

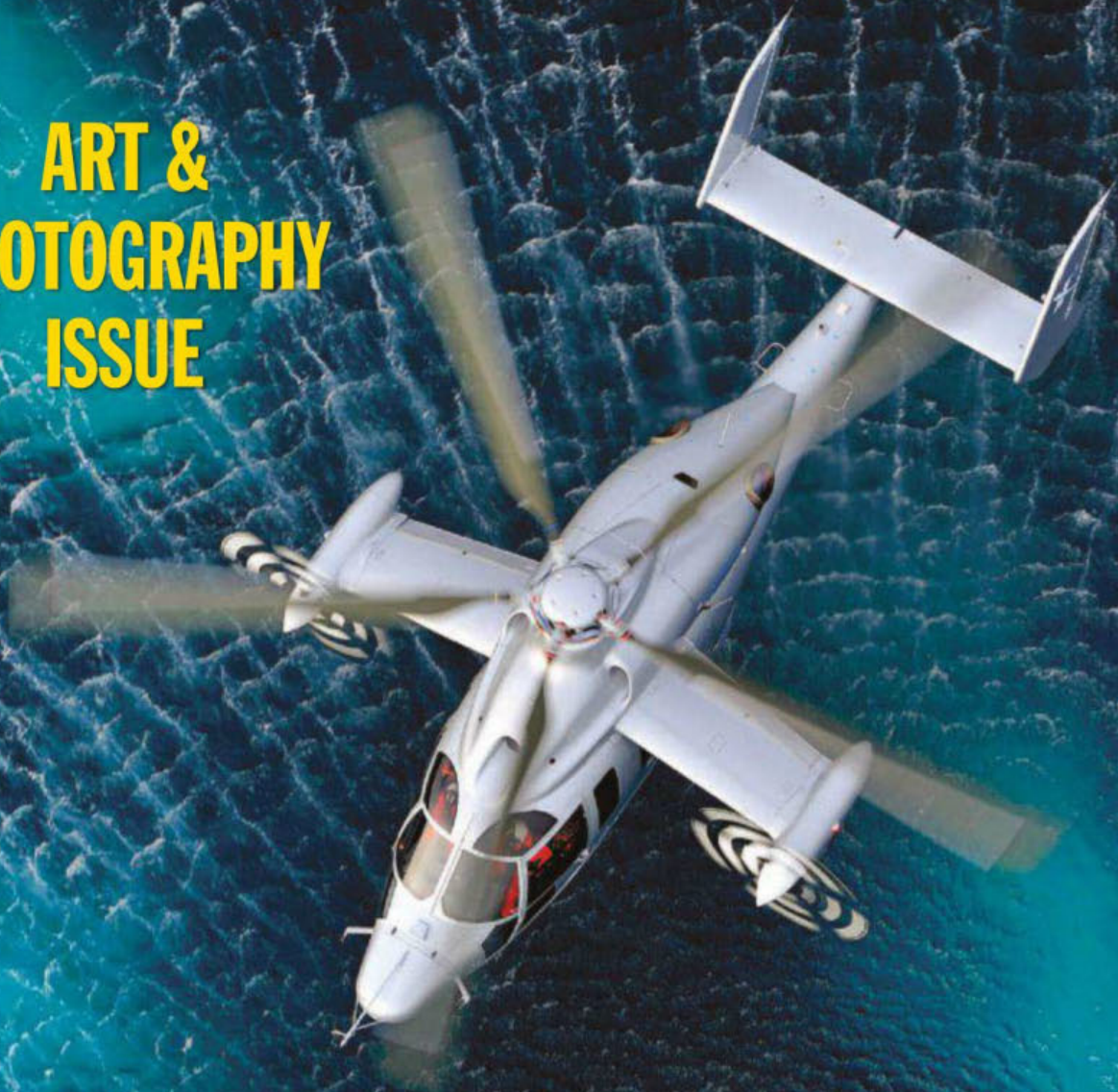
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Ted Carlson of Mission Viejo, Calif., shot this Aviation Week photo contest entry showing U.S. Navy Beech T-34C Turbo Mentors of TAW-5, in Centennial of Naval Aviation markings, as they fly off Florida at sunset.

COVER STORIES



- 32 **Alain Ernault** of Bagnaux, France, took third place in the General category of this year's AW&ST photo contest with this shot of the Eurocopter X-3 hybrid helicopter. Based on a Dauphin airframe, the twin-turboshaft helicopter relies on a five-blade rotor with

two propellers on short wings to provide its high speed. The X-3 has achieved 232 kt. in sustained forward flight.

- 74 **AW&ST editors** deliver cheers and jeers for actions in 2011 related to myriad aerospace and defense activities.

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74 Cheers and jeers to the 2011 aerospace and defense industry winners and sinners



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2011'S BEST AVIATION PHOTOS

📷 **The wait is over** to see the winners from the 20th Annual Aviation Week Photo Contest. See the images selected by our panel of judges, the favorites that you—the readers—picked and more than 200 finalists. AviationWeek.com/photo

JSF REPORT

💬 **A top-level** Pentagon review of the Joint Strike Fighter found five "major consequence" problems with the aircraft, Senior Editor Bill Sweetman reports on our **Ares** blog. The post generated more than 100 comments, which you can read here: <http://tinyurl.com/7rmxox>. Our Ares blog can be found at AviationWeek.com/ares

ABANDONED SHIP

✨ **In a special series**, *Aviation Week* details an exclusive investigation that scrutinizes missteps the U.S. Navy has made with regard to its destroyer fleets that are likely to force the service to up-end its \$121.8 billion plan for their development. Based on data uncovered and exclusive interviews, *Aviation Week* broke these stories on its Aviation Week Intelligence Network (AWIN) website. AWIN subscribers can read the full coverage online at AviationWeek.com/awin

STRATOLAUNCH UNVEILED

💬 **Senior Editor Guy Norris** dives into the planned Stratolaunch air-launched rocket system on our **On Space** blog (AviationWeek.com/onspace). For pictures of what could be the largest aircraft ever made—something that looks like two 747s bolted together—go to <http://tinyurl.com/cfnr6xt>

**HE DID WHAT?**

💬 **Suicidal donkeys**, canoodling off-duty pilots and poorly behaved Hollywood stars are the stock-in-trade of our weekly roundup of all that's weird and wonderful—and true!—in the world of aviation. Find Strange But True Aviation News every Friday on our **Things With Wings** blog (AviationWeek.com/wings). The latest installment can be found at <http://tinyurl.com/7odjc5w>



"Purple Morning Princess"

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FROM THE WEB

Comments from readers on AviationWeek.com

Guy Norris's "Japan Poised For F-X Announcement" generated several lively exchanges, including:

U.S. AIR FORCE



Bismarck's opener:

Japan is under military occupation of the U.S., otherwise the Rafale would tarnish the Super Hornet and would bury all the rest combined.

Sferrin notes:

It didn't take long for the excuses to start.

alexandre responds:

[The] Rafale is a better aircraft . . . due to its carrier-capable omnirole.

redstone states:

The Rafale was not even participating in the Japanese competition.

Naole opines:

Japan is worried about China, North Korea and Russia, so they need the U.S. Selecting the F-35 simply makes sense.

The David Fulghum/Bill Sweetman "Downed UAV Technology Outdated" article continues to elicit a host of responses, including:

MilWatch says:

Even if the sensors were not the newest (and there's just speculation about this), info about structure, coatings and elements of the electronics can be learned from the wreckage. China will probably be paying a visit . . . like they did with the special-mission helicopter in Pakistan.

MJ agrees:

In 1998 Pakistan was able to recover at least two intact U.S. RGM/UGM-109 Tomahawk cruise missiles that were fired against targets in Afghanistan. Pakistan then developed the 750-km-range Hatf-VII Babur land-attack cruise missile and China the DH-10/CJ-10s.



Join the discussion at :

www.aviationweek.com/avweek

FEEDBACK

FUTURE HO!

In "Aftershocks" (AW&ST Nov. 28, p. 22) you say that the failure of the U.S. Congress to enact true budget reform has placed the F-35 at risk. But, canceling it would not necessarily be a bad thing. We have already reached the point of diminishing returns for human crewed tactical aircraft.

Remotely piloted vehicles are widely operated. Semi-autonomous vehicles already exist and fully autonomous tactical aircraft cannot be far off.

The manned fighter will soon join the cavalry, the battleship and the Zeppelin as anachronisms of war. We should be investing in the future.

Guy Wroble

DENVER, COLO.

ACQUISITION ANGST

A recent cover (AW&ST Nov. 28) displays the graceful curves of the T-38 in contrast to the BAE Hawk. So why replace a design which—50 years after its debut—continues to be a paradigm of performance and ease of maintenance? And why replace it with a foreign design? The T-38 is fully amortized and integrated into our system. Instead, we should be studying methods of integrating new systems and materials into its basic design, something the Israelis have done with the F-5.

Replacing supersonic T-38s with an inferior product suffers from the same flawed logic that suggests that a fledgling air force like that of Iraq will transition to an advanced fighter like the F-16 with fewer complications than they would if they adopted an upgraded (purposely designed export fighter) F-5.

Todd Fredricks

AMESVILLE, OHIO

OUTPOSTS FOR SOLAR POWER

"Closing the Case" (AW&ST Nov. 21, p. 20) suggests that power beamed to Earth from orbit will be viable for remote and emergency energy in 10-30 years. The most valuable application for space solar power (SSP), however, is in space itself.

Electric-plasma propulsion technologies have been developed that offer high specific impulse but are burdened by the heavy solar or nuclear plants needed for motive power.

Using a rectenna instead of a large onboard plant to gather beamed power would result in light and simple vehicles with high specific impulse. A fleet of efficient electric tugs could replace

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chemical rockets for transfers among low-Earth, geosynchronous and trans-lunar orbits, all powered by a single SSP platform.

And SSP platforms could be placed at near and far Earth-Moon Lagrange points, in lunar orbit and at the far Sun-Earth Lagrange point as stepping-stones to boost the velocity of deep-space exploration vehicles and sharply reduce transit times. Mars awaits.

Paul R. Johnson

HOUSTON, TEXAS

SSP FOR HERE AND THERE

The article on space-based solar power could also mention the impact of wireless transportation of electricity on civil and commercial air transport industries. Compare an airliner to an electric-powered train receiving electricity from above and enjoying an unlimited range. Beaming power from Earth orbit to the Moon can also speed up the creation of permanent settlements there.

S. Bahram Sadighian

ALEXANDRIA, VA.

TURN INQUISITIVE EYE TO THE EAST

The eastern Mediterranean Sea is becoming very crowded now that the Russians have completed a 2007 agreement with Syria, delivering two Bastion coastal missile systems—mobile cruise-missile launchers that use the Yakhont.

With more than 60 of the supersonic anti-ship cruise missiles for the two systems, Syria should be able to defend its entire coastline.

Remember how hard it was to locate and destroy scuds in Iraq. And also remember that the older and less-stealthy French Exocet raised havoc with the British fleet in the Falklands.

I would like to see Aviation Week address air ops in congested airspace and assess the capabilities of fleets and Syrian coastal/air defenses. This new defensive system is inherently hazardous to Israel, at the very least.

Peter J. Peirano

RIDGEWOOD, N.J.

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Singapore Airshow 2010 Attendance Figures

- ▲ 259 foreign government and international delegations from 80 countries
- ▲ 897 companies from 36 countries
- ▲ 62 of the top 100 aerospace companies
- ▲ 43,459 trade attendees from 133 countries
- ▲ 27 airline CEOs



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Holger Beck has become head of the marketing, sales and product management division at *Luft-hansa Technical Training* in Hamburg, as part of his function as chief commercial officer. **Karsten Schmidt** will be promoted to COO from managing director of Lufthansa Systems Aero-nautics.

Drew McEwen (see photos) has been named head of global sales and business development and **Lisa Gies-sert** head of sales administration and customer support at *Piper Aircraft*, Vero Beach, Fla. Before joining Piper in 2010, McEwen was a sales executive with Hawker Beechcraft Corp. Gies-sert is a 20-year Piper veteran who has held multiple management roles.

Anna Gawthorpe is the new safety and quality manager at *Execujet's* new fixed-base operation in Cambridge, England. She was airfield operations and safety unit manager at London City Airport.

Olivier Mazzucchelli has been named CEO managing director of Lufthansa-Air France joint venture *Spairliners*, Hamburg. Before joining the Air France Group in 2000, he was safety auditor at Yacimientos Petrolif-eros Fiscales.

Brian Sheridan (see photo) has been appointed VP and general manager of *BAE Systems' SpecTal* business, based in Arlington, Va. He was VP and deputy general manager for the Intel-ligence and Security sector.

Greg Mays has joined *Alaska Air-lines* as managing director of airframe, engine and component maintenance, repair and overhaul. He was managing director of global cargo operations at Delta Air Lines.

Aubry Mayse (see photo) has been promoted to director of planning and distribution for product support mat-terials from senior manager at *Gulf-stream Aerospace*, Savannah, Ga.

Bernd Heinrich has taken over the operating management of *RUAG Avia-tion's* Geneva-based business aviation unit and **Tobias Laps** has become the head of the global sales team. Both share more than three decades of ex-perience in international aviation.

David A. Marcontell has been pro-moted to president and chief operating officer of Denver-based *TeamSAI*. He

was president of the company's M&E Solutions.

Shane Carter has been named public affairs director for *Little Rock (Ark.) Airport*. He was director of the Arkan-sas Methodist Medical Center Foundation.

Jon Hinkley (see photo) has joined *Cicoil*, Valencia, Calif., as Western U.S. sales manager. He was a regional sales manager at Calmont Wire and Cable.

Carlton Brewer has be-come *Aerojet's* site executive in Huntsville, Ala. He held man-agement roles in U.S. Defense Department weapons system programs.

Daniel Allen will become president of U.S. operations at *CACI International*, Arlington, Va., Jan. 1. He will succeed **Wil-liam Fairl**, who will become chief development officer. Allen has been chief operating officer.

Gilles Garczynski (see photo) has been appointed ex-ecutive VP-human resources at *Messier-Bugatti-Dowty*, Velizy-Villacoublay, France. He suc-ceeds **Stephane Legrand**, who transferred to another position.

James P. O'Connor has been appointed North American business development manager at *Ledil Oy*, Salo, Finland.

Chris Ferguson, retired U.S. Navy captain and a former NASA astronaut, has joined *Boeing's* Houston-based Space Exploration Div. as director of commercial crew interface.

Andrew Ladouceur (see photo) has been promoted to VP-charter sales and client ser-vices from manager of the air charter group at *Meridian Air Charter*, Teterboro, N.J.

Suzanne Rubin has been named president of the *Ameri-can Airlines* AAdvantage pro-gram, succeeding **Maya Leibman**, who has become chief information officer and senior VP-information technology.

USAF Cols. **Michael T. Brewer** and **Thomas A. Bussiere** have been nominated for promotion to brigadier general. Brewer is commander of the



Drew McEwen



Lisa Giesert



Brian Sheridan



Aubry Mayse



Jon Hinkley



Gilles Garzynski



Andrew Ladouceur

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Arnold Engineering Devel-opment Center, Tullahoma, Tenn. Bussiere is inspector general at Global Strike Com-mand Headquarters, Barks-dale AFB, La.

HONORS AND ELECTIONS

Shinichiro Ito, president and CEO of the ANA Group, has been named Person of the Year 2011 by Tokyo-based *Orient Aviation* magazine. He was selected for demon-strating "the highest level in leadership, imagination, outstanding business ability and appetite for revolution-ary change."

Michael Curto has been elected chairman of the *Met-ropolitan Washington Airport Authority's* board of directors. He is a partner in the law firm of Patton Boggs and deputy chair of its Business Depart-ment.

Robert Burke of Northrop Grumman has been elected to the board of directors of Washington-based *Women in Aerospace*. Other new board members are: **Tammy Cam-eron** of Boeing, **Susan Choda-kewitz** of Tetra Tech, **Giovan-na M. Cinelli** of law firm Jones Day, **Stephanie Fraser** of Metron Aviation, **Chris-tina Frederick-Recascino** of Embry-Riddle Aeronautical University, **Susan Saadat** of Thrane & Thrane, **Barbara Slayton** of Lockheed Martin Corp., **Rebecca Spyke Keiser** of NASA and **Judy Smith** of

ITT Exelis.

James W. Benz, chief operating of-ficer of Genesee & Wyoming, and **Gary L. Long**, president and CEO of Omni-TRAX, have been elected to the board of the Denver-based **Intermodal Transportation Institute**. ☺

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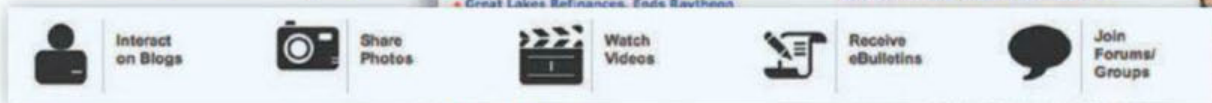
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AW&ST/S&P Market Indices

(as of 12/14/2011)

PERCENT CHANGE



Weekly Market Performance

Closing Prices as of Dec. 14, 2011

Company Name	Current Week	Previous Week	Fwd. P/E	Tot. Ret. % 3 Yr.	Tot. Ret. % 1 Yr.
AIR TRANSPORT					
AAR Corp.	17.16	17.61	8.4	12.5	-35.3 ▼
ACE Aviation Holdings	9.83	10.10	-16.3	68.1	-22.4 ▼
AerCap Holdings N.V.	10.63	11.20	5.5	285.1	-22.3 ▼
Air Berlin	2.92	3.39	-1.6	-43.3	-41.7 ▼
Air Canada	1.01	1.05	-2.3	-17.3	-71.4 ▼
Air France - KLM	4.99	5.81		-60.5	-72.5 ▼
Alaska Air Group	72.01	70.06	8.1	182.4	27.2 ▲
All Nippon Airways Co Ltd.	2.91	2.87	22.4	-34.7	-24.2 ▼
Allegiant Travel Co.	51.52	52.92	14.5	24.7	6.5 ▲
AMR Corp.	0.69	1.12	-0.3	-92.6	-90.9 ▼
Asiana Airlines Inc.	6.08	6.37	5.0	91.2	-35.9 ▼
Atlas Air Worldwide Holdings	35.81	40.47	6.9	147.6	-36.1 ▼
BBA Aviation plc	2.73	2.83	9.7	185.9	-14.1 ▼
B/E Aerospace Inc.	36.43	38.39	14.5	408.8	-0.6 ▼
CAE Inc.	9.31	10.09	13.2	48.4	-13.7 ▼
Cathay Pacific Airways	1.69	1.72	8.3	66.1	-37.4 ▼
China Southern Airlines	25.20	26.91		234.7	-12.8 ▼
Copa Holdings SA	58.55	64.08	7.9	142.7	7.1 ▲
Delta Air Lines Inc.	8.15	8.56	3.3	-23.3	-35.5 ▼
Deutsche Lufthansa AG	11.23	12.39	10.8	-7.8	-46.8 ▼
easyJet plc	5.76	5.94	10.1	40.5	-12.9 ▼
FedEx Corp.	77.29	84.19	11.3	30.9	-15.8 ▼
GOL SA	7.75	8.78		99.8	-48.8 ▼
Hawaiian Holdings Inc.	5.96	6.19	4.4	54.0	-26.5 ▼
Heico Corp.	57.95	59.38	31.3	225.7	28.9 ▲
Jet Airways (India) Ltd.	4.24	5.09	-5.6	46.4	-70.4 ▼
JetBlue Airways	5.12	4.95	11.5	-4.5	-22.7 ▼
Korean Air Lines Co. Ltd.	40.34	41.96	8.6	13.7	-34.9 ▼
Lan Airlines SA	23.35	24.21	19.0	185.4	-23.6 ▼
Qantas Airways Ltd.	1.51	1.66	10.4	-29.8	-43.9 ▼
Republic Airways Holdings Inc.	3.92	3.95	5.3	-61.0	-45.7 ▼
Ryanair Holdings ADS	29.20	30.78	62.6	9.9	-2.4 ▼
Singapore Airlines Ltd.	7.72	8.08	18.1	61.1	-19.3 ▼
Skywest Inc.	12.02	12.58	17.4	-19.2	-25.7 ▼
Spirit Airlines, Inc.	15.45	16.00	9.4		—
Southwest Airlines	8.17	8.58	10.7	8.1	-35.0 ▼
TAM SA	19.47	20.01		152.8	-15.7 ▼
United Continental Holdings, Inc.	19.83	20.69	3.5	108.3	-16.9 ▼
United Parcel Service Inc.	70.64	73.31	15.2	49.7	0.7 ▲
US Airways Group	5.59	5.59	4.2	-12.0	-44.9 ▼
WestJet Airlines Ltd.	10.05	11.26	9.4		-22.8 ▼
Zodiac Aerospace SA	80.12	84.35	12.4	149.9	17.3 ▲

COMMENTARY

2012: A&D's Last Hurrah

You wouldn't know it from reading the headlines, but the aerospace and defense industry turned in a strong performance in 2011. A new forecast released last week by the Aerospace Industries Association (AIA) projects that sales will end the year at \$218 billion, up 3.5% from 2010. U.S. contractors are expected to see income from military aircraft rise 7%, civil aircraft grow by 3% and missiles and space increase by 2% each. "It's not as bad as we expected," says Bill Chadwick, research director at the Washington-based trade group. "Everything is up a little bit." And AIA forecasts that industry sales will decline just \$43 million—or a negligible 0.02%—in 2012.

That may seem counterintuitive, given the depressing developments of 2011. NASA shut down the space shuttle program, and programs such as the Joint Strike Fighter, V-22 Osprey and Ground-based Midcourse Defense—to name just a few—face curtailment or termination unless a dysfunctional Congress can reverse enacted cuts that will trim Pentagon spending by almost \$1 trillion over 10 years. But AIA's near-term optimism is justified.

The defense budget is drawn out over several years so cuts can take some time to filter down. The sales gains in 2011, for example, were the result of contracts awarded when military spending was rising at a healthy clip. And the bulk of the cuts that threaten the Pentagon are not scheduled to start taking effect until January 2013.

Meanwhile, robust sales of civil aircraft should ease some of the pain from lower military spending. AIA projects that orders of U.S.-made civil aircraft will rise 23% this year to nearly \$107 billion, underpinning an unprecedented production ramp-up in Boeing's factories that will continue into 2014.

But 2012 will almost certainly be the last hurrah. An axe is hanging over the industry, and how hard it falls is anyone's guess. In the worst case, Congress and the Obama administration will fail to reach a deal on deficit reduction and the \$600 billion in cuts included in passage of the budget bill—on top of \$330 billion already enacted—will take effect in 13 months, a process known as sequestration. "Robert Gates called these cuts 'catastrophic' and Leon Panetta calls them 'devastating,'" says AIA President and CEO Marion C. Blakey, referring to the recent and current defense secretaries. "There are not much stronger words in the English language to describe what the effect is if [sequestration] goes through."

It gets worse. Domestic budgets also face a \$600 billion reduction, which would imperil the FAA's NextGen air traffic modernization initiative and NASA programs. Blakey says some cuts could be offset with reforms to U.S. export control regulations that put domestic contractors—particularly satellite builders—at a disadvantage in overseas markets. "Our CEOs are looking outside our borders for growth, and export reform can really move the needle." Considering what is coming, they will need all the help they can get. ☹

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.

SPACE

Global Again

Russia's national satellite navigation system, Glonass, finally has once again reached its full operational capability to provide global coverage. The Glonass operational fleet now includes 24 satellites with eight on each of the three orbital planes. The last, 24th Glonass-M spacecraft entered into service on Dec. 8. It is from the last batch of the three satellites orbited on Nov. 4 aboard a Proton-M launch vehicle. Three more satellites (two this year and another early in 2012) will become operational. Additionally, two more Glonass-Ms have been temporarily withdrawn from the constellation for maintenance; one satellite of the same type is being held in orbital reserve while a new Glonass-K spacecraft is undergoing on-orbit testing.

Radar Satellite Launched

The launch of a Japanese radar satellite on Dec. 12 is to be followed by a second in 2012-13, as the country builds up its space-based reconnaissance capability. It joins three optical reconnaissance spacecraft and helps replace two units that failed in orbit. Japanese media credit radar satellites with resolutions of 1-3 meters (3-10 ft.), although the performance depends in part on the frequency of the radar. The same, rather wide, range of resolutions has been quoted for earlier Japanese radar satellites. Although Japan's space reconnaissance program is commonly linked to North Korea's firing of a missile over Japan in 1998, there is evidence that the technology effort began in the 1980s. The latest launch is the 20th of the Mitsubishi Heavy Industries H-2A rocket. The next radar satellite is due to be launched in the fiscal year beginning on April 1, 2012.

Satellite Nears Operations

U.S. Air Force officials plan to turn the new Advanced Extremely High Frequency (AEHF) jam-proof communications satellite over for operational use in early 2012 after a protracted journey into orbit and subsequent testing period. The Lockheed Martin satellite, worth more than \$1 billion and launched Aug. 14, 2010, experienced an onboard liquid apogee engine failure, forcing operators to employ other thrusters for a 14-month journey 22,000 mi. into geosynchronous

orbit. To date, they have demonstrated use of the new, higher data rate capability provided by AEHF.

DEFENSE

'Stuxnet' Attack Lauded

It is hard to tell if USAF Gen. (ret.) Michael Hayden, former director of both the National Security Agency and CIA, was being coy, ironic or very straightforward when he suggested the "Stuxnet" attack on Iran's nuclear industry was "incredibly precise" and targeted enough to have been carried out by "responsible nations." That addresses, to a degree, the notion that the U.S. and Israel in some way colluded to slow down Tehran's nuclear program. Hayden made the comment at the Black Hat Abu Dhabi conference for cyberoperations specialists. The \$1 million software bomb "was designed to trigger only in very carefully defined, discreet circumstances," he said. "The question of precision is one that would weigh heavily on any government's mind before doing this, and particularly mine." But he praised the results. "Given the issue of Iranian

nuclear weapons, slowing them down, destroying a thousand centrifuges is just about as pure a good as I can think of."

Certification Delay

Airbus Military now projects type certification for the A400M airlifter will be delayed until the second quarter of 2012. A few weeks ago, Airbus Military officials still thought a 2011 certification might be possible. Issues have been finding the right weather conditions to allow completion of the anti-icing trials and a delay in some flight trials because of problems with the TP400D turboprop. In a briefing to investors, COO Fabrice Bregier notes, however, that preparations are still underway to meet the contractual deadline of delivering the first airlifter in March 2013.

Oman Order

Oman is adding 12 F-16 Block 50s to its fleet under a \$600 million foreign military sales deal with the Pentagon. The contract covers 10 F-16Cs and two F-16Ds. Oman also is in talks with Eurofighter for purchase of the Typhoon.

United Aircraft Expects 20% Revenue Growth

The CEO of Russia's United Aircraft Corp., the entity that unites the country's fixed-wing aircraft manufacturers, expects to see revenue this year hit 200 billion rubles (\$6.3 billion), or 20% more than last year. Mikhail Pogosyan says deliveries this year will total 110 aircraft, about 20 of which will be commercial aircraft. While he did not break down the deliveries by type, they are likely to include 5-6 Sukhoi Superjet 100 regional jets, three Antonov An-148 RJs, two Tupolev Tu-214 and two Tu-204-300 narrowbodies, two Beriev Be-200 water bombers, two Ilyushin Il-76MFs, one Il-76TD-90VD and one Il-96-400T cargo aircraft. The Russian air force has already received six Sukhoi Su-34 bombers (shown), 12 Su-27SM single-seat fighters, two Su-30M2 double-seaters and nine Yak-130 jet trainers. As for export deliveries, according to Moscow-based defense think tank CAST, UAC is expected to ship a total of about two dozen Su-30s to Vietnam, Uganda and Algeria. The latter should also receive 16 Yak-130s. Various modified versions of the MiG-29 fighter are to be handed over to India and Myanmar.



UNITED AIRCRAFT CORP.

AIR TRANSPORT

Trade Spat

The World Trade Organization's long-running effort to adjudicate large commercial aircraft subsidies is due for another airing on Dec. 19. The Dispute Settlement Body (DSB) will hear U.S. objections to the EU's claim that it has withdrawn subsidies, which the EU published on Dec. 1. The EU insists it has fully met its obligations to withdraw subsidies, a claim Washington rejects. On Dec. 19, the EU delegate is expected to formally introduce the Dec. 1 document outlining how the bloc has complied with the WTO's findings and the U.S. is expected to respond, says a WTO official. Separately, the U.S. requested another dispute-settlement meeting on Dec. 22. The U.S. wants authorization to impose as much as \$10 billion in sanctions against the EU for its perceived lack of compliance with the WTO findings—those would not necessarily be imposed on related aerospace products.

JAL's First 787

Japan Airlines' first Boeing 787-8, which it expects to receive in February, has rolled out of the paint hangar in Everett, Wash., with an all-white livery and the airline's traditional stylized crane in red on the tail. JAL will be the second 787 customer to take delivery after launch customer All Nippon Airways. The 787 will be used on thrice-weekly flights

BOEING



OBITUARY:

Boris Chertok, who led development of flight control systems for rockets and spacecraft from the beginning of the Soviet Union's program and was the longtime deputy to General Designer Sergei Korolev, died Dec. 14 of pneumonia at home in Moscow. He was three months short of his 100th birthday. An aviation expert during World War II, Chertok followed the Red Army into Germany at war's end to recruit German engineers and learn what he could about their work on the V-2 ballistic missile and other rocket weapons. Later he joined Korolev at the NII-88 research institute northeast of Moscow, where they began a collaboration that encompassed landmark efforts ranging from Sputnik-1 through the Salyut space stations and N-1 Moon rocket. In September 1947, Chertok was part of the team that began rocket testing in Kazakhstan, including at the site known today as the Baikonur Cosmodrome. He continued to work as a consultant to RSC Energia after his retirement, and wrote a four-volume memoir *Rockets and People*, which outlines his long career.

from Tokyo's Narita International Airport to New Delhi and on all of its daily Tokyo Haneda flights to Beijing. JAL expects to launch a route from Narita to Boston in April using the 787. JAL has 35 787-8s on order.

Boeing's Best Week

The 251 new orders Boeing added as

of Dec. 14 marked its best week of the year and raised its net order intake to 778 for 2011. Orders for passenger aircraft include Southwest's agreement to buy 150 737 MAXs and 58 737 NGs; and two 777s and 10 787s from Etihad.

Also coming in were orders for two 777s from unidentified customers, six 777s from China Southern Airlines and the revelation that six previously ordered but unidentified 777s belong to Hong Kong Airlines.

FedEx Order and Deferral

Boeing also received orders from FedEx for two 777Fs and 27 767-300Fs, the latter as replacements for some of the carrier's ancient MD-10Fs. FedEx is deferring delivery of 11 other 777Fs. The moves will allow FedEx Express to lower its operating and maintenance costs, and to balance international capacity with expected demand, the carrier said. FedEx's original plan was to replace the MD-10s, which are operated in domestic U.S. service, with MD-11Fs that would be moved from international routes as the carrier took delivery of 777Fs. The new plan has the MD-11s remaining in international service longer and the MD-10Fs instead being replaced. Despite the 777F deferrals, FedEx Express will still be taking delivery of 16 of the aircraft over the

Four 777s Win 330-Min ETOPS Ratings

The FAA has granted Boeing type-design approval for four 777 models to fly extended operations (ETOPS) up to 330 min., boosting the long-distance safety rating for the big twinjet by 123 min. Most 777 routes are easily covered by the current rule of as much as 207 min., but the new standard will help those operating in the South Pacific, over the North Pole and from Australia to South America to fly the most direct routes. First to take advantage of the rule is Air New Zealand, which put it into service in early December flying from Los Angeles to Auckland.

At this stage, the 330-min. rating for 777s applies to General Electric-powered 777-200ER, 777-300ER, 777-200LR and 777 Freighters. GE is the exclusive engine provider on all but the 777-200ER, which also can be powered by Pratt & Whitney or Rolls-Royce. Approval for them is expected in the next few months, Boeing says.

The FAA's original 777 rating was 180 min., but was later extended to 207 min. by an application from carriers. Winning that 180-min. rating at certification, rather than an earlier

120-min. standard, was a major goal for Boeing.

The European Aviation Safety Agency (EASA) granted a 207-min. type rating for the 777 last October, as sought by Air France to fly a 777-300ER from Los Angeles to Papeete, Tahiti. EASA is also expected to adopt the 330 min. rule. The 787 was initially certified with a 180-min. type rating but Boeing expects it to gain a 330-min. rating when individual carriers seek it.

While ETOPS initially stood for extended twin operations, it now refers to "extended operations" and defines how long two- or four-engine aircraft are permitted to be from reaching an emergency landing site in case of an engine shutdown.

However, type-limiting designations for the newest four-engine jets, such as the 747-8, will not come into effect until Feb. 17, 2015. At that time, certification will be for 180-min. operations; longer flights will require additional regulatory approval.

ETOPS approval is a two-step process. Besides type-design approval for manufacturers, regulators also must certify that individual airlines are able to operate extended operations routes.



BY GUY NORRIS

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COMMENTARY

Beyond XWB

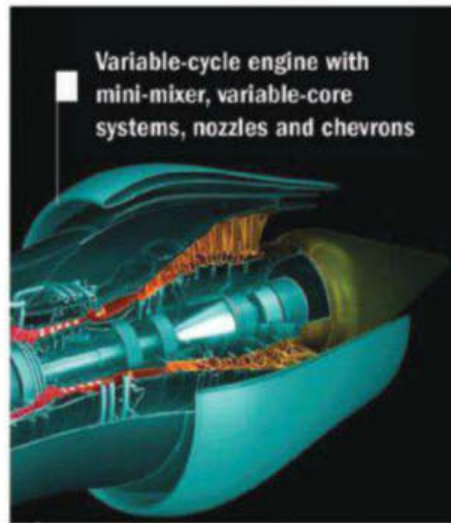
Bladed spinners and mini-mixers could lie in Rolls-Royce's big-engine future

With the first version of the Trent XWB engine for the Airbus A350 poised for the start of test flights, Rolls-Royce is already stepping up studies of what comes next in its big-engine lineup.

One key question is whether the recent birth of the new Rolls-Royce midsize engine joint venture with Pratt & Whitney will increase the chances of geared turbofan (GTF) technology spreading to the next generation of higher-thrust turbofans beyond the Trent XWB. For now it seems unlikely, mainly because Rolls believes its existing three-shaft architecture provides multiple jumping-off technology options for improving both thermal and propulsive efficiency.

However, in the longer term, there is a good chance that geared technology may be used in some form in higher-thrust Rolls engines. Both General Electric and Rolls have acknowledged that the appeal of the GTF concept increases in proportion to thrust. Even before the newly forged relationship with Pratt was announced in October, Rolls said ultrahigh-bypass-ratio geared fans may be required to meet the challenging targets of future emissions goals, such as those outlined in the European Union's Flightpath 2050 vision for air transport.

Overall, Rolls shows no signs of diverging from the guidelines of its existing research strategy, which groups technology acquisition within three broad bands—up to around five years, around 10 years, and up to 20 years and beyond. The company calls this its Vision 5, Vision 10 and Vision 20 programs, with Vision 5 originally covering engines such as the Trent 900 for the Airbus A380, and later



ROLLS-ROYCE

the Trent 1000 for the Boeing 787.

Rolls bases its near-term big-engine development squarely on the Vision 10-derived Trent XWB architecture and is starting to reveal more details about what the technology options are. At this year's International Society for Air-Breathing Engines meeting in Sweden, Rolls's future programs senior project engineer, John Whurr, said: "The core architecture of the Trent XWB, in particular the two-stage intermediate turbine, facilitates development of the core thermodynamic cycle."

It does this, he explains, by enabling increased compressor pressure ratios, and overall pressure ratio, without compromising the efficiency of the high- and intermediate-pressure turbines (HP/IP). Improvements in the core could also come from introducing a "cooled" cooling-air system to enable higher compressor temperatures without affecting component lives. Higher turbine exhaust temperatures,

and hence better thermodynamic efficiency, could be gained by introducing ceramic matrix composites (CMCs) in the turbine.

Driven by the need to be "greener," Rolls sees an increasing trend toward lower specific thrust and improved propulsive efficiency. The low-pressure (LP) system will play a big role in this, with the likely adoption of lightweight composite fan blades and containment casings, lighter LP turbines using advanced materials such as titanium aluminide, as well as slimline nacelle concepts that will mitigate the drag and weight of the larger-diameter engines of the future.

Further advancements under study include increased use of fuel as a heat sink, greater use of CMCs and possibly the introduction of variable-area exhaust nozzles similar to those in development for the PW1000G.

The raft of technologies under consideration for the longer-term Vision 20 period is what begins to stir the imagination. They include intelligent control systems with advanced prognostics/diagnostics and connectivity, as well as a fuel-cooled intercooler. For the first time in more than a decade, the engine could also look significantly different, with radical changes to the fan. Rolls is studying a bladed spinner, for example, which integrates the root of the fan blades with the spinner in an arrangement that "allows us to squeeze more flow through a fan of given size," says Whurr.

Internally, the Vision 20 engine could feature stator-less contrarotating HP and IP turbines and a casing for the IP compressor formed from a bladed drum made from metal matrix composites. It could also be configured with all-ceramic, self-diagnostic bearings and embedded centerline electric motors/generators.

To further boost efficiency, Rolls is also studying a novel concept called a mini-mixer, which would be wrapped around the aft casing. The forced mixer would be "one of the best ways to improve transfer efficiency" between the core stream and bypass stream, says Whurr. Taken as a whole, the studies show there is no shortage of ideas when it comes to squeezing yet more efficiency out of conventional turbofans. ☺

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COMMENTARY

Toward a Single Business Model

When Southwest Airlines shivers, all low-costs catch cold

Don't tell Gary Kelly and Laura Wright, but they are notable throughout Europe's aerospace community. Southwest Airlines' chief executive officer and chief financial officer, respectively, may not be aware that their U.S.-based airline's business model has cast such a long shadow abroad. However, they should know that the low-fare carrier's setup has been a universal source of inspiration for nearly four decades. Because of that, people here who are involved in the low-cost sector are increasingly anxious since Kelly acknowledged he has concerns about the future of the model, thanks to an emerging cost challenge that could become a serious threat.

This unprecedented angst permeating Southwest's business "flight path" results from American Airlines' Chapter 11 bankruptcy protection filing and planned restructuring. Now that American has joined the crowd, all major U.S. legacy carriers without exception have opted for the Chapter 11 route to revamp and slash costs, boost overall productivity and adapt to an all-new landscape. Kelly, who likes neologisms, calls the revitalized majors "New Airlines" in an indication that the U.S. airline industry is entering a new era.

It took pre-deregulation giants a long time to adapt to unlimited competition and high fuel prices. Famous brands vanished, such as Pan Am, Eastern Airlines, California-based Western Airlines and TWA,

and a great many startups failed to achieve profitability. But Southwest took an innovative tack that proved successful. Ryanair, EasyJet and other low-fare carriers around the world followed Southwest Airlines founder Herb Kelleher's innovative approach. Even French passengers boarding Air France domestic flights should thank Kelleher for the rock-bottom fares they enjoy. The flag carrier, a typical legacy player, had to adjust its rates because it now operates a growing number of city pairs in direct competition with low-fare carriers that copied Southwest's model.

However, Southwest is now facing a cost challenge that has its followers and disciples alarmed. If the icon itself is weakening, what could this

Southwest Airlines operates only Boeing 737s. Last week it ordered 150 reengined 737 MAXs and 58 737NGs.

mean for the imitators? At this point, there is no clear diagnosis. Fuel now accounts for more than 30% of direct operating costs, fuel-hedging benefits are decreasing and operating costs for commercial carriers are on par with those for low-fare or network operators—as are taxes. All airlines increasingly look alike.

It was not long ago that the debate centered on an envisioned hybrid business model, a subtle combination of conventional strategy and the low-cost way. Suddenly, the time has come to possibly create or adapt to another viable model, an outcome that caught many airline analysts off guard. Authors Kevin and Jackie Freiberg could repeat an assessment they formulated 25 years ago in *Nuts! Southwest Airlines' Crazy Recipe for Business and Personal Success*. In that book they noted that the problem with trying to understand why Southwest is the envy of businesses all over the globe is like trying to understand which piece of a gorgeous mosaic is responsible for the striking beauty of the overall work. Today, perhaps the mosaic is beginning to crumble a bit at the edges.

Kelleher created a corporate personality, not just a low-fare airline, and this of course has morphed now that the airline has become a giant. Including newly acquired AirTran, Southwest now transports about 110 million passengers per year.

European low-fare airlines have another good reason to monitor Southwest. Can its economic model remain healthy if it has to be content with a modest growth rate? It posted a mere 1.7% rise in November. In this context, it becomes increasingly difficult to boost efficiency and productivity.

In other words, Southwest may continue to face difficulties while trying to initiate yet another unique business model. And this is why the eyes of Europe's aerospace industry are keenly watching Kelly's and Wright's next move. ☐



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COMMENTARY

Punishing the Wrong People

FAA is hindered from certifying foreign repair stations due to lack of TSA security rules

With the end of the year fast approaching, there are two significant pieces of unfinished aviation-related business that official Washington needs to complete as soon as possible. The first, of course, is FAA reauthorization, which is now in its 22nd extension. The FAA has been limping by on short-term extensions since 2007, and the latest one is set to expire on Jan. 31.

Soon after the Republicans took over the House of Representatives last January, Rep. John L. Mica (R-Fla.), chairman of the House Transportation & Infrastructure Committee, said: "We are not going to an 18th extension." But politics intervened and what Mica hoped to accomplish in a matter of weeks or a few months has turned into another year-long slog. House and Senate leadership now is involved in resolving the remaining issues and there seems to be at least a modicum of reasonable hope that agreement on a long-term extension may finally be on the horizon. There has been some hopeful talk about getting a bill done by year-end, but history is not on the side of the optimist in this case.

The other issue has attracted far less attention but is no less frustrating: the Transportation Security Administration's (TSA) inability to promulgate a final repair station security rule.

In 2003, Congress mandated that TSA issue security rules for foreign and domestic repair stations by August 2004. The agency missed the deadline.

The Implementing Recommendations of the 9/11 Commission Act of 2007, passed by Congress in August 2007, gave TSA until Aug. 3, 2008, to issue final repair station security rules. TSA again failed to meet the deadline, so a congressionally mandated penalty kicked in. From that point on, FAA has been prohibited from issuing new

GOODRICH CORP.



foreign repair station certifications.

Don't spend too much time pondering why Congress would penalize the repair station industry because a government agency failed to meet a deadline. It doesn't really make any sense. How does prohibiting FAA from carrying out an important function incentivize TSA to follow the will of Congress?

What the industry should spend some time thinking about is the impact the whole mess has had on repair stations and their employees. By most measures, aviation is growing faster outside the U.S. than domestically, but U.S. repair stations seeking to grow internationally have been stymied.

According to the results of an informal Aeronautical Repair Station Association (ARSA) survey of its members, U.S. companies that responded are losing a combined \$18 million a year in revenue because they cannot obtain certification for new foreign repair stations. Three-quarters of the 36 respondents say their companies have a foreign repair station application pending or will submit one once the ban is lifted. In a recent letter to TSA Administrator John Pistole, ARSA Executive Vice President Christian A. Klein said, in part: "TSA's failure to finalize repair station security rules hinders job creation and growth at home."

Last month, 20 industry trade association and company executives co-signed a letter to Homeland Security Secretary Janet Napolitano in which they complained about the situation and urged that it be remedied by Dec. 31. The letter stated, in part:

Goodrich CEO Marshall Larsen's company operates a number of overseas facilities, including the Aerostructures Service Center in Singapore (left). He was one of the signatories of a letter urging TSA to finalize repair station security rules by year-end.

"The extensive delay in promulgation of a final rule regarding repair station security has a negative impact on our industry and the U.S. economy. American companies seeking to expand their markets overseas are hindered relative to foreign competitors due to the inability to get new repair stations certified."

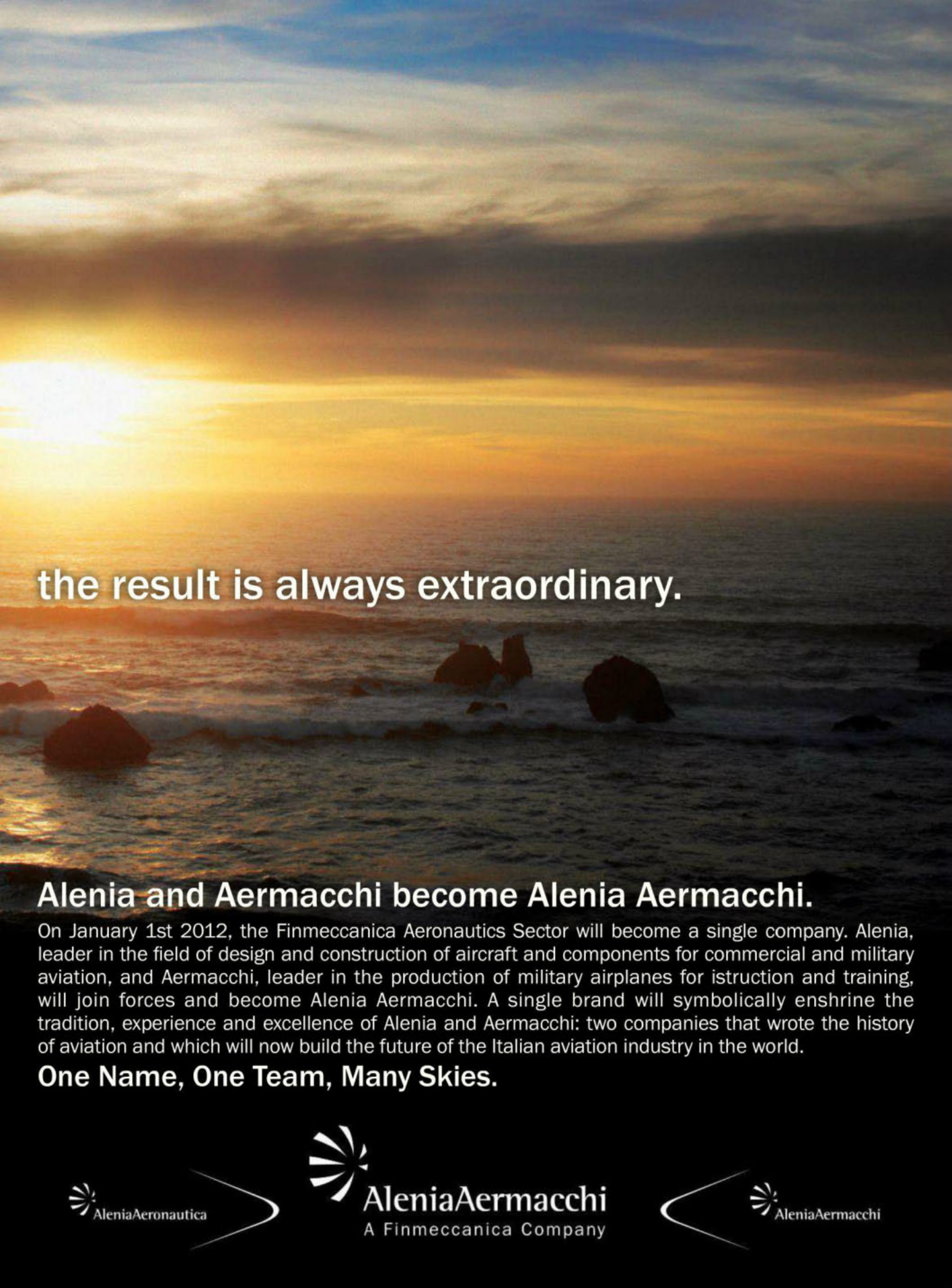
The Nov. 22 letter to Napolitano seemed to light a fire and in early December it looked as if the final rule would be released by mid-month. That optimism has dimmed as the month has progressed and it is unclear when the rule, which has not yet undergone formal review by the Office of Management and Budget, will be released.

Clearly, this has gone on long enough. Penalizing repair stations serves no purpose. TSA and the Department of Homeland Security need to release the rule, or Congress needs to step in, lift the moratorium and figure out some other way to impel the agencies to do what they've been ordered to do. ☛

Dawn: *an astronomical phenomenon caused by the refraction of the sun's rays on the atmosphere.*

When two forces unite in the sky





the result is always extraordinary.

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COMMENTARY

Spaceflight Milestone

Dragon could launch commercial space era

With the setting of a Feb. 7 launch date for the first commercial spacecraft to attempt a linkup with the International Space Station, NASA managers hope to launch a new economy in low Earth orbit (LEO) as well. If Space Exploration Technologies Inc. (SpaceX) succeeds in berthing its Dragon cargo capsule at the orbiting outpost, the way will be open for regular commercial cargo deliveries by the end of 2012. A year ago the company became the first to launch a private spacecraft to orbit (see photo) and recover it after reentry.

A successful Dragon-ISS linkup will be a vindication for Michael Griffin, the former NASA administrator who launched the Commercial Orbital Transportation Services (COTS) effort with \$500 million to seed private development of commercial cargo carriers during the George W. Bush administration. And it could be a harbinger of the LEO economy that Griffin's successor, Charles Bolden, and his colleagues in the Obama administration want to kick off.

Philip McAlister, director of commercial spaceflight development at NASA headquarters, predicts commercial crew flights to the station will be operating as soon as five years from now, and the station will continue as an anchor destination for private spacecraft, "as long as it is safe and productive" after its planned shutdown date in the fall of 2020.

McAlister may be a little optimistic about the start of commercial flights—with passage of its fiscal 2012 congressional appropriations, NASA



SPACE/CHRIS THOMPSON

has slipped its estimated first flight of a commercial crew vehicle by one year, to 2017, because of a shortfall in commercial crew funding to \$406 million from the \$850 million it requested. That means the agency will have to buy more seats on Russia's Soyuz vehicles. NASA also must finish its safety reviews for the SpaceX flight, according to William Gerstenmaier, associate administrator for human exploration and operations.

But it is clear there is growing momentum toward a commercial economy in LEO. Orbital Sciences Corp., the other COTS contractor, is preparing to fly its Cygnus cargo carrier atop the new Antares (formerly Taurus II) launcher from Wallops Island, Va., later in 2012. And executives from other companies working on crew-rated vehicles told a "future-space" conference in Seattle Dec. 9 that they are making progress on their milestones, too.

Mark Sirangelo of Sierra Nevada Space Systems, says the first flight version of his company's Dream Chaser space plane was to be delivered this

month, with flight testing to begin next year. Parachute tests on Boeing's CST-100 capsule will begin soon, says the company's Peter McGrath. Rob Meyerson of Blue Origin, the secretive Seattle area startup working on a vertical-takeoff-and-landing commercial crew-delivery spacecraft, says the company is installing a thrust chamber assembly at Stennis Space Center in Mississippi. The BE-3 liquid oxygen/liquid hydrogen engine's combustion chamber and nozzle will be hot-fired at the center's E-1 test stand.

Meyerson's appearance marked a rare public sighting for Blue Origin, which is said to have an endowment from Amazon.com's deep-pocketed founder Jeff Bezos that will allow it to keep working on its mysterious vehicles in the face of serious failures like the one that cost it a flight-test vehicle last summer (*AW&ST* Sept. 12, p. 39).

"We have steady funding and we're going to be designing, building and flying space vehicles 15, 20, 30 years from now, regardless of how the program changes over time," Meyerson says.

If the SpaceX mission goes as planned, the Hawthorne, Calif.-based company will have met its final operational COTS milestone and be eligible to begin cargo deliveries under its \$1.6 billion, 12-flight commercial resupply services contract with NASA. SpaceX says the Dragon was designed to meet human-rating requirements and is already working on a launch abort system with CCDev money to advance that work. Also in the pipeline, according to the company, is a shift from the grapple and berth approach to a direct docking. Gerstenmaier says safety concerns about getting a commercial crew vehicle off the ISS in an emergency are driving NASA's preferred design away from the grapple to a direct-docking system that meets the international standards published in 2010.

NASA is building an advanced docking system combining elements of U.S. and Russian technology that it hopes to test before commercial crew vehicles begin flying to the ISS in 2017. That hardware could be made available to commercial operators as government-furnished equipment or as a design they could manufacture themselves, Gerstenmaier says. ☼



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COMMENTARY

Defense Offensives

Undeterred by earlier failures, hawks on the Hill pledge a deficit-reduction plan

One maxim around here says that congressional compromises offend in proportion to their age. A deal reached a day ago is acceptable, if still regrettable; but a deal reached a month ago can become totally unpalatable—even to the very people who agreed to it. Thus is the case with the so-called sequestration effects of the emergency deficit-cutting and debt-ceiling deal passed into law in August. To offset a \$600 billion reduction scheduled to fall on defense spending starting in 2013, Republican hawks in the House and Senate are pledging to pull together a package of legislative proposals early next year to avoid the automatic cuts in sequestration (*AW&ST* Dec. 5, p. 22). Rep.

Buck McKeon (R-Calif.), chairman of the House Armed Services Committee, wants to delay the penalty for a year and provide a down payment on the deficit

ZUMA/NEWSCOM FILE PHOTO



SEN. LINDSEY GRAHAM

incurred by eliminating 10% of the federal workforce through attrition. Senators working on a larger package are looking at the sale of wireless spectrum and freezing the pay of government workers, among other proposals.

The problem is, ideas like these have been eyed repeatedly this year: first by an erstwhile legislative cabal led by Vice President Joe Biden over the summer; then by the "Super Committee" that was created by the deficit law and failed last month to reach agreement on alternative cuts that would have prevented the sequestration. But the hawks believe they can at least offset defense cuts without touching the controversial stuff and, in the process, gain Democratic support. While it sounds optimistic, the motivation is more akin to disgust at their own willingness to put drastic defense spending cuts on the table back in August. "It offends

the hell out of me," says one hawk, Sen. Lindsey Graham (R-S.C.).

But Republican moves to fence off the Pentagon in turn offend many Democrats, some of who are painting the effort to do away with the sequestration penalty as patently dishonest. "Flip, flop. Double-cross," says Rep. George Miller (D-Calif.). "Should have thought of that before." ☹

LIFTING LIMITS

Defense contractors are breathing easier this week after they appear to have dodged a new restriction on how extensively their salaries can be covered under federal contracts. The move was part of the annual defense policy bill, which was rushing to completion in Congress last week. The Senate's version of an earlier bill tried to limit salaries to \$400,000, but the final congressional compromise keeps the covered

level at nearly \$700,000 and even allows the government to provide exemptions. As with taxes, the limit is important in certain types of federal deals that account for costs such as contractor pay. Still, opponents of the higher cap, including Sens. Barbara Boxer (D-Calif.) and Charles Grassley (R-Iowa), were outraged. "We have more work to do to whittle down the cap of the salary subsidy," Grassley says. "The high cap is very disappointing." ☹

RECALIBRATING

Last but not least, with its budget for commercial space crew vehicles halved by Congress, NASA will shift to a more "flexible" procurement strategy to get the so-called space taxis flying as soon as possible (see p. 20). Instead of the standard fixed-price contract it had planned, the agency will continue to use Space Act agreements in its Commercial Crew Development (CCDev) program as it rushes to replace space shuttle rides to the International Space Station.

"With a firm fixed-price contract, if we don't get the funds that we anticipated, it makes it tough to renegotiate the contracts," says William Gerstenmaier, associate administrator for human exploration and operations. "We actually get a bunch of contract-change paper back and forth, which isn't a very good way of doing business."

NASA hopes competition will motivate CCDev contractors to meet its published human-spaceflight safety requirements, and at least two of them—Space Exploration Technologies and Blue Origin—endorse the change. Both were founded by dot-com billionaires, and Blue (as the startup endowed by Amazon.com founder Jeff Bezos is known) suggests NASA keep its seed-money contributions to 20% of the total "and perhaps less."

Less certain is Rep. Ralph Hall (R-Texas), chairman of the House Science Committee, who worries that NASA cannot afford more than one commercial crew vehicle contractor. "To reduce risk and cost, and to minimize further schedule slips," Hall says, "it would be my hope that two commercial companies would team together to jointly develop a cost-effective and safe launch system." ☹

Channel Divi

Germany and Italy add pressure to break apart Franco-

ROBERT WALL/LONDON

Battle lines are being drawn in European efforts to restructure the unmanned aircraft sector. But one big question looms: What front will France be fighting on?

An effort between France and the U.K. to launch a joint medium-altitude long-endurance (MALE) UAV program has already suffered its first delays and now may also be caught up in unrelated political turmoil that has London and Paris at odds. The dispute between French President Nicolas Sarkozy and British Prime Minister David Cameron over plans to reform Europe's financial governance system has strained the personal ties that underpinned last year's formation of the so-called Entente Frugale—a long-term security partnership aimed at allowing both sides to sustain military capacities at a time of diminishing resources.

Whether the palpable ill-will spills over into the security relationship should become clearer in February, when a summit is planned between the two sides on security matters. A prior security summit, called for this month, was scrapped when the political focus in Europe shifted to saving the euro.

The summit was expected to see the launch of the MALE unmanned aircraft program, with BAE Systems and Dassault Aviation already having teamed up to develop and build the system. Still unclear is whether the deal would simply be handed to the two industrial players, or if others would be allowed to compete.

The Franco-British partnership has also drawn criticism from other players in Europe who feel left out. Industrially, for instance, EADS has complained that the link-up would cut short efforts at rationalizing Europe's UAV efforts

and lobbied instead for countries to back its Talarion unmanned aircraft concept.

As if on cue to take advantage of the tension between Paris and London, EADS and Alenia Aeronautica have announced their own partnership arrangements to cooperate in the realm of unmanned aircraft, first looking at the MALE mission area and later also at unmanned combat air vehicles (UCAV). An EADS sister unit of Cassidian and Alenia already plays a role on the European Neuron UCAV demonstrator.

The Cassidian-Alenia set-up effectively tries to mirror the Franco-British pronouncement, but without a firm government commitment to develop a program. However, the German and Italian defense ministries have quietly agreed to work more closely together, although no specific program details are attached to that agenda.

U.K. Defense Secretary Philip Hammond recently told Parliament that he expects the Franco-British UAV program to move forward. "We will look for a suitable opportunity, probably in the new year, to make a joint announcement" about the commitment to the joint assessment phase.

In addition, France, Britain, Germany and Italy have a larger geostrategic goal in mind—to shut out U.S. and Israeli unmanned aircraft makers from the European market. But as the political and industrial deliberations drag on, more opportunities are emerging for those contenders as militaries look to meet urgent operational needs.

The Netherlands, for example, is moving forward with plans to buy an off-the-shelf MALE UAV system six years after the floundering of the so-

called EuroMALE program. The aim is to conduct an assessment phase and then deploy a fully operational system within a year of its initial fielding in 2015, Defense Minister Hans Hillen tells his legislature.

The Dutch system, initially at least, would not be armed, but it would be equipped with an electro-optical/infrared payload, a synthetic aperture radar and a laser designator. It will also be required to have satellite communications capability. Even France and Germany are considering off-the-shelf buys because of urgent operational



de

- British alliance

needs; the U.K. has already done so.

So what is the likelihood the Sarkozy-Cameron tiff will harm the long-term security cooperation agenda between the two countries? The impact will be minimal, suggests Alastair Cameron, an associate fellow at the Royal United Services Institute for Defense and Security Studies. "The relationship will have time to mend" before the two leaders meet again, he suggests, while noting that French and British military officials have been working together far more closely since the arrangement was established.

However, one key variable lies ahead—the French presidential elections, with the first round of voting taking place in April. Although Sarkozy is trailing badly in the polls, he may gain political mileage by using Cameron as a whipping boy; but such a move could torpedo near-term progress.

It is not just the unmanned aircraft sector that is watching what happens to the Franco-British alliance. A cornerstone of the arrangement also is to further rationalize the missile sector and push forward several cooperative initiatives. However, the two defense ministries have failed in their goal this year to launch the development and manufacturing phase of the Future Anti-Surface Guided Weapon (Heavy)—FASGW-H, or ANL in French—and more clearly spell out upgrade plans for the Storm Shadow/Scalp cruise missile. Both initiatives could still materialize in early 2012.

Also on the agenda is to further streamline industrial capacities, including within MBDA, to avoid duplication and establish centers of excellence. One issue still to be resolved, though, is how to handle other elements of the guided-weapons supply chain in the two countries, including at Thales and Safran.

Even as MBDA seeks to restructure

its European footprint, it is moving forward with a separate effort to bolster its U.S. presence and, after months of talks, has finalized a deal to buy Northrop Grumman's Viper Strike business. The terms of the deal have not been disclosed, but MBDA CEO Jerry Agee says the company has already completed the regulatory review under the Committee on Foreign Investment in the U.S. process. The engineering and production capabilities will be managed under the special security agreement governing MBDA Inc.

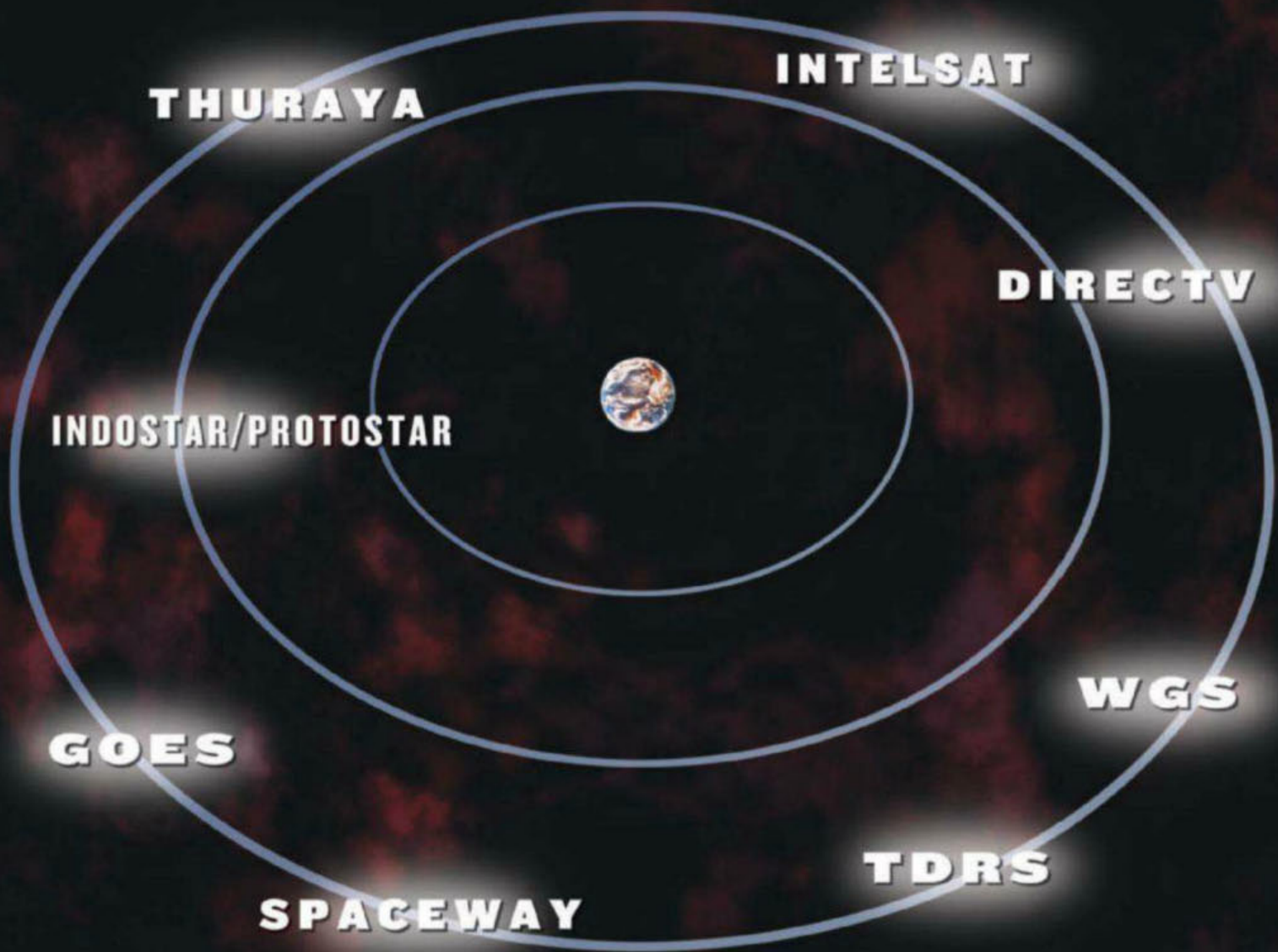
The deal effectively meets two objectives that MBDA set for an acquisition in the U.S. One was to give itself direct customer access—in this case, the U.S. Army—and the other involves securing a site where it could mass-produce munitions as it bids on contracts.

MBDA Inc. already owns a facility in Westlake Village, Calif., but production capacity there is limited. The Huntsville, Ala., production facility is located on the U.S. Army's Redstone Arsenal and does not have the limitations of the California plant. The deal also includes an engineering facility in Huntsville.

Besides developing its own munitions, the U.S. business would be looking to bring in technologies from its European parent. ☛

BAE Systems and Dassault plan to use the Mantis UAV as their departure point for a joint unmanned aircraft development program.





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UNMANNED AIRCRAFT



The Air Force is trying to buy an advanced version of the Predator Avenger, a jet-powered, stealth-shaped unmanned aircraft with a larger payload and better performance.

TYSON RININGER

Afghan Avenger?

The U.S. Air Force prepares to build an advanced UAS

DAVID A. FULGHUM and BILL SWEETMAN/WASHINGTON

The U.S. Air Force is planning to develop a heavier, more powerful version of the jet-powered, reduced signature Predator C Avenger unmanned aerial system (UAS) for deployment soon in combat zones.

"General Atomics Systems Inc. has shown the ability and willingness to quickly ramp up production capacity if the Air Force and other customers decide to rapidly field the Predator C," states an Air Force acquisition document. Those customers are the CIA and other U.S. intelligence agencies. That means a Predator C-plus with more and larger sensors and weapons could become the next-generation stealth UAS design. That would relieve the Pentagon of having to create a new MQ-X in a budget environment that is guaranteed to quash new programs. General Atomics is the "only company that has built and flown a demonstrator with the required capabilities [which include some stealth and heavier weapons] and is developing a larger, more capable version suitable for deployment," the Air Force document states. The project was already under way before the loss of a reduced signature UAV near Kashmar in northeastern Iran Dec. 4, say U.S. officials.

The Air Force's secretive Big

Safari—a rapid-acquisition organization—is overseeing the Predator C project. However, USAF officials say the effort is expected to quickly expand beyond a single-aircraft demonstrator program. They also contend that the Avenger's radar reflectivity can be made smaller and that UAS stealth is one of the capabilities to be studied in the test program.

General Atomics Aeronautical Systems, which builds the Predator family of UAVs, has operated from a U.S. military facility at the Kandahar (Afghanistan) International Airport for at least four years. It housed Predators and the then-secret Lockheed-Martin RQ-170 Sentinel (first photographed at Kandahar) that crashed (AW&ST Dec. 12, p. 18).

Among the Predator C's initial payloads will be Goodrich's MS-177 with a long-range, multi-spectral 177-in. focal-length sensor. It was demonstrated on the E-8C Joint Stars program so that radar and video data could be fused. A similar system flew on the U-2, where it was paired with a signals intelligence payload to collect fused video and electronic emissions. The MS-177 is an oblique photographic sensor using dual-band imaging over three independent optical fields of view. Modes include wide-area and line



BOEING RECEIVES TRACKING AND DATA RELAY (TDRS) M CONTRACT NOVEMBER 30, 2011

NASA has exercised an option to add TDRS M

Satellite to the existing TDRS fleet. Three Boeing-built

TDRS satellites are currently providing critical services to NASA, with two more on schedule for future delivery.



search, pinpoint and stereo targeting. Another option is full-motion video like that carried by the RQ-170 to collect data on Osama bin-Laden. Signals intelligence is considered to be a likely add-on.

The \$15 million sole-source procurement contract to General Atomics is to provide a test aircraft for the project. The contract was to have been awarded in November, but budget constraints intervened. According to the justification for "other than a full and open competition," the test aircraft is needed to develop "next-generation UAS sensors, weapons and tactics, techniques and procedures" and thereby allow "quick, smooth and efficient fielding of these advanced capabilities to the area of operations." The argument put forward by the 645th Aeronautical Group, aka Big Safari, stationed at Wright-Patterson AFB, Ohio, included a Pentagon decision that there are insufficient assets in Afghanistan to gather the necessary information, fully engage the present threat and prepare for the next generation of conflict.

Big Safari offers a streamlined acquisition process regularly used for urgent requirements. The acquisitions are critical, quick-reaction-type supplies/services deemed necessary for national security and that are outside normal acquisition parameters. Projects during the Cold War often involved equipping transport as well as high-performance aircraft with clandestine cameras and electronic surveillance devices.

The request also noted that in addition to the need outlined by USAF, the project provides a test platform for both the Secretary of Defense and intelligence agency "customers under an ongoing, classified [defense-secretary]-directed program." The July 5 letter of direction predated the Sentinel crash. The Predator C is designed to provide a "significantly increased weapons and sensors payload capability," and it is much faster than the MQ-9 Reaper. The aircraft has an internal weapons bay and three hard points on each wing. Funding will come from 3,600 research and development accounts.

The future seems bright for General Atomics because the memo also calls for a "permanent, next-generation UAS test capability," which indicates additional production of the jet. The first Avenger has been flying on a weekly basis; the second aircraft produced should make its first flight soon. The aircraft slated for Afghanistan will be sequenced for later production, says an aerospace industry insider. ☐

The Big Drop

Billionaire Paul Allen backs Burt Rutan's vision of air launch

MICHAEL MECHAM/SEATTLE and FRANK MORRING, JR./WASHINGTON

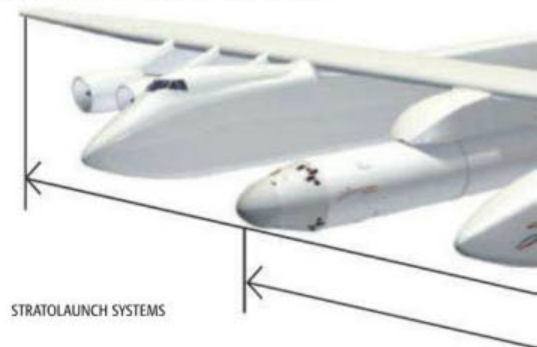
In what is probably the year's most exotic approach to space launch, billionaire entrepreneur Paul Allen and aircraft designer Burt Rutan aim to use the equivalent of two Boeing 747-400s to carry a Falcon 9-derivative rocket to 30,000-35,000 ft. for an air-drop launch of satellites or humans into low Earth orbit.

Their two-fuselage design brings to mind the Model 76 Voyager developed by Rutan that circled the world without stopping or refueling Dec. 14-23, 1986, or, more recently, the WhiteKnight mother ship for SpaceShipOne that won the Ansari X Prize in 2004 as the first privately funded, human-rated spaceship. But this time the carrier aircraft is to have a wingspan stretching 385 ft.—a 747-400's is 212 ft.—and a takeoff weight of 1.2 million lb., which rivals an Airbus A380's.

“I don't think we're developing any new technology here, but this is a very complex system that we have to optimize.”

"Since the success of SpaceShipOne, I have thought a lot about how to take the next big step, a private orbital system," Allen says of his new venture, Stratolaunch Systems, part of Vulcan Inc., the business and philanthropic holding company he owns in Seattle. Funding the venture will be "an order of magnitude beyond SpaceShipOne," he acknowledges. Stratolaunch aims for the first test flight of its "carrier aircraft" in 2015 and an initial rocket launch in 2016.

Allen and others associated with the venture—including Rutan, former NASA Administrator Michael Griffin as a company board member, and Gary L. Wentz Jr., former chief engineer of science and mission systems at NASA's Marshall Space Flight Center who is



STRATOLAUNCH SYSTEMS

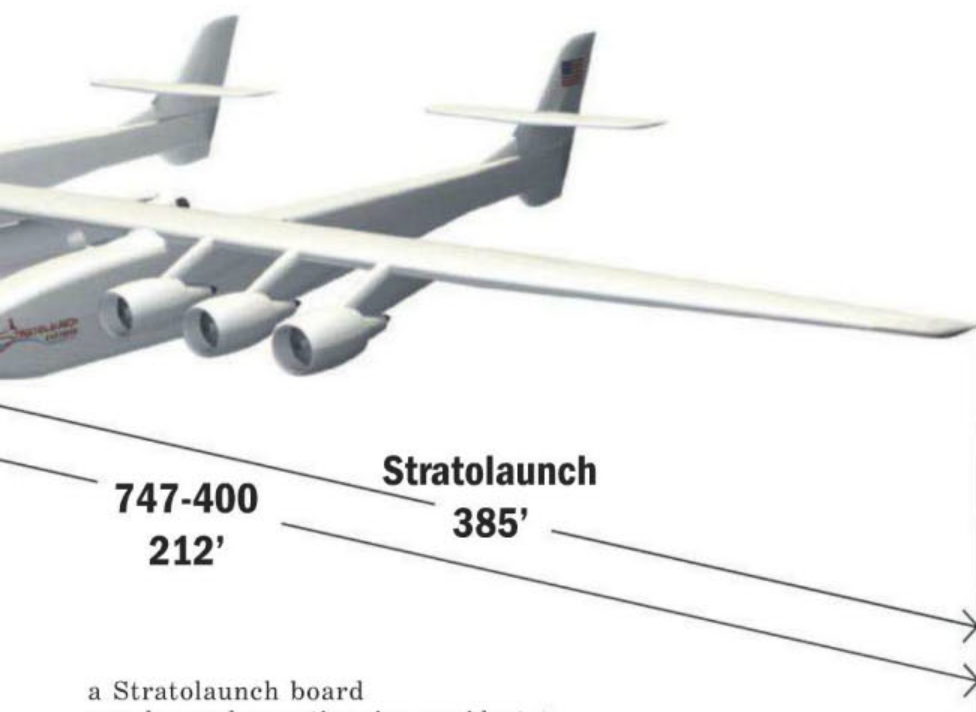
now Stratolaunch's chief executive and chairman—declined to provide many specifics about the program's design, specifications or costs during a briefing in Seattle last week. Rutan says their reluctance stems from a need to protect proprietary data.

The Stratolaunch enterprise is scattered across the country. Scaled Composites, the company Rutan founded that is now part of Northrop Grumman, will build the composite carrier aircraft in a new hangar it is constructing at Mojave Air and Spaceport in California. The Falcon launch vehicle is being developed at the campus of Space Exploration Technology (SpaceX) in Hawthorne, Calif., and the 40,000-50,000-lb. mating and interface system needed to suspend the rocket from the carrier's center wing is being developed by Dynetics Inc., an aerospace and engineering company in Huntsville, Ala.

Wentz says Stratolaunch is in the process of purchasing two used 747-400s that will be cannibalized for engines, avionics, flight deck, landing gear and other proven systems that can be recycled to cut development costs. One task is to design the launch control system, which will be handled entirely from the carrier aircraft, he says.

Dynetics's mating and interface system will be required to hold a launcher weighing up to 490,000 lb. "We'll be integrating the mission planning stuff associated with the drop and the launch, and building the hardware that will allow the drop," says David A. King,

Stratolaunch's carrier aircraft will have a wingspan nearly twice as wide as a Boeing 747-400's, but it will use as many of the older airplane's systems and components as possible to cut development costs.



a Stratolaunch board member and executive vice president of Dynetics.

For that work, Dynetics will apply its experience as prime contractor on the U.S. Air Force's GBU-43/B Massive Ordnance Air Blast (Moab) bomb, and with Boeing on the GBU-57A/B Massive Ordnance Penetrator (Mop) bunker buster, which weigh 20,000 and 30,000 lb., respectively.

"We've got a fair amount of experience dropping big, heavy stuff, too, both aerodynamically and from a mechanical perspective," King says.

Aerodynamic considerations probably will require a shorter version of the Falcon 9 launch vehicle than the one SpaceX is using in its bid to supply cargo and eventually crew to the International Space Station. That in turn will likely drive the air-launched Falcon to fewer than the nine Merlin kerosene-fueled engines SpaceX uses in its ground-based first stage. King says those trade-offs are still being worked out, as is the timing for moving from unmanned payloads to crew vehicles.

"We've been providing Vulcan with a lot of information about what we believe the market to be, at least in the [Defense Department]/NASA world," says King, a former director at Marshall. "Obviously, we don't know as much about the commercial world or the tourism

world, but we're talking with them now about how we're going to stand up the right kind of team to go do that."

Dynetics has been under contract to Vulcan for almost a year and has some 40 employees on the project so far. SpaceX joined more recently, and the overall team is still working through details of how to progress toward its 2016 first launch.

"This is a development program, and development programs take five to seven years to get through," King says. "A lot of that depends on funding and funding profiles and how well you do and how much existing technology you're putting in place. I don't think we're developing any new technology here, but this is a very complex system that we have to optimize, and we have to optimize it just right to make it work and get the kind of payload capability that we need. We've got a lot of work to do, but we see this as a fairly typical development program."

The result, he says, will be a Delta II-class launch vehicle able to compete with anything in that class worldwide. "Anything there and south of there—we'll be taking a look at those markets," King says.

Among the details still to be nailed

down are where the Stratolaunch System will operate from. Potential sites include Florida's Kennedy Space Center, Edwards AFB near Scaled Composites' headquarters in Mojave, or Hickam AFB in Hawaii, Wentz says. The carrier will require a 12,000-ft.-long runway and the capability for fueling the two-stage liquid-fueled Falcon rocket.

While Rutan began sketching out such an air-launch system 20 years ago, he emphasizes that today he is retired and it is the younger engineers at Scaled Composites doing the detailed work.

Also yet to be determined is the venture's revenue stream, says Griffin. "Initially, there is a thriving communications satellite market" for small comsats suitable for the Falcon. The Defense Department and NASA's scientific community have similar needs.

"There's also a huge demand for payloads produced by unskilled labor at home that would like to go into orbit," Rutan jokes of humans eager to orbit the Earth.

Because satellites are the easiest payloads to launch, the companies that want to send them into orbit are most likely to be Stratolaunch's initial paying customers, Griffin says. Spacecraft weighing up to 13,500 lb. will be carried by the unmanned Falcon.

"At some point, we will have the capability to loft up to six people," Griffin says. Beyond the need to assure their safety during launch, the question arises as to what passengers will do once they are in space. One obvious answer is that they will be space tourists on missions lasting no more than a few days.

Griffin says it is too early to say whether the Stratolaunch can service the International Space Station, although Rutan says it is shameful that the U.S. no longer has the capability to carry its own astronauts to the station.

"It's become more expensive to put people in orbit with the systems this country has [now] than it was in the very first year of the very first decade" of U.S. manned spaceflight, Rutan says.

"I believe there have to be several really big breakthroughs to make [spaceflight] more affordable and safer so we have access to orbit," Griffin adds. "I believe using air launch may be one of several breakthroughs to do that."

Asked if he would like to be among the first passengers, Allen demurred, saying he is inherently cautious—even if he is apparently willing to risk \$200 million or more as the backer of Stratolaunch. ☐

Full Circle

France may regain competitive edge in Earth-observation sats

AMY SVITAK/PARIS

Commercial Earth observation was all but invented in France, yet companies here that pioneered the high-resolution optical imagery market a decade ago have been edged out in recent years by tough competition from the U.S.

That could change, however, with the planned launch of France's first Pleiades high-resolution Earth-observation satellite this month, one of two next-generation optical-imaging spacecraft designed to serve military and civil users while reserving capacity for commercial customers.

Nearly 10 years in the making, the €760 million (\$1 billion) Pleiades program started in October 2003 with a €314 million

year selected Astrium as one of its radar imagery suppliers.

Astrium Geo-Information Services, a commercial company owned by Astrium and a subsidiary of Astrium Services, which commercializes Earth-observation imagery worldwide, already holds agreements with three companies seeking direct tasking rights to commercial Pleiades data. These include Japan's Pasco Corp., East-Dawn of China and Canada's MDA Corp., all of which have signed up for volume purchases of Pleiades imagery with the ability to directly send commands to the satellites.

Designed as a follow-on to France's SPOT satellites, with the capability to acquire the same wide-swath panchromatic and multispectral imagery, Pleiades will feature cutting-edge technological advances such as: 70-cm (27.5-in.) ground resolution that can be resampled to produce 50-cm resolution across a 20-km (12-mi.) swath; a high degree of agility that allows acquisition of several images successively along track or off-track for mosaic ground scenes; onboard storage capacity of 600 GB; and a downlink data rate to 450 mbps.

Both satellites are to be launched to a polar orbit at 694 km in altitude with 180 deg. between them in order to maximize the revisit time for any given area of the Earth's surface. The second satellite is scheduled for launch in spring 2013.

The French Ministry of Defense, through annual contributions to CNES, is paying for 90% of the Pleiades mission. The remaining 10% is covered by four nations that agreed to contribute minority stakes in Pleiades in return for programming rights equivalent to their participation: Belgium, 4%; Spain, 3%; Sweden 3% and Austria 0.4%.

With the planned launch of the two Pleiades satellites, France has a chance to regain its status as an Earth-observation leader.

Because the French defense ministry financed Pleiades through CNES, it has rights to 50 images per day from the two-satellite system. Pleiades managers estimate the two satellites together will produce 900 images per day.

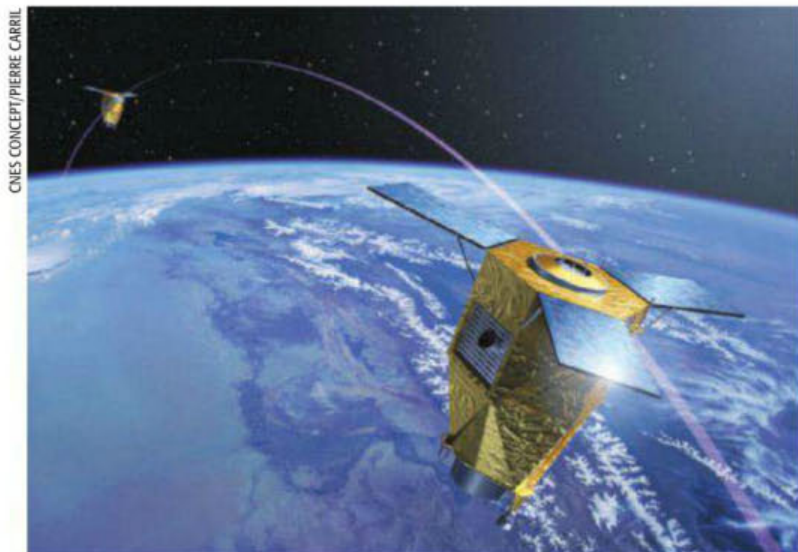
Of the 850 remaining images, 40% are reserved for the French government for civil research programs and mapping. The other 60% are set aside for Astrium Geo-Information Services for global commercial sales.

The government has vowed it will not add value to the 40% of the 850 images reserved for government users in a way that would compete with Astrium's ability to market images.

Pleiades was set to launch Dec. 16 from French Guiana, along with four Elisa radar eavesdropping satellites developed for the French procurement agency DGA and a Chilean Earth-observation satellite. All six spacecraft are built by Astrium.

Although Pleiades could be the last government-funded civil satellite, France continues to advance the field of optical imaging systems. CNES is working with defense ministry money on a next-generation optical system tentatively named CXI, the roman-numeral equivalent of 191 that corresponds to an annual defense funding line included in the CNES budget request.

In addition, France is forging ahead with the optical component of Europe's next-generation imaging intelligence-satellite network. Last year Astrium landed a €795 million contract to build two very-high-resolution imaging intelligence satellites for the optical component, known as CSO. The spacecraft will replace France's Helios 2 satellites, which were launched in December of 2004 and 2009, respectively. ☼



fixed-price contract awarded to EADS-Astrium by the French space agency CNES, with Thales Alenia Space of France and Italy providing the principal optical instrument.

Financed almost entirely by the French government, both satellites were designed to launch atop Europeanized Soyuz rockets—the first in mid-2008, followed by the second in 2009. But the debut of the rocket from Europe's Kourou, French Guiana, spaceport was postponed repeatedly, forcing lengthy delays in the Pleiades launch and depriving Astrium of anticipated revenue.

Meanwhile on the opposite side of the Atlantic, the U.S. Defense Department in 2010 awarded a 10-year, \$7.3 billion contract to two Astrium competitors in the U.S.—Dulles, Va.-based GeoEye and Longmont, Colo.-based DigitalGlobe—dramatically altering the landscape for commercial Earth-observation services in the global market.

Such pre-purchasing mechanisms do not exist in Europe—France has declined to reserve capacity on Astrium's SPOT 6 and 7 medium-resolution wide-swath optical imaging satellites, for example. But the addition of Pleiades to Astrium's geospatial intelligence services portfolio could give the company access to other markets, including the U.S., where the Pentagon last

Anyone who has been following the progress of the Joint Strike Fighter program knows it has had many ups and downs, and each week seems to bring at least one new development. Interpreting what it all means at any given time is akin to reading tea leaves. The latest is last week's news that Japan has chosen the F-35, but that was counterbalanced by an unflattering review of the program's technology assessment leaked from the Pentagon. The two developments serve as high and low points for this fifth-generation fighter—a reminder that the program remains very fluid, and the only certainty is that more ups and downs are likely for many months to come, as explained in the articles that follow.

Not Just Japan

Tokyo's expected F-35 choice in its F-X competition may prompt other JSF sales

BRADLEY PERRETT/CANBERRA, AUSTRALIA, AMY BUTLER/WASHINGTON and GUY NORRIS/LOS ANGELES

In English-speaking countries, people like to keep up with the Joneses. For South Korean defense ministry officials, it is important to keep up with the Tanakas.

That is one reason why Japan's expected order for the Lockheed Martin F-35 is likely to result in sales of more than the 42 fighters that industry officials anticipated Tokyo would buy. Another is that the aircraft chosen for Japan's fighter program for this decade may well be built throughout the 2020s, long after the initial requirement is filled.

A Japanese order for F-35s, especially if followed promptly by one from South Korea, will bolster early demand for the stealth fighter, potentially offsetting reductions in purchases by other customers, such as the U.S. and cash-strapped European countries. Both North Asian countries urgently need to replace old F-4 Phantoms—and, with the F-35, both would run the risk that the troubled program could force them to wait longer than planned.

Japan's decision, leaked to leading local media and expected to be announced before the end of the year, is also likely to confirm that Japan has drawn a line under its 55 years of full-scale fighter manufacturing. With the F-35, Japan is likely to join Italy in assembling the aircraft, but industry officials say the need to protect stealth secrets means that the F-35 cannot be completely manufactured outside of the U.S.—and doing so would be extraordinarily costly anyway.

Boeing and Eurofighter, offering the

F/A-18E/F Super Hornet and Typhoon, respectively, have been Lockheed Martin's rivals in Japan's F-X competition. Their aircraft have been available for extensive manufacturing in Japan.

The same two companies now stand at heightened risk of losing the similar but



U.S. AIR FORCE

larger competition to supply 60 fighters to South Korea. One issue on the minds of the competitors is that South Korean defense ministry officials would be loath to buy an aircraft that the country's highly nationalistic politicians and voters would criticize as less modern than Japan's. The F-35 looks like a safer buy—even though, in both countries, critics will likely question the wisdom of choosing the immature design, especially after the latest revelations of development troubles in the leaked "quick look review" report (see p. 30).

A U.S. defense official says no changes are being made to the F-35 development

schedule as a result of the report. These issues were known to the program office and contractor, and fixes are being worked on.

In South Korea, Boeing is offering the F-15SE Silent Eagle, derived from the F-15K, which is already partly built there. Again, the Silent Eagle and the Typhoon promise to sustain South Korea's domestic fighter production base, whereas the F-35 would leave plants, engineers and mechanics looking for other work.

Japanese industry has urged that the new fighter chosen be built until the late 2020s. Even at the low production rates typical in Japan, that would result in deliveries of perhaps 120 fighters, partly replacing Japan's Boeing F-15J Eagles. Under the i3 program, Japan is working on technologies for another fighter that would be built starting in the 2030s.

Reasons for Japan's F-35 choice include its stealth and suitability for information-networking, says the *Yomiuri* newspaper, adding that the Japanese government is satisfied with U.S. willingness to share information with Japanese manufacturers. It is taboo in Japan to discuss strike missions, but another key advantage of the F-35 is clearly its ability to penetrate hostile defenses, notably those of North

Korea. The F-4s are tasked with air-to-air missions, but Lockheed Martin promotes the F-35's air-to-ground capability.

Japan likely values F-35 stealth features such as internal weapons stowage for both the air-to-air role and an improved ability to penetrate North Korean defenses.

The order for the first four aircraft, fully imported, should be in the budget for the year beginning April 1, 2012, with

deliveries starting in 2016. Japanese companies will help make later units. Unless Japan relaxes its ban on arms exports, it cannot supply parts for F-35s built for other countries—although the desire to sustain the industry and hold down costs could lead to a change in policy. Japan launched a review of the ban last year, possibly in anticipation of an F-35 order.

In the run-up to the decision, Lockheed Martin bolstered its bid by offering Japan manufacture of several F-35 components as well as final assembly and checkout, integration and test, depot-level sustainment, repair and overhaul. The assembly plant will cost about \$1 billion, industry

officials say. Japan will also be able to assemble the F-35's Pratt & Whitney F135 engine, although any customer will need to do that if it is to overhaul the turbofan.

The Japanese air force originally hoped to replace its last Phantoms in the fiscal year beginning in April 2009 and lobbied the U.S. to be allowed to buy the Lockheed Martin F-22. The replacement program slipped even as Mitsubishi Heavy Industries and suppliers such as IHI Corp. and Mitsubishi Electric Corp. faced the end of F-2 strike fighter production. The last F-2 was handed over in September.

The manufacturers proposed building more F-2s to keep themselves busy, but in the past few weeks it has become more clear why that was not a possibility. Defense Minister Yasuo Ichikawa told the Diet on Nov. 9 that more F-2s would cost ¥15 billion (\$193 million) each. The F-2, based on but larger than the Lockheed Martin F-16, has also been criticized as too small for further development.

The Japanese order, and its potential South Korean follow-on, have unusual value to the program because the two countries and the manufacturer are all keen on early deliveries. Lockheed Martin hopes for more units in early batches to reduce unit costs, says Tom Burbage, executive vice president of F-35 integra-

tion at Lockheed Martin. Equally important, he says, is stability. "We have not yet had a year where the number we planned is what we got appropriated," causing turbulence in the supply chain, he says. "Facing volatility in our supply chain is one of our biggest challenges."

For Japan, the challenge will be to receive new aircraft on time to preserve its fighter force. To begin taking delivery in 2016, its first aircraft will be part of the low-rate initial production batch 8 (LRIP 8), which is due to be ordered in 2014. The 2016 deliveries are scheduled to include the Block 3 software.

The South Korean defense ministry also hopes to order next year and begin taking delivery in 2016, a schedule that seems uncomfortably close to the JSF development plan. The program's technical baseline review conducted this year called for testing to finish in 2016 on the F-35A, the version that the North Asian countries are interested in. The F-35 program—the Joint Program Office and Lockheed Martin—recently wrapped up an integrated baseline review that is intended to match funding to work laid out in the technical baseline review.

Comments by the chairman of the U.S. Joint Chiefs of Staff, Army Gen. Martin Dempsey, last week hinted that there

may be slips in F-35 orders; the details will appear with the budget release in February. Meanwhile, the Defense Acquisition Board will review the integrated baseline plan and new cost estimates for the program next month.

The Joint Executive Steering Board (JESB), a panel of senior officials from each F-35 country, was supposed to have its second 2011 meeting this month. But the meeting has been delayed to March because the U.S. government might change its planned orders in February. The JESB should include obligations for LRIP 6, but any slips would likely ripple into later LRIP buys, including LRIP 8.

While the plans of the U.S. and other customers are not solid, more than 100 F-35s are in the LRIP 8 buy, customers for which include the U.S., Italy, Australia, Netherlands, Norway, Israel and Turkey.

In contrast to the program boost from the urgency of Japanese and South Korean requirements, Australia's longstanding commitment may be in doubt because Canberra cannot afford to wait beyond the end of the decade to replace its Boeing F/A-18A/B Hornets. It has already begun buying the obvious F-35 alternative, the Super Hornet. ☐

With Bill Sweetman in Washington.

JSF Gremlin Alert

BILL SWEETMAN/WASHINGTON

While Japan expects to receive its first F-X fighters for training in 2016, a new report suggests that the F-35 will not meet its 2015 target for starting initial operational test and evaluation, which would delay the completion of certificated training plans and syllabi.

A high-level Pentagon "quick look review" (QLR) panel recommends that plans to accelerate production from 2013 onward be made "event-driven" after its investigation revealed multiple "major consequence" issues in the JSF program. Those problems—including aerodynamic buffeting, an unsafe fuel dump system, unreliable secondary power system and multiple issues with the helmet-mounted display—could mandate costly modifications for aircraft produced before fixes can be designed and tested.

Prime contractor Lockheed Martin and program office officials have acknowledged some issues (AW&ST Dec. 12, p. 38), but the QLR depicts many of these problems as being harder to remedy than previously reported.

The QLR report was marked for U.S.-only distribution, so it was not available to partner nations or prospective customers, including Japan. Copies were obtained early last week by Aviation Week, and the report can be read online at aviationweek.com/extra

The panel was chartered by acting Pentagon acquisi-

tion boss Frank Kendall on Oct. 28, after top U.S. Air Force, Navy and U.K. Royal Air Force operational test force commanders expressed concern that the F-35 may not be ready to start initial operational testing in 2015 due to issues discovered since flight tests sped up in 2010.

Countering earlier critics, such as the 2008 Joint Estimating Team, JSF advocates contended that modeling and simulation would unearth more problems in advance of flight testing, so predictions based on historical models would not apply. In fact, the F-35 test program is showing similar levels of discovery to other programs, and the QLR team postulates that it will continue to do so. As a result, the QLR team predicts that as-yet-undiscovered problems will emerge in areas such as fatigue and buffeting.

Since June 2010, 725 engineering change requests have been initiated, of which 148 are ready to incorporate. On average, it takes 18-24 months between the identification of a change and its release to production. Under the current plan, close to 200 aircraft will be on order by the halfway point in flight testing.

The QLR report gives new details of some specific problems. A unique F-35 feature—the ability to display infrared imagery on the pilot's visor—will not be available until the Distributed Aperture System sensors and the JSF's central computer are upgraded. The Integrated Power Pack, a complex system that integrates emergency and auxiliary power and environmental control functions, has been changed 16 times during flight tests, a 48-hr. process. ☐

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BEST OF THE BEST

Jason Pineau

Yellowknife, Northwest Territories

De Havilland DHC-6 Twin Otter rests under a thin band of aurora borealis on Point Lake, Northwest Territories.



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PHOTOGRAPHY AND ART ISSUE

FIRST PLACE DEFENSE

Perttu Karivalo

Oulu, Finland



Finnish Army Aviation NH90 helicopter, with Maj. Jaro Kesanen at the controls, winches rescue divers to a Finnish border patrol boat on the high seas about 15 nm from Oulu, Finland, during the Shark 2011 Search and Rescue Exercise. The patrol boat was cruising at 15 kt. with a 15-kt. head wind, so the helicopter was flying at 30 kt. sideways and 12 ft. over the boat.

SECOND PLACE DEFENSE

Geoffrey Lee

Camberley, England

Flight Lt. Dan Hayes flies RAF 1 FTS 2011 Tucano, which is based at RAF Linton on Ouse, Yorkshire, England.



THIRD PLACE DEFENSE

Jay Beckman

Chandler, Ariz.

The "Digi Hornet" from VFA-122 Flying Eagles emerges from its own vapor cloud over EAA AirVenture 2011 in Oshkosh, Wis.



FIRST PLACE SPACE



Bill Congdon and Steve Moon

Centennial, Colo.

An experimental heat shield-aeroshell for a NASA planetary entry vehicle undergoes a ground test with a heating rate of 150 watts per square centimeter.

SECOND PLACE SPACE



Ben Cooper

Daytona Beach, Fla.

Atlantis spends its final night on the Kennedy Space Center launch pad in the pouring rain on the eve of the 135th and final space shuttle launch.

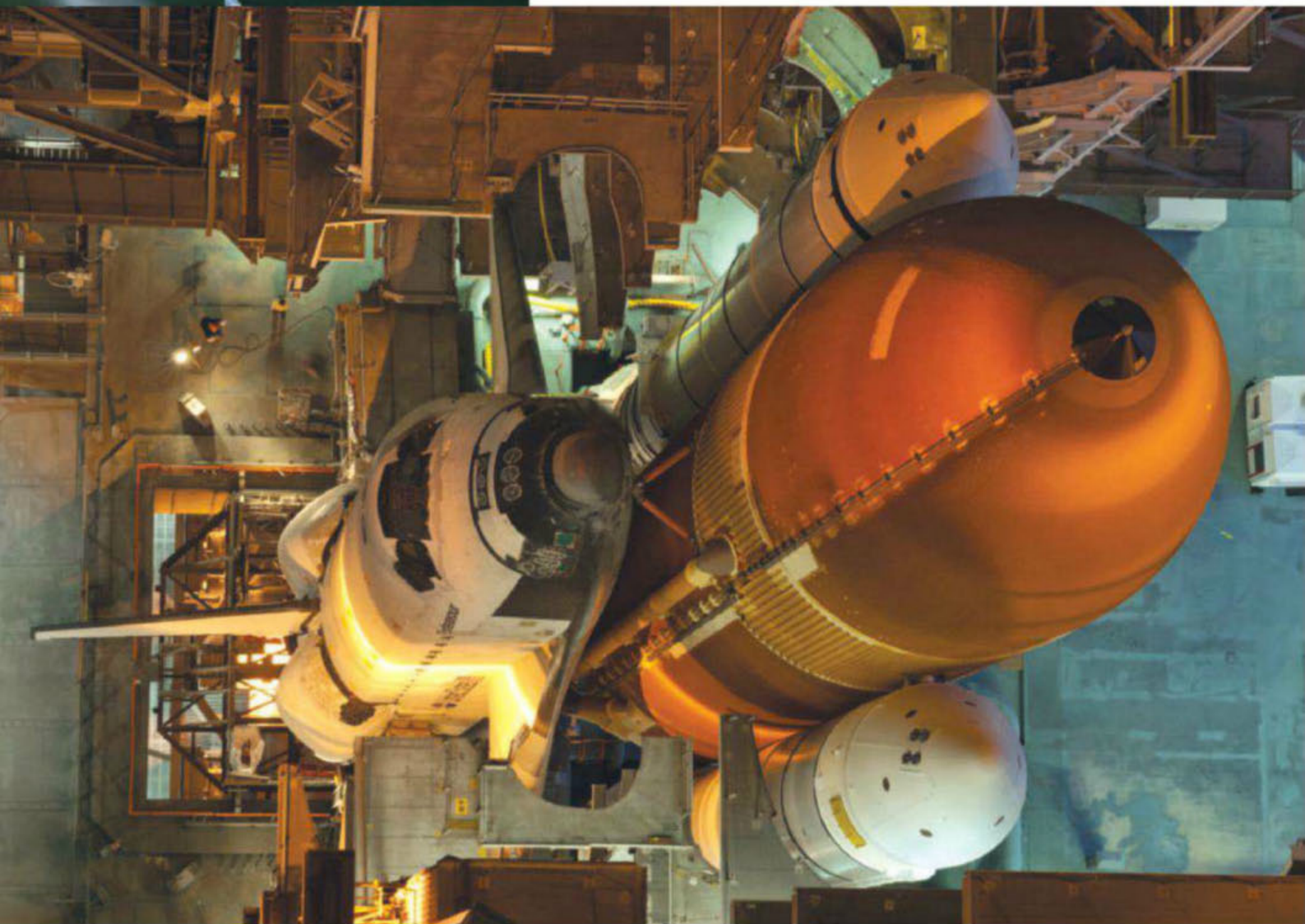


THIRD PLACE SPACE

Ben Cooper

Daytona Beach, Fla.

An overhead view of Endeavour before the penultimate space shuttle rollout from the Vehicle Assembly Building to the launch pad at Kennedy Space Center.





FIRST PLACE COMMERCIAL

Leonid Faerberg

Moscow, Russia

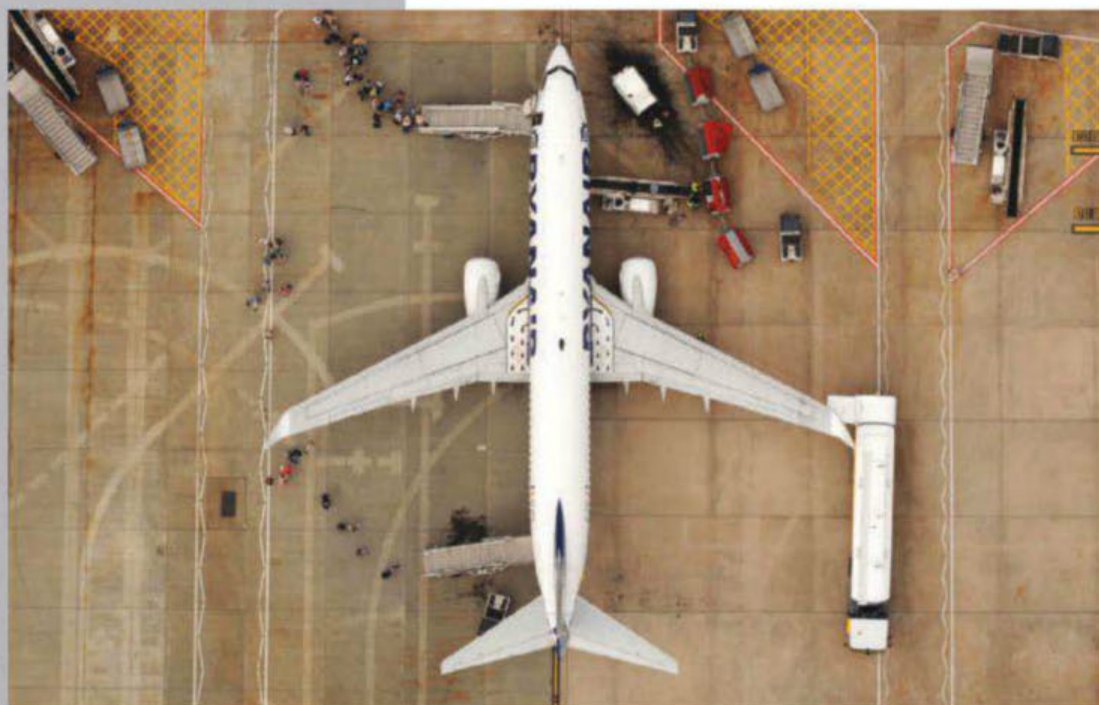
Airbus A380 performs a low-visibility flyover
at the MAKS-2011 air show at
Zhukovsky, Russia.

SECOND PLACE COMMERCIAL

Nicholas Wilkinson

Manchester, England

Ryanair Boeing 737-800 takes on passengers,
luggage and fuel at Liverpool
John Lennon Airport in England.



THIRD PLACE COMMERCIAL

Ognyan Stefanov

Sofia, Bulgaria

Thomas Cook Airlines Boeing 757-200
prepares for takeoff from Sofia on a
foggy night.



FIRST PLACE GENERAL



Rod Reilly

Suwanee, Ga.

Stefan Hokof paints the name
Twilight Tear on P-51D N25IL at
EAA AirVenture 2011.

SECOND PLACE GENERAL

Jim Koepnick

Oshkosh, Wis.

Amy Gesch takes off in her Dakota
Cub on skis.



THIRD PLACE GENERAL



Alain Ernoult
Bagneux, France

Experimental Eurocopter X3 hybrid leaves
its wake on water below.

READERS' CHOICE



Tamas Kolos-Lakatos

Cambridge, Mass.

Airport fire trucks at Budapest, Hungary, greet a KLM Boeing 737-900 in SkyTeam livery as the alliance celebrated the opening of a new ticket office there.



Jay Beckman

Chandler, Ariz.

"Sentimental Journey" from the Arizona Wing of the Commemorative Air Force and "little friends" cross over Red Mountain in Mesa, Ariz.



James N. Brown

Covington, Ga.

The final space shuttle mission provided a rare opportunity to photograph the orbiter Endeavour from high atop the Rotating Service Structure, following rollout.



Jamie Hunter

Woking, England

An F-15C of the USAF 65th Aggressor Sqdn. turns and burns as the pilot attempts to evade an F-22A Raptor.



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THE JUDGES

JAMES R. ASKER/AW&ST



(L to R): Photographer, author and archivist **DANA BELL** has retired after a 30-year career with the U.S. government. Starting as a photo researcher with the Air Force in 1976, he moved to the Smithsonian Institution's National Air and Space Museum in Washington in 1982. Bell has written 24 books on aviation history, and is now a full-time author. This year marked his 14th as a photo contest judge.

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

THE WINNERS



BEST OF THE BEST Jason Pineau

Pineau is a commercial pilot based in Yellowknife, Northwest Territories. Flying the DHC-6 Twin Otter—on floats, skis and tundra tires—he has the opportunity to photograph much of Canada's north. More of his work can be found at www.jasonpineau.com



2nd PLACE DEFENSE Geoffrey Lee

Lee has been an air-to-air photographer for 31 years and has more than 500 hr. of military back-seat experience. He joined Hawker Siddeley Aviation as a photographic apprentice and has since flown with the Royal Air Force, created Planefocus Ltd. and produced two books of his work. Lee has photographed every British civil and military aircraft type from the Spitfire to the Concorde and has worked with civil and defense aerospace companies worldwide.



3rd PLACE DEFENSE Jay Beckman

Beckman started Crosswind Images two years ago after a 20-plus-year career in network sports television. He belongs to the International Society for Aviation Photography, Arizona Aviation Photographers, Experimental Aircraft Association and Aircraft Owners and Pilots Association. www.crosswindimages.com



1st PLACE DEFENSE Perttu Karivalo

Karivalo is a commercial pilot, flight instructor, seaplane bush pilot and owner of aviation consulting company Night Sky Inc. (www.nightssky.fi), who lives in Oulu, Finland. He also is a Finnish air force reserve pilot. Karivalo has been photographing aircraft since 1977 and been the photographer and commentator for the air force display team Midnight Hawks since 1998, taking air-to-air photos from the back seat of the team's BAE Hawk Mk. 51s. He was director of Finland's annual air show in 2010 and 2011 and is a regular contributor to aviation magazines such as *Combat Aircraft*, *Aviation Monthly of Finland*, *Soldier of Finland* and *Fuerza Area*.



1st PLACE SPACE Bill Congdon & Steve Moon

Congdon (left) is a thermal protection engineer who for 30-plus years has worked on NASA and U.S. Air Force systems including Mars Viking and Mars Pathfinder. He is director of the ARA Ablatives Laboratory in Centennial, Colo. Under the NASA Science Mission Directorate In-Space Propulsion Technology (ISPT) Project, he is principal investigator for advanced heat-shield systems. Moon has been an electrical engineer with Gray Research for 11 years and was the Aerocapture Technology Area test coordinator for the ISPT Project.

services for the Americas, managing media sales of all Reuters news services to broadcasters and of Reuters News Pictures and Health News Service.

With a passion for unique images in aviation, **CHRIS SORENSEN** became a professional photographer, honing lighting, composition and movement skills that have led to his work being featured in more than 100 publications, including *Aviation Week & Space Technology*, *Forbes*, *Newsweek* and *Business Week*. His assignments have ranged from a day in the life of United Airlines for its official history, to a five-stop papal tour, to the hand-construction of a business jet. Sorensen's eye for special aerospace imagery is what has prompted *AW&ST* to enlist him as a judge in its annual photo competition for the past 13 years. Among his many citations, Sorensen has won the Aviation Journalist of the Year Award from the National Air Transportation Association. He is currently shooting photos with the theme "IT at Work" for the Information Technology Group of Los Angeles World Airports, photographing virtually every aspect of an airport's operation. He can be contacted at cs@chrissorensen.com, and samples of his work can be viewed at www.chrissorensen.com

PEGGY FERRIS and husband **KEITH** have worked together as a team in support of his artistic and photographic efforts for more than 50 years. She is responsible for the organization of Keith's reference files, library and collection of more than 50,000 35mm slides. Peggy has traveled extensively with Keith in support of his work for the aerospace industry and U.S. Air Force. Keith created the 25 X 75-ft. B-17 and Jet Aviation

murals in the Smithsonian Institution's National Air and Space Museum in Washington. During his 60 years as an aviation artist, he has served the advertising, editorial, public relations and historic documentation needs of the aerospace industry and U.S. military. His career includes 48 years of flying in military jet aircraft using his camera in support of his 60 major paintings that document Air Force history in the U.S. Air Force Art Collection. His aviation art can be seen at www.keithferrisart.com

BARBARA BAKER BURROWS is director of photography for *LIFE*, whose books in the last year included *The Royals*, *John Lennon*, *100 People Who Changed The World*, *America: A Visual History* and *Wonders of Life*. Burrows has been associated with the magazine for more than 40 years, during which she has assigned and coordinated the photography of major events from *LIFE*'s coverage of the Apollo program to John Glenn's return to space, Democratic and Republican National Conventions and the Olympics. Along the way, she worked in Time Inc.'s magazine development group and was part of the team that created *People* magazine. Among the books Burrows has edited is *One Nation, America Remembers September 11, 2001*. She is also a co-author of the *National Geographic* book, *The Kennedy Mystique*. Burrows has curated numerous photography exhibits—including one in Florence, Italy, in November 2006 to mark the 40th anniversary of catastrophic flooding there—and has judged many national and international photography contests. She is on the boards of directors of the Gordon Parks Foundation, Lennart Nilsson Science Awards and Eddie Adams Photography Workshop. Burrows has been a judge of the *AW&ST* photo competition since 1993.



2nd and 3rd PLACE SPACE **Ben Cooper**

Cooper has been an aerospace photographer since his first trip to see a shuttle launch at age 14. Now 27, Cooper was a NASA photographer for the final three years of the space shuttle program while continuing to freelance for media organizations such as *SpaceflightNow.com* and *Aviation Week & Space Technology*. He was an engineering major at Embry-Riddle Aeronautical University. Cooper's work can be seen at www.LaunchPhotography.com



3rd PLACE COMMERCIAL **Ognyan Stefanov**

Stefanov began his aviation photo career in 2006 and now belongs to the AirTeamImages and Pixstel aviation photography agencies. His work has appeared in magazines such as *Aircraft Illustrated*, *Aerospace Publishing*, *Loop*, *Airliner World*, *Air & Cosmos* and *HeliOps*. Stefanov is now a full-time aviation photojournalist at *Club Wings* magazine and since 2010, has been an official photographer for the Bulgarian air force.



1st PLACE COMMERCIAL **Leonid Faerberg**

Faerberg is a co-founder of Transport-Photo Photography, an online image stock and photo agency covering all types of transportation in Russia, the Commonwealth of Independent States and worldwide. Faerberg has been a contributing photojournalist for *Air Transport Observer*, a monthly sister publication of *Aviation Week & Space Technology*, and a web portal covering the aviation business in Russia and the CIS. His photos have been published in aviation magazines—including *AW&ST*.



1st PLACE GENERAL **Rod Reilly**

Reilly has more than 25 years of professional photography experience. His forte is capturing people and places in ways that tell compelling stories for corporations and publications. Reilly has combined his lifelong love of aviation and aviators with his photography skill into a body of work that focuses on aircraft in the air and on the ground. His work can be seen at www.rodreillyphoto.net/Portfolio



2nd PLACE COMMERCIAL **Nicholas Wilkinson**

Wilkinson has been a professional news and features photographer in the U.K. for four years. He developed his passion for creative photography during his previous career as a long-haul truck driver. While working as a photographer, Wilkinson found an interest in aviation images from the number of assignments that required him to charter an aircraft.



2nd PLACE GENERAL **Jim Koepnick**

Koepnick is in his 27th year as chief photographer at the Experimental Aircraft Association in Oshkosh, Wis. He is responsible for much of EAA's air-to-air photography for its five publications, including *Sport Aviation* magazine, and the *World of Flight* Calendar. Koepnick is also responsible for directing photographic coverage of the annual EAA AirVenture-Oshkosh, where he has flown more than 1,000 air-to-air forays.



3rd PLACE GENERAL **Alain Ernoul**

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

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

The American Society of Aviation Artists is pleased to join *Aviation Week & Space Technology* for the 12th year in presenting the art from ASAA's 2011 International Aerospace Exhibition in this special year-end issue. *AW&ST* has selected its "Best of the Best" award winner from the exhibition and top choices for honors in the categories of Military, Space, Commercial and General Aviation. ASAA's prize winners were selected by an ASAA-invited judge.

The ASAA 2011 exhibition commemorated the Centennial of Naval Aviation, in the National Museum of Naval Aviation in Pensacola, Fla., from May 1-Aug. 31. The exhibition also marked ASAA's 25th year and included some of ASAA's finest naval aviation art as well as a broad spectrum of aviation subjects, artistic styles and media. Artists attending ASAA's educational forum at the museum included those from the U.S., Canada, Brazil, U.K., Spain and Switzerland.

Dedicated to the pursuit of excellence and public appreciation of aerospace art, ASAA was founded in 1986 by professional aviation artists Keith Ferris, Jo Kotula, Bob McCall, R.G. Smith and Ren Wicks, bringing together people who share a love of aviation and art as well as supporting high standards of professionalism, authenticity and artistic quality in aviation art. ASAA is an educational organization providing hands-on workshops as well as art and aviation academics for attendees at its annual aviation art forums. ASAA welcomes U.S. and international friends as both artist and associate members. They now represent 41 states plus the U.K., Canada and more than 15 additional nations worldwide.

Artist and associate members receive *Aero Brush*, the quarterly color journal of the American Society of Aviation Artists. Content includes commentary, news of the aviation art world, exhibitions, latest works, technical presentations on aviation subjects, composition, drawing, painting and materials, the business aspects of aviation art, and more. ASAA encourages those in the aerospace community interested in receiving *Aero Brush* quarterly to join ASAA as a friend with an associate membership.

The 2012 ASAA International Aerospace Art Exhibition will be on display at the Kalamazoo (Mich.) Aviation Museum from June 3-Sept. 8. The ASAA 2012 Aviation Art Forum dates will be June 4-9 at the forum hotel and the museum. For full forum and exhibition details, visit the ASAA at www.asaa-avart.org

For additional ASAA information, contact Executive Secretary Nanette O'Neal, 6 Nathan Drive, North Brunswick, N.J. 08902, or at asaacontact@asaa-avart.org

Membership information is available at asaa-avart.org or from Membership Chairman Robert J. Keith, 43 Robert St., Dartmouth, Mass. 02747-2625, telephone (508) 993-6776, or at airboy76@hotmail.com

ASAA Award of Merit



BEST OF THE BEST

Norman Siegel

"Louis Bleriot Lors du Premiere Salon de L' Aeronatique a Paris, 1909"
36" x 36" • Oil





The first Paris air show opened on Oct. 7, 1909, just 11 weeks after Louis Bleriot's record-breaking solo flight across the English Channel. The "Salon de L' Aeronautique" was an indoor affair held at the magnificent Grand Palais, originally built for the 1900 World's Fair. A 775,000-sq.-ft. interior was capped by a 162,000-sq.-ft. steel and glass dome. More than 100,000 visitors came to admire the

early examples of "airborne mechanical locomotion" and buy them. There were balloons, dirigibles, biplanes, monoplanes and boats, all spanning the past and present with a peek into the future. Nearly all engine, propeller, tire and canvas suppliers were there, some of which survive today. Electricity was new and the exhibit was lit at night by hundreds of globes hanging from the steelwork.



THIRD PLACE MILITARY

Andy Browne

"Lost Aviator"

12" x 14" • Oil

This is one in a long series of Naval Aviation paintings that I completed while my brother was serving in the U.S. Navy aboard the USS Dwight D. Eisenhower (CVN 69). My brother ejected from his F-14 Tomcat after a total loss of hydraulics over the Caribbean in 1983. He survived without serious injury, but it was a horrific night in which three aircraft and two crewmen were lost.





FIRST PLACE MILITARY

David Rawlins

"Winged Warrior"

27" x 48" • Oil

"Winged Warrior" and "Kimmie Kar" survived World War II intact. Both were later scrapped in Kingman, Ariz. "Winged Warrior," a B-17G of the 95th Bomb Group, was piloted by Robert Newman on nine of his 29 missions during the war. "Kimmie Kar" was piloted by Myron Doxon on at least 13 missions. "Kimmie Kar" was named after Doxon's daughter. Newman also flew "Kimmie Kar" on one mission. Both Newman and Doxon survived the war and are now retired. Newman lives in Wilmington, N.C., and Doxon in Seattle.

SECOND PLACE MILITARY

Richard Allison

"Corsair"

18" x 24" • Oil

A superlative carrier-based fighter aircraft of World War II, the Vought F4U Corsair was originally considered unsuitable for carrier operations. In fact the aircraft was restricted to land basis for more than half of its wartime career. Eventually, it was certified for carrier operations in 1944. Corsairs were also delivered to the Royal Navy, which operated them over both the Pacific and Atlantic oceans. The Korean War saw the Corsair employed primarily in the ground attack role. The F4U remained in production longer than any other American fighter in World War II.





FIRST PLACE SPACE

Mark Bray
"Soyuz Express"
18" x 36" • Oil

The Russian Soyuz rocket program has been active since its first unmanned launch in 1963. The program has recorded more than 1,700 launches since then—a feat no other space program can claim. Today, the Soyuz rocket is used primarily to transport personnel and related equipment to the International Space Station. During the early 1980s, the production of Soyuz launchers reached a peak of 60 per year, making it the world's most prolific launch platform. "Soyuz Express" captures the grace and beauty of this 50-year-old technology as it leaves Earth and heads toward an orbital rendezvous with the space station.

ASAA Honorable Mention



SECOND PLACE SPACE

Charles Kadin

"Canadarm 2"

14" x 24" • Oil

M.D. Robotics' Canadarm made working in space a reality. Astronauts use the space shuttle's Canadian-designed and built robot arm to maneuver astronauts and equipment into any position necessary to service the space station.



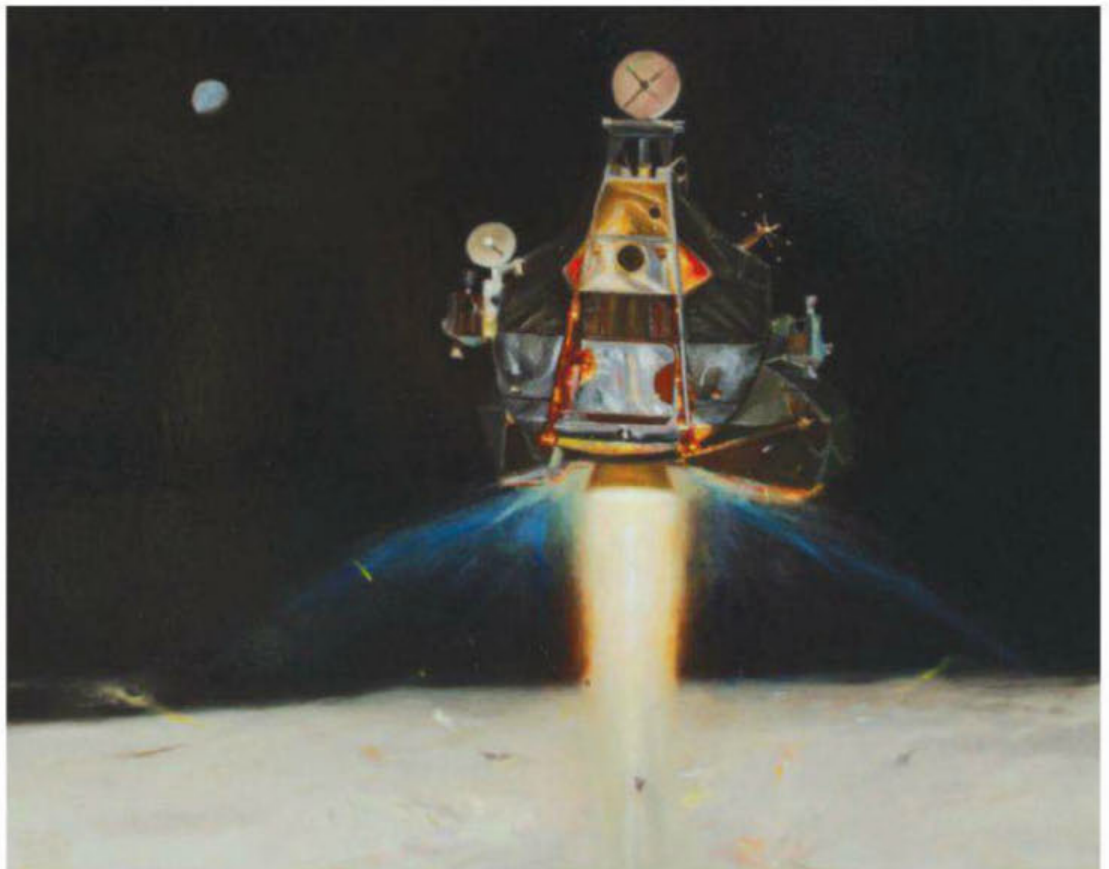
THIRD PLACE SPACE

John Clark

"Return from the Moon"

16" x 20" • Oil

The Lunar Excursion Module (LEM) fires its rocket motor and is shown seconds after separating from its descent stage, which remains behind on the lunar surface. It is heading for a rendezvous with the command module orbiting the Moon.





FIRST PLACE COMMERCIAL

Charles Thompson

"The Graceful Princess"

19.7" x 27.6" • Oil

Three prototypes of a gigantic flying boat intended for commercial service were constructed in Britain between 1943 and 1953. The Saunders Roe Princess was almost as large as the Hughes H.2 Hercules (Spruce Goose) with a 215-ft. wingspan and 330,000-lb. takeoff weight. It had the largest pressurized hull ever built and fly-by-wire controls and was designed to carry a 40,000-lb. payload at a cruising speed of 360 mph. Powerplants were 10 3,780-hp Proteus prop-turbine engines, eight coupled in pairs and driving contra-rotating propellers. Only one flew—G-ALLUN—before the program was scrapped.

THIRD PLACE COMMERCIAL

Kevin Farrell

"Just in Time"

11" x 16" • Oil

This painting depicts a FedEx MD-11, silhouetted by the late afternoon sun, moments before touching down at Portland (Ore.) International Airport.





SECOND PLACE COMMERCIAL

Tom Kalina
"Purple Morning Princess"
 24" x 36" • Oil

A Hawaiian Airlines Boeing 767 cruises into a tropical morning sunrise above the Pacific Ocean. Established in 1929 as Inter-Island Airways flying among the islands of Hawaii, the carrier changed its name to Hawaiian Airlines in 1941 to pave the way for eventual transpacific operations.





FIRST PLACE GENERAL

Norman Siegel

"Louis Bleriot Lors du Premiere Salon de L' Aeronatique a Paris, 1909"

36" x 46" • Oil

Winner of Best of the Best, see caption on p. 49



THIRD PLACE GENERAL

Cher Pruys
"Polished"

12" x 7.5" • Watercolor

A magnificent Beech 18 has been prepared for a show. Great attention has been given to the preparation, which is evident in the breathtaking results. It is ready for showing, it is "Polished."



SECOND PLACE GENERAL

Pati O'Neal
"Afternoon Delights"

18" x 24" • Oil

Golden rays of a late Georgia afternoon accent the delight of friends enjoying gorgeous flying weather. As one enjoys the peaceful ride of the hot air balloon, the other has fun in the Piper J-13 Cub.





BEST OF THE BEST and 1ST PLACE GENERAL Norman Siegel

A graduate of The Cooper Union in New York, Siegel went into advertising design, graphics and marketing while also working as a free-lance illustrator. As his advertising responsibilities grew, illustrating became a serious recreational outlet. He has always maintained a love for all things aviation and space. In 1989 he started a virtual advertising agency with two partners. Their first client, and still their client, is Discovery Communications.



1st PLACE COMMERCIAL Charles Thompson

Thompson styled automobiles for the Ford Motor Co. for 37 years. He is an ASAA Artist Fellow, winning the Best of Show—British Artist prize in 1991; Founder's Awards in 1993 and 1996; Merit Awards in 1995, 1996 and 1997; and the James V. Roy Award for the best painting in the show in 1999. He is a member and past chairman of the British Guild of Aviation Artists, founder-member of the British Guild of Motoring Artists, master artist of the Experimental Aircraft Association, and winner of several SimuFlite aviation art contests in Dallas.



2nd PLACE COMMERCIAL Tom Kalina

Kalina has been painting and flying since he was 16, accumulating more than 16,000 hr. in a variety of aircraft types. His piloting background brings authentic views of aircraft and their realm to the canvas. Kalina specializes in oil paintings of commercial and general aviation, with an emphasis on airliners of the 1950s. For more than a decade, he was staff artist for the World Airline Historical Society.



3rd PLACE COMMERCIAL Kevin Farrell

Farrell studied painting and life drawing at the Art Students League of New York. He is fascinated by the human-built environment and through his work, attempts to express the beauty in cityscapes, industrial landscapes, machines and transportation subjects. Farrell resides in Portland, Ore., and is a member artist of the Portland Art Museum Rental Sales Gallery.



1st PLACE MILITARY David Rawlins

Rawlins graduated from college in 1989 with a BFA in painting and then put away his oils. About 20 years later, he started painting again, and has since done a good deal of set painting for several theaters in North Carolina and Pennsylvania.



2nd PLACE MILITARY Richard Allison

Allison is the former illustrator and editorial cartoonist for *Army*, *Navy* and *Air Force Times* in Washington. Showing a respect for the historical significance of his subjects, Allison's work has been displayed in several major galleries and museums across the U.S. An avid plein-air painter, Allison brings to his studio paintings a sensitivity to light and color that can only be developed from direct observation.



3rd PLACE MILITARY Andy Browne

Browne is a landscape painter and printmaker who is interested in the murkier moods of landscape. Her landscapes prompt viewers to look over their shoulders to see if the vultures are circling too close to the viewer. There is a malaise in Browne's paintings that emphasizes our current disconnect with our physical environment.



1st PLACE SPACE Mark Bray

Bray has been drawing and painting since early childhood and has always been fascinated with flight. Having painted a wide variety of subjects, the Kansas City, Mo., native is now concentrating his artistic efforts on the world of flight and aerospace. He has been an associate member of the ASAA since 2008.



2nd PLACE SPACE Charles Kadin

Following a career spanning 50 years in the graphic arts, Kadin pursued his interest in aviation history and aviation art. Since 1986, his work has been exhibited by the ASAA, Canadian Aviation Artists Association (CAAA), CAE SimuFlite and Canada Aviation Museum, and he has won a number of awards in these juried competitions. His work has been published in aviation magazines. During the past 15 years, Kadin has contributed more than 10 works to the U.S. Air Force Art Program. He has published prints and posters, and he accepts commissions that focus on aircraft, individuals in aviation and historical events. Kadin is CAAA president.



3rd PLACE SPACE John Clark

Clark became interested in airplanes at age 6. This interest expanded to include spacecraft and the astronomical universe they explore. For 38 years, Clark's efforts have been directed toward commissioned works for *Astronomy* magazine, NASA and the U.S. Air Force Art Program. Clark is an Artist Fellow and past president of ASAA and holds the ASAA Jo Kotula Founders' Chair.



2nd PLACE GENERAL Pati O'Neal

O'Neal has won recognition for both 2-D and 3-D pieces in juried shows. Her interest in aviation began as a child in Hawaii, watching visiting air shows. Although not a pilot, she enjoys many facets of aviation and flying in a variety of aircraft. O'Neal enjoys portraying the different dimensions of aviation, from scenic images to illustrating stories.



3rd PLACE GENERAL Cher Pruys

Pruys is a self-taught artist who paints in a wide array of mediums including watercolor, oil and acrylic. For the past 10 years, most of her paintings have been of aviation subjects, having completed more than 170 aviation commissions. Pruys has sold her paintings in every province of Canada, several of the states in the U.S., and as far away as Hong Kong and Micronesia. Pruys's works can be found in galleries, museums, board rooms and private collections.



BOMBARDIER

Clustering

In Montreal, the critical mass comes from government-private teaming

MICHAEL MECHAM and ANTHONY L. VELOCCI, JR./MONTREAL

Montreal and the surrounding province of Quebec are using a top-to-bottom approach of government and industry support to help their small and medium-size aerospace manufacturers be more competitive by innovating within the supply chain.

Working with industry and provincial officials, Canada is building a policy framework designed to assist companies, particularly in doing business internationally, since there is little domestic market for their products and services. The effort includes a review of all federal policies that might have significant impact on the industry, including restrictions on technology sharing. This policy scrub will include federal funding.

Working groups are focused on broad areas—ranging from technology demonstration and development to procurement—with the goal of helping to position the industry to take greater advantage of “emerging opportunities” in the U.S. and elsewhere, says Richard Steffens, minister counselor for commercial affairs in the U.S. embassy in Ottawa. A major focus is on developing a “mechanism” for helping companies to identify those opportunities.

Canada’s interest in constantly adapting its aerospace industry, which mostly fits the so-called small and medium-size enterprise (SME) model, to compete globally is being mirrored increasingly by outsiders wanting to do business in Canada. This month’s third biennial aerospace forum, which was hosted by Aero Montreal, a think tank founded by local government and aerospace and defense (A&D) leaders in 2006, attracted supplier delegations from Arizona and Connecticut eager to tell Canadians how easy it is to work with their companies.

Canada is expecting to announce a new approach for working with the U.S. on controls on technology exports. “The Canadian government believes in its aerospace industry, and it has actively supported it,” says James Quick, president and CEO of the Aerospace Industries Association of Canada.

Those efforts from the top are more than matched by what city and provincial officials are doing. For the past two years, Aero Montreal has been working on a mentoring program for SMEs, which it formally kicked off in June. Its initial goal is for 20 SMEs to be taken under the wing by some of Quebec’s 15

larger Tier-1 suppliers and the province’s four OEMs—airframer Bombardier, engine maker Pratt & Whitney Canada (PWC), simulation and training specialist CAE and civil helicopter maker Bell Helicopter. The big four will monitor three companies each, while the smaller Tier 1s will take a single supplier. Aero Montreal Chief Executive Suzanne Benoit says 13 SMEs have cleared a di-

Bombardier is transitioning to U-shaped production lines and a radio-frequency identification system in its Challenger factory in Dorval near Montreal.

agnostic exam to qualify for mentoring; the remaining seven should be in place by the end of January.

Montreal—Canada’s second largest city, after Toronto—accounts for 55% of the nation’s A&D revenues, the majority generated within 30 km (19 mi.) of downtown. The industry employs 40,000 and recorded sales of C\$11.4 billion (\$11 billion at current exchange rates) in 2010, 80% of which came through exports. Aero Montreal counts 235 A&D companies in Quebec.

The majority of these are SMEs with fewer than 50 employees and revenues below \$20 million. Most work across industrial sectors, but A&D accounts for at least 30% of their revenues. To increase that percentage as defense budgets fall, small suppliers need to master supply-chain skills, says Gilles Labbe, president and CEO of landing gear and aerostructures specialist Heroux-Devtek and head of Aero Montreal’s board of directors. As one of Quebec’s top Tier 1s, Heroux-Devtek is one of the mentors.

Labbe says some suppliers can thrive by gaining a reputation as niche application specialists. But he thinks the surer path is to learn how to be integrators for larger suppliers.

Despite a rough introduction, Boeing’s 787 supply-chain model, which relies on suppliers to feed the assembly line with integrated parts and systems, was a common reference point during Aero Montreal’s formal presentations and hallway conversations. The “value added” that lower-tier suppliers can bring to development programs, whether they are as complex as the 787 or simpler, is seen as becoming a discriminator in future competitions. Tier 1s and OEMs at the conference did not expect to be pulling in major work packages because times are tight, despite predictions that they might do so. If outsourcing remains



CAE, which counts the U.S. Air Force as a customer for C-130J pilot training, is moving into open architectures to create a dynamic synthetic environment so multiple users can engage in training simultaneously.

an industry trend, then integration skills will be in high demand.

Aero Montreal's mentoring program aims to move its SMEs up a technology-readiness rating scale to "Mach 5," the equivalent of the five-star ranking Bombardier awards its top suppliers or the Gold standard set by PWC. None of the 20 is above Mach 3 and most are at the most basic, Mach 1 level, says Benoit.

With a small home market, fitting into other people's supply chains—particularly the Europeans' and Americans'—is fundamental for the Canadians. Across the board, as much as half of their sales are to U.S. customers, with the Europeans a close second. So the Canadians are accustomed to fitting in.

Aero Montreal is fond of saying that its cluster of A&D companies is the world's third largest after Seattle and Toulouse. The fact that the region does not have a Boeing or an Airbus as an anchor is somewhat of an advantage. "In Seattle, you've got the whale; in Toulouse, you've got the whale, but Montreal doesn't have one," says Jacques St.-Laurent, a former Bell Helicopter Canada president and founding president of Aero Montreal. He currently heads Montreal International, an agency on the lookout for foreign direct investment in high-technology growth industries, including aerospace.

Being a competitor one day and a partner the next is common in A&D, but Montreal counts it as a regional strength that its OEMs do not compete directly with each other, and that few of its Tier-1 suppliers do. It frees them to collaborate, says St.-Laurent.

While his efforts are aimed at recruiting foreign companies to establish operations in Montreal, Jacques Daoust, president and CEO of Investissement Quebec, is the industry's special banker, working in parallel with Montreal International to help fund the province's A&D and other technology projects. St.-Laurent emphasizes many of the practical aspects of relocation—finding facilities, clearing visa hurdles and locating schools for incoming executives' children—while Daoust manages a C\$11 billion portfolio investment group designed to overcome the common problem of many—a lack of capital to start job-creating initiatives.

The provincial government provides Investissement Quebec with C\$4 billion for direct investment in company projects and pays it a fee to execute that mandate. The other C\$7 billion is Investissement Quebec's own money. The result is a development agency that needs only a 2% return but with the tools of an investment bank. It operates 12 offices scattered in the U.S., Asia and Europe to

attract investment in Quebec while providing seed money, in the form of grants or direct financing, for the province's startup projects. Like the U.S. Export-Import Bank, Investissement Quebec also provides loan guarantees for foreign buyers of Canadian-built aircraft.

The point, Daoust says, is to create and preserve high-paying, skilled jobs. He says Investissement Quebec has created 7,100 jobs and protected 900 more since its founding in 1998. "I won't subsidize debt," he says. "I will help Bombardier if they are creating jobs."

And it has. Investissement Quebec provided financial support for the final assembly facility that Bombardier is building in nearby Mirabel for its C-Series regional jet. It also helped PWC with the assembly factory it opened nearby for the aircraft's PW1524G geared turbofan engines. Both are seen as job-creators; but should either company fall behind in the goals it agreed to with Investissement Quebec, says Daoust, then penalties can run as high as \$200,000 for each job missed.

That is a tough standard for A&D companies as they try to drive inefficiencies out of their assembly process by introducing new manufacturing technology. Says Daoust: "If you are rich enough to buy the machine that kills that job, then maybe you don't need the loan." ☐

Empty Nest

Production of the expensive, but exquisite, F-22 comes to an end in an era of austerity

AMY BUTLER/WASHINGTON

With the final F-22 rolling off Lockheed Martin's assembly line last week, the Marietta, Ga., facility is now focusing its efforts on making its C-130J and C-5M operations more efficient.

The Raptor business is not dead, though. A massive program, once estimated to cost as much as \$8 billion to modify the twin-engine stealthy fighters, is under way and delivering through the next several years.

The \$67 billion F-22 program was the Air Force's most ambitious fighter project to date. While this led to the fielding of a revolutionary capability—craftily dubbed the “fifth-generation” fighter capability by Lockheed Martin's marketing officials when it was eyed for termination over less-expensive legacy models—it also embodied an ethos in the Air Force to pursue high technology at all cost.

Civil and military onlookers suggest that this ambition took on a life of its own and eventually became a weakness. This came to head in June 2008 when then-USAF Chief of Staff Gen. T. Michael Moseley and then-USAF Secretary Michael Wynne were asked by then-Defense Secretary Robert Gates to resign following multiple missteps, including unauthorized lobbying by the Air Force to buy more F-22s than approved by Gates.

After 20 years of design and production, what began as an effort to buy 650 fighters capable of evading former Soviet radar defenses to escort bombers to tar-

gets there came to an end with Raptor 195 rolling out of the final assembly facility Dec. 13—22 years after the Berlin Wall came down. The USAF has purchased 187 combat F-35s with eight test models.

The F-22's tooling, which once covered 250,000 sq. ft. of the plant and employed, at its peak, 900 people, will now be dismantled for storage; 150 workers remain dedicated to final checkout and testing of the last Raptor. Delivery to the Air Force, its only customer since the U.S. forbade international sales, is slated for next year.

Tooling from Lockheed's F-22 work in Fort Worth and Boeing's wing and aft-fuselage facility in Seattle has been categorized and put in storage at the Sierra Army Depot in California, says Jeff Babione, vice president and general manager of the F-22 program. The remainder of the tooling in Marietta will be sent to California by the end of next year.

In preparing the tooling for storage, Babione says Lockheed was able for the first time to use multimedia resources. The goal is that future workers who need to pull items out of storage to craft a part will have videos of today's line workers' methods for reference.

This has already been put to the test. An inlet part for a Block 20 aircraft at Tyndall AFB, Fla., needed to be replaced though there was no spare requirement for it. Parts were located in storage and electronic book references helped workers to craft the item, Babione says.

Once the F-22 tooling in Marietta is stored, the space will be dedicated to

parts to support growing C-130J production—the rate has recently increased to 36 per year—as well as the C-5M retrofit line. “The current flow is not optimum for those two lines,” Babione says, adding that travel time for tasks on the production floor are expected to decrease once the new parts storage area is established.

Though the company has been ramping down employees and investment on the F-22 since the Pentagon decided in 2009 to end its purchases, there is still some overhead from the program that will be absorbed by other programs in Lockheed Martin Aeronautics Systems, including the C-130J, C-5M and F-35. “They will all see an increase in their rates because of the loss of the work in this factory,” Babione says.

Overhead has been an issue of interest for senior Pentagon officials as they negotiate new contracts against the backdrop of potentially draconian spending cuts to defense. Earlier this month, Brett Lambert, industrial policy chief at the Pentagon, noted that some contractors still must shrink their physical footprints for savings.

Lockheed officials contend that the new parts storage area will prove valuable to the customer by providing efficiencies in assembling the airlifters.

Meanwhile, the company is continuing work on modification packages for the Raptor. The first, increment 3.1, will be fielded in the next two years and is designed to use the active, electronically scanned array radar to provide mapping from “extremely long ranges,” and allow for improved autonomy to attack ground targets with the new 250-lb. Small-Diameter Bomb. Also included are some undisclosed electronic protection systems.

Two smaller updates—4 and 5—designed for AIM-120D and AIM-9X launches, respectively, are slated to be finished around 2015.

The next major increment—3.2—will

Raptor 195, the last to be produced, is slated for delivery to the U.S. Air Force next year.



ROD REILLY

include the long-awaited integration of Link 16 onto the F-22 to finally allow it to communicate with legacy fighters. It will also include improvements by using the onboard F-22 sensor suite for enhanced

guidance of the AIM-120D and AIM-9X. The Air Force is also eyeing use of an automatic ground collision-avoidance system on the F-22, although a contract has not yet been negotiated for that work.

The price of Raptor 195 is \$152 million, up from roughly \$300 million in then-year dollars for the first aircraft, including engines but not the amortized cost of development. ☐

Congress Saves

With steep cuts on the horizon, lawmakers keep programs alive

JEN DIMASCIO/WASHINGTON

MEADS INTERNATIONAL

The Meads program has survived the Senate Armed Services Committee's recommendation for termination.



“Congress doesn’t kill programs, the Pentagon does.” The adage that defense contractors live by may hold true even in an atypical year.

In 2011, more than 80 freshmen lawmakers came to Washington to scale back government spending and pledged not to care about their reelection prospects. Individual defense committees did zero out several programs and one committee handed down steep reductions to the Pentagon’s largest weapons system, the Joint Strike Fighter (JSF).

But by the time differences among those bills were resolved, it became apparent that tea party freshmen were just as resistant to whacking defense programs as colleagues who have operated inside the Beltway for decades. As the end of the legislative session neared, the time for compromise kicked in. Once Congress can reach a deal to finally approve defense spending for fiscal 2012, programs including the Medium Extended Air Defense System (Meads) and the Joint Light Tactical Vehicle are likely to receive money that will keep them alive until 2013. And the Joint Strike Fighter avoids major reductions despite calls by the program office to scale back production.

Next year, the Pentagon can decide whether to swing the ax.

The president asked for slightly more than \$800 million over the next two years to wrap up development of Meads, a tri-national missile defense program. The Senate Armed Services Committee teed up Meads for a kill, arguing that the program has been poorly managed and is far behind schedule and way over budget. Sen. John McCain (R-Ariz.) led efforts to shoot down the missile defense system and urged the Pentagon to renegotiate international agreements for developing the program with Germany and Italy.

But after a full-court press from Lockheed Martin, the Pentagon and Italy and Germany, the Senate Appropriations Committee provided full funding for the missile system. With the powerful spending committee lining up in support of the program, the authorization bill language was likely to go nowhere.

So the final version of the defense authorization bill that passed last week blunted potential cuts, carving out 25% of this year’s request and asking the Pentagon to limit the scope of the program or renegotiate termination costs

with the Meads’s international partners.

And while that’s stern language, it’s not an outright kill, leaving Lockheed to fight inside the Pentagon and on Capitol Hill for its survival next year. Defense industry officials calmly note that Deputy Defense Secretary Ashton Carter has justified Meads in the past and is likely to go to bat for the program again.

While the Senate Appropriations Committee was Meads’s congressional savior, the committee recommended outright termination of the Joint Light Tactical Vehicle (JLTV).

The appropriators view directly contradicts the Army and the Marine Corps, whose top generals argue that the cost of recapitalizing a Humvee will be close to the price of a new JLTV.

While the resolution between the House and Senate language has yet to be released, industry officials are anticipating Congress will support both the JLTV and the Humvee for another year, saving that battle for next year as well.

The Senate Appropriations Committee also backed \$695 million in reductions to Lockheed’s JSF, citing problems with development while the aircraft is in production. Despite the warning from the committee that was echoed recently by the program manager and amplified by a “quick look review” report (see p. 30) detailing another raft of program woes, lawmakers are not likely to slow production or impose harsh penalties on the contractors.

According to a Republican lawmaker, appropriators have agreed to provide enough cash to make 31 jets, just one less than the House, had recommended.

And a tough provision in the Senate’s version of the defense policy bill sought to hold Lockheed’s feet to the fire for cost overruns exceeding a certain amount on the fifth lot of aircraft. The new law will only apply to the sixth lot of JSFs, which the Pentagon and Lockheed will negotiate one year from now.

At that time, the Pentagon will be facing the potential for \$600 billion less than it had anticipated over the next 10 years unless Congress finds \$1.2 trillion in deficit reduction. It will be a new year, and time for another test of the conventional wisdom. ☐

New Arena For LCCs

Rival low-cost airlines prepare to launch operations in Japan next year

ADRIAN SCHOFIELD/TOKYO

Japan's airline industry is set for a major transformation in 2012 with the debut of three low-cost carriers, as airline executives bet that there is enough demand to match the sudden emergence of a competitive LCC market.

Japan is a late arrival on the low-cost scene compared to other mature airline markets. It has had only a few locally based carriers—most notably Skymark Airlines—offering low-cost service, but now both Japan Airlines (JAL) and All Nippon Airways (ANA) are setting up joint-venture LCCs.

ANA is one of the partners launch-

AirAsia Japan's A320s will look similar to this aircraft from an existing AirAsia carrier.

ing Peach Aviation in March, and is also teaming with Malaysia-based AirAsia to debut AirAsia Japan in August. JAL will introduce Jetstar Japan by the end of 2012 in partnership with Qantas subsidiary Jetstar. The main battleground will be Tokyo Narita International Airport, where AirAsia Japan will go head-to-head with Jetstar Japan as well as new service from Skymark.

The Jetstar and AirAsia branded LCCs are drawing heavily on their overseas partners' expertise in low-cost operations. JAL will not participate actively in setting up Jetstar Japan's business model or in its operations, says JAL President Masaru Onishi. The business plan will be determined more by the Jetstar Group. JAL was not involved in selecting the CEO of the Japanese startup, who is from outside the airline industry.

While ANA is also relying on its overseas partner's low-cost savvy, AirAsia Japan CEO Kazuyuki Iwakata is an ANA veteran, and about 20 other ANA employees have been seconded to get the carrier started. However, Iwakata notes

that recruiting from outside ANA has now begun.

Iwakata says that while help from ANA specialists is required to set up the LCC, it is vital that the full-service culture is not transferred from ANA. "The most important thing for us is the LCC culture, and we're learning a lot about that from AirAsia," he says.

The three new LCCs will each begin with just a handful of aircraft, but have ambitious growth plans. AirAsia Japan, for example, plans to have four Airbus



KEITH GARNETT

A320s by the end of 2012, and expects the fleet to increase to 30 in 2016. This will include A330s from 2013 for medium- and long-haul international flights.

AirAsia Japan's goal is to be carrying more than 10 million passengers annually within five years. Iwakata says this is an achievable target, as the "Japanese LCC market potential is huge."

New capacity at Tokyo's two airports has been the major catalyst for the emergence of LCCs. "For a long time in Japan, LCCs couldn't grow because of limited capacity at the Tokyo airports," says Iwakata. But that situation has changed in the past few years, with Haneda opening a fourth runway and Narita gaining approval to increase slot numbers, which has created opportunities for LCCs.

The current market share for LCCs in Japan is less than 10%. Iwakata is "very optimistic" about the demand for low-

cost travel, and because of this, he is not worried that there will be two other LCCs planning to begin operations in Japan next year. "I don't care how many LCCs appear, the [potential] market is enough to compete with others."

Iwakata says the Japanese airline market is in a stage similar to Europe's in the 1990s, before the boom in European budget carriers that now account for as much as 30% of traffic. LCC market share in Japan should be similar to what it is in Europe and North America, he asserts.

While some traffic will be diverted from full-service carriers, LCCs will mainly stimulate new demand, says Iwakata. The introduction of low-cost service will give people another option for weekends, instead of expensive alternative leisure activities, he says. Domestic fares are relatively high in Japan, so many people cannot afford to fly often to visit family. However, they would do so if lower fares were available.

ANA CEO Shinichiro Ito stresses that the different hub cities for Peach and AirAsia Japan will mean little overlap for the two LCCs that ANA has helped to establish. Iwakata agrees there will not be much need for head-to-head competition initially, but the two will eventually compete on some routes.

AirAsia Japan's growth plan highlights the rapid expansion that could occur in the LCC sector. It

intends to begin flying from Narita with two A320s in August, and the first three domestic routes will be to Sapporo, Fukuoka and Okinawa. A third A320 is due to arrive in October, allowing flights to the South Korean cities of Seoul and Busan. A fourth A320 will be added by the end of 2012, and there will be around 25 within five years.

The aircraft will be leased, and will likely come from existing AirAsia orders, says Iwakata. Discussions are under way with AirAsia regarding the leasing arrangement.

AirAsia Japan intends to place A330 orders sometime in 2012, with the first aircraft to arrive in 2013, says Iwakata. The carrier plans to expand the A330 fleet to 10-12 aircraft. Potential long-haul markets include Thailand, Singapore, Indonesia, Hawaii, Australia and New Zealand. ☐

Boom Time

GE, CFM are runaway winners in record order year, but Pratt and Rolls share spoils

GUY NORRIS/LOS ANGELES

Riding a wave of record-breaking airliner orders that are continuing well into the tail end of 2011, engine makers are looking for a sustained period of solid production into 2013 and beyond.

Although the boom year has been dominated by the surge in midsize engine orders tied to the newly launched Airbus A320NEO and Boeing 737 MAX families, a large proportion of the order value is still tied to the healthy demand for larger-thrust engines.

Many of the major deals include addi-

showing for every previous year other than 2007 when it netted around 250 new GE90 orders. The biggest single boost to the orderbook came in November when Emirates signed for an additional 50 777-300ERs at the Dubai Air Show. The \$6 billion deal was part of a sales flurry that pushed the 777 long-range and freighter orderbook to more than 780.

More than half of these remain to be delivered, meaning that GE has more than 740 GE90s yet to be built or in backlog. Overall, GE says total GE90

ers Embraer's E170/E190 and Bombardier's CRJ families.

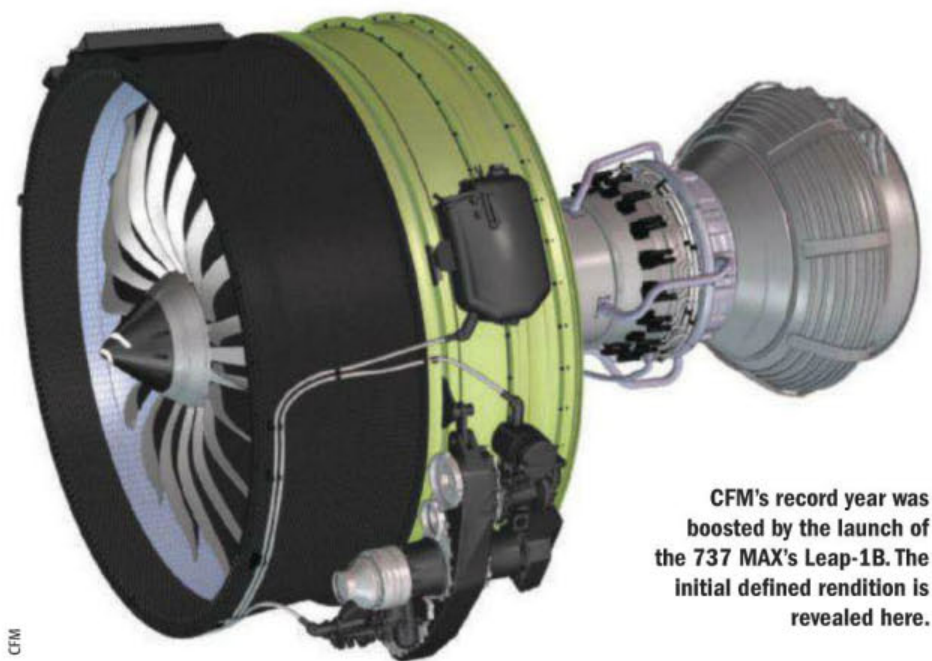
For CFM, 2011 also marks a new record with 3,160 firm orders—eclipsing 2007's 2,704. Boosted to new highs by sales of Leap engines for the A320NEO, 737 MAX and Comac C919, even the 1,500 orders for the CFM56-5/7 alone would represent a strong year—coming close to the 1,584 total for 2010.

The rush to reequip with the more fuel-efficient Leap began with the Paris air show and has resulted in a record haul of 1,660 engines in less than six months. Due in part to last week's Southwest Airlines order (see p. 65), the firm Leap-1B tally for the 737 MAX stands at 300, while firm orders for the A320NEO include 930 Leap-1As. The Leap-1C firm orderbook for the C919, meanwhile, grew to 430. Importantly for next year, when some manufacturers expect a falloff in new orders, CFM could see many of the outstanding commitments for the Leap-1B on the MAX converted to firm orders. Based on Boeing's estimates of 948 MAX commitments, CFM currently expects to secure firm orders for 1,896 Leap-1Bs.

In terms of overall value, new CFM56 business booked in 2011 is worth \$14 billion based on list prices, while the total Leap order value for the year is \$35 billion. "That means total 2011 orders and commitments are at \$49 billion," says the engine maker.

The biggest strategic change to the market in 2011—the restructuring of International Aero Engines (IAE) and the launch of a new mid-thrust engine joint venture between Rolls-Royce and Pratt & Whitney—also seems to have had an immediate impact on the fortunes of all concerned. In the weeks following the October announcements by Rolls and Pratt, business picked up for both the PW1000G geared turbofan and IAE V2500 engine families.

Boosted by a surge of new business announced at Dubai, plus JetBlue Airways' decision last week to buy 86 engines for its A320NEOs, combined orders and options for the various versions of the PW1000G passed the 2,200 mark by late 2011. The V2500 order book—bolstered by American Airlines' decision last month to choose the engine for its new fleet of A321s—has now grown to 6,800. Other key successes this year included combined new sales of 165 engines to China Eastern and China Southern airlines. With commercial control of IAE now in the hands of



CFM's record year was boosted by the launch of the 737 MAX's Leap-1B. The initial defined rendition is revealed here.

tional commitments that could provide a valuable margin of new firm orders in 2012-13. This will be particularly important to the stability of the production system and its suppliers as the flood of new orders abates next year—which some, notably Airbus, predict.

The biggest winners, by a long shot, continue to be General Electric and CFM International, GE's joint venture with Snecma. Mirroring Boeing's exceptional year for sales of the 777 long-range series, GE announced wins for 388 GE90-115Bs, more than double its best

orders, including spares, now stand at more than 2,000 engines. The 777 orders made up for a relatively barren year for the GENx family, which powers the 787 and 747-8. Although just eight new wins were netted overall, GE is focused on ramping up production to meet the aggressive delivery schedule set by Boeing for next year. Overall, GE expects to deliver around 200 GENx-1Bs and -2Bs in 2012.

GE also picked up 48 new orders for the GENx's predecessor, the CF6, as well as 108 orders for the CF34, which pow-

Pratt following the sale of the Rolls equity and program shares for \$1.5 billion, the consortium is confident of breaking the 7,000-sales barrier in 2012 as part of combined V2500 and PW1000G deals. Overall, roughly 4,800 V2500s have now been delivered.

Evaluation of the initial PW1000G variants for the Mitsubishi Regional Jet and Bombardier CSeries continues with more than 1,250 hr. and 2,800 cycles racked up for its first two applications. Riding high on concerns over continuing fuel-price volatility, Pratt is optimistic of picking up additional PW1000G business in 2012, particularly for the A320NEO, where it faces head-to-head competition against CFM's Leap. Pratt's big-engine family also notched up a notable, but increasingly rare, order for 10 PW4000s to power five new 777s for All Nippon Airways (ANA).

Rolls amassed steady sales for the improved Trent 700 on the A330, announcing orders and options for 116 engines by early December. The largest orders came from Cathay Pacific Airways and Singapore Airlines, which between them ordered 60 engines for the long-range Airbus twin. Rolls also began the year positively, officially confirming British Airways' earlier order for 12 Trent 900-powered A380s plus options on a further seven aircraft. Together with the Trent 900's selection by Asiana and Skymark, the year's orders and options for the engine grew by 96.

The same British Airways deal included confirmation of Trent 1000s for 23 787s plus options on 18, and helped provide some early relief to what was a slow year for sales of the most recent engine version. Later wins at Norwegian Air and Oman Air helped push the announced Trent 1000 business to around 110 engines, 36 of which were options.

From a program perspective, however, just like GE, Rolls is firmly focused on ramping up production of Trent 1000s to meet Boeing's accelerating 787 delivery schedule for 2012 and beyond. Rolls is also completing FAA certification of the first upgraded "Package B" version, which will form the basis for the standard-production-configuration deliveries. The improved engine, which brings fuel burn closer to Boeing's original cruise specification, obtained European Aviation Safety Agency certification on Dec 7.

The U.K. engine maker also marked the long-delayed entry into service of the first Trent 1000-powered 787 in October with the start of commercial services by launch customer ANA. The inaugural

flight marked the first time an all-new Boeing widebody has entered service powered by a Rolls engine.

The Trent XWB for the A350 is due to make its first flight on an A380 testbed early in 2012 and, as the exclusive engine

for the new Airbus twin, is the fastest-selling Trent ever, with more than 1,100 sold to date. Aside from the revamp to the design of the highest-power XWB variant for the A350-1000, Rolls also notched 54 new orders from TAM of Brazil. ☛

High Note for Boeing

Big Southwest endorsement for 737 MAX is another positive checkoff for 2011

MICHAEL MECHAM/SAN FRANCISCO

Boeing Commercial Airplanes is showing a strong order finish for 2011, bringing a future revenue flourish to more fundamental advances it has made in production during the past few weeks that should ease the way its factories meet a busy schedule in 2012.

BCA's current order book, as of Dec. 14, grew by 251 in just a week to reach a net 778 for the year. Topping the list was the key endorsement by Southwest Airlines for Boeing's newest project, the 737 reengining program called MAX. Besides adding 58 737 Next Generations to what is already the industry's biggest 737 fleet, Southwest will be the MAX launch customer with a combined

firm order for 150 in the 737-7 and 737-8 configurations, plus 150 options. Being at the head of the 737 ordering pack is a familiar position for the Dallas-based carrier, which also launched the 737-300, -500 and NG series.

First deliveries are set for 2017, two years after Airbus says it will be ready with its reengining program, the A320NEO.

Although the Southwest order has a list price value of \$19 billion, Boeing and Southwest officials acknowledge the real price was deeply discounted. An indication of how much comes from Southwest Chief Operating Officer Mike Van de Ven, who says the total 350 airplanes Southwest has on order with Boeing, counting previous commitments, will require it to make an average annual capital expenditure of \$1.2 billion from 2012-22, or \$12 billion for the entire period.

Southwest's decision brought out

the optimism at Boeing and on Wall Street. Noting that the size of the order exceeds the 200 that Airbus recently received from AirAsia for NEOs, BCA President and Chief Executive Jim Albaugh predicted that his company could have 1,400-1,500 commitments for MAX by the end of next year. It already has 948 orders and commitments in hand. Where Airbus's remarkable success with NEO dwarfed Boeing's single-aisle report at this year's Paris air show in June, Albaugh says the playing field is starting to level. By next year, MAX will be splitting the market with NEO, he predicts.

Citibank analyst Jason Gursky is among the Wall Street crowd who agree. "We expect 2012 to be the Year of Boeing, marked by at least 1,200 orders," he declares.

Until the MAX breakthrough, the 777 was Boeing's order star and it continues to shine, resting now at a record 200 net for the year. The big twin-aisle jet so dominates its market segment that it essentially has no competition, at least until Airbus is able to produce the A350-1000, but that program is suffering delays.

Much of 2011 has been a trial of the patience of Boeing's leaders. They had to wait until September before the 787's first delivery was made to All Nippon Airways (ANA), and it came more than three years late. At the same time, their launch customer for the 747-8 Freighter, Cargolux, canceled a delivery ceremony at the last minute over contract details, which were later ironed out. All the while, Airbus was achieving record

**Much of 2011
has been a trial of the
patience of Boeing's
leaders**

orders and deliveries, mostly on the strength of the NEO.

But 2011 has not been a constant struggle for BCA. Despite its delays, the initial 787s in service are winning plaudits. ANA Chief Executive Shinichiro Ito has been traveling the world extolling its "very smooth" service entry. Last week, the FAA completed type certification for the 747-8 family with a signoff for the passenger version—the Intercontinental. The freighter was certified in August and eight are now in operation, also without major squawks. Early next year, Lufthansa will welcome the first passengers aboard the Intercontinental.

Some of BCA's best end-of-year news has come not from its products but from the people who make them. Two weeks ago, Boeing won support from its largest and most militant union, the International Association of Machinists and Aerospace Workers (IAM), for a contract that will provide labor stability for nearly five years, to September 2016.

Besides bonuses, performance-based pay incentives and a continuation of nearly all the pension and health benefits workers hold dear, the agreement provides written assurances that machinists were eager to see—a commitment that Seattle's Puget Sound area will remain Boeing's base for airplane manufacturing. That pledge included assurances that the 737 MAX will be built in Renton, Boeing's longtime single-aisle production center. Machinists and Washington state political and eco-

nomic leaders feared the company might take MAX's production out of the state.

Within days of the vote, the IAM fulfilled its own unstated but implicit contract pledge to Boeing. The union ended the protest of BCA's decision to locate its second 787 final assembly line in its non-union factory in South Carolina rather than BCA's unionized factory in Everett, north of Seattle. The nettlesome case was being contested before the National Labor Relations Board and would likely have tied up Boeing for years with court fights, until the IAM's withdrawal prompted the NLRB to drop it.

Meanwhile, a related good sign for the stability of Boeing's factories came from Spirit AeroSystems in Wichita, where the Society of Professional Engineering Employees in Aerospace (Speea) signed a 9.5-year contract after months of wrangling. Speea now has four similar long-term contracts in place; this is good news for Boeing, since Spirit is its largest outside airframe supplier, providing the entire fuselage for 737 NGs and the MAX and playing essential roles on all Boeing programs.

So Boeing will enter 2012 with important checkoffs on a long to-do list. But it is missing some. At this stage it may be a tight squeeze to make a revised delivery goal of 15-20 787s and 747s. As of last week, Boeing had delivered 10—eight 747s and two 787s—and it has already said it will not deliver any more 787s until January as it continues to struggle with changes that flowed from flight-test and produc-

tion issues on the first 50 jets produced.

Also on next year's agenda are more negotiations with Speea, which has congratulated the IAM on the success of its new contract, indicating the direction the engineers want to go.

Building the 787 faster leads the list because the program uses a different supply-chain model. It is far more dependent on suppliers fulfilling key assembly, integration and test tasks prior to final assembly than are Boeing's other programs. The company needs to make a significant dent in the 787's backlog of 819 airplanes, which stretches to 2019.

The program's order rate is the best of any new commercial jet in history, but Boeing CEO James McNerney says the size of the 787's backlog discourages new customers. Still, there is some evidence that sales activity is stirring. Etihad Airways says it will take another 10 long-range 787-9s; it already has ordered 41 787s. Oman Air has ordered six 787-8s,

In every program, Boeing is increasing production rates. BCA reports adding more than 11,000 jobs since the start of the year.

Southwest, which has owned nothing but Boeing aircraft, looked at Airbus's NEO, but the airline's senior vice president for technical operations, Brian Hirshman, says the MAX gives more "mission flexibility" at some airports—such as Chicago Midway—with limited runway lengths. ☐

With Andrew Compart in Washington.



With Southwest committed to two versions of the 737 MAX, Boeing now predicts 1,400-1,500 orders by the end of 2012.

Noise Over Emissions

Airlines, aircraft makers face reinvigorated environmental debate in 2012

ROBERT WALL/LONDON

In theory, 2012 will be a critical year to define noise and emissions standards for the global aviation industry. In practice, the continued battle between Europe and countries in other regions over including airlines in the EU emissions trading system (ETS) threatens to overshadow any constructive dialog.

Even though the ETS is capturing most of the attention, other discussion areas could have similarly significant

One concern of those opposed to including airlines in the EU ETS is that financially strained carriers, such as Austrian Airways, will struggle with absorbing ETS costs.

implications for airlines and industry. For instance, this month's environmental agreement at Durban, South Africa, under the U.N. Framework Convention on Climate Change calls for the establishment of a green climate fund to which airlines would be expected to contribute.

But for the next few months, emissions trading is likely to remain center stage and will once again grab the spotlight this week, when the European Court of Justice is expected to issue its verdict on Dec. 21 in a case brought by Airlines for America (formerly known as the Air Transport Association) challenging the inclusion of its members in the European ETS. A reversal of the policy is improbable, however, since an EU advocate general's recommendation has already upheld the current language.

The European Court of Justice's anticipated decision to sustain the involvement of airlines in the ETS is likely to draw fierce response from the cadre of countries—including India, China and some in the Middle East—which oppose the inclusion of their airlines in the EU ETS.

Beyond words, though, the political standoff may sharpen in early 2012, as U.S. officials expect the Senate to pass legislation that would bar U.S. airlines from complying with the ETS, effectively matching House language and making it likely that a law will be in place for the U.S., at a minimum, to retaliate. U.S. Sen. John Thune (R-S.D.) kicked off the legis-

lative process in the Senate this month.

Even without congressional action, the U.S. could retaliate at any time if it chooses. Paul Gretch, director of the Office of International Aviation at the U.S. Transportation Department, told the Future of Air Transport conference

in London this month that Transportation Secretary Ray LaHood has leeway to take action, such as imposing fees or restricting U.S. market access for European airlines.

Although European officials are adamant about proceeding with their plans, they also urge others not to overreact and start a trade war. The time to discuss the issue does not run out on Jan. 1, argues Margus Rahuoja, a senior adviser to the European transport commissioner, Siim Kallas. Rahuoja notes that payments for 2012 emissions are not actually due until 2013, so the start of airline inclusion in January should not be seen as a deadline.



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Continuing the dialog in 2012 will be critical also as the International Civil Aviation Organization (ICAO) begins preparing for its 2013 general assembly meeting. A raft of environmental issues are on the agenda as a result of the outcome of the 2010 assembly, and there is much work to be done to make good on the commitments formulated a year ago.

ICAO plays a key role because opponents of the EU ETS legislation argue the U.N. body is where the aviation carbon dioxide emissions issue should be managed; EU officials counter that lack of progress at ICAO forced their hand to act unilaterally. The dispute over the ETS overshadowed the last general assembly, so ICAO went into a cooling-off period before its working groups again focused on devising a global framework. But as the assembly meeting in 2013 draws closer, those working parties must start to address the issue again if they want to put a proposal to members at the next assembly.

One of the most challenging issues is the discussion over so-called "market-based measures." An ICAO council meeting planned for next month could set the tone for talks throughout the year. "Most of the barriers have been political, not technical," notes Tim Johnson, director of the Aviation Environment Federation, based in London.

Good work has been done in recent months, including member states looking at their actions plans, says Paul Steele, executive director of Geneva-based industry lobby the Air Transport Action Group.

Steele says the Durban meeting—at which aviation was hardly addressed—has renewed the urgency to drive the environmental discussions forward, which he expects will increase political pressure to make progress at ICAO. The U.N. Conference on Sustainable Development in Rio de Janeiro in June could add to the pressure. That meeting "will be very interesting for aviation," Steele says, noting that industry will try to point out that "we are a key catalyst for global growth."

Emissions trading is not the only CO₂-related topic on the agenda for 2012, though. ICAO is also looking to set a certification standard for new aircraft that is likely to reflect a number of factors, including aircraft range and weight, though probably not seat count. Details of the standard are being closely guarded within ICAO's Committee on Aviation Environmental Protection (CAEP), which is supposed to have

a proposal ready in about a year's time.

Johnson is skeptical that the new certification standard can be agreed upon in time for the 2013 general assembly, but Steele says talks progressed well last month, making him more confident that the standard could be ready to be applied beginning in 2014.

The other key technical discussion with CAEP is over Chapter 5 noise standards, which are expected to be

strengthened by a cumulative 10 db to 11 db over Chapter 4 levels. Europe is pushing hardest to strengthen noise regulations, and the EU put forward noise-related provisions in a recent legislative proposal governing airports.

Looming in the background, though, is the potential for rhetoric over emissions trading to infect the technical discussions and again threaten meaningful progress at the ICAO level. ☐

Ambitious Agenda

Star's new CEO will have to lead expansion and integration at the same time

JENS FLOTTAU/ADDIS ABABA, ETHIOPIA

In choosing Mark Schwab to be its new CEO, the Star Alliance is counting on the industry veteran's experience and connections to help it through the crucial junctures it is facing.

Schwab was appointed CEO of Star Alliance Services GmbH by the chief executive board at its meeting here last week. He retired last summer from United Airlines, where he ran the carrier's alliance department. Schwab replaces Jaan Albrecht, who becomes CEO of Austrian Airlines Jan. 1.

Industry executives say Schwab was one of three candidates on the shortlist, which reportedly also included Alex de Gunten, secretary general of the Latin American and Caribbean Air Transport Association (ALTA).

In his new job, Schwab has to deal with some well-known problems, mainly how to ensure that decision-making is as efficient as possible with 28 member carriers. Lufthansa CEO Christoph Franz indicates that Star is looking at streamlining corporate governance structures, but no details have yet emerged. Jaan Albrecht, Schwab's predecessor, developed substantial diplomatic skills during his 10-year tenure and pushed through at least one major governance reform that saw the introduction of different participation levels and the abolishment of the regional member scheme.

One project Star airlines agreed upon after almost three years is the introduction of standardized long-haul economy seats. So far, Lufthansa, Austrian Airlines and Air China are the only three

carriers to have signed firm purchase contracts with manufacturer B/E Aerospace for a combined 15,000 seats that are scheduled to be installed throughout 2012. But that is only a fraction of the alliance's long-haul economy-class capacity, which amounts to as many as 800,000 seats, and the B/E Aerospace seats are also being considered for medium-haul flights. Officials say agreement was difficult to reach because airlines traditionally tailor aircraft interiors to their specific tastes and needs down to minor details.

Star executives assembled here to welcome Ethiopian Airlines as the 28th member. Three more airlines are pre-



paring to join: AviancaTaca and Copa Airlines, although that process is turning into an extremely delicate operation (see p. 70). Shenzhen Airlines is expected to be admitted toward the end of 2012. But Schwab and his colleagues will have to find ways to improve Star's position in Russia and India, in particular. It is the only alliance that does not have a member in Russia and Air India was dropped as a candidate in August, given the carrier's constant problems in meeting minimum admission requirements.

One of the most interesting strategic questions, in addition to what is going to happen at its Latin American membership base, is how to deal with the Persian Gulf carriers. Star Alliance members such as Air Canada and Lufthansa have been very vocal about the threat they see in the growth of Qatar Airways, Etihad Airways and Emirates and have been lobbying their governments not to grant the three more traffic rights.

However, two industry executives separately tell Aviation Week that Star was close to accepting Etihad as a member last year, an approach that is understood to have been backed by then-Lufthansa CEO Wolfgang Mayrhofer. But the plan has since been dropped, allegedly with Mayrhofer's departure late last year. And with Etihad's most recent negotiations over an investment in Air Berlin—which is soon to be a Oneworld member—it looks almost certain that Etihad's membership will not be brought up again.

The alliance has no official comment, but the issue shows that the Persian Gulf carriers' competitors elsewhere

are beginning to consider joining forces with them, realizing that they are not going away. That approach was also brought up by Qatar Airways CEO Akbar al-Baker, who proposed cooperation rather than opposition at the Arab Air Carrier Organization annual meeting in Abu Dhabi in late November.

The addition of Ethiopian cements Star's lead in the African market over rivals Oneworld and SkyTeam. Ethiopian is the group's third member on the continent after South African Airways (SAA) and Egyptair, and the alliance hopes that Ethiopian will serve as the missing link for better coverage of intra-African routes, in addition to providing long-haul connections to Asia and Europe.

Ethiopian is in the midst of implementing its "Vision 2025" strategy to operate a fleet of 120 aircraft to 90 destinations carrying 18 million passengers annually and reaching \$10 billion in annual revenues by 2025. The airline would more than double its fleet from the current 48 aircraft.

"We are considering Singapore, Kuala Lumpur and Guangzhou as additional destinations," Ethiopian CEO Tewolde Gebremariam says. The airline is one of a small group of African carriers that is growing its long-haul network in spite of the massive expansion of European and Middle Eastern carriers on the continent. Its biggest regional competitor is Kenya Airways. Ethiopian's long-haul growth is mainly founded on its order for 10 Boeing 787-8s, the first of which is to arrive in mid-2012, three years later than planned. "The delay was very painful for Ethiopian, but it was

worth waiting for," Gebremariam says.

Another growth project is hitting delays, too. Last year, Ethiopian, Egyptair and SAA announced plans to set up one or more joint venture airlines to enable them to better cover Western Africa. Ethiopian has already launched ASKY, a joint venture with local investors in Togo that was to be used as the basis for an expanded effort. ASKY operates three Boeing 737-700s and one Bombardier Q400. While the plan to bring Egyptair and SAA in as investors and grow ASKY "is still active," according to Gebremariam, it seems to be very much on the back burner right now. The Ethiopian CEO concedes that in order to grow, ASKY must add bases in other West African countries, but no sites are even being considered yet. "We need more time for that," he says.

Given the Egyptian revolution in the spring, Egyptair is still very much focused on returning load factors and traffic to pre-revolution levels and building connecting markets through Cairo so that it will be less dependent on local demand. The airline is also undergoing a leadership change that is making investment decisions difficult.

Meanwhile, SAA has had several unpleasant experiences investing in other African airlines and is surely taking a slow approach, too. One factor that is making the ASKY expansion more complex is that while Lagos, Nigeria, would be the obvious base from an economic point of view, politics in the country make establishing a base there a tough proposition. ☛



Ethiopian Airlines painted one of its Boeing 767-300ERs in a special Star Alliance livery to mark its admission to the group. Ethiopian's membership cements Star's lead in Africa over rivals Oneworld and SkyTeam.

Alliance Puzzle

With the LAN/TAM merger nearing, Star Alliance faces some crucial decisions

JENS FLOTTAU/ADDIS ABABA, ETHIOPIA



Star Alliance is quietly preparing to further strengthen its presence in Latin America. But this move may come at the cost of losing its most important member in the region.

The world's largest airline alliance is facing an extremely complex and fluid situation. Star member TAM Brazil is in the process of merging with LAN, which is a member of a major competitor alliance, Oneworld. In parallel, the proposed Latam Airlines Group's biggest regional rival, Avianca-Taca, is about to join Star. The Chilean anti-trust authority informed LAN that as part of the merger approval, LAN and TAM can only be in one alliance and it cannot be the same as Avianca-Taca's. And LAN CEO Enrique Cueto tells Aviation Week that joining forces with the Bogota-based competitor does not make strategic sense.

Last week, Cade, Brazil's competition watchdog, approved the transaction, which imposes some restrictions for the Sao Paulo-Santiago, Chile, market that include relinquishing two slot pairs in Sao Paulo. The conditions are seen as manageable, although LAN has launched a legal challenge against portions of the Chilean ruling. Shareholders are scheduled to vote on the deal Dec. 21.

With Delta (a Skyteam alliance member) now a minority shareholder in Brazilian carrier Gol, Star believes it has no alternative in what is by far Latin America's biggest market.

While TAM seems likely to leave Star in favor of Oneworld within the next two years (following a grace period allowed by the competition watchdog), Star is not giving up without a fight. Chief ex-

ecutives of the 28 member carriers dissected the issue at their board meeting in Addis Ababa, sources close to the talks tell Aviation Week. The group has not yet defined an exact way ahead, but one important decision—whether to proceed with Avianca-Taca's membership—must be taken before next May.

LAN Chief Operating Officer Ignacio Cueto said last month that Latam will make a decision on its future alliance affiliation by mid-2012, indicating that there is likely to be a direct link between it and how Star proceeds in the Avianca-Taca case.

Several strategies are still being discussed, the sources say. One, possibly the least likely, would be to cancel Avianca-Taca's admission, which would leave room for TAM and LAN. But that approach is risky: Latam could decide to go with Oneworld anyway, so such a move would certainly turn into a diplomatic fiasco. However, Star already stopped the integration of one future member earlier this year, after Air India was proved to be unable to fulfil the minimum requirements.

Another option is to keep Avianca-Taca and drop TAM Brazil after two years at the latest. But one source indicates that Star could also use the time available to try to persuade the Chilean authority that having everybody in the same camp with all the "proper" regulatory strings attached is not necessarily an anti-consumer stance.

"The process has to be well-managed," TAP Portugal CEO Fernando Pinto says. "We have to have an intelligent solution." TAP—a Star member—is keen to keep TAM in the group, as its own long-haul

network is almost entirely focused on Brazil and it needs a local partner for feed. But even Pinto does not go so far as to demand that Avianca-Taca should be denied access to the alliance in favor of TAM, although he is clear that "we would like to have TAM in the alliance."

To make matters even more complex, TAP is in the process of being privatized. Thus, the Portuguese airline might have to leave Star, particularly if the carrier is bought by International Airlines Group, which has already publicly expressed its

Star Alliance is looking for ways to keep TAM Brazil in the group, even after the merger with LAN.

interest in TAP. Again, no decisions are expected until the second half of 2012.

Avianca-Taca CEO Fabio Villegas was also at the chief executives' board meeting in advance of his airline officially joining the alliance, as was Copa Airlines CEO Pedro Heilbron. The Panama-based carrier is also expected to become a Star member in May 2012. Villegas says he has not received any indication that plans for his airline's admission are changing. "We know what we are going to do—we will join Star in April or May." But beyond that, "we don't know what is going to happen." Villegas points out that Avianca-Taca knew that TAM was part of Star when it decided to join and that it continued with the process following the Latam merger announcement.

In the opinion of Jeff Smisek, CEO of United Continental, the Latam-Avianca situation "is going to be an issue," but he believes it is premature to make decisions now with so few hard facts available. Lufthansa CEO Christoph Franz says it is up to Latam to make a decision. "It would be easier to continue an existing cooperation [with TAM]," Franz says, but he also underscores the "dynamic growth of Avianca-Taca" that made the airline attractive to Lufthansa and Star.

"Everybody just wants to keep all options open," says Air New Zealand CEO and Star Alliance Chairman Rob Fyfe. "We all sit and wait."

TAM Brazil has ruled out joining Skyteam, even if the airline does leave Star Alliance. "It will be either Oneworld or Star," TAM CEO Libano Barroso says. "We control our decision, not the others. But it is very difficult at this point to make predictions. Let's see how it plays out." ☛

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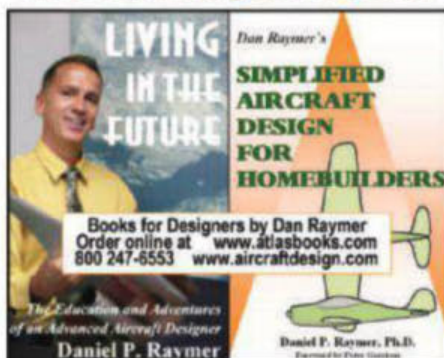


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The McGraw-Hill Companies

Aviation Week & Space Technology
December 19/26, 2011 VOL. 173, NO. 45 (ISSN 0005-2175)

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Jan. 24-25—SMI Conferences' Joint Forces Simulation & Training. Grange City Hotel, London. Call +44 (207) 827-6000, fax +44 (207) 827 6001 or see www.jointforcetraining.com

Jan. 28—American Heroes Air Show. Lee County Sports Complex, Fort Myers, Fla. See www.heroes-airshow.com/fortmyers/

Jan. 31-Feb. 2—Aerial Refueling Systems Advisory Group's Winter Planning Meeting. Hilton Palacio del Rio, San Antonio. Call +1 (937) 431-8106 or see www.arsaginc.com

Feb. 2—Business Aviation Regional Forum. Landmark Aviation, Lakefront Airport, New Orleans. See www.nbaa.org/events/forums/20120202

Feb. 7-9—Association for Unmanned Vehicle Systems Program Review 2012. Omni Shoreham Hotel, Washington. Call +1 (703) 845-9671 or see www.auvsi.org

Feb. 13-16—Practical Aeronautics Short Course: "Introduction to Jet Engines—A Practical Perspective." The Aero Institute, Palmdale, Calif. Call (970) 887-3155 or see www.practicalaero.com

Feb. 14-19—Singapore Airshow. Changi Exhibition Center. Call +65 6542-8660, fax +65 6546-6062 or see www.singaporeairshow.com

Feb. 22-23—MIU Events/Exhibitions India Group's Indian Business Aviation Expo 2012. Manekshaw Center. New Delhi. Call +44 (124) 351-3606 or see www.miuevents.com/ibae2012

Feb. 23-24—Fifth Society of Experimental Test Pilots' Annual Southeast Symposium. Ramada Plaza Beach Resort, Fort Walton Beach, Fla. See www.setp.org/table/southeast

Feb. 27-29—Defense Maintenance Sustainment Summit. Hilton Torrey Pines, La Jolla, Calif. See www.wbresearch.com/dms/

March 5—Speednews' Second Annual Aerospace Raw Materials & Manufacturers Supply Chain Conference. Also, **March 5-7**—26th Annual Commercial Aviation Industry Suppliers Conference. Both at Beverly (Hills) Wilshire Hotel, Calif. See www.speednews.com/conferences

March 9-11—Valiant Air Comm'n's 2012 Tico Warbird Air Show. Titusville, Fla., Space Coast Regional Airport. See www.vacwarbirds.org

March 19-21—International Academy of Astronautics/American Astronautical Society's Conference on Dynamics & Control of Space Systems. Hotel Ipanema. Porto, Portugal. See www.astrodynamics.org.pt/

March 19-22—Practical Aeronautics Short Course: "Introduction to Aeronautics—A Practical Perspective." National Institute of Aerospace, Hampton, Va. Call (970) 887-3155 or see www.practicalaero.com

March 21-22—Avionics Europe 2012 Conference & Exhibition. M.O.C. Event Center. Munich, Germany. Call +44 (199) 265-6619 or see www.avionics-event.com

March 27-29—Asian Business Aviation Conference and Exhibition. Shanghai Hawker Pacific Business Aviation Service Center. See www.abace.aero/2012

Jan. 31-Feb. 2—MRO Middle East 2012. Dubai, United Arab Emirates.

Feb. 14-16—Defense Technology and Affordability Requirements. Arlington, Va.

March 7—54th Annual Laureate Awards. Washington.

March 13-14—Innovation Supply Chain Showcase. Orlando, Fla.

April 3-5—MRO Americas 2012. Dallas.

April 3-5—MRO Military Conference & Exhibition. Dallas.

April 3-6—Aircraft Electronics Association's 55th Annual International Convention & Trade Show. National Harbor, Md.

April 23-25—NextGen Ahead: Air Transportation Modernization. Washington.

May 8-9—Civil Aviation Manufacturing. Charlotte, N.C.

May 23-24—MRO Regional—Eastern Europe, Baltics and Russia. Vilnius, Lithuania.

Sept. 19-21—MRO IT Conference & Showcase. Miami.

Oct. 9-11—MRO Europe. Amsterdam.

PARTNERSHIPS

Jan. 26-27—Global Space Technology Convention. Singapore.

Feb. 9-10—Global Space Technology Conference. Singapore.

Feb. 11-14—HeliExpo. Dallas.

Feb. 14-19—Singapore Airshow.

March 27-April 1—Fidae International Air & Space Fair. Santiago, Chile.

June 11-15—Eurosatory. Paris.

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A&D in 2011: Cheers and Jeers

Throughout the year, *Aviation Week & Space Technology* reports on developments across the aerospace and defense industry—the setbacks as well as the successes—using the editorial page to put issues into their larger contexts. We always try to call them as we see them, going so far as to bite the hand that feeds us when we think such commentary is deserved. We believe our readers expect nothing less. And so, to the winners and sinners of 2011, we offer **CHEERS** and **JEERS** for the considerable achievements and for the significant embarrassments of the last 12 months.

WHITE HOUSE



CHEERS to U.S. President Barack Obama for pulling the trigger on the daring Navy Seal raid on fugitive al Qaeda leader Osama bin Laden. Obama could have taken the safer route, using airpower to destroy the Pakistani house where bin Laden was hiding, but the world may have never known that he had been killed. However, we **JEER** Obama for his bombastic attacks on the business jet industry, an attempt to score political points at the expense of a vital industry that employs thousands.

SWISS AIR FORCE



CHEERS to the F-35 program for completing its first shipboard trials on the USS Wasp with two F-35Bs, but **JEERS** to the program for multiple travails (see p. 30), including failing to start pilot training at Eglin AFB, Fla., this year, as planned, and for tardiness in developing software critical to declaring operational capability. Meanwhile, defense officials in Switzerland, earn our **CHEERS** for conceding that the Gripen is not the biggest bomb-dropping, missile-toting fighter on the block, but endorsing it as good enough and praising its

low life-cycle cost.

To the NATO collation that conducted the air campaign that helped insurgents in Libya to rid themselves of the odious, murderous dictator of decades, Col. Moammar Gadhafi, we offer **CHEERS**. And more **CHEERS** to the Arab League for endorsing the effort against a member state and to Qatar for contributing actual aircraft.

JEERS all around for the mess over the EU's emissions trading system (ETS). To the EU itself for its unilateral approach to a global problem, acting in violation of the Chicago Convention and then donning the thin rhetorical fig leaf of not being a party to that agreement—even though all its member states are. Crossing the Atlantic, we offer **JEERS** to U.S. Sen. John Thune (R-S.D.) and Rep. John Mica (R-Fla.) for introducing bills that would prohibit American carriers from participating in the ETS, thus fomenting a trade war.

NASA gets **CHEERS** for launching three big missions this year with the Juno Jupiter space probe, Gravity Recovery and Interior Laboratory (Grail) and Mars Science Laboratory. But **JEERS** to NASA for slipping the James Webb telescope, hitting the restart button on human space exploration and bailing

out of the Mars exploration project with the European Space Agency. It all adds up to no more big missions at NASA for perhaps a decade. While we look to orbit, we **CHEER** the U.S. Air Force and Lockheed Martin for finally deploying the Advanced Extremely High-Frequency and Space-Based Infrared System satellites but follow with resounding **JEERS** because they are both years late and billions of dollars over budget

CHEERS to Airbus for its smart A320NEO strategy. In eight months it won more than 1,000 orders for the single-aisle airliner, forced Boeing to hurriedly launch a competitor and put a huge roadblock in front of Bombardier's CSeries. Further **CHEERS** to Boeing's 787 program, which made its first delivery after a torturous delay of more than three years. Ditto for the 747-8 program, which has completed its FAA certification, seen eight freighters delivered and is on track for the first passenger delivery early next year. But for the Commercial Aircraft Corp. of China, **JEERS** for failing to meet its 2011 deadline for certifying the ARJ21 regional jet. And **CHEERS** for Bombardier, Cessna, Dassault, Embraer and Gulfstream, for continuing to invest in new models of business aircraft even as that industry remains stuck in a painful downturn.

JEERS to the FAA for the continuing budget and timetable problems with the En Route Automation Modernization program, a vital precursor to the NextGen air traffic management architecture, and to EU member states for their appalling lack of progress in implementing the Single European Sky to cut ATM costs and airline emissions. And **JEERS** to lackadaisical civil aviation authorities of Indonesia and the Philippines for failing to get their respective countries off air safety blacklists.

JEERS, JEERS AND MORE JEERS to the 112th U.S. Congress, the most partisan—and dysfunctional—in recent memory. In refusing to compromise on raising taxes or reining in unaffordable entitlements, lawmakers have left the Pentagon facing \$1 trillion in automatic budget cuts. In a remarkable focus on the fine points while ignoring the big picture, Congress continued to insist on funding weapons systems year-to-year, making programs less efficient, and then failed to pass defense appropriations bills in a timely manner.

Spreading its collateral damage to the civil side of aviation, Congress continues to fail in its responsibility to craft a long-term funding plan for the FAA, a dereliction of duty that dates to 2007. By failing at one point to pass yet another temporary funding extension, lawmakers put 4,000 civilian workers and 70,000 others in airport-related construction out of work for weeks over the dispute about funding the FAA. Then lawmakers left Washington for a five-week summer vacation. But **CHEERS** go to airport inspectors who kept working without pay and even dug into their own pockets to cover travel expenses.

To end on a literally and figuratively uplifting note, we **CHEER** the Veterans Airlift Command, the organization that provides free air transportation to wounded U.S. veterans and their families for medical care through a national network of volunteer aircraft owners and pilots. ☺



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➤ **SPACE: Launch Vehicles In The Post-Shuttle Era**

Monday, Jan. 9, 12:00 Noon - 1:00 p.m. (EST)

Moderator: Frank Morring, Jr., Senior Editor - Space, Aviation Week

Featured Industry Expert: Jeff Foust, Sr Analyst, Futron

Summary: U.S. space-launch leadership is on the verge of evaporating as tight budgets and political infighting stymie a coherent approach to replacing the space shuttle fleet. With China set to surpass the U.S. launch rate, what's the worldwide outlook for launching payloads and people in the coming decades?

➤ **COMMERCIAL AVIATION: Predictions For The Post-Duopoly Era**

Tuesday, Jan. 10, 12:00 Noon - 1:00 p.m. (EST)

Moderator: Frank Jackman, Managing Editor, Civil Aviation, Aviation Week Intelligence Network

Featured Industry Expert: Kevin Michaels, VP, ICF/SH&E

Summary: With Airbus and Boeing working toward the mid- to late-decade service entry of the A320NEO and 737 MAX re-engined narrowbodies, our experts will offer a head start on what comes next and what the industry needs to do to prepare for the next-generation narrowbodies.

➤ **DEFENSE: 2012 Program Scorecard**

Wednesday, Jan. 11, 12:00 Noon - 1:00 p.m. (EST)

Moderator: Michael Bruno, Managing Editor, Defense, Space & Security, Aviation Week

Featured Industry Experts: Todd Harrison, Center for Strategic & Budgetary

Assessments; Steven Grundman, Grundman Advisory

Summary: Join us as our experts examine the biggest winners - and losers - in the 2012 major program budget battles, as well as how the international procurement landscape might have to adapt to surging interest in Asia and the Pacific.

➤ **BUSINESS AVIATION: Business Aviation Regulatory Update**

Thursday, Jan. 12, 12:00 Noon - 1:00 p.m. (EST)

Moderator: Bill Garvey, Editor-In-Chief, Business & Commercial Aviation

Featured Industry Experts: Kent Jackson, Attorney; Jens Henning, VP, Operations, GAMA; Dave Labrozzi, President, GE Capital Corporate Aircraft Finance

Summary: Our industry experts will speak to the future of business aviation with a specific focus on three critical topics - Regulatory and Legislative issues (taxes and user fees), Security (challenges and concerns) and Financing (what is the "new normal"?).

➤ **MRO: Fleet Optimization**

Friday, Jan. 13, 12:00 Noon - 1:00 p.m. (EST)

Moderator: Leeann Tegtmeier, Editor-In-Chief, Overhaul & Maintenance

Summary: Join us as we examine the best strategies for optimizing fleet composition and operations as technological advancements put efficiency and profitability in your grasp.

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The Falcon 7X photographed by K. Tokunaga

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