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35 Wows Paris

Boeing Launches the 737-10

Boeing will officially launch the 737-10 on June 19, the first day of the Paris Air Show, marking the go-ahead of the fourth major member and fifth derivative of the MAX family. Featuring an additional 66-in. fuselage stretch over the 737-9 as well as modern landing gear, the new 737-10 will extend single-class seating capacity to 230. The aircraft will enter service in 2020 following the debut of the 737-9 in 2018, and the entry-into-service of both the 737-7 and 200-seat MAX 200 in 2019.

The initial order book is expected to be in the 100-plus aircraft range from lessor China Aircraft Leasing Group Holdings, Indonesian-based low-cost carrier Lion Air and Indian airline SpiceJet. Boeing is also understood to be in talks with European carrier Ryanair over the 737-10.

—Guy Norris

Embraer Launches 737-10

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F-35 Wows Paris

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Featuring an additional 66-in. fuselage stretch over the 737-9 as well as modified main landing gear, the new 737-10 is a response to the Airbus A321neo and will extend single-class seating capacity to 230. The aircraft will enter service in 2020 following the debut of the 737-9 in 2018, and the entry-into-service of both the 737-7 and 200-seat MAX 200 in 2019.

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—Guy Norris

Profit Hunter!

In front of Embraer’s E195-E2 eagle-beak “Profit Hunter” here Sunday are Embraer Executive Jets president and CEO Michael Amalfitano, Embraer Commercial Aviation president and CEO John Slattery, Embraer S.A. president and CEO Paulo Cesar de Souza e Silva, Embraer Defense & Security CEO Jackson Schneider and Embraer S.A. services and support president and CEO Johann Bordais.
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F-35 Flight Demo to ‘Crush Years of Misinformation’

The F-35’s much-anticipated performance at this year’s Paris Air Show will give Lockheed Martin the opportunity to finally lay to rest the rumors that the fifth-generation fighter is not as powerful or agile as the aircraft it is intended to replace.

Billie Flynn, the Lockheed Martin test pilot who will be flying the F-35A in the skies above Le Bourget this week, firmly believes the aerial demonstration he has planned will quash the skeptics. The F-35 will put on a show on par with the F-22 Raptor demonstration, famous for wowing air show crowds around the world, Flynn pledges.

In fact, the demonstration will prove that the F-35 is more maneuverable than any of the aircraft Flynn has flown, including Boeing’s F/A-18 Super Hornet, Lockheed’s F-16 Viper and the Eurofighter Typhoon, he says.

“I think after 10 years since first flight with our first opportunity to demonstrate the capabilities and the maneuverability of the F-35, we are going to crush years of misinformation about what this aircraft is capable of doing maneuver-wise,” said Flynn in an interview with Aviation Week ahead of the show.

—SEE PAGE 12

Airbus Explores A380plus

Airbus is offering its customers an enhanced version of the A380 dubbed the A380plus, seeking to regain market traction with its biggest aircraft.

The new version will feature 13% lower costs per seat compared to the current A380, Airbus says. The A380plus, if firmly launched, will feature new winglets and some wing refinements that, the manufacturer expects, will contribute to a fuel-burn reduction of up to 4%. Furthermore, Airbus is targeting a significant reduction of maintenance by stretching intervals and reducing downtime for the six-year check. The A380plus also includes proposed changes to the interior that will allow for the addition of up to 80 seats in a four-class configuration.

The A380plus is Airbus’ latest attempt to attract more customers to the program, which has been in crisis mode for some years. But the project falls way short of the A380neo, a study Airbus has looked at before and that would have involved a re-engining. Airbus Commercial Aircraft president Fabrice Brégier said earlier this month that there was clearly “no business case” for the more extensive changes.

The A380plus will feature an increased maximum takeoff weight (MTOW) of 578 tons, compared to 575 tons for the current version. That will allow airlines to carry up to 80 more passengers over the same range (8,200 nm) as the existing aircraft or increase the range by 300 nm for ultra-long-haul missions.

Airbus is understood to be talking to Emirates about another follow-up order for around 20 more A380s that could be announced at the Dubai Airshow in November. Securing further commitments in the short term is crucial for Airbus to be able to avoid having to decide further production cutbacks.

—Jens Flottau
Paris Showcases Latest Aerospace Programs

Beginning with the first appearances of new narrowbody and widebody airliners from Airbus and Boeing, the first company demonstration by the Lockheed Martin F-35A Joint Strike Fighter and the international debut of the Mitsubishi Regional Jet, the 2017 Paris Air Show promises to be eventful. We preview 18 of the aircraft types that are here at Paris for the first time.

Airbus A321neo
Making its Paris flying-display debut, the Airbus A321neo entered airline service on the eve of the show. Virgin America took delivery of the first aircraft in April. The largest member of Airbus’ re-engined A320neo family, the A321neo made its first flight in February 2016.

Airbus A350-1000
The second and largest member of the Airbus A350 XWB family, the A350-1000 is making its Paris debut. The aircraft entered flight testing in November 2016, and the first delivery to Qatar Airways is planned by year-end. The A350 is powered by the Rolls-Royce Trent XWB.

Airbus Helicopters H160
Having made its first flight on the eve of the last show, in June 2015, Airbus Helicopters’ H160 medium twin is debuting at Paris. Intended to replace the AS365 and H155 Dauphin models, the H160 is powered by new Arrano turboshafts from Safran Helicopter Engines.

Airbus Helicopters VSR700
To be displayed in the static park, Airbus Helicopters’ VSR700 is a vertical-takeoff-and-landing naval unmanned aircraft being developed with French shipbuilder DCNS and planned to fly by year-end. The UAV is based on Hélicoptères Guimbal’s Cabri G2 light-piston helicopter.

Antonov An-132D
Making its international debut, the Antonov An-132D is a modernized An-32, being developed with Saudi Arabia’s Taqnia. Powered by P&W PW150A turboprops, the aircraft has Honeywell avionics and other Western systems. The An-132D made its first flight in March, and Taqnia plans to begin production in Saudi Arabia in 2020.

Boeing 737-9
The second member of Boeing’s re-engined MAX family for flight, the 737-9 took to the skies in April and is making its public debut at Paris. Boeing began deliveries of the first MAX, the 737-8, in May and is expected to launch the biggest member of the CFM Leap-1B-powered family, the 737-10, during the show. Deliveries of the 737-9 are set to begin in 2018.

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Boeing to Unveil First NMA Detail in Paris

With Boeing’s new midsize airplane (NMA) project one of the expected top talking points of this year’s Paris Air Show, the manufacturer is tipped to use the event to showcase its concept and roll out the first few tangible details.

While details of the evolving configuration remain closely held, Boeing says it is still pursuing innovations across multiple areas ranging from manufacturing processes and production systems to propulsion to help close the business case. The outline twin-aisle family concept is designed to fill the gap between the 737-10 and 787-8, and will seat between 220 and 270 and fly up to 5,000 nm.

However, while the NMA is configured with a twin-aisle cross-section, it is targeted at single-aisle operating costs. To achieve this Boeing is therefore focusing on several advances in the overall design as well as the way it is built and powered. But exact details of how that is being accomplished remain under wraps. “We have the process capability and the ability to architect and tool the airplane so that we can design the configuration we want in the production system we want. That’s about as deep as I’m going to go, because that’s part of the secret sauce,” says Boeing Commercial Airplanes vice president and general manager of airplane development, Mike Delaney.

Boeing is, however, making no secret of its increasing reliance on model-based systems engineering to dramatically change the way it is developing new products across the company. MBSE focuses on defining customer needs and functionality early in the development cycle. The concept brings together all the disciplines and specialty groups into a team to form a structured development process that proceeds from concept to production to operation.

One area of “secret sauce” in Boeing’s approach to the NMA is the closer-than-ever integration it is designing into the interface between the wing and engine. Discussions meanwhile continue with CFM, the General Electric-Safran joint venture, Rolls-Royce and Pratt & Whitney. “The engine companies are responding extremely well,” Delaney says. We are very pleased with the technical interaction with all three.” —Guy Norris
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Security Is Beefed Up For 2017 Paris Air Show Following Terror Attacks

Organizers of this year’s Paris Air Show have bolstered security measures following a series of terror attacks in France – and Britain – over the past 24 months and in recent weeks. “There will be concrete measures in place to deal with a truck attack,” says chairman Emeric D’Arcimoles, while the French Air Force will also protect the airspace from potential unmanned air vehicle threats. He would not elaborate on the types of measures that would be taken.

More than 1,000 private and state security personnel, including soldiers and police, are on duty.

Organizers are promising a bumper year, with many of the chalets and exhibition halls selling out as early as last October. Some 2,300 companies and organizations are planning to exhibit this year, from 45 countries. There will be 300 official delegations, 150 of which are from militaries, representing 87 nations.

D’Arcimoles says that the traditional visits are expected from French president Emmanuel Macron and the new prime minister, Edouard Philippe.

The team is currently planning for attendance by around 150 aircraft, and a 2- to 2.5-hr. flying display.

Among debutantes here are the F-35 Lightning II Joint Strike Fighter, the Mitsubishi Regional Jet and the Kawasaki P-1.

Other new types include the Embraer KC-390 airlifter and the Embraer E195-E2 airliner.

Officials said there will be no attendance from Russian-built military aircraft because of sanctions against Moscow, although a Sukhoi Superjet regional airliner is here.

Public day displays by the French Air Force’s aerobatic team, the Patrouille de France, will be shortened by 10 min. and restricted only to the team’s formation flying. During the display team’s performance, the operation of the two southern runways at Paris Charles de Gaulle will be halted.

See related story on page 90.

—Tony Osborne

Boeing 787-10
The 787-10, which is making its international show debut at Paris, has the distinction of being the first Boeing airliner to make its maiden flight outside of the Seattle area, taking to the air from the company’s Charleston, South Carolina, plant in March. The -10 is the largest member of the 787 family, and deliveries are planned to begin next year. The display aircraft is powered by Rolls-Royce Trent 1000 TENs.

Cirrus SF50 Vision Jet
Cirrus Aircraft’s SF50 Vision is being displayed at Paris by French importer Aerolithe, after the single-engine personal jet made an international debut in May at the European Business Aviation Convention & Exhibition (EBACE 2017) in Geneva, where it received European certification. Deliveries began at the end of 2016 after the Williams FJ33-powered aircraft received FAA certification in October.

Diamond DART 450
Making its first Paris appearance, in the static display, Diamond’s DART 450 is a tandem-seat turboprop trainer aimed at commercial and military markets. Powered by a Ukrainian Motor Sich AI-250S turbo-prop, the all-composite aircraft made its first flight in May 2016 and its first international appearance at last year’s Farnborough Airshow.

Embraer E195-E2
For the second year in a row, Embraer will debut a new airliner at an international air show, with the E195-E2 planned for the flying display at Paris. The largest member of the second-generation E-Jet E2 family made its first flight in March. The first family member, the E190-E2, debuted at Farnborough in 2016. Pratt & Whitney’s PW1900G geared turbofan powers the E190/195-E2.

Embraer KC-390
Making its Paris debut, Embraer’s KC-390 is scheduled to participate in the flying display at Paris after making an international debut on static display at Farnborough in 2016. Development of the military tanker/transport is progressing, with certification and initial operational capability with the Brazilian Air Force planned by the end of 2017.

Kawasaki P-1
Japan’s Kawasaki’s P-1 maritime-patrol aircraft is to make its first Paris appearance, and is slated to participate in the flying display. This follows the show debut of the anti-submarine aircraft in 2016 at the UK’s Royal International Air Tattoo. Japan is seeking export customers for the unique design, which is powered by four indigenous IHI F7 turbofans.

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Airbus’ Leahy to Retire
‘Sooner Rather than Later’;
Kiran Rao to Take Top Sales Job

Airbus is nearing a major change in its sales organization, as current chief John Leahy indicated that he will retire soon.

Leahy, who is 66, said on the sidelines of the IATA Annual General Meeting in Mexico last month that he will retire “sooner rather than later” at the advice of his doctors. He did not give a firm date for the step, but said that Kiran Rao, his current deputy, will fill the position.

Leahy joined Airbus in 1985 and became head of sales in 1994. He is widely credited with the company’s remarkable commercial success.

When John Leahy joined the U.S. arm of Airbus, the young European company’s global market share was just 13%. Today Airbus is at parity with Boeing, and by some measures it is ahead.

Since 1994 Leahy has headed global sales for Airbus. He is one of the most prolific sellers of aircraft the industry has ever seen. Under his guidance, the Toulouse airframer amassed a backlog of aircraft orders worth more than US$800 billion at list.

But to call Leahy a mere salesman would miss the larger impact he has had on the airplane and airline industries. He has been a fulcrum, bringing together the hopes of airline customers and airplane developers. Most recently, as well as leading commercial activity for the Airbus A380, A330 and A350 programs, Leahy played a key role in the launch of the A320neo family, the fastest-selling program in aviation history.

In his three decades at Airbus, he has worked with five CEOs and outlasted seven commercial sales chiefs at Boeing. The Airbus story is inextricably linked with Leahy’s career.

For his role in the Airbus success story, Leahy received Aviation Week’s Philip J. Klass Award for Lifetime Achievement.

—Jens Flottau

L3 Technologies Longsword

L3 Technologies’ OA-8 Longsword, a light-attack/surveillance version of the Air Tractor AT-802 agricultural aircraft, is to be on static display at Paris. Also designated the AT-802L, the two-seat aircraft is capable of staying on station for 5 hr. at a 400-nm radius. The Longsword carries an L-3 Wescam electro-optical sensor and a variety of weaponry.

Leonardo M-345

Leonardo’s M-345 low-cost jet trainer has been selected by two foreign air arms. Company officials refuse to name the two countries in question but state they are new customers to its products. Leonardo says it hopes to sign a contract with one of the customers by the end of the year. The aircraft, previously referred to as the High Efficiency Trainer (HET), took to the air for the first time at the end of December.

Lockheed Martin F-35A

Originally not planned to appear at Paris, the Lockheed Martin Joint Strike Fighter will now perform aerial displays, with a U.S. Air Force F-35A flown by a company pilot. This follows the F-35A flyby from the USAF Heritage Flight Team, and flight-and-hover displays by the U.S. Marine Corps F-35B, in the UK in 2016, at the Royal International Air Tattoo and Farnborough Airshow.

Lockheed Martin LM-100J

The LM-100J commercial freighter version of Lockheed Martin’s C-130J-30 Hercules airlifter is set to make its international debut in the static park at Paris after making its first flight in May. The original LM-100 commercial Hercules was last produced in 1982. The LM-100J is scheduled for FAA certification and delivery to the unidentified launch customer in 2018.

Mitsubishi MRJ90

Mitsubishi’s MRJ regional jet will be making its international debut at Paris, 10 years after the concept was unveiled at the show. The initial MRJ90 version has been in flight testing in Japan and the U.S. since November 2015, but a series of program delays have pushed back first deliveries of the Pratt & Whitney PW1200-powered aircraft to mid-2020, to launch customer All Nippon Airways.

Turkish Aerospace Industries Hurkus

Making its international debut at Paris, where it will take part in the flying display, TAI’s Hurkus-A turboprop trainer received European certification in 2016. TAI is now developing the Hurkus-B advanced-trainer and Hurkus-C light-attack variants for delivery to the Turkish armed forces.
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F-35 Demo to Vindicate the Aircraft

Not as agile as the Super Hornet? Nor as fast as the Typhoon? Don’t you believe it, says Lockheed Martin test pilot Billie Flynn. He’ll put the F-35A through its paces at Le Bourget this week, proving that the aircraft is more maneuverable than any he’s flown, he says, including Boeing’s F/A-18, the Eurofighter and his own company’s F-16 Viper.

“After 10 years since first flight with our first opportunity to demonstrate the capabilities and the maneuverability of the F-35, we are going to crush years of misinformation about what this aircraft is capable of doing,” Flynn said in an interview with Aviation Week.

The F-35’s maneuverability is all the more impressive because, unlike the F-16s that perform at air shows, the Joint Strike Fighter flying the demonstration this week is fully combat-ready. Flynn’s F-35A will move easily through complex aerial maneuvers loaded with everything it needs to go to war.

“All of those airplanes that do air shows – the Hornet, Viper – they are all slicked off without all the external stores,” Flynn said. “They are a party trick at an air show, versus a combat-configured F-22 or F-35.”

The flight demonstration is carefully scripted to highlight the kinematic capabilities of the F-35A, particularly its slow-speed handling qualities, said Flynn. He will start with an afterburner takeoff, almost immediately pointing his nose to the sky and letting the aircraft climb away essentially vertically. This impressive move is unique to the F-22 and the F-35, he said.

Next, Flynn will reverse back in front of the crowd, and perform a “square loop” to show the aircraft’s instantaneous pitch capability and high angle-of-attack (AOA) maneuverability. Then he will turn around, reverse back in front of the crowd, and perform a slow-speed, high-AOA pass. Afterward, he will light the afterburner and fly straight up into the sky once again.

From there, Flynn will pull up vertically in front of the crowd and execute a maximum AOA “power loop,” where the aircraft flips on its back – another signature Raptor move. Then he will initiate a spiral at 50 deg. AOA, called a “pedal turn,” which he says will be the most impressive part of the entire routine.

After reversing again in front of the crowd, the last move is a maximum-G, 360-deg, turn, which highlights the maximum-rate, minimum-radius-turn capability of the aircraft, Flynn said. The F-35 in its current 3i configuration is limited to 7G; when the fighter gets its full war-fighting capability with the final 3F software, it will be able to pull 9Gs.

“This aircraft down low in this environment is an absolute monster,” said Flynn. “It is more powerful, it is more aggressive than any of us, including those of us who fly the F-35, would have imagined before we began this flight demo process.”

The high show does not include the F-35 opening its weapon-bay doors, as the F-22 does during its air show routine. The low show, which the F-35 will perform if there is inclement weather or cloud ceiling, includes opening the weapon-bay doors, according to Lockheed spokesman Mark Johnson.

Lockheed’s F-35 air show profile has been in the works for well over a year, according to Flynn. The team has conducted over 800 simulator runs to evaluate the profile, and Flynn began practicing in the aircraft at the company’s facility in Fort Worth, Texas, about a month ago.

The company has developed air show routines for all three F-35 variants – the U.S. Navy F-35C carrier variant and the U.S. Marine Corps F-35B vertical-takeoff-and-landing variant as well – but this year Flynn is focused on the U.S. Air Force F-35A version.

Flynn had to modify the routine to accommodate airspace restrictions unique to the Paris show, he said. Flying is limited laterally and vertically because of Le Bourget’s proximity to both the city of Paris and Charles De Gaulle Airport. Flynn is also limited by time – he only has 6 min. for the routine at Le Bourget, where at most air shows he would have 10.

“We focused on the ‘wow’ factor and left out the elements of a routine that would be part of a non-Paris-type profile,” Flynn said. “You have to live inside very tight restrictive boundaries, but it still permits us to put on a show that I believe will squelch the critics once and for all.”

So how will the F-35 demonstration compare to the Raptor’s always-impressive routine? It’s very similar, Flynn said.

“We all love what the Raptor can do. I would say the F-35 and the F-22 both put on demonstrations that are unique to our fifth-gen maneuverability,” said Flynn. “But don’t forget, that’s not how we dominate – we dominate because of stealth and sensor fusion.”

The two F-35As from Hill AFB, Utah, arrived at Le Bourget Airport June 13 and will be maintained on-site by Air Force maintainers and security personnel. One aircraft will be flying, and one will be on static display.

―Lara Seligman
Textron’s NightWarden Emerges From Shadow

Unveiled by Textron Systems today at Paris, the NightWarden is a new Group 3 tactical unmanned aircraft system (UAS) designed to offer capabilities found in larger, more expensive Group 4 medium-altitude, long-endurance UASs.

The company-funded NightWarden is developed from Textron’s Shadow M2 evolution of the U.S. Army’s RQ-7BV2 Shadow tactical UAS and is ready for production, says Bill Irby, SVP and general manager of Textron Systems’ unmanned systems business.

The NightWarden is designed to perform multiple mission types including surveillance, targeting, strike and electronic attack, and to host multiple payloads that can be integrated more easily thanks to new open-architecture avionics, he says.

With a maximum takeoff weight of 750 lb. (340 kg), up from the Shadow V2’s 467 lb., the new aircraft can carry a payload of up to 1.30 lb., up from 95 lb. “That’s a significant increase for a Group 3 UAS,” says Irby. A new engine and increased fuel capacity give the UAS a 15-hr. endurance at 90 kt. and 16,000 ft. (4,877 meters). This compares with the V2’s 9 hr.

In addition to a standard electro-optical/infrared full-motion-video sensor, the NightWarden can carry communications-relay, electronic-attack, electronic-intelligence or signals-intelligence payloads as well as a sense-and-avoid system. The UAS can also be armed with lightweight precision weapons such as Textron’s Fury small glide munition.

With an increased range of 684 mi., the NightWarden can be equipped with one of several satellite-communications systems enabling beyond-visual-line-of-sight operation. “Satcom is common on Group 4 UASs, but they are expensive systems and have a large footprint on the ground,” says Irby.

The NightWarden can support “hub-and-spoke” operations where the UAS flies from a forward location and reaches back via satcom to a remote command center in the way that Group 4 systems such as the MQ-9 Reaper are operated.

The new UAS has automatic takeoff and landing, remote taxiing, and emergency recovery parachute and enhanced landing that enables the NightWarden to operate from unimproved airstrips, whereas Group 4 UASs require prepared runways, Irby says.

The aircraft is powered by the latest, water-cooled and silenced version of Elbit company UEL’s rotary engine, which has increased power, greater electrical output and lower acoustic signature. Irby says the engine is expected to meet Textron’s increased time-between-overhauls target.

Textron (Static Display A4) is talking to potential customers in Europe, the Middle East and Asia as well as in the U.S., and has conducted demonstrations domestically and in-country. Prototypes have logged more than 400 hr. of flying, and production aircraft could be delivered within 12 months of a contract, he says.

—Lara Seligman

Cobham Sensor to Fight Hypoxia

AS THE PENTAGON struggles to determine what’s behind a spike in hypoxia-like cockpit incidents across several U.S. Navy and U.S. Air Force fleets, Cobham (Hall 2b, Booth E156) believes it may have a groundbreaking new method of pinpointing the root cause of the problem.

Cobham’s Aircrew-Mounted Physiological Sensing System (AMPSS) is a breathing sensor suite that monitors pilots’ inhalation and exhalation throughout a flight, according to Rob Schaeffer, company product director for environmental systems. In a nutshell, AMPSS monitors the airflow as it enters and leaves the pilot, assessing it for changes in pressure, humidity, temperature, oxygen concentration, flow rate, carbon dioxide content - anything that might cause hypoxia-like symptoms such as light-headedness, tingling fingers, or passing out.

“So we will know what’s going in and we will know what’s coming out, and then from a physiological standpoint we then start to draw some conclusions or make some educated guesses as to what’s going on in terms of the physiology of the pilot,” says Schaeffer.

AMPSS is small and simple: It comprises an inhalation module located on the end of the pilot’s mask breathing hose, and an exhalation module connected to the mask’s exhalation port. The pilot hooks it on before he even walks out to the cockpit, said Schaeffer. Yet despite its simplicity, this would be the first time the Pentagon has implemented such a system.

Cobham delivered the inhalation piece of AMPSS on June 13 to the U.S. Air Force School of Aerospace Medicine at Wright-Patterson AFB, Ohio, where the Navy’s aeromedical research unit will begin initial testing on the system. The company will deliver the exhalation module by the end of August. Testing could take anywhere from a few weeks to a few months, depending on how soon the services want to begin implementation, Schaeffer said.

—Graham Warwick
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Bell 505 Gets FAA Certification

*BELL’S MODEL 505* JetRanger X has been awarded its long-awaited certification by the U.S. FAA.

The single-engine light helicopter was awarded Transport Canada certification in December 2016 and was formally approved by the FAA on June 7. EASA approval is expected soon.

“This is another significant milestone in our journey to market entry for the Bell 505,” said Bell CEO Mitch Snyder.

The Textron Aviation unit delivered the first Model 505 during this year’s Heli-Expo in Texas, and has been working to convert the hundreds of letters of intent received during the aircraft’s development into formal orders. Bell has previously said that conversion rates were around 80%.

Bell is working on STCs for equipment such as cargo hooks, a cargo weighing system and automatic door opening. Several STCs have already been awarded.

“Customer response for the Bell 505 has been outstanding, and we look forward to seeing the aircraft perform all the various missions it’s equipped for around the world,” Snyder said.

The 505 has a U.S.-built Safran Arriel 2R turboshaft and is fitted out with a Garmin G1000H flight deck. The Bell 505 first flew on Nov. 11, 2014, and test aircraft have flown more than 1,000 hr.
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Gripen E Makes First Flight

Swedish aerospace and defense company Saab has completed the first flight of its prototype E-model Gripen fighter jet this past Thursday, June 15.

The prototype, coded 39-8, took to the air at 10:32 a.m. local time from the company’s development facility at Linköping, flying for 40 min. and reaching an altitude of 13,000 ft. before touching down safely.

Video and imagery of the aircraft departing and in flight showed a relatively short takeoff run in dry power and revealed that the company has retracted the gear in flight, a relatively rare occurrence in first flights. Two twin-seat JAS-39D Gripenes acted as chase aircraft for the flight.

“The flight was just as expected, with the aircraft performance matching the experience in our simulations,” said Marcus Wandt, one of Saab’s experimental test pilots.

Speaking at an online press conference, Wandt said that the test flight proved handling qualities with gear down and the gear up. “The flight control system reacted better than we had hoped for,” he added. “Its acceleration performance is impressive with smooth handling.”

The company expects to fly the aircraft again in the coming weeks.

The flight comes more than a year after 39-8 was rolled out in a glitzy reception at Linköping. Saab (Chalet 379) had originally planned to perform the maiden flight at the end of 2016, but this was pushed back to the second quarter of 2017 to further mature the federated software architecture on the aircraft and qualify it to a commercial standard known as DO-178C.

The architecture has allowed the company to speed the development of the aircraft. Saab stated that the short time between power-on and engine runs - roughly nine weeks - during 2016 is a direct result of the software performance.

The first flight is a significant milestone in the program. The Gripen E will equip both the Swedish and Brazilian air forces. Sweden is currently planning to buy 60 single-seat Gripen models, while Brazil will purchase 36 aircraft including eight two-seat models. The twin-stick model will be developed in Brazil through Saab’s cooperation with Embraer.

First deliveries to the Swedish Air Force are expected in 2019, although the first front-line unit will not be formed until 2023. Deliveries will run on until 2026. The Swedish government is considering funding an additional 10 aircraft. —Tony Osborne

Leonardo Brings BriteCloud Decoy to F-16, Typhoon

THERE HAVE BEEN some changes at Leonardo’s “Batcave” since ShowNews first visited last summer. There is now a sign outside the electromagnetically sealed room, identifying it as the BriteCloud Assembly and Test Controlled and Ventilated Environment - and high up in the “airlock” entryway, a small figurine of the Caped Crusader himself stands guard.

But the most substantive development is that this facility, in the basement of Leonardo’s Luton plant, is now manufacturing a second type of the company’s innovative new active, expendable RF countermeasure system. BriteCloud 218 is rectangular, whereas the original BriteCloud decoy is cylindrical.

The first iteration of the product fits in to the type of stores dispenser found on such fast-jet types as the Tornado. The company is under contract with the Royal Air Force’s Rapid Capability Office to supply sufficient 55mm BriteCloud cylinders to enable development of tactics and operational procedures for using the system on that platform.

BriteCloud 218 will fit the dispensers found on the F-15, F-16 and Typhoon. The company has partnered with the Danish Air Force, which flew it on the F-16 during trials held early this year, and the RCO contract will also investigate Typhoon integration.

“It’s exactly the same in terms of capability, but it’s just over half the volume,” says Geoff Tithecott, capability manager for Leonardo’s countermeasures business. “That’s been helped a little bit by the fact that round is not quite as good for packaging electronics as rectangular is.”

Both versions of the BriteCloud unit have spring-loaded fins that deploy when the unit is ejected from the dispenser.

“You’re not trying to get any superb performance out of it, or have it fly a long way – it’s just about it doing the right thing repeatably,” Tithecott says. “The reduced weight is one of the things that made the aerodynamics more difficult. Things tend to fly better if you’ve got weight at the nose and fins at the back. Because this one had to come in at a much lighter weight, there wasn’t the option of putting so much weight in the nose.”

As well as being able to offer BriteCloud to operators of F-series fast jets, Leonardo is marketing the decoy alongside its Seer radar warning receiver under the brand BriteEye. This is envisaged as a retrofit solution for operators of fighter types that may not currently carry countermeasures, or only have a very limited capability. —Angus Batey

The rectangular form factor will allow the BriteCloud decoy to be integrated quickly and cheaply onto F-16 and F-15 jets.
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Kratos to Promote Valkyrie, Mako Drones

Kratos’s killer combat drones, the XQ-222 Valkyrie and UTAP-22 Mako, are making their European debut this week at the show. Nations such as Germany have proposed introducing armed “loyal wingman” aircraft as force multipliers for pricey fifth-generation warplanes.

The XQ-222 and UTAP-22, derived from aerial target drone technology, have already captured the imagination of the U.S. military services stateside but are more obscure concepts on the world stage.

The XQ-222 is in the advanced stage of development as a trailblazer for the U.S. Air Force Research Laboratory’s (AFRL) Low-Cost Attritable Aircraft Technology (LCAAT) initiative. Valkyrie is scheduled for first flight in “spring 2018,” Kratos says.

Meanwhile, a pair of UTAP-22s already flew collaboratively with a Marine Corps AV-8B Harrier aircraft in late 2015 and are being called back into service for a follow-on demonstration as part of a larger force exercise. Kratos says the aircraft will carry sensors and be teamed with manned aircraft for the trial, with flights planned from June to August. The forthcoming flight tests are sponsored by the Pentagon’s Defense Innovation Unit Experimental and Strategic Capabilities Office organizations in partnership with U.S. Strategic Command.

“The Mako and Valkyrie represent an entirely new category of UAV,” says Kratos Defense & Security Solutions CEO Eric DeMarco. “We have been able to combine high performance with low cost in fully functioning aircraft and we did it in less than two years – not decades.”

The XQ-222’s development started in July 2016. The aircraft measures 30 ft. tip to tail, 20 ft. shy of the Lockheed Martin F-35 Lightning II, and has a range of 3,000 mi., Kratos advertises.

The aircraft is rail-launched, with a parachute landing system, and will be priced at between US$2 million and US$3 million per copy depending on production rates, with the sweet spot being 100 per year. Kratos is building three initially.

AFRL LCAAT project manager Bill Baron foresees this type of aircraft operating in concert with the fifth-generation F-35 and F-22 fighters as well as surveillance aircraft. Because of the extraordinary time and cost of developing and building advanced, low-observable manned warplanes, the air force is exploring less-expensive options to boost force sizes.

Germany recently disclosed plans to field so-called remote carriers alongside its notional Command Fighter Advanced (CFA) aircraft, which will replace the Tornado in the 2030s.

Kratos (Hall 3, Booth A118) will also be targeting the expanding group of nations fielding the F-35 as potential customers.

“The XQ-222 Valkyrie and UTAP-22 Mako drones provide fighter-like performance and are designed to function as wingmen to manned aircraft in contested airspace,” Kratos says.

—James Drew

FAA Certifies Longsword Avionics

THE U.S. FAA has granted a supplemental type certificate for updated digital avionics and cockpit to L3 Technologies (Chalet 326, Static Display C2) for its AT-802L Longsword surveillance/light attack aircraft.

The Longsword, based on an Air Tractor AT-802, is on static display here. It is similar to the Iomax Archangel – a Thrush T660 crop duster transformed for the military. L3 will equip the Longsword for intelligence, surveillance and reconnaissance (ISR) or attack munitions. At Le Bourget, L3 will display a new, flexible ISR system called SPYDR II.

L3 has added an updated digital avionics and cockpit, including a Garmin G600, dual-screen primary and multifunction displays, an air data computer and an attitude/heading reference system. It also has a digital intercommunication system and an L3 next-generation electronic standby instrument system. The FAA provided another STC and military type certification for the aircraft in 2016, according to an L3 statement.
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Two years after Bombardier reintroduced the CSeries with a new senior management team at the 2015 Paris Air Show, the Canadian manufacturer hopes to build off the aircraft’s successful service entry to win new orders.

Bombardier will display the latest CSeries it has delivered, an airBaltic CS300, here this week. The aircraft is the fourth CS300 Latvia’s airBaltic has received and the 13th CSeries to be delivered overall. Swiss International Air Lines (SWISS) has received eight CS100s and one CS300.

SWISS and airBaltic placed the CS100 and CS300, respectively, into service in fourth quarter 2016. “This will be the first time that we actually have a production, customer aircraft with the full customer interior” on display at an air show, Bombardier SVP Colin Bole said at the IATA Annual General Meeting in Mexico last month. “It is the first time that we’re showing a real finished aircraft and that’s going to be important.

“I expect that’s going to draw a good amount of attention,” Bole said. “We’ll have Martin Gauss, the airBaltic CEO, there to very proudly present his aircraft.”

Bole said “the buzz is getting around” about how well the CSeries is performing in service for SWISS and airBaltic - which he said has operated a CS300 for as much as 17 flight hours in a single day.

Bombardier (Chalet 282) secured breakthrough orders for the CSeries from Delta Air Lines (75 firm CS100s) and Air Canada (45 firm CS300s) in 2016 but has not announced any new sales this year.

“A lot of [airline] people we’ve been talking to have actually confirmed they’ve heard from SWISS or from airBaltic that the aircraft are performing extremely well, reliably day in and day out,” Bole said. “The reliability, the ruggedness of the aircraft, is excellent.

“The word is for sure getting around.”

But Bole conceded that it has not been easy to persuade airlines to commit to the aircraft.

“The biggest difficulty has been to really demonstrate to airlines there is that need for an aircraft in the 100- to 150-seat category,” he said.

“There had been over the last eight or nine years a significant shift upward in capacity driven by airlines looking for lower seat-mile costs and [Boeing and Airbus] pushing airlines toward larger aircraft because it also suited them.

“But now that we’ve demonstrated that we can deliver... the airlines are beginning to look again.”

—Aaron Karp
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New Narrowbodies Rule at Airbus and Boeing

New narrowbodies dominate at Paris this year, as Airbus and Boeing face continued weakness in demand for their “Show”ier widebody jets.

As civil aircraft manufacturers gather for this year’s Paris Air Show, they are receiving mixed demand signals from the market. In spite of the massive drop in new order activity for both Airbus and Boeing since last year, backlogs are still more than healthy and production levels are expanding. IATA has been reporting better than expected traffic figures for the first few months of 2017, indicating that volumes remain resilient for now. But others warn the good times may soon be over.

Short-term growth is still likely, at least for the next 12 to 18 months, said Adam Pilarski, senior VP for Avitas, at the recent ISTAT Asia conference in Hong Kong. But he and other experts predicted that the peak of the cycle is nigh. Pilarski believes that “long-term problems are mounting and the bubble is expanding.”

“I’m moving away from assuming the bubble will start slowly deflating, to a higher probability of it bursting,” he says.

Laurent Delvart, head of Asian aviation for Credit Agricole, noted that a downturn will come. “I’m not a believer in [the theory] that this time will be different,” he said.

The industry achieved “extremely good results” last year, said Delvart. And while it is not necessarily the start of a broader slide, numbers have generally been down in the first quarter of this year. Fuel prices have “not gone up dramatically,” but yields have been lower due to extra capacity coming into the market.

For Boeing, the 2017 Paris air show is a key opportunity to showcase the 737 MAX at a critical time for the program. The company is tipped to use the event to officially launch the 737-10, its long-debated counter to the A321neo and the fourth major derivative of the family. It will also highlight progress on the 737-9, which entered flight test in April, as well as mark the start of MAX deliveries, which began with the handover of the first 737-8 to Malindo Air on May 16.

Having enjoyed a relatively hurdle-free development path for the MAX, the late drama associated with the discovery in early May of a potential forging flaw in some of the aircraft’s CFM Leap-1B engines came as an unwelcome interruption. Although Boeing and CFM were able to re-shuffle engines to resume customer acceptance flights and deliver the first aircraft a mere 24 hr. later than its latest revised schedule, the aircraft manufacturer is still dealing with the downstream issues. These include an inevitable slowdown on pre-delivery 737-8 production and customer flights, as well as flight testing of the 737-9.

The first 737-9, which had just completed initial airworthiness testing when flying was stopped in early May, was about to begin flutter checks and had not resumed flight tests as of May 17. Fortunately Boeing says the 737-9 test program, like that of the 737-8, was ahead of schedule, providing some margin. Boeing remains confident of catching up quickly, however, and expects to begin 737-8 deliveries to Norwegian and Southwest in July and September, respectively.

Progress on sales of the 737-10 will also be a talking point. Approved by the Boeing board late last year for offer to airlines, Boeing has had at least seven solid months in which to accrue sufficient orders for a firm launch at the show. The company revealed more about its 737-10 campaign in March at the ISTAT Americas conference in San Diego.

Airbus, meanwhile, enjoys a comfortable market share vis-à-vis the 737 MAX and is in little hurry to make additional moves.

That said, Airbus is studying options for a composite wing for narrowbody aircraft, a path the company has so far avoided because it was not convinced of the benefits. The proposed 797 could be the catalyst for change, particularly if the combination of an existing, adapted airframe with that new wing and new engines would allow Airbus to avoid having to invest in an all-new aircraft for the category.

In order to compete with the NMA, Airbus would have to stretch the A321neo further. The aircraft, in its highest density layout, can currently accommodate around 240 passengers, but that version would not be capable of flying transatlantic distances.

The A321LR, the long-range version of the family, is currently planned for a maximum range of 4,000 nm and Airbus has been looking for ways to extend that range by a few hundred miles.

—Jens Flottau, Guy Norris and Adrian Schofield
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Taqnia to Build An-132D in Saudi Arabia

Taqnia, the Saudi company partnered with Antonov to develop the An-132D airlifter, plans to begin building the aircraft in-country from 2020. The aircraft’s first flight took place from Antonov’s Gostomel facility near Kiev on March 31.

The government-funded technology development and investment company, which is providing half the funding for the development of the aircraft, expects to begin producing the aircraft in 2020, two years after the establishment of a production line in Kiev, retired Maj. Gen. Mohammed Saeed Ayash, Taqnia’s transport aircraft director, told Aviation Week at the IDEF defense show.

The company is yet to make a firm decision on the location of an assembly line, although it will likely be located at a new airport to be built to serve the city of Taif in the Makkah Region in Eastern Saudi Arabia. With the establishment of an assembly line, Taqnia also wants to establish a Saudi supply chain to support both production lines, and Ayash says that Saudi industry is gearing up for the project, and could eventually provide up to 60% of the components.

The An-132D is the latest derivative of Antonov’s twin-engine transport family that dates back to the early 1960s. The new model makes use of Western systems rather than Russian ones in line with Kiev’s policy to end industrial and defense cooperation with Russia’s military operations in the east of Ukraine and the annexation of Crimea.

The aircraft is powered by a pair of Pratt & Whitney Canada PW150A engines, each driving a six-blade propeller by the UK’s Dowty. Honeywell (Chalet 104) is supplying Primus Epic avionics while France’s Zodiac (Chalet 214) and Germany’s Liebherr (Chalet 279 and Hall 2a, Booth A276) are providing oxygen equipment and air-conditioning systems, respectively. Ukrainian companies are providing fuel, hydraulic and control systems.

“Taqnia’s involvement in the An-132D stems from Saudi Arabia’s plan to reduce its reliance on oil and increase its defense manufacturing capability. The Saudi military wants to use the An-132 for military transport and for special mission duties such as intelligence gathering and electronic warfare.

On May 10, Taqnia, Antonov and Turkey’s Havelsan defense electronics firm signed an MoU on the joint design, installation and manufacturing of the An-132MP for maritime patrol.

“I believe the aircraft will be very competitive in the market,” Ayash said. “Antonov has the technical and design know-how, and we have the operational experience.”

Antonov is at Chalet 319 and Hall 6, Booth A54.

—Tony Osborne and Maxim Pyadushkin
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Civil Aviation Programs to Watch

New Boeing airliners taking shape; Brazilian, Chinese and Russian narrowbodies in flight testing; and Airbus defining its next move. The commercial airliner industry is pushing hard to keep the growth coming. Along with key new business jets, we take a look at the “must-watch” civil aircraft programs.

**Boeing 737 MAX**
With the anticipated launch of the 737-10 at Le Bourget, the pace of Boeing’s re-engined twinjet program continues to accelerate. Flight testing of the initial 737-8 was completed earlier this year and, despite a last-minute precautionary halt to all flying caused by checks to the CFM Leap-1B engines, the first aircraft entered service with Lion Air Group’s Malindo Air in May. Boeing is catching up on flight tests and begins 737-8 deliveries to Norwegian Air in June, with Southwest Airlines following later this summer. Flight tests of the 737-9, which is making its international debut at Paris, began April 13.

**Airbus A350-2000**
After shelving development of the smallest A350 version, the A350-800, Airbus continues to study launch of a further stretch of the aircraft to complement the A350-900 baseline variant and the -1000, now in flight tests. The air show at Le Bourget could yield more clues about Airbus’ widebody plans. Studies have been underway for some time, driven by a capacity gap between the -1000 and the Boeing 777-9X. The 777-9X offers about 30 more seats than the -1000 in standard configuration and reaches the 400-seat mark—but Airbus executives are not convinced the market for large widebody twins justifies the addition.

**Airbus A330neo**
After a smooth development phase, the Airbus A330neo program has hit its first major snags ahead of flight testing, certification and deliveries. Two aircraft are parked in Toulouse awaiting their Rolls-Royce Trent 7000 engines. The delays already have caused major changes to the schedule: First flight, originally expected for the spring of 2017, is now not expected until at least late summer. And launch operator TAP Portugal is now scheduled to receive the first of its 14 aircraft on firm order in March 2018 or later—not before year-end 2017, as forecast when the aircraft was launched in 2014.

**Boeing 787-10**
Four years after the 787-10 was launched at the 2013 Paris Air Show, the third member of Boeing’s 787 family is entering its third full month of flight testing and remains on track for first delivery to launch customer Singapore Airlines early in 2018. The first Boeing airliner to be assembled exclusively in South Carolina, the 787-10 made its initial flight on March 31 and will appear at the show. The first test aircraft, the Rolls-Royce Trent 1000 TEN-powered ZC001, is engaged in envelope expansion work while the second aircraft, which joined the program in early May, is the first General Electric GE9x powered 787-10.

**Future Falcon Business Jet**
The Dassault Falcon 8X entered service late last year; the first Falcon 5X delivery is planned for 2020, and the company is already working on its next business jet. “We want to be in a position to launch a new Falcon business jet at the end of 2017,” Dassault Aviation Chairman and CEO Eric Trappier said in the company’s 2016 annual report. “Preliminary studies are focusing on enhanced comfort and a reduced environmental footprint, mainly by reducing fuel consumption and noise.” It is likely the future Falcon will use the Falcon 5X as a new platform.

**Comac C919**
The Comac C919 program has a first delivery date of 2020 (the first flight was on May 5). But this is not definitive; the manufacturer is striving for the target, says a senior program source, implying it may be missed. Early on, Comac declared a target for direct operating costs 10% lower than then-current aircraft in the same class—the Boeing 737 NG and the first series of Airbus A320s. These competitors have now been updated with new engines. Indeed, the A320’s CFM Leap-1A is almost the same as the C919’s Leap-1C. EASA has begun work on validating the Chinese type certificate.

**Airbus A320neo**
While the A320neo has been in airline operations for 18 months now, Airbus is continuing introduction and testing of the two other variants. The first—an A321neo powered by CFM’s Leap-1A—was delivered to Virgin America in April, but delivery of the first Pratt & Whitney PW1100G-equipped aircraft was still pending in mid-May after delays. The first A321neo powered by CFM engines made its first flight in April. Airbus has 3,616 firm orders for the A320neo, 1,736 for the A321neo and 55 for the A319neo. The first 94 A320neos were delivered at the end of March.

**Airbus A380**
The A380 remains the most worrying item in the Airbus portfolio. The manufacturer has orders for 317 aircraft, 210 of which have already been delivered. The backlog of 107 aircraft is in theory enough to sustain production at current rates for nine years. But the reality is more complicated. Airbus urgently needs more orders for its largest commercial aircraft. The OEM set 2017-18 production at a much reduced rate of 12 aircraft per year after Emirates deferred 12 deliveries by one year. However, there are still open production slots to be filled in 2019.

Continued on page 32

**June 19, 2017 | AviationWeek.com/ShowNews**
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Bombardier Business Aircraft’s Global 7000 is an all-new aircraft with GE Passport 20 engines.

CONTINUED FROM PAGE 30

Boeing NMA
Behind closed doors, Boeing continues to refine plans for the launch of a New Midsize Airplane (NMA), already unofficially dubbed the 797, to fill the capacity gap between the 737 MAX and 787 in the mid-2020s. While exact details remain scarce, the work seems to have narrowed down to focus on a twin-aisle family concept with two main variants seating 220-270 passengers and offering a 4,800-5,000-nm range capability. The viability of the NMA hinges on merging twin-aisle capacity with single-aisle operating costs. Boeing is evaluating unconventional cross-sections, and advanced structures and aerodynamics.

Embraer E2
Embraer’s 195-E2 prototype will make its international debut at the Paris Air Show, marking the second year in a row that the Brazilian manufacturer has demonstrated sufficient confidence so early in a flight-test campaign to bring a new model to a major overseas trade event. Embraer, which took the E190-E2 to last year’s Farnborough Airshow as part of a European sales tour, made the first flight of the stretched E195-E2 at the end of March, three months ahead of schedule, and is now into the busiest phase of its US$1.75 billion, multiyear next-generation E2 development effort.

Bombardier CSeries
Bombardier transformed its CSeries order book in 2016 with landmark sales to two marquee customers: Air Canada for 45 firm orders and 45 options for CS300s, and Delta Air Lines for 75 firm orders and 50 options for CS100s. The company also began deliveries of CS100s to CSeries launch customer Swiss International Air Lines and CS300s to AirBaltic. The production ramp-up has been slowed by delivery delays of Pratt & Whitney PW1500G geared turbofans, but Bombardier expects to deliver 30-35 aircraft this year as planned. Quebec’s $1 billion investment in the CSeries, however, has prompted international trade complaints.

Bombardier Global 7000
Bombardier has flown three of four Global 7000 test aircraft, keeping the ultra-long-range, ultra-large-cabin business jet on track for delivery in the second half of 2018. Highlights include reaching a speed of Mach 0.995. Designed to fly 7,400 nm at Mach 0.85, the 7000 is an all-new aircraft with GE Passport 20 engines and fly-by-wire digital flight controls. In 2015, Bombardier extended the program by two years, in part for a wing redesign. Wing supplier Triumph Group sued Bombardier to recover additional costs, raising concerns of a program impact, but said May 24 it had reached a “comprehensive settlement.” Chalet 282 and Hall 2b, Booth G172.

Irkut MC-21
Russia’s new MC-21 airliner, the first Russian-made narrowbody commercial passenger transport designed in the post-Soviet era, is progressing toward first deliveries to Russia’s largest carrier, Aeroflot, in 2019. The aircraft manufactured by Irkut Corp. (Hall 2a, Booth B198), a subsidiary of Russia’s government-owned aircraft holding company, UAC/United Aircraft Corp., made its first flight in May, slightly less than a year after the prototype was rolled out. The aircraft was powered by Pratt & Whitney PW1400G-JM engines. An alternative Russian powerplant – the Aviadvigatel PD-14 – just completed initial trials on the Ilyushin Il-76LL flying lab, which has enabled engine certification tests to start.

Boeing-777X
Boeing passed through the 70% detailed design mark for its 777X flagship on the eve of the Paris show, and tests of a wide-ranging series of avionics, power and other integrated systems are ongoing at the company’s ground laboratories close to Boeing Field in Seattle, Washington. The test plan this year is expected to culminate with integration of all the evaluated systems into a representative aircraft dubbed “Airplane Zero.” Assembly of the first parts for the initial 777-9, a static test airframe, meanwhile is underway in the purpose-built 777X composite wing center at nearby Everett.

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Embraer E2 prototype will make its international debut at the Paris Air Show, marking the second year in a row that the Brazilian manufacturer has demonstrated sufficient confidence so early in a flight-test campaign to bring a new model to a major overseas trade event. Embraer, which took the E190-E2 to last year’s Farnborough Airshow as part of a European sales tour, made the first flight of the stretched E195-E2 at the end of March, three months ahead of schedule, and is now into the busiest phase of its US$1.75 billion, multiyear next-generation E2 development effort.

Bombardier Global 7000
Bombardier has flown three of four Global 7000 test aircraft, keeping the ultra-long-range, ultra-large-cabin business jet on track for delivery in the second half of 2018. Highlights include reaching a speed of Mach 0.995. Designed to fly 7,400 nm at Mach 0.85, the 7000 is an all-new aircraft with GE Passport 20 engines and fly-by-wire digital flight controls. In 2015, Bombardier extended the program by two years, in part for a wing redesign. Wing supplier Triumph Group sued Bombardier to recover additional costs, raising concerns of a program impact, but said May 24 it had reached a “comprehensive settlement.” Chalet 282 and Hall 2b, Booth G172.

Irkut MC-21
Russia’s new MC-21 airliner, the first Russian-made narrowbody commercial passenger transport designed in the post-Soviet era, is progressing toward first deliveries to Russia’s largest carrier, Aeroflot, in 2019. The aircraft manufactured by Irkut Corp. (Hall 2a, Booth B198), a subsidiary of Russia’s government-owned aircraft holding company, UAC/United Aircraft Corp., made its first flight in May, slightly less than a year after the prototype was rolled out. The aircraft was powered by Pratt & Whitney PW1400G-JM engines. An alternative Russian powerplant – the Aviadvigatel PD-14 – just completed initial trials on the Ilyushin Il-76LL flying lab, which has enabled engine certification tests to start.

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More modest fighters designed for unconventional warfare and anti-terrorist action, state-of-the-art missiles, tiltrotors for the international marketplace, aerial fueling tankers, maritime patrol and special-mission aircraft are on the many to-do lists of the global aerospace defense industry. We take a look at the “must-watch” defense aviation programs.

Bell-Boeing V-22 Osprey
As production of Bell-Boeing’s V-22 Osprey winds down, the U.S. Navy is making a concerted effort to sign additional customers. Japan is currently the program’s only international buyer. In an effort to make the V-22 more appealing to potential buyers, the Navy unveiled a plan last year at the Farnborough Airshow that offers European countries the option to share logistics support by purchasing the costly tiltrotor as a group. Local industry would also benefit: Any country that participates can choose to contract out V-22 support work – such as preventative maintenance or post-production modification – to indigenous companies with existing infrastructure. Chalets 332/335.

OA-X Light-Attack Demo
Nations with limited resources have figured out that exquisite fighter jets are not always optimal for irregular warfare and counterinsurgency operations when low-cost light-attack aircraft would do just fine. The U.S. Air Force has long resisted buying a dedicated light-attack fleet to relieve its high-end warplanes, even while trying unsuccessfully to retire the 1970s-era Fairchild Republic A-10 Thunderbolt. This could be about to change, with the service inviting manufacturers of the Textron Scorpion Jet and AT-6 Wolverine and Sierra Nevada Corp./Embraer A-29 Super Tucano. The USAF could buy as many as 300 aircraft. Sierra Nevada is at Chalet 254.

Future Combat Air System
Britain and France are due to commence full-scale development work on two unmanned Future Combat Air System (FCAS) demonstrators toward year-end, following feasibility studies completed at the end of 2016. There appear to be some headwinds, however, over what each nation wants to achieve with the aircraft. Britain would like it to be an experimental demonstrator, while the French would like something more operationally capable. The two demonstrators are due to fly in 2025, with the aim of moving into development of an operational system in the 2030s. The FCAS programs in each country also will look at manned alternatives.

MBDA Meteor
MBDA’s Meteor air-breathing, beyond-visual-range, air-to-air missile is now in service with Swedish Air Force JAS-39C/D Gripen, and integration on the Eurofighter Typhoon and Dassault Rafale is close to completion. On the latter two aircraft types, the weapon will likely be ready for use on the front line sometime during 2018. The weapon is also planned for integration on the F-35 in the coming years. The missile will likely need advanced data links and electronically scanned radars. How other nations such as China, Russia and the U.S. develop analogs or countermeasures could prove the best way to judge its impact. Chalet 254.

F-35 Joint Strike Fighter
The F-35 makes its Paris Air Show debut this year, marking the first time the U.S. Air Force has sent a stealth aircraft to Le Bourget since the B-2’s brief visit in 1995, and the first time one has been displayed in the static park since the F-117 in 1991. The appearance comes on the heels of the F-35’s first European training deployment in April, where the aircraft trained with NATO allies across the region. Although France is not purchasing the F-35, its presence at the show is a win for Lockheed Martin as the company looks to boost international sales. Chalet 324.

Boeing KC-46A
The KC-46A tanker is one of the most watched programs right now, as Boeing is on tap to deliver 18 aircraft and associated wing-aerial refueling pod systems by October 2018. Boeing Defense, Space and Security chief Leanne Caret says that keeping the KC-46 on track is at the top of the company’s priority list. But due to design challenges, the delivery schedule for the initial aircraft is significantly tighter than usual, and the U.S. Government Accountability Office has expressed concerns that the schedule could slip. Chalets 332/335. CONTINUED ON PAGE 36
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CONTINUED FROM PAGE 34

Boeing P-8A Poseidon
The U.S. Navy’s seventh Boeing P-8A Poseidon squadron has begun flight operations at Whidbey Island in Washington state, marking the halfway point in the phase-out of the 1962-vintage Lockheed Martin P-3C. The milestone comes amid strong international interest in the Boeing 737-based submarine hunter. In April, Norway announced plans to buy five P-8As to replace its P-3s, introduced in 1969, with delivery from 2021-22. New Zealand has been approved by the U.S. State Department to buy four to replace its P-3Ks. Boeing has begun building the first two British P-8s for delivery by 2019. Australia and India are expanding their fleets too. Chalets 332/335.

Dassault Rafale
With three export orders in the bag and a fourth to be announced possibly later this year or in 2018, according to CEO Eric Trappier, Dassault’s Rafale is finally replicating the export success enjoyed by the earlier Mirage family. Work is under way to develop the F4 configuration with enhanced communications and sensors, paving the way for upgraded weapons. The French defense ministry wants the F4 capability in service by 2025. The F3R capability currently being readied for 2018 will add the Meteor air-to-air missile to the aircraft’s inventory. Groupe Dassault is at Chalet 183.

Future Vertical Lift
Is the U.S. Army-led Future Vertical Lift (FVL) program shaping into another multiservice, multinational project akin to the F-35 Joint Strike Fighter? Yes, it seems, but hopefully without the billions of dollars in cost overruns and delays. The U.S. Army and Marine Corps are jointly defining their requirements for a future high-speed, long-range rotorcraft to eventually succeed utility and attack variants of the Sikorsky H-60 and Bell Helicopter H-1. There is already strong interest in FVL from Australia, the Netherlands and the UK, and more will take notice once the Bell V-280 Valor and Sikorsky-Boeing SB-1 Defiant begin flying.

TF-X
With the signing of agreements in May, BAE Systems engineers now plan to move to Ankara to join Turkish Aerospace Industries (Chalet 274) colleagues to begin designing an indigenous twin-engine, fifth-generation fighter aircraft. The new aircraft would replace Turkish Air Force F-16s starting in 2029. Turkey wants to fly a prototype by 2023. In the coming weeks, expect an engine decision likely to favor a European OEM as Turkey pushes to have an aircraft that is virtually free of U.S. International Traffic in Arms Regulations. Turkey also is developing an active, electronically scanned array radar, avionics and weapons for the jet.

F-16 Upgrades
Lockheed Martin is looking for new international orders for the F-16 to extend production past the 2020s. The F-16V, or Block 70, adds Northrop Grumman’s APG-83 scalable, agile-beam active, electronically scanned array radar; a center pedestal display; a new advanced mission computer; a joint helmet-mounted cueing system; and the auto ground collision avoidance system. The new AESA radar is critical to the upgrade, delivering greater situational awareness, improved flexibility and quicker all-weather targeting. It also provides F-16s with fifth-generation-fighter radar capabilities by leveraging hardware and software commonality with F-22 and F-35 AESA radars. Chalet 324.

MALE 2020
France, Germany, Italy and Spain have signed up to develop a multinational medium-altitude long-endurance unmanned air system. Germany is leading the development through Airbus, which is likely to use its UAS development experience to produce an aircraft that might resemble the company’s Talarion design from the late 2000s. The plan is to produce a platform that could be fielded by 2025.

Special Mission Aircraft
The U.S. Air Force’s aging special-mission aircraft fleet is ready for an overhaul. Not only is the service pursuing a replacement for its Lockheed Martin EC-130H-based Compass Call electronic-attack aircraft, but it also is poised to select a contractor to replace its Northrop Grumman E-8-based Joint Stars program. And now the service is kicking off an analysis of what could be a multibillion-dollar program to replace the Boeing 747-based E-4B “Doomsday Plane” and the Navy’s Boeing 707-based E-6B Mercury fleet with a single “Survivable Airborne Operations Center.” Contractors are in hot pursuit of each opportunity.

Airbus would like its A400M customers to assume most of the (continuing) program risk.

Airbus A400M
The complex Airbus Military A400M airlifter program continues to struggle. Now in service with France, Germany, Malaysia, Spain, Turkey and the UK, Airbus still encounters difficulties in bringing the tactical capabilities to front-line service. Last year, Airbus took a €2.2 billion (US$2.5 billion) hit on its 2016 financial results as a result of late deliveries and penalties. Airbus has now begun negotiating with customer nations to loosen what CEO Tom Enders calls a “topside share of the risk.” Export orders remain a challenge, but Airbus has made progress with a potential sale to Indonesia, and a much-rumored contract with Egypt may still be in the offing.
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ATR Faces Renewed Competition From Jets

Slow ATR 42/72 turboprop sales last year are the result of combining adverse market forces that put the airframer in a position its executives could have thought a thing of the past – competing against jets.

During the so-called “jetmania” market shift of the 1990s and early 2000s, a new generation of 40- to 70-seat jets managed to lure regional carriers.

They were promoted as a way for regional carriers to get rid of an image of slow, old technology. Turboprop sales plummeted and ATR was badly hit. But the operating costs of jets went spiraling when oil prices increased. Turboprops regained their attractiveness thanks to their lower fuel consumption, as well as passenger comfort improvements. The production of some prominent turbofan-powered competitors ceased.

But now the salespeople of the Toulouse-based manufacturer have to argue against these jets again. “In most sales campaigns [we are involved in], the customer is considering buying either a cheap used jet or a new efficient turboprop,” says ATR CEO Christian Scherer. For instance, Embraer has been placing used E170s - that had their first life with U.S. carriers – into emerging markets.

The market is soft overall and ATR took orders for a disappointing 36 aircraft (34 ATR 72-600s and two ATR 42-600s) in 2016. One of the reasons for the soft market is the stronger U.S. dollar. Citing Indonesian carriers as an important example, Scherer notes many of ATR’s customers pay in other currencies.

Therefore, a used jet may be more affordable. Compounding the problem are relatively low fuel prices, which make the turboprop’s better business case less obvious. So jetmania is not dead – “everybody wants a jet; they buy one, burn their fingers [due to the higher operating costs] and then buy a turboprop,” Scherer says.

The phenomenon can also be seen with pilots, who tend to see turboprops only as a stepping stone. Thus ATR’s customers also face a pilot shortage. “Maybe we should have anticipated the pilot bottleneck,” Scherer concedes. And not only the airlines are having a hard time finding pilots, they also have to cope with scarce slots at training organizations. In a bid to contribute to the solution, ATR in January installed an additional ATR 72-600 sim in Paris.

Finally, according to Scherer, there “may be a bit of oversupply in the turboprop leasing sector.” Selling to lessors involves finding a modus vivendi to avoid competing with each other. Scherer sees a lessor as best placed to offer availability at a six- to 18-month notice, the airframer being positioned for 18-month-distant slots.

As a result of the weakening sales, Scherer has decided to “stabilize” the production at an annual 80, thus stopping the planned ramp-up to 100 or more. The backlog is still reassuring, estimated at three years of production.

The supply chain, once a source of delays, is now “doing rather well,” Scherer says. Leonardo and Airbus, both ATR’s parent companies and main suppliers, have agreed on a procedural change: Subassemblies are handed over at their own factories, which means ATR is not accepting them if incomplete.

In 2017, ATR salespeople hope to conclude the sale of 40 aircraft to Iran Air, announced in early 2016 (the first four ATR 72-600s were delivered last month).

Farther east, efforts to sell ATRs in China continue. Scherer cites two kinds of obstacles – protectionism, as the Chinese government wishes to promote AVIC’s turboprops, and political, as granting an air operator’s certificate to a startup airline in a remote province has to be thoroughly mulled. “But the Great Wall is not insurmountable,” he says.

Current market trends have not changed ATR executives’ belief in the intrinsic advantages of the turboprop. When Sweden-based carrier BRA organized a public relations event for the first flight of one its new brand-new ATRs on biofuel, Scherer seized the opportunity to promote its products as more environmentally friendly than a jet.

ATR is at Static B2.

—Thierry Dubois

ATR opened a new training center in Miami, Florida, this year, including a full-flight simulator (FFS) for the 600-series aircraft (shown here). The company said last week that it will install an FFS manufactured by TRU Simulation + Training for the ATR 72-600 in Paris too, to be EASA-certified with operations to start in November.
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Scorpion, AT-6 and A-29 Chosen For USAF’s Light Attack Demo

It comes as no surprise to the aerospace world that the U.S. Air Force has settled on Textron’s Scorpion jet and AT-6 Wolverine turboprop, along with Sierra Nevada and Embraer’s A-29 Super Tucano, to face off in a light attack demonstration this summer.

All three aircraft had been considered frontrunners for the OA-X demonstration, which could eventually lead to procurement of a low-cost light fighter fleet for counterterrorism missions.

The Super Tucano, the only light air support aircraft in the world with a U.S. Air Force Military Type Certificate, was a sho-in from the start. The turboprop, designed for close-air support (CAS), countermass destruction and aerial reconnaissance missions in low-threat environments, is already proving itself in operations with the Afghan Air Force. Designed to operate in high temperatures and extremely rugged terrain, the A-29 is highly maneuverable and has a low heat signature.

It also has historically lower operating costs than most jets, an advantage in tight budget times. The Air Force has said affordability will be key to the OA-X effort, if a program of record emerges.

Meanwhile, Textron Aviation’s AT-6 is also a low-cost turboprop, based on Beechcraft’s T-6 Texan trainer. It is already widely used for training by the U.S. armed services, as well as by the Canadian, Greek, Iraqi and Israeli air forces.

Textron Airland’s Scorpion is a bit more of a stretch for OA-X. The Scorpion made its first flight in 2013 but has not yet signed any customers, and Textron recently withdrew the aircraft from competing for the Air Force’s T-X Advanced Pilot Trainer. Scorpion is a light jet rather than a turboprop, potentially a disadvantage from a cost perspective.

However, Textron is confident both aircraft are “exceptional platforms” to fulfill the light attack mission, a spokesman told Aviation Week.

Boeing and Lockheed Martin have opted not to participate in this early stage of the OA-X effort, and Northrop Grumman has declined to comment.

The upcoming experiment, scheduled to take place in August at Holloman AFB, New Mexico, is the first step toward potentially fielding a low-cost, light-attack aircraft to fight terrorists in the Middle East. The potential 300-aircraft buy could also help alleviate the service’s growing pilot shortage, providing additional seats for training.

The Air Force earlier this year released a list of notional requirements for the companies looking to participate in the experiment. The aircraft selected must be able to perform light attack and armed reconnaissance, and operate from austere locations. Qualifying aircraft need to be able to support a high operations tempo of 900 flight hours per year for 10 years, and have a 90% mission-capable rate for day and night missions.

The aircraft must be able to take off using a maximum runway length of 6,000 ft., and be equipped with secure tactical communications and the ability to hit stationary or moving targets day and night. In addition, qualifying jets must have a 2.5-hr. mission endurance with an average fuel flow of approximately 1,500 lb./hr. or less. The aircraft will also be evaluated for survivability, including infrared and visual signature.

—Lara Seligman

USAF Secretary Cools Talk of 300-Aircraft OA-X Buy

The secretary of the U.S. Air Force has stressed that the OA-X light attack initiative “is not a procurement, it’s an experiment” as participants such as Sierra Nevada Corp. (SNC) and Textron wish for a return on investment.

Speaking at an Air Force Association Forum in Washington on June 5, Heather Wilson said although the experiment could inform future acquisition plans and decisions, there is no guarantee the service will end up buying a light attack fleet.

This clarity from the top comes amid heavy investment by the SNC- and Textron-led teams, who are preparing their respective A-29 Super Tucano and AT-6 Wolverine and Scorpion Jet aircraft for the OA-X flying experiment. The candidates will fly in mock combat profiles at Holloman AFB, New Mexico, in August.

Textron has invested in four Scorpion aircraft without any confirmed launch customer, including one prototype and three production-confirming models. There are already more than 120 armed versions of the Beechcraft T-6 Texan II trainer turboprop in operation around the globe, although the company has not secured a launch customer for the latest Wolverine.

SNC and Embraer produce the latter’s Super Tucano in Jacksonville, Florida, for Afghanistan and Lebanon but need more orders to keep the line going.
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Sukhoi Plans Next-Generation Superjet

Sukhoi Superjet 100 celebrates its 10th anniversary since rollout this year, but the Russian manufacturer already is planning a new generation of this regional jet. The SSJ 100, with extended capacity, new wing and new engine, is expected to appear after 2025, Vladislav Masalov, the new president of Sukhoi Civil Aircraft Corp. (SCAC), told ShowNews.

He explained that the SSJ 100 modernization will be done in several stages. The first effort till 2020 calls for the improvement of the current aircraft. “This includes the improvement of runway performance and airframe reliability and retrofit under the requirements of the European SESAR air traffic management project,” explained Masalov.

He said that the next step will be the development of a completely new 130-seat platform with a new wing by 2023. The previous effort to expand the capacity of the existing airframe, known as SSJ-100SV (stretched version), has been abandoned.

The large aircraft will require a new powerplant. The existing SSJ 100 has a single-engine option – SaM146, manufactured by French Safran in cooperation with Russia’s United Engines (UEC) – but the future modification may have a Russian powerplant.

“We will talk with both Safran and UEC. The latter plans to scale down the PD-14 engine for 7 to 9 tons thrust,” explains Masalov, who headed the Russian engine manufacturer in 2012-15. The 14-ton-thrust PD-14 designed for Russia’s MC-21 narrowbody airliner is being flight-tested now, with certification planned for 2018-19.

After the new powerplant is selected, it will also be used to re-engine the current 100-seat aircraft. This enables Sukhoi to offer to the market de facto a new family consisting of 100- and 130-seat variants after 2025. “We will have a new regional aircraft with flight range, operational efficiency and runway requirements significantly improved to satisfy the market demand,” mentioned Masalov.

He explained that this modernization program has yet to be approved by the board of United Aircraft Corp. (the parent company of SCAC), following discussion with leasing companies, airlines and key suppliers. The program cost is estimated at about RUB60 billion (roughly US$1.1 billion) with 50 to 60% of this sum to be financed by SCAC.

“But approval or disapproval of this program doesn’t rule out the improvement of the aircraft’s basic version,” Masalov said, adding that the company allocated RUB1.5 billion for this effort for this year.

The SSJ 100 modernization plan was announced shortly after Sukhoi took full control of the program after Italian Finmeccanica reduced its participation to only a 10% stake in Venice, Italy-based joint venture SuperJet International, the latter offering SSJ 100 customization for Western customers, as well as training and after-sales support.

According to Masalov, SCAC’s main priorities are now the increase of sales and improvement of after-sales support. The Russian manufacturer expects additional orders from two major SSJ operators – Russia’s largest carrier, Aeroflot, and Mexican Interjet – as well as to launch a re-marketing scheme with Russian GTLK State Transport Leasing Company for Russian carriers. “So the annual output of 35 airframes we are planning for the next several years is very much achievable,” Masalov hopes.

Ten years after the SSJ 100 rollout, SCAC is preparing to build its 150th airframe. The manufacturer delivered 26 aircraft in 2016, and 25 in 2015. For the past few years, the program enjoyed strong financial support from the Russian government, which provided the company with resources to cover its financial debt and subsidized the aircraft leasing to Russian airlines. The sales plan for this year stands at 34 aircraft, with a further 38 and 37 airframes to be sold in 2018 and 2019, respectively.

More than 120 aircraft are now in operation in Russia, Mexico, Thailand, Kazakhstan and Europe. At the beginning of June, Irish carrier CityJet, which became the SSJ 100’s first European operator, received its sixth aircraft of the type. It wet-leased the jetliner to another European operator, Brussels Airlines, which already operates two Russian aircraft. Sukhoi Civil Aircraft is at Chalet 349.

—Maxim Pyadushkin
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**Saab’s Never-Surrender Global Gripen Campaign**

EVEN as Saab celebrates the first flight of its JAS 39 Gripen E-series aircraft, the bulk of its near-term international sales opportunities center around the in-production C/D model.

The aircraft manufacturer says that three sales opportunities are on the near horizon: new C-models for Botswana in Africa and for NATO members Slovakia and Bulgaria in Eastern Europe. Elsewhere, Saab (Chalet 379) is offering either the Gripen C/D or E/F, depending on budget and capability, to Belgium, Canada, Croatia, Columbia, Finland, India, Indonesia, Malaysia, the Philippines and Switzerland.

As is common in all fighter procurements, each campaign has ups and downs, stops, starts and restarts, as well as unique political, cultural and financial requirements. Richard Smith, Saab’s head of Gripen marketing and sales, says the key to these contests is to never quit. “Patience is absolutely key,” he says. “If you give up, you lose. Don’t give up.”

Gripen is considered one of the Western World’s premier multirole fighters. It competes primarily against the Korea Aerospace Industries FA-50 Golden Eagle and Lockheed Martin F-16 as well as upgraded legacy fighters in the single-engine combat aircraft market. The in-development E-series Gripen is a lower-cost alternative to the Boeing F/A-18E/F Super Hornet, Dassault Rafale, Eurofighter Typhoon and Lockheed F-35 in other competitions.

Generous financing options by the Swedish government help the Gripen get ahead in some markets, whereas other nations value the significant technology transfer that can come from a Gripen purchase. Saab’s last major win was the Gripen E/F sale to Brazil, but it now needs a couple of long-running C/D campaigns to translate into firm contracts to support C-series production in Linköping until the future E-series takes over in the late 2020s. The first of three single-seat Gripen E test aircraft will fly in the next couple of months, and first delivery is expected in 2019.

Saab aims to grow the family of Gripen operators, which counts NATO members Czech Republic and Hungary, South Africa, Thailand and the UK’s Empire Test Pilot School in addition to Sweden and Brazil.

In Africa, the Botswana Defense Force Air Wing needs a replacement for its single squadron of outdated Canadair CF-5s. Botswana is weighing the Gripen C/D against a competing offer from Korea, the FA-50. A request for proposals (RFP) went out in June 2016 and the Swedish government responded with Saab’s fighter in January. “Discussions are moving forward with Botswana; we’re offering genuine fighter capability,” Smith says.

In Central Europe, the Slovak Air Force needs to replace its squadron of Soviet-era MiG-29s. Saab is leveraging the Slovak Republic’s strong military-to-military relationship with the Czech Republic to push Gripen across the line. Saab has been in discussions with Slovakia since 2015 and in November 2016, it responded to a new RFP issued earlier in the year.

“There’s been ups and downs and changes in the government on top of that, but healthy negotiations,” Smith says. “We’re awaiting information on how to proceed.”

Bulgaria is in the process of forming a new government, which is holding up a decision on a new fighter to replace its MiG-29s. Sweden responded to a December 2016 RFP and the Gripen was recently singled out as the preferred choice. Smith expects the winner to be publicly announced in April.

In all three cases, Saab is offering the latest MS20 Gripen C-series configuration.

—James Drew

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**Saab’s Monster Missile Prepped for Next-Gen Gripen**

Saab’s beastly looking anti-ship cruise missile, the RBS15, is to be upgraded and installed on Sweden’s new E-series JAS 39 Gripen and Visby-class corvette.

The newest Robotsystem15 Mark 3 is already operational as a surface-to-surface weapon for ships and coastal defense batteries, but the Swedish Air Force (SwAF) has not adopted a new air-launched model since the RBS15F in 1982. While today’s C-series Gripen can carry two RBS15Fs per sortie, the Gripen E that will soon take its maiden flight can carry four. This feat is made possible by a more powerful GE F414-39E engine, additional fuel capacity and reconfigured weapons stations.

The Swedish Defense Material Administration awarded Saab an SEK$3.2 billion (US$360 million) contract in March for development of the improved anti-ship weapon, tentatively called the extended-range RBS15F (air-launched), RBS15 Mark 3+ (ship-launched) or RBS16.

Michael Höglund, Saab’s head of missile systems marketing and sales, says the development program will run from 2017-26 with initial deliveries in the mid-2020s.

Meanwhile, the Gripen is about to begin its flight test campaign with deliveries to the Swedish and Brazilian air forces starting around 2019. Sweden’s first squadron of single-seat E-models will be ready for combat by late-2023, the SwAF says.

—J.D.

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Saab’s RBS15 missile is already operational on ships and for coastal defense batteries.
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Dassault Facing Tough Times With Falcons But Now the Rafael Fighter Is Looking Better

“Our customers are very active; the market isn’t flat in terms of discussions, it is flat in terms of placing orders,” Dassault Aviation chairman and CEO Eric Trappier says. He is talking about Falcon business jets. For at least 15 years, his statement could have been about the Rafale fighter as well.

Dassault, which traces its roots to an innovative propeller designed by its founder, Marcel Dassault, in 1916, has kept the strong corporate culture of a family-run business with a passion for aviation. Although relatively small – 12,000 employees – in a world of giants, it has remained fiercely independent. And despite a consistently healthy cash flow, it has not tried to take over any other aerospace company.

But Dassault has notched only three Rafale fighter export deals since 2015, while deliveries of its Falcon business jets are at their lowest point in 21 years.

Companies comprising civil and military businesses often emphasize the robustness of their dual activity – the weakness of one market can be offset by activity in the other. This has been especially true for Dassault. In 2007, Falcons were selling like hotcakes while the Rafale had begun acquiring a reputation of being an “unsalable” aircraft.

Rafale export sales took off at last in 2015, but demand for business jets has failed to recover from the 2007-08 global financial crisis.

The effect of the Rafale contracts has so far been practically negligible on revenues because early export deliveries have only offset an agreed slackening in domestic deliveries. Trappier says total 2017 revenues should be higher than 2016’s €3.6 billion (US$4 billion), thanks to Rafale export sales.

Nevertheless, civil R&D expenditures may come under scrutiny. Dassault usually releases an overall number that lumps together civil and military R&D activities. Yet it clearly cited the Falcon 5X’s program suspension for the decrease in R&D spending in 2016, to €293 million.

Dassault has for decades endeavored to stay at the forefront of business aviation technology in a relentless competition with archival Gulfstream. Last October, Dassault received EASA and U.S. FAA certification for its FalconEye combined vision system. It is the first head-up display to blend synthetic terrain imaging with actual thermal and low-light camera images. Development cost has not been disclosed, but its duration – at least three years – gives an idea.

Meanwhile, the Falcon 5X program, a clean-sheet design featuring a wider fuselage, is stalled. Supplier Safran is partially redesigning its Silvercrest turbofan powerplant to meet the performance specifications. Entry into service has been postponed to 2020. It is fair to assume that much of the development cost for the 5X lies ahead.

And now? “We want to be in a position to launch a new Falcon business jet at the end of 2017,” Trappier says. Dassault is considering more laminar airflow on the wing to cut fuel consumption, a U-shaped empennage for lower noise, and a new generation of composites that can be more effectively recycled. A fuel cell could replace the APU for greater overall energy efficiency.

The quandary? Technology advancement is ramping up as Falcon deliveries are trending down. This year, Trappier anticipates 45 – the weakest number since 1996. However, Falcon deliveries have consistently declined since 2013, while the world’s GDP has steadily grown.

Global deliveries of business jets were down 8% last year. Even Gulfstream, which for some time had managed to curb the damage, saw deliveries slide to 88, from 120 in 2015. Trappier expects the business jet market to remain weak in 2017, with a gradual recovery likely to begin in 2018.

But last year, “to sell Falcons we had to fight – and we had to cut prices,” he says.

On the military side, global spending is showing no signs of slowing, so Dassault employees should not be too anxious about the future of combat aircraft, whether manned or unmanned. Concurrently, the recent formation of a new government in France has probably reassured company executives about maintaining the momentum in Rafale export orders. Former Defense Minister Jean-Yves Le Drian is credited with having paved the way for the first contracts with foreign countries – Egypt, Qatar and India.

Dassault Aviation is at Chalet 193 and in Hall 2a, Booth A251.

—Thierry Dubois
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Boeing’s NMA Poses Propulsion Puzzle

How will engine makers approach Boeing’s NMA – with a big small engine or a small big engine? This week will see beaucoup traffic between the chalets as engine makers jockey for position in the early contest to power the NMA - Boeing’s New Midsize Airplane.

The stakes are high for all concerned. The embryonic Boeing project, unofficially dubbed the 797, is targeted at entry into service around 2025 and almost certainly will be the biggest “must-win” new development airliner program of the first half of the next decade. Strategically speaking, the NMA engine selection campaign is on a par with those for industry-defining propulsion decision makers such as the Boeing 737 and 777-300ER. While it is too early to be sure, engine makers also know the winners will be in pole position to power an Airbus response.

Boeing’s entry-into-service target for NMA – 2025 – will require new engine testing in 2022-23. History shows there is a long and complicated route to selection and, given the usual five- to six-year gestation period for new propulsion systems, now is the time to begin. Boeing is tipped to follow the 787’s market-driven dual-source model for the NMA rather than go sole-source as it did for the 777X. However, there are uncanny similarities between the present-day race for the NMA and 1999, when Boeing was in the final phases of what became a sole-source engine selection for the proposed 777-200X/300X longer-range variants, which became the 777-200LR/300ER.

Key points:
- The NMA thrust requirement estimated in the 45,000-lb. range;
- Boeing’s power requirement is within the thrust bracket of the existing GE/Safran CFM (Chalet 121) joint-venture agreement;
- Pratt & Whitney (Chalet 346) sees NMA as opportunity for its first growth GTF application; and
- Rolls-Royce (Chalet 93) is likely to offer an engine based on the new geared UltraFan architecture.

The contest for the 777-200X/300X was fierce. Financially hit by the recent costly development of engines for the baseline 777 and Airbus A380, the cash-strapped engine makers were in no mood for another three-way market split. General Electric bid a growth version of the GE90, but only on the condition it was selected as the exclusive engine. Pratt & Whitney, which argued for a downselect to two options, proposed an all-new design based on a scaled-up version of the PW6000. Rolls-Royce, which had built a growth demonstrator called the Trent 8104, was confident of matching Boeing’s growing thrust needs but wary of another expensive market battle. In the end, GE famously won with the performance promises of the GE90-115B and a hefty financial package backed by pledges of 777 orders from GE Capital Aviation Services. Yet the engine selection events that came to a head at the Paris Air Show 18 years ago ultimately went far beyond the latest 777. They reshaped the industry, paving the way for today’s widebody teaming of Airbus and Rolls in Europe, and Boeing and GE in the U.S. GE’s selection also further alienated Pratt from the big-engine market and fired its determination to reenter the single-aisle sector by developing the geared turbofan (GTF).

Fast forward to today, and the distant echoes of this long-gone contest are still reverberating as the engine makers begin to shape their campaigns. There is one crucial difference, however, which only adds to the conundrum. The NMA’s outline thrust requirement is in the quirky 45,000-lb. range. In the 1960s, this was prime territory for the first generation of high-bypass-ratio engines such as GE’s CF6-6, the powerplant derived from the Lockheed C-5’s engine that equipped the first McDonnell Douglas DC-10, the Rolls RB211-22B for the initial Lockheed L-1011 and Pratt’s first JT9D-3 for the Boeing 747-100.

But as engine power grew, so did the aircraft, and the thrust sector was largely left behind until a decade later, when a second-generation turbofan series emerged to power the Boeing 757. The NMA engine specification likely will require high-bypass ratios of 10:1 and above and overall pressure ratios of at least 50:1 at top of climb. Moreover, the new NMA engine requirement is above the current thrust range of the latest single-aisle powerplants - CFM’s Leap or Pratt’s PW1000G GTF - and well below the present generation of widebody production engines such as the PW4000, Trent and GEnx. For GE, the company’s response therefore will be framed within the original CFM joint-venture agreement with Safran Aircraft Engines, which extends up to 50,000 lb. thrust.

Boeing is at Chalets 332 and 335.

—Guy Norris
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GO BEYOND
Boeing Aims for $50 Billion in Services

How do you steer a company with 145,000 employees and nearly US$100 billion in annual sales into the future? New airliners, military trainers, fighters and an unprecedented services initiative are among Boeing’s top priorities. Chairman, President and CEO Dennis Muilenburg sat down at the company’s Chicago headquarters with Aviation Week Editor-in-Chief Joe Anselmo and Senior Editor Guy Norris.

A new aftermarket business, Boeing Global Services, is standing up on July 1 with a goal of generating $50 billion in annual sales. That’s a big deal.

We see a $7.5 trillion aerospace marketplace over the next 10 years. About $2.5 trillion of that is services. Today we have, arguably, about 50% of the installed base of airplanes in our sectors but only 7-9% of the services. So we have plenty of headroom to grow. I think our unique OEM knowledge and scale give us the opportunity to add value for customers like nobody else. Fifty billion dollars is a big, audacious growth target, but we can see our way to achieving that.

Your commercial development programs seem to be meeting schedule and cost targets. Has Boeing got its mojo back?

We have very good momentum. Much of that is built on lessons learned from the past. [Former CEO] Jim McNerney and I launched our development program excellence initiative several years ago, and you are seeing signs of progress. The 787-10 was completed early and is flying extremely well. The entire 737 MAX family [has been] delivered under cost and a little ahead of schedule. Unfortunately, the process improvements were not all in place when we started the [KC-46A] tanker program, so we have had some challenges there.

Boeing Chairman, President and CEO Dennis Muilenburg

Where are you on the proposed NMA [New Midsize Airplane]?

We see a clear market space between our 737 and 787 families, an aircraft that is in the 5,000-nm range, 250-seat capacity. It’s bigger than the 757 and flies farther. But the business case has to make sense. If we decide to launch, this will be as much about production system transformation as airplane technology.

Developing a twin-aisle NMA that operates at single-aisle costs seems pretty challenging.

We are changing the nature of how we design and build airplanes. It’s about digital design and bringing smart innovation and automation into the production lines. It allows us to bring airplanes together with significantly reduced flow times and costs, which then turns into speed to market.

Do you feel as if you’ve got a good grip on the 777X development?

The engine’s running. We are deep into detailed design, and we have begun building production parts. I just visited our composite wing center in Everett [Washington]. We’ve got production parts flowing through the factory as we’re putting together the first wingboxes. So we are making the transition from finalizing the detailed design to initiating production and starting engine runs. That is all going to build toward flight testing in 2018 and first delivery in 2020.

Boeing has deals to sell nearly $20 billion worth of airplanes to Iranian airlines. Given the tensions between the U.S. and Iran, how likely is it that we will see any of those airplanes delivered?

Those airplanes are in flow. Every step of the way we are staying completely aligned with the government approval process. You’re right, it’s a challenging political environment, and we are mindful of that. But these are big deals. We expect to start delivering these airplanes in 2018. I cannot predict the future, but I can predict that we are going to stay aligned with the U.S. approval process.

Boeing’s relationship with President [Donald] Trump seems to have improved a lot since he accused the company last December of gouging the taxpayers on the next Air Force One.
That opening comment helped create a dialog, and we were able to sit down and have a good, open conversation on a broad range of topics. What we have with President Trump is an administration that is welcoming business input. We’re glad to have a seat at the table as we think through things like trade policy, tax reform, regulatory reform and a strong and stable defense budget. The president is very good at inviting dialog and is open to ideas and inputs. Aerospace has the biggest trade surplus of any sector in the country, about $90 billion. Boeing is a large portion of that, along with our supply chain.

About a quarter of your commercial airplanes are sold in China. Have you communicated with the new administration the importance of a two-way trade relationship with China?

We have, and I think that conversation has led to a very productive engagement between the U.S. and China. President Xi [Jinping’s] visit [to the U.S.] and the dialog he had with President Trump set a very cooperative tone. The world needs more than 39,000 new commercial airplanes over the next 20 years, and almost 6,800 of those will be in China. We just opened a new 737 finishing center in Zhoushan, which will enable us to deliver more aircraft to our Chinese customers. It also is one of the reasons we will be able to ramp up 737 production domestically, from 42 a month today to 47 later this year, 52 next year and 57 in 2019. We’ve been able to make the case to the president and his administration that a productive trade relationship with China can create this kind of mutual growth.

Help us understand Boeing’s complaint that Bombardier is dumping its CSeries aircraft in the U.S. market.

Public data on the CSeries aircraft is that they cost $33 million [to build] and that, in the attempts to break into the U.S. market, [Bombardier has] been offering them at about $20 million. And the fact that this airplane is being sold to customers in Canada at a much higher price than it’s being sold to [Delta Air Lines] should also provide pause. It’s clearly a classic dumping case.

Boeing’s entry into the U.S. Air Force’s T-X trainer competition is designed and built in America. Do you see that as an advantage?

Our U.S. content on that airplane, including supply chain, will be north of 90%. The majority of our competitors are leveraging an of-the-shelf airplane from another country. Our approach to T-X is unique in that we stepped back and set a clean-sheet design that’s purpose-built for the next generation of training, rather than trying to take an off-the-shelf system that was designed for a different era and is modified or somehow upgraded to limp along for the future. We’ve got two airplanes flying and they are doing very well. But as we get into the final bidding we are going to be very disciplined. This is not a program that the future of our company is dependent on. We will be aggressive, but we will also make sure we are adding value for the company and our shareholders.

How does space fit into Boeing’s future?

We have been in the business since it was invented, and expect it to be a strong part of our portfolio for decades to come. CST-100 [Boeing’s Crew Space Transportation capsule] will enable access to the International Space Station for NASA. It also positions us as more destinations in low Earth orbit evolve over time – opportunities in microgravity, manufacturing and space tourism. Deep space exploration and the work we’re doing on the Space Launch System with NASA are other important parts of the human space exploration marketplace. In our satellite business, we’ve invested in electric propulsion. United Launch Alliance, which has had 119 successful launches, is really important to us. But we are also looking at how to break the cost curve on access to space, even teaming up with people like Blue Origin on next-generation rockets.

What technical disruptors are going to have the most impact on aerospace in the next decade or so?

There is a range, both product- and process-oriented. We recently announced a co-investment in Zunum Aero [of Kirkland, Washington], which is working on electric propulsion for small transport aircraft. There are questions of how scalable that technology is, but some level of electric propulsion aircraft will likely happen. Disruptions on affordable high-speed travel – hypersonic commercial travel – and making that business model close so that you can go anywhere in the world in 2 hr. is a technical disruption that will arrive at some point, and we are continuing to invest there.

Making low Earth orbit space travel routine is a technical disruption that is underway. We’re also working on technical disruptions for our defense customers as they contemplate future missions – electronics is a deep investment area there. But it also gets into disruptions in how we design and build. We are looking at things like modularity, automation, on-demand customization. Things around additive manufacturing, digitization of our entire value chain from design to manufacturing.
Bregier: ‘The Commercial Aircraft Market...’

Airbus Commercial President Fabrice Bregier speaks to Aviation Week’s Jens Flottau about aircraft demand, the difficult introduction of the A320neo and possible program upgrades.

The commercial aircraft market has slowed considerably. When do you see the next upswing coming?

We had announced that we would probably not achieve a book-to-bill ratio above one this year. Not because there is a slowdown of the market; you see the traffic growth, it is still very positive, but we have a huge order book and we need to deliver on the promises to our customers. We cannot offer slots before 2022 on the A320 family. We will see what the year-end result will be. We still have more than six months ahead of us, but the priority goes to delivery of the A350 and the A320neo ramp-up.

And 2018?

Too early to say. The market is still extremely bullish on single-aisle. If I could ramp up faster, I would probably find customers. This confirms the decisions we have taken to go to 60 single-aisle aircraft in 2019. On the widebody side we can see huge demand, but there is more pressure, so some airlines have decided to postpone deliveries. As for Airbus, we can confirm that we will stabilize the A330 at a rate of six a month, transitioning at that rate from the cce to the neo. For the A350 we can confirm a rate of 10 for the end of 2018.

How many A320ceo slots do you need to fill before completing the transition to the neo?

Unfortunately we do not have many A320ceo slots to fill. We offered a few additional A320ceo slots because that was a possibility [in conjunction] with the engine suppliers. It was also a good way to anticipate a slightly lower ramp-up of the A320neo due to the issues around the new-generation engines. The market is facing growth that is not supported by [either] Boeing’s or Airbus’ production. If we could do more, the market would absorb more. There is interest in the A320ceo beyond what we expected, so we will continue to deliver them in 2018 and 2019 – different than what we thought three to four years ago. As of today, I do not discard the possibility of delivering A320ceos in 2020.

Do you see risks for specific parts of the backlog?

I am sure we will get to talking about the A380 [laughs]. But other than that I do not see any particular risks. We will try to get to a rate of 60 on the narrowbody side as soon as possible, and see if there is extra potential to go higher later. We have to go step by step, and clearly today the priority is to have two engines that support that kind of ramp-up.

Where would the additional aircraft be built?

We can probably marginally increase output in the current final assembly lines, and we have extra potential in Tianjin, China, and Mobile, Alabama.

There has been a lot of talk about overcapacity in the long-haul market.

I am not concerned about widebody overcapacity at the planned A330 and A350 rates, but you can see that we kept assumptions reasonable. Our plans are stable. We try to avoid big ups and downs. Stability of production and the supply chain are big drivers for us.

Do you need more A380 orders this year to fill the open 2019 slots?

That is correct. But you can [also] say that we managed to adjust production of the A380 [very well] internally and in the supply chain. We hope we can sustain A380 production at one a month, but to do that in 2019 and beyond we will need additional orders.

Are you considering large winglets to improve A380 fuel-burn performance?

We have plenty of ideas to improve all of our aircraft. Regarding the A380, you are right, we might come to this conclusion. We could do this if there is a business case. It is probably something that is affordable and far away from what we called the A380neo. This will take longer. The idea is incremental improvement.

How concerned are you about the current problems the big Middle East carriers face?

It is fair to say that there were some headwinds for some Gulf carriers that made them more cautious in their development plans. However, my challenge today is to deliver the A380s to Emirates and the A350s to Qatar Airways. We do not see a change in their strategy and fleet planning.

Airbus has faced many unforeseen problems in the introduction of the A320neo, mainly because of the issues with Pratt & Whitney engines. When will the backlog be cleared?

We delivered 110 neos by mid-May – we were at 68 at the end of last year – so it is 42 so far this year. We are still [not at] the goal I set for the team. We are targeting a total number ofneo deliveries this year close to three times the 2016 level. The engine guys are working extremely hard to manage the ramp-up, both Pratt & Whitney and CFM. They are fixing the in-service issues, which are known, with good improvements already. We have a road map until summer to fix the remaining in-service issues, which in fact limit the number of spares available to support the fleet, hence the ramp-up of production.

To your point, we are forced to produce aircraft without engines, like last year. Otherwise we would not be able to deliver more than 200 neos at the end of the year. We will probably
peak at 30 or a bit more airframes waiting for engines.

**Is Pratt & Whitney now doing enough to address the situation?**

We have to be fair with our partners. They inject a lot of new technology into the engines, both CFM and Pratt & Whitney. They do everything possible to fix the in-service issues. It is true that Pratt faced a higher number of problems. You remember the engine start-up time, a lot of messages in the cockpit – that has been fixed. We still have two or three things to fix, but these are very sophisticated technologies.

**Airbus appears to be working on an ‘A320neo plus plus’. What are you looking at?**

We have the A320neo, which is leading [in terms of orders]. It is basically the A320ceo with a new engine. We wanted to transition seamlessly and did not want to take a risk at the aircraft level. We have enough risks at the engine level. But if we are consistent with what we say, which is that the A320neo family will still be delivered in good quantities until 2030, perhaps later, we will have to continue for the next 13-15 years to improve that family.

I cannot be too specific. We are looking at a series of technologies and whether it makes sense to incorporate them into an existing aircraft. These are studies and projects that we are carrying out on the A350, A330 and A380, too.

**So any upgrade would not be specific to the A321neo?**

No, we have a family of aircraft.

**Are you considering a further stretch of the A321neo to compete with Boeing’s proposed middle-of-the-market aircraft?**

We are not there yet. If Boeing launches a new aircraft we will of course look at it very carefully and see whether it is a threat to our market and what would be our best reaction. However, we already have two aircraft in two different categories, which are the A330 and the A321neo.

The A330 probably has longer-range capability than the new middle-of-the-market aircraft and could be very useful. It is also much cheaper than the 787. And on the other end we have the A321neo, especially the LR, which is the most competitive aircraft if you do not need higher capacity or even longer range. It already has transatlantic range. We cannot say that we have no aircraft able to respond to this demand.

**You are facing delays in the A330neo program as you are still waiting for engines.**

This is true. Rolls-Royce made a fantastic offer, and the ground tests confirm that the engine will deliver the promised performance. That is already a good start. But they are late, probably because when you add the A350-900 ramp-up, the A350-1000 development, the 787-10 – this is too much right now for Rolls-Royce. We had to postpone the first flight, which to me is a pity because my teams were ready. However, the plan is to fly by the end of this summer – do not expect June 30 – which would allow deliveries by the end of the first half of 2018.

**Do suppliers always overpromise and struggle in execution?**

I hope not always. Sometimes suppliers plan for success everywhere and do not have enough buffer or flexibility to close the gap if something goes wrong. You cannot plan for everything to be delivered as expected. Airbus also has its own difficulties. Ramping up is extremely challenging. This is also why we invest a lot in the digital transformation of our operations.
Embraer Marks ‘Transformative Year’

Embraer is marking “an exciting and transformative year” with the Paris Air Show debut of three of the world’s top aircraft in their class—all fly-by-wire: the military KC-390 medium transport, the commercial E195-E2 airliner, and the Legacy 450 business jet. It is also the first time Paulo Cesar Silva has attended the show as the Brazilian airplane builder’s president and CEO, having taken the helm 12 months ago.

With brand-new models coming to market in its commercial, military and business jet divisions, Embraer’s product range is set for the foreseeable future. Silva has taken the opportunity to take a breath and reset the company. “It is time to monetize our portfolio and return some of the huge investments to our shareholders,” he says.

That doesn’t mean Embraer is standing still. It recently formed a fourth business division that will handle all customer services, maintenance, repair and overhaul under one umbrella. And it is investing in future technologies to help shape future products, from eco-friendly airliners to aerial Uber-like transportation systems.

• COMMERCIAL: “My target is to continue to be the market leader in our segment and the third-largest commercial aircraft manufacturer,” says Silva. “With the E2 airliners we will have the most efficient family of aircraft in the 70- to 130-seat segment. Every model is optimized for its market.” The E2 program is on time and on budget, he says, with delivery of the first E190-E2 expected in the first half of next year. The E195-E2, he claims, is the most efficient single-aisle airliner in the world, with unit costs very close to those of the Airbus A320neo or Boeing 737 MAX. “Not that we want to compete with the larger aircraft,” he is quick to add. Airlines have ordered more than 1,700 E1 and E2 jets over the last 12 years, and some 3,300 have been delivered.

• MILITARY: “With the KC-390, we have a very good opportunity to go really big with important countries that could be potential buyers. So we need to structure the unit for that,” says Silva. “It is no secret that Portugal is interested in the aircraft” and could become the first export customer this year. Meanwhile, Boeing has agreed to help Embraer with sales support for the aircraft around the world. Embraer Defense’s other major product, the Super Tucano trainer and light attack aircraft, in service with numerous air forces and with the military in Iraq, has been invited to a fly-off in August as part of the process to replace the U.S. Air Force’s A-10 Groundhog battlefield support aircraft.

• EXECUTIVE JETS: No new platforms for now, says Silva, as the market for new business jets likely faces another two-year slump. “There is huge pressure on price and margins. We have taken the decision to be more disciplined in terms of the number of aircraft that we are going to manufacture and deliver. We have to make sure we will not operate under losses.”

• SERVICES: “We already have about 15% of our revenues coming from services. In the next 10 years we would like to grow that to roughly 25%.” There are currently around 2,000 Embraer aircraft in operation, just in commercial aviation. In addition, there are over 1,000 Embraer executive jets. “We are also enlarging our capability to supply certain equipment in the aircraft, such as seats, and going deeper.”

• INNOVATION: Embraer opened a global business innovation center at its Melbourne, Florida, facility, with outposts in Silicon Valley and Boston, to explore “disruptive technologies” related to any aspect of air transportation. The objective is to explore business opportunities related to the future of air travel and collaborate with start-up businesses, investors, academia and corporations. In April, Embraer announced an agreement with Uber to explore the concept of an ecosystem—dubbed Uber Elevate Network—that will allow the potential development and deployment of small electric vertical takeoff and landing vehicles (VTOLs) for short urban commutes.

—John Morris
U.S. Delegation Puts Aerospace Jobs at the Forefront

In an effort to boost the exports of aerospace companies, the U.S.-based Aerospace Industries Association is talking numbers of something the American president would love – jobs.

Last year, aerospace and defense employment dipped by 0.6% to 2.42 million, led by job losses in the supply chain, the association reports. To reverse that trajectory, AIA will be at the Paris Air Show emphasizing the industry’s importance to trade in aerospace, cultivating new contacts and gaining support for policy changes to smooth exports.

The U.S. is bringing a strong delegation led by Transportation Secretary Elaine Chao, Deputy Defense Secretary Bob Work and FAA administrator Michael Huerta. About 350 U.S. companies, from 32 states, plan to exhibit at the show.

“This is about jobs,” says AIA president and CEO David Melcher. “This is a U.S.-based industry. Things that we manufacture, that go abroad, are good for jobs at home.”

Foreign trade has been a bright spot for the industry, with aerospace and defense exports reaching a record US$146 billion in 2016. The trade surplus was US$90.3 billion - the highest of any U.S. industry sector.

At Paris, AIA will be trying to expand on that success, building support among members and visiting politicians to lobby for the Export-Import Bank and improving the U.S. Foreign Military Sales process.

The Export-Import Bank could be providing export-credit financing to some US$30 billion in U.S. aerospace deals, but any deals involving more than US$10 million are in limbo until the bank’s board is fully staffed. In April, President Donald Trump appointed two Republican members of the board. However, they have not yet received a confirmation vote by the U.S. Senate. Even if they are approved, another member will have to be appointed, as the term of the board’s vice chairman will expire July 19.

And even though defense exports remain high, Melcher says the U.S. could still improve. In the past five years, global weapons sales have grown, while the share of that market has remained stable.

AIA is working on several fronts to make it easier to export weapons by adjusting U.S. regulations. The U.S. lost global sales of space payloads and night vision technology due to International Traffic in Arms Regulations. Now the Missile Technology Control Regime (MTCR), which was put in place to prevent the spread of ICBMs, has blocked exports of U.S. unmanned aircraft, a market in which the U.S. was dominant, and led to innovation in UAV technology in other countries. Melcher is seeking to “revise or upgrade” the MTCR. “That would be on the top of my list,” he says.

Melcher is also seeking to create a national security cooperation strategy that would call on the departments of commerce, defense and state to place a priority on defense exports. Commitments between military allies are solidified through FMS, Melcher says, “with the support and the interactions and the training that continue long after the sale has been announced.”

Plus, AIA will be supporting many workforce initiatives proposed by Adm. John Rixey, the outgoing head of the U.S. Defense Security Cooperation Agency, to increase the size and professionalism of those who evaluate and support FMS. With the numbers of deals and the complexity involved, “you have to have more people,” Melcher says.

Since taking office, President Donald Trump has helped place a focus on the industry and to prioritize U.S. exports, Melcher says, pointing to Trump’s recent visit to Saudi Arabia to announce some US$110 billion in potential defense exports over the next decade. “I don’t know what would have been the answer in the absence of that emphasis, but the fact is, emphasis matters,” Melcher says. “If you’re picking some targets where you have opportunities or you have things that have been languishing, and you’re making it known that as the president I’m trying to move these things through the system, then folks fall in line. You have to have a national-level mandate or an executive-level mandate. That is important.”

Melcher says AIA also likes where the Trump administration is headed with streamlining regulations and with defense spending – although the association would like to see more dollars directed at the Pentagon.

But the industry is wary about protectionist trade rhetoric. “If the U.S. adopts a protectionist stance on certain things, there will be a reaction,” Melcher says. “It’s going to be some kind of reaction where they’re going to look out for their own interests. That’s the problem with protectionism. It raises everybody’s walls.”

—Jen DiMascio
How L3’s Chief Plans to Grow Again

Michael T. Strianese, chairman and CEO of defense contractor L3 Technologies (formerly L-3 Communications), sat down with Aviation Week Editor-in-Chief Joe Anselmo and Managing Editor for Defense and Space Jen DiMascio at the company’s headquarters in New York.

You’ve led L3 for 11 years now. How does the company look today relative to when you succeeded cofounder Frank Lanza?

I like to joke that as soon as I showed up the lights went off and the party ended. We had the Budget Control Act and sequestration. It was managing through a much different environment. Mergers and acquisitions became a smaller part of the story. We were focused more on taking advantage of our low stock price and were very opportunistic in repurchasing shares. Beginning last year, we returned to a strategy of disciplined growth. We’re very focused on the areas where we occupy No. 1 and No. 2 positions, whether that’s EO/IR systems and sensors, night vision, training and simulation, secure communications or airport security.

We ended last year with a couple of very targeted acquisitions in the airport security space. We began this year with an acquisition in the undersea space [OceanServer Technology] and just made another one in the space [Open Water Power]. The geopolitical environment we’re in has really pivoted toward Asia, and I think the undersea marketplace right now is analogous to what the drone marketplace was at the beginning of Iraq and Afghanistan, where there was a large unmet need for full-motion video to provide the warfighter with situational awareness. That market has grown from zero to probably $30 billion. I think the undersea market is in its infancy. There’s opportunity there.

Is the defense market at an inflection point? Is the tide turning back under President Trump?

We know that there is a focus on readiness. To us, that means getting equipment back to its state of readiness. We serve that market, as well as training. The low point was at the end of 2015, and the budget started to grow, very modestly, in 2016. There’s a bunch of numbers floating around from [Senate Armed Services Chairman John] McCain, the Pentagon, the White House. I wouldn’t sign up to any of them until they get passed. But I can tell you, for sure, that there will be growth over where we’ve been. In the early days of L3 the company was growing organically at a rate of 8-10%, and I’d like to see us back at that level sooner rather than later.

That’s a pretty ambitious goal. We’ve been there before, and I don’t see that as an impossibility. We’re trying to stay focused on all areas where we would reasonably expect to see growth, including Foreign Military Sales. Some of the process has been improved in getting export clearance in areas such as night vision and ISR, where modified aircraft can provide persistent full-motion video to protect borders and critical infrastructure. We have sold several versions of our Spydr system, which was really based on the Project Liberty aircraft from many years ago. There’s also an aircraft known as Longsword that’s been sold to certain countries to provide that capability.

L3 CEO Michael Strianese

L3 is a lead system integrator (LSI) on the U.S. Air Force’s Compass Call program to update its communication jamming aircraft. I would like to think we were selected to be the integrator of that platform due to our great track record of being able to missionize virtually any aircraft and deliver it on time and on budget. I think the combination of being a world-class systems integrator for airborne systems and being platform agnostic puts us in a good position.

L3 also is active in the training market.

There’s an unmet demand for 50,000 commercial pilots over the next decade. We had always been front and center with full flight simulators. Now, because of demand in the commercial space for full pilot training by the hour, we acquired a company in the UK that provides the actual trainers and the ability to license pilots. We provide them the simulator experience with a qualified instructor, and that saves the airline the [expense] of having to buy the simulator and use their own pilots as instructors. It’s also a model we can bring to the military as they get tighter and tighter on pilots. That’s an example of taking a business we knew well and adding an acquisition to really transform it.

A U.S. Air Force EC-130H Compass Call aircraft at Bagram Air Base, Afghanistan. The aircraft is assigned to the 41st Expeditionary Electronic Combat Squadron. L3 is a lead system integrator on the program.
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New Leonardo Chief Needs to Consider Next Steps
Leonardo refocuses on U.S. market, targeting helicopter and trainer needs.

Walking into the role of Leonardo CEO on May 16, Alessandro Profumo is taking control of a group in much better shape and more prepared for the future than predecessor Mauro Moretti found it in 2014.

At that time, what was then Finmeccanica was saddled with debt and burdened by loss-making energy and public transportation companies. But Moretti changed all that.

On his watch, the noncore businesses have been disposed of, debt has fallen and the numerous semi-independent businesses that operated under the Finmeccanica brand have been painfully regimented into a single divisionalized organization.

In the UK, Leonardo’s other market pillar, the former AgustaWestland, Selex ES and DRS Technologies UK, have been reformed under a new, single operation called Leonardo MW, a company that can now claim to be the UK’s second-largest aerospace and defense company after BAE Systems.

Over the last 18 months, Leonardo secured its largest contract ever – selling Eurofighters to Kuwait – and made a slew of both divestments and acquisitions.

But the big question is: Where can Profumo take the company next?

Leonardo has grown its stake in Avio Space Propulsion – previously part of the larger Avio group now owned by GE – to 28% from 14% after the company was sold by its previous owners, the private equity firm Cinven.

In December 2016, Leonardo acquired Pisa-based Sistemi Dinamici, which developed the 330-lb SD-150 Hero unmanned helicopter, which Leonardo now actively markets as an intelligence and surveillance platform for naval and commercial use.

And in March, its U.S. division DRS purchased Daylight Solutions, a specialist in defense commercial laser products, for US$150 million.

While the home market in Italy has stagnated in terms of defense spending, Leonardo has managed to pick up several key contracts such as development of the new M345 low-cost jet trainer and a new attack helicopter for the Italian Army. But the loss of a contract to upgrade British Apache attack helicopters was a painful hit, leaving the company with a handful of support contracts and research and development projects through a strategic partnering agreement with the UK Defense Ministry.

It is no wonder, then, that Leonardo is again focusing its attention on other markets, notably in the U.S. Now that thoughts of a full or partial sale of its U.S.-based defense electronics DRS division have come to naught, the company is proving a useful means of entry into the U.S. market, where the Italian company has consistently struggled to make serious headway.

After the failure through two partnerships – with General Dynamics and Raytheon – to offer the M346 trainer for the U.S. Air Force’s T-X program, Leonardo is now going it alone with DRS as prime, presenting the M346 as the T-100.

A partnership with Boeing to offer the AW139 utility helicopter to meet a U.S. Air Force requirement for support helicopters would also be a useful boost into the U.S. market, particularly with an assembly line already established in Philadelphia.

Along with a push to build up the company’s cyber capabilities, another key area for growth will be Leonardo’s defense electronics business.

In January, Moretti said the company was already the largest defense electronics business in Europe, but he wanted to build on that. On top of leading the development of active, electronically scanned array radars for the Eurofighter Typhoon and Saab Gripen fighters, Leonardo’s infrared search-and-track technologies could also find their way onto more U.S. platforms, thanks to integration onto Northrop Grumman’s multisensor Open Pod.

Leonardo Courts ATR, Quietly Exits SCAC
One of Mauro Moretti’s interests while he was Leonardo CEO was obtaining full control of regional airliner manufacturer ATR, despite the regional turboprop market taking a dive due to low oil prices.

Leonardo currently owns 50% of ATR – Airbus owns the other half – and may have been willing to swap for Airbus’ holding in exchange for its own 25% stake in missile manufacturer MBDA. Moretti says he also had pushed for development of a 100-seat aircraft by ATR. However, Airbus has so far shown no interest in either option, and it is unclear whether new CEO Alessandro Profumo will pursue the same strategy.

Leonardo has at least managed to quietly withdraw from its unprofitable Russian joint venture, the Sukhoi Civil Aircraft Co. (SCAC), which designs and manufactures the Sukhoi Superjet, selling off its remaining 5.53% holding in the company in January. It has also become a minority shareholder in SuperJet International, the Italy-based company marketing the aircraft, following the sale of most of its shares back to SCAC, reportedly for €1 (US$112).

—T.O.

Leonardo CEO
Alessandro Profumo

The SD-150 Hero drone for naval and commercial use is now a Leonardo product.
Russian Helicopters (Chalet 373) hasn’t brought any of its rotorcraft to Le Bourget this year. But a few weeks before the Paris Air Show, the Russian manufacturer reported the first horizontal flight of its newest Kamov Ka-62 medium twin. The first flight took place on May 25, more than a year after the first hover test. The Ka-62 prototype spent 15 min. aloft, at speeds of up to 68 mph (110 kph).

Although Kamov, now a subsidiary of Russian Helicopters, is well known for its coaxial rotor military and civil helicopters, the Ka-62 became a true innovative model for the famous design house: It’s the first Kamov helicopter with a single main rotor. It’s also the first Russian rotorcraft that features a shrouded tail rotor.

The foreign contribution to Ka-62 includes the main transmission, designed by Austrian company Zoerkler, and 1,680-hp Safran Ardiden 3G turboshaft engines. The engines are expected to be certified very soon, while the helicopter will need about two years of trials to earn its basic certificate, say sources in the Russian aerospace industry.

The Ka-62 is to have a maximum takeoff weight of 13,330 lb. (6,500 kg) and can carry a payload of up to 4,859 lb. or 15 passengers inside the cabin. Russian Helicopters doesn’t have any firm orders for the type now but expects the new model can be used for passengers, transport, offshore, medevac, search-and-rescue or patrol missions. According to Russian minister of industry and trade Denis Manturov, Ka-62 sales may reach 365 airframes through 2030. “Realization of this program will enable Russian Helicopters to capture not less than 20% of the [global] intermediate class helicopter market by 2025,” he forecasted. —Maxim Pyadushkin
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GE Aviation Steps Back, Takes a Breath, Is Looking Ahead to a Very Busy Future

Imagine the calm in the center of a whirlwind. There sits David Joyce, president and CEO of GE Aviation and vice-chair of GE, as future technologies, new materials and the developing world of digital flash by at blurring speed. Ceramic matrix composites, additive manufacturing, titanium aluminides, digital twins and artificial intelligence blaze new trails of opportunity.

Before I think about future disruptions, we must digest everything we currently have on our plate,” says Joyce. “We’re going through the fastest ramp-up of new-product introduction in history.” GE and its partner Snecma will deliver close to 500 Leap engines this year for the Airbus A320neo and Boeing 737 MAX, with the number climbing to more than 2,000 a year by 2020 (the engine also powers the Comac C919). Joyce’s team has devoted a huge effort to preparing the supply chain for the massive increase in production, with redundancy to ensure it can handle any potential issues that occur anywhere within the supply base. “We’ve done the most comprehensive failure modes and effects analysis on our supply chain,” says Joyce. That preparation was illustrated earlier this year when a batch of faulty castings in France caused a big scare but just a brief ripple in the well-oiled machinery. But that attention to execution doesn’t stop Joyce from thinking about the future.

“We’ve all been very, very busy over the last eight to 10 years. I’ve probably spent eight and a half billion dollars in commercial research and development” to bring the Leap, GE9X (for the Boeing 777X) and Passport business jet engine (for the Global 7000) to fruition. “So when people say, ‘Gee, it’s kind of disappointing there aren’t too many commercial engine programs going forward,’ I’m thinking, ‘Are you kidding me?’ I’m kind of happy that we’ve got to start delivering what we committed to, and can reload our technology portfolios for what it’s going to take in the out years, the way-out years. Taking a deep breath right now is not a bad idea. Just take a look at where we’ve been.

“But stay tuned. I’m more excited about material technology development now than I have been at any time in my 37 years in the industry.

“I look at titanium aluminides and I look at all the metal powders for additive, I take a look at ceramic matrix composites, it’s a whole family of material systems, and what those will all enable in terms of the way we think. Its the beginning of a new material system journey for this company for the next two to three decades.

“And then architectures, you know, there’s lots of different engine architectures that we’ve all looked at in the past, and there’ll be a time with these other enabling technologies, when they earn their way on, easily. And so, although I don’t think I’d want to relive it, I kind of wish I was a 35-year-old senior engineer in one of these companies. The innovation and the level of application going forward is very exciting. Super exciting.”

GE Aviation CEO
David Joyce

GE Adds an Additive Business

GE is so enthused about additive manufacturing that it launched GE Additive, led by David Joyce, as a company to attract third-party business. It aims for revenues of US$1 billion by 2020, and in the last year bought controlling shares of Arcam of Sweden and Concept Laser of Germany, two leading additive equipment and material suppliers. Joyce says additive technologies are expected to result in US$3 billion to US$5 billion dollars in cost savings throughout GE by 2025.

9X Bumps the 90

“The GE90 doesn’t seem old enough that we’re talking about replacing it, but essentially that’s what we’re doing with the GE9X. On the opposite side is this little, tiny Advanced Turboprop. What do these two have in common? A massive amount of technology inside the machine, so the ATP has probably the highest utilization of additive manufacturing out of any engine that we’ve done to date. It will set the stage for the next generation of additive utilization across the GE portfolio.”

—David Joyce

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Pratt Patents Protect Its Powerplant

Pratt & Whitney’s president Bob Leduc is bullish about the engine maker’s future and, following intense efforts to overcome recent high-profile production delays related to the geared turbofan (GTF), says the company and its Pratt & Whitney Canada sister unit are on track for the busiest growth period since the 1960s.

With more than 8,000 GTFs in the backlog, and future growth variants under study for next-generation developments like Boeing’s new midsize airplane (NMA), Leduc also vows to use whatever means are available to protect the company’s perceived technology lead in this area. “We have spent over US$1 billion on this over 20 years on something that until three years ago our competitors dismissed out of hand as something we could never make work, and now we see them challenging our patents. Particularly in the case of GE, they have challenged quite a few in the U.S.,” says Leduc.

But GE has not “been as successful in those challenges, I think, as they’d have hoped. They are kind of batting one to two. We have 3,500 patents they got to get through, so we will see. But we think we are pretty well protected and we plan to defend our position.” Leduc adds that other legal challenges could even include suing Rolls-Royce should the UltraFan be selected as a finalist by Boeing for NMA. The UK engine maker is currently developing a very large power gearbox system rated at up to 100,000 hp for a range of engines from 25,000 lb. (11,340 kg) to 110,000 lb.

However, beyond the PW1000G, Leduc is keen to broaden the discussion to paint the company’s recent progress in broader strokes. Pratt is “a lot bigger story than GTF, but that’s all that people seem to want to talk about, and I get it,” he says. “We believe we are positioned for growth, and at the end of the day, we are going to focus on our core, which means investment in engines, infrastructure and the digitalization of all that.” Manufacturing and digital initiatives, most of which were already in play when the GTF issues began to loom in late 2014 and early 2015, are particularly highlighted by Leduc.

Although Pratt’s digital initiative is just getting under way with pilot trials and supply-chain control and monitoring developments, Leduc says the strategy is key to the company’s long-term success. “Until you connect the entire value chain end-to-end digitally, then you can’t capture the full benefits of that. So it will probably take us seven to 10 years to get there.” Despite the runway still ahead, Leduc says the early use of the digital strategy to track part numbers and process flow “has been instrumental in helping us ramp up the GTF and support existing fleets. This power of real-time data allows us to work on hot spots before they become a crisis.”

Pratt’s military-engine business is similarly in the ascendency due to exclusive positions on three of the Pentagon’s top U.S. Air Force acquisition programs: the Lockheed Martin F-35 Joint Strike Fighter, Northrop Grumman B-21 bomber and Boeing KC-46A tanker. “We have swept the last three big procurements,” says Leduc, who contrasts the company’s current position with a far gloomier scenario less than two decades ago.

“When I was at Pratt in my prior life before I went to Hamilton Sundstrand and Sikorsky, I can remember sitting in the conference room and we were actually wondering whether or not we were going to stay in the military-engine business. GE had F-14s, and they had really taken the F100 business away from us — we were actually wondering whether or not we were going to stay in the military-engine business. GE had F-14s, and they had really taken the F100 business away from us with the F110. They had found their way onto the F-15, remarkably, and we had the F-22. But the F-22 was not a big production program, and we sat there and wondered what was going to happen. In that period in the late 1990s, early 2000s, we actually thought there was no way for us to come back; then we won the JSF and the world changed.”

For Leduc, the lesson is easy. “The world does change — don’t give up on your legacy, because you never know what’s going to happen. Today we’d argue we have the world’s best military-engine portfolio.” —Guy Norris
Leonardo says it has entered exploratory discussions with the U.S. Army on potential missions for its AW609 commercial tiltrotor.

The talks with AMRDEC, the Army’s Aviation and Missile Research Development and Engineering Center in Alabama, have emerged because of the DoD’s wider interest in potential roles for smaller-model tiltrotor aircraft, says Leonardo strategy and business development VP Roberto Garavaglia.

“They are interested in testing a smaller tiltrotor to work with their larger tiltrotor aircraft,” Garavaglia told Aviation Week, adding that discussions could lead to Leonardo providing one of the prototypes to the AMRDEC agency in the coming years after the aircraft has achieved civil certification.

There has, however, been no detailed discussion on what kind of missions the aircraft could fulfill.

Leonardo (Chalet 240) is unable to offer an armed version of the AW609 due to contractual issues with Bell Helicopter, which had a 50% stake in the program until 2012.

Military support missions have been mulled for the AW609 in the past, with the U.S. Marine Corps once examining the potential of an armed version to provide fire support for its V-22 Ospreys, and replacing the AH-1 Cobra.
IAI Invests to Maintain Edge

From missile defense, strategic intelligence, surveillance and reconnaissance (ISR) from the air and in space, to advanced training capabilities, cybersecurity and broadband data communications, Israel Aerospace Industries maintains its position as provider of weapon systems and capabilities that establish some of Israel’s strategic pillars. Yet most of the companies’ revenues come from export, as IAI leverages the advanced technologies developed for domestic use toward that end.

“We ended 2016 with a nice growth in new business, reaching US$4.2 billion per year, an all-time high, even before adding a few billion more in new ‘mega projects’ that were announced in the first quarter of 2017,” chairman and CEO Joseph Weiss told ShowNews. “But we are not resting on our laurels. Determined to secure growth forward, we embarked on a streamlined and improvement plan and tripled investment in R&D to pave the way for even more innovative future offerings.”

In 2017 the company will continue to show good results. “Our deal flow is based on numerous contracts from customers based in five continents, all contributing to a solid backlog,” Weiss explained. “This backlog has grown significantly recently, adding several mega projects we have worked on for years. The backlog is spread over several years, providing IAI a good operating basis for years.

“Our employees are also part of this success,” Weiss added. “We invest in growth, research and development and encourage innovation; we also streamline to maintain our competitiveness in the global market.”

Air and missile defense have evolved into a successful sector for IAI. “We are a global leader in this area, which we entered in the early 2000s,” Weiss said. “Our turnover in this sector, based on ongoing sales of naval and land-based systems to several customers, exceeds US$4 billion and continues to grow. IAI’s position in this field is unique, as our portfolio covers all main elements of such systems – sensors (radars, EO), interceptors, command and control. This enables us to best address specific customers’ requirements and needs. We have an excellent, ongoing cooperation with the Indian government, military and industry. Now, as these matured systems enter full-scale production and operational service, all sides share the benefit of this cooperation.”

Unmanned systems are another growth engine for IAI (Chalet 210). The company pioneered this field in the 1970s, and 40 years later, it maintains its leadership position, offering advanced, sophisticated systems that meet the needs and operational requirements of modern armed forces. Some of these missions are quite unique. IAI was the first to offer UNVs for maritime surveillance, and its Heron I drones carry out missions with several navies worldwide. According to Weiss, the demand for drones keeps growing, and to address it, IAI recently launched an enhanced, strategic variant of the Heron TP, along with “small, tactical platforms that will offer our customers expanded mission capabilities, beyond those that were available in the past.

“We envision robotics as another growth engine for the future. Just as unmanned aircraft evolved in the air, robotics systems will evolve on the ground,” Weiss added, saying that IAI had invested 40 years of experience in unmanned systems and robotics, developing many solutions for military and civil use. “Some are applicable for ‘hot’ new developments, such as autonomous vehicles,” Weiss said, noting that some of these technologies are relevant for this market and that the company is discussing future cooperation in the private sector.

“Cybersecurity is another growth sector that has rapidly grown in recent years,” Weiss continued. “The turnover of this sector alone surpassed US$100 million this year, indicating the relevance of our offering and market need for our solutions. We have recently announced the formation of a ‘cyber industry cluster’ led by IAI, which includes leading, best-in-class companies including Checkpoint and Verint, that offers integrated, national-level cybersecurity solutions for countries.

“Our strategy highlights growth in commercial aviation – in the field of MRO, aircraft conversions and manufacturing – offering competitive, innovative, advanced manufacturing capabilities to leading OEMs. Following comprehensive streamlining of our MRO activities IAI/Bedek has dramatically grown its business volume. Our hangars are full and booked for months with conversions and heavy maintenance. We feel we are on the right [path] to improve. In the future, IAI will maintain a larger share of defense activity of about 73%, but with a higher scale, our commercial operations will certainly improve.

“In summary, beyond the numbers, IAI is positioned on a growth path based on technological edge,” Weiss concluded. “From the chip to systems of systems, IAI dominates the market with unique solutions based on the combined know-how, technology and capabilities of its employees [and] partners and [the] operational experience of systems used by our customers worldwide.”

—Noam Eshel
CFM Secures ETOPS for Leap Engines

CFM International has certified 180-min. ETOPS for both the Leap-1A and -1B engines. Certification marks a significant final development milestone for the Airbus A320neo and Boeing 737 MAX propulsion programs.

“T he job is done,” says CFM program EVP and general manager François Bastin. Engine ETOPS clearance at this early stage of Leap service is a key achievement, he adds. Although versions of the CFM56 have previously been cleared for ETOPS operations, the double 180-min. certificate for the Leap-1A/B is the first time this level has been accomplished virtually concurrently with entry into service.

Pratt & Whitney, which competes with the PW1100G against the Leap on the A320neo family, meanwhile, is optimistic of clearing the geared engine for 120-min. ETOPS sometime in the fourth quarter of this year.

Since the first Leap-1A-powered A320neo entered service in August 2016, some 67 are now in service, including the first handful of A321neos. Deliveries of the initial Leap-1B-powered Boeing 737 MAX are also under way, with two aircraft now in service. Flight tests of the first Leap-1C-powered Comac C919 began on May 5.

CFM’s backlog has meanwhile increased to more than 14,500 engines, representing eight years of production. Despite record-setting deliveries of 1,600 engines in 2016, the bulk of which were CFM56s, the GE-Safran joint venture has seen the backlog increase with 1,193 new orders worth US$16.5 billion placed so far in 2017. Up until the eve of the Paris Air Show, the order tally for this year has been made up of 887 Leap engines and 306 CFM56 units.

“We are looking at an equally aggressive year for 2017 in terms of deliveries,” says CFM EVP Allen Paxson, who notes that the installed fleet has grown to more than 24,000. Overall, some 1,900 production engines will be delivered this year, of which 500 will be Leap models. CFM, which has so far taken orders for more than 12,500 Leap engines, expects to be producing 2,000 engines per year by 2020.

Noting that CFM is close to overcoming the impact of the recent Leap-1B low-pressure turbine production-quality issues that briefly halted 737 MAX flight tests last month, Bastin adds that “this is an extremely stressful and hard ramp-up that no one has done in the industry before. It is like an Ironman Triathlon.” Despite some manufacturing-yield issues that have also slowed the supply of some engines to Airbus, Bastin says, “We are skating with being right on schedule with Airbus deliveries,” although he concedes the engine maker is still off by “just a handful of engines.”

—Guy Norris

Méheust Climbed the Ladder of Success

Six years ago, Gaël Méheust landed the second launch order for CFM International’s Leap engine, with an order to power 30 Airbus A320neo aircraft for Scandinavian airline SAS.

And now he’s president and CEO of CFMI, where he took the helm in February.

“I was in charge of sales for half the world,” he tells ShowNews. “My counterpart for the other half of the world, who just beat me for the initial launch order [with Virgin America], was Kevin McAllister.” McAllister is now executive vice president of the Boeing Co. and president and CEO of Boeing Commercial Airplanes.

“We started very humble,” Méheust notes. “And we lost the first three campaigns,” he recalls.

CFMI came to the Paris Air Show that year badly lagging behind Pratt & Whitney, with a score of Pratt geared turbofan orders 500, Leap zero. CFM ended the week with 800 orders on the books.

Today, Méheust is sitting on a backlog of more than 12,300 Leap engines.

“I went from this tough beginning into this big success. It’s a fantastic opportunity for me to be the CEO of CFM at this time.”

“Back then, I had to be believed by the customers [in promising a paper engine]. But today, I’m able to come back and see the same customer, as the CEO of the company, and say, ‘We delivered.'”—John Morris

—Guy Norris
Rolls Ready for Dual Debuts at Paris

Rolls-Royce’s strategy of focusing resources on large commercial aircraft engines sees it powering not one, but two new widebody aircraft making their debuts at this year’s Paris Air Show. And it could have been three.

The sight of the Trent XWB-97-powered Airbus A350-1000 and Boeing’s Trent 1000 TEN-equipped 787-10 in the skies over Le Bourget will give Rolls cause for cheer, after reporting its biggest-ever loss in February. And, but for holdups on the Trent 7000, the engine in development for the re-engined A330neo, Rolls (Chalet 93) would have had a chance at a memorable Paris hat trick.

The success of the A350-1000 and 787-10 contrasted with delays to the A330neo sum up a year of ups and downs for the engine maker. Hit badly by the decline of the British pound after the UK’s vote last summer to leave the EU, Rolls recorded a £4.6 billion (US$5.7 billion) loss for 2016. The company also included the £671 million in bribery and corruption settlements to authorities in Brazil, the UK and the U.S. About £4.4 billion of the losses resulted from a write-down on the value of financial hedges that Rolls uses to protect itself against currency fluctuations.

The A330neo’s absence from the show underlines how the UK engine maker’s double development strategy for Airbus and Boeing was also double-edged with risk. This is because the Trent 7000 is based on the Trent 1000 TEN, which is itself based on a hybrid of the original Trent 1000 developed for the 787 and the XWB created for the A350. By leveraging one program against the other, Rolls extended its exclusivity with Airbus to include the A330neo while simultaneously gaining a leg up in its fight with General Electric for greater market share on the 787.

However, this close dependency inevitably meant that trouble with one program potentially exposed the other. The hybrid engine was launched for the stretched 787-10 in 2012 while the spin-off Trent 7000 was selected for the A330neo in 2014. The timing appeared to dovetail well, with the new 787 engine originally due to be certified by the end of 2015 and enter service in late 2016, while the Airbus engine was to certify in early 2017 and make its service debut by the end of this year.

So when development problems hit the Trent 1000 TEN in 2015 there can be little doubt that Airbus sat up and took notice. Durability issues with a feature of the engine called the banded stator led to a redesign and pushed back initial engine certification to mid-2016. This appears to have had an inevitable knock-on impact on the A330neo timetable. Rolls rallied extra resources around the Trent 1000 TEN effort, which resulted in the engine being able to support the on-time first flight of the 787-10 in March 2017. The situation was different at Airbus, however, where the engine maker was already pushed to the limit supporting the A350-900/1000 programs.

Although details are scant, Portugal’s TAP Airline, launch customer for the A330neo, announced in December 2016 it was delaying acceptance of the first aircraft from late 2017 to March 2018, a date subsequently extended to around the middle of next year. Airbus meanwhile announced that first flight of the A330neo, originally targeted for early 2017, would be pushed back until later in the year, citing engine delays as the main cause.

“We see the engine delay as tied to challenges Rolls had with the Trent 1000 TEN engine,” says financial analysts Bernstein, noting that A330neo orders remain weak.

Yet, despite the gloom, analysts also see a glimmer on the horizon as the prospect of cash generation finally begins to emerge. After more than a decade of intensive new engine development, Trent delivery volume is on the rise at Airbus and Boeing, while the Trent XWB and 1000 TEN appear to be performing well in flight tests. The first variant of the XWB family, the XWB-84, is flying on more than 80 aircraft with 12 operators and production has now reached the rate of five engines per week on the new product build line in Derby, England.

The XWB-97 powered the A350-1000 for its first flight on Nov. 24, 2016, and has amassed more than 200 flights on the three aircraft now in the Airbus flight test program. As of May 2017 development testing still included three ground test units, two of which involved cyclic maturity and crosswind evaluation engines at Rolls-Royce’s NASA Stennis facility, and a third that was devoted to systems testing at Derby. —Guy Norris
Electric-drive truck manufacturer Workhorse will unveil a hybrid-electric vertical-takeoff-and-landing (eVTOL) aircraft at the Paris Air Show. Flight tests of the two-seat SureFly are planned to begin this year, and the company is aiming for FAA certification on the initial piloted model in 2019.

The eight-rotor SureFly builds on Workhorse’s development of the HorseFly delivery drone, which is designed to operate from the roof of the company’s hybrid-electric delivery truck. UPS is testing the truck/drone combination for last-mile deliveries in rural areas.

The design is reminiscent of the Ehang 184 now being flight-tested by Chinese drone maker Ehang, but that eVTOL aircraft is single-seat, with the rotor pairs mounted on arms under the cabin, and is being developed from the outset to fly autonomously.

SureFly has a 200-hp Honda aviation engine and a dual-battery backup system, powering eight independent motors mounted in upper/lower contra-rotating pairs on folding arms above the cabin. If a motor fails, the aircraft will land automatically on seven propellers, says Workhorse.

If the combustion engine fails, the battery pack will provide power for landing. If both engine and battery pack fail, a ballistic recovery parachute will automatically or manually deploy to bring the complete aircraft down safely, the company says.

While early models will be piloted, Workhorse’s goal is to develop an autonomous eVTOL aircraft that can carry two passengers or 400 lb. of cargo up to 50 mi. Maximum altitude is 3,000 ft. and speed 50 mph. Design gross weight is 1,500 lb.

Workhorse is targeting the air-taxi market and says charging the battery in flight with the engine eliminates the need for long battery-charging periods between flights. Lacking wings, SureFly is designed for short hops, the company predicting an average trip length of less than 10 mi.

The most efficient flight path for the aircraft, Workhorse says, will be a vertical takeoff and climb to 3,000 ft., then a constant linear descent to 500 ft. and a vertical landing. This minimizes the thrust needed to fly forward. The company has a winged eVTOL design with tilting props for longer ranges.

— Graham Warwick

Workhorse (Static Display A5) is planning to commence flight testing of its SureFly eVTOL aircraft later this year, with an eye to 2019 certification.
Known primarily as an avionics and communications company, Rockwell Collins has diversified over the past three years into flight services with the acquisition of Arinc, and now with the US$8.6 billion acquisition of B/E Aerospace’s cabin interiors business. Rockwell Collins president, chairman and CEO Kelly Ortberg described to ShowNews where the company is headed.

**How is the new, bigger business positioned?**

We have some tremendous momentum right now. We have strong growth coming from our information management services business, which we started as the result of our Arinc acquisition in 2014; our government systems business is now a steady growth engine for our company, with four consecutive quarters of at least 5% sales growth; and in our Commercial Systems business, our OEM positions continue to be strong, with Boeing and Airbus ramping up their narrowbody rates.

Of course, the biggest thing we have going on right now is our new interior systems business, formed as the result of our acquisition of B/E Aerospace. With this business, we’re moving into new market segments – cabin interiors – and geographic regions, plus we’re expanding our customer base beyond mostly OEM customers to include more airlines.

**What are your “must win” campaigns out there?**

Regarding specific campaigns, Rockwell Collins is currently involved in the U.S. Army’s Handheld, Manpack and Small Form Fit program – we’re one of only a few companies competing for this work. We’ve passed qualification testing and feel good about our solution as the U.S. Army downscales to two vendors later this year after field-testing. Other pursuits we’re focused on include additional positions on the F-35 and the U.S. Air Force’s TX trainer program.

**Could you give a brief overview of your different businesses?**

**Commercial Systems**

We expect our commercial systems business, which spans air transport and business aircraft, to grow this fiscal year – even with the challenges we face in the business aviation market. Much of that is being driven by the 737 MAX entry into service, which represents our company’s largest contributions to date on any single-aisle aircraft. We’re well-positioned on all of Boeing’s next-generation aircraft, including touch-screen flight displays on the 777X, and our products continue to expand on Airbus aircraft. In fact, expect to see a major announcement from us related to Airbus during the Paris Air Show.

**Government Systems**

In our government systems business, we’ve turned a corner after several years of flat activity. Defense budgets are on the rise, and in the U.S. earlier this year, we landed a significant contract, along with Leonardo DRS, from the U.S. Navy to supply our encrypted, next-generation tactical training system for the Tactical Combat Training System Increment II (TCTS Inc-II) program. It’s a big deal and will increase war-fighter readiness at a reduced training cost, enabling interaction between a number of participants in live, virtual and constructive (LVC) training.

As a side note, we’re getting inquiries into our government systems about aircraft seating and other interior products now that we’ve stood up our new interior systems business – a great synergy in the making.

**Information Management Systems**

Connectivity is more essential than ever, and we know this because we’re experiencing double-digit growth in our information management services business. Specifically in the cockpit, more robust data streams and sophisticated applications are enhancing operational efficiencies, safety and on-time flight performance. In the cabin, broadband connectivity is enabling passengers to stay connected throughout their flight, and it also provides new ways to enhance the passenger experience.

High-bandwidth connectivity is a major focus for the airlines right now. Last fall, we won a major position with Norwegian Air Shuttle to provide a nose-to-tail integrated digital aircraft solution for their fleet of Boeing 737 MAX and 787 aircraft. This solution combines our avionics, cockpit communication, cabin connectivity and information management solutions to deliver enhanced operational efficiency for the airline and high-bandwidth connectivity for passengers.

**What does the B/E Aerospace acquisition bring to the table?**

When bringing two aerospace leaders together, you have to be purposeful in your actions and make sure to not cause any major disruptions. In fact, our customers told each of us to not mess it up once they heard about our intent to acquire B/E Aerospace. That said, the synergy possibilities that our new interior systems business brings to the overall company are tremendous and we couldn’t be more excited. You’ll see great things happen from Rockwell Collins all while minimizing risk to our current business opportunities.

**Will we see more major acquisitions by Rockwell Collins?**

We’ll be taking a pause in any large deals in order to service our debt but will be open to smaller, bolt-on acquisitions. I wouldn’t expect to see anything over US$50 million.

Rockwell Collins Building on B/E Buy

Rockwell Collins is providing a nose-to-tail integrated digital aircraft system for Norwegian Air Shuttle’s Boeing 737 MAX (shown) and 787 jets.
Heritage for the future

L-159

Saab Upbeat About New Sales

Sweden’s jack-of-all-trades and master of many, Saab Group, arrives at the Paris Air Show with a lineup of new airborne weaponry, from fighter jets to trainers and early-warning and submarine-hunting aircraft. The company has even started work on a 21st-century version of the air-launched Robot system-15F (RBS15) anti-ship missile introduced in 1982.

Last May in Linkoping, the Scandinavian company rolled out the first of three test aircraft of the new Gripen E-series multirole fighter ordered by the Swedish and Brazilian air forces.

Then, in September, Boeing and Saab (Chalet 379) unveiled their clean-sheet offering for the U.S. Air Force’s $16 billion T-X trainer program, the “BTX.” The first two prototypes are now flying in St. Louis, Missouri.

Those touchstone products are complemented by the special-mission GlobalEye airborne early warning and control (AEW&C) and Swordfish maritime patrol aircraft, both based on the Bombardier Global 6000 business jet.

Already this year, the company has disclosed new GlobalEye customers and signed a deal with the Swedish defense materiel administration (FMV) for development of the next-generation version of the RBS15 to arm the Gripen E.

The company also appears to have Sweden’s backing for the T-X, with Swedish Air Force officials telling reporters on a Saab media tour in May that the Boeing/Saab offering is its first choice to replace the 1967-vintage Saab 105/SK 60 military trainer if selected by the U.S. Air Force.

From aircraft to submarines, Saab builds more than 600 pieces of military hardware across 250 different market offerings.

“We’ve consolidated the whole Swedish defense industry,” says Saab President and CEO Håkan Buskhe. “We’ve never had so many projects ongoing at the same time since the Cold War. We have a fishing rod strategy, with many fishing rods in many lakes.”

The Swedish government is Saab’s most important customer, but domestic military spending is not high enough to support all of Saab’s product lines. For that, the company looks abroad.

Saab is marketing its flagship fighter product, the Gripen, to Belgium, Botswana, Bulgaria, Canada, Croatia, Colombia, Finland, India, Indonesia, Malaysia, the Philippines, Slovakia and Switzerland. The aircraft is already operated by the Czech Republic, Hungary, Sweden, South Africa, Thailand and UK Empire Test Pilot School.

Buskhe says Saab’s relationship with Bombardier on the GlobalEye and Swordfish programs, as well as its generous technology transfer offer, makes Canada “a very interesting possibility going forward.”

Buskhe believes that during the next couple of years, many of the company’s long-running sales campaigns will yield firm orders. The company, founded in 1937, is eager to prove it will be around for another 80 years.

—James Drew

Airbus Performs Automated Aerial Refueling

AIRBUS HAS CARRIED out its first aerial fueling contacts using an automated system, a test which could pave the way for automatic fueling of receiver aircraft.

The company’s converted A310 tanker testbed performed six dry contacts with an F-16 of the Portuguese air force during a test flight off the Portuguese coast on March 21, Airbus said on May 9.

The company says the technology holds “great promise” for enhancing the safety and efficiency of aerial fueling operations with the boom fueling system fitted to the company’s MRTT, the A330-based Multi Role Tanker Transport.

The automated system uses passive image processing using the rear-view cameras to fly the boom to a pre-contact position above the receiver aircraft’s fueling receptacle. The system requires no changes to receiver aircraft.

“This represents a fundamental advance,” said Miguel Gasco, who heads Airbus Defense and Space’s Incubator Laboratory in boom AAR operations.

The imaging technology for the automatic fueling system was developed by Airbus’ space division with an eye to fueling satellites in space or for space debris removal.

The F-16 pilot who flew the mission off Portugal said the contact was “very precise and expeditious.”

The system could be introduced on the current production A330 MRTTs as early as 2019.

—Tony Osborne
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Lockheed Begins LM-100J Commercial Hercules Flights

Lockheed Martin has begun flight tests of its LM-100J commercial freighter version of the C-130J Hercules military airlifter, with FAA certification planned for 2018. The aircraft made its first flight from Marietta, Georgia, on May 25.

The LM-100J is one of a growing list of commercial products from the defense contractors, including the LMH-1 heavy-lift cargo hybrid airship and LM-XE small long-endurance unmanned aircraft system, which is based on the military Stalker XE.

A second LM-100J is in final assembly, and first deliveries to the still-undisclosed launch customer are scheduled for 2018. The LM-100J is a version of the long-body C-130J-30 and a follow-on to the L-100 civil Hercules produced up to the early 1990s.

The main changes from the C-130J are the deletion of military-specific hardware and software, including provisions for defensive countermeasures, secure communications and electronic warfare systems, formation lights and station-keeping equipment.

The main external difference is the lack of lower windows below the windscreen. Internally, the LM-100J has a simpler gaseous-oxygen system rather than liquid oxygen. The Rolls-Royce AE2100-D3 engines, Dowty propellers and the cargo-handling system are the same as the C-130J’s.

The LM-100J can carry a 40,000-lb. payload 2,450 nm. One of the target markets is in the development of remote areas, including mining and oil and gas exploration. Lockheed is also targeting this market with the LMH-1, which is designed to carry 47,000 lb. 1,400 nm but does not require runways. The hybrid airship is scheduled to fly in 2018, and deliveries are planned to begin in 2019. Lockheed Martin is at Chalet 324 and Static Display C2.

ATR Offers ATR 42 STOL Version

ATR IS READY to offer a package enhancing short takeoff and landing capabilities of the ATR 42. What CEO Christian Scherer describes as “a substantial piece of work” will allow the STOL version to land on and take off from runways as short as 2,625 ft. (800 meters).

The most current version of the aircraft, the ATR 42-600, needs at least 3,360 ft. for takeoffs at maximum passenger load and standard conditions; therefore, the improvement would be around 20%. Scherer sees a big potential market in fjord environments or small island airstrips where short runways dominate or obstacle clearance and steep approach capabilities are needed. “The essence of regional aviation is route opening,” Scherer says. “But I get the sense that the world has forgotten the ATR 42.”

Scherer considers the ATR 42 to be “an underutilized asset.” He now sees “quite a bit of activity around the world.” ATR plans to pitch the aircraft toward the operators of the roughly 1,000 30-seaters and other smaller turboprops that are aging and in need of being replaced over the next several years.

The most important change to the aircraft would be a larger rudder to allow for more authority in a one-engine-out scenario, and consequently more powerful hydraulics. The package will only be offered should customers show a significant level of interest, because it would require substantial investment by the manufacturer.

Aircraft performance is also helped by the introduction of lighter seats that will be available for both the ATR 42 and 72. The new seats will reduce weight by up to 300 kg. ATR is also dropping the supplier of its air-conditioning system and has given the work to Liebherr.

The company is also talking to Pratt & Whitney Canada about how maintenance costs of the PW127M engine can be reduced. While declining to give further details about the changes, Scherer says that “the path leads us to a significant upgrade with a main focus on maintenance costs,” highlighting that the ATRs are already the lowest fuel-burn-per-seat regional aircraft. ATR has been studying for some time what engine improvements can be made. The success of re-engining programs for narrowbodies also raised the question of whether a completely new motor for the aircraft can be developed, but that now appears to be off the radar again.

—Jens Flottau
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Comac C919 Makes First Flight

Comac’s C919 narrowbody airliner flew for the first time on May 5, taking off from Shanghai for a 79-minute flight that took it to an altitude of 3,000 m (10,000 ft).

The flight achieved all test objectives, Comac says. Flying characteristics were normal, the test pilot who commanded the mission, Cai Jun, said after landing.

The situation in the cockpit, monitored by ground engineers, was remarkably cool and quiet, says a program source, indicating the crew met little or no difficulty in the flight.

After a short takeoff run along runway 4 of Shanghai Pudong International Airport, Cai and first officer Wu Xin took C919 unit 101 to airspace southeast of Nantong, a city 120 km (75 mi.) to the northwest of Shanghai Pudong. Also aboard were observer Qian Jin and flight engineers Ma Fei and Zhang Dawei.

Comac Setting Up Second ARJ21 Line

CHINA’S COMAC IS planning increased automation as it sets up a second production line for its ARJ21 regional jet.

A final goal is to achieve a moving production line like the one that Boeing uses to assemble the 737, a Comac official said at a conference in Shanghai.

But a moving line looks far away, since the manufacturer still has work to do even in getting its first production line up to a planned rate of 15 aircraft a year. Beyond that, the company is targeting output of 30 aircraft a year, for which it will need the second line, and ultimately 50.

Comac says it has orders for more than 300 ARJ21s. The company tends to be loose in its definition of “order,” however, counting contracts that Western aircraft makers would not regard as definitive.

The current ARJ21 line is at the old Shanghai Aircraft Manufacturing plant, the original base of the program, at Dachang, Shanghai. The second is being built at Comac’s new and vastly larger plant on the southern side of Shanghai Pudong International Airport, where Comac will also assemble the C919 158-seat airliner. The ARJ21 is designed to seat 78 in two classes.

The first ARJ21 was delivered in November 2015 to Comac subsidiary Chengdu Airlines, which began flying the type commercially in June 2016. It has two units in service.

Orders for C919 Top 600

China’s Everbright Financial Leasing has ordered 30 Comac C919s, taking the claimed order book for the 158-seat narrowbody aircraft above 600.

In view of the lateness of the program, currently about four years, avoiding definitively binding contracts looks wise; Comac is presumably liable to pay little or no compensation for missing delivery promises. But Comac’s policy also means that, by the standards of Western manufacturers, its claimed order book is an exaggeration.

Announcing the order, Comac did not disclose delivery dates. Earlier C919 contracts signed by the state manufacturer have not committed it to deliver at any particular time, industry sources have said.

Since the C919 is promoted as a cause for national pride, the first flight was broadcast live on national television and received widespread coverage by other forms of media.

The C919, dimensionally similar to the Airbus A320, is designed to seat 158 passengers in a standard two-class cabin arrangement. The extended-range version is intended to fly 5,555 km – though just how far it will go will be discovered during the flight-test effort. Flight testing will last well over two years and employ another five aircraft, the first of which is still in assembly.

Comac’s C919 narrowbody flew for the first time from Shanghai’s Pudong International on May 5.
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Russia’s MC-21 Makes First Flight

Russia’s new MC-21 airliner made its first flight in Irkutsk on May 28, vice-premier Dmitry Rogozin reported, and flew again on June 14. It is the first Russian-made narrowbody commercial passenger aircraft designed in the post-Soviet era.

The program was launched in 2007 and is headed by Irkut Corp., a subsidiary of Russia’s government-owned aircraft holding United Aircraft Corp. The flight prototype was rolled out almost a year ago, in early June 2016. It’s the MC-21-300 variant that has a maximum takeoff weight (MTOW) of 174, 216 lb. (79,250 kg) and can carry up to 211 passengers for a distance of up to 3,728 mi. (6,000 km). The shorter, 159,967-lb. MTOW variant - MC-21-200, with 165 passenger capacity – is at design stage.

The MC-21 took off powered by Pratt & Whitney PW1400G-JM engines. The alternative Russian powerplant, Aviadvigatel PD-14, has just completed initial trials at the IL-76LL flying lab that enables it to start the certification tests. Russian certification is to be obtained in 2018.

MC-21 certification in Russia is now planned for 2018, with the EASA certificate to be obtained a year later.

The MC-21 backlog stands at 175 firm orders, mostly from government-owned Russian leasing companies, and more than 100 commitments. Russia’s largest carrier, Aeroflot, is expected to become the launch operator, with first airframes to be delivered in 2019.

When the MC-21 program was launched, it was planned to enter service in 2016, the same year the A320neo and the Bombardier C-Series enter service. However, delays in development, both organizational and technical, are likely to put the Russian aircraft at the end of the line of the new-generation aircraft in its segment, which will likely further limit its market in development.

Aircraft avionics components are supplied by Honeywell, Thales and Elbit Systems. Other partners include Zodiac Aerospace, Eaton, Meggitt and Goodrich. More foreign suppliers have been involved with setting up a modern production line at the Irkut facility in Irkutsk as well as with delivering materials for aircraft production.

Foreign technologies brought to the program by international suppliers will stay in Russia as Irkut wants its partners to keep post-sale maintenance of their components in Russia. The selection of the Russian partners should be finalized by June.

The aircraft name, MC-21, comes from the Russian acronym Magistralny Samolet 21 veka, or “mainline aircraft of the 21st century.” The MC-21 will be the first Russian commercial aircraft to feature a high-aspect-ratio composite wing that has a supercritical profile. Composite components also include the wing box and vertical and horizontal fins.

The wing box and wing panels are being produced using the vacuum infusion technology developed by AeroComposit, another UAC subsidiary. The wing box developed cracks at the point of contact between the composite wing skin and the titanium beam during the fatigue test at TsAGI Central Aerohydrodynamic Institute in Zhukovsky, near Moscow, in February. This required wing reinforcement on the first prototype.

The aircraft avionics suite includes multifunctional 9-in.-by-12-in. displays, electronic flight bags, and enhanced vision and synthetic vision systems. The MC-21 will also become the world’s first commercial airline aircraft with active sidesticks, supplied by United Technologies Aerospace Systems (UTAS).

—Maxim Pyadushkin

Russia Investing in PD-14 Engine for MC-21

Russia’s United Engine Corp. (UEC), part of state-owned Rostec Corp., will invest RUB21.9 billion (US$389.3 million) to upgrade its production facilities through 2025 to build PD-14 engines to power Irkut’s MC-21 aircraft.

According to Rostec, RUB4.6 billion, funded through a corporate bonded loan, will be invested in production re-equipment with modern machinery. Another RUB4.3 billion will be used to create an after-sales service system – including establishing repair facilities, a training center, a spare parts distribution network, and maintenance and repair centers.

“The project will be implemented using funds from the federal budget,” Rostec said in a statement.

UEC plans to produce “at least 50 sets of equipment per year,” and will invest RUB2.95 billion in the project over the next eight years, Rostec said.

UEC expects to complete the upgrade of the stand for aircraft engine testing by this year’s third quarter. Investment in the project is estimated to be RUB96.2 million.

Russia’s United Aircraft Corp. subsidiary Irkut has chosen two engine options for the MC-21 – Russia’s PD-34 and Pratt & Whitney’s PW1400G. The MC-21 was rolled out on June 8, 2016.

UEC is at Chalet 377 and Hall 2a, Booth C198.

—Polina Montag-Girmes
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Boeing’s 737-8: Evolved to the MAX

Fifty years after the 737’s first flight, Boeing passed the 9,500-deliveries mark last month as the latest iteration, the 737-8, marketed as the MAX 8, entered service. There is more to the MAX than new engines and cockpit, but it is still a 737, our pilot finds.

Boeing has notched more than 3,700 orders for this third generation of the world’s bestselling jetliner. And that number could easily be eclipsed if the aircraft stays in production until 2030 as planned.

The Guppy, a popular nickname among pilots of Boeing’s smallest jetliner, has been in continuous production since 1967, the longest manufacturing run of any airliner. Significant advances in engine technology over the last half century, up to the CFM Leap-1B turbofans that power the MAX, are a prime reason for its ongoing success.

Aviation Week had the opportunity to fly the 162-passenger 737-8 from Roswell, New Mexico, with Keith Otsuka, Boeing’s test and evaluation chief pilot, to experience the differences between it and the 737 Next Generation we flew nearly two decades ago. Most importantly for operators, the -8 can fly 14% farther on virtually the same fuel quantity as the latest 737-800.

The Leap 1B turbofans account for most of the range gain. Dual-surface, laminar-flow winglets contribute 2% over the blended winglets fitted to NG-series 737s. A contoured tail cone, removal of aft-body vortex generators, revised auxiliary power unit (APU) inlet and exhaust, new bleed air system computer and numerous small aerodynamic improvements account for most of the rest.

With a seats-full, tanks-full range of more than 3,500 nm, the 737-8 opens up more long, thin routes between new city pairs, such as Dulles-Anchorage, New York-Panama City and Buenos Aires-Panama City, plus Singapore-Narita, Dubai-Kuala Lumpur and Mumbai-Moscow.

The aircraft has a 40% smaller noise footprint than its predecessor, despite having a 7,000-lb. heavier maximum takeoff weight. The Leap-1B engines also produce 20% lower emissions of nitrogen oxides and half the unburned hydrocarbons of the CFM56-7BE turbofans that power the NG.

Strapping into the left seat, there is no mistaking this cockpit for anything other than a Boeing 737. There is ample room for two pilots, but the cockpit gets crowded with third and fourth crewmembers on jump seats. Up front, the NG’s six 8-in.-by-8-in. ARINC D-size screens are replaced by four 9-in.-by-12-in. landscape-configuration displays from the Boeing 787. The integrated standby instrument is relocated to the center of the panel along with the landing-gear handle and indicator lights and nosewheel steering switch.

The primary flight displays (PFD) have edge-to-edge sky/earth backgrounds with vertical insets for air data. The magenta cross-pointer flight director is carried over from the 737NG. A single-cue flight director is optional. Spare area on the outer edges of the display may be used for clock and flight ID data.

Cockpit flows and checklists for the crew are virtually identical to those for the 737NG. There’s the well-rehearsed litany of dozens of switch throws, button pushes and knob turns that dates back to the original 737 designed in the Apollo era.

Aircraft serial-number 1A003, the 737-8 I flew, is chock full of flight-test equipment, configuration and full thrust, takeoff V speeds were 133 kt. for V1 takeoff decision speed, 135 kt. for rotation and 145 kt. for V2 one-engine-inoperative climb speed. Computed takeoff field length was 5,991 ft. for Runway 21.

At such comparatively light taxi weight, it took little increase from idle thrust to start the aircraft rolling on the ramp. Carbon brakes now are standard, saving 693 lb. I used them frequently to check taxi speed, as a result of the relatively high idle thrust.

The aircraft had the optional Rockwell Collins head-up display (HUD), a significant safety and situational awareness upgrade, in my opinion. I used it almost continuously during the evaluation flight.

Our flight plan would take us from Roswell about 100 nm northeast to Texico VOR and then back via airway V-280 to Chisum VOR. This would give us enough time to climb to altitude to spot-check cruise performance.

Rolling onto Runway 21, I advanced the thrust levers to stabilize the engines at 40% N1 fan rpm, then engaged the autothrottles.
As the engines reached full thrust, it appeared that the -8 was noticeably quieter than the 737NG on takeoff.

Initial pitch feel at rotation was moderate, with nicely proportionate roll feel. At 1,000 ft., I reduced pitch attitude and accelerated. Once speed had increased above V2 + 15 kt., I retracted flaps to 1 deg. At 1,500 ft., I retracted all high-lift devices at about 190 kt.

We settled into a 250-kt. climb through 10,000 ft., then accelerated to 280 kt. until reaching Mach 0.78 for the remainder of the climb to FL 350. Once level, the aircraft cruised at 449 KTAS while burning 4,460 lb./hr. in ISA-3C conditions at a weight of 140,500 lb.

Near Texico, Albuquerque Center vectored us back toward Roswell to avoid other air traffic. With the autopilot engaged, the aircraft smartly rolled to a 30-deg. angle of bank. There is no automatic half-bank mode built into the flight guidance system for high-altitude cruise, as the aircraft is buffet free up to a 40-45-deg. bank angle at optimum cruise altitude up to ISA+15C. But, for passenger comfort, the crew manually may dial in 10-, 15-, 20-, 25- or 30-deg. bank angles as appropriate for the phase of flight.

We began an idle descent, using the flight spoilers to hasten descent rate. Down at 15,000 ft., we flew both left and right 360-deg. turns at 45-deg. bank angles. The flight-path vector on the HUD and PFD makes it easy to stay on altitude. The speed-error tape and acceleration cue on the HUD make for precise speed control.

Next we flew the aircraft with one engine at idle and the other at high thrust to simulate engine failure. Rudder pedal forces needed to keep the slip/skid indicator centered were quite moderate and, with a moderate quarter-chord wing sweep of 25 deg., there was little dihedral effect that required roll input to maintain balanced flight.

We also flew an approach to stall in the clean configuration. When the stall-warning stick shaker was triggered, I consciously pushed forward on the control wheel to reduce pitch attitude and advanced the thrust levers to climb thrust. As the engines accelerated, the thrust caused a pronounced nose-up pitching moment. I countered the effect with ample push on the wheel and plenty of nose-down pitch trim on the stabilizer.

Returning to Roswell for pattern work, I hand-flew the first approach with flaps at 30 deg. At 140,000 lb., the Vref30 landing approach speed was 135 kt. I set 140 kt. as the target speed. This approach would be to a touch and go.

As I extended the flaps to 15 deg. and then 30 deg., there was a noticeable increase in lift that caused mild ballooning. Slight control-wheel inputs kept the aircraft on altitude. Guided by the instrument landing system to Runway 21, I used the HUD to control flight path and speed, as it is a most effective tool for enhancing hand-flying precision and smoothness. As the radio altimeter called out “30” to alert me to the aircraft’s height above the runway in feet, I retarded thrust to idle, checked the rate of descent and settled onto the pavement.

On the go, Otsuka reconfigured to flaps 15 deg., reset the pitch trim for takeoff, and said “Go!” I advanced thrust and rotated on his call. I cleaned up the airplane and flew downwind for 10 nm for our final landing.

I flew the final landing approach at flaps 40 deg. and auto-brakes 2. I set the speed bug at 141 kt. for Vref40 + 5 kt. Touchdown was uneventful. But I relaxed too much back-pressure on the wheel and the nose gear plunked down much too firmly.

It is obvious the 737-8 lacks the fly-by-wire flight controls, avionics integration and automation, and other advanced technologies of newer jetliners. It is an airplane with design roots dating back to the Space Race.

Boeing’s 737 has had a record-setting production run and the -8 will help maintain its momentum. It is a strong contender in the single-aisle market, rejuvenated with new engines, improved winglets and upgraded displays. But there are only so many ways an airplane can be stretched, strengthened, lengthened and re-engined before it loses out to more modern designs. The MAX could be the swan song for the world’s bestselling jetliner.

—Fred George

Boeing announced U.S. FAA certification of the 737 MAX 8 for commercial service on March 9.
Controp: Growing Smart Vision

With increasing demand for electro-optical equipment for surveillance and security, Israel’s EO specialist Controp Precision Technologies is set on a growth path.

Following a record year in sales in 2016, the company is expanding its operating base as it enters new markets. “Addressing the demand from key markets, we expanded our presence overseas,” corporate vice president for marketing and sales Hagay Azani, told ShowNews. “We see substantial new opportunities in Asia-Pacific, particularly in border protection, homeland security and aviation and maritime upgrades.”

According to Azani, this activity is focused primarily on strategic markets in Asia-Pacific, where the company acts as a prime or as a subcontractor, and in India, where it teams with local partners to offer its products under the “Make in India” policy. In Europe and in North and Latin America, Controp is also involved in major projects, primarily as a subcontractor.

To support this growth the company is expanding its core, Israeli-based operation. “We doubled our research, development and engineering teams to bring new capabilities to market,” said Azani. “For example, our high-performance, miniature EO payloads meet a strong demand in mature markets in North America. As the pioneers in this field, our miniature payloads are positioned ahead of the competition.”

Another example for a growth segment at Controp is persistent surveillance – an area the company excelled in for many years. These capabilities are increasingly employed for border protection and security of strategic sites. “With security concerns and floods of refugees, Europe is waking up. Military and security agencies demand more capabilities to deal with these evolving threats,” Azani explained. To meet the growing demand, Controp is expanding rapidly.

“In the past year, Controp [has been] undergoing an ‘engineering revolution,’” Azani noted. “We are investing hundreds of man-hours in technological research, development of new products and engineering of upgrades across our product line.” One example is technology migration. “About two years ago our leading product, SPEED-ER, was selected for a major border surveillance network that required extensive upgrades in capabilities – particularly integration of multiple sensors for challenging climate conditions and image enhancement processing capabilities that would deliver a generation leap in performance.”

“Today, these advancements are implemented in other products across our product line – for example, the T-STAMP-XR, which we are introducing here at the Paris Air Show,” Azani noted. “Another example is the iSky-50HD – our popular and proven DSP payload, which is now modernized and enhanced with the introduction of HD sensor technology. In time, additional advancements will be implemented in all the products we offer,” he concluded.

—Noam Eshel

IAI’s EHUD for the IAF

ISRAEL AEROSPACE INDUSTRIES MLM will supply the Israel Air Force the latest generation of EHUD air combat maneuvering instrumentation pods, to be carried on conventional fighter jets. These systems will be able to interface with internal ACMI systems already integrated by IAI in the IAF/Leonardo M-346 Lavi advanced jet trainer. The pods will enable trainees to “fight” with and against fourth-generation combat aircraft in realistic, networked combat scenarios using the Lavi, which is already equipped with an EHUD derivative dedicated to its own training scenarios.

The use of EHUD opens the door for shared, live drills and debriefing with the Lavi airplane, based on the EHUD network, as is already carried out by operational IAF units and foreign countries. EHUD is established as the standard ACMI system of the NATO air forces.

“EHUD provides training services to many air forces and supports multinational drills to allow our clients to experience the best, most modern training methods and make the most of every training sortie efficiently and accurately,” Jacob Galifat, general manager of the IAI/MALAM Division, Missiles & Space Group, said. To date, more than 1,000 EHUD ACMI systems have been shipped, along with hundreds of debriefing systems.

“These technologies represent a natural evolution of [the] EHUD system, providing network support for live, virtual and constructive training formats,” Galifat added.
Upcoming MRO Events

Aero-Engines Europe
September 13-14, 2017 | Madrid, Spain

MRO Europe
October 3-5, 2017 | London, UK

Airline Engineering & Maintenance: North America
October 18-19, 2017 | Miami, FL

MRO Asia-Pacific
October 31-November 2, 2017 | Singapore

Aerospace Manufacturing Asia-Pacific
November 1-2, 2017 | Singapore

Aero-Engines Asia-Pacific
November 1-2, 2017 | Singapore

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Flying the A321neo

Small but significant changes – not just new engines – set the re-engined A321neo apart.

Arriving at Airbus headquarters on the south side of Toulouse-Blagnac Airport, it was clear there was going to be one unexpected factor for our upcoming A321neo test flight: low clouds, rain and a westerly wind at 50F.

On our way to the briefing room, ahead of what would be more than 3 hr. of test flying, we passed the two A321neos used for certification testing, both parked outside Airbus’ flight center at Blagnac. One of them is powered by the Pratt & Whitney PW1100G, the other by the CFM Leap-1A.

At a length of 146 ft., the A321neo is the longest of the A320neo family, but its larger engines are the distinctive difference from the conventional engine option (CEO) version. They make the aircraft look more balanced and powerful.

But the neo is about more than just putting new engines under old wings, and that is reflected in flight testing, explained Airbus test pilot Capt. Etienne Miche De Mallaray and flight-test engineer Sandra Bour-Schaeffer.

The new airframe/engine combinations had to undergo intensive testing, including flutter, crosswind landings and minimum unstick speed, which is used during certification to establish other speeds like rotation (Vs).

As the new engines add about 1.8 metric tons (4,000 lb.) to the aircraft’s dry operating weight, areas such as engine pylons, wing structure and bleed and oil systems were adapted. Other changes were made to improve the A320neo family by introducing technology developed for the A380 and A350. Certification flight-testing turned out to be about three-quarters of the effort required for an all-new aircraft, at more than 4,000 flight hours.

The aircraft for our flight, registered as D-AVXA, is powered by PW1100G geared turbofans. The larger fan diameter, at 6.8 ft., and the reduction in number of fan blades to 20 from 36 on the CFM56-5B, are the obvious differences from the CEO.

The higher bypass ratio of 12.5:1, compared to the CFM56’s 6:1, is also immediately visible and accounts for most of the NEO’s lower fuel burn, noise and emissions. On the A321neo, the PW1100G is rated at 32,900 lb. thrust and therefore has about 1,000 lb. more thrust than the CEO, while maximum takeoff weight is unchanged at 93.5 metric tons. Because of the lower fuel consumption, range is increased by 500 nm, or 2 metric tons of extra payload is available.

Cleared to taxi toward Runway 32L, I released the parking brake. Our A321neo started to move without increasing thrust as the ground-idle thrust is higher than I am used to on the CEO to provide the necessary cooling for engine accessories.

Skies were still overcast with a cloud base at 1,400 ft. I was curious to see the pitch damping at rotation, Airbus’ answer to the certification requirement for tail-strike protection on takeoff and again used on the A380 and A350. But first the sound of the engines caught my attention as the thrust levers were advanced to takeoff power. It is a surprisingly deep sound that gives the impression there is more thrust if needed.

During the rotation, with a 10-kt. crosswind and a little turbulent air, it was not possible to feel the pitch damping. This is slightly reducing the elevator force at pitch angles above 7 deg. Mallaray said a normal, steady rotation is expected just like on the CEO and that if, for any reason, a further pitch input is commanded, it is still possible to rotate the tail into the ground.

After retracting gear and flaps, we climbed northwest out of Toulouse into a block of airspace at 8,000-16,000 ft. While I tried to get a feel for the differences in manually flying the neo compared to the CEO.

Arriving in the reserved airspace, we were finally out of the clouds and continued at varying speeds with different flap settings. The aircraft felt comfortably familiar to an A320CEO pilot. However, the pitch and roll control are more direct and dynamic, and the little allowance or slackness in the CEO is not there.

We climbed to high altitude, catching a glimpse of the Atlantic coastline west of Bordeaux.

After reaching FL 300, we slowed to “green dot” speed (minimum clean), which is now 216 KIAS, then accelerated to the maximum operating Mach number of 0.82. At high altitude and high speed, airliners have to be handled carefully, as small pitch changes have large effect. The Neo felt just as sensitive as the CEO, and at low speed it felt similarly well-balanced and easy to control.

During our idle-power descent back toward Toulouse, I checked the fuel page on the system display and saw an impressive combined fuel flow of 5 kg/min. (12 lb/min.) for both engines.

Our low-power/low-drag descent was interrupted by air traffic control and the need to be put into sequence for our first approach at Toulouse Airport. We prepared an instrument landing system approach for Runway 32L at 65 metric tons in configuration.
3, which is the lower of the two landing-flap settings and unchanged from the ceo. However, on this approach we were going to level off at about 150 ft. above the runway and fly a low pass to demonstrate the runway overrun warning, a new option on the neo that is also available on the A350.

As we flew above the touchdown zone of the 11,483-ft.-long runway, the system called out first: “If wet, runway too short” – and in fact it was wet. About 2 sec. later, the next warning level came up: “Runway too short.” Both warnings were also shown on the PFD. Had we already touched down, the system would have continued to calculate the remaining runway length. If it was critically short for deceleration, the synthetic voice would have called for “Max braking,” “Max reverse” or even for “Keep max reverse” if the pilot was reducing reverse thrust.

After the demo, I pushed the thrust levers into the TOGA notch, climbed back to 4,000 ft. on the northeastern side of the airport, cleaned up the aircraft and prepared for a flaps full landing on Runway 32L. Our gross weight was down to 64 metric tons, and we would see a crosswind of almost 11 kt. on landing.

Our approach speed (Vapp) was calculated at 135 kt. with the maximum flap setting, which has been increased to 37 deg. from 35 deg. on the A321neo and to 40 deg. on the A320neo. The change was due to customer demand for better takeoff and landing performance on short runways. With the higher flap settings, Vapp is decreased by 5-6 kt. compared to the ceo, resulting in 5-7% shorter landing distances.

On my first approach, I thought the aircraft was not as stable in pitch as I was used to, but our test pilot made clear this was because the power changes I was used to on the ceo were a little bigger than needed on the neo. Smaller changes of engine thrust will keep you from over-controlling in speed and pitch.

After our final landing, I opened the reversers and used idle thrust for a smooth deceleration. Compared to the ceo, the higher ground idle of the neo engines helped slow us down faster without using the brakes. This keeps the brakes cool for the next departure and will extend the life of the expensive carbon brakes.

Pilots type-rated on the A320 family can fly the neo after an approved differences course that covers familiarization, technical changes and procedures. This can be done by self-study via computer-based training and takes half a day.

The engine manufacturers promised fuel savings of 15% on the A320neo family, and airline experience so far shows these are being achieved – and sometimes exceeded – depending on route structure. Additionally, the neo is reducing noise footprint by 50% compared with the ceo, and emissions of NOx and CO2 are sharply cut.

Because of the new engines, many systems had to be adapted and different limits put in place, but the aircraft will tell you if you are coming close to any of them. Airbus has taken the opportunity to build in technical advances developed for the A380 and A350 but at the same time has managed to keep 95% commonality to the ceo, which is important for the airlines and their maintenance divisions.

And how does it fly? It flies like a ceo with some improvements, which is a compliment. Manual control via the sidestick is more reactive, and it feels more direct and dynamic. Due to the number of small changes, as an airline pilot, I would prefer not to fly the neo and ceo during the same duty time on the same day. But the aircraft is fun to fly, and I am sure pilots will appreciate the technical upgrade.

—Tim Wuerfel

The A321neo is the largest of Airbus’s re-engined A320 family, seating up to 236 passengers.
Parker: ‘You Don’t Last 100 Years by Accident’

The spirit of Art Parker lives on.

He was an inventor, an engineer and an entrepreneur. He never gave up,” says Tom Williams, chairman and CEO of Parker Hannifin, of the man who founded Parker Appliance Company 100 years ago with his partner Carl Klamm.

Today, Parker Hannifin is a Fortune 250 global leader in motion and control technologies in a wide range of diversified industrial and aerospace markets, with revenues last year of US$11.4 billion.

Getting there wasn’t an easy road. That the company survived at all and later thrived was due to the determination of Art Parker.

You think trade shows are expensive? Well, Parker’s first led to the company’s bankruptcy in 1924.

Having invented pneumatic brakes for trucks but having found no customers, Parker took the company demonstrator, hitched on a trailer containing his entire inventory, and set out from Cleveland to a trucking trade show in Boston. But on Laurel Mountain, Pennsylvania, the trailer hitch broke and Parker’s prospects plunged to the bottom of a ravine.

That was a warning not to put all your eggs in one basket. Parker failed to heed it after buying back his company from bankruptcy and switched his attention from a lackluster truck market to a precarious aviation market. He supplied his patented and leakproof fuel system fittings to the Glenn Martin Company, the largest aircraft company in America in Cleveland in the early 1920s and also in financial trouble itself, for the MB-2 bomber. The quality of his equipment was appreciated by Martin’s chief airplane designer, Donald Douglas, who would found Douglas Aircraft; plant manager James Kindleberger, who would found North American Aviation; and chief draftsman Lawrence Bell, who would start Bell Aircraft. All later became important customers of Parker.

Glenn Martin would introduce Art Parker to his good friend Bill Boeing over dinner, and Parker won another company that is still a major customer today.

Charles Lindbergh heard through that tight network of Parker’s fuel distribution system, and had it installed for The Spirit of St. Louis’ transatlantic trip 90 years ago. That crossing helped promote Parker’s reputation in the aerospace industry.

During World War II, Parker produced 500 million fittings and couplings for the fuel systems of each and every one of the 324,000 American-made bombers, troop transports and fighter planes.

But in 1945 the government, then Parker’s only customer, canceled all contracts, leaving Parker with a huge inventory that had to be liquidated. Art Parker died at the age of 60, and his wife, against the advice of many, invested his US$1 million life insurance back into the struggling company. That was enough to carry it through to the boom years of the 50s.

Parker learned its lesson and diversified. Aerospace, which at one time was 90% of its business, today represents just 20% with revenues last year of US$2.26 billion.

—John Morris

Looking Ahead

Chairman and CEO Tom Williams believes Parker Hannifin is set for the next century. The past 100 years underpins the company’s Win Strategy with goals of engaged people, premier customer experience, profitable growth and financial performance that will take it to new levels. It will, in fact, transform the company.

Improved safety performance is key to that strategy as it is a clear indicator of engagement, says Williams.

“A safety-first environment requires a high level of individual ownership and is a precursor to strong long-term financial performance. This ownership culture will drive improvements in safety, as well as in quality, cost and delivery.”

Parker’s goals include:
• To engage its employees in a culture of safety that will drive performance and lead to zero accidents.
• A premier customer experience. “We changed one key word, ‘service,’ to ‘experience’ says Williams, to add speed and ease of doing business. Its progress will be measured with a “Would you recommend Parker to a friend?” survey.
• To grow faster than the market by a benchmark 1.5% versus industry production growth. “It’s a dynamic goal. In the past we had a static goal. It’s a good way to stand out,” says Williams.
• To grow earnings organically 8% year over year through lean processes and supply chain management.

“We want to be a Top Quartile company on key metrics, including safety.”—J.M.
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Typhoon Production Nudges to 2023

With the delivery by Leonardo of the 500th Eurofighter to the Italian air force, production of the multinational combat aircraft is entering its twilight years. Work is now under way to further slow production rates in a bid to be ready for potential future customers.

Based on the current order book, there are now just 99 Eurofighter aircraft left to be delivered by Airbus, BAE Systems and Leonardo. Production of the Eurofighter would have ended next year if it had not been for Italy’s success in securing a key order for 28 aircraft in Kuwait. The order secures series production of the Typhoon out until 2023, potentially helping to put the aircraft in a comfortable position to compete in upcoming fighter programs – including Belgium where the selection of a new fighter is planned for next year and in Finland where selection is expected in 2021.

The companies are in the process of adjusting the production rates, Eurofighter CEO Volker Palalto told journalists in Turin on April 11, adding that “major unit lines are to deliver until 2022” – suggesting that production for the core nations had been bridged to close the gap until Kuwaiti aircraft come on stream.

In Italy, where the Kuwaiti aircraft will be assembled, this process has already been agreed; the Italian air force is now due to receive its final Typhoons in 2019-20, officials close to the program told Aviation Week. It is unclear whether the same approach has been applied in Germany, Spain and the UK, although BAE System has previously announced lower production rates to keep the line “warm” for potential future orders.

The last of 72 aircraft for Saudi Arabia are due to be delivered in the coming months, while the first for Oman began flying last November. Deliveries of the Omani aircraft are expected later this year.

Kuwait’s jets will now be the first Typhoons to receive the new active electronically scanned array Captor-E radar, development of which is being led by Leonardo (Chalet 240) as part of the Euroradar consortium.

Flight testing with the Captor-E switched on in-flight began earlier in 2017 following a series of environmental test flights to demonstrate how the radar handle various aspects of the aircraft’s envelope. Initial tests have been performed in the air-to-air capability in search and track capabilities. Air-to-surface capability testing will follow later, officials say.

—Tony Osborne

Typhoon Readied for Brimstone Trials

MBDA’s Brimstone 2 precision strike missile is being prepared for use on the RAF’s Eurofighter Typhoon aircraft, with trials beginning this summer.

BAE Systems is preparing to perform a series of test firings of MBDA’s Brimstone 2 air-to-ground missile from the Eurofighter Typhoon as it moves to integrate the weapon for use by the British Royal Air Force. BAE plans to launch nine of the weapons this summer as part of its Phase 3 Enhancements (P3E) program, one of two upgrade packages that BAE and the other Eurofighter partners are working on to add new capability.

The integration of the Brimstone is a UK-only requirement as part of the RAF’s Project Centurion. Centurion will integrate the three primary air-to-ground weapons that equip the Panavia Tornado GR4, which is to exit service in early 2019, on to the Typhoon. Raytheon’s Paveway IV precision guided bomb is integrated onto the Typhoon through the P1E upgrade now operational over Iraq and Syria, while the MBDA Storm Shadow cruise missile is being integrated as part of the P2E package along with MBDA’s Meteor beyond-visual range air-to-air missile.

The upgrades only apply to the later model Tranche 2 and 3 Typhoons.

Clearance and drop trials with Storm Shadow were completed using Italian development aircraft in 2016, while Meteor testing culminated with dual firing by a Spanish aircraft in February of this year; however it is likely that additional launches of both weapons will be carried out by RAF test and evaluation crews to develop their operating doctrine, says Andy Flynn, Eurofighter delivery director at BAE Systems.

Although the upgrades are mostly software, the introduction of the Meteor requires modifications to the radar allowing the fitment of a two-way data link to communicate with the missile as well as adjustments to the system that pushes the weapon away from the aircraft from the semi-conformal fuselage stations.

BAE will also integrate the Litenng V laser designator pod, which brings with it increased range and acuity of targets, which Flynn says will be invaluable when using Brimstone.

MBDA is in Chalet 173. Raytheon is at Chalet 294.
SpeedNews is pleased to present its 18th Annual Aviation Industry Suppliers Conference in Toulouse, on September 18-20, 2017.

Delegates will hear from aircraft and engine manufacturers on the status of their new programs and learn from experts on important topics affecting our industry, including delivery and retirement forecasts. We also provide information pertinent to maintenance companies and subcontractors.

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The Preliminary Agenda is available on www.SpeedNews.com
Beyond the Flight Line: The Modern MRO

3-D printing, connectivity and virtual reality will be plentiful in Paris as maintenance, repair and overhaul exhibitors pull out the latest in technology to grab attendees’ attention. Among the hooks? Le Bourget visitors will be able to fly aircraft (virtually).

Even the first-time Paris Air Show attendee knows the must-see action is along, and above, the flight line. But ignoring the 2,000-plus exhibitors that dare show up with something less than a complete aircraft is a sure way to miss some of the show’s most innovative concepts. Here is a small sampling of worthwhile stops around Le Bourget this year, with a nod to three emerging technologies: virtual reality, connectivity and additive manufacturing.

AFI VR Engine Run-Up
Air France Industries KLM Engineering & Maintenance, which now uses its MRO Lab to consolidate innovation ranging from repairs to special tooling, will be showing off several of its advanced products. Among them: virtual-reality Boeing 787 training for technicians. Developed in collaboration with Air France Group subsidiary HOP! Training by ICARE, the system reproduces an entire aircraft in a 3-D setting and grants the student virtual reality “access.” Paris Air Show guests will be able witness an engine run-up using the technology. Hall 2B, Booth C137.

Cobham Fuels the Fighter
Cobham’s Paris exhibit will include its recently released Virtual Refueling (VR) air-to-air refueling simulator. The active demonstration enables a participant to assume the role of a fighter pilot maneuvering behind a tanker on a fueling mission. The simulator uses high-fidelity hose-and-drouge performance models that accurately capture the physics of Cobham’s wing-pod and centerline systems, including mishaps such as off-center contacts. Developed to lower the cost and risk of air-to-air fueling, the system is available in desktop, virtual reality, or full-motion versions. Hall 2B, Booth E156.

Connected Aircraft I
The connected aircraft’s emergence is creating opportunities for suppliers of data-management and transmission equipment. Avionica specializes in both, and is winning customers looking to equip both new and legacy aircraft. Cathay Pacific Airways recently tapped the avionics supplier to equip its fleet of 747s, 777s, A320s and A330s with an onboard server, Iridium-compatible satellite communications system, 4G cellular data transmission system and a quick-access recorder. IcelandAir has chosen the same combination for its 737 MAX fleet. The package gives both airlines global voice and data connectivity for myriad uses, including air-to-ground communications and automated wireless transmission of operational data. Avionica will be displaying its e-enabling avionics in Paris. Hall 3, Booth E119.

Connected Aircraft II
Connectivity will be a major airline industry theme long after this year’s show wraps up. Rockwell Collins is betting as much, and its recent purchase of B/E Aerospace underscores its confidence. While it is easy to see how an avionics maker and an interiors specialist can fit together, combining expertise in the front and back of an aircraft, Rockwell Collins executives see far more integration potential. For instance, the ability to place sensors on cabin seats can lead to significant changes in the passenger experience, such as alerting the cabin crew when passengers snoozing during a long-range flight move their seats from a reclined to an upright position, signifying they are ready for service. Similar technology could warn of a pending seat malfunction, which could give technicians a heads-up before a broken premium seat becomes a threat to a future flight’s revenue. Rockwell Collins will be talking connectivity of all types – from throughout the cabin to flight tracking – at the show this year. Chalet 313, Row B.

Pushing 3-D Printing Further
With additive manufacturing (AM) gaining interest across aerospace, expect more sea-soned aerospace names will be home to the Paris Air Lab. More than 20 exhibitors representing start-ups, industrial groups and seasoned aerospace names will be on display, as will its QantAM system. Deference bed fusion, or laser melting, metal AM degradation occurs when a polymer-based auxiliary material is exposed to high-energy photon fluxes. Norsk Titanium AS, based in the Norwegian capital, is a leader in additive manufacturing of aerospace components. Last year, Air France Industries KLM Engineering & Maintenance signed a 20-year exclusive agreement with the company to repair high-pressure compressor and turbine airfoils and maintain them in an optimal condition. The agreement is part of the French aerospace group’s strategy to strengthen its position as a major supplier of engine MRO services.

Airfoils Advanced Solutions Is Born
The 49,000-sq.-ft. (15,000-sq.-meter) facility at the Sars-et-Rosières business park in northern France will repair high-pressure compressor and turbine airfoils and maintain them in an optimal condition. The agreement is part of the French aerospace group’s strategy to strengthen its position as a major supplier of engine MRO services.

A380 Superjumbo
The A380 superjumbo has been a familiar sight in the skies of Paris, serving as a testament to the city’s role in aviation history. The aircraft, which first flew in 2005, has been a symbol of innovation and engineering excellence, and its presence at the Paris Air Show is a testament to its continued relevance in the industry.

3-D-Printed Structural Parts
Norsk Titanium AS has spent more than a decade developing and commercializing additive-manufactured, aerospace-grade titanium components. In April, it announced a milestone purchase order from Boeing for 787 structural parts that use the supplier’s patented RPD/rapid plasma deposition additive manufacturing technology, which transforms titanium wire into parts with little waste. The 787 parts, which earned FAA certification in February following a detailed testing program, will be the first 3-D-printed titanium structural parts to fly on an air transport aircraft. Attractive for its strength, titanium is gaining
favor among OEMs. Norsk’s RPD process combines the benefits of titanium with the efficiency of 3-D printing. Norsk will have some of the 787 components on display at its Paris exhibition, as well as a full-scale mock-up of the company’s Merke I RPD machine that produces the parts. Hall 1, Booth H299.

Pushing 3-D Printing Further
With additive manufacturing (AM) gaining interest across aerospace, expect more seasoned suppliers to crop up at the industry’s signature events. Renishaw’s AM technology will be making its Paris Air Show debut this year. The company’s RenAM 500M laser powder bed fusion, or laser melting, metal AM system will be on display, as will its QantAM software. Renishaw is part of Horizon (AM), a consortium of UK-based organizations developing AM for the aerospace sector. Other members of the Horizon (AM) team include GKN Aerospace, Delcam, and the Universities of Sheffield and Warwick. The program is backed by the UK’s Aerospace Technology Institute. Hall B, Booth G188.

The Innovation Station
This year’s Air Show will have a new feature in a familiar space. Concorde Hall, so named for the two iconic supersonic airliners it houses, will be home to the Paris Air Lab. More than 20 exhibitors representing start-ups, industrial groups and seasoned aerospace names will come together and show off collaborations that focus on innovation. Projects fit into several categories, including drones, passenger experience, sensors, advanced manufacturing and data analysis. Among the attractions are five virtual reality booths, a future vehicles booth and an “Earth seen from above” photo exhibition. Twice each day during the show, the Innovation Stage will feature a representative from an aspiring start-up pitching industry executives – and the rest of the audience – on the merits of a specific project. Concorde Hall.

—Sean Broderick

Airfoils Advanced Solutions Is Born

AFTER ANNOUNCING PLANS last year, Air France Industries KLM Engineering & Maintenance (Hall 2b, Booth C137) and Safran Aircraft Engines (Hall 2a, Booths A228 and A252) confirmed that their Airfoils Advanced Solutions joint venture will commence operations in 2018.

The 49,000-sq.-ft. (15,000-sq.-meter) facility at the Sars-et-Rosières business park in northern France will repair high-pressure compressor blades and variable stator vanes on multiple engine types. These include CFM International’s CFM56 family engine for the Airbus A320 and Boeing 737, the GE90 option on the Boeing 777 and the Engine Alliance GP7200 powering the Airbus A380 superjumbo.

Airfoils Advanced Solutions will be able to handle 200,000 parts per year. The ramp-up of services will initially begin with blades overhaul, followed by repair services for engine vanes.

Safran Aircraft Engines will hold a 51% share of the JV, with Air France KLM holding the remaining 49%. The engine manufacturer’s services and MRO EVP, François Planaud, described the founding of the JV as a step forward for its repair capabilities in high-pressure sections of engines it currently services.

“It’s also a tremendous opportunity for Safran Aircraft Engines to strengthen our position as a major supplier of engine MRO services,” Planaud added.

Anne Brachet, EVP at Air France KLM Engineering & Maintenance, said, “This joint venture reflects our development strategy, which is rooted in innovation and the development of new repair solutions to continuously improve the competitiveness of our engine support services.”

Brachet added that the engineering and maintenance specialist will continue its investment in its home bases in France and the Netherlands as well as farther afield.

AFI KLM E&M said that once AAS is functioning, between 200 and 250 staff will eventually be employed at the site in a variety of technical and administrative roles.

—James Pozzi
Pratt & Whitney Launches ‘EngineWise’ for MRO

Pratt & Whitney has unveiled “EngineWise” as a new approach to aftermarket service designed to provide more predictive and responsive solutions to customers.

The new service brand reflects the manufacturer’s mandate to support the existing and emerging fleet of operators, quickly evolve digital capabilities, and meet customer desires for tailored MRO support for the 10,500 Pratt & Whitney engines in service across 400 operators around the world, said engine services VP Eva Azoulay. “Change is here to stay, and knowledge and intelligence is the way we’re going to stay ahead of that change,” Azoulay said. By bringing together its people, technology and infrastructure through EngineWise, she said, Pratt can better adapt to customers’ needs and evolve its data and analytics capabilities faster.

EngineWise also leverages United Technologies Digital, which launched an accelerator in New York last month to “unleash” the big data opportunities across the parent company’s businesses. Azoulay says that in-house analytics expertise should help Pratt & Whitney deploy faster predictive and analytical outputs.

“We’re not perfect. There are opportunities for us to improve our services and capabilities,” she said. “We’re trying to say with EngineWise that we are leveraging to get better.”

The new MRO approach is also driven by Pratt & Whitney’s need to hire “25,000 new employees over the next decade to support our growth,” she added. That is on top of the 4,500 hired since 2015 to support the onset of V2500 MRO work and the introduction of the geared turbofan.

“EngineWise should help increase the capability of that team quickly,” Azoulay said. Pratt & Whitney (Chalet 346) is already increasing its use of virtual reality in training and introducing video borescoping for field service assistance to deploy virtual assistance in real time.

In the near future, expect to see Pratt & Whitney develop new services that “fill the gap” between time and material and power-by-the-hour packages, adaptive solutions for leased fleets and EFAST – enhanced flight-data acquisition storage transmission – tools to provide in-service engines more predictive capability.

—Lee Ann Shay

Pratt Seeks More PW1000G MRO Partners

PRATT & WHITNEY is in negotiations with several companies about joining MTU Maintenance, IHI, and Lufthansa Technik as members of the emerging global MRO network for the new PW1000G family of geared-turbofan engines.

“We are negotiating with others to bring them into the network,” said Pratt & Whitney president Robert Leduc.

Pratt & Whitney (Chalet 346) is spending US$450 million on its Columbus Engine Center in Georgia, in part to increase its capability to handle PW1000G shop visits, Leduc said. He revealed P&W is now conducting 440,000 man-hours of MRO training a year at its three Global Training Centers – which are located at its East Hartford, Connecticut, headquarters campus, at Shanghai and at Hyderabad in India.

P&W will also expand its PW1000G MRO activities by investing in other aftermarket functions.

“We’re adding mobile services and line services, because we know we have to prepare for the huge number of shop visits to come,” he said.

Leduc spoke to reporters attending the engine manufacturer’s annual media event – held this year at P&W’s engine development, testing and production center far out in the Everglades, northwest of West Palm Beach, Florida.

—Chris Kjelgaard
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Honeywell Eyes Broader Scope for Predictive Maintenance Offering

Supplier combines existing data sets to deliver actionable results

Honeywell, having demonstrated the effectiveness of its GoDirect maintenance services (MRS), a prescriptive MRO analytics offering on auxiliary power units, plans to expand the capabilities to other subsystems and even to non-Honeywell products, company executives say.

"We started with the APU because it was a specific problem identified by an airline customer," says Abhi Seth, Honeywell’s senior director, data science and analytics. "We can take this and apply it to other components, including non-Honeywell components. It all depends on what the customer wants."

The system’s key, adds Roman Lopatko, Honeywell’s senior director, strategic marketing, is leveraging different data sets. GMS starts with the fault data being generated from the component or subsystem itself—the so-called physical data. It then factors in other variables, such as flight-segment parameters and environmental conditions, to better understand failure modes. Once those modes are understood, Honeywell can recommend fixes.

“When an issue is detected, we give the airline a specific action, right down to replacing a part,” Lopatko says. The system is customizable by customer. For instance, some airlines want to know when actions need to be taken within a three-day window, Lopatko says, but some may want the window to be larger. Regardless of the variables, GMS’s goal is simple: warn of an imminent failure that, if not addressed, will likely result in a schedule disruption.

Honeywell has two announced GMS customers: Hainan Airlines and Cathay Pacific. Both are using the service on APUs. Hainan was the first announced customer, but the deal came on the heels of a yearlong trial in which Honeywell worked with Cathay to develop and fine-tune its system before going to market.

Cathay was experiencing reliability issues with its Honeywell-supplied Airbus A330 APUs, due in part to the stress of hot and humid conditions the carrier’s aircraft regularly experience.

Beyond creating headaches for the airline’s operations team, the challenges—which affected the air-conditioning systems—were leaving plane loads of passengers uncomfortable as aircraft sat on the tarmac.

With GMS running, Cathay has seen a 35% reduction in in-service APU issues, and the system’s accuracy in pinpointing issues—and the subsequent recommendations—is about 99%.

While Hainan and Cathay are the only announced GMS customers, Lopatko says Honeywell is working with several other operators.

“Our message is simple: there is a lot of untapped potential in the data that’s already available,” he adds. —Sean Broderick

Airbus: Global MRO Worth $120 Billion by 2036

Airbus estimates demand for 550,000 new maintenance engineers over the next 20 years as the value of the global MRO market doubles. Between 2017 and 2036, the manufacturer reckons that global airlines will need 34,170 new passenger aircraft (and 730 freighters) to support average annual traffic growth of 4.4%. This will lead to a doubling of the global fleet, providing Airbus’ global services business with a “catalyst to grow.” Asia-Pacific will take more new aircraft than any other region, and will also lead growth in the MRO market, which Airbus predicts will double in value from US$60 billion today to US$120 billion by 2036.

Airbus A330-300 operated by Cathay Pacific
France Adapts to Terror Attacks

The task was huge. Matches took place in 10 stadia, each ringed by two additional security perimeters. Open-air areas where fans could congregate to watch coverage on large TV screens, known as Fan Zones, were established for the duration of the tournament in numerous cities (the Nice attack took place four days after the tournament, where the city’s Fan Zone had been located). Training facilities, team hotels and official delegations – often including political leaders as well as sporting dignitaries – all offered high-profile targets. In total, Khoury says, there were 110 official sites to secure.

Throughout, a key priority was ensuring the event – and by extension the nation – did not feel as if it was on lockdown. “If you have a political summit you can put all your efforts into security,” Khoury says. “If you’re dealing with sport or culture you have to find a balance between festivity and security so the importance of risk analysis is key.” That analysis was underpinned by an extensive intelligence-gathering operation. Social-media monitoring augmented work by law enforcement and security agencies.

The one significant incident to occur during the tournament – fighting inside the stadium in Marseilles during a match between England and Russia – could have been prevented, Khoury believes, had information about known hooligans been passed on in time.

“International cooperation was not always good in terms of quality,” he says. “The Russians gave us information after the match, so we went and arrested people, but not before. Also we don’t have a European database of troublemakers or [fans subject to] stadium bans – so when you sell tickets, you cannot be sure.”

The success of event security is subject to the harshest of metrics. Khoury does not go into specifics but says there had been “terrorist attempts before and during” the tournament, which were foiled through solid intelligence work and “preventative arrests.” An extensive cybersecurity operation detected and defeated “hundreds of thousands” of attacks.

“The only systemic risk for the Euros was security,” he says. “You can have bad matches, people waiting, and it’s OK – but if there had been a terrorist attack during the Euros we would have been obliged to cancel the event. [That would have had a] big economic impact, [and sent out a] bad image. Security is not an option, and it should be considered an asset and not a constraint.”

—Angus Batey

Euro Security Lessons

Zaid Khoury outlines some of the conclusions drawn from the Euro2016 security operation that could assist those planning security for major events

Start Early
“You have to consider security as the first priority, from the beginning, when you outline the concept of your event.”

Ensure Security Teams Control Access at Every Stage
“The accreditation system should be in the hands of security people. It was not the case [at Euro2016] and therefore it was complicated.”

Adapt Rather Than React
“When we had terrorist attacks in November 2015 we didn’t change our security model, but we took tips from that, and consolidated and enhanced measures.”

Quality and Quantity
“The main thing is that you cannot have a cheap approach to security. It’s not just a guy on the door, it’s a process. Security has a cost, and you have to pay a fair price.”

The terrorist attacks on the Bataclan concert venue and the Stade de France in Paris, and the massacre in Nice, all took place since the last Air Show.

Yet the challenge of securing an already well-protected site is far simpler than providing security for large public events. The most recent edition of the European Football Championships took place in France last summer. The security operation was managed by Zaid Khoury, who is now a prefect in the French Interior Ministry but at the time was working for tournament organizers UEFA.

“My job was to create some harmony between the sport part and the state part on security issues, because there is a shared responsibility and you need one single umbrella,” says Khoury, speaking at the Counter Terror Expo in London in May. “Everything happening during the event – even outside the event – has an effect, not only in terms of image but in terms of organization.”
OPINION

Promoting Partnership Over Politics

National pavilions are an invitation to international cooperation

It’s been two years since the last Paris Air Show. What’s new in your country?

Depending on where you’re from and where you stand, it’s easy to mistake that question for a political statement. Since 2015, there have been more than 50 presidential elections around the world. Add parliamentary or legislative contests, appointed posts and related staff turnover, and there’s a lot of “what’s new” happening politically in most of our countries.

Considering the nature and outcomes of some of those elections – notably in the U.K., France, South Korea, the Philippines and the U.S. – you could even be forgiven for hearing a tinge of exhaustion in the query. For some, the pace of change has been nonstop.

From Kallman Worldwide’s perspective (we’ve been organizing U.S. exhibitors at international events since 1963, and at Le Bourget since 1995), the coincidence of this show with political shifts in one direction or another is somewhat “déjà vu all over again.” Over the past 22 years, the U.K. has had five prime ministers; France and the U.S. each had four presidents, South Korea six, and the Philippines five. Politics happens.

Over the same period, global military spending has grown from US$1 trillion to nearly US$1.7 trillion, according to the Stockholm International Peace Research Institute. Deloitte says commercial aircraft production has increased 120.5% since 1996 to keep pace with passenger and freight demand.

In other words, palace intrigue may be a perennial conversation starter at the Paris Air Show, but it’s not the conversation: The business of Le Bourget would appear to be politics-proof, or at least agnostic.

Thus, my question – and even more so, the answer – is precisely why America and 27 other countries are presenting national pavilions here this week, and it has nothing to do with politics.

National pavilions are a patriotic expression of collective industry pride, presented in the spirit of global partnership. From nation to nation, they’re an invitation: “Come see our country’s new equipment, products and services. Show us yours. Let’s work together.”

National pavilions are also practical. They give participating exhibitors – especially first-time small and medium-size enterprises (SMEs) – instant equity and scale. I think that’s why, as emerging economies flex their industry muscles in global supply chains, we’re seeing an increase in the number of national pavilions and exhibitors participating in them around the world.

Of the 2,300-plus exhibitors from nearly 50 countries participating in the 2017 Salon du Bourget, organizers report more than 1,300 – 55% – are exhibiting in a national pavilion.

The largest national contingent here besides France is the U.S., with more than 350 exhibitors. Nearly 70% – 240-plus – are exhibiting in the new 13,800-plus-sq.-ft. (4,200-plus-sq.-meters) USA Partnership Pavilion in Hall 3, the centerpiece of the American effort, organized by our company in coordination with numerous government agencies, including the Departments of Commerce, Defense and State.

Our pavilion exhibitors represent 32 states, including 19 state pavilions. More than 60% are SMEs, 78 are first-time Paris exhibitors, and all are working to initiate or strengthen connections that will create new jobs back home by growing exports and/or recruiting overseas partners to establish or participate in U.S.-based operations.

This is Kallman’s 12th consecutive Paris Air Show, the first organizing under the “USA Partnership Pavilion” banner. We chose this new name to communicate that, now more than ever, we all share in each other’s successes. Beyond the dollar value of buy-sell transactions, collaboration and teamwork are the preferred currencies of the global marketplace.

To punctuate the message, the pavilion theme is “celebrating a century of French and American partnership.” Bolstered by milestone achievements of the 20th and 21st centuries, the relationship between France and the U.S. exemplifies the spirit of bilateral cooperation promoted at Le Bourget since 1909.

The theme will be the topic of a keynote conversation between representatives of the American and French aerospace industries associations, AIA and GIFAS, in The Forum, the pavilion’s new presentation stage, Tuesday morning (Hall 3, Booth 3-D08). This weekend, we’ll extend the program with Public Day activities on Saturday.

Remarking on this initiative, Paris Air Show chairman Emeric d’Arcimoles noted, “Since the days of the Wright brothers and Blériot, France and the United States have shared a proud history, healthy competition and mutual respect for each other’s pioneering accomplishments in flight.”

Indeed, from OEMs to SMEs, Americans at Paris share those values with France and beyond. Our collective presence here affirms our nation’s commitment to global aerospace and defense partnerships that further common business interests and strengthen democratic alliances.

Tom Kallman is president and CEO of Kallman Worldwide Inc., organizer of U.S. exhibitors at the Paris Air Show since 1995.
The state that revolutionized the automotive industry has taken to the skies to become one of the top places in the country for aerospace business. Michigan. Home to more than 600 aerospace-related companies, Michigan is ranked among the top 10 states for major new and expanded facilities. To learn more about aerospace opportunities in Michigan, visit the MEDC booth in Hall 3 – E128 at the International Paris Air Show.
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