French President Arrives at Show

President Emmanuel Macron visited the Paris Air Show yesterday, showing his confidence in the French armed forces’ latest equipment by arriving in a French Air Force A400M. He toured the show’s static display and visited many exhibitors. He also dropped in at the U.S. Pavilion to underscore transatlantic partnerships.

The Drones Are Back!

For the second show running, the static display was photographed and filmed by a DJI Inspire 2 UHD 4K drone, flown here with special permission by Aero3A. Images are available from ASDS MediaBank at http://www.asds-media.com

Lines Spark Flurry of Orders

Order announcements flew fast and furious on the opening day of the Paris Air Show, surprising observers who had expected a lull in airlines stocking up on future capacity. But the launch of the 737 MAX 10 came with orders for more than 150 aircraft, while Airbus logged close to 300 sales for its A320neo family. CFM International boosted its backlog for Leap engines by more than 800 engines worth some US$6 billion.
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Working together with our customers, we’re leading aerospace and defense into the future.
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Cockpit Connectivity Communication Cabin

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Airlines Spark Flurry of Orders

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William Garvey Is Given Lifetime Achievement Award

Aviation Week Network’s William (Bill) Garvey was presented the Lifetime Achievement Award at the Aerospace Media Dinner in Paris on Sunday night. Bill is editor-in-chief of the leading business aviation publication, Business & Commercial Aviation.

During a career that has spanned nearly 50 years, Garvey has established himself as a well-known and widely respected ambassador for aviation. He has shaped BCA into a primary source of content that drives decisions in the business aviation community, delivering vital operational, safety and management information that can immediately be put to work in the cockpit, cabin or service hangar. The magazine has won numerous editorial awards under Garvey’s watch.

Garvey knows aviation hardware as only an active aviator can. He holds a commercial pilot’s license, and has multiengine, instrument, seaplane and glider ratings. He began his career as a newspaper reporter on Long Island in 1968, moving on to become a writer/editor for the Associated Press. He served as managing editor of Aviation Week Television, producing more than 100 videos. Prior to that, he was the top editor for both Flying and Professional Pilot magazines, as well as a member of the senior editorial staff at Reader’s Digest.

Commenting on the award, Joe Anselmo, Aviation Week Network’s executive director for content, said: “Bill is not just a talented editor, he is also a gifted writer. He is a fountain of knowledge and has helped many of us gain a better understanding of the business aviation industry. The Aerospace Media Dinner judges have honored a long record of outstanding achievements in aerospace journalism. All of us at Aviation Week are proud to call Bill a colleague.”

In 2015, Aviation Week & Space Technology’s former Editor-in-Chief David North was honored with the Lifetime Achievement Award.

More Awards for Aviation Week

FROM MILLENNIALS TO Baby Boomers, Aviation Week Network writers took home four awards at this year’s Aerospace Media Awards in Paris. In addition to the Lifetime Achievement Award for Bill Garvey of BCA:

• Aviation Week & Space Technology Pentagon Editor Lara Seligman beat out five other finalists for the Best Young Journalist award.

Lee Ann Shay Daniel Katz

• Lee Ann Shay, editor-in-chief of Inside MRO, captured the Best Future Tech award for an in-depth look at how the internet of things is changing the aftermarket business.

• Daniel Katz, Aviation Week’s director for defense analysis and data, won an honorable mention from the judges for his multipart series “State of Stealth.”

“We could not be prouder of our editorial team,” said Aviation Week Network editor-in-chief of BCA William Garvey, editor-in-chief of BCA.

Composite Fuselage for Boeing’s NMA

While detailed design of the projected new midsize airplane (NMA) is still years away, Boeing has confirmed for the first time that the concept will be based around a composite fuselage.

Revealing the first outline design elements of the proposed aircraft to ShowNews at the Paris Air Show, Boeing is showing a 787-like twin-engine tube-and-wing concept with high-aspect-ratio, fifth-generation composite wings. However the “tube” in this case is unusually shaped, being made up of a “hybrid” composite fuselage with a cross section whose shape is between that of the circular 777 and that of the ovoid 737. More details are expected to be unveiled today.

—Guy Norris
MORE NMA NEWS ON PAGE 16
Boeing Launches Largest 737 MAX

Boeing used the opening morning of the 2017 Paris Air Show to announce that it has officially launched the Boeing 737 MAX 10, destined to be the largest of the four-aircraft MAX range.

“Our customers told us to build it bigger . . . and that’s exactly what we’re bringing to the market,” said Kevin McAllister, Boeing Commercial Aircraft president and CEO.

He said that the company had already garnered more than 240 orders and commitments from 10 customers for the new type, with these planned to be announced throughout the show.

The MAX 10 will be capable of seating up to 230 passengers, with Boeing claiming a 5% seat-mile cost and trip cost advantage over its nearest competitor, the Airbus A321neo. Boeing defined some of the proposed modifications to the MAX 10 – then designated -10X – in January 2017.

“Adding the 737 MAX 10 gives our customers the most flexibility in the market, providing their fleets the range capability, fuel efficiency and unsurpassed reliability that the 737 MAX family is widely known for,” Boeing says the MAX 10 will have a range of 3,215 nm with one auxiliary fuel tank.

The MAX 10 has a 66-in. fuselage stretch compared to the MAX 9, together with levered main undercarriage. Other alterations to earlier versions include a variable exit limit rating mid-exit door, a lighter, flat aft pressure bulkhead and a modified wing for low-speed drag reduction.

Boeing is at Chalets 332 and 335, and on Static Display C2.

— Alan Dron

U.S. Navy Super Hornet Shoots Down Su-22 in Syria

The Syrian Armed Forces has warned the U.S. of “serious repercussions” after a Boeing F/A-18E Super Hornet belonging to the U.S. Navy shot down a Syrian Sukhoi Su-22.

The Soviet-era ground attack aircraft had dropped bombs close to U.S.-backed Syrian Democratic Forces (SDF) south of the town of Tabqah in Syria on June 18 and was “immediately shot down” by the Super Hornet.

The single-seat F/A-18 had been patrolling the area after Syrian government-backed forces attacked an SDF position in Ja’Din earlier in the day.

The Syrian government decried the incident in a statement confirming “the loss” of the Su-22 pilot. The Russian Ministry of Defense says in its own statement that the pilot ejected, but his fate is unknown.

The incident marks the first U.S. air-to-air downing of a manned Syrian warplane since the U.S.-led intervention in Syria to combat the Islamic State terrorist group began in September 2014.

The shoot-down comes after a U.S. Boeing F-15E Strike Eagle on June 8 intercepted and destroyed an armed UAV controlled by “pro-regime forces,” which had been threatening U.S.-backed forces fighting in Syria. The drone was reported as an Iranian-made Shahed 129, similar in size to the MQ-1.

In a statement about the Su-22 intercept, the combined joint task force leading Operation Inherent Resolve (OIR) said in a statement that the U.S.-led coalition operating in Syria “will not hesitate” to defend itself or partner forces from any threat. However, it stresses that the coalition isn’t looking for a fight with forces loyal to Syrian president Bashar al-Assad or his Russian backers but would act if necessary.

The air-to-air engagement occurred at approximately 6:40 p.m. local time. Coalition aircraft were conducting a “show of force” against pro-Syrian regime forces that had been advancing on Ja’Din 2 hr. prior.

Russia was contacted by the U.S. via an established “deconfliction line” prior to the Su-22 shoot-down to try and de-escalate the situation, CJTF-OIR says. Russia called the Su-22 shoot-down a “cynical violation” of the Syrian Arab Republic’s sovereignty and claims proper de-confliction procedures were not followed. Moscow says that from now on, coalition aircraft flying west of the Euphrates will be considered potential targets by Russian aircraft and surface-to-air missiles.

The Syrian government says in a statement that its aircraft crashed in the Resafa region of Syria. Damascus maintains its forces were targeting terrorists in the area and directly accuses the U.S. of supporting Daesh, the local name for the Islamic State.

This is the latest in a string of run-ins between U.S. and Syrian forces, the most spectacular being President Donald Trump’s Tomahawk cruise missile strike on Shayrat Airbase in April in retaliation for chemical weapon attacks on civilians by Syrian forces.

That attack, involving 59 missiles fired from U.S. Navy warships, destroyed several Su-22 and Mikoyan-Gurevich MiG-23 aircraft.

— James Drew

An F/A-18E Super Hornet launches from the flight deck of the USS George H.W. Bush.
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CAE Says Pilot Training Must Grow to Meet Demand

The world’s airlines will need 255,000 new airline pilots over the next 10 years, according to Canadian company CAE, which bills itself as the industry’s leading training organization for commercial aviation with a market share of about 25%.

“Rapid fleet expansion and high pilot retirement rates create a further need to develop 180,000 first officers into new airline captains, more than in any previous decade,” it says in its first Airline Pilot Training Demand Outlook, released today.

These numbers mean that over 50% of the pilots who will fly the world’s commercial aircraft in 10 years have not yet started to train.

“This record demand will challenge current pilot-recruitment channels and development programs. In turn, new and innovative pilot career pathways and training systems will be required to meet the industry’screwing needs and ever-evolving safety standards,” the report says.

Interestingly enough, it does not mention the word “shortage.” In 2016, approximately 20,000 pilots entered the airline profession around the world, and the industry will need to build on that momentum to meet future demand, says CAE president and CEO Marc Parent. There needn’t be a shortage, he maintains, if the airlines and the training industry recognize the future demand and prepare for it now.

In its leading role in training - CAE is twice the size of its nearest competitor - CAE is playing its part, working with airlines and regulatory authorities to develop innovative ways to train pilots.

One of those is the Multi-crew Pilot License program, launched in 2010 with Air Asia to accelerate 200 cadets into the right-hand seats of narrowbody airliners. “We’ve proven that the cadets are very high caliber - it’s not the flight hours that count, but their competency - and we’re seeing increasing demand from various areas of the world,” Parent notes.

The first nine AirAsia MPL cadets, who graduated in 2011 and have since been flying as first officers on the airline’s Airbus A320s, last month became captains.

“Our first MPL cohort is very talented and we are very proud of their accomplishment, today flying as AirAsia captains,” says Tony Fernandes, group chief executive officer of AirAsia.

Since 2010, more than 85 AirAsia cadets have been training through the MPL program.

Earlier this month India’s Jet Airways and CAE (Chalet 62) launched a new Commercial Pilot License (CPL) cadet pilot training program aimed at creating more than 380 professional pilots over the next five years. The first set of 60 cadets will begin training in the second half of 2017.

Also with Air Asia, CAE is developing its Next Generation Training System (NGTS), which builds on years of training advances with innovative data-collection and analysis techniques that measure and rate the skill performance of the pilot.

“This Next Generation Training System is the stepping stone to reaching a new level in pilot training efficiency,” says Fernandes. The NGTS is in beta-phase testing with several other airlines, and CAE hopes to formally launch it later this year.

NGTS will help airlines promote younger pilots to captain with training based on competency rather than flight hours.

“It uses data that allows objective assessment of pilots by skill level,” says Parent. “That knowledge is useful when you can use it to deepen the level of competency of those pilots,” he adds.

In addition to its civil and military training activities, CAE sold 50 full flight simulators last year, recording 8% growth with revenues of US$2.7 billion.

—John Morris
When it comes to MRO, Boeing is thinking big – really big. The company plans to use the Paris Air Show to set the stage for its July 1 stand-up of a new Global Services division that aims to capture a much larger share of the services work on Boeing and other aircraft.

How much? The airframer is aiming for the new unit to be generating US$50 billion – a figure that equals roughly half of Boeing’s current sales – annually within five to 10 years. It is, in the words of CEO Dennis Muilenburg, “a big, audacious growth target, but we can see our way through to achieving that.”

Boeing Global Services will merge the company’s commercial and defense services portfolios. Stan Deal, the president and CEO of the new Dallas-based business, says Boeing currently has a 7% aftermarket share on commercial aircraft in service and 9% on military aircraft. His boss, Muilenburg, wants to see that share mushroom. “There’s nobody with a foothold in both the government sector and the commercial sector like Boeing,” Deal said in an interview. “I’d like to increase our win rate by 100%.”

And that goal is not limited just to Boeing aircraft. “We already do a number of things on Airbus airplanes and Lockheed airplanes, and we plan to do more,” Deal says.

Deal explains that one of the keys to success will be a shift in culture. Boeing Global Services must get away from the company’s heritage as a heavy industrial manufacturer to provide faster, competitively priced services.

In addition to gaining more business from current capabilities, Deal expects to bolster growth with selective acquisitions and the launch of new services, such as 737BCF and Jeppesen FliteDeck Pro 3.0. Boeing Global Services will launch with four core service capabilities: supply chain; engineering, modifications and MRO; digital software; and training/professional services.

Those four service capabilities will in turn be distributed across four channels: commercial, business and general aviation, U.S. government and international governments.

“We’re in the midst of a reorganization,” Deal says, adding that more details about the unit’s structure should be announced in the third quarter. While the majority of military services will transfer to the new entity, some pieces, such as embedded engineering teams and modernizing current platforms, will remain under Boeing Defense, Space & Security president and CEO Leanne Caret.

Unlike its Commercial Airplanes unit, where Boeing faces a single primary competitor in Airbus, the services arena is much more fragmented. Competitors include Lockheed, L3 Technologies, Airbus and Lufthansa Technik, as well as a lot of smaller operators. A number of “nontraditional” players are also coming into the market, Deal says.

As he stands up its new organization, Deal wants a “service champion culture” that also incubates innovation. “Last year we produced 17 new services,” he says. “We’d (ultimately) like to innovate 100 ideas a year and take them to market.”

—Lee Ann Shay and Joseph C. Anselmo

UTC Aerospace Systems Celebrates Space Suit’s Role in 200th Space Walk

UTC AEROSPACE SYSTEMS is celebrating the use of its space suit on the landmark 200th space walk at the International Space Station, in May.

NASA astronauts Peggy Whitson and Jack Fischer took part in the milestone space walk on May 12, wearing the company’s Extravehicular Mobility Unit (EMU), which has been used on a total of 151 NASA space walks in support of ISS assembly and maintenance.

For Whitson, the space walk was her ninth, the most ever by a female astronaut.

“For more than half a century, UTC Aerospace Systems has provided critical life support technologies to help mankind explore the cosmos,” said Gail Baker, senior vice president, ISR and space systems. “From John Glenn’s first orbit of the earth, to Neil Armstrong’s first steps on the moon, to the 200th space walk at the International Space Station, we were there to help make the missions possible and keep the crew safe.”

The suit provides oxygen, carbon dioxide removal, thermal control and power for electronics including suit health monitoring and two-way communications.

UTC Aerospace Systems, a United Technologies Corp. unit, supplied space suit soft goods and helmets for Project Mercury, the U.S.’s first human spaceflight program, which began in 1958.

The EMUs were originally designed to support two-week shuttle missions but now remain in use for approximately six years.

—Helen Massy-Beresford
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Mitsubishi MRJ Makes First European Visit

Mitsubishi Aircraft has flown its much-delayed Mitsubishi Regional Jet to Europe for the first time to go on display at the Paris Air Show as flight tests continue.

The MRJ program has more than 400 orders, including options, but has suffered a series of major delays, with the latest announcement in January 2017 of a further two-year delay after new certification requirements forced a design revision.

When Mitsubishi launched the program in 2008, first delivery was scheduled for 2013.

“We have been experiencing very good progress on the flight-test program,” said Mitsubishi Heavy Industries president and CEO Shunichi Miyanaga. “At this moment, we don't expect to announce new orders this week,” he added.

Mitsubishi Aircraft’s (Chalet 266) sales and marketing VP and general manager Yugo Fukuhara told Aviation Week, “Of course we hope for European customers, but this is a global air show and we are also looking for customers in the U.S., Latin America and Asia.

In the long term, the company wants to sell more than 1,000 MRJs, including the 88-seat MRJ90 and the 76-seat MRJ70 variant, he added.

The aircraft on display in Paris is FTA-3, which took its first flight in Nagoya, Japan, on Nov. 22, 2016, and on April 1, 2017, arrived at the Moses Lake, Washington, flight-test center, where it has been undergoing a number of tests including on its avionics and autopilot. It recently traveled to Alabama to be painted in launch customer All Nippon Airways' livery before its Paris appearance.

It arrived in Le Bourget on June 15, having flown via Winnipeg and Goose Bay, Canada, and Keflavik, Iceland, Mitsubishi said.

“Bringing the aircraft to Europe is a very big milestone,” said Fukuhara. “We see around 100 potential customers for the MRJ, so we are always talking to around 100 potential customers. We can’t control the timing of any announcement - at the air show it is ideal but it is not necessary.”

First deliveries of the aircraft, to launch customer ANA Holdings, are scheduled for mid-2020. That will follow expected type certification in 2019.

The MRJ received the type certification for its PW1200G geared turbofan engine in May, following other notable program testing milestones in recent months, including static strength, company lightning, initial natural icing, cold and hot soak, high-speed flutter and flight load survey tests, Mitsubishi said.

Flight tests are focusing on the MRJ90 for the moment, Alex Bellamy, senior director, program management office, MRJ, at Mitsubishi Aircraft Corp., said.

“Our strategy is that if we mature the 90, the 70 will come quickly as a derivative.”

Aside from the four flight-test aircraft, another aircraft is also being used for ground testing in Nagoya.

ANA Holdings has 15 of the MRJs on firm order and in April said it would lease four more Boeing 737s from 2018 to cover the MRJ program delays, following previous decisions to postpone retirement of some 737-500s, and also buy three Bombardier Q400s to bridge the gap.

Osamu Shinobe, ANA Holdings’ vice chairman, said June 18 those fleet measures were enough to bridge the gap until 2020. Asked if ANA would be interested in the MRJ70 variant, he said the airline’s priority was introducing the MRJ90 but that it would think about the MRJ70 too.
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Daher to Grow Footprint in Americas

Aerostructure specialist and business aircraft manufacturer Daher says it is actually growing its American footprint, after years of expressing hope of doing so. Meanwhile, in aerostructures, the good shape of the commercial aircraft business has not offset the downturn in business jets and helicopters, which has been compounded by slow deliveries on some Airbus programs.

“We know we are going to do business in the Americas, thanks to aerostructure contracts we have already signed or are negotiating,” Didier Kayat, CEO of the Marseille, France-based company, told ShowNews. He would not give details on the new contracts, but a first foray has been the Gulfstream G500 and G600, for which Daher is supplying carbon-fiber main landing gear doors. It is also supplying spars for the Embraer Legacy 500. Kayat says his “American vision” goes from Brazil to Canada.

He also believes expanding on the other side of the Atlantic is good for “risk mitigation.” Over the past four years, Daher has focused on “robustness,” Kayat emphasizes. The goal has been achieved, notably with €1 billion (US$1.1 billion) revenues and a leap in on-time deliveries at Airbus’ factories, to 99.8% from 90%, Kayat asserts. The strategy in the Americas is the next logical step in becoming more robust, as Daher has so far relied heavily on European programs.

Part of the growth in the Americas is expected to come from acquisitions. This would be part of an “ineluctable” ongoing trend toward consolidation in aerospace suppliers. “There are too many players for this situation to be durable,” Kayat says. Such mergers are happening at the Tier 1 level, as exemplified by the Safran-Zodiac Aerospace agreement. French aerospace lobby Gifas has also been encouraging its smaller members to join forces. Daher is mainly family owned, and Kayat therefore trusts the company’s shareholders have a long-term vision.

For Daher, manufacturing aerostructures for customers in the Americas is relatively new, but selling aircraft there is not. The region, especially the U.S., has accounted for 85% of the sales of the TBM turboprops (the initial model being the TBM 700). Expanding a single product into a family of aircraft, the TBM 910 and TBM 930, has proved successful, says Kayat. More than 50 TBMs will be delivered this year, for the third consecutive year. “The program shows our customers we can certify an aircraft; it is a differentiator,” he adds.

Despite the good performance of the TBM on the market, Daher has been suffering from its exposure to slow sales in business aviation. The company is an aerostructure supplier for Dassault, which has been heavily impacted by the ongoing downturn. Gulfstream used to look immune but last year saw sales fall sharply. Some other sectors that used to be important for Daher are no longer healthy. The rotorcraft market has slowed down significantly since 2014. In contrast with the A320 and the A350 (for which Daher is a supplier), the Airbus A380 and A400M are produced at low rates. “Regional aviation has poor visibility on the depth of its backlogs,” Kayat adds.

As a result, in March, Daher was manufacturing 9% less aerostructures than planned when the company did its business forecast in October 2016. Kayat points out that Daher’s business model has services – such as organizing the logistics for Airbus Helicopters’ factories – as its second pillar. Accounting for 50% of revenues, they are more resilient, he says.

In technology, the company is now betting on thermoplastic composites. Compared to the more widely used thermosets, thermoplastics can yield lighter components with faster production cycles. “We have demonstrated the economical viability of thermoplastics,” says Kayat. Daher engineers built a thermoplastic composite rib that is 35% lighter than its metal equivalent but for the same cost, they claim. The part is being exhibited here at Daher’s Booth B253, Hall 2a.

—Thierry Dubois
Deployed and operational for today’s and tomorrow’s missions.
Boeing Facing a Challenge With the NMA

The good news first. Airline interest in the proposed new midsize airplane that Boeing is starting to develop from scratch and that Airbus is looking at responding to is huge. Seventy-eight percent of respondents in a joint Aviation Week/Bank of America Merrill Lynch survey said they were interested in buying such an aircraft.

In a market that is currently notorious for not placing many orders at all, that is a very significant number. Airlines also not only want the aircraft, they want it fast – some two-thirds would ideally like to take delivery of it by 2021, years before the earliest realistic entry-into-service dates the manufacturers can offer.

But the survey, published ahead of the 2017 Paris Air Show, also makes clear how difficult it will be for manufacturers to get definition of the aircraft right and that it is not a single aircraft they are looking at but a family with different range and seating versions. Airline requirements could trigger a fascinating strategy play that not only involves future designs but also includes current product lines: the Airbus A320neo family, which controls around 60% of the single-aisle market, a position it appears to be able to hold for the foreseeable future; and the Boeing 737 MAX, the relative weakness of which at the top end Boeing tries to address through the 737-900ER.

The middle of the market, sitting between true long-haul aircraft and the single aisles, has always been a tricky segment to address. Airbus started out as an aircraft manufacturer in what arguably is the most difficult part of the portfolio. The A300 and A310 were no real successes. The one true success in the space was the Boeing 757-200. The 767 and the A330 were already too much aircraft for the mission required. The A321neo and the A321LR look like they are getting closest to where the 757 left.

What airlines are asking of Boeing and Airbus in the survey puts the OEMs in a difficult spot: the vast majority of the airlines (90%) want fewer than 250 seats in a two-class configuration, but up to 5,000-nm range (76%). A not insignificant 24% want even more than the 5,000 nm. Two-thirds of potential future operators also expect a composite fuselage and composite wings. In other words, an aircraft not too different in size from today’s narrowbody families, but with a lot more range.

That is a problem for their suppliers. If they follow their customers’ requests, they risk either cannibalizing their current narrowbody offerings or making it harder to turn a successor into a commercial winner. Or, likely, both. Boeing not only faces the challenge of having to develop an aircraft similar in size to the 737 that is different enough to address different segments, it seems more or less committed to building a small 767ish widebody with a lot better economics than the 1980s design. But the smaller the aircraft gets, the more difficult it becomes to both keep widebody features and sustain narrowbody economics. Engineers are working on sophisticated designs that, Boeing claims, make both possible.

But do customers even want a widebody? The survey does not deliver a clear answer. Only 51% of the airlines involved would consider a small widebody if it fit into existing gate infrastructure. That is not necessarily always a given if manufacturers at the same time take the range requirement seriously, which would then likely mean a large wing. Of course, the wings could become an issue even for a long-range narrowbody at some of the single-aisle gates at dense airports.

At the outset, Airbus appears to be in the more comfortable position. The A321neo and its LR version seem to be about the right size for most operators, and being too small is not as serious a problem as being too big. On the other hand, the survey also shows Airbus is not there yet, in particular as far as range is concerned. A lot more work needs to be done, as the A321LR as currently proposed reaches only slightly over 4,000 nm. As part of the A321neo-plus-plus project (part of a broader initiative to modernize the A320neo family), some more capacity is under consideration, but, more importantly, more range has to be designed into the aircraft. Boeing knows the 737-9 and even less so the 737-10 are not the answer because of the range limitations. That’s where NMA comes into play.

And the market seems ready for it. Sixty percent of the survey’s respondents say what they have heard about the Boeing project meets their expectations, while only 40% say the same about the “A322neo,” the stretched and upgraded A320neo family addition Airbus has been looking at. Now all Boeing has to do is to get the design right. —Jens Flottau
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Raytheon’s Missile Systems Anticipates Single-Digit Growth

With ongoing North Korean missile tests and tension in Eastern Europe, the first successful test of the U.S. missile defense shield against an ICBM could not have come at a better time for missile maker Raytheon.

Taylor Lawrence, president of Raytheon Missile Systems, anticipates single-digit growth into the future. “We’re one of the engines of growth for the company,” he says. The missile shield test was a big win for Boeing, Northrop Grumman and other firms with work on the massive Ground-based Midcourse Defense program. Raytheon’s slice of that program, the Exoatmospheric Kill Vehicle Capability Enhancement—II Block 1, was a central part of the action. The test proved it worked, allowing production of the kill vehicle and Boeing’s Configuration 2 booster to proceed.

On that large national missile defense program, Raytheon is working on the next-generation kill vehicle using technology from the SM-3 IIA program. “As we build that out, we’ll flow technology in back into the SM3 IIA program at sea and ashore,” Lawrence says. Raytheon sees the portfolio as a family of kill vehicles from the exoatmospheric to the endoatmospheric to terminal capabilities with the Patriot missile defense system and even a next generation of point-defense systems with its SkySceptor, a version of Israel’s David’s Sling program to intercept medium- and long-range rockets.

Raytheon partnered with Israel’s Rafael on the 186-mi.-range (300 km) interceptor. Raytheon is also working on a derivative of Rafael’s Iron Dome – the Sky Hunter, which would counter rockets, artillery and mortar fire. “Depending on the class of threat that you’re facing, whether short-range threat or a midrange threat, you’re going to need various layers to defend yourself,” Lawrence says.

“Because those could come in in quite high numbers, you need high numbers to defend yourself. So you need a low-cost and affordable capability.”

In March, Poland formally declared its intent to purchase Raytheon’s Patriot missile defense systems, indicating a contract could be signed this fall. Raytheon has been working to entice Poland, offering the lower-cost SkySceptor.

“We have a great offering with Patriot, and we’ve augmented it with SkyCaptor, which is an exciting opportunity to give them a low-cost package that they’ve asked for,” Lawrence says.

—Jen DiMascio

Avio Aero Sees Additive Repair Future

ITALY’S AVIO AERO (Hall 1, Booth E318) is experimenting with additive repair technologies that could transform the company’s services business.

In conjunction with Bari Polytechnic in southern Italy, the company is exploring direct and cold deposition technologies that could be used to repair a wide range of complex metallic aerospace components. Scanners would map the component and would be able to locate areas of damage to be repaired. The technology could be applied to components produced through so-called 3-D-printed or through more traditional means such as casting.

“It’s an area of interest, because there is a huge fleet out there that needs to be served,” explained Riccardo Procacci, Avio’s president and CEO speaking to ShowNews on the eve of the Paris Air Show.

“If you can find new ways of serving the fleet for repairs and be more productive, that’s the way you open a new market.”

The direct deposition works in a similar way to laser metal deposition, heating the material and the powder to join them together. But Procacci believes the cold deposition holds more promise: it fires the material at a very high speed into the component being repaired, generating a plastic deformation and joining the material together.

“Being colder than any other repair technology, you don’t heat up the part; you rebuild it without altering its properties or coatings,” added Procacci.

Avio already has a limited services business, providing MRO services for military engines, but Procacci says that while this is an important area of work, it is unlikely to expand.

“Services is a key growth strategy for Avio,” added Procacci.

The General Electric-owned company is beginning to play a key role in GE’s additive manufacturing future. Indeed, GE CEO David Joyce suggested that Avio and Italy would be at the “center of the growth of our additive ecosystem.”

Avio’s facility at Cameri, near Milan, has been converted from an additive manufacturing technology center into an additive manufacturing plant producing fifth- and sixth-stage blades for the GE9X engine destined for the Boeing 777X family of aircraft.

—Tony Osborne
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UTAS Bets on Big Data, Electric Aircraft

After acquiring Goodrich in 2012 for US$18.4 billion, United Technologies combined it with Hamilton Sundstrand to create the super supplier UTC Aerospace Systems. Today UTAS employs 41,000 globally and counts on markets outside the U.S. for 60% of its US$15 billion in annual sales. President David Gitlin met with Aviation Week Editor-in-Chief Joe Anselmo and Senior Business Editor Michael Bruno at the company’s headquarters in Charlotte, North Carolina.

What are the biggest trends you see going on in aerospace?
We are behind the automotive industry by a decade or two, especially when it comes to more electric and intelligent vehicles. Automotive came out with [hybrid] electric vehicles 20 years ago with the [Toyota] Prius, and they were going zero to 60 [miles per hour] in 12 sec. Now you have Tesla and the Model-S going all electric and zero to 60 in just over 2 sec. Your car also is a lot more intelligent than it used to be – it can do everything from parallel park itself to [driving] hands-off on the highway. The amount of sensors and intelligence within the vehicle has grown exponentially over the last 20 years. You’re going to see the same on aircraft. Aircraft will for sure become more intelligent and more electric.

How far off is electric propulsion?
The honest answer is I don’t know, and I’m not sure the industry knows. But whether it’s 10, 20 or 30 years, it will happen. It will start small in general aviation and move up to business jets and so on. As the world’s leading electric systems business, we will continue to invest in the underlying enabling technologies.

What disruptive technologies do you see transforming your business?
The two biggest trends are more electric and more intelligent. We are perfectly positioned in the middle of these two seismic trends. We see a future where you have complete prognostics and diagnostics throughout the entire aircraft and an ability to have complete flight optimization. Traditionally in aerospace it has taken a very long time for technological advances to make their way onto an aircraft. As you go more electric and get more intelligent with more sensors, you will be able to implement technological innovation onto an aircraft much quicker.

How will UTAS leverage the big data innovation lab that United Technologies is standing up in Brooklyn, New York?
The digital revolution is an enormous enabler of trends taking place in the industry. Some operators want to do a lot more in house, and there are some that in a perfect world would focus exclusively on the passenger experience and turn over the keys of an aircraft to someone who can manage the flight optimization and the maintenance. Digital could enable us to manage their entire maintenance. UTC Aerospace Systems has 55 MRO sites and distribution centers all over the world. If you order anything off of Amazon.com, you know exactly where it is and when it’s arriving at your house. Often it’s the same day or the next day. We’re creating that same kind of ecosystem in terms of how we communicate and interface with our operators.

The OEMs are starting to push into the aftermarket.
We view that as an opportunity to partner with the key aircraft OEMs. If they want to provide a complete nose-to-tail offering, that’s OK. We just want to make sure that they partner with us on the equipment that we provide to them. We still want that direct airline intimacy, but in some cases it will go through the aircraft OEM.

Some observers have noted that aircraft have been producing data for a long time and not everything is need-to-know now. In some cases data is not being collected that would be hugely helpful. We have a new electric brake actuator controller (EBAC) that we’ll be introducing on the 787 in the next couple of months. We’ve designed that to gather in real-time data about the braking system that our previous EBAC would not have been able to get. That is very important for us to be able to ensure that our brakes don’t in any way impact the operator. I think big data is often talked about in a vacuum of “let’s just do big data.” I look at it in terms of the operator experience. How do we use data to improve our airline customers’ performance?
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Spirit Fabricates a Turnaround

For Kansas-based manufacturer Spirit AeroSystems, the answer to growth apparently has been right in front of it all along.

At least that is the hope, now that the company is well into efforts to grow its fabrication offerings for commercial and defense OEMs, as well as other aerospace and defense Tier 1 providers and maybe outside industrial companies, too.

“We see a significant opportunity in fabricating components, whether they’re metallic or composite, as a Tier 2 supplier, so to speak,” Spirit president and CEO Tom Gentile told ShowNews.

In interviews ahead of the Paris Air Show, Gentile and Alan Young, Spirit fabrication VP, offered optimism and insight into Spirit’s moves to catalyze its fabrication work into a margin-growing business. The project reflects a total reversal of company plans just two years ago, when previous leadership was looking at offloading Spirit’s fabrication capabilities.

“It was a small change, about 180 deg.,” Young jokes.

For instance, Spirit is integrating 20 new three- and four-axis fabrication machines it acquired recently from an unidentified Mexican seller and is now busy setting them up in the company’s McAlester, Oklahoma, center of excellence. The move came after Gentile – who took over a year ago – and his team began looking around the world for new sites to grow into. Instead, they learned it could be better to buy the machines, move them across the border and work with the local United Automobile Workers union to grow the work.

The McAlester center is part of a three-pronged plan to boost fab-based revenue for Spirit, Young says. The others entail harnessing the company’s chemical process and five-axis machining. Adding process certifications will help too. The fab push comes after Gentile came on board and looked to make the best use out of what Spirit already was doing. The company was then one of the largest fabricators of parts, but it was doing a roughly US$500 million business with itself, he says, consuming all 38,000 parts itself.

“We’ve had to reinvent ourselves” – a process that has included management restructuring – “and become a more outward-looking organization,” Young says. Similarly, his group now is partnering closely with Spirit’s aftermarket team.

But since redundant fab capacity was already in place on purpose, growing does not necessarily require a “huge” amount of investment, Young says. Instead, the company has been making more targeted investments, in new machines to take on small, aluminum three- and four-axis work, for example, or in hiring key managers and workers with critical skills. Likewise, the five-axis machine work already does not demand a large degree of manual labor and depends more on technology, processes and programming.

“We’ve really had a long, hard think about what we could be competitive on,” Young says. Getting more competitive mostly involves technology, engineering excellence, programming and product development. Spirit can offer faster turn times, attractive rates and expertise, he claims.

Gentile and Young decline to offer internal forecasts or metrics, but they assert they are already seeing progress. “Some of our suppliers have now become our customers,” Young says. He points out that Spirit is on record as saying it wants to do more Airbus work and more defense industry work.

“Frenetic times, a lot of activity, a lot of iron in the fire,” Young says. “It’s fair to say that Spirit is in a different place than three or four years ago,” Chalet 385.

Daher Showcases TBM 930 With WWI Livery

A DAHER TBM 930 business turboprop can be seen here at Static Display B4 with a symbolic livery honoring the 100th anniversary of America’s entry into World War I.

The stars and stripes featured on this TBM 930 are a reminder of the role of France’s Morane-Saulnier – the predecessor aircraft manufacturer to Daher – in developing America’s nascent airpower during the early 1900s, says Daher. Morane-Saulnier’s “Parasol” high-wing aircraft served as trainers for the American Expeditionary Forces at Issoudun, France, which was the world’s largest air base at the time. Today, Daher claims to have nearly 1,000 airplanes in operation in the U.S. The fleet includes “more than 600” TBM turboprops, as well as light piston singles.

“Backed by a network of 15 service centers, our company continues to give wings to U.S. aviators,” says Nicolas Chabbert, Daher airplane business unit SVP, Chalet 226 and Hall 2a, Booth B253.

—Thierry Dubois
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Boeing and Bombardier are clashing over whether deep discounts to key CSeries buyers are business as usual - the U.S. manufacturer has asked U.S. authorities to decide whether offering launch pricing to influential airlines years after an aircraft is launched is subsidy-enabled price dumping - or just an extension of established industry practice.

Commercial aviation is familiar with launch pricing, the often deep discounts customers are offered in return for accepting the risks in developing and introducing a new aircraft type. Every manufacturer does it. But what about a re-launch: Is the practice still acceptable?

Boeing (Chalets 332 and 335) is accusing Bombardier of selling its C Series jetliner at prices far below the cost of production. “Launch pricing, as the name suggests, occurs at program launch,” the company testified at an anti-dumping hearing of the U.S. International Trade Commission on May 18.

The sale of C Series CS100s to Delta Air Lines in 2016 was “a market defining event,” said Boeing vice chair Ray Conner. The sale set a “subsidized benchmark...far below the commercial price for that airplane that...will continue to hurt us for years to come,” he said.

Bombardier (Chalet 282 and Hall 2b, Booth G172) launched the CSeries in 2008, with Lufthansa as its first customer. In 2015, after development delays and cost overruns, a new CEO and commercial aviation management team at Bombardier re-launched the program with the goal of rebuilding a shaky order book around a core of major airlines whose endorsement would restore confidence.

“Seven to eight years after launch, a steep drop in prices would not be consistent with normal industry practice,” Boeing told the ITC - arguing that it instead shows the CSeries program is failing. Bombardier disagrees. “Having been on the buying side of aircraft for many years, I would view this as normal course,” says Bombardier Commercial Aircraft CEO Fred Cromer.

Cromer, hired from lessor International Lease Finance Corp. by new Bombardier CEO Alain Bellemare, acknowledges the company “reintroduced and re-launched” the C Series in 2015 after overcoming the development delays and demonstrating the aircraft’s promised performance.

Around the same time, the Montreal-based manufacturer secured a $1 billion equity investment in the C Series program from the Quebec government and sold a $1.5 billion stake in its rail business to Quebec’s pension fund. The capital infusion restored the struggling company’s liquidity and gave it the financial flexibility to aggressively pursue marquee customers.

In 2016, Bombardier secured first an order from Air Canada for up to 45 CS300s then an order from Delta Air Lines for 75 CS100s, transforming the order book and infusing new momentum into the CSeries program just as the aircraft entered service. But the sales came at deep discounts, Canadian accounting rules forcing the company to record a $500 million “onerous contract provision.”

Boeing told the ITC that the price at which Delta sold the CS100s to Delta threatens the survival of its 737-7, the smallest member of the 737 MAX family, now in development and scheduled for delivery in 2019.

Only Boeing is talking numbers, citing public data to claim the CS100 was sold to Delta for less than $20 million, but costs about $33 million to produce. That sale price is “off by millions,” says Bombardier. “The Boeing numbers are not accurate, whether we’re talking about the sales price or the cost,” Cromer says.

Boeing is pushing the ITC to find that price dumping enabled by government subsidies poses immediate economic harm, although the Delta deliveries will not begin until 2018, because the “price transmission” effect is already depressing 737-7 prices in sales campaigns at other U.S. airlines.

— Graham Warwick

The View From La France

Airbus says it has better aircraft offerings than Bombardier’s CSeries jet – and feels that Boeing gets too much help in the market. Asked about Boeing’s dumping claims against Bombardier, Airbus commercial president Fabrice Bregier said he personally feels them to be “inappropriate.”

“We have to focus on the competition, that we have a better aircraft than the CSeries,” he told Aviation Week.

“So far,” Bregier said, “we have demonstrated that because market penetration of the CSeries [has been] quite limited. A level playing field should be the ultimate goal for this market: We are also concerned about the level of support Boeing gets for the 777X, for example.

“It is a global worry, and I hope it will be regulated in a more consistent way.” —G.W.
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MiG Hopes for MiG-35 Fighter

Despite the Western sanctions, famed Russian jet maker MiG is here to remind the public – and the industry – of its latest iteration of the Fulcrum family, the MiG-35 fighter, and to attract attention to its other efforts.

The two MiG-35 prototypes have been in flight tests since the beginning of the year under a contract with the Russian Defense Ministry. “The government trials go according to the schedule and should be completed at the end of 2017, beginning of 2018,” MiG CEO Ilya Tarasenko told ShowNews.

The fighter is to be ordered by the military under the new defense procurement plan for 2018-25. The contract is expected to be inked after the trials end. This aircraft is based on the MiG-29K ship-based fighter supplied for both the Russian and Indian navies. Although it was previously offered to India with Phazotron-NIIR Zhuk-A AESA radar, the Russian military preferred the less-advanced Zhuk variant with slotted array. It can track up to 30 airborne targets at a range of 99 mi. (160 km), and engage up to six air- and four ground-based targets simultaneously. Another innovation is the new electro-optical station designed by Moscow-based SPP Corp. It combines an optical targeting system, an under-fuselage container for ground target detection, and missile approach and laser warning sensors.

The MiG-35 purchase is likely to mean salvation for the manufacturer, which ran out of large contracts last year. Tarasenko confirmed earlier that the Russian military received all ordered MiG-29K and MiG-29SMT fighters. The long-term contract for delivery of the ship-based fighter to the Indian Navy has also been completed. “We are waiting to sign a serial contract with the Russian Defense Ministry to start working with export customers,” Tarasenko said, adding that the export potential of this fighter may include more than 30 countries – operators of previous MiG-29 modifications. The priority markets are Asia and Latin America.

MiG is also attempting to diversify its product range beyond the fighters. At IDEX 2017 defense show in Abu Dhabi in February, the Russian manufacturer signed a letter of intent with UAV for joint development of the fifth-generation light fighter. Tarasenko was cited by Russia’s Kommersant daily earlier this month as saying that the partners were discussing the project schedule now. Another effort includes the development of future interceptor aircraft concurrent with the MiG-31 upgrade for the Russian Air Force. Tarasenko said that MiG designers are also working on light and medium unmanned aircraft that can combine reconnaissance, electronic warfare and ground attack missions. He promised that the prototypes will be demonstrated to potential customers soon.

The corporation’s facility in Lukhovitsy, near Moscow, has also been selected for the assembly of the modernized Ilyushin II-114-300 passenger turboprop. Its first flight is planned for next year, with serial production planned to launch in 2021.

—Maxim Pyadushkin

Leonardo Unveils Modernized Mirach

Leonardo has lifted the cover off the latest derivative of its Mirach target drone.

The single-engine M40 - Mirach 40 - is able to simulate a wide range of airborne threat targets, mimicking a variety of aircraft as well as infrared- and radar-guided missiles.

The company has developed the new Mirach with commercial components, making the system easily exportable, and says it features a greater range of capabilities, including anti-ship-missile-like sea-skimming flight as well as high-G maneuvering, which Leonardo says is uncommon in “comparatively priced competing systems.”

Launched by rocket and recovered by parachute, the Mirach M40 is the latest in a long line of Mirach-family drones. Earlier Mirach models are used by a number of air forces across the world, including those of France, Italy and the UK.

The company also says the new model can exceed the speed of competing systems, including twin-engine models, despite having a single, multi-fuel propulsion.

“The use of a single engine also reduces maintenance requirements and allows for easier deployment even at very remote training ranges,” the company says.

Leonardo’s latest Mirach target drone: the M40
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Textron Shows Off Scorpion

Things are looking up for Textron AirLand’s Scorpion jet this year.

The company will be showing off the Scorpion at the Paris Air Show at Le Bourget Airport this week fresh off the news that the U.S. Air Force has selected the low-cost intelligence, surveillance and reconnaissance (ISR) and light-attack jet to face off against Textron’s AT-6 Wolverine turboprop and Sierra Nevada-Embraer’s A-29 Super Tucano in a demonstration at Holloman AFB, New Mexico, this summer.

All three aircraft had been considered front-runners for the Air Force’s so-called OA-X light-attack demonstration, which could eventually lead to procurement of a low-cost light fighter fleet for counterterrorism missions.

Textron’s internally funded Scorpion jet made its first flight in 2013 but has yet to sign its first customer. The company recently withdrew the aircraft from competing for the Air Force’s T-X Advanced Pilot Trainer. Still, the company said customer interest was sufficient last October to start a limited production run.

The Scorpion made its international air show debut in 2014 with an appearance at the Royal International Air Tattoo in the UK. It also appeared at Le Bourget in 2015.

However, the Scorpion is seen as a bit more of a stretch for OA-X. It is a light jet rather than a turboprop, potentially a disadvantage from a cost perspective.

Still, Textron is confident both the Scorpion and AT-6 are “exceptional platforms” to fulfill the light-attack mission, spokeswoman Rosa Lee Argotsinger told Aviation Week May 15. “Both platforms offer advanced mission systems technology, affordability and adaptability,” said Argotsinger. “Designed, sourced and built in the U.S., the Scorpion and AT-6 also offer a strong, positive economic impact aligned with the goals of the current administration.”

GE Aviation’s ‘Printed Turboprop’ Engine Is to Run This Year

The world’s most “printed engine,” GE’s new Advanced Turboprop, in which additive manufacturing replaces 855 normally made parts with just 12 “printed” components, is on track to run for the first time this year. It will power Cessna’s new Denali aircraft.

“Everybody asks me what is the name of the new Advanced Turboprop,” says Brad Mottier, VP and general manager of GE Aviation’s business and general aviation and integrated systems operation. “And I tell them it’s ‘the Advanced Turboprop.’ ”

Interest in the new engine is running high, and GE is in talks with other civil and military airframe manufacturers for the ATP, which GE has designed to offer up to 20% better fuel burn and 10% more power than an equivalent-size 800-shp to 1,650-shp Pratt & Whitney Canada PT6.

It is, says Mottier, the first clean-sheet-design turboprop in its class in more than 30 years — since Honeywell certified the TPE331 in 1965. GE Aviation has committed more than US$400 million in development costs, and has invested more than US$1 billion in developing its additive manufacturing capabilities.

“We’ve built all of the additive manufacturing parts, and converted a test cell to run the engine at our turboprop center of excellence in Prague,” Mottier says. Production engines will be assembled and tested in a new factory being built there.

In an industry first for an engine this size, the ATP will feature a single-lever full-authority digital engine control (FADEC) that will manage fuel flow, propeller pitch and speed, as well as bleed valves and variable stators within the engine.

The result? Jet-like operability for the pilot, with a single “throttle” lever and built-in limit protections.

GE Aviation is at Chalet 142. Textron Aviation/Cessna is at Static Display A4.

—John Morris

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Spaceflight Takes Off...

For things (mostly) without wings because they are not needed in the vacuum of space, the Paris Air Show comes at a time when the space industry appears to be entering a golden age of government and private-sector activities at both ends of the size scale.

The next year could see full-scale ground tests of the first large rocket since Saturn V that is designed to take humans and other valuable cargo beyond low-Earth orbit, and early swarms of tiny satellites in LEO providing daily Earth-observation updates and total worldwide internet and other connections.

One or more companies soon will offer private citizens a firsthand glimpse of suborbital space for the price of an expensive ticket. And “New Space” entrepreneurs will continue moving space launch toward aircraft-like operations with reusable first stages and other components.

Meanwhile, the family of spacefaring nations is growing by leaps and bounds, with many of the new national programs likely to be on display at Le Bourget. China has much to show, as it progresses toward a Mir-class space station at the turn of the century, but nations as diverse as the United Arab Emirates, Thailand and Peru also are beginning to play in the space arena.

Goverments continue to be a huge source of funding for civilian and military space activities, spending about $US77.5 billion collectively in recent years, according to a count by the U.S. Aerospace Industries Association. The governments’ technical ambitions match the public money they spend.

For example, astronomers have grown accustomed to practicing their science from robotic vantage points above the obscuring atmosphere, to the point that spectacular Hubble Space Telescope images have become almost commonplace. Now the U.S.-European James Webb Space Telescope is undergoing thermal-vacuum testing in an old Apollo chamber at NASA’s Johnson Space Center, in preparation for a launch in 2018 designed to put its 6.5-meter (21-ft.) segmented mirror at the Sun-Earth L-2 point, for unprecedented infrared observations of the early universe and the planets orbiting other stars.

Work is beginning on Würtz, the Wide-Field Infrared Survey Telescope, a robotically serviceable exoplanet finder built around a surplus telescope mirror from the U.S. National Reconnaissance Office. China is planning a communications relay satellite to orbit the Moon, offering its services to all comers as the international “Moon village” proposed by European Space Agency chief Jan Woerner begins to develop with public and private investment.

Despite recent manufacturing setbacks, NASA continues to bend metal on its Space Launch System, or SLS, a heavy-lifter comparable to the Saturn that is intended to move humans and heavy robotic payloads to the Moon, Mars and well beyond in an effort to expand the terrestrial biosphere and press the search for extraterrestrial life forms.

The U.S. space agency is also drawing data from SpaceX’s private reusable launch vehicle development with infrared imagery of Falcon 9 landings. The data may one day inform the supersonic retro-propulsion techniques that probably will be needed to land the 20-ton payloads SLS will send toward Mars at the other end of the journey.

Spearheaded by SpaceX, reusable launch and reentry is the big story this year. The innovative launch-services upstart, headquartered in an old aircraft factory in Hawthorne, California, wants space launch to be almost as commonplace and cost-efficient as airliner operations, which don’t throw away the airplane after every takeoff.

The company has combined private and public resources to develop a reusable Falcon 9 first stage that is starting to demonstrate commercial reusability, landing on an oceangoing barge downrange. Soon the company hopes to fly its Falcon Heavy – three Falcon 9 core stages that will lift off bolted together side by side and land separately, tail-down.

For now, SpaceX has the commercial reusable launch market to itself, but that will not last forever. Blue Origin, another billionaire-backed startup, has demonstrated reusable suborbital flight with its New Shepard booster, flying five times without removing its cryogenic BE-3 engine and with only minimal refurbishment. The company is building assembly, test and launch facilities at Cape Canaveral for its orbital New Glenn launcher, which is in development to ride seven reusable BE-4 hydrocarbon engines to orbit and back.

Full-scale testing of the BE-4 is in the works. United Launch Alliance has partnered with Blue Origin on its development, and depending upon the outcome of the full-scale ground-test campaign sees it as the preferred engine on its planned Vulcan replacement for the Atlas V and Delta IV launchers. If the
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CONTINUED FROM PAGE 30

BE-4 doesn’t work out, Aerojet Rocketdyne is developing a comparable AR1 as a “drop-in replacement” for the Russian-built RD-180 that powers the Atlas V, as well as for the Vulcan and other launch vehicles in that class.

Vulcan is not the only new launch vehicle in development. Airbus Safran has broken ground on a new factory at Les Mureaux, France, where it will integrate the new Ariane 6 core stage, due for its inaugural mission in 2020.

On Sriharikota Island in the Bay of Bengal, the Indian Space Research Organization is preparing the first launch of its Geosynchronous Satellite Launch Vehicle Mk. 3, a long-awaited milestone that will mark the first flight of the launcher with an indigenous upper stage after years of using Russian hardware. And on Hainan Island off the south coast of China, the new heavy-lift Long March 5 is scheduled to launch the Shijian 18 communications platform soon, followed later this year by the Chang’e 5 spacecraft on the first leg of its lunar sample-return mission.

While the orbital launch industry booms, a new human spaceflight industry is on the verge of liftoff as well. Blue Origin has unveiled the autonomous New Shepard passenger capsule it will use to fly space tourists to the black sky and weightlessness of suborbital space, and Virgin Galactic is back in the air after a fatal flight-test accident with its piloted SpaceShipTwo suborbital tourist spaceplane.

Both are also marketing their capabilities to microgravity researchers who need a little more time than they can get on a sounding rocket to run their experiments, or to check out their hardware for a stint on the International Space Station (ISS).

For research that doesn’t require hands-on crew time, Sierra Nevada Corp. (Chalet 254) is offering its Dream Chaser commercial ISS cargo carrier as a stand-alone orbital laboratory. The lifting-body reusable spaceplane is attractive to researchers who need its low-G runway return to recover delicate samples for analysis on the ground.

Dream Chaser was an unsuccessful contender in NASA’s commercial-crew competition, and it may yet fly humans if another customer can

Rendering of Sierra Nevada’s Dream Chaser spacecraft and cargo module attached to the ISS

real spaceflight hardware, advances in miniaturization are driving the development of smallsat constellations of smallsats for Earth observation and broadband communications.

Planet, formerly DigitalGlobe, is on the verge of bringing the internet to villages in the developing world – will take a lot of LEO birds.

OneWeb is well on the way to a planned 720-satellite constellation that will bring the internet to villages in the developing world and add capacity to satellite internet elsewhere.

Never a company that thinks small, SpaceX plans a constellation of 4,225 LEO spacecraft eventually. Others are working toward smaller swarms in the nearer term, such as the 60-CubeSat constellation Canada’s Kepler Communications plans to launch by the end of 2017.

Rocket Lab, Virgin Galactic’s LauncherOne and other launch service providers are working hard to move smallsats from piggyback-payload status onto dedicated rides sized for their spacecraft.

It is just one more example of the proliferation of spacecraft applications in operation or development as planet Earth moves toward an off-planet economy.

—Frank Morring Jr.
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The ANTONOV AN-132, a manoeuvrable bird with fast takeoff and landing capabilities, can operate anywhere in the world in all weather conditions. A joint product venture between world leaders in aviation, the AN-132 features innovative technologies, combined with ANTONOV’s vast experience, and can be used for a range of civil and military tasks.

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Ariane 6 Production Costs to Drop 50%

As the advent of new commercial players has forced the European space industry to reinvent itself, the goal of a 50% cut in launch costs is trickling down to every aspect of the Ariane 6’s production.

The European Space Agency, launch operator Arianespace and launcher manufacturer ArianeGroup (formerly known as Airbus Safran Launchers) contend an expendable heavy launcher can still compete with the most urgent threat to the Ariane 5 – SpaceX’s reusable launchers. But it can do so providing costs are halved and reliability stays at its current level, the European stakeholders believe. Engineers are confident their experience will ensure the latter condition is met – the latest Ariane 5 flight was its 78th success in a row. They are now focusing on the former, from new methods of assembly for the Vulcain 2.1 engine to the layout of the integration building for the Ariane 6’s main stage.

A factory is now being built at ArianeGroup’s site in Les Mureaux, France. The assembly line of the new launcher’s lower liquid propulsion module (LLPM) will focus on improving production techniques. The most salient change is in the module’s position. Whereas manufacturing the Ariane 5’s LLPM involves erecting it four times, the Ariane 6’s LLPM will be put together horizontally. Vertical integration used to be the norm since the Ariane 1 or even before – for missiles – in the French industry and had never been challenged. Yet, it takes 5-7 hr. each time an Ariane 5 module has to be “verticalized” or “horizontalized.” The Ariane 6 will be erected once on the launch pad.

In the new configuration, workers will be closer to each other. They no longer will be on different floors, thus making communication easier. Workers will no longer have to travel in an elevator or organize a separate journey for pyrotechnic material. For a team manager, having the overall view of the work will be more natural. On the floor, flows have been made as straight as possible, with a minimum number of turns and crossings. The expected bottom line is greater productivity.

New processes have been adopted. A laser (instead of a chemical liquid) will be used for metal surface treatment before the thermal protection is applied. The thermal protection layer will no longer take the form of panels but will be sprayed onto the metal. Both changes are devised to accelerate production and improve quality. Friction stir welding will replace the more conventional tungsten inert gas method, mainly to improve quality.

Meanwhile, the new building’s non-recurring and operating costs are expected to be much lower than they would have been with the current practice. At 25 meters, its height will be more than halved, which reduces the amount of steel used in the construction. Completion of the building is anticipated in the summer of 2018. But, in order to start using the building as soon as possible, the factory will be finalized in sequence. Those areas that will be ready first will immediately receive production equipment. Friction stir welding equipment will be delivered in August.

In a virtual reality room, workers can ensure a job can be performed. The space between two objects must be compatible with the use of a tool, for example. Each task has to be validated. ArianeGroup’s engineers thus hope to detect 95% of the potential problems the factory’s layout could cause. The Ariane 6’s production schedule calls for the first complete LLPM to be shipped by the summer of 2019.

In Vernon, near Les Mureaux, the assembly line is being rearranged to halve the Vulcain 2.1 engine’s production cycle. For example, transferring the finished engine into its container will take half a day, compared to 3.5 days for the Ariane 5’s engine.

A Vulcain 2.1 is put together on a mobile arm. This enables workers to always have the engine at the correct height, thus reducing the number of quality mishaps. The improvement impacts design, as easier manufacturing allows different positioning of some parts relative to each other – a groove no longer has to be below the related seal, for example. As of May 19, the first Vulcain 2.1 was in final assembly.

In April, a program review confirmed “sufficient maturity” to begin the production of the Ariane 6’s ground qualification models, which will undergo exhaustive testing. Production of the first flight models is scheduled to begin by year-end. The first flight of an Ariane 6 is slated for 2020.

—Thierry Dubois
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**Aerojet Rocketdyne and Orbital ATK Remake Themselves**

Before there were SpaceX, Blue Origin and other upstart space-access providers, Aerojet Rocketdyne and Orbital ATK were on the scene. Once safely ensconced as the propulsion subsystem providers of choice in the then largely government-driven space market, the two companies have been remaking themselves in the face of Silicon Valley billionaires and the impatient and commercially oriented business climate in which those competitors operate.

For Aerojet and Orbital, the business transformations have been occasionally painful and practically existential. But they also have been necessary, according to executives and analysts who follow the sector. And there is more change to come.

In August, Orbital ATK (Chalet 102) acknowledged that overly aggressive bidding on its US$2.3 billion, decade-long contract with the U.S. Army for small-caliber ammunition at the armed service’s Lake City Army Ammunition Plant in Missouri, coupled with a then-new business-tracking software system, forced the company to have to restate financial results for 2015. Worse yet, in early April 2017, an explosion at Lake City killed one employee and damaged one of the facilities.

Not surprisingly, Orbital has been reconsidering Lake City. In a May 11 teleconference with financial analysts, executives said they were “finalizing multiple offers to purchase the facility.”

Better known for its rockets, satellites and NASA work, Orbital – which merged with the aerospace half of Alliant Techsystems in February 2015 – also has been the key provider of ammo to the U.S. military and is one of the world’s largest manufacturers of small- and medium-caliber ammo. That kind of portfolio diversity has been crucial for Orbital to ride out the tumultuous space-access and satellite markets.

New product development has been a key focus, according to what Orbital CEO, president and co-founder Dave Thompson has told analysts in recent quarterly teleconferences. One new offering is an on-orbit satellite servicing system. Final design review of the system is slated for this month, and the self-funded program remains on track for delivery to the launch site and launch of the first satellite servicing vehicle at the end of next year.

Near term, Thompson says Orbital is considering starting on a second servicing vehicle later this year. “We continue to proceed along the lines of having a small fleet of up to five of these servicing systems in orbit over the next four to five years, some of which will have advanced capabilities, robotic capabilities beyond those of the first and second satellites.”

As for Aerojet Rocketdyne, on April 10 the company announced plans for a second phase of its CIP/competitive improvement program, first launched two years ago. Aerojet plans to consolidate its Sacramento and Vernon, California, and Gainesville, Virginia, sites while centralizing and expanding its presence in Huntsville, Alabama. The latter will include a new manufacturing facility for AR1 engine production, as well as additive manufacturing (AM), composites production and R&D. The facility is expected to be ready for production by mid-2019.

Huntsville will gain 800 jobs in the transition, but about 1,100 of the existing 1,400 positions in Sacramento will be relocated or eliminated, as will 170 jobs via Gainesville’s closure. “Given the dynamic nature of this industry, strategic business decisions such as these, while difficult, are critical to establishing a solid course for our future,” Aerojet president and CEO Eileen Drake said April 10.

Yet the company has been consolidating and restructuring for years. In June 2013, it bought Pratt & Whitney Rocketdyne. In 2015, besides launching the CIP, it changed its name and corporate structure from GenCorp to Aerojet Rocketdyne, replaced Scott Seymour with Drake, and made a long-shot bid to take over United Launch Alliance, a 50/50 joint venture of Lockheed Martin and Boeing that is a principal customer. This year, along with unveiling the second wave of CIP, it bought the Coleman Aerospace business unit from L3 Technologies.

“There is recognition that cost will be a driver,” Aerojet senior VP for strategy and business development Jim Simpson said. It is not that cutting costs is new, but it is now on par with product performance and seen as a differentiator in a commercially driven space market.

—Michael Bruno
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First Japanese F-35 Emerges From MHI

It’s a far cry from the early 1970s, when Mitsubishi Heavy Industries (Hall 4, Booth C78) built some 20 F-4 Phantoms a year, but the company has just rolled out the first of 38 Lockheed Martin F-35A Lightnings scheduled for local assembly.

The fighter, put together at Nagoya, Japan, follows four F-35s that Lockheed Martin delivered to the Japanese Air Force from the program’s main plant, at Fort Worth, Texas.

Since MHI is only assembling F-35s, apparently using no domestically made structural parts, the program is not sustaining much of Japan’s skills in fighter manufacturing. Going back to the 1950s, the company previously made F-86 Sabres, F-104 Starfighters, Phantoms and Boeing F-15 Eagles, additionally fabricating the parts. It also built combat aircraft that it designed, the MHI F-1 and F-2.

All that ended when the last F-2 was completed in 2011, though local fighter manufacturing may resume next decade if Japan launches development of an indigenous combat aircraft or one to be made jointly with another country. The defense ministry has said it chose not to build F-35s locally because the U.S. insisted on very tight technology control, Japan was not prepared for manufacturing and MHI could still learn advanced techniques in assembly. Unmentioned is the obvious problem that tooing up to make some fraction of 42 aircraft would be quite uneconomical.

—Bradley Perrett

Italy Rolls Out First F-35B

THE FIRST SHORT takeoff and vertical landing model F-35 to be assembled outside the U.S. has been rolled out from Italy’s Final Assembly and Check-Out (FACO) facility.

The aircraft, coded BL-1, was rolled out at the Italian government’s FACO at Cameri airbase on May 5. The LRIP Lot 9 aircraft is the first of 30 F-35Bs ordered by Italy, with the fleet to be split equally between the Italian navy and the air force. The air force will also operate around 60 F-35As.

The aircraft is now being prepared for its first flight with formal delivery planned for November. Rome wants to use the F-35B to replace the A-11 Ghibli, also known as the AMX light attack aircraft, and the McDonnell Douglas AV-8B Harrier in service with the air force and navy, respectively.

Italy spent roughly US$1 billion establishing the FACO at Cameri, crafting the workstations to be replicas of those found at Lockheed Martin’s Fort Worth, Texas, facility. The investment was seen as a major step to anchor work for the country’s aerospace sector, with Leonardo leading the effort, especially with the expected ramp down in Eurofighter Typhoon orders.

The milestone comes just months after Italy began basing its first F-35As at Amendola airbase.

—Tony Osborne

Germany Could Replace Tornado With F-35

The German air force is seriously interested in the Lockheed Martin F-35 Lightning II as the central node of its future networked strike complex, which includes unmanned surrogates.

Germany is considering starting a new development program or buying an off-the-shelf, next-gen warplane as a future replacement for the Cold War-era Tornado.

Called Command Fighter Advanced (CFX), the future fighter would replace the Tornado around 2030. It must be tightly interoperable with unmanned assets, specifically disposable, reconfigurable “remote carriers” and reusable unmanned combat air vehicles (UCAV) that can return to base after missions.

Lt. Gen. Helmut Schutz, commanding general of the Luftwaffe’s Air Forces Command, said May 24 at a close-air-support summit in Washington that a request for information is about to be sent to the U.S. capital for information about the F-35.

He says Germany is looking at what advanced fighter aircraft are available on the market today and if any meet the Luftwaffe’s vision for future combat operations. The F-35 is being seriously considered because of its advanced sensing and networking capabilities, and because it finally would allow the Luftwaffe to be more interoperable with its NATO allies.—James Drew
Des pièces aérospatiales fabriquées en Ontario sont utilisées dans 80 % des satellites de communication commerciaux et intégrées aux dix principaux programmes d’avions mondiaux. Les sociétés de l’Ontario sont donc devenues spécialisées dans la mise au point de matériaux légers de pointe et de solutions logicielles avant-gardistes qui permettent de réduire les coûts en carburant et d’optimiser le rendement.

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Creating the Seeds of Disruption

“Transportation as we know it is set to change. The dominant solutions available today are deeply flawed and demand disruption,” states Omer Bar-Yohai, the founder of EViation – the Israeli startup that is preparing to lead this change.

The sharing economy with Uber-like solutions, the shift to sustainable energy and autonomous vehicle technologies are all set to be major factors in this disruption. We make the tools that will take this disruption to the sky!

“We design, test and build the tools that will enable the future of regional transit by air, changing consumers’ perception of both distance and time,” claims Bar-Yohai. Five years from now, EViation is set to enable cheap, high-speed, sustainable and convenient regional commuting using light aircraft, tightly integrated with on-demand ground transport solutions. Currently, a sub-scale prototype is undergoing testing and risk-reduction evaluations. The company expects its first firm orders from its lead customer next year.

With EViation’s all-electric aircraft, the company’s customers will be able to fly six to nine passengers across distances of up to 800 mi., at a cruising speed of over 220 kt. “With this aircraft, air taxi operators will be able to serve customers’ on-demand travel [to] the nearest landing strip for the price of a train ticket,” Bar-Yohai says.

“Our solution is electric from conception,” Bar-Yohai explains, “taking a holistic approach to aircraft design, allowing us to fully optimize the benefits of electric aviation.” These include distributed propulsion and optimally efficient aerodynamic design enabled by all-composite design, higher propulsive efficiency and compact energy storage using high-energy density batteries.

The new aircraft will also be designed with autonomous flight capabilities and built to work in today’s regulatory environment. “We became part of NASA’s on-demand mobility program and GAMA and the FAA electric aviation committees,” Bar-Yohai says.

Operators will benefit from the lower energy and reduced maintenance costs, while low noise and zero emissions enable such electrically powered planes to operate from landing strips close to urban areas.

—Noam Eshel

EViation has three designs in the pipeline.

- Alice, a small aircraft designed to carry six to nine passengers, cruising at 10,000 ft. to a range of 350 mi. at a speed of 220 kt. Alice will be optimized to operate as an air taxi and will be offered for roughly US$1.4 million in serial production.
- Alice ER, the “luxury” model. At a cost of only US$1.9 million, EViation is positioning Alice ER as a low-cost but highly usable alternative to an expensive executive plane. The aircraft will be able to carry six passengers and fly from any airstrip capable of operating general aviation. With a pressurized cabin, it will be able to climb to and cruise at 28,000 ft. and fly up to 800 mi. at a speed of 250 kt.
- EViation’s Orca, the unmanned variant, designed to a maximum takeoff weight of 250 kg. Orca will be able to travel more than 497 mi. at a cruising speed of 144 kt. and remain airborne for more than 8 hr., carrying a payload of 50 kg. Designed for VSTOL (very short takeoff and landing), it only requires a 99-ft.-long (30 meter) runway.

EViation partnered with established manufacturers for production and certification risk sharing. At the Paris Air Show, the company unveiled its teaming with Magnaghi Aeronautica SpA, the manufacturer of the SkyAero aircraft, and FBM, an Israeli producer of carbon-based composites, which manufactured the all-composite prototypes. EViation (Static Display A8) has teamed with Leonardo and Dassault Systems to pursue unmanned variants of the design, with up to a gross takeoff weight of 5 tons.

—N.E.
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Elbit Systems Unveils All-Seeing SkEye

Elbit Systems is publicizing a novel wide area persistent surveillance (WAPS) capability that was kept under wraps for years, as it was providing unique operational capability for homeland security and the fight against terror.

Known as SkEye, this WAPS maintains video surveillance over a huge area, using a single payload that integrates multiple cameras that together provide an image of one billion (10^9) pixels in size. The system enables military and security forces to constantly and closely monitor an area of interest (AOI) up to 50 sq. mi. (80 sq. km) large.

SkEye provides real-time, high-resolution monitoring of the entire area, covering up to 10 simultaneous areas of interest in real time.

In addition, it provides operators and analysts “backtracking” capability, tracing events back in time to detect the origins of related movements and events.

“SkEye is not positioned to replace traditional payloads but to provide a new capability that we know as WAPS - it provides a clearer picture in less time, thus exponentially increasing trust in the decision-making process.”

Yair Ganor, business development manager for persistent surveillance and WAPS at Elbit Systems’ Intelligence & C4ISR division, explained. While looking over a large area of interest, operators can zoom into 10 different regions of interest (ROI) to understand the connection between unfolding events. This is achieved without neglecting the rest of the area, which is still being recorded and constantly analyzed.

The solution is operational in several countries, utilizing unmanned platforms such as the Hermes 900 and Hermes 450, as well as various light manned aircraft including the Cessna C208 Caravan and the Viking Air Twin Otter DHC-6.

The aircraft installations are often used over urban areas where access of unmanned systems is limited. Such platforms are more suitable for border and infrastructure security, as well as for military persistent surveillance in combat theaters where permissive environments enable continuous loitering of drones.

BrightNite Opens the Night for Helo Pilots

**ELBIT SYSTEMS HAS RECEIVED** the first order, worth US$17 million, from a NATO country, for its BrightNite vision system, designed to enhance the visibility and situational awareness of helicopter pilots in degraded visual environment (DVE) flight conditions. The order calls for the delivery of an unspecified number of BrightNites to be integrated and installed on the customers’ helicopters.

BrightNite enables helicopter pilots to operate safely at night more than 90% of the time, including in DVE and adverse weather conditions that otherwise limit helicopter operations.

Low-flying helicopters are especially vulnerable to risks - difficult terrain, enemy fire or obstacles in their flight path. Prior to BrightNite, flight crews have had to rely on night vision goggles (NVG) to accomplish their mission. Factors such as complete darkness, poor weather conditions, brownouts, whiteouts and sandstorms often limit the pilots’ field of view (FOV) using NVG.

Comprised of non-gimbaled, uncooled FLIR and complementary, highly sensitive metal-oxide semiconductor (CMOS) sensors, the BrightNite DVE solution provides the pilot with an intuitive image with an ultra-wide field of regard, projected through the pilot’s helmet-mounted display through the ANVIS/HUD.

The sensor is installed in the helicopter’s nose, to obtain a panoramic picture arc in front of the pilot. This picture is displayed to the pilot in real time.

This piloting solution delivers the landscape scenery directly to both eyes of the pilot, augmented with 2-D flight symbology and 3-D mission data layers superimposed on the outside terrain picture. This method enables BrightNite to provide an intuitive head-up, eyes-out orientation when flying in pitch-dark or brownout conditions.

In 2016, the company successfully demonstrated the system in a series of night flights carried out in Israel on an Airbus Twin Star helicopter. The flights involved dozens of pilots from different nationalities from various services. They flew missions on moonless, pitch-dark nights. For the demo, BrightNite provided the pilots with night-piloting capabilities similar to and even exceeding those of attack helicopters.

—Noam Eshel

**SkEye, says Elbit, “provides a clearer picture in less time, thus exponentially increasing trust in the decision-making process.”**
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IDEAS BORN TO FLY™
The DA62 MPP (Multi-Purpose Platform) builds on the company’s success with multi-mission versions of the smaller DA42. Diamond claims that the 5,071 lb. (2,300 kg) maximum-takeoff-weight DA62 will challenge more expensive and heavier business turboprops such as the Beechcraft King Air that are widely used for intelligence surveillance and reconnaissance missions, in part because of its low operating costs and endurance of up to 10 hr.

The company claims that its low-noise and infrared signature will allow it to loiter over targets without being noticed. The enlarged cabin provides additional volume, comfortably accommodating two pilots plus two mission system operators along with their equipment.

Diamond has modified the nose to accommodate larger electro-optical cameras weighing up to 220 lb. A belly station is capable of mounting radar payloads weighing up to 110 lb., while a satellite communication pod housing holds L-, Ku- and Ka-band antennas.

The DA42 MPP TerraStar is a radically modified version of the 2-metric-ton twin-engine general aviation platform. The aircraft has been developed to meet upcoming demands for an aerial survey platform to be used by the oil, gas and mining industry, capable of carrying very low frequency antennae, radiation detection and magnetometer sensors.

Also making its international debut here is the company’s new range of ground station systems designed to work in coordination with Diamond’s MPP platforms. Standard functions of the ground stations include video transmission from the airborne platform to the ground station, voice communications, mission planning, moving map, video management and secured connectivity back to headquarters. The company is also planning to demonstrate a new communication antenna capable of receiving S- and C-band frequencies in the same device. Diamond worked with Vienna-based Propagation Ideas & Solutions (PIDSO) to develop the system for use on the DA42 and DA62 MPP aircraft.

The system combines two antennae in a single enclosure, which impacts less on the aircraft’s aerodynamics and speeds up the integration process on the platform.

The two companies have also started the development of a "triple band plus dual polarized antenna that will also meet future requirements," said Alexander Hauthaler, Diamond’s technical director of special-mission aircraft.

Making its Paris debut is the Dart-450 carbon-fiber civilian-certified aerobatic trainer aircraft powered by the Ukrainian Ivchenko-Progress Motor Sich Al-450 lightweight turboprop engine.

The 4,700-lb. gross-weight DART-450 is designed to have a +7/-5G aerobatic capability as a trainer and 8 hr. endurance as a surveillance platform. The cockpit is equipped with Garmin avionics, side-stick and pneumatic ejection seats. Joining the DART-450 is the 3,968-lb. DA50-V piston-engine light aircraft capable of carrying five people including the pilot. The DA50 will be available in three different variants: the four-seat 230-hp DA50-IV, the five-seat 260-hp DA50-V and the seven-seat DA50-VII.

K-Max Production Run Extended

KAMAN SAYS IT will extend the production run of its K-Max utility helicopter out to 2019, having been encouraged by increased demand and interest for the aircraft.

The initial production run of the distinctive single-engine intermeshing-blade rotorcraft ended back in 2003, with 38 aircraft built. However, the success of a U.S. Marine deployment of an autonomous K-Max in Afghanistan has helped to generate renewed interest in the type. Kaman (Chalet 8 and Hall 3, Booth D118) restarted production in 2015 with a commitment to build at least 10 new aircraft.

Orders for new K-Max helos have so far come from China, Europe and North America.

The company says that additional unmanned firefighting and humanitarian missions for the K-Max are also being developed and tested.

“Continued demand [for] and interest in the capabilities of the K-Max have provided us the confidence to extend production into 2019 at a minimum,” said Kaman Aerospace president Greg Steiner.

“Our team has done a great job assessing the global market and working with potential and existing customers to secure additional orders for our K-Max helicopter.”

The first flight of a new-build K-Max from the reestablished line took place on May 12; the aircraft is due to be delivered to Lectern Aviation, a firefighting operator based in China. Two more have been ordered by Alaska-based Rotak Helicopter Services.
F-35 Lightning IIs have flown thousands of sorties powered by the F135 propulsion system, developed from the highly successful fifth-generation engine for the F-22 Raptor. Pratt & Whitney partners with customers around the world to provide sustainment solutions that keep the F-35 Lightning II dependable and affordable. We are proud to power today’s most advanced fighter aircraft. Now, we are advancing engine technology to provide the next generation of fighter engines for tomorrow’s defense needs.

Learn more at pw.utc.com
Certifications Bolster Pratt’s GTF Lineup

Pratt & Whitney expects production capacity increases will see deliveries of its PW1000G geared turbofan family continue to ramp up back toward earlier targets while progress continues on component upgrade programs designed to improve the durability of early delivery GTF engines.

Amidst the production ramp-up for the PW1100G-powered Airbus A320neo and PW1500G-powered Bombardier CSeries, the paces of GTF certification and flight test support also continues to accelerate in support of three other GTF-powered programs: the Irkut MC-21, Embraer E2 and Mitsubishi Regional Jet MRJ-70/90. The MC-21, powered by the PW1400G, made its first flight on May 28, while the FAA has now certified the PW1900G for the E90/195-E2 and the PW1200G for the MRJ.

Pratt, which is currently completing assembly and test of the sixth and seventh PW1400G for delivery to Irkut, says the only engine certification program remaining for completion is the PW1700G for Embraer’s E175-E2. The certification plan for this engine, an aero-mechanically identical variant of the 56-in. fan diameter MRJ engine, is expected to remain broadly on track despite Embraer’s late 2016 decision to delay the service debut of the shorter “E2” family member by a year until 2021.

Updating progress on Pratt’s recovery plan from the problems that mostly dogged the PW1100G program, Pratt & Whitney Commercial Engines president Chris Calio acknowledges the company has “had some challenges in the first 18 months. On the industrial side we have had fan blades pace some of our deliveries early on. So in response we have brought on line two additional fan blade production facilities—one in Japan and one in Michigan. This has doubled our capacity and yield is improving. We think fan blades will no longer be a pacing item and we are catching up there,” he says.

The production issues were focused on manufacturing quality of the hybrid titanium-aluminum fan blades for the PW1100G and PW1500G. Versions of the hybrid blades are also made for the 73-in.-diameter PW1900G for Embraer’s E190-E2 test fleet and the 81-in.-diameter PW1400G for the prototype versions of the Irkut MC-21. The fan blades for the smaller, 56-in.-diameter PW1200G and PW1700G developed for Mitsubishi and Embraer are made from solid titanium and not impacted by the same production ramp-up issue.

Calio, one of several top new executives introduced by Pratt president Bob Leduc, also says testing is progressing on an upgraded combustor design that is expected to counter problems that have led to some engine removals from A320neos operating in India. “We have seen some durability issues on the combustor panels, particularly in harsh environments. So we offered an upgrade last year that improved time on wing and we have another coming up this year that will further improve that.”

The upgraded “Block C” standard combustor is expected to be introduced in the fourth quarter of this year.

Addressing the carbon seal problem around a bearing housing that led to additional engine removals, Calio says this was caused by “premature deterioration. We recently completed a retrofit around the fleet in under a month so that issue should stabilize. We have also got a new configuration in production engines that should improve time on wing. Some of those in the field have accumulated pre-existing wear and so the retrofit should stem that tide a bit.”

“New production engines are coming off the line with a full set of hardware and software fixes,” says Calio. “This is a long term game and we continue to be in the early stages of that game. We know we have caused our customers some pain and some disruption so addressing those issues is our 100% top priority and will continue to be.

“We will absolutely get these issues fixed and we will absolutely get this engine to where it needs to be.”

Around 65 GTF-powered A320neos and CSeries aircraft are now in service. Pratt expects to deliver between 350 and 400 PW1000Gs by the end of this year.

Pratt & Whitney is at Chalet 346.

—Guy Norris

PT6 – Engine of Change?

Pratt & Whitney Canada (Chalet 346, Static Display C2) is celebrating recent delivery of its 100,000th turbine engine but is adding little to an earlier revelation that a 2,000-shp powerplant is in prospect for both helicopter and airplane applications.

Speaking in Geneva on May 21, P&W general aviation marketing VP Nicholas Kanelias would say only that the company was running demonstration programs for technologies to be incorporated.

But having stressed how much the venerable PT6 has changed during its 50-year life, P&W seems curiously reluctant to consign the designation to history and adopt a new number for a 21st-century turbine. The decision, it seems, has yet to be made.

Speaking in March, company president John Saabas noted that the company had identified a gap in its product range between the 1,750-shp PT6C-67C/E and the 2,300-shp PW100 family of engines. The new “PT-Something” would likely be a further development of the PT6C core and be ready to launch by the end of the year – at least in an initial, helicopter platform, delivering a 10-15% reduction in specific fuel consumption.

—Paul Jackson
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Pratt’s F-35 Engine Upgrades Reflect Eye on the Future

Pratt & Whitney is framing its F135 upgrade effort as the first step in a long-term roadmap for fighter propulsion based on adaptive technology.

The manufacturer hit a new milestone in its roadmap for upgrading the F135 turbofan that powers the Joint Strike Fighter, and is looking to leverage that success to help secure the next generation of fighter propulsion.

The engine maker recently completed key tests of a proposed core upgrade package for the engine, confirming the potential for significant fuel savings and higher F135 thrust as soon as 2020. Crucially, the improved performance would come at a reasonable price to the U.S. government – the upgraded powerplant is “cost neutral” from a procurement perspective, says Matthew Bromberg, Pratt’s president of military engines.

But the F-35 is planned to fly far beyond 2020 – until 2070, if recent Pentagon estimates prove correct. The fighter will need an engine that can keep pace with technological advancements for the next five decades. For now, as prime contractor on the F-35 powerplant, Pratt has a foothold in current and near-term U.S. fighter propulsion. But as threats and technologies evolve, that may change.

Both Pratt (Chalet 346) and General Electric (Chalet 142) are working under the U.S. Air Force-led Adaptive Engine Technology Demonstration (AETD), as well as the follow-on Adaptive Engine Transition Program (AETP), to test technology for a new generation of fighter engines. Under AETP, Pratt and GE are developing demonstrators – Pratt’s XA101 and GE’s competing XA100 – to pave the way for an adaptive, 45,000-lb.-thrust-class combat powerplant, as well as the possible re-engining of the JSF.

Hoping to stave off competition from GE and other engine makers, Pratt has framed its F135 upgrade effort as the first step in a long-term roadmap for fighter propulsion based on adaptive engine technology. That not only refers to the three-stream adaptive cycle the industry is currently maturing, but also adaptive controls, an adaptive sustainment system, and eventually perhaps an adaptive core that can handle unique operating pressure ratios, Bromberg argues.

Pratt’s F135 modernization plan is envisioned as a seamless bridge to a next-generation fighter engine – the initial core upgrade package, or Growth Option (GO) 1.0, is just the first step.

“As each upgrade becomes available we will look at taking the elements of that architecture suite and inserting that into the motors as available,” Bromberg says. “Adaptive architecture is the umbrella for the future of fighter engine propulsion and Growth Option 1.0 will be the first incarnation of upgrading the JSF to go down that direction.”

GO 1.0 is the first phase in a two-stage improvement roadmap for the F-35 engine first unveiled in 2015, promising 6-10% more thrust and 4-6% fuel burn reduction. It builds on a suite of core technologies evaluated since 2013 under the U.S. Navy-sponsored FBR (fuel burn reduction) program. It also incorporates design improvements developed by Pratt under earlier technology programs including the Air Force-supported component and engine structural assessment research (Caesar), which focused on the F135’s predecessor, the F-22’s F119 engine.

Evaluation of the package, which is focused on the high-pressure compressor, turbine and combustor stages, was done using testbed engine FX701-1 at test site A3 at Pratt’s West Palm Beach, Florida, facility. Although not a program of record for the F-35, Pratt says risk-reduction work done on the test rig has proved GO 1.0 could be executed as a low-cost means of improving the aircraft’s range and acceleration.

“We feel very confident that we could launch a program, complete the testing and EMD [engineering, manufacturing and design], and have a production change or retrofit available by 2020,” Bromberg says. If Pratt gets “the green light” to begin work on a formal improvement package this year, he says, the development would align with the JSF’s planned Block 4.2 upgrade.

Pratt believes GO 1.0 is very attractive to the F-35 community, primarily due to affordability. After the “relatively short” EMD program, the U.S. government would have to swap out the old engine for the new, upgraded system across the fleet, but that could be done on an attrition basis during scheduled depot maintenance.

At its core, Pratt’s overall strategy is to provide options for whatever path the Air Force chooses.

“We have this umbrella strategy of adaptive architecture and we will start proving out the technologies one by one,” Bromberg says. “We are trying to provide options to spiral them in at relatively low-risk, low-cost programs.”

—Lara Seligman and Guy Norris
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A decade of asymmetric warfare against low-intensity opponents, Western air forces begin to increase their capabilities against near-peer adversaries, demanding more advanced capabilities.

Facing growing threats means new, advanced air defense capabilities, modern fighter planes and smarter and more agile sensors and missiles. While many air powers field fifth-generation fighters, they also maintain their current fleets of combat aircraft, which must be upgraded to align with the new capabilities.

Israel’s Rafael Advanced Defense Systems (Static Display A8) offers the weapon systems, avionics and ISR capabilities that enable such airplanes to meet these goals to achieve superior qualitative military edge (QME).

“Our systems enable existing aircraft to obtain updated intelligence, cooperate better and strike with utmost precision, well beyond the enemy’s reach,” said Yuval Miller, Rafael’s executive VP and general manager of the company’s air and C4ISR systems division.

According to Miller, these systems include new generations of targeting and intelligence, surveillance and reconnaissance (ISR) assets, comprehensive communications networks and data links, an enhanced family of standoff, guided munitions and the latest families of air-to-air missiles.

“Unveiled here at the last Paris Air Show two years ago, Lightning 5 is the latest version of our Litening targeting pod that introduces revolutionary capabilities in both air-to-surface and air-to-air warfare,” Miller said. The pod’s capabilities are measured in electro-optical performance, which are five times better than Litening 3, enabling pilots to acquire targets and engage them from a range well beyond 100 km (62 mi.). “Beyond targeting, these pods are capable of air-to-ground missions with ISR and BDA, and support air-to-air missions well beyond visual range. In fact, even aircraft equipped with integral infrared search and track sensors will benefit from Litening 5 air-to-air capabilities such as target identification and recognition,” he explained.

Rafael’s Reccelite XR represents the latest reconnaissance pod variant. Previous versions were used primarily for stand-in missions. According to Miller, thanks to the XR’s superior optics and sensors, Reccelite XR can fulfill almost 80% of the standoff missions performed with long-range optical sensors (LOROS). In addition, it offers the mission flexibility and persistence required for persistent wide area surveillance (PWAS) missions, which are critical capabilities for asymmetric warfare. These missions are performed either by combat aircraft or unmanned platforms.

Rafael’s Spice family of smart, guided aerial weapons continues to expand, and now includes the 2,000-, 1,000- and 250-lb. variants. The Spice 250 introduces another revolution, as it allows an existing fleet of aircraft to quadruple its strike capacity. This new weapon is designed to defeat soft and hard targets in stationary or moving profile, on land and at sea. The system employs the Spice’s traditional scene-matching guidance technology, enhanced with special algorithms and communications to receive updates and acquire moving, relocatable or naval targets. This guidance system is immune to countermeasures such as GPS jamming, providing significant increase in aircraft load-out on such traditional platforms as the F-16 and F-15.

“Last year, we completed an important test series and will soon complete another series, toward initial deliveries of operational weapons next year,” Miller added.

Rafael’s latest air-to-air missiles are designed to enable air forces to meet modern threats posed by adversary air power. The I-Derby ER beyond-visual-range missile is the newest interceptor introduced by Rafael for air-to-air and surface-to-air missions. This variant of the Derby is equipped with a new digital, software-programmable active-RF seeker with sophisticated electronic counter-countermeasure (ECCM) capabilities and advanced multi-pulse rocket propulsion extending its range well beyond 62 mi. while maintaining high kinematic efficiency at the terminal phase.

The advanced capabilities introduced by Litening 5 and Spice are equally important to the Joint Strike Fighter (JSF), but the integration of such systems on a fifth-generation platform is not a simple task. “We are convinced that the operational needs will bring our systems to those platforms,” commented Miller. “The F-35 is highly advanced and impressive and the integration of our systems will enable it to maintain its qualitative advantage in the Middle East theater.”

—Noam Eshel
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Sixth-Gen XA100 and XA101 Engine Studies Ramp-Up

The age of the adaptive cycle engine, as a new class of combat aircraft propulsive system in its own right, is edging closer to reality with detailed design of the first three-stream demonstration units under the U.S. Air Force’s Adaptive Engine Transition Program (AETP) getting under way.

AETP will mature three-stream engine technology for the future U.S. Navy F/A-XX and the Air Force’s F-X sixth-generation fighters. Targeted initially at the 45,000-lb.-thrust class, the engine is also baselined to fit within the existing confines of the F-35A engine bay, making it a contender to replace the Joint Strike Fighter’s current Pratt & Whitney F135 from the mid-2020s onward. New contracts worth some US$2 billion for the AETP demonstrators were awarded in June 2016 to General Electric and Pratt & Whitney.

To underline the importance of this step toward the emergence of a new generation of engine technology, the air force has broken with tradition by designating the two AETP demonstrators the XA100 and XA101. Instead of following on from the “F” for “fan,” or turbofan series, which most recently saw the F135/136s developed for the F-35, the new “A” for “adaptive” naming convention is a milestone on a par with the start of the naming of “J” for “turbojet” series in the 1940s. The XA100 is being developed by GE, while the XA101 is being designed by Pratt.

The third stream provides an extra source of airflow that, depending on the phase of the mission, is designed to provide either additional mass flow for increased propulsive efficiency and lower fuel burn for longer endurance, or additional core flow for higher thrust and cooling air to boost combat performance. The third stream can also be used to cool fuel, providing a heat sink for aircraft systems. The additional flow can also be used to swallow excess air streaming up around the inlet, improving flow holding and reducing spillage drag.

“It’s great to get a designation, and that validates it is more real,” says GE Aviation Advanced Combat Engine programs general manager Dan McCormick. “It is still an X engine, so it is still in development, but I thought it was good that this step was taken. The Air Force went through some debate over whether they call it another F-series engine, but they ended up going to the A-series engine. To me this validates a whole new architecture and a whole new line of engines,” he adds.

GE is currently progressing through the final phases of the AETD program by conducting component evaluations and running or evaluating data from three rig tests of a compressor, core engine and adaptive fan module.

The third large-scale rig test is the core engine, which is also expected to wrap up late this month or early in June. “It is a pretty challenging program because it is very complex. That is because with an adaptive cycle engine with the three streams and heat exchangers, when you run the core you have to simulate the rest of the engine. It is actually more complicated to run than a full-up engine test, because we have to adapt the facility to simulate the inputs from the rest of the engine,” McCormick explains.

Although the overall pace of testing has been slower than hoped, McCormick says, “we are still making great progress and have over 30 hr. of tests on the core.”

Aerodynamic and aero-mechanical data from the compressor and fan rigs will aid design of the XA100 for improved operability. “All these lessons learned [are] very valuable,” says McCormick. “In terms of performance, we are getting the compression characteristics and stage loading we expected, and in terms of operability, it can handle the surge margin, and so on.” The core engine test, meanwhile, provides another data set for the compressor. “And we are starting to get combustor and turbine interactions around that,” he says.

While neither GE nor Pratt have shown details of their adaptive engine designs, both incorporate variable geometry devices that dynamically alter the fan pressure ratio and overall bypass ratio—two key factors influencing specific fuel consumption and thrust. The adaptive, multi-stage fan boosts fan pressure ratio to fighter engine performance levels during takeoff and acceleration, and in cruise lowers it to transport-aircraft-like levels for improved fuel efficiency. The third stream, which is external to both the core and standard bypass duct, is used to alter the bypass ratio.

—Guy Norris

Safran Proceeds With Zodiac Takeover

SAFRAN’S SHAREHOLDERS APPROVED on June 14, during their annual general meeting, the financial resolutions ensuring the advancement of the plan to acquire Zodiac Aerospace.

The general meeting, with more than 90.5% of votes cast in favor, approved the amendment of the bylaws to create preference shares. It simultaneously authorized the board of directors to issue preference shares in the event of a public exchange offer. Both resolutions were required to implement the offer on Zodiac, Safran says. “I am delighted with the mark of confidence of our shareholders,” chairman Ross McInnes stated.

The day before, Zodiac had confirmed it was progressing as hoped to solve its manufacturing problems. The group’s progress in on-time and on-quality deliveries are in line with the April 28 plan, CEO Olivier Zarrouati said. He specifically referred to Airbus A350 livery deliveries (now heading to a monthly delivery rate of 10) and to fixing issues in the Cwmbran, UK, seat factory. “We are ahead of the plan, profitwise,” he added.

In his last order announcement before leaving his position, Zarrouati said Air France has selected the Optima business-class seat for its new A350s and for the retrofit of some Boeing 777s. Yann Delabrière is taking over from Zarrouati today. Safran is at Chalet 139, Hall 2a Booths 228 and 252, and Static Display B4.

—Thierry Dubois
The money is being invested in equipment for snow clearance and rapid runway repairs, Maj. Gen. Mats Helgesson, chief of the Swedish Air Force, told journalists in Paris on June 18.

Sweden has famously deployed its jets onto highways and general aviation airfields since the early years of the Cold War to increase their chances of surviving an expected Soviet attack. The dispersed basing systems such as Ba90 actually shaped the requirements of Swedish fighters, in particular the Viggen and more recently the Gripen.

However, the skill of operating from roads has faded since the end of the Cold War, and Sweden’s focus on more international operations meant the need for the practice has gone away. However, the resurgence of a more belligerent Russia, military activity in the Baltic and a renewed Swedish focus on national defense has prompted the air force to return to the regimen.

Helgesson said the air force was “very heavily investing in this [capability] right now,” as it faced unfriendly neighbors, in reference to Russia.

The dispersed operations are expected to feature heavily in an upcoming nation exercise called Aurora, which will test the country’s armed services’, national guard’s and government agencies’ ability to deal with a national emergency. Some 19,000 personnel will take part in the exercise planned for September.

Helgesson said the armed forces was benefiting from an SKR10.2 billion increase in defense spending until 2020. The increase was helping them to rebuild capabilities including the establishment of a battle group on the strategic Baltic island of Gotland to be equipped with mechanized and armored units.

Although the focus is now on the development and service entry of the new Gripen E, the first prototype of which flew on June 15 prior to the Paris Air Show, Helgesson said it was getting ready to make a decision on a life extension for the air force’s six Lockheed C-130H Hercules to see them through to around 2030.

The upgrade, likely to begin in the next two to three years, would address new navigational and air traffic control requirements and any airframe issues. Helgesson also said that the air force planned a further request for information to probe the market on a future training system to replace the aging Saab 105/Sk60 trainer, which has been in service for 50 years. The fleet will likely have to soldier on until 2024/25, he added. —Tony Osborne

—Tony Osborne

The Swedish Air Force is plowing SKR2 billion (US$230 million) into new equipment to allow it to resume Cold War-style operations from road runways.

Sweden Steps Up Dispersed Operations

The Gripen E flies – but can it land on a road?
Leonardo is progressing its plan to turn its M-346 jet trainer into a lightweight multi-role combat jet with the revealing of a new, meaner version of the aircraft here at Paris.

The M-346FA - Fighter Attack - builds on the FT (Fighter Trainer) model unveiled at last year’s Farnborough Airshow by adding additional weapons hard points in the form of wingtip missile rails as well as fitment of a radar that had been designed by Leonardo for the aircraft more than a decade ago.

“We have a platform flying with a lot of potential,” said Leonardo test pilot Enrico Scarabotto, speaking to journalists at the unveiling of the aircraft here on June 18.

“Adding additional sensors and weapons turns it into a light fighter and adds an aggressor role,” he added.

Leonardo says it is taking a family approach in terms of the aircraft’s development and marketing. The company will continue to offer the aircraft in its basic advanced jet trainer mission, but customers will be able to add a series of optional extras to take the aircraft to its light attack role including defense aids, secured communications and the option to carry a targeting and reconnaissance pod. The company is also studying the integration of smart weapons, an electronic countermeasures system and also some limited radar cross-section (RCS) reduction including cockpit coatings, air-intake grid and radar-absorbent-material application.

Scarabotto said RCS reduction could serve the aircraft well in the aggressor role.

The company says work has already been carried out in clearing the aircraft to drop several types of dumb bombs and that the Litening targeting pod has already been partially integrated. Leonardo has also defined the steps to integrate the radar into the avionics. Additionally, it sees potential in the integration of the IRIS-T air-to-air missile in conjunction with a helmet-mounted sight.

The company is hoping that these initial steps to de-risk development will help encourage customers to get behind the program and “maintain a competitive cost,” Scarabotto said.

Several air forces have already expressed their interest in the M-346FT and FA models, the company said.

—Tony Osborne

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Israel Sharpens Its Air Power

Fielding a new wing of fifth-generation Lockheed Martin F-35A fighter jets, modernizing its existing air power and quadrupling its strike capacity, the Israel Air Force is undergoing a generation leap that will prepare it to meet future challenges.

The most significant modernization currently under way is IAF’s fielding of 50 U.S. F-35A Lightning II fifth-generation fighters, dubbed Adir. Israel has already fielded five such planes and intends to field an entire squadron by 2020, to be followed by a second, and possibly a third squadron in a five-year span. As the first stealth-capable combat jet the IAF has ever operated, the Lightning II opens unprecedented opportunities and expanded freedom of action, particularly when nations in the region are equipped with increasingly advanced counter-air and ground-based air defense capabilities.

With its stand-in survivability and excellent sensors and connectivity, the F-35 also improves the combat potential of the entire air force, both in air superiority and air strikes. Yet, as advanced as the avionics armament on the JSF is, the IAF plans to enhance and improve the plane, adding indigenous capabilities. For that purpose, Israel will receive a test aircraft to serve with the country’s flight-testing unit and enable testing of weapons, systems and modifications exclusive to the IAF.

Opponents that will have to deal with Israel’s air force will realize a strike potential that is disproportional to any air forces of a similar fleet. Challenged with massive growth in rockets and missiles aimed at the homeland, the IAF more than quadrupled its strike generation rate, using precision-guided weapons. These capabilities can be employed against all types of targets, in all relevant ranges. This trend will continue, with the introduction of smarter, lighter weapons that would increase the load-out of conventional aircraft (Lockheed Martin F-16I, Boeing F-15I) that still form much of the combat force.

Use of unmanned platforms is likely to be increased. With the introduction of Elbit Systems’ Hermes 900 and IAI Heron TP, the IAF has increased the utilization of drones over a wide range of missions. Since drones currently operate in permissive airspace, it is likely that the IAF will adapt new protection measures and other capabilities to maintain their services even in the presence of the advanced air defenses that begin to appear in the region.

Future improvements could also deliver new assault transport capabilities, enabling the air force to enhance operational capabilities for special operations. Two options are considered: the CH-53K and Boeing CH-47F - both offer significantly higher performance and lift capabilities, compared to the CH-53/2000. But if special operations are considered, the outsourcing of its training and simulation, turning to the commercial sector to deliver turnkey systems that included aircraft, avionics, maintenance, training aids and flight simulators. The recent programs include the supply of Italian-made Leonardo/Aermacchi M-346 Lavi that replaced the Lockheed Martin F-16B and old A-4N Skyhawk, and the establishment of the “simulator squadron” where pilots can train in complex air combat scenarios. This trend will continue with the introduction of large UAV simulation facilities and new flight simulators for the F-35.

—Noam Eshel

Two of the five new F-35s currently operating with the IAF. Orders for all 50 aircraft are secured, with options for 25 more.

F-35 Adir pilots are training with other units. An F-16I is at right.
Israel’s missile pioneer Rafael Advanced Defense Systems (Static Display A8) is showcasing the latest version of its multipurpose guided missile — Spike LR II. Company executives define the new variant as the first “fifth generation” guided missile, for its ability to adapt to and defeat different types of targets and countermeasures, including active protection.

Spike-LR II is smarter, sharper and more agile than its predecessors, but is designed to operate from the same launchers used for Spike MR and LR, enabling users to modernize and gain more firepower without investing in new logistics and infrastructure. Rafael offers a new, lightweight launcher that enables light helicopters to carry four such missiles, which can defeat main battle tanks, vehicles or bunkers from 6.2 mi. (10 km).

The new missile uses a new, passive and uncooled multiband seeker that integrates both thermal and high-definition color imagery, increasing the weapon’s target acquisition and tracking efficiency even against complex and evasive targets. The new seeker features a smart target tracker using artificial intelligence features.

Designed for use against elusive targets with low signature, Spike LR II has an embedded inertial measurement unit, allowing the missile to pursue targets or grid coordinates allocated by remote source. This function is useful for “lock on after launch” or when engaging “disappearing targets,” when the launching platform does not have visual identification of the target.

Rafael offers the missile with a choice of two warheads — an anti-tank missile optimized with an enhanced tandem charge that increases armor penetration by 30% over the previous generation. Another advantage of the new missile is its ability to strike at higher impact angles — Spike LR II will be able to hit targets at up to 70 deg., delivering more lethal top attack profile.

The second type is the multipurpose version, provided with a different tandem warhead using multiple fusing presets designed to defeat light or fortified targets. The variable fusing enables the operator to set the fuse to penetrate a target or explode on impact. Designed to operate as a penetrating warhead, the missile’s warhead would breach a small hole through reinforced concrete, for the main charge to follow through.

Rafael plans to deliver the weapon to operational units by the end of 2018. —Noam Eshel

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Raytheon Oversees Changing ISR Market

It’s the perennial problem-set facing defense contractors: New threats requiring new solutions emerge faster than procurement systems can respond; meanwhile, consumer technologies race ahead, suggesting that higher capability can routinely be achieved at an ever-decreasing price point.

Yet at Raytheon Airborne Systems in the UK, a solution may have been found. Overseer, a modular mission system built around COTS (commercial, off-the-shelf) hardware, and able to integrate a wide variety of sensors, has been developed with a specific future use case in mind — yet its deliberately broad applicability will enable the company to compete for a wide range of new business.

“If you look at legacy systems, they tend to be really bespoke coded applications into the sensors, and that’s really not where software is today,” says Phil Nettleship, Raytheon AS’s chief technical officer. “We’ve specifically looked at where airborne platforms are going in the future, and we’ve tried to address how you might bring in new sensors and change technologies without having to re-code the whole mission system.”

Overseer is built around COTS hardware running Microsoft’s Windows 10 operating system. This means future Overseer iterations should not be limited by hardware or software compatibility issues.

“Microsoft has said they’re not going past Windows 10 – from now on it’ll be Windows 10, build X,” explains systems engineer Phil Collier. “They’re trying to make Windows 10 as future-proof as possible, and that fits in with what we’re trying to do.”

In a demonstration at Raytheon’s facility in Broughton, North Wales, Collier shows how different sensor feeds can be overlaid onto a single operating picture on the Overseer workstations. Off-board sensors — for example, video being streamed from an unmanned aircraft — can be displayed in windows over or next to information from radar or electronic-intelligence sensors.

“The way we’ve developed the system allows the pattern-of-life [picture] to be viewed alongside live data,” Collier says. “I can create another viewing window, load previous data, then compare it with the whole solution.”

The initial impetus for development came out of the anticipated requirement for an updated mission system for the Royal Air Force’s Sentinel R1 fleet, for which Raytheon is the prime contractor. The Sentinel mission system is nearing the end of its working life, though indecision by the UK’s defense ministry about the platform’s future has meant no contract has yet been issued for an upgrade. Work on Overseer has been funded internally by Raytheon: Development took place in the UK, so the technology is free of export restrictions.

There have been suggestions that other sensors could be added to the Sentinel’s synthetic aperture/ground moving target indicator (SAR/GMTI) radar. For example, a long-range electro-optical (LORO) sensor would enable the platform to positively identify targets. But adding extra sensors into an already dated mission system would be difficult, and is unlikely to provide an optimal solution. Overseer’s ability to accommodate multiple sensor types in a single working environment is a result of Raytheon keeping one eye on Sentinel while the other scopes the wider international marketplace. As well as extending the utility of any platform it is installed on, this adaptability will help reduce training burdens. Crews will only need to learn to operate one system, rather than become familiar with different systems for each different sensor or platform.

Despite the uncertainty around its use on Sentinel, then, Overseer’s development is clearly an asset to the company. With the ITAR-free system in its inventory, Raytheon can address requirements for fleets as small as one or two aircraft, where the specific combination of sensors, airframe and analytical capability may not exist anywhere else. Rather than having to create a bespoke installation of a unique combination of equipment, Overseer provides a common core around which the specific and different elements can be inserted easily, quickly, and at the lowest possible cost.

Nettleship confirms that Overseer has been bought, though the company is unable to divulge details of who by or for what applications. So far, customers are acquiring Overseer as part of a larger package, but it is also available for the retrofit market.

“The ones we are on contract for are for new platforms,” he says, “but we are talking to other [customers] about upgrades. Around the world at the moment there is a lot of interest in upgrading sensors on platforms, because people can’t necessarily afford the whole solution.”

Raytheon is at Chalet 294.

—Angus Batey
After four decades of the technological superiority of Western military forces, where the performance of drones has evolved and perfected military techniques, tactics and procedures (TTP), such capabilities are becoming common on both sides of the battlefield. Armed UAV and loitering weapons – capabilities that once were exclusive to the U.S. and the Israelis – are now available worldwide and utilized even by insurgents and terrorists who have mastered the use of commercially available drones, for target acquisition and aerial attack.

Past uses of drones by terrorists focused primarily on situational awareness and documentation of offensive actions, but in the latest wave of drone attacks, the remotely controlled craft were transformed for rudimentary though highly capable offensive use, and were employed to drop weapons on targets or directly attack targets with impressive accuracy and surprise.

These applications exploit the latest technologies – high-resolution HD or 4K cameras, low-cost, high-precision gimbaled payloads and semi-autonomous flight modes. Data links gradually migrate to higher frequencies, exploiting frequency-hopping techniques that make jamming harder than ever before. These platforms are available online and are modular and scalable, enabling developers with average experience to produce relatively sophisticated and customized systems from parts and components available online, resulting in DIY – do-it-yourself – drones.

In fact, the small and innocent toy can be turned into a smart, deadly improvised explosive device. As traditional IEDs, these drones have a significant propaganda value, exacerbating their lethal effect. Due to the stunning visual effects they provide, drone-monitored and drone-carried attacks have generated huge interest online, spreading havoc and fear among opposing forces – far beyond their lethal impact. However, the risk is real and growing, driving military and security forces worldwide to field counter-UAV solutions.

Some of the more lethal ones are becoming part of the tactical forward air defense units, while C-UAV applications for homeland security measures are designed to provide softer, more controllable effects.
Aero Vodochody of the Czech Republic has begun producing a new batch of L-159 ALCA/advanced light combat aircraft for the Czech Air Force, a move the company hopes will pave the way for additional export orders.

Aero is building a trio of new-build two-seat L-159 ALCA jets to meet Czech Air Force requirements following its declaration earlier this year that it was ready to restart production.

“We have re-established our supply chain for the L-159 and we are now ready to respond to international customers,” company CEO Giuseppe Giordo said.

The batch of three follows the production of a single aircraft for Iraq last year. Aero chose to build three new aircraft because it could not convert single-seat aircraft to the twin-stick standard. The three new aircraft will also be the L-159s built to the T2 standard with modernized avionics. Some obsolescence issues have also been resolved.

Giordo says the company is now working on a midlife update for the L-159, which will mark 20 years since its first flight on Aug. 5. The update will include improvements to the avionics and probably an uprated version of Honeywell’s F-124 turbofan. The company is also reviewing alternative radar and defensive aids systems that could equip the upgraded aircraft. A new laser designator pod is also being integrated.

In the meantime, the company is progressing with the development of the L-39NG. A retrofit of the NG’s avionics and the Williams International FJ-44 turbofan into existing L-39 airframes should be certified by the end of 2018. Development of the new-build L-39NG airframe, noteworthy because it eliminates the type’s distinctive wingtip fuel tanks, is also now underway. Assembly of the first wing has already started and the building of the fuselage will start in the summer. The L-39NG’s first flight is planned before the end of 2018. Certification is expected a year later.

Giordo says the company has begun contract negotiations with the Czech Air Force to be the launch customer for the L-39NG to support its international flight training center at Pardubice.

“The market is perceiving the L-39NG in a very good way because it can deal with both basic training and advanced training requirements,” Giordo said.

The company is taking a two-tiered approach to marketing the two aircraft. If air arms want an aircraft primarily for training with a secondary role of light attack, then the L-39NG is being offered. For those nations looking for a light attack aircraft first and an advanced trainer second, the L-159 is the company’s answer.

“We have good opportunities in Eastern Europe [for the L-39NG] in the short-term,” Giordo says.

Marketing is also being carried out in the Middle East and Asia, often in direct competition with Giordo’s old employer, Leonardo. The L-159 is being heavily used by the Iraqi Air Force on combat missions against Daesh fighters. U.S. red-air training company Draken International is also supporting U.S. Air Force training with the type at Nellis AFB, Nevada. Giordo believes there will be additional opportunities for the L-159 and L-39NG in this role, and the aircraft will be offered to contractors as a platform for the UK’s Air Support Defense Operational Training (Asdot) requirement.

Crucially, Giordo says Aero has regained the trust and confidence of several existing L-39 operators as it pushes to regain MRO work on the aircraft.

With a stronger focus on its military work, Giordo has reduced Aero’s involvement in some supply work, notably including a contract to produce Airbus A321 panels that was subcontracted from Leonardo.

The company is instead focusing on supply chain work for programs in which it has a risk share, including the Bombardier CSeries and Embraer KC-390 airlifter.

Earlier this month the company signed an agreement with Lockheed Martin-owned Sikorsky to continue supplying cockpits for the UH-60M Black Hawk until 2023. The company has delivered 240 cockpits to Sikorsky since 2011.

Giordo says Aero will consider other supply work but only if it meets the strict criteria of being linked to a successful program, provides some technological content and gives a return on investment.

—Tony Osborne
UTC Aerospace Systems is proud to announce our sponsorship of Orbis Flying Eye Hospital. We’ve put commercial airplanes, fighter jets and astronauts in the sky. And still, we continue to move the world forward. Our sponsorship of Orbis Flying Eye Hospital will help bring quality eye care and surgical training to underserved countries around the globe with the goal of ending preventable blindness. It’s a lofty goal, but one that UTC Aerospace Systems is uniquely equipped – and excited – to help make possible. To learn more or get on board with the mission, visit www.orbis.org/pages/flying-eye-hospital-utc.
Lockheed Martin’s potential new arms deals to Saudi Arabia could include integrated air and missile defense systems, helicopters, naval ships, radars, aerostats and space-related “elements.”

Marilyn Hewson, Lockheed chairman, president and CEO, told Bernstein’s 33rd Annual Strategic Decisions Conference in New York on May 31 that Lockheed’s work could include border patrol and counter-terrorism, maritime security capabilities, aircraft modernization, and “things that are needed in terms of supporting the defense needs in Saudi Arabia.

“If we rolled up everything that we saw in that package that is being discussed with the Saudis, from integrated air and missile defense, to helicopters, to ships, to radars, to aerostats, to space-related elements, etc., then we could see new-business potential for us of up to US$28 billion over the life of those programs, if they come to fruition,” she said.

Moreover, it could take 30 years or so to turn the whole US$28 billion figure into real revenue. For starters, each foreign military sale must go through formal congressional notification and not be stopped. Then formal contracts must be signed, products built and delivered. And the package’s value entails what could be earned throughout the life cycle of maintaining the weapons, including what is paid inside the kingdom.

“When I mention the [US]$28 billion, I’m talking about here are the systems and capabilities that were in that package, that if they go out through the life of 30 years and you not only deliver them but you sustain them and maintain them, that’s how you get up to US$28 billion,” she said.

The package also entails ongoing efforts. “Some of these we’ve been working on for some time with the Saudis and what their desires are,” Hewson said. For instance, the Saudis in 2012 got U.S. congressional notification registered for the possible acquisition of 25 C-130Js, both tankers and basic C-130s. They have only bought two so far, and the rest could fall under this package.

Poland Declares Need for Fifth-Gen Fighters

Poland has declared a need for a fleet of fifth-generation fighter aircraft equipped with long-range precision weapons to act as a deterrent against an increasingly aggressive Russia. Warsaw also reiterated a need for attack helicopters, air and missile defense systems and advanced electronic warfare technologies, the country’s defense ministry has stated in a strategic review published on May 23. To pay for the new capabilities, which will also include a new main battle tank developed through international cooperation, Warsaw plans to increase defense spending to up to 2.2% of gross domestic product in 2020 and up to 2.5% in 2030.

Philippines to Buy 12 Combat Jets

The Philippines is likely to order up to 12 more Korean Aerospace (KAI) FA-50 light attack aircraft, taking the air force closer to required numbers. President Rodrigo Duterte has promised to order more jets, using wording that implies but does not guarantee that they will be FA-50s. He has previously criticized the country’s use of the type, designated by the Philippine air force as FA-50PH. “By the time I leave office, you will have 24 jets,” he now says. “I will acquire 12 more jets soon.” Duterte’s six-year term expires in 2022 and cannot be extended.

Elbit to Develop Panoramic Displays for F-35

Lockheed Martin Aeronautics has awarded Elbit Systems of America LLC a contract to develop a cockpit display replacement for the F-35 aircraft. The development contract is for the Technology Refresh 3, Panoramic Cockpit Display Unit. The award expands Elbit’s work on the F-35, which already includes power amplifiers, structures and sustainment work. In addition, Elbit, together with Rockwell Collins, supplies the F-35 Helmet-Mounted Display System, through their joint venture Rockwell Collins ESA Vision Systems (RCEVS). Elbit Systems is at Chalet 200 and Static Display A8.

German Heron TP Deal Clears Court

The battle in Germany between the Israel Aerospace Industries Heron TP and General Atomics Aeronautical Systems MQ-9B SkyGuardian appears to have been won by the Heron TP, but California-based General Atomics is not conceding defeat just yet. On May 31, the Higher Regional Court of Düsseldorf rejected an appeal by General Atomics against the government selection of an Airbus-led leasing arrangement for the IAI Heron TP. The deal would replace an ongoing Airbus/IAI leasing contract for the unarmed, legacy Heron 1 remotely piloted aircraft, which is now supporting military operations in Mali and Afghanistan. However, General Atomics is not ready to surrender just yet because the contract with Airbus still needs parliamentary approval.
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.
Come to Orlando, Says Orlando Partnership

Need a U.S. presence? You can’t do better than Orlando, says the Orlando Economic Partnership (Hall 3, Booth D20).

The region’s aviation, aerospace and defense industry, with an annual payroll of US$1.5 billion and 220 companies, is one of the strongest in the country,” says Casey Barnes, the organization’s business development VP.

“Our highly trained workforce contribute to regional strengths in aircraft manufacturing; maintenance, repair and overhaul; research and development; and modeling, simulation and training,” he says. “Orlando is the world’s epicenter for modeling, simulation and training, with the simulation and training commands for the Navy, Army and nine other federal entities all in Orlando.”

Among the companies now in Orlando are:

- Lockheed Martin, with more than 7,000 employees, and a recent expansion of its Mission Systems and Training, Training and Logistics Solutions facility;
- France-based Thales, which has announced plans to add 173 new jobs in the Orlando region while investing US$6.6 million in the local community;
- BBA/Signature Flight Support, the world’s largest FBO network for general aviation, has moved its headquarters to downtown Orlando, keeping 200 jobs and expanding by 70 new employees; and
- Jeteye Inc., an aviation sales, leasing and manufacturer of sea planes, which is opening its global headquarters in Orlando, creating 50 high-wage jobs over two years and investing US$5.4 million in the region.

Concerned about the future? With higher education assets like the University of Central Florida, the University of Florida and Embry-Riddle Aeronautical University, “the region produces more engineers in the aviation, aerospace and defense industry than any other region in the Southeast,” says Barnes.

Pratt Gets EASA Nod for PW1100G ETOPS

Pratt & Whitney (Chalet 346) has secured EASA approval for 180-min. extended range operations for its PW1100G-JM geared turbofan engine, the manufacturer said here yesterday. The ETOPS certification sets the maximum allowed amount of single-engine flying time that an aircraft can be from the nearest suitable airport. “This is a significant milestone for both the Pratt & Whitney team and the PurePower engine family,” said Pratt commercial engines president Chris Calio. The PW1100G-JM powers the Airbus A320neo. U.S. FAA ETOPS approval for the PurePower GTF engine was granted in December.

Boeing Locks in Dutch Chinook Order

Boeing has secured a US$541 million contract for 15 CH-47F Chinook rotorcraft for the Netherlands as it eyes other opportunities with Saudi Arabia, Israel and Germany. The Royal Netherlands Air Force operates the D-model Chinook and has already taken delivery of some CH-47Fs but is moving forward with plans to modernize its entire fleet. Boeing also says it has received a request for information from Israel for 18-24 aircraft and Saudi Arabia has moved forward with plans to buy 48 Chinooks. In Germany, Boeing (Chalet 332 and 335, Static Display C2) will compete against the Sikorsky CH-53K King Stallion to meet a requirement for 40-60 medium heavy lift aircraft.

S7 Sea Launch Orders 12 Zenit Rockets

S7 Sea Launch Ltd., a new operator of the Sea Launch project, has taken a first step toward restarting operations by ordering 12 Zenit carrier vehicles from Ukrainian manufacturer Yuzhmash. According to Yuzhmash, it is already assembling two rockets – Zenit-3SL and Zenit-3SLB – under this order. They are to be used for both sea and land launches. The liquid-propellant Zenit-3SL rocket can deliver 6,160 kg to the standard reference geosynchronous transfer orbit. The SLB variant is used for land launches and can carry up to a 5,000-kg payload. Neither S7 Sea Launch, nor its parent, S7 Group, provided official comments.

Supersonic X-Plane Is Closer to Reality

NASA has issued a draft request for proposals for development of its Quiet Supersonic Transport (QueSST) low-boom flight demonstrator, starting the clock ticking toward first flight of the new X-plane in early 2021. The program calls for the development, build and flight test of a clean-sheet X-plane that will be used to support the potential change in FAA regulations that will enable supersonic flight over land. The effort is targeted at demonstrating a sonic boom 60 dba lower than that produced by the Anglo-French Concorde or a typical military aircraft.

General Atomics to Demo UAV-Borne Laser

General Atomics Aeronautical Systems (Hall 3, Booth B132) plans to demonstrate an ultra-high-speed laser satellite communications terminal for the MQ-9 Reaper later this year. The company will test an MQ-9-compatible airborne laser terminal on a mountain in the Spanish Canary Islands, off the coast of Morocco. The terminal will link up via laser with Europe’s Alphasat, an advanced communication satellite positioned above Africa in geostationary orbit. If the test is successful, the next step will be flight trials on an MQ-9 Reaper next year. Laser-based communication would enable gigabytes-worth of encrypted imagery, video and other data to be exchanged every second in near-real-time.
Elbit Systems Debuts Missionized Multirotors

With unmanned systems technology progressing toward smaller, more agile and autonomous capabilities, systems that once required big platforms are now contained in much smaller, sometimes more capable, drones. Israeli exhibitors at the Paris Air Show highlight some of these innovations.

Elbit Systems unveiled here a family of multirotor drones developed by its commercial partner, the Israeli Flying Production company. The company introduced three models here at the air show – the six-rotor Da-Vinci, quad-rotor Thor and three-rotor Nox. Each is designed for different uses. The smallest is Nox, carrying an ultra-light, stabilized EO/IR payload that weighs only 160 g. Nox can carry a total payload of 700 g on a 50-min. mission.

Thor is a bit larger, carrying a useful payload weight of up to 1.5 kg for 75 min. While drones are often detectable by the buzzing noise of their rotors, Thor is designed for ultra-quiet stealth missions and, according to the designers, is undetectable beyond 154 ft. (50 meters). It is carried folded, along with the payload, power pack and control unit, in a single backpack and can be assembled and ready to fly in less than 10 min.

Da-Vinci is the largest multirotor in the line. Although it carries significantly more weight (3.5 kg of useful payload), it is quite compact. The system is carried by two soldiers and can be operated for 1.5 hr. One of the unique missions Da-Vinci is designed for is electronic surveillance, using the Cybair payload combining a stabilized EO/IR payload and cellular intercept. Optimized to deliver “man-in-the-middle” (MITM) tactical interception, Cybair enables signal intelligence exploitation over modern (4G/3G) networks, requiring the interceptor to be positioned close to the target. Carrying the Cybair payload, the Da-Vinci unit can position itself as close as possible to the target, even when the subject under surveillance is mobile. It is also optimized for operation in hostile environments where, if compromised, manned ground teams could be at risk.

—Noam Eshel
Stratasys Speeds Up Aerospace 3-D Printing

The routine use of additive manufacturing technologies in the manufacture of aircraft parts may be moving a crucial step closer with two announcements from AM specialist Stratasys.

The company, jointly headquartered in the U.S. and Israel, has worked with NIAR, the National Institute of Aviation Research in Wichita, Kansas, to create an end-to-end 3-D-printing process that can produce parts that will meet FAA and EASA certification requirements. And last week, Stratasys (Hall 4, Booth 208) announced a partnership with Boom Supersonic (Chalet 8) that will see 3-D printing used in the development program, where the technology’s benefits can be most fully realized.

Certification for AM aerospace components is complicated, usually involving certifying each part of the process for each customer, application and component. By working with NIAR, under FAA supervision, Stratasys has created an end-to-end process that can be used by different customers to manufacture certified parts. The process is based around a tweaked version of the company’s Fortus 900mc 3-D printer and its Ultem 9085 resin feedstock.

“The first public announcement of certifying the process came in 2014, and [since then] it’s been customer by customer, having to each do that themselves, each potentially with slightly different outcomes,” says Scott Sevcik, the company’s business-development lead for aerospace and defense. “From now, what our customers are able to do is certify the process as opposed to certifying each individual part.”

The key to unlocking the certification challenge lies in repeatedly achieving constant quality. If an AM process does not produce parts of uniform structural consistency, either because the feedstock is variable in quality or the printer does not layer the feedstock in exactly the same way every time, the component will lack integrity. Such a process cannot be used to create parts that meet aviation standards, even for non-flight-critical components.

“We’ve had to go from a technology that really wasn’t looking at the mechanical properties, to understanding them, characterizing them, and then addressing any issues of variability,” says Sevcik.

The new Stratasys process will not, as yet, be able to produce any safety-critical components, but it will be used - for the first time - to produce components that have a limited load-bearing capability. Sevcik sees this as a significant move toward wider use of AM in aircraft.

“Much of what we’ve seen certified to date has been very low-criticality interior components,” he says. “But that has largely been because of not having standards, not having repeatability, and not being able to trust the process. The material system involved here is quite strong, so we can enable a higher level of trust. We are moving into some lightly loaded parts for the first time, as people are able to put more trust and confidence in the part.”

The deal with Boom will see Stratasys chipping away at some of the other barriers to wider AM adoption. The three-year technical partnership agreement involves the AM company in building parts and tooling for Boom’s demonstrator aircraft.

Sevcik argues that the attractiveness of the project is less about the unusual nature of the aircraft, and more to do with the opportunity to be involved at an early stage.

“Boom is not looking to replace parts,” he says. “Many of our applications today have been on mature platforms, and from a cost-benefit standpoint it really needs to trade against the qualification of the original part. We have customers who are really able to design for the process, and when they’re able to incorporate printing from the start of the design they’re able to fully leverage the value proposition that additive offers.”

This means not just that Boom will be able to quickly manufacture a redesigned component as its overall concept is tweaked during development, but that the supersonic aircraft will benefit from having lighter parts, and possibly fewer individual pieces.

“They’re going to build a very, very fast aircraft, and they want to build it quickly,” Sevcik says. “But AM’s real value isn’t just in speeding up the supply chain - it’s actually in being able to produce the part you can’t produce any other way. A part that utilizes the design freedom of AM is really where the key is. We’re able to take assemblies of pieces and turn them into a single part, and do design for light weight because you only need to put material where it needs to be to carry the load, rather than letting it because it’s really hard to remove during the manufacturing process.”

—Angus Batey
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Ontario, Canada, remains a stable source of aerospace activity, although some chinks in the armor have appeared over the last year. Some sectors have shown modest growth, while others have retrenched.

There is certainly stability within the aerospace sector in Ontario, and modest growth for some companies,” said Moira Harvey, executive director, Ontario Aerospace Council.

At present, the province’s highly diversified aerospace cluster accounts for CA$6 billion in annual revenue and 21,000 direct jobs, according to the Ministry of Economic Development and Growth. Every commercial aircraft flying today has a part made in Ontario.

“The big question is whether these programs will stay at the high level of production, and whether the Toronto-based component-producing vendors supporting programs of Airbus and Boeing mainly will continue at the same rate,” said David Tyerman, transportation and industrial analyst with Cormark Securities Inc.

Some growth-through-acquisition strategies have taken place since ShowNews last visited Ontario. In December 2016, SatCom Direct finalized its acquisition of TruNorth Avionics, the Canadian manufacturer of cabin communications systems.

Canadian firm Samuel purchased metal additive maker, Burlock Technologies and, in mid-December 2016, Wanfeng Auto Holding Group, a Chinese manufacturer of aircraft and automobile parts, acquired a controlling interest in Ontario-based Diamond Aircraft Industries.

Some of Ontario’s existing aerospace companies are growing. Mississauga, Ontario-based MHI Canada Aerospace Inc. is now the primary producer for the Challenger 300 wing. It also makes the Global 5000/6000 wing and center fuselage. MHI has developed a new vertical wing jig, which can be used for different aircraft models.

Shimco, a manufacturer of precision parts for fixed- and rotary-wing aircraft, continues to enhance its new manufacturing facility in Cambridge, which opened in mid-October 2016. Customers include Bell Helicopter, Bombardier, Embraer, UTAS Goodrich, Kawasaki Heavy Industries, Messier-Bugatti-Dowty and Héroux-Devtek Inc.

Magellan Aerospace, a Canadian manufacturer of aerospace systems and components, announced in March 2017 an agreement between Magellan UK and Airbus for the supply of complete crown module assemblies for all variants of the A350XWB.

Ontario Manufacturing of Mississauga, Ontario, is growing 20% per year over the last six years, tripling in size. In 2017, Cyclone received a CA$15 million contract from Boeing to provide parts on the 777X.

In neighboring Quebec, Héroux-Devtek (Hall 3, Booth E48), which specializes in the development and repair of landing gear and actuation systems, is another company facing challenges and opportunities simultaneously. The company will lay off 90 employees by the end of this year. The move is due directly to OEMs reducing production rates for certain aircraft programs, including the Boeing 777.

In June 2016, it completed the final assembly of the pre-production ship set for the 777 landing gear. Héroux-Devtek has a long-term contract to produce landing gear for the 777X.

Bomardier Commercial Aircraft cut production of its high-wing Q400 turboprop regional airliner and Global business jets over the years. Current production rate of the Q400 has dropped to around 20-25 per year, estimated Konark Gupta, an aerospace analyst at Macquarie Canada. Meanwhile, Bombardier Business Jets reduced production of its Global 5000 and 6000 business jets made at Downsview due to a slowdown in this sector.

Yet the business jet division marches forward. Flight tests of the Global 7000 continue unabated. In May, a third flight test vehicle joined the program. Bombardier estimates it will deliver 135 business jets in 2017, including Learjets.

Despite the mixed news, the Canadian government months ago reaffirmed its commitment to aerospace, stating it would provide CA$372.5 million over four years in repayable contributions to Bombardier Inc.

The loan program is unrelated to the Canadian government’s recently announced CA$950 million Superclusters Initiative to help jump-start innovation in high-growth sectors, including transportation.

While industry will benefit from the Superclusters, the entity that receives the funding must be an industry-led “not-for-profit” organization. Project funding provided by the Initiative must be matched one-for-one by industry contributions.

Despite the various market challenges, Ontario continues to be a driving force in aerospace. “Overall, the aerospace industry in the province seems to be growing,” said Macquarie’s Gupta. “The government is supporting aerospace and private money is flowing in. I think Ontario is a growth story for some time.”

—Robert W. Moorman
Airbus Details A380plus Modifications

Changes as designed for the A380plus upgrade package will be available for entry-into-service by 2020, according to A380 marketing head Frank Vermeire. Airbus gained authority to offer the package, but has not yet received firm commitments from either existing or new customers. The A380plus project targets a cash-operating-cost reduction of 13%, to be reached through changes to the wing, maintenance intervals and cabin lay-out. Customers can pick only parts of the upgrade, which would reduce the cost improvements. Airbus says the A380plus will burn up to 4% less fuel than the current version of the aircraft.

The winglets will be 15.4 ft. (4.7 meters) high. Airbus installed mockups at the MSN04 test aircraft displayed in Le Bourget, but the actual devices have not yet been built, nor has a supplier been picked. Wing changes also include upper belly fairing improvements and wing camber modifications increasing height by 1.3 in. (33 mm) between rib 10 and rib 30. The wing will also be slightly retwisted. “We have a better understanding of wing aerodynamics,” Vermeire said.

The wing changes are now being looked at “mainly as a line fit,” and Airbus is looking at the option of retrofitting winglets at a later stage.

Vermeire dismissed the option of a re-engining that Airbus studied earlier as part of the A380neo proposal. Airbus Commercial Aircraft president Fabrice Brégier said earlier this month that there was “no business case” for the A380neo.

Airbus also decided to pick up some technologies developed for the A350 and put them back into the A380. That applies to the in-flight entertainment system, the flight management system (FMS) and the fuel pumps.

Vermeire said the upgrade will reduce weight and improve reliability. The later-technology FMS will also help reduce fuel burn, he stressed.

Airbus also feels comfortable with stretching maintenance intervals for light and base maintenance. Light checks will in the future be required after 1,000 hr., compared to the current 750 hr. Downtime at heavy checks is also reduced. Airbus claims that overall the maintenance changes will allow airlines to keep the aircraft flying for an additional six days per year.

The third part of the A380plus study are cabin-densification initiatives proposed at the Aircraft Interiors Expo (AIX) in Hamburg, Germany, earlier this year. The changes, if all implemented, would free up room for up to 80 additional seats. That would allow airlines to raise seat count in four classes from the current 490 to 570 seats.

--Jens Flottau

CFM Adds 800 Extra Engines to Ramp-Up

DRIVEN BY INCREASED orders of Airbus, Boeing and Comac aircraft, CFM International (Chalet 121) plans to add an extra 800 CFM56 and Leap engines to its already bulging production plan between 2018 and 2020.

The General Electric-Safran joint venture already expects to deliver 1,900 engines this year, the bulk of which – some 1,400 engines – will be CFM56s, while production of Leap engines alone is currently scheduled to reach 2,100 in 2020. On the way there, CFM will make 1,200 Leaps in 2018 and 1,900 in 2019. It is likely these numbers will be updated to reflect the additional production targets.

The extra engine tally will largely be made up of more CFM56 engines in the first two years and additional Leaps in the later part of the decade. The change in numbers will come through a stretch-out of CFM56 engines for additional A320ceo and 737 Next Generation aircraft that are expected to be announced by Airbus and Boeing this week. The additional Leap engines are expected to be for supplemental orders of A320neos, C919s and additional MAXs, including the newly launched -10.

“Airbus and Boeing asked us to add a collective 800 engines between now and 2020,” says GE Aviation president David Joyce. Despite the additional load on the already unprecedented production commitment, he adds, “We feel pretty good about the ramp-up. It’s not an extrapolation, it’s an interpolation. It’s game-on and we are ready.”

It is not clear how the additional engines will be reflected in the aircraft ramp-up plans already announced by Airbus and Boeing. Both manufacturers are expecting to increase monthly rates, with Airbus targeting 60 A320s per month by 2019 and Boeing 57 by around the same time.

The additional orders are expected to be revealed at the show this week and will contribute to GE’s growing backlog of US$158 billion – some US$149 billion of which is for commercial engines.

For Paris, “we are eyeballing US$15 billion in new business,” says Joyce. “So what’s not to like in this business environment?”

--Guy Norris
Why Things Are Looking Up for Boeing Military Aircraft

When Boeing lost the U.S. Air Force Long-Range Strike Bomber competition in 2015, the consequences for the company’s military aircraft unit, and its defense business in general, looked dire. There were no remaining U.S. combat aircraft competitions, and even the Air Force T-X trainer contract looked like a long shot. Worse, the military unit’s long-running but highly profitable fixed-wing legacy platforms were winding down, with few hopes for export wins or resumed U.S. procurement. C-17 production ended last year. Military rotorcraft production is trending downward, too.

Eighteen months later, the situation looks quite different. Boeing’s St. Louis facility is in a much better place, with new orders for the F-15 and F/A-18 and the prospect of more export and domestic orders. Best of all, there are now long-term goals that could keep the unit alive and healthy for the long run.

The first improvement is with export orders. In November 2016, Kuwait announced a buy of at least 28 and possibly as many as 40 F/A-18E/Fs, the U.S. approved the sale of 36-72 F-15s to Qatar – making it the first new F-15 customer in 12 years – and Canada announced an order for 18 F/A-18E/Fs as an interim fighter replacement option. Since Canada’s fighter requirement covers only 65 aircraft, the country is unlikely to operate two types.

It is safe to assume that those 18 aircraft will be followed by 47 more, although Boeing’s trade complaint against Bombardier could jeopardize this outcome.

The second improvement is with U.S. orders. After years of counting on Congress to add Super Hornets to its annual budget, the Navy last year resumed requesting Super Hornets in its base budget. President Donald Trump has called for a “large buy” of additional Super Hornets, including the development of a long-mooted Block III variant.

This Navy emphasis on Super Hornet acquisition is hardly new; in fiscal 2013-16, it procured 100 F/A-18E/Fs and EA-18G Growlers, with the fiscal 2017 budget adding 14 more (up 12 from the Navy’s requested two). What is new is that the Navy now has the political cover needed to delay the bulk of its F-35C acquisition program while keeping the Super Hornet procurement program going.

The third improvement is with the T-X trainer competition. A year ago, there were four players. Since then, Northrop Grumman exited, and Leonardo has been abandoned by its second U.S. partner, leaving it to bid through DRS, its U.S. subsidiary. In short, there are now just two leading candidates: the Boeing T-X and Lockheed Martin/Korea Aerospace T-50A.

Finally, there is the growing hope that all of these opportunities are creating a bridge to somewhere. Specifically, there is increased Pentagon interest in a sixth-generation fighter, with the Air Force F-X or “Penetrating Counterair” program and the Navy F/A-XX development programs. There is even the prospect of a resurrected and upgraded F-22. Unlike the F-35, which has zero Boeing content, the F-22 is one-third Boeing. The Trump administration requested a sharp increase in sixth-generation fighter funding in its fiscal 2017 supplemental request.

Boeing’s military unit may not be building its legacy fighters when the time comes to bid for these large new fighter programs, probably in the late 2020s. But a combination of upgrade and sustainment work, UAVs, special-mission jetliner variants (such as the P-8 and KC-46) and military rotorcraft could keep the unit going at a healthy level through the 2020s, and perhaps beyond.

As the graph above indicates, however, the current programs of record tail off markedly around 2025, making additional wins essential. T-X, the Air Force J-Stars and AWACS recapitalization programs – and more exports – are Boeing’s key opportunities to keep the bridge level.

The fortunes of Boeing’s military unit matter, both from an industrial base and a corporate perspective. Even in a relatively weak year like 2016, the unit still provided US$12.5 billion in revenue, or 13.2%, of Boeing’s total US$94.6 billion. It also provided US$1.2 billion in earnings from operations, or 20.7% of Boeing’s US$5.8 billion total. And from a U.S. defense capabilities standpoint, Boeing represents the Pentagon’s best hope of keeping a second fighter manufacturer in business.

In early 2016 the only apparent possible future for the military unit was gradual extinction or the acquisition of Northrop Grumman’s military aircraft business. But a year later, a third way has emerged: The unit might just survive with its own products and prospects.

Richard Aboulafia is vice president, analysis at Teal Group. The views expressed are not necessarily shared by Aviation Week.
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