAN group, and Aerogal, which is being integrated into AviancaTaca through the Synergy Group.

A second cornerstone in the country's emerging aviation policy is the use of air transport as a catalyst for regional development. "We are trying to improve connections inside Ecuador to support economic growth," says Utreras.

The government has been giving airlines access to lower-cost financing to promote fleet renewal and at the same time greatly subsidizing fuel for domestic routes. Those supports end this year and now "the terms for incentives are being redefined," according to Utreras.

One part of the new aviation policy is a government-guaranteed $35 per-sector fare on domestic regional services. TAME is beginning to operate three ATR-42s that it was given by the state to fly on the subsidized routes. Landing fees and fuel costs will also be reduced at the country's small airports and air-



The Ecuadorian government is relaxing its control of TAME, looking for a strategic investor to help make the carrier profitable.

JOEPRIESAVIATION.NET

Aires Boeing 737s with Airbus A320s. It is not clear what LAN will do with Aires' Bombardier Q400 fleet, as LAN operates no regional aircraft across its network.

Peru could be a good example for how things might evolve in Colombia, too. LAN entered the market in 2000 and struggled at first. "We made a lot of mistakes in Peru," says Cueto. "Among others, we picked the wrong partners initially." But now LAN Peru dominates the country's airline industry, with a 61% market share domestically and 44% on international routes. The unit has 30 aircraft—22 Airbus A319s and eight Boeing 767s—and will be among the first LAN divisions to receive Boeing 787s for its long-haul operations.

LAN's businesses are split across several divisions: the domestic networks work with separate management and have profit-and-loss responsibility; the international network is managed from Santiago. All long-haul aircraft are registered in Chile, but they move seamlessly through the system. For example, a Boeing 767 could fly a LAN Airlines (Chile) service via Lima to New York and from there a LAN Ecuador flight to Guayaquil before ending up in Lima as a LAN Peru service to Madrid. Because of union restrictions, crews are always based in the countries of a flight's origin. And, with Argentina's stricter aviation policies, the country does not allow foreign-registered aircraft on domestic routes. LAN Cargo is also based in Santiago, but CEO Ureta has dual offices in Santiago and Miami and the unit's chief operating officer works out of Miami.

"We have a very detailed briefing with the Cuetos in Santiago on the first Tuesday of every month," says Manuel van Oordt, vice president for marketing and sales at LAN Peru. "It spans several hours and goes into details like the load factor on a particular route on a particular day." The policy is also not to continue flying unprofitable routes for strategic reasons, but to cut capacity when losses become too large. The going has been tough for LAN in the last two years, especially in Peru, where it faces decreasing overall fare levels and competition from new low-fare entrants.

The challenge with the Latam integration is that the Cuetos' influence cannot pervade the organization as it has at LAN and its affiliates. TAM has taken years to adapt since the death of Rolim Amaro in 2001, which has weakened its corporate culture somewhat, though it appears to be on a more stable path now after many management changes at the top. In the end, if Latam is to be successful, Rolim Amaro's foresight and legacy will have to be complemented by the culture brought by his friends from Santiago.

fields to encourage new flights there.

"Airline service should be affordable, like land service," says Utreras. "We want to open up the airline market to the middle and lower middle classes."

For larger markets, such as Guayaquil-Quito or Quito-Cuenca, the government would like to see more low-fare competition, although exactly how it would foster competitors remains to be determined. The future of Quito-based Boeing 737-200 operator Icaro appears to be similarly uncertain and Air Cuenca has already stopped flying.

In contrast to Ecuador, Colombia has seen little direct state interference with its airline industry, and the country is now the second-biggest air transport market in Latin America behind Brazil.

"Policies of the Uribe administration have led to the state restoring order," says Ralph Etzold, chief operating officer at Bogota El Dorado International Airport. "Security has been reinstated at least in the big cities," following many years of seemingly uncontrolled violence by the drug cartels. While that chapter of Colombia's history has not quite drawn to a close, "there is a growing willingness to look at foreign investment in Colombia again," Etzold says.

Without incentives like Ecuador's, the Colombian airline industry has made air travel as affordable as land transport simply by lowering fares. "Aires has pulled the people out of the overland busses," Etzold says. However, the previous growth rates on domestic routes are unlikely to be sustainable following the takeover of Aires by LAN and its relaunch as LAN Colombia.

Colombia's neighbor to the east, Venezuela, and Argentina are the sleeping giants of the regional air transport market, but they are showing no sign of waking up. Argentina's recently reelected president, Cristina Fernandez de Kirchner, is continuing with a highly protectionist policy that affects all sectors of the economy. Aerolineas Argentinas became state-owned again in 2008 after almost two decades as a private company. In 2010, the carrier lost $486 million on revenues of just $1.17 billion. In 2008, the loss ($942.7 million) was almost as high as total revenues ($1 billion).

Critics say the airline is highly inefficient and overstaffed, but the government and its strong unions are blocking reform efforts. Aerolineas Argentinas is in the process of becoming a member of the SkyTeam alliance and it proposed a code-sharing deal with Brazilian airline Gol Linhas Aereas Inteligentes.

At the same time, it is very difficult for competitors to thrive in Argentina. The LAN Argentina subsidiary operates 10 Airbus A320s and two Boeing 767-300ERs that it had to register in the country, which is not the policy elsewhere in Latin America. And the group has found it almost impossible to obtain more traffic rights. "Argentina has told us they need time to rebuild Aerolineas, so we are growing more slowly than we want to," says a LAN official.

Argentina is a country of 40 million people spread over long distances, so the potential market for airlines is huge. But for the moment it is only exemplifying an economic policy that other parts of Latin America have long left behind.

AGENCIA BRASIL

Two's Company

Both GOL and TAM vie to maintain their positions as Brazil's two largest operators

DARREN SHANNON/WASHINGTON

It has been an eventful year for Brazil's two largest carriers, marked with consolidation efforts both at home and abroad and continued expansion, albeit at a more conservative rate than planned.

Despite the best efforts of Brazil's many start-ups (see p. 55) the domestic market is dominated by Grupo TAM and GOL Linhas Aereas Inteligentes, which combined provide close to 80% of the country's air services. And while organic growth is powering some of this dominance, the two airlines are also trying to acquire new capacity to maintain their positions.

TAM's proposed merger with Chile's LAN Airlines aside, the airline this year has made two significant moves to bolster its position as the country's largest operator—namely, the overhaul of its Pantanal operation, which was purchased in 2010, and a proposed investment in startup TRIP Linhas Aereas.

Both decisions are connected. The move to drop Pantanal's ATR 42-300 fleet in favor of the Airbus narrowbodies that form the core of TAM's mainline fleet not only brought the carrier further into the parent company's fold, it also pushed some smaller-capacity routes to TRIP, which operates Embraer E-Jets. At the same time, TAM completed due diligence for its proposed 31% purchase of TRIP's capital stock and proceeded with an information-technology integration that allowed the two operators to expand a code-share accord.

TAM is evaluating this code share, and could purchase a stake in Brazil's fifth largest airline by year-end.

GOL, meanwhile, has been busily preparing a $196.5 million takeover of Webjet Linhas Aereas to defend against TAM's expansion. GOL says the deal, which is still under regulatory review, will automatically provide it access to a low-cost operation focused on price-sensitive leisure passengers and a network reflecting the demands of Brazil's largest tour operator, which is owned by the same holding company that is selling Webjet.

According to GOL, this will allow it to vault over TAM to become the largest operator within Brazil; while that is dependent on the metric used, it does at the very least provide GOL with five more percentage points of a buoyant market.

Brazil, while still promising the best growth of any country detailed in the International Air Transport Association's latest forecast, is starting to show some signs of stress as competition between the two giants and from start-ups begins to tighten yields. Both responded quickly, with TAM halting a fleet growth scheduled for 2012 and replacing four-engine Airbus A340s assigned to some European routes with smaller, twin-engine A330s. GOL, meanwhile, under more pressure from investors, went further with a dramatic cost-cutting initiative that includes the early return of leased Boeing 767s and a major revision to the maintenance, repair and overhaul outsourcing contract it has with the U.S.'s Delta TechOps.

Brazil's two main airlines are taking various measures to ensure they retain their market dominance.

But this is Brazil, and even with these measures, both GOL and TAM expect demand to grow by double digits in 2012. GOL's capacity at the same time will increase 7% in 2012, in part through an aircraft utilization rate in excess of 13 hr. a day. TAM has yet to release its 2012 guidance.

International growth has taken a back seat in 2012, due primarily to TAM's proposed merger with Chile's LAN Airlines. As it stands, TAM retains, and will continue to retain, control of the vast majority of capacity as Brazil readies for the combined traffic booms of the 2014 FIFA World Cup and the 2016 Summer Olympics.

Much is expected from these quadrennial events, with TAM forecasting 2.5 million additional passengers during the 45-day World Cup alone. Importantly, TAM also expects a residual benefit of 500,000 passengers a year once the World Cup passes.

TAM asserts that it has a fleet plan to meet these higher traffic numbers, which during the World Cup will mirror 2020 forecasts, and GOL says it is ready for the increased demand. And while Brazil's aviation infrastructure continues to be criticized, officially the two airlines say they expect no problems.

Some evidence for the optimism was provided earlier this year when Brazil's government issued its first concession bid at Sao Goncalo do Amarante Airport, and plans are being readied for privatization programs at three more airports, including Sao Paulo's Guarulhos International.

Should this program succeed, TAM and GOL will be able to further cement their positions in the region, but hopefully with provision for further growth for the country's fledgling startup sector.

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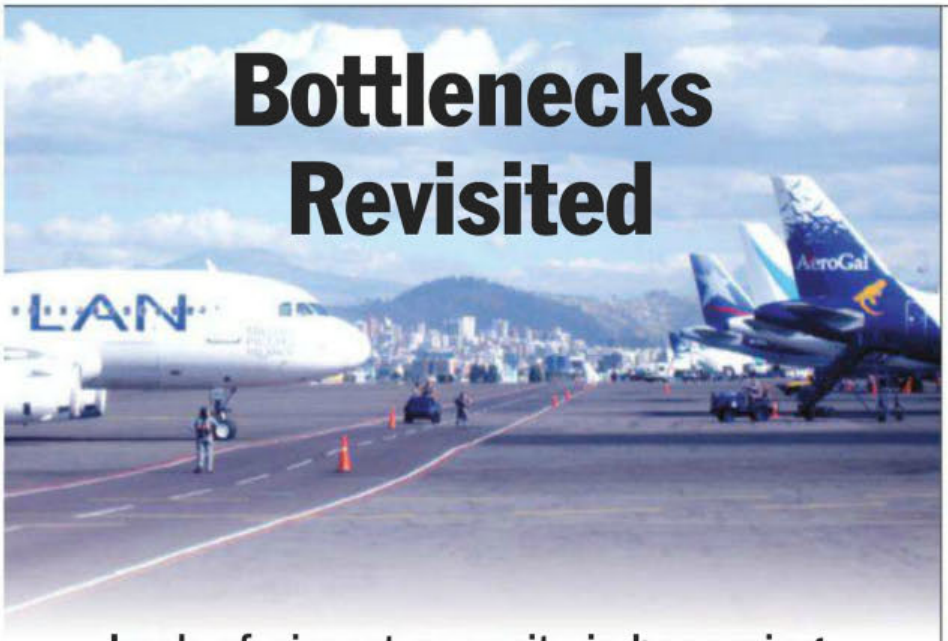
JENS FLOTTAU/AW&ST

Bottlenecks Revisited



A LAN Ecuador Airbus A320 makes the last turn to its parking area at Quito Airport. The city's new airport is opening next year and will provide more capacity.

Lack of airport capacity is becoming a major concern across Latin America

JENS FLOTTAU/LIMA, PERU; and BOGOTA, COLOMBIA

In many cases, Latin American airlines may be fierce competitors, but most of them have one thing in common—bad infrastructure. And there is no short-term relief in sight.

Airports are quickly becoming a nagging bottleneck as the region's airlines continue their fast-paced growth. The capacity shortfall is seen in almost all major markets, even where facilities are partially privatized. Even though renovation projects are under way in some locations, their completion may be too late to satisfy airline customers.

The biggest concern involves the largest market, Brazil. The country is hosting the soccer world championship in 2014 and the Summer Olympics in 2016. Its airports—which are in desperate need of upgrades—are owned and operated by Infraero, a government organization. While there have been studies related to building an all-new airport for Sao Paulo, Brazil's economic center, most observers now suggest that such an undertaking is unrealistic and too time-consuming.

Instead, the focus is on a fundamental revamp of Sao Paulo's Guarulhos International Airport. The government has launched a tender process for a concession that would be held by an expert airport operator for a defined time period. The operator will be required to provide the needed capacity increase. That constitutes a big challenge at the cramped and overcrowded airport, particularly if disruptions to routine operations are to be kept to a minimum. There is hardly space to build an additional terminal next to the existing facilities. And airport operators have already indicated that it will be all but impossible to meet the 2014 target date for the initial phase of expansion.

In addition to Guarulhos, privatization initially will include Viracopos-Campinas International and Brasilia International airports. A 51% stake in the three facilities is to be sold, with Infraero retaining the remaining 49%. A decision on the winning bids is slated to be made by May 2012.

Sao Paulo is facing an even greater capacity challenge with its domestic downtown airport Congonhas. The facility is surrounded by residential and business areas, starting right on the other side of the airport fence, and has no more room to grow. Following severe accidents such as a fatal TAM Airlines Airbus A320 runway overrun in 2007, the public debate about relocating the airport heated up again, but there is no alternative on the horizon.

The existence of a domestic and an international airport has forced TAM and the other Brazilian carriers to split their operations, and makes the building of a connecting hub much more difficult. The same is true for Rio de Janeiro, where most domestic flights are handled at the spectacular Santos Dumont Airport right next to Sugar Loaf Mountain, whereas international services depart at Galeao, also an outdated facility.

While these problems are most apparent in Brazil, they are not limited to it. In Colombia, Avianca and its competitors—such as Copa Colombia or LAN Colombia (formerly Aires)—confront the shortcomings of Bogotá's international airport every day. The existing terminal is much too small, and the access roads are also inadequate. Although the airport has two runways, the longer one is closed at night for noise abatement. Long-haul services have to depart from the shorter runway, but can only do so in one direction because of the high mountains nearby. Bogota itself is already at an altitude of 8,600 ft., a situation that leads to frequent delays.

A new terminal is under construction but will "already be too small" when it becomes available, declares AviancaTaca CEO Fabio Villegas. The building is slated to be opened in mid-2012 but the schedule might not be met. There are also constraints in the way the concession has been granted to a consortium led by Zurich Airport. The agreement covers the existing and the new international terminal but not Avianca's domestic departure gates. Any expansion beyond the foreseen construction would have to be negotiated from scratch, and any discussions are expected to be difficult as they would have an influence on the business model and profitability of the existing concession. There are already unconfirmed rumors that Zurich Airport might withdraw.

In Lima, Peru, the concession—to Lima Airport Partners, a Fraport-led consortium—is clearer and covers the entire airport, but that does not mean airlines are pleased. The existing terminal is operating at or beyond capacity in peak times; the scarcity of gates and subsequent morning hubs by LAN Peru and Taca Peru make the system prone to delays.

Airlines have been demanding access to more capacity at Lima more quickly, but they will have to wait at least five more years. By 2013, the airport expects to begin construction of a new terminal to the east of the existing runway. A second runway will follow even later.

MARIO ROBERTO DURAN ORTIZ

Out of the Blue

Brazilian regional carrier finds success with an unusual business model

JENS FLOTTAU/FRANKFURT and LONDON

Regional aircraft and low-cost flying do not match well, according to conventional wisdom. But Azul Lineas Aereas Brasilieras is proving the contrary.

Established in 2008 by former JetBlue CEO David Neeleman, who was born in Brazil, Azul is based at Viracopos Airport in Campinas, 50 mi. northwest of the country's economic center, Sao Paulo. Viracopos was Brazil's first big international airport, displaced in that role in 1985 by Guarulhos, which is less than 20 mi. northeast of the city center. Viracopos was used primarily as a major cargo airport for many years, but since Azul started operations there three years ago, things have changed quickly.

"We were about creating a new market," says Azul's chief commercial officer, Trey Urbahn, who is also a former JetBlue executive. "The market was ripe for a new entrant; it was significantly underserved."

Following the demise of several of the country's traditional airlines, including Varig and Vasp, there were only two large carriers left, Gol Linhas Aereas Inteligentes (including some parts of the old Varig) and TAM. Both operate fleets of mainline aircraft such as the Boeing 737-800 (Gol) and the Airbus A320 family (TAM), and their networks are hub-and-spoke to the extent possible in a country with two main airports each in Sao Paulo and Rio de Janeiro, three of which have considerable capacity constraints.

REUTERS/LANDOV FILE PHOTO

Following his departure from JetBlue Airways, David Neeleman set up Azul three years ago.

Urbahn argues that the aircraft flown by TAM and Gol are too large for the market. The average domestic aircraft in Brazil has 142 seats, compared to 111 in the U.S. And in 2000, 200 destinations in Brazil were served, but that number has declined to 128 now.

In contrast to TAM and Gol, Azul flies Embraer 190s and 195s and ATR-72s. Its 33 190s and 195s are equipped with 106 and 118 seats, respectively, which allows the airline to operate at a load factor better than 85%. Azul offers connecting services, "but we build the network based on origin and destination traffic,"

Azul operates the Embraer 195 at very high load factors and achieves the highest daily utilization worldwide.

Urbahn says. The E-Jets fly an average of 13 block hours per day, the highest utilization worldwide.

In late October, Azul placed an order for another 11 Embraer 195s, bringing its total E-Jet commitment to 52 aircraft. It also has bought 30 ATR 72-600s, the first of which was delivered last month.

The airline has 120 daily departures at Viracopos alone, "but we can easily foresee 250 per day," Urbahn says. Azul expects to fly 10 million passengers next year. Being far outside of Sao Paulo is not seen as much of a disadvantage because heavy traffic in the city makes travel times to the other two airports unpredictable, and economic growth is not limited to the city alone. Campinas, too, is sharing in Brazil's economic success and Urbahn says Azul sees "huge pent-up demand."

Azul is offering fares discounted by as much as 70% for 30-day advance purchases, a strategy that is taking a lot of traffic away from the country's traditionally most popular mode of transport, the overland bus system. But the airline and its competitors are also benefitting from a growing middle class; 51% of the population is middle class now, up from 38% in 2000.

While the move to operate ATRs is very unusual for an airline such as Azul, Urbahn says the aircraft "allowed us to get into much smaller markets that gave us access to much higher fares."

Next year, the carrier will introduce 36-channel live TV across its fleet, which will cost an additional $1 per passenger, "but it will create a higher revenue premium," Urbahn says.

Poised for Partners

Proximity is a decisive factor in maintenance choices as the price of fuel remains high

LEE ANN TEGTMEIER/WASHINGTON

Fuel costs could be driving more airline aftermarket work to vendors closer to operators' home bases. Although 82% of all airline maintenance, repair and overhaul (MRO) is outsourced, according to TeamSAI, only 21% leaves an operator's region.

While "geography is not a prime consideration in the decision process" for selecting maintenance vendors, it "clearly can impact costs both positively and negatively," says Delta Air Lines spokesperson Ashley Black.

The proximity of SkyTeam alliance partners Aeromexico and Delta certainly has fostered the expansion of its maintenance relationship, which is evolving to include a jointly owned and operated maintenance facility in Mexico. The airlines are in the final stages of completing their agreement. The facility will likely be located at Aeromexico's bases in Mexico City or Guadalajara and should be operational by the beginning of the third quarter of 2012.

"The facility will include seven maintenance bays for the already outsourced heavy airframe maintenance on narrowbody and widebody aircraft for Delta, as well as airframe maintenance for Aeromexico and independent third-party operators," says Black.

Rather than foster joint-venture projects between airlines, TAP Maintenance and Engineering Brazil expects to see more partnerships between OEMs and MROs, prompted by manufacturers' increased presence in the market, says Anderson Fenocchio, the company's business development director.

Many of TAP's largest customers—Webjet Linhas Aereas, GOL Linhas Aereas Inteligentes and Azul Linhas Aereas Brasileiras—are based in Brazil but others, such as Air Transat and Centurion Air Cargo, are based in North America.

TAP services several Embraer aircraft, but it does not yet have ATR capability. Considering customer Azul has ordered 30 more ATR 72-600s, with options for another 10, this might be the next OEM certification TAP will pursue.

TAP's Brazilian hangars and backshops are about 75% full, but Fenocchio forecasts an average of 80-85% for 2012.

In Costa Rica, independent maintenance facility Coopesa forged a partnership with Timco Aviation Services in the U.S. to give Timco customers the option of maintaining their aircraft in Costa Rica, where labor rates are slightly lower. Spirit Airlines sent a few aircraft there this year and has booked two lines of maintenance for 2012. Coopesa also booked some Boeing 737 C checks with Copa Airlines for next year. Copa, which used to be a customer of ST Aerospace in Panama, started sending a few 737s to Coopesa earlier this year.

Coopesa also has slots reserved for Cayman Airways, Canadian North, DHL Aeroexpresso, Vivaaerobus and Gecas in 2012. It is just finishing two Airbus A319 C checks for Tame of Ecuador.

As of early November, TeamSAI says the Latin American and Caribbean fleet consists of 1,404 aircraft, which is a 1.9% increase since January. The consultancy values the MRO market in the region at $2.1 billion.

TAP AIR PORTUGAL

Heavy maintenance on Boeing 737s, Embraer jets and Airbus A330 aircraft are generating the most volume of work for TAP Maintenance and Engineering Brazil, followed by landing gear MRO.

Roller-Coaster Results

Updated TPA study shows airline industry on the cusp of another slide

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Cathay Pacific, like other Asia-Pacific carriers, saw its score fall in the mid-term update of Aviation Week's TPA study.

ADRIAN SCHOFIELD

The global airline industry appears to have passed its latest financial peak, and the billion-dollar question now is how far—and how quickly—it will fall before bouncing back. Airlines will be hoping that the dip is a brief one, but the cyclical history of this industry shows that a sustained drop is just as likely.

The latest mid-term update to Aviation Week's Top-Performing Airlines (TPA) study reveals that the median score in the mainline/legacy category has leveled out and begun to decline, following two years of strong growth (see graph). The median score for the category dropped to 56 by the end of June 2011, compared with 58 at the end of 2010. While this is still far above the level of the last trough in 2008, it does represent a change in momentum.

All TPA scores are based on operational and financial data from the trailing 12-month period, for publicly traded airlines only. A full TPA study is completed annually; this year's report was published in July using data through the end of 2010 (*AW&ST* July 11, pp. 40-48). The mid-term update is designed to give a snapshot of industry dynamics halfway between the full TPA reports.

The overall trend in the mid-term update echoes recent financial forecasts by the International Air Transport Association (IATA). The airline group estimates that 2010 was the peak year for profitability in the current industry cycle. The industry collectively is expected to earn a profit of $6.9 billion this year, but this is down from the $16 billion profit in 2010. The 2012 profit is expected to fall further to $4.9 billion, IATA says.

It is instructive to look at the momentum of recovery since 2008, says TPA Project Manager Michael Lowry. The year-on-year percentage increase in overall scores was smaller in 2010 than in 2009, and as in the IATA forecast, 2010 appears to have been the high-water mark. This points to a disturbingly brief recovery period after a painful downturn.

The regional breakdown of the June 2011 results shows some surprising variations. In the last full TPA study, the Asia-Pacific, North America and Latin America regions were strongest, with Europe lagging. But in the new mid-term report, Europe is the only region with its median TPA score still growing—albeit at a slower pace—while the others are seeing a decline.

This trend is also apparent in the updated top-10 rankings. Singapore Airlines is still ranked first, although its total score has declined. Cathay Pacific's score, previously the second-highest, has plummeted 14 points to 69. Almost all the Asia-Pacific carriers in the mainline category have seen their scores drop.

Most European carriers, meanwhile, have boosted their scores. Lufthansa has climbed to fourth place, and SAS and Finnair have reappeared in the top 10 after healthy increases in their scores.

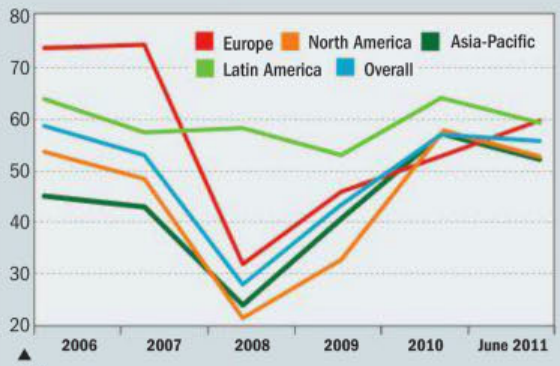
This is one of the most interesting trends to emerge from this TPA update. Conventional wisdom suggests that the European airlines would be suffering most since this is where the greatest economic turbulence has occurred. However, several European carriers have risen in the rankings. IATA notes in its latest forecast that while the outlook is not good for Europe, passenger demand has held up better than expected. This is partly due to a weaker euro that is boosting inbound tourism and exports.

At the same time, a global cargo decline is hurting the Asia-Pacific carriers, since they rely more heavily on freight. Lowry says that many of the Asian carriers "operate from export-driven countries that are struggling with market slowdowns in the U.S. and Europe."

Lowry expects to see "further softness" in the second half of 2011, and this will likely mean median scores in all regions will be down from 2010 levels in the next full TPA study. "Lower median results for Europe are in the cards, but probably lagging the declines we will see from the other regions," says Lowry.

TPA Median Scores

by region, mainline/legacy category



▲ **TPA scores**

2006–2010 use full-year data, and 2011 uses 12 months ending June 30.

Source: Aviation Week TPA Studies

Aviation Week Intelligence Network subscribers can see more on the mid-term update at the Top-Performing Airlines website, **AviationWeek.com/awin/tpa** *This includes new analysis on low-cost carrier trends, and revised top-10 lists for mainline, LCC and regional categories. This site also features rankings, score breakdowns and analysis from the last full TPA report, which was released in July.*

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Electronics	ATGI	HiRAT (Hi-Powered Ram Air Turbine)
	Becker Avionics Inc.	DB406/ PDB406
	Infotech Enterprises Limited	Explosion Proof Enclosure of PACK CONTROL UNIT of air-conditioning system
	Luciol Instruments	LOR-220
	Lufthansa Technik	aerosight
	PacketDigital LLC	PowerSage Power Management Integrated Circuits
	Sandel Corporation	HeliTAWS
Manufacturing Processes	Eclypse International Corporation	Intermittent Symptom Failure Detection & Location Capability
	Makino, Inc.	ADVANTiGE
Other	Clearfix Aerospace	Clearfix Aerospace Catalyzed Window Repair System
	Hydronalix, Inc.	Hydronalix Hurricane Tracker
	Industrial Technology Research Institute	REDDEX
Other Process Innovation	AdducentTechnology, Inc.	AeroProbe Electronic Tool Detection System
	Delta Sigma Corporation	ProjectionWorks
	Elixair International LTD	SkyMill Revolution
	IBM	Digital Information Archiving System for PLM
Power and Propulsion	AV&R Vision and Robotics	Automated Blade Leading and Trailing Edge Profiling System
	Fraunhofer ILT	Additive BLISK
Sensors	Impact Technologies LLC	LUCAS - Lubricant Condition Assessment System
	Logos Technologies Inc.	Lightweight Expeditionary Airborne Persistent Surveillance (LEAPS) System
Service Innovation	Air New Zealand Technical Operations	A320 MLG Retraction Actuator Jack In-Situ Boring and Spotfacing Tool
	Jackson Aircraft Weighing Service	Large Jet Scales
	Row 44 Inc.	In-flight Broadband Entertainment Platform
	VAS Aero Services LLC	Aviation Parts Outlet
Software	AGI	Satellite AR
	BridgeNet International	VOLANS
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	Object Computing Inc.	OpenDDS Model Driven Tool Kit

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Generational Shift

A wave of new aircraft programs is under way that will help define the next era of the global airline industry. The first of these aircraft types are entering revenue service, and will accelerate the phase-out of some iconic current-generation commercial aircraft models.

Boeing in particular will look back at 2011 as a transitional year. The first Boeing 787 was finally delivered on Sept. 26 to launch customer All Nippon Airways (ANA), which is flying its initial 787-8s on short-haul routes.

As soon as this milestone was achieved, however, attention shifted to the extended 787-9 variant. A timetable slip means launch customer Air New Zealand is now due to receive the first -9 in early 2014, compared to the previous target of December 2013.

A few weeks after ANA received its 787, Boeing delivered the first 747-8 Freighter to launch customer Cargolux. This did not occur without drama, however. The handover was delayed three weeks after Cargolux initially rejected delivery of the -8F due to contractual issues regarding fuel-efficiency targets.

Airbus has also had schedule problems with one of its marquee products. The Airbus A350, which will compete against Boeing's 777 and 787, is due for first delivery in early 2014, several months behind the original target of late 2013. Meanwhile, the aircraft that helped start the current wave of new programs, the A380, is now in its fifth year of operation.

On the narrowbody front, Airbus and Boeing have both moved to upgrade their popular lineups. Airbus was first out of the gate with its NEO (New Engine Option) line of A320 aircraft, announced almost a year ago, with deliveries set to begin in 2015. Boeing followed with the announcement in August of its 737 MAX program, first deliveries of which are slated for 2017.

Beyond these two aerospace giants, regional jet and narrowbody development efforts continue around the globe. The base model in Bombardier's CSeries family is expected to enter service in 2013, the Mitsubishi Regional Jet in 2014 and Comac's C919 narrowbody in 2016. Deliveries of the Sukhoi Superjet 100 began this year.

Global economic uncertainty could potentially dampen airline order activity and provide further challenges for programs that are struggling to attract customers. For most of the big-ticket programs, however, backlogs are healthy enough to weather another demand downturn.

The following profiles were compiled by Forecast International, a leading resource of data for Aerospace 2012, which will be published Jan. 23.

—Adrian Schofield

Airbus A318 The A318 is a twin-engine, 107-132-passenger narrowbody jetliner. Initial flight occurred in January 2002. In May 2003, the A318 (with CFM56 engines) was certificated by the European Joint Aviation Authorities (JAA); FAA certification followed a month later. Deliveries began in July 2003. Through 2010, Airbus produced 74 A318s. The A318 is powered by two 21,600-23,800-lb.-thrust turbofan engines, either the Pratt & Whitney PW6000 or the CFM International CFM56-5B. Primary competitors are the Embraer 190 and 195 and Bombardier CSeries. Thirty additional A318s are forecast for production through 2020.

Airbus A319/A320/A321 These models, along with the A318, make up Airbus's A320 family of twin-turbofan, narrowbody airliners. The initial model in the series was the A320, which made its first flight in February 1987. A320 deliveries began in 1988, followed by deliveries of the stretched A321 in 1994 and shortened A319 in 1996. All three original models are available with a choice of either CFM International CFM56 or International Aero Engines V2500 engines. The A319 typically seats 124 passengers, the A320 carries 150 and the A321 seats 185. Through 2010, Airbus produced 1,229 A319s, 2,562 A320s and 609 A321s. An additional 73 A319-derived ACJs (Airbus Corporate Jet) were also produced. Direct competitors for the A320 family are the Boeing 737 series and Bombardier CSeries.

Airbus A319/A320/A321NEO In December 2010, Airbus announced that it was launching the NEO (new engine option) line of reengined A320 family aircraft. The NEO variants are offered with either Pratt & Whitney PW1100G or CFM International Leap-X engines. Deliveries are scheduled to begin in 2015. Airbus will continue to offer its baseline A319/A320/A321 models (with the traditional engine options). Including baseline and NEO models, production of 5,251 A319/A320/A321 aircraft is forecast for 2011-20.

Airbus A330 The A330 twin-engine, widebody commercial passenger transport was developed by Airbus to replace aircraft such as the A300, DC-10-10 and L-1011. An A330 prototype first flew in November 1992. Deliveries began in December 1993. Customers have a choice of turbofan engines in the 64,000-72,000-lb.-thrust class: the GE CF6-80E1, Pratt & Whitney PW4000 or Rolls-Royce Trent 700. Three A330 models are available. The A330-300 seats 335 passengers in two classes or 295 in three classes. The -200 seats 293 in two classes or 253 in three. In 2010, deliveries began for the -200F freighter. Through 2010, 421 A330-200s, 321 A330-300s and six A330-200Fs were produced. Production of 483 A330-200/300s and 100 -200Fs is forecast for 2011-20, but the passenger models are likely to be phased out in favor of the new A350XWB. Direct competitors are the Boeing 767 and 787.

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Airbus A340 The A340 is a four-engine, intercontinental widebody commercial transport aircraft. A prototype flew in October 1991, and deliveries began in January 1993. The A340-200 and -300 were certificated by the European Joint Aviation Authorities in December 1992 and FAA in February 1993. Both are powered by four 31,200-34,000-lb.-thrust CFM International CFM56-5C4 turbofan engines. Two newer models, the longer-range -500 and stretched -600, are powered by Rolls-Royce Trent 500s. Typical seating for the -200, -300, -500 and -600 is 262, 295, 313 and 380 passengers, respectively. Airbus delivered 376 A340s through 2010.

Airbus A350XWB Currently in development, the A350XWB is a twin-engine, widebody jetliner intended to compete with Boeing's 787 and 777. The XWB will be powered by Rolls-Royce Trent XWB engines rated at 74,000-92,000 lb. thrust and will have a cruise speed around Mach 0.85. Three basic versions are being marketed: the -800, -900 and -1000. Depending on version, the XWB seats 270-350 and will have a range of 8,000-8,500 nm. An ultra-long-range -900R and freighter, -900F, are also to be available. The A350XWB is scheduled to fly in 2013 and enter service in 2014. Production of 662 aircraft is forecast through 2020.

Airbus A380 In developing the 525-passenger A380, Airbus chose to leap past Boeing's 747 in capacity class. Boeing is marketing the 747-8 to indirectly compete with the A380, but no direct competition exists in the 500-plus-seat market. The A380 is powered by four turbofan engines rated at 70,000-76,500 lb. thrust each, and can be outfitted with either the Rolls-Royce Trent 900 or GE/Pratt & Whitney Engine Alliance GP7200. Airbus currently produces only a passenger version of the A380, delaying development of a freighter version until at least 2014. First flight occurred in 2005, with 45 A380s produced through 2010. Production of 301 is forecast for 2011-20.

Airbus Military C212 The C212 made its first flight in March 1971 and deliveries began in May 1974. It is built in Spain by Airbus Military (formerly known as EADS CASA) and under license in Indonesia by Indonesian Aerospace (IAe). Approximately 474 C212s (of all versions) were built through 2010. The C212 is an unpressurized 21-28-passenger regional turboprop. The C212-200 is powered by two Honeywell TPE331-10R-511C or -512C turboprop engines rated at 900 shp each. The C212-300 used two TPE331-10R-513C turboprops, also rated at 900 shp each. The latest model, the C212-400, uses two TPE331-12JR-701C engines rated at 925 shp each. Airbus Military now builds only the -400 version, which received Spanish certification in 1998. IAe builds the NC212-200 model in Indonesia and may eventually assume production and final assembly responsibility for the C212-400. The build forecast sees 26 new C212s in 2011-20.

Antonov An-28/An-38/PZL M28 The An-28 and An-38 are twin-turboprop utility/transport aircraft. First flight of the An-28 occurred in 1969, with temporary Soviet certification following in 1978 and full certification in 1986. A Westernized version of the An-28, the M28, made its first flight in 1993 and received FAA certification in 2004. A stretched An-28, the An-38, made its first flight in 1994 and received Russian certification in 1997. The An-28 is powered by two PZL Rzeszow TWD-10B/PZL-10S engines, while Pratt & Whitney Canada PT6A-65B engines power the M28. The An-38-100/120 models are powered by Honeywell TPE331-14GR turboprops, while Omsk TVD-20 engines equip the An-38-200. Some 194 An-28s, 51 PT6A-powered M28s and nine An-38s were produced through 2010. Principal competition comes from the Dornier 228 and Viking Air Twin Otter. An additional 44 M28s are forecast for production through 2020.

Antonov An-124/An-225 The An-124 is a four-engine, intercontinental-range heavy-lift cargo transport, while the An-225 is a six-engine, heavy-lift jet designed to carry the Soviet shuttle orbiter Buran. Initial flight of a production An-124 prototype took place in 1982 and commercial operation began in 1986. Both are powered by Ivchenko-Progress D-18T turbofan engines. Fifty-five An-124s and one An-225 have been produced.

Antonov An-148 The An-148 is a twin-engine regional jet designed to serve the 70-80-seat market. First flight took place in 2004, with type certification by Russia and Ukraine following in 2007. Power comes from two Ivchenko-Progress D436-148 turbofan engines. Seven An-148s were built through 2010 and an additional 151 are forecast for production through 2020. The An-158, a stretched 99-passenger version, first flew in 2010.

ATR Series The ATR series are turboprop-powered regional transport aircraft. ATR is a joint venture of EADS and Alenia Aeronautica. The ATR 42 was first delivered in 1985 and the ATR 72 in 1989. The latest versions are the ATR 42-600 and 72-600. The latter received European Aviation Safety Agency certification in May 2011. Both -600 variants are powered by a pair of Pratt & Whitney PW127M engines, rated at 2,400-2,750 shp each. Through 2010, 940 aircraft in the entire ATR series were produced. Production of 668 is forecast for 2011-20.

COMMERCIAL AIRCRAFT UPDATE

Boeing 737 The 737 series is a family of twin-engine, narrowbody commercial transports. Seating capacity varies depending on model, though the most typical two-class configurations are 126 passengers for the 737-700, 162 for the 737-800 and 180 for the 737-900ER. All three models, which are the current production versions, are powered by two CFM International CFM56-7 turbofans. The first 737 flew in April 1967 and received FAA certification in December 1967. Through 2010, Boeing produced 7,092 737s. The company is projected to manufacture 4,658 737s during the 2011-20 forecast period. The 737 competes directly with the Airbus A320 family as well as the Bombardier CSeries. In response to the A320NEO, Boeing has decided to launch the reengined 737 MAX, with CFM International Leap-1Bs.

Boeing 747 The 747 is an intercontinental, four-engine widebody commercial transport aircraft. A total of 1,467 747s were produced through 2010. First flight and certification occurred in 1969. In February 2010, Boeing achieved the maiden flight of the 747-8 series, which includes the 747-8 Intercontinental passenger model and 747-8 Freighter. Both versions feature four GE GEnx engines rated at 66,500 lb. thrust each. The 747-8I is stretched 18 ft. compared to the 747-400 to accommodate 467 seats in a three-class configuration. First 747-8F delivery, to launch customer Cargolux, occurred in October 2011. Production of 211 747s is forecast for 2011-20. The 747's primary competitors are the Airbus A340-600 and A380.

Boeing 767 Through 2010, Boeing produced 994 of these twin-engine, widebody commercial transport aircraft. A 767 prototype was rolled out in August 1981, with first flight the following month. Current models include the 767-200ER, -300ER, -400ER and -300F freighter. Typical two-class seating layouts are 224 seats for the -200ER, 269 for the -300ER and 304 for the -400ER. All three models are sold with a choice of GE CF6-80C2 or Pratt & Whitney PW4000 engines. The future of the 767 had been heavily dependent on the outcome of the U.S. Air Force's KC-X tanker competition, as Boeing proposed a 767 variant for the program. Since Boeing won the recompeted contract, the 767 has found a new lease on life. However, Boeing's new 787 will essentially replace the 767 in the company's commercial airliner product line. Exclusive of militarized models, production of 71 767s is forecast for 2011-20.

Boeing 777 The 777 is a twin-engine, widebody commercial transport aircraft. First flight occurred in June 1994, followed by FAA/JAA certification in April 1995 (Pratt & Whitney-powered version). Deliveries began in June 1995. The 777-200ER seats 301-440 and is powered by two PW4000, Trent 800 or GE90 turbofans rated at 84,000-95,000 lb. thrust each. Two newer versions are the -200LR and -300ER. The -200LR, which seats 301 in three classes, is powered by a pair of 110,100-lb.-thrust GE90-110B1 or 115,300-lb.-thrust GE90-115BL turbofans. The -300ER seats 365 in three classes and is equipped with 115,300-lb.-thrust GE90-115Bs. A freighter variant, based on the -200LR, is also available. A total of 910 777s were produced through 2010, and production of another 880 is forecast in 2011-20. The new Airbus A350XWB will be the main competition.

Boeing 787 The 787 Dreamliner series is a two-version family of twin-engine, widebody airliners. The 787-8 carries 210-250 passengers and has a range of 7,650-8,200 nm. The 787-9, lengthened by 20 ft.), seats 250-290 and has a range of 8,000-8,500 nm. Both versions are offered with either two Rolls-Royce Trent 1000 or General Electric GEnx turbofans producing 62,800-69,800 lb. thrust each. A third possible version, the 787-10, would be stretched another 20 ft. beyond the 787-9. The Dreamliner received FAA and European Aviation Safety Agency certification in August 2011, followed by delivery to Japan's All Nippon Airways of the first 787-8 the following month. Deliveries of the 787-9 are not expected to begin until early 2014. Production of 1,160 aircraft is forecast through 2020. The Dreamliner's main competition is the forthcoming Airbus A350XWB.

Bombardier CRJ Series The CRJ series is a family of twin-engine, 44-100-seat regional jets. The initial model was the 50-seat CRJ100, which is no longer in production. It first flew in May 1991 and deliveries started in October 1992. The CRJ100 was replaced by the 50-seat CRJ200, which is powered by a pair of 9,220-lb.-thrust GE CF34-3B1 turbofans. Other variants have included the 44-seat CRJ440, which is also powered by CF34-3B1s; the 64-78-seat CRJ700, powered by two 13,790-lb.-thrust CF34-8C5 turbofans; and the 86-90-seat CRJ900, powered by two 14,255-lb.-thrust CF34-8C5s. Bombardier's Challenger 850 business jet/corporate shuttle is based on the 50-seat CRJ200LR. The newest aircraft in the CRJ series, the CRJ1000, is a stretch of the CRJ900, allowing a 100-passenger configuration. It made its first flight in September 2008, with certification following in December 2010. In May 2007, Bombardier introduced next-generation versions of the CRJ700 and CRJ900 featuring operating-cost improvements, an all-new cabin and increased use of composite materials. More than 1,630 CRJ series aircraft were produced through 2010. Another 580 are projected to be built in 2011-20. Primary competition comes from Embraer, though the Comac ARJ21, Sukhoi Superjet 100 and Mitsubishi Regional Jet may draw away potential customers.

Bombardier CSeries Launched in July 2008, Bombardier's CSeries family comprises the CS100, which carries 110 passengers, and the 130-seat CS300. The aircraft will be powered by two Pratt & Whitney PW1000 geared turbofans producing 21,000-22,900 lb. thrust each. Both the CS100 and CS300 are to be available in standard and extended-range versions and the CS300 is additionally to be available in an "extra-thrust" version. CS100 service entry is planned for late 2013, and the CS300 is to arrive about a year later. The CS100 will compete with the Embraer 190 and 195 and the Airbus A318, while the CS300 will vie against the Boeing 737 and Airbus A319. Some 295 CSeries aircraft are forecast to be produced through 2020.

Bombardier Q Series This twin-engine turboprop aircraft family was known as the Dash 8 series. The Q100, the original model in the series, made its first flight in June 1983; first deliveries followed in October 1984. The Q100 carried 37-39 passengers and was equipped with 2,150-shp Pratt & Whitney Canada PW120/121 engines. Other models have included the 37-39-passenger Q200 (with 2,150-shp PW123C/D engines) and the 50-56-seat Q300 (with 2,500-shp PW123Bs). Production of the Q100, Q200 and Q300 has ended. The 68-78-seat Q400 (with 6,000-shp PW150As) remains in production. Through 2010, 1,008 Q series aircraft were produced and an additional 462 are forecast to be built in 2011-20. The main competitors are the ATRs.

Cessna Caravan This single-turboprop-powered utility/passenger aircraft first flew in December 1982. Through 2010, Cessna produced 2,015 Caravans of all types. Designed with the small-package delivery segment in mind, the two models currently in production, the Caravan 675 and 208B Grand Caravan, have maximum useful loads of 1,898 kg (4,200 lb.) and 2,041 kg, respectively. Power for both aircraft is provided by a Pratt & Whitney Canada PT6A-114A turboprop engine rated at 675 shp. Cessna is forecast to deliver 1,004 Caravans in 2011-20.

Comac ARJ21 Initially, the new ARJ21 regional jet from Commercial Aircraft Corp. of China (Comac) is to be available in the ARJ21-700 78-90-seat variant, while later introduction of the 98-105-seat -900 is a possibility. Power will be provided by two GE CF34-10A turbofans producing 18,500 lb. thrust each. Rollout of the first ARJ21-700 occurred in December 2007, followed by first flight in November 2008. Four -700s were built through 2010, and 179 are forecast for production through 2020. The ARJ21 faces competition from Bombardier and Embraer.

Comac C919 A twin-turbofan-powered, commercial passenger transport aircraft, the C919 targets the international duopoly of Airbus and Boeing in narrowbody airliner sales. Variants include the baseline C919-200, which seats up to 168 passengers; the C919-100, a 130-seat model that will compete against the Airbus A319; and the C919-300, a 190-seat model designed to compete with Airbus's A321 and Boeing's 737-800/900. Comac has selected the CFM International Leap-X1C engine to power the C919. Service entry is planned for 2016, with 85 aircraft forecast for production through 2020.

Daher-Socata TBM 850 The TBM 850 is a single-engine, 4-6-passenger, turboprop-powered aircraft that replaced the earlier TBM 700 in 2006. It is designed to compete with very light jets. Power is provided by a single 850-shp Pratt & Whitney Canada PT6A-66D engine. The aircraft has a range of about 1,520 nm. Through 2010, production totaled 222 aircraft. Production of 414 more units is forecast for 2011-20.

Embraer 170/175/190/195 This is a family of twin-engine, 70-122-seat regional jet aircraft. The 70-80-passenger 170 made its first flight in February 2002, while the 78-88-seat 175 flew for the first time in June 2003. The 170 and the 175 share a common engine in the 14,200-lb.-thrust GE CF34-8E. The 94-114-seat 190 made its initial flight in March 2004, while the 106-122-passenger 195 first flew in December 2004. The 190 and 195 share a 18,500-lb.-thrust version of the CF34-10E. Through 2010, some 719 aircraft in this series were produced; an estimated 1,038 are forecast for 2011-20. Competition comes mainly from Bombardier aircraft.

Embraer ERJ 135/140/145 The ERJ 135/140/145 family is a series of twin-engine, 37-50-seat regional jets. The initial model in the series was the 50-seat ERJ 145, which first flew in August 1995; deliveries began in late 1996. The next model was the 37-seat ERJ 135, which made its initial flight in July 1998; deliveries began in July 1999. The 44-passenger ERJ 140 first flew in June 2000, with initial deliveries in July 2001. All models use variants of the Rolls-Royce AE 3007 turbofan. Through 2010, 924 aircraft in the series were produced, not including the Legacy 600 or 650 business jet versions of the ERJ 135.

COMMERCIAL AIRCRAFT UPDATE

GECI Skylander The French company GECI International and its Sky Aircraft subsidiary are developing a 19-passenger twin turboprop called the Skylander SK-105. The Skylander was formally launched in September 2008. The aircraft is powered by a pair of Pratt & Whitney Canada PT6A-65B engines. Certification and service entry are planned for 2012.

GippsAero GA10 The Australian company GippsAero is developing an 8-10-seat turboprop aircraft that is to be powered by a Rolls-Royce 250-B17F2 engine. The aircraft will have a maximum all-up weight of 2,155 kg (4,750 lb.). First flight of a GA10 developmental prototype is scheduled for this month. Australian type certification is planned for February 2013.

Harbin Y-12 A 19-seat utility aircraft, the Y-12-II is equipped with Western avionics and Pratt & Whitney Canada PT6A-27 engines flat-rated to 620 shp each. The Y-12-IV has winglets, a strengthened undercarriage and redesigned seating. The Y-12E is powered by 750-shp PT6A-135 engines. Harbin is currently developing the Y-12F, which will have a substantially different design from the earlier Y-12s. The Y-12F will have a wider fuselage, retractable landing gear and increased speed, range and payload. It will be equipped with 1,100-shp PT6A-65B engines and Honeywell Primus Apex avionics. A total of 49 Y-12-II/III/IV and Y-12E aircraft are forecast for production in the coming 10 years.

Hawker Beechcraft King Air Beech launched the King Air series of 8-12-seat, twin-turboprop aircraft in 1963. Since then, numerous variants have appeared. Deliveries totaled were 6,526 through 2010. Hawker Beechcraft currently markets the King Air C90GTx, King Air 250 and King Air 350i. The C90GTx is powered by two Pratt & Whitney PT6A-135s producing 550 shp each, the 250 by two Pratt & Whitney PT6A-52s rated at 850 shp each, and the 350i by two 1,050-shp Pratt & Whitney PT6A-60As. Some 1,229 King Airs are expected to be produced in 2011-20.

Ilyushin IL-96-300/400 The Il-96-300 is the first of this four-engine, medium/long-range, widebody commercial passenger and cargo transport aircraft family. It first flew in 1988, followed by certification in December 1992. The -300 is powered by the Aviadvigatel PS-90A engine, but may get the improved PS-90A2. The -400 is a stretched version that also comes as the -400T dedicated freighter. Both are powered by the uprated PS-90A1. The NK-93 propfan is also being considered for installation on the -400 and -400T. The -400 passenger version can carry 436 in a single-class configuration, 386 in two classes or 315 passengers in three classes. Eighteen Il-96-400s are forecast for production in 2011-20.

Irkut MS-21 The Irkut MS-21 is a twin-turbofan, narrowbody derivative of the defunct Yakovlev Yak-242 airliner. First flight is planned for 2014. The MS-21 family comprises the 150-seat MS-21-200, 181-seat -300 and 212-seat -400. All three are to be available in both basic and extended-range versions; the -200 is also to be available in a long-range variant. Power will be provided by Pratt & Whitney PW1400G or Aviadvigatel PD-14 engines. Service entry is targeted for 2016. Primary competition for the MS-21 is likely to come from the Boeing 737, Airbus A320 and Comac C919. Eighty-one MS-21s are expected to be produced through 2020.

LET L-410 The current L-410UVP-E20 model of this 15-19-passenger, unpressurized, twin-turboprop regional/utility transport aircraft is powered by two GE M601 engines. GE is developing an improved H80 powerplant that combines the M601 design with GE-developed 3-D aerodynamic design techniques and new materials. The H80 features an extended service life of 3,600 flight hours or 6,600 cycles between overhauls and improved hot-day takeoff performance and high-altitude cruise speeds. The engine requires no recurrent fuel nozzle or hot-section inspections. Aircraft Industries intends to complete certification of the H80-powered L-410 by mid-2012. Besides building new-production L-410s powered by H80 engines, the company also plans to market an H80 retrofit for existing M601-powered L-410s. More than 450 are in service, with 79 slated for production during the next 10 years.

Mitsubishi Regional Jet Mitsubishi formally launched the Mitsubishi Regional Jet family in March 2008. Two basic models are planned: the 78-passenger MRJ70 and 92-passenger MRJ90. Both are powered by a pair of Pratt & Whitney PurePower PW1200G geared turbofans. Extended-range and long-range versions of each basic model are envisioned, while a 100-seater dubbed the MRJ100X is also being considered. First flight of the MRJ is scheduled for 2012. Service entry is planned for 2014. Some 214 MRJs are forecast for production in 2011-20.

Pilatus PC-12 This pressurized, single-turboprop-powered, corporate/utility transport aircraft first flew in May 1991 and received Swiss and U.S. certification in 1994. It has seating for nine passengers in its standard layout. Portugal's OGMA assembles green aircraft and also manufactures some components. The current PC-12 production version, the PC-12 NG (Next Generation), is powered by the 1,200-shp Pratt & Whitney Canada PT6A-67P. A total of 1,041 PC-12s, in all versions, were built through 2010. Production of 944 units is expected in 2011-20. The PC-12 competes with the Daher-Socata TBM 850, Cessna Caravan and Hawker Beechcraft King Air.

RUAG Aerospace Do 228 Next Generation Launched in 2007, RUAG Aerospace's Do 228NG (Next Generation) is an updated version of Dornier's original turboprop Do 228. The aircraft is powered by 776-shp TPE331-10 engines and features other improvements such as a new glass cockpit, five-blade propellers and aerodynamic changes to the wing. The first Do 228NGs were delivered in 2010 and 74 are forecast to be built in 2011-20.

Sukhoi Superjet 100 The Sukhoi Superjet 100, formerly known as the Russian Regional Jet, is a family of twin-engine regional transports powered by Snecma/NPO Saturn SaM146 turbofan engines rated at 13,500-17,500 lb. thrust each. The series has been launched with a 95-98-seat baseline model, the Superjet 100-95. The shortened 100-75, a 75-78-seat version, and the lengthened 100-115/120, a 115-120-seater, are being considered. The Superjet 100-95 made its first flight in May 2008 and achieved initial Russian/Commonwealth of Independent States certification in early 2011; deliveries began in mid-2011. Production of 201 Superjet 100s is forecast in 2011-20.

Tupolev Tu-204/214 The Tu-204-100 short/medium-range, narrowbody commercial transport aircraft is powered by a pair of Aviadvigatel PS-90A turbofans, while the Tu-204-120 variant has two Rolls-Royce RB211-535E4 engines. The Tu-214, also known as the Tu-204-200, has a higher maximum takeoff weight (244,155 lb.) than the Tu-204-100. It retains the PS-90A powerplants of the -100 but carries additional fuel. The Tu-204's first flight occurred in January 1989. Through 2010, 79 Tu-204s (in all versions) were produced. Forecast International expects 48 Tu-204s, including the Tu-204SM variant (an enhanced version of the Tu-204), will be produced in 2011-20.

Viking Air DHC-6 Twin Otter Series 400 Viking Air owns the manufacturing rights to a number of out-of-production de Havilland aircraft, including the DHC-6 Twin Otter non-pressurized, high-wing, twin-engine turboprop utility aircraft. In April 2007, Viking Air launched a program to restart production of the 19-passenger Twin Otter. The updated Viking Air Twin Otter Series 400 incorporates more than 800 changes to the Series 300 and is now powered by a pair of Pratt & Whitney Canada PT6A-34s or optional PT6A-35s. First flight occurred in February 2010, followed by Transport Canada certification in June 2010 and initial deliveries in July 2010. Production of 143 aircraft is forecast in 2011-20; three aircraft were completed through 2010.

Xian MA60/MA600 The MA60 twin-turboprop transport aircraft is a stretched version of the Xian Y7-200A, in turn a variation of the Antonov An-24. Accommodation can be provided for 52-60 passengers. The aircraft is powered by two 2,750-shp Pratt & Whitney Canada PW127J engines. Initial flight and delivery of the MA60 took place in 2000. A freighter version, called the -500, is also marketed. In May 2010, a new variant, the MA600, was awarded certification by the Civil Aviation Administration of China. The MA600 features reduced weight, an upgraded cabin, new avionics (the Rockwell Collins Pro Line 21 suite) and a host of other improvements. Eventually, the improved and more advanced MA600 may supplant the MA60 in production. Through 2010, 53 MA60s and three MA600s were produced. A total of 149 MA60/MA600s are forecast to be produced in 2011-20.

Xian MA700 Xian is developing a twin-turboprop regional airliner dubbed the MA700. This aircraft is not an MA60 variant, but rather a clean-sheet design. Features include six-blade propellers, a T-tail and an unswept, high-mounted wing. Two versions are envisioned: with 70-plus and 90-plus seats. A dedicated freighter variant has also been considered. The MA700 effort is in the design phase, with formal launch tentatively planned by year-end. Negotiations are under way with Pratt & Whitney Canada regarding supply of an engine and may be ongoing with Rolls-Royce. Service entry of the MA700 is officially targeted for 2015. Xian intends to pursue FAA and European Aviation Safety Agency certification. The MA700 could replace the MA60/MA600 in production.

Heads Up

Moon still holds sway for potential profits missions, despite policy changes

MARK CARREAU/HOUSTON

The Moon might have been nudged aside by U.S. policymakers in favor of a near-Earth asteroid as the next destination for human explorers, but it remains a focus for internationally sponsored missions and entrepreneurs drawn to a deeper scientific understanding of the celestial neighborhood—as well as to the potential for profits from resources mined from the lunar surface.

Still, money from investors to nurture the latter, and the political will to enable the former, remain significant near-term obstacles, according to experts who gathered here for the annual meeting of the NASA-chartered Lunar Exploration Analysis Group (LEAG).

NASA JET PROPULSION LABORATORY

The Moon might not shine as brightly for politicians and policymakers, but it remains the focus of many explorers and companies.

The group examined the current best options for reestablishing a human presence on the Earth's closest neighbor. In spite of President Barack Obama's decision to cancel his predecessor's lunar-oriented Constellation program, NASA still is an organizational force behind the recent Global Exploration Roadmap. The road map represents an evolving 25-year strategy to reach Mars with either an asteroid or the Moon serving as a stepping-stone. A dozen space agencies participated in the blueprint unveiled in September under the banner of the International Space Exploration Group.

NASA's latest planning in support of the road map includes a lunar encampment suitable for small crews rotating through for stays of 7-28 days. The NASA-led, 15-nation International Space Station framework serves as a model for the road map's governance. But in a key departure from Constellation, the global road map would assign "critical path" hardware—surface rovers, for instance—to international participants, according to John Connolly, the destination lead for NASA's Human Architecture Team.

"When we are not doing something, we are planning something," Connolly assured the advisory panel in a presentation that summarized NASA's on-again, off-again interest in the Moon dating back to the Apollo era.

At the commercial extreme, Shackleton Energy envisions a full-time mining operation at the Moon's south pole for the extraction of water ice from permanently shaded craters. The water drawn from preserved comet impacts would be processed into propellants positioned in spacecraft depots in low Earth orbit or the L-1 Earth-Moon Lagrange point to refuel aging communications satellites, says Jim Keravala, Shackleton's chief operating officer. The water also could go to fuel spacecraft moving through cis-lunar space on other missions.

Shackleton, which envisions the refueling depots as the revenue-generating equivalent of telecommunications satellites, recently initiated an Internet campaign soliciting crowd-sourced donations as the precursor to a traditional fund-raising effort planned for next year.

"The point is to create value that people will pay for," Ken Murphy, president of the Moon Society and a Dallas investment portfolio manager, told the gathering.

"The financial industry is really in a bind right now," he says. "There is lots of cash in the system to prop up the economy. But the banks are not lending to companies that can't show they have customers."

The Pacific International Space Center for Exploration Systems (Pisces) at the University of Hawaii at Hilo envisions a third approach: a multiuser research park supporting a blend of public/private activities on the Moon, poised to grow in response to commercial as well as scientific interest. The proposed International Lunar Research Park would offer common utilities to government and commercial tenants.

The university is establishing a precursor, a prototype facility at the Hilo campus to support analog missions to a range of deep-space destinations. Hawaii's volcanic terrain would support the testing of robotics as well as life support, mobility and communications systems under a Space Act Agreement with NASA, says Pisces Deputy Director John Hamilton.

And if the Moon is too far and too expensive, Hamilton offers another suggestion: his island state. Hawaii is strategically positioned among the globe's spacefaring nations for the next best thing, a dress rehearsal, he declares.

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Jan. 15-16—American Institute of Aeronautics and Astronautics' 15th Annual FAA Space Transportation Conference. Walter E. Washington Convention Center, Washington. Also, 10th Annual U.S. Missile Defense Conference and Exhibit. Ronald Reagan Building and International Trade Center, Washington. And, **Feb. 15-16**—15th Annual FAA Commercial Space Transportation Conference. Walter E. Washington Convention Center. See www.aiaa.org
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April 3-5—MRO Americas 2012. Dallas.
April 3-5—MRO Military Conference & Exhibition. Dallas.

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Aviation: Stop The Squabbling

JOHN D. ROCKEFELLER, 4th

Rockefeller, a Democrat of West Virginia, chairs the U.S. Senate Commerce, Science and Transportation and Committee. This is adapted from a speech given last week to the Aero Club of Washington.

The remarks that I have prepared are tough—they are not the remarks that I wish I could deliver, praising our successes and focused only on the future. But I hope that there will be some demonstrable benefit to my sharing a blunt assessment of where I think we stand as an aviation community.

I am angry and frustrated that after four years Congress still has not been able to pass a reauthorization of the FAA. Everyone here recognizes the FAA is one of the most important agencies in the government. But that doesn't seem to force compromise. The inability of the aviation industry to work together to address one of the most critical problems facing our nation—an aviation system that's not ready for the 21st century—is an embarrassment. Together, we need to find a way to change that.

Let me tell you why I say our divisions have determined the fate of the FAA bill and thwarted our nation's progress. It's 2007—general aviation versus the commercial airline industry. The dispute is over how to pay for the NextGen air traffic control system. The fight stalls the bill for months. When FAA finally gets to the floor, a fight between airlines over pension policy kills the bill. It's 2010—the fight between FedEx and organized labor is resurrected from 1996. That Gordian knot of a dispute is exacerbated by two other inter-industry fights. One, a multi-airline fight over slots at Reagan Washington National Airport and, two, an airport-airline fight over Passenger Facility Charges. The combination of disagreements makes it impossible to get a bill enacted into law. It's 2011—a fight between one single airline and organized labor imperils the bill.

> "Aviation's divisions have determined the fate of the FAA bill and thwarted our nation's progress. Industry shares the blame for inaction."

I don't intend to diminish the importance of these issues. Some of the disagreements involve core principles, some have real economic consequences. Many people feel passionately about them. I certainly have strong views on each. Even though I aggressively advocated for many of these provisions, I was always willing to compromise to get the job done. I believed then, as I do now, that none of these issues was, or is, more important than the development of the NextGen air traffic control system. Not one of these issues is more important than the overall fiscal health of our aviation industry. What's more, none is as important as the continued safety of the nation's aviation system.

Nevertheless, the sad fact is the small issues that divided us ultimately dictated the outcome. We have lost four years. We have forgone hundreds of millions of dollars that should have been directed to the Aviation Trust Fund. The damage of inaction has been great. We cannot continue on this disastrous path. But, stunningly, we stand on the precipice of losing another FAA Reauthorization bill.

We started the 112th Congress in the Senate with the FAA bill. It was the first bill to hit the floor. The majority leader was teeing us up for success. We had spent hundreds of hours trying to reach agreement on the contentious issues that came up during the previous two efforts. We solved the funding issue. To its credit, the general aviation community advocated for a tax increase on high-end GA aircraft operations. The fight over slots at National Airport, again, almost derailed the bill on the Senate floor. It was a hard, brutal process. We got a deal. Not a perfect one, but sufficient. The Senate FAA Reauthorization passed with 87 votes.

Fast-forward several months. We worked with the House to produce a compromise bill. I was genuinely hopeful that the bill would be signed into law. However, the issues that still divide some of us threaten the common goals of all of us. Again, we are stalled. We all know why. I am angry at the situation. I do not understand how the fixation of one airline can be seen as paramount such that the House would shut down the FAA to get its way.

The FAA shutdown this summer damaged the agency, its employees, the industry and Congress. It also came at great cost to my state. This summer, the House sent over a short-term extension of FAA funding that made rifle-shot changes to the Essential Air Service, which affected such operations at Morgantown, a thriving university, high-tech community. I can guarantee you that I will do what it takes to make sure West Virginia's airports and air service will never again become collateral damage in this process. I sincerely believe everyone here shares in the blame for how we came to this point. I'm the first to admit that Congress has not done its job, although I hasten to add that I believe the House did not act in good faith when its members refused to appoint conferees. But I do think the industry shares blame for the lack of action on an FAA bill.

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