

# ASIAN AIRLINES & AEROSPACE

VOL 28  
OCTOBER/  
NOVEMBER/  
DECEMBER  
2019

A GBP PUBLICATION

MCI(P)165/03/2019 • SINGAPORE \$15, REST OF THE WORLD US\$20

## BRIMMING WITH POSSIBILITIES

With aircraft OEMs reaping the benefits of using digital twins, MROs have started to invest in the technology as well

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ATR is looking to build on its entry into the South Korean market

## HAZY FUTURE

The 737 Max may start flying again in the U.S. in January next year, but Boeing has work to do before regaining the trust of the public and that of regulators in other regions



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## EDITOR'S NOTE

### Living in Uncertain Times

The 7387 Max crisis continues to take a toll on Boeing. Apart from the company's sales and profits plummeting, it has also had to deal with the anger of its customers and the public. The crisis has also caused the two crashes but also concerning regulators around the world that the crash is safe to fly again. The Indonesian National Transport Safety Committee (NTSC), which investigated the Lion Air crash, has previously pointed fingers at Boeing and the Federal Aviation Administration (FAA), citing its pressure on the aviation giant.

There seems to be general consensus among aviation regulatory agencies around the world that the aircraft should be rushed back into service. It is likely that the international regulators will not concurrently approve the airplane's return to service. Do not be surprised if the jet resumes flights in a patchwork fashion, with FAA being the first to give the green signal.

The other big story to follow is the tussle between Airbus and Boeing over their next-generation of long-haul aircraft. Dantes, the early bird among airlines, is gearing up for Sunrise, its ultra-long-haul initiative. If the project is approved, the inaugural flight will take off in 2022/23.

Although much of the focus is on China that is leading Asia's aviation boom, India is quietly making strides. Much of the growth is due to the heady Low Cost Carriers (LCCs) operating in the country have made in recent times. With its growing aircraft fleet size, strategic location advantage, rich pool of engineering expertise, and lower labour costs, India also has all it takes to be the next major MRO hub in the region.

Another year is about to pass, and I hope you enjoyed our coverage of aviation international news and events in 2019 as much as we enjoyed bringing them to you. Please visit our website, [www.gbp.com.sg](http://www.gbp.com.sg), for the latest aviation and MRO news. As I sign off, I wish you a joyous Holiday Season and a most prosperous and healthy New Year.

Happy Reading!

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## COVER STORY

# 737 MAX FUTURE

THE 737 MAX MAY START FLYING AGAIN IN THE U.S. IN JANUARY NEXT BEFORE REGAINING THE TRUST OF THE PUBLIC AND THAT OF REGULATORS IN OTHER REGIONS

► Arun Sivasankaran

It is not a good time to be Boeing CEO Dennis Muellenberg. Just when it seems like Boeing was making progress in its attempts to get the 737 MAX back on the air, it comes news of trouble for the 737 MAX aircraft. A predecessor to the 737 MAX, about fifty 737 MAX planes have been grounded after several operators, including Qantas, Korean Air, Southwest Airlines, Garuda Indonesia, Lion Air, Sriwijaya Air, and Garuda Indonesia Airways, discovered cracks on the aircraft.

For a company that is desperately trying to shore up its safety reputation, the task of earning the confidence of operators and the flying public just got a whole lot harder. If that wasn't enough, there was the grilling by lawmakers for two straight days in front of an audience that included people who had lost family members in the twin crashes that killed 346 people. From admitting at a congressional hearing that he knew, before the second deadly crash of the 737 MAX in March, that a test pilot had raised questions about the safety of the jet, to acknowledging mistakes in the design of a Max flight-control system and revealing, rather unwittingly, that he had never flown

on a 737 MAX before the two crashes, Muellenberg had a tough time in the spotlight.

**In the Firing Line**  
Indonesia's National Transport Safety Committee (NTSC), which investigated the Lion Air crash that killed the 189 people on board on October 29, 2018, mainly points fingers at Boeing and the Federal Aviation Administration (FAA). The design and certification of the 737 MAX 8 is the primary cause of the accident, the committee said in its report made public in October, days before Muellenberg took the heat from lawmakers. "During the design and certification of the Boeing 737 MAX, assumptions were made about flight crew response to malfunctions which, even though consistent with current industry guidelines, turned out to be incorrect," investigators wrote. The design of the Maneuvering Characteristics Augmentation System (MCAS) system itself was a contributing factor, as it relied on information from a single external sensor, making it vulnerable to erroneous input from that sensor."

Investigations by the committee revealed that Boeing was able to design and test its own system without proper oversight or a thorough assessment from the FAA. Boeing engineers did not expect the MCAS system to fail continuously and repeatedly, the report stated, and failed to seriously consider that possibility. The crew isn't the only one to take Boeing and FAA to task for the two deadly crashes. An international flight safety panel, which included representatives from NASA, the FAA and civil aviation

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authorities from Australia, Canada, China, Europe, Singapore, Japan, Brazil, Indonesia and the United Arab Emirates, said in its report, submitted in October, that the FAA and Boeing were at fault on several fronts. The regulatory agency wants to modernize its aircraft certification process to account for increasingly complex automated systems by ensuring that aircraft incorporate fail-safe design principles that don't rely too heavily on pilot input, the report said. Boeing was pulled up for its "inadequate communications" to the FAA about the MCAS, inadequate pilot training and shortage of technical staff.

**Trying to Regain Trust**  
The company is working hard to earn back the confidence of regulators and operators. Boeing has redesigned the Maneuvering Characteristics Augmentation System (MCAS) software that

was at fault in both the crashes, updated operation manuals and sought feedback from pilots of Max operators around the world after providing them simulator sessions with software updates. It has conducted over 800 test and production flights with the new software. In October, the company said that it had added flight control computer redundancy to MCAS and three additional layers of protection. It has also successfully completed a dry run of a certification flight test and submitted to the Federal Aviation Administration (FAA) a "final software test" and "complete system description" of revisions to the plane.

We know that the public's confidence has been hurt by these accidents and that we have work to do to earn and re-earn the trust of the flying public, and we will do that," Muellenberg said at an investor conference in New York in May. "We are taking all actions necessary to make sure that accidents like those two never happen again."

The company CEO had earlier expressed optimism that

the airplane would be back in service before the end of the year, but a brief statement to reporters before attending a Senate panel, was no mention of that. "We have eluded both crashes and we know what to fix," he said. "Once the Max returns to fly, it will be the safest airplane in the sky."

**Erping on the Side of Caution**  
There is general consensus among aviation safety agencies around the world that the aircraft should be rushed back into service. The FAA, which was the last regulatory agency to ground the aircraft, responded to the NTSB report by saying that it had not set a timetable to approve the plans to return to service after the FAA deems it is safe.

International regulators have indicated that even if FAA approves the airplane's return to service, they would pursue their own safety analysis of the aircraft before it flies again in their skies. Industry experts say cooperation among various safety agencies is crucial to regain public confidence. Airline chiefs say that Boeing must convince regulators worldwide, and not just the FAA, of the 737's safety, if it's to restore faith in its model.

"Trust in the certification system has been damaged" among regulators, between regulators and the industry and with the flying public," says IATA CEO Alexandre de Juniac, who advocates a coordinated approach of Boeing software fix by various aviation safety agencies around the world. "While Boeing's US Federal Aviation Administration act is centre stage, the close collaboration of counterpart manufacturers and civil aviation authorities around the world are essential." The continuing lack of unanimity among the regulators has the IATA worried. "With the 737 MAX we are at a bit of a world," because we don't see the unanimity among international regulators that should be the case," de Juniac told reporters in September.

**FAA Under the Scanner**  
The delay on the part of the FAA to ground the aircraft after the crashes, and the allegedly close relationship the regulatory body shares with the plane maker, have come in for plenty of scrutiny in the months since the plan was grounded in March. The Congress, the FBI and the media have been keen to investigate the FAA certification process.

A particular revelation, that the FAA allows employees of aerospace companies, rather than its own inspectors, to decide on certain

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safety issues when an aircraft is being designed and assembled, especially caused outrage. Boeing is among the 79 companies that have been approved around the world's regulators to let their employees work, while being on their payroll, as FAA design engineers assess safety. Amidst reports that the FAA intends to do some sort of control of aviation safety to the industry, lawmakers say they want to end the practice of the regulatory agency outsourcing certification tasks to manufacturers. American consumer advocate Ralph Nader, whose grandniece was killed in the Ethiopian Air crash, however, doesn't think FAA is likely to be doing it, given Boeing's clout in the industry. "The FAA has been in the pockets of the Boeing company for years," he says.

Although controversial, the self-inspection program, which was created in 2005, has been largely effective and has, according to Boeing, led to the "safest transportation system in the world." The numbers support the point of view: commercial aviation in the US had had a safer safety record over the last decade, with just one passenger over the last decade. According to supporters of the ODA, the program, reauthorized in 2018, helps fix a gap: the FAA would need US\$1.5 billion to hire an additional 10,000 inspectors otherwise. Among the detractors is the Professional Aviation Safety Specialists, a union representing FAA inspectors, which has been vocal in opposing the expansion of the ODA system.

**Rift Out in the Open**  
By international agreement, planes are certified in the country where they are built, and the decision is made, if ever, questioned by regulatory bodies in other parts of the world. The crashes, however, have resulted in a rift between regulatory agencies, with the FAA on one side and the other. The industry has been scrambling to get it likely that the international regulators will not concurrently approve the airplane's return to service. The FAA is likely to give the green signal first, with FAA being the first to give the green signal.

Once the airplane is approved to return to service, the country's director-general for air transport, the new software and implementation of new installation. It would also have to run a series of maintenance checks on the jet, that have been in for months. The process, according to some, could take more than a month.

**Uneasy Road Ahead**  
Max 737 operators, who have had to cancel thousands of flights since the aircraft was grounded, are aware that passengers would hesitate to fly on a 737 MAX plane even when it is certified safe to fly and reintroduced into service. According to a survey earlier this year, about 41% of Americans said the plane would need to safety

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necessary for oversight moving forward. "We will not work the 737 MAX until we know we have full assurance from regulatory authorities around the world, our colleagues in the flight deck, engineers, and our airlines that the 737 MAX is safe," Sara Nelson, president of the Association of Flight Attendants, which represents United's flight attendants and those at 10 other airlines, said in a statement.

**Economic Impact**  
The crashes have so far cost Boeing more than \$8 billion, according to Bank of America Merrill Lynch. Sales and deliveries of the Max planes are expected to cancel 50 flights a day in November and 75 a day in December. American Airlines has announced that it will keep the airplane grounded until January 16. Southwest Airlines, the biggest 737 MAX customer in the US with 34 aircraft, had announced, as early as in July, that it would include the aircraft in its schedule only after Jan. 5.

**Making their stand clear**  
Labor unions representing flight attendants at American and United have reservations about bringing the troubled aircraft back into service in haste. "After these two days of hearings, it is clear there were serious breakdowns in the supervision of the 737 MAX," Lori Bassett, president of the Association of Professional Flight Attendants, which represents American's 26,000 cabin crew members, wrote in a letter to Boeing's CEO on Oct. 30. "We have fundamental questions about whether the FAA has the resources

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MAINTENANCE REPAIR OVERHAUL

OF USING DIGITAL TWINS, MROs HAVE STARTED TO INVEST IN THE TECHNOLOGY AS WELL

► Arun Sivasankaran

In an industry where any idea that minimizes aircraft downtime is worth its weight in gold, the excitement around the concept of digital twins and the growing use of it in predictive maintenance hasn't come as a surprise for industry watchers. The concept of a digital twin has been around for more than a decade, but there was a question mark over its cost effectiveness.

**Brimming with Possibilities**  
With aircraft OEMs reaping the benefits of using digital twins, MROs have started to invest in the technology as well.

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**Showing the way**  
As it is to be expected, it was the OEMs that took the lead. In September last year, Boeing CEO Dennis Muellenberg told investors in California that the company has started to use digital twins to achieve a 40% improvement in first-time quality of

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the parts and systems it uses to manufacture commercial and military airplanes by using the digital twin asset development platform. Digital twins, he added, would be the "biggest driver of production efficiency improvements for the world's largest airplane maker over the next decade."

GE Aviation, which has been a pioneer in the use of digital twin concept in aviation, produces digital replicas for every engine it produces, thus giving the company an electronic trail for its engines. So precise and true to life are the company's digital twins of its jet engines that the Federal Aviation Administration allows it to use digital analytical techniques to comply with regulatory requirements, thus eliminating the need for physical inspections.

During a flight with a GE engine, sensors on the engine collect information about its performance. This is then downloaded and transmitted in real time to the digital twin so that the electronic version is always up to date with the actual engine. This allows the company to monitor performance and predict maintenance issues, thus reducing maintenance costs. The company has also helped develop the first digital twin for an airplane's landing gear. According to Bihl, former CEO of GE Digital, the company has more than 12 million digital twins currently in operation, with most of them in aviation and energy sectors.

**Growing Use of the Technology**  
Apart from building digital twin components for its GE engines, the GE has teamed up with Invoys to reduce flight delays with the help of large landing gear manufacturers. The companies achieved this by developing a digital twin of landing gear that can be applied to both the nose and main landing gears as well as to the hydraulic system that drives the gear. Invoys created the digital twin by first studying the failure modes of the landing gear, and then identifying 34 locations where sensors could be applied to provide data for early detection of wear or malfunction. The data from these 34 locations, Invoys created a digital twin of each aircraft's physical landing gear. Data is collected an average of once per second from each of the 34 sensors on the landing gear during takeoff and landing. The data is stored and then analyzed to diagnose anomalies to determine fixes for any issues. Actual data is then compared with predicted data based on the digital twin, with deviations being used to modify the predictive models for required maintenance intervals.

With the technology producing accurate results on engines, it is surprising none in the



the top 10 commercial airlines combined. The annual cost of maintenance of the fleet touches US\$7.5 billion. Military planners and technology leaders are unanimous in their view, using digital twins could dramatically improve maintenance regimes, thus bringing costs significantly.

GE Aviation has opened an Accelerator in Washington DC, providing a space for the military and its contractors to collaborate with GE experts in new technological solutions. "Even a 1 percent improvement in maintenance efficiency would give the military resources it needs to modernize," says Todd Steffler, general manager of military operations at GE Aviation. "Everyone knows there is room to improve." The US Air Force is also interested in using the technology to keep its fleet healthy longer. NASA has, for more than a decade, used digital twins to monitor its space stations and spacecraft.

#### Asset for Independent MROs

Neelam Elog, director of the MRO product line at the aerospace and defense business unit for IFS, believes independent MROs stand to benefit from the intelligent use of digital twins. Companies can use the technology to increase aircraft safety, reduce the time to repair shop-to-shop or by-the-hour service provider, extend asset life and improve the business supply chain. As an example of carrier's using digital twins to increase aircraft safety, Elog cites the example of Dash carrier KLM, which reduced its minimum equipment list defects and delays and cancellations by 50% since introducing AI to manage predictive maintenance.

Companies can put an effective digital twin strategy in place with the support of agile and flexible enterprise software geared toward data-driven decision-making, says Elog. "Independent MROs who are regularly capturing key data streams in their enterprise software can start to quickly take advantage of digital twinning to differentiate their service offerings against other independent MRO competitors and also against large airlines/OEs that have a number of disparate systems in place."

Among IFS customers that have a dedicated digital twin program is Test-Flux, a leading provider of test and simulation services for aerospace and defense organizations. The company has a dedicated digital twin approach for ground support assets and test equipment, has the engineering & design and procurement data of the asset in its selling, and also has full control of the IoT-enabled test and simulation data and can integrate it with other data, and then execute that maintenance in its repair shop.

#### MROs Take Note

With word traveling around the industry that OEMs are pleased by the return on investment in digital twins, carriers and MROs have started showing a willingness to incorporate the concept in their operations. Mark Martin, director of commercial aviation at IFS, believes digital twins will increasingly play a major role in aircraft fleet management by MROs. MROs will look to take advantage of digital twin information gained from original equipment manufacturers (OEMs) to capture much of the reliability data, he says. Much before digital twinning was a trend, MRO major Lufthansa Technik had started using the technology. The company's Aviator platform offers digital twins for propulsion engine and the company has a comprehensive digital record of each engine that come in for repair, and then developing digital twins for each engine. Full-fledged digital twins help the company perfect the digital twin and compare it with the real engine as part of its predictive maintenance activities. The use of the technology by the MRO has helped its customers improve fleet planning, better predict maintenance costs, and to prevent aircraft on-ground incidents. The company has also extended digital twin technology to air-cycle machines and brake steering control units.

According to IT consulting IDC, companies that invest in digital twin technology will see a 30 percent improvement in cycle times of critical processes, including maintenance. The company forecasts that 60% of manufacturers in different sectors will monitor products or performance using digital twins. With the introduction of digital twins, companies are able to cut maintenance costs by depending on predictive maintenance rather than on unscheduled

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## REVIVED RTA

DE HAVILLAND CANADA IS PUSHING HARD FOR DASH 8-400 SALES

▶ Atul Chandra

De Havilland Canada is pushing hard to gain traction for the Dash 8-400 aircraft, pitching the type as an efficient regional operator with more seats, fuel speed, and more cargo capacity, combined with its short take-off and landing capabilities. "There is a solid existing order book and we continue to aggressively market the aircraft," says De Havilland Canada CEO Todd Young. The Canadian airframe says it is seeing strong interest from existing and prospective customers in Africa and Asia, and that the Dash 8-400 aircraft is the only turbo-prop capable of seating up to 50 passengers.

The Dash 8-400 regional transport aircraft programme was acquired from Bombardier by Longview Aviation Capital and led to the re-launch of the De Havilland Canada in June 2019. De Havilland Canada recently delivered the 800th Dash 8-400 produced at the company's Toronto facility. With more than 350 aircraft currently in service with North American operators, the Dash 8 aircraft has been recognized as a strategically valuable asset of fleets serving a spectrum of successful business models, including by many significant members of the RAA. "Young says, the Dash 8 customer base includes more than 65 operators and operators and the airframe will now support the world's widest fleet of Dash 8-400/200/300/400 aircraft."

The Tanzanian Government Flight Agency (TGA) signed a firm purchase agreement with

De Havilland Canada in June for a Dash 8-400 aircraft in a 78-seat, dual-aisle configuration, marking the first firm order for the Dash 8-400 under the De Havilland ownership. Air Tanzania will operate the aircraft under lease and the new Dash 8-400, will join the fleet of the type already in service and another previously ordered one. "Our current fleet of three Dash 8-400 aircraft is performing very well and offering excellent passenger amenities," said Ladislav Malind, CEO, Air Tanzania. Malind has expressed his satisfaction of the Dash 8-400 aircraft's low operating costs and reliable operations in the airline's high-utilization environment. "The after-sales support that we have been receiving from De Havilland Canada has been excellent and we are happy to reinforce our commitment to this aircraft as we count on more support from De Havilland Canada as our fleet, operations and route network continue to grow," Malind adds.

De Havilland Canada is also offering Express's ultra-light T1252 E2 seats on the Dash 8-400 as an option. Indian Low Cost Carrier LCC, SpiceJet took delivery of its first Dash 8-400 aircraft with T1252 E2 installation in December 2018. Express's T1252 E2 weighs only 6.5 kg per passenger and is the lightest seat certified for installation on the Dash 8-400 aircraft. Depending on the configuration, the choice of these seats, reduces in-flight weight by between 300 and 1,000 lbs. In addition to offering up to 90 per cent fuel savings, the Dash 8 aircraft is unmatched in the market and is also available in other configurations. A future configuration could be a three-class, 50-seat configuration for regional aircraft operators seeking to serve specific local opportunities.

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The main modification on the 42-600S is the introduction of a larger radiator, for greater control of the aircraft at lower speeds. Increased braking efficiency of 60 per cent improvement for STOL operations and the ATR 42-600S will be able to symmetrically deploy its spoilers to improve braking efficiency on landing. There will also be an auto-brake system which, so that full braking power occurs immediately upon landing. While the new 42-600S will have the same engine as the ATR 42 and 72, ATR 42-600S pilots to be able to select between the ATR 42 and 72 engine ratings. This could give them the ability to use increased power for performance STOL operations, or more efficient operation with less power, while operating on longer runways.

Upgrading a Market Leader Since its arrival in 2011, the ATR 400 series has become the number one aircraft in the global regional aviation market. One of the cornerstones of its success has been the policy of continuous improvement which continues to deliver innovations that offer real value to both airlines and passengers.

The 400 comes, as standard, with a full glass cockpit with Performance-Based Design (PBD) and a new cockpit display. The new cockpit display is the first commercial aircraft-maker to offer a such a system. There are many airports that do not have Category I or II instrument approaches, but a solution that can help to improve visibility in such situations.

have no ground-based navigation system, such as ILS (Instrument Landing System) but all airports are equipped with ILS. The 400 comes with ATR's Avionics system, which includes A320 size overhead bins and A320 size seats.

The 400 also has an option that is called ClearVision, a vision system that provides either enhanced or synthetic vision, or a combination of the two, providing the pilot better situational awareness in conditions of reduced visibility, such as at night or in bad weather. ATR is the first commercial aircraft-maker to offer a such a system. There are many airports that do not have Category I or II instrument approaches, but a solution that can help to improve visibility in such situations.

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## BATTLE OF THE GIGANTS

ONE OF THE BIGGEST CONTESTS IN THE AVIATION INDUSTRY OF LATE HAS BEEN THE ONE TO OFFER THE LONGEST FLYING ROUTES

▶ Jay Menon

The battle between Airbus and Boeing over their next-generation of long-haul aircraft has heated up once again, with Qantas set to fly the aircraft for its ultra-long-haul initiative, Project Sunrise.

Qantas has challenged Airbus and Boeing, the world's two leading airframers, to develop an aircraft capable of flying anywhere in the world from anywhere else, ushering in a new era of ultra-long-haul travel.

#### Prized Competition

While Airbus is pitching its A350-1000 as its lead contender for Qantas's Project Sunrise, Boeing is pitching its 777-300ER. However, Boeing's 777-300ER decision timeline will depend on customer demand. These pitches, together with findings from the research flights and other streams of work, will form part of a business case being developed by Qantas to inform a final yes/no decision on Project Sunrise expected the end of the year. If approved, flights would start in 2022/23.

The 787-9 used for the first research flight took off with maximum fuel and a restricted passenger and baggage load (and no cargo) to allow the aircraft to operate the flight non-stop. It represented the world's first flight by a commercial airline from New York to Sydney and only the second time a commercial airline has flown from London to Sydney.

#### Testing Days

A total of 49 passengers and crew were on the flight, which was led by a series of experienced pilots to assess how well the aircraft would perform on the flight. Data from these experiments will be used to help shape the crew rostering and customer service of Qantas ultra long

haul flights in future - including Project Sunrise. Tests ranged from monitoring pilot brain waves, metabolism levels and stress, through to exercise classes for passengers.

Cabin lighting and in-flight meals were also adjusted in ways that are expected to help reduce jetlag, according to the medical researchers and scientists who have partnered with Qantas. Arriving in Sydney, Qantas Group CEO Alan Joyce said: "This is a really significant first for aviation. Hopefully, it's a preview of a regular service that will speed up how people travel from one side of the globe to the other. We know ultra long haul flights pose some extra challenges but that's been true every

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## FORGING NEW MARKETS

ATR IS LOOKING TO BUILD ON ITS ENTRY INTO THE SOUTH KOREAN MARKET

▶ Atul Chandra

A new Korean carrier, H1 Air will soon commence operations with two 72-500 aircraft, making it the first ATR operator in South Korea. H1 Air is backed by South Korea's leading transport company, High Global Group and plans to launch operations in the coming month. It is currently going through the air operator certificate (AOC) application process with the regulator. The new carrier plans to grow its ATR fleet by 2023 to 10 airplanes at the rate of two new aircraft each year.

ATR is bullish on its prospects in South Korea, where it is promoting the ATR 42-600 and ATR 72-600. "There is renewed interest in Korea for regional aircraft and a growing appreciation for the versatility and flexibility of regional aircraft," Jean-Daniel Kosowski, Sales Director for ATR in Charge of Korea told Asian Airlines & Aerospace, during an exclusive interview, prior to the start of Seoul International Aerospace and Defense Exhibition (Seoul ADEX 2019) in November. Kosowski offers that the ATR is the best aircraft for developing new routes and markets and that the existence of a strong customer network in the region is a major factor for potential operators. ATR's turboprops will also help operators in launching new air services connecting Korean cities to ports in southern Japan and to cities in northeast China.

H1 Air has chosen Ulsan as its base and plans to launch domestic services first and later look to expand internationally. The H1 Air aircraft was developed by Skyward Aviation and Papa Golf Aviation, which saw the sale to the new carrier of two aircraft previously operated by Air Tahiti. The aircraft with SI Nos 862 and 860 were delivered on 30 April and 8 July 2019 respectively.

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## ENTERTAINMENT ON THE GO

AIRLINES SEE IFE AS A KEY DIFFERENTIATOR

▶ Atul Chandra

Airlines continue to invest in new generation In-flight Entertainment (IFE) systems in their quest to win the hearts of the travelling customer. The growth of high-speed Wi-Fi is also increasing passenger expectations with regards to their IFE experience onboard the aircraft. It would not be out of place to say that, for many customers today, the default expectation is to have access to a wide selection of entertainment provided on an in-seat monitor or on their personal devices, supported by high-speed Wi-Fi.

In September, JetBlue selected Thales' AVANT IFE for its single-aisle A220-300 fleet. Deliveries of the IFE systems which will be fitted on 70 A220-300 aircraft start next year. 253 of JetBlue's single aisle aircraft have been fitted with Thales' inflight entertainment and connectivity solutions. In 2020, JetBlue set out to disrupt the industry as the first airline to offer live TV on every seatback, on every plane. While extremely proud to continue the long-standing relationship with our partners at Thales, and look forward to introducing a brand-new, custom-fit JetBlue generation of in-flight entertainment on our A220 aircraft," says Maria Stojanovic, director of product development, JetBlue. Every seat on JetBlue's A220s will feature the latest 32" high-definition HD screens with picture-in-picture functionality, custom connected applications, audio and video on-demand, and personal device pairing to meet customer expectations. The Android-based AVANT system equipped with high capacity servers, locally stored content, and integration with the onboard connectivity systems. USB and AC power will also be available for every customer to keep their devices fully charged.

Upgrading a Market Leader Since its arrival in 2011, the ATR 400 series has become the number one aircraft in the global regional aviation market. One of the cornerstones of its success has been the policy of continuous improvement which continues to deliver innovations that offer real value to both airlines and passengers.

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[IN-FLIGHT ENTERTAINMENT]

#### Panasonic to the Fore

Indian Full Service carrier Vista Air is the launch customer for the new Vista Inflight Map Platform and Games, developed by Panasonic Avionics Corporation (Panasonic) as part of its Theatre solution. The newly-launched entertainment solutions developed by Panasonic will be installed on Vista's Boeing 787-9 and Airbus A320neo aircraft fleet from 2020. David Barlett, Chief Technology Officer of Panasonic Avionics Corporation, says: "We know that passengers who are entertained and engaged in flight are happier with their travel experience. Arc has completely re-imagined and revolutionized what an inflight map experience can be and Games fully immerses people of all ages in inflight, reflecting the future of the passenger experience. Panasonic is honored to be working with such a forward-looking and award-winning airline as Vista to launch these solutions."

Arc is a revolutionary, personalized 3D inflight map application and solution for Panasonic's inflight entertainment and connectivity (IFEC) systems. Arc's innovations include the industry's first personalized maps capability, new Map-as-a-Service technology that enables the development of applications utilizing the map engine and features set, premium destination

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time technology has allowed us to fly further. The research we're doing should also offer better strategies for improving comfort and wellbeing along the way.

"Night flights usually start with dinner and then lights are dimmed. We started with lunch and kept the lights on for the first six hours, to match the time of day at our destination. It means you start reducing the jetlag straight away."

"What's ahead is clear it's how much time you can save. Our regular one-stop New York to Sydney service (QF12) took off three hours before our direct flight but we arrived a few minutes ahead of it, meaning we saved a significant amount of total travel time by not having to stop," added Joyce.

Qantas Captain Sean Golding, who led the first photo operating the service, said: "The flight went really smoothly. Headsdown picked up overnight, which slowed us down to start with, but that was part of our scenario planning. Given how long we were airborne, we were able to keep optimizing the flight path to make the best of the conditions."

"We had a lot of interest from air traffic controllers as we crossed through different airspace because of the uniqueness of this flight. We also had a special sign-off and welcome home from the control towers in New York and Sydney, which you don't get every day." "Overall, we're really happy with how the flight went and it's great to have some of the data we need to help assess turning this into a regular service," said Captain Golding.

#### The Way Forward

Two more research flights are planned as part of the Project Sunrise evaluations - London to Sydney in November and New York to Sydney in December. All carbon emissions from the research flights will be fully offset. Qantas has named its endeavor "Project Sunrise" after the airline's historic "Double Sunrise" end-to-end flights during the Second World War, which remained airborne long enough to see two sunrises. "We're making the first YES-NO decision on Sunrise by the end of this year. In the meantime, we have an opportunity to do some exciting research," Joyce said.

Airbus and Boeing are fighting aggressively to win Qantas Project Sunrise order. Not only will the winner secure a record title applied to the aircraft, but also end up being an A380 replacement in the future. Airbus with the

A350-1000 weighing 45 tonnes less at take-off compared to the 777-300ER, is confident of winning the order. "The airplane will be available in the time frame required by Qantas at the end of 2022," Airbus head of A350 marketing Maria Luisa Ugena says. "There are no uncertainties around it. Various adjustments are being discussed with Qantas to increase the performance of the A350-1000, including bumping up to 750 nautical miles to 8700 nautical miles with 375 passengers."

Under a new agreement with Boeing, Qantas will be purpose the scheduled end flights of upcoming 787-9 deliveries in October, November and December as research flights for the long-haul routes. Australia's regulatory authority, the Civil Aviation Safety Authority (CASA) will also use the flights for the on-board medical crew to establish new regulatory requirements for the long-haul flights. Two Australian universities, Monash University and Sydney University's Charles Perkins Centre will participate in the research portion of the flights. "Ultra-long-haul flying presents a lot of common sense questions about the comfort and well-being of passengers and crew," Joyce said. "These flights are going to help us answer those questions and make sure that Boeing and Airbus have aircraft that can do the job, and we have their best-and-first offers on the table - including a compelling offer from Boeing to deal with any delay to the 777s. We have a high-level design of what our cabins would look like. And we're working with regulators to allow flights beyond 20 hours," Joyce said. "There's plenty of enthusiasm for Sunrise, but it's not a foregone conclusion. This is ultimately a business decision and the economics have to stack up." Joyce added.

#### PROJECT SUNRISE RESEARCH FLIGHTS - KEY FACTS

- Non-stop flights from New York and London to Sydney will take around 18 hours each, subject to wind and weather conditions. The data from these flights will be used to help assess turning this into a regular service.
- The flights will be collected off the production line by Qantas pilots, and the order will be delivered to the airline by the end of the year.
- The flights will take place in October, November and December, in-line with scheduled aircraft deliveries from Boeing.
- Flights will have up to 40 people (including crew) on board and a minimum of luggage and catering to extend the range of 787-9.
- Other than crew, those in the cabin will mostly be Qantas employees and researchers.
- After the flight, Qantas will offer a regular service with Qantas International - with just a few extra miles on the clock.
- Qantas operates the largest airframe aircraft off-shore in the world. This same option will be used to offset all the carbon emissions from these three flights.

Qantas will have up to 40 people (including crew) on board. Australia, Airbus has once flown non-stop from London to Sydney. That flight had a total of 25 people on board and minimal luggage. The flight was a record for the airline. The flight was a record for the airline. The flight was a record for the airline.

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#### INTERACTION-JEAN DANIEL KOSOWSKI

#### "WE SEE FOUR KEY MOMENTS FOR THE ATR IN KOREA"

Atul Chandra, Sales Director for ATR in Charge of Korea

Kosowski highlights the versatility of the ATR family for South Korean operators as follows:

- Launching new air services connecting second and third-tier cities in Korea.
- Launching new short-haul international air services linking Korea to other countries.
- Launching new short-haul international air services linking cities in Korea, especially those in the south, to cities in southern Japan.
- Launching new air services to the new island airports that will be built in Korea.

Currently the domestic flights are mostly north-south and nearly all the flights are routed through either Seoul or Jeju. But we see there are opportunities to fly cities in the east and west direct. In particular, those cities in the east that are not connected to high-speed rail. South Korea is also an emerging international gateway as Busan, Cheongju, Man and Daegu.

So you already have international travellers flying into these cities.

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#### Point-of-Interest Content, Monetization

opportunities for airlines through Panasonic's Marketplace e-commerce platform, and the ability to integrate with airline advertising and promotions. Panasonic's Arc personalized 3D inflight map application allows airlines to leverage the high viewability of moving maps in-flight. It is available across all inflight displays including seatback, overhead, handsets, and within mobile apps and web portals. In April, the Games offering, which is part of Panasonic's Theatre entertainment solution, is an attempt by Panasonic to cater to gamers worldwide as

crew to receive a brand-new iPhone Xs. The new iPhones will be loaded with a selection of apps to help crew members find additional assistance during their journey, such as, provide flight and airport information, confirm requests for airport assistance, confirm details of new bookings when onward flights are delayed or cancelled, book special meals and amenity personal preferences.

New Look Airbus carrier Qantas will upgrade all 12 of its A380 aircraft as part of a multi-million-dollar upgrade. The airline recently took delivery of the first upgraded A380. Upgraded Qantas A380s will seat a total of 485 passengers in a four class layout with 14 First Suites (unchanged), 70 Business Suites (by seat), 60 Premium Economy (by seat) and 600 Economy (by seat).

Smaller use of space on the A380 has allowed Qantas to increase the number of Premium Economy seats (from 36 to 60). The larger Premium Economy cabin also features a self-service bar. At the same time, the carrier has significantly expanded the

Larger, Full HD screens with a movie picture quality resolution of 1920x1080p in First Class (16" IFE screen), Business (16" IFE screen) and Premium Economy (12" IFE screen). The refurbishment of the aircraft is also being done in the time frame required by Qantas at the end of 2020. Qantas took delivery of its first A380 in 2008 and operates the aircraft at Melbourne, Sydney, Singapore, London, Los Angeles, Hong Kong and Dubai.

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IF INDIA CAN BRING TO REALITY THE CHANGES THAT ARE CURRENTLY BEING DISCUSSED, IT COULD BE A GAME CHANGER FOR ITS MRO INDUSTRY

► Jay Menon

India seems to have been shaken up from its slumber as Thailand's neighbours across the ocean, announced plans to build a full-fledged MRO unit in response to a rapid increase in the number of aircraft operating in the region. For decades, the commercial aircraft maintenance, repair and overhaul (MRO) market in Southeast Asia has been controlled by leading players in Singapore, the regional aviation hub. These Singapore companies have been providing maintenance services for airlines both in and outside the region.

Leading aircraft makers Boeing and Airbus expect that carriers in the Asia-Pacific region will need about 16,000 new aircraft valued at US\$2.6 trillion by 2036. This means huge opportunities for MRO service providers as commercial aircraft are required to be inspected and maintained after every flight and overhauled every few years.

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#### Land of Opportunity

That Airways MRO arm, Thai Technical, hopes to incorporate its U-Tapao-based joint venture MRO with Airbus by the first quarter of 2020, for launch in 2022. The facility will be able to support various aircraft types including the Airbus A380, A350, A330 and A320, as well as Boeing types such as the 747, 777, 787 and 737.

So with Thai Airways International and Airbus partnering to explore MRO business opportunities at the island nation's U-Tapao airport, global and domestic providers of aviation services to commercial airlines are now seeking to capitalise on the growth of the region's aviation industry through the maintenance business.

India, with its growing aircraft fleet size, strategic location advantage, rich pool of engineering expertise, and lower labour costs has huge potential to be a global MRO hub. India's current MRO market size is estimated to be about US\$750 million. As per Boeing itself, the market is expected to grow at 7 per cent CAGR for the next 7 years to reach \$1.2 billion by 2020. With

the fleet size likely to double by 2020, the need for a strong domestic MRO industry is critical and not just desirable.

#### Making an India Entry

Illinois-based AAR recently announced a joint venture with Indian Airlines, a leading aviation company in India, for the development of a new airplane maintenance, repair and overhaul (MRO) facility in western Indian city of Nagpur. The new MRO facility, which is already under construction, will initially comprise six narrow-body bays, including one bay for paint. Additional phases are planned for a total of 16 bays, as well as component repair shops.

The MRO will serve India's fast-growing commercial aviation market and is scheduled to open in the fall with FAA, EASA and DGCA certifications. Fully aligned with the 'Make in India' initiative, the facility will employ Indian nationals, including some of the existing Indian workforce. A training school under Indian's CAR 147 certification and the government of India's Skill Development Program will allow hundreds of students to gain skill sets and employment. The initial group of students will receive practical training at one of AAR's MRO facilities in the United States.

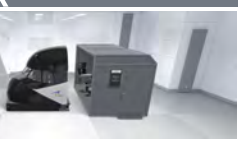
**"WE ARE EXCITED TO EXPAND AAR'S MRO EXPERTISE OUTSIDE OF THE AMERICAS IN PARTNERSHIP WITH INDIAN, WHICH HAS THE LOCAL MARKET AND CULTURAL KNOWLEDGE NEEDED FOR SUCCESS,"** says John Holmes, President & Chief Executive Officer, AAR.

**"WE ARE LOOKING FORWARD TO BRINGING OUR MRO EXPERIENCE TO CENTRAL INDIA TO HELP SERVE THE COUNTRY'S FAST-GROWING AIRLINES."**

#### Waiting for Growth

India's GMR Aero Technic Ltd. (GATL), a 100 per cent subsidiary of GMR Hyderabad International Airport Ltd. (GHIAL), received the prestigious Federal Aviation Administration (FAA) approval on popular narrow body aircraft (B737/A320). The FAA approval will make GATL an authorised MRO services provider for all 'C' checks for FAA registered B737/A320 aircraft and for NOTI (non-destructive testing) inspections.

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## IN ROBUST HEALTH

2019 WAS ANOTHER GOOD YEAR FOR MAJOR PLAYERS IN THE CIVIL AVIATION FLIGHT TRAINING AND SIMULATION MARKET

► Arun Sivasanakar

The civil aviation flight training and simulation market witnessed healthy growth in 2019, spurred by operators scrambling to produce quality pilots and the need for cost-cutting in pilot training. Major players consolidated their position, with some exploring new markets.

With technological advancements in the field of flight simulators making synthetic training more realistic than ever before and providing real life-like experience to pilots, industry experts predict the demand for such devices to increase in the future. With the market primed for sustained growth, it is not a coincidence that the industry has seen a sharp increase in the money being invested in research and development, with companies vying with each other to introduce new products and gamer deals.

According to a forecast by Grand View Research (GVR), an US-based market research and consulting company, the global flight simulators market will reach US\$6.62 billion by 2024, spurred by an increase in air traffic and the need for trained pilots. There are currently about 1400 devices that simulate commercial airlines in use around the world, an increase of about 80 from 2018. More than one third of the synthetic training devices are in North America, with simulators of Boeing aircraft types accounting for 45% of all such equipment in the world. According to GVR, FFS products, which accounted for over 85 per cent of the total revenue in 2015, is expected to grow at a CAGR of over 4% until 2024. Manufacturing costs as well as operation and maintenance costs of flight simulators continue to be on the high side, but the many advantages of such devices – it saves fuel, extends the life of aircraft and engines, and allows training in conditions such as severe thunderstorms and system failures – will ensure enough activity to keep the major players busy for the foreseeable future, industry experts say. Although North America currently has the largest market share of flight simulators, it may not hold on to the position for long. Companies are targeting the Asia Pacific region as well as other growing markets such as Latin America and the Middle East.

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"The GATL is the sole MRO provider in South Asia region with FAA approval in place offering fully equipped workshop and aircraft painting capabilities to handle requirements for B737, A320, ATR and Bombardier CRJ400. It is currently developing capabilities to include MRO capabilities for wide body aircraft and the new B737 MAX variant among others," says an official at the MRO unit. All aircraft owned by India can be certified by the DGCA (Director General of Civil Aviation), which is backed by the licences India has procured from the OEMs.

But when the aircraft is leased, apart from DGCA certification the airlines have to be certified by an MRO accredited with the FAA, or by the EASA (European Aviation Safety Agency). Currently, the GATL holds the largest share of the market for outsourced airline base maintenance MRO business in India, backed by a wide set of approvals and certifications from across the globe including DGCA and EASA.



There are also talks that the Tata-Singapore Airlines venture Vistaar, which plans to induce more aircraft into its fleet from the Airbus A320XLR2neo family, has outsource its engineering support services to original equipment maker Airbus and is also negotiating with home-grown AirWorks for MRO of its fleet.

Unlike Thailand, India has a larger fleet of aircraft of various types. India's largest MRO Air India Engineering Services Ltd. (AESL), which till recently was doing maintenance of all national carrier Air India's aircraft, has decided to take in airlines belonging to other airlines. Currently, within India, AESL has facilities at Mumbai, Delhi, Kolkata, Hyderabad, Nagpur and Thiruvananthapuram where, apart from Air India aircraft, it services airlines of other airlines.

"AESL marketing team is already in touch with various airlines, and we are hopeful to sign up with new operators like AirAsia Berhad, AirAsia Thailand, United China, VietJet of Vietnam, Kalitta Air, Thai Smile, Cebu Pacific, Manila, Oman Air and Sri Lanka Airlines for additional stations in India. In addition to this, AESL has also entered into agreements with domestic operators like Jet Airways, GoAir, Air Asia India and SpiceJet to carry out their base maintenance work at MRO facilities of AESL in India," an official of AESL informs.

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According to industry experts, establishing inventories has been a very serious problem. With thousands of components for each type of aircraft, any MRO which wants to be a global player must be able to cater to at least 50 per cent of the normal repair requirements of an aircraft. AESL is believed to be capable of meeting only 25 per cent of the business requirements as of now. That means putting up money for the components, the test bays, the software and the licences. According to estimates, AESL will require around \$250 million to upgrade itself as a world class MRO.

AESL meanwhile, has firming up plans to open a MRO unit in Muscat, Oman, from where it expects to generate labour revenue of at least US\$500,000 per annum. The Muscat MRO will be a part of AESL's overseas expansion plan under which it first opened an international branch in Sharjah, United Arab Emirates (UAE). Based on the experience and backed by cost benefit analysis, the opportunity to expand to other international stations will also be explored. At present, the report for Abu Dhabi, Ras Al Khaima, Muscat has been prepared to start AESL's line maintenance operations and achieve profitability," the company official informs.

Srujan Kashyap, executive vice president and head of Engineering & Maintenance for Air India, which was one of the first private airlines to get the AESL services says,

"We request companies offering MRO services to set up a facility in India. We need more volume. The 'Make in India' program should look at attracting work from South East Asia and the Middle East, as India, with its growing aircraft fleet size, strategic location advantage, rich pool of engineering expertise, and lower labour costs has huge potential to be a global MRO hub. India has the MRO in India to take to the next level. The government policy to give a push to the sector."

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#### Positive Steps Needed

Former president and managing director of Airbus Pierre de Baulazet says, "development of MRO units in India is not happening at a pace as it should. I haven't seen local investors invest fully fledged in MROs. If it hadn't been on taxes and royalty at some airports, which have made it uneconomical for MROs in India, we wouldn't see so many airlines flying abroad for MRO services." Two main airports of Delhi and Mumbai charge rents which are 50-100 per cent higher than that charged at equivalent facilities in Europe and Turkey.

"The Airport Authority of India (AAI) should allow MRO work to happen at its airports across the country. Although this is permitted at their airports, detailed rules and regulations make it practically impossible. The space needs to be made available at reasonable rents and procedures simplified for MRO work to be carried out," says an industry official who didn't want to be named, as he argues that rents at the two main airports of Delhi and Mumbai need to be rationalised.

#### High Charges

The two main airports also impose about 20 percent royalty charge on maintenance work at the airports. And the demand by the MRO industry to the government to slash these rates was sternly objected by the government. The MRO industry also has urged the Indian government for a reduction in the tax burden on the sector.

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currently levelled at 18 percent. The MRO Association of India has warned that the industry could face a closure if the Goods and Services Tax (GST) "anomaly is not set right". Founder secretary general of the association Pankaj Sen says airlines are finding it cheaper to send their aircraft overseas for maintenance although they cost more. The cost benefit that the MRO industry enjoyed because of low cost of labour in India – US\$20 to US\$35 an hour – has been eroded due to the GST burden.

He referred to countries such as Singapore and Malaysia where GST is levied at 7 percent and Sri Lanka which does not levy any tax at all on the industry. According to the association, with 500 commercial aircraft in the Indian airline fleet at present, the value of MRO work is estimated to be around US\$800 million. The value of MRO work is expected to reach US\$1.75 billion in the coming years when another 1,000 aircraft are added to the fleet strength. "But the industry can suffer tremendously if things remain same," Sen warns.

The major growth engine in the aviation sphere will be Asia, especially China and India, which will become the largest region, nearly doubling in-service fleet and related MRO demand. Hence a reduc-

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#### one with Philippine Airlines.

#### Making Major Inroads

In October, FlightSafety Testion Aviation Training, a joint venture between FlightSafety International and TRU Simulation + Training, announced that it would install a new simulator for the Garuda Citarion Latitude aircraft in Europe. The exact location is yet to be determined. The simulator, which will be manufactured by TRU Simulation + Training and equipped with FlightSafety's VTS1150 visual system, is expected to enter service by the end of 2020 following Level D qualification. FlightSafety Testion Aviation Training provides training to operators of Beechcraft, Cessna and Hawker aircraft at 17 Learning Centers around the world using a fleet of 89 full flight simulators.

Meanwhile, FlightSafety International and Gulfstream Aerospace are preparing to provide training for the new Gulfstream G700 aircraft. The design of a new FlightSafety FTS1000 FFS for the aircraft is underway; the simulator will be installed at the FlightSafety Learning Center in Savannah. FlightSafety International is expected to start construction on a new Learning Center in Houston, Texas, in the spring of 2020. The Center will be equipped initially with 12 full flight simulators for a wide variety of aircraft types. And will include a dedicated area for training on Pratt & Whitney Canada engines. During the course of the year, the company also expanded its Sikorsky S-70 Training Program, delivered an Embraer E-175 simulator to the ExpressJet facility at Houston Intercontinental Airport, installed an E-175 cabin trainer as well as worked on graphical Flight deck simulators for the Embraer E-175 and E-175 aircraft. It was also selected by Egyptian to design and manufacture a full flight simulator for the Airbus A320neo aircraft. In June this year, the company's new Embraer E-Jets E2 training program received the approval of the FAA, the European Union Aviation Safety Agency, and the National Civil Aviation Agency of Brazil.

#### Enhancing Their Market Share

At the Paris Air Show, TRU Simulation + Training announced that Istanbul-based customer International Flight Training Center had signed a letter of intent for two new full flight simulators, a 737 MAX and A320neo FFS. IFTC operates five TRU-built simulators. In October last year, the Boeing Flight Services Training Center in Shanghai received Level D qualification for China's first-ever 737 MAX full flight simulator, delivered by TRU Simulation + Training. TRU also signed a contract with Shandong Airlines in China for two 737 MAX FFS.

In April this year, L3 Commercial Aviation announced that it would Flight Training Devices (FTD) to Spirit Airlines training center in Miami, Florida. The company supply 10 new fixed-base devices, including two Level 5 A320neo CEO/NEO Convertible FTDs, four Flat Panel Trainers and four dual-screen Virtual Flight Deck stations, as well as a tablet-based Flight Management System Trainer and customized EHSIS Systems and Procedures suite. In October last year, the company opened its newly expanded pilot training center facility in Arlington, Texas. The facility will offer simulation and instruction for military as well as commercial pilots. In October last year, L3 Commercial Aviation announced that it has been selected by Qantas to provide a B787-9 RealitySever FFS for use at Qantas Flight Training Facility in Sydney, Australia. In July last year, the company also signed a deal with Shenzhen Airlines to provide a Boeing 737-8 FFS for its training center.

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# GATHERING MOMENTUM

8TREE INTRODUCES NEW CAPABILITIES EVEN AS DENTCHECK, ITS DENT MAPPING TOOL, IS APPROVED FOR USE BY MORE CUSTOMERS

## ► Arun Sivasankaran

It has been a good year for 8tree, the company that makes dentCHECK, a handheld-portable, completely wireless 3D scanner tool that drastically reduces damage-mapping and reporting times. In October, Lufthansa Technik announced that it was using DentCHECK across all of its global base maintenance facilities. The leading MRO provider is the latest in the list of MROs and operators that have adopted the tool that has the capability to reduce dent-mapping and reporting times by as much as 90 percent compared to traditional manual methods that use depth-gauges and straight-edges.

**"AFTER TESTING SEVERAL DENT-MAPPING TECHNOLOGIES IN OUR INNOVATION BAY AT LUFTHANSA TECHNIK MALTA, WE WERE CONVINCED BY 8TREE'S DENTCHECK BECAUSE OF ITS USER-FRIENDLINESS AND PERFORMANCE,"** says Cathal O'Loughlin, Head of Tooling & Equipment at Lufthansa Technik Base Maintenance Services.

**"BY ACCELERATING THE DAMAGE-MAPPING PROCESS, DENTCHECK INCREASES EFFICIENCY AND FREES CAPACITY OF OUR SKILLED STRUCTURE MECHANICS."**



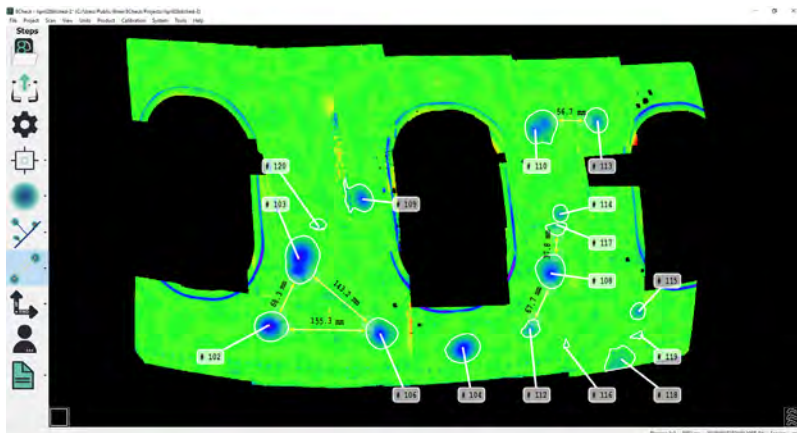
Some of the leading commercial operators, cargo and defense MROs that currently use the tool are easyJet, Delta TechOps, Aeromexico, Portugália Airlines, and DHL-Express. Among those that are considering the adoption of the tool in their maintenance operations is Allegiant Air, which conducted a study that spanned four aircraft and almost a hundred damage locations. The study revealed time savings of 87 percent. Enthused by the results, Allegiant is exploring the implementation of dentCHECK across its maintenance operations.

"Pre-owned aircraft comprise a majority of Allegiant's fleet, and thus, mapping pre-existing damage is a critical part of our aircraft induction process," said Jack Fraser, Managing Director, Technical Support & Compliance, Allegiant Air, at the 62nd annual A4A NDT Forum in Long Beach, California, in September. "dentCHECK significantly reduced the time it took us to measure and report damage, while also delivering improved accuracy and consistency of measurement. We saw a drop from 92 minutes per damage location using traditional measurement methods, to only 12 minutes with dentCHECK."

## New Customers

"We decided on dentCHECK because of the great efficiency gains it can deliver to a busy MRO operation such as ours," says Ralf Noether, director maintenance of European Air Transport Leipzig, a division of DHL Express. "The one-button operation and instant 'go/no-go' answers empower our technicians to confidently make decisions on-the-spot, thereby improving aircraft turn-around-time."

Another happy customer is SR Technics, which will use the tool to enhance its maintenance operations in Switzerland and Malta. "The main reason we have selected dentCHECK is because we were confident that this innovative solution has proven to be a great benefit to our maintenance operation allowing us to send accurate dent assessment reports



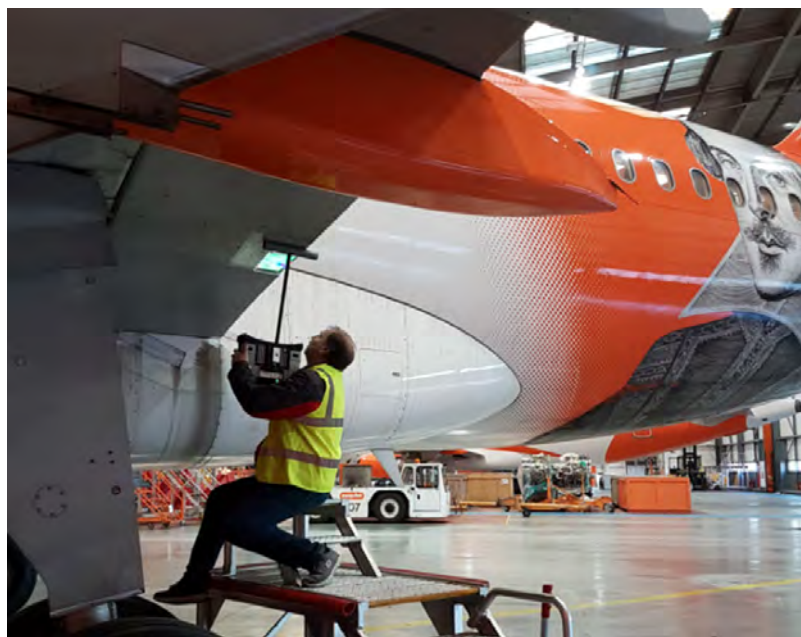


to our customers more rapidly than ever we experienced before,” says Jakob Straub, Head of Aircraft Services & Line Maintenance at the Zurich-based MRO. “As a result, true value is added to our customer having his aircraft returned back to service more quickly and efficiently.”

Purpose-built for the aviation maintenance industry, the completely wireless 3D scanner tool with integrated AR delivers real-time ‘go/no-go’ answers at the push of a single-button, significantly reducing damage-mapping and reporting times, compared to traditional manual methods that use depth-gauges and straight-edges. This shortens aircraft Turn-around-Time (TaT), which further reduces lost revenues and very directly improves operational efficiency for airlines. Detailed case-studies published by TAP-M&E and easyJet, as well as news from Airbus’ Flightline, DHL-Express and Zeppelin, demonstrate that dentCHECK reduces inspection and reporting times by up to 90%.

## Adding Capabilities

Buoyed by the enthusiastic response from airlines and MROs to dentCHECK, 8tree rolled out new offerings this year. After launch-



ing 8cloud, Blend-Out Assistant and Multi-damage report offerings at MRO Middle East in Dubai, the company unveiled dentCHECK pano at MRO Americas in April. According to Arun Chhabra, CEO, 8tree, the combined impact of these new offerings enhances maintenance efficiency by orders of magnitude, “far in excess of the 90% time-savings enabled by the dentCHECK tool alone.”

8cloud is a secure, cloud-based damage reporting platform that expedites the sharing of inspection content and reports between all stakeholders in the aviation maintenance industry. Designed to handle data from any inspection tool, 8cloud is now integrated within dent & buckle’s aviation damage tracking platform. According to Erik Klaas, CTO, 8tree, the company plans to develop similar 8cloud integration interfaces to other popular maintenance software systems, at no additional cost to end-users.

“We created 8cloud to address a chronic unmet need in how the aviation industry shares damage analyses amongst key stakeholders”, says Klaas. “Over the past few years, airlines, MRO and OEMs have continued to rapidly embrace the inspection and reporting

benefits delivered by 8tree’s dentCHECK tool. However, they have been hamstrung – primarily due to corporate IT restrictions – in sharing damage content within and outside their organizations. 8cloud overcomes these IT barriers, by offering a secure, browser-based interface for reporting, storing and sharing content from 8tree or other 3rd party inspection tools.”

“As an aircraft structures engineer, I clearly see benefits of integrating dent & buckle with dentCHECK,” says Kristinn Palsson, CEO, dent & buckle. “All relevant data concerning damages and repairs is stored in one place and tracked from the initial discovery, which is now standardized with dentCHECK – dent & buckle adds value to with its 3D interface and keeps on tracking through the repair stages to the end of the service life of the aircraft. The data that has until now mostly been recorded on paper we can now use for fleetwide analysis, redelivery or audits and learn much more about the operation of the fleet.”

dentCHECK pano is a response to requests from the industry, says Erik Klaas, CTO, 8tree. “They wanted us to develop a quick and seamless method to map entire aircraft bays, similar to how dentCHECK already allows them to perform quick spot-checks on smaller areas. dentCHECK pano allows them to do just that, producing a digital collage that can be archived for comparison during future maintenance. In early customer trials, pano has directly driven more than 95% time-savings compared to traditional methods.”

According to 8tree, dentCHECK pano can inspect, stitch and report an entire aircraft bay in less than 10 min, compared to 3-4 hours using other methods. “This has significant upside implications for RVSM measurements,” says Klaas.

## Endorsement by OEMs

The widespread attention that dentCHECK has received in the industry comes in the wake of endorsements by multiple OEMs. Airbus has published multiple approvals of dentCHECK in its Tool Equipment Manuals for dent-mapping on metallic aero-structures and composite cabin floorboards. dentCHECK also expedites blend-out remaining thickness measurement of uniform thickness panels as per procedures outlined in Airbus’ SRM 51-11-00 and SRM 51-11-13. Similarly, Boeing’s Service Letter recognizes the use of 3D scanning tools, such as dentCHECK, for dent-mapping on all of its commercial aircraft family types. dentCHECK performance has also been formally recognized for all De Havilland Dash8 (formerly Bombardier Q400) and Bombardier CRJ aircraft. ■

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Purpose-built for the aviation maintenance industry, the completely wireless 3D scanner tool with integrated AR delivers real-time 'go/no-go' answers at the push of a single button, significantly reducing damage-mapping and reporting times, compared to traditional manual methods that use depth-gauges and straight-edges. This shortens aircraft turn-around-time (TAT), which further reduces lost revenues and very directly improves operational efficiency for airlines. Detailed case-studies published by TAP-M&E and easyJet, as well as news from Airbus Flightline, DHL-Express and Zeppelin, demonstrate that dentCHECK reduces inspection and reporting times by up to 90%.

#### Adding Capabilities

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benefits delivered by Brees's dentCHECK tool. However, they have been hamstrung – primarily due to corporate IT restrictions – in sharing damage content within and outside their organizations. Bredol overcomes these IT barriers, by offering a secure, browser-based interface for reporting, storing and sharing content from Brees or other 3rd party inspection tools."

"As an aircraft structures engineer, I clearly see benefits of integrating dent & buckle with dentCHECK," says Kristin Palsson, CEO dent & buckle. "All relevant data concerning damages and repairs is stored in one place and tracked from the initial damage which is now standardized with dentCHECK – dent & buckle adds value to with its 3D interface and keeps on tracking through the repair stages to the end of the service life of the aircraft. The data that has until now mostly been recorded on paper we can now use for fleetwide analysis, readability or audits and learn much more about the operation of the fleet."

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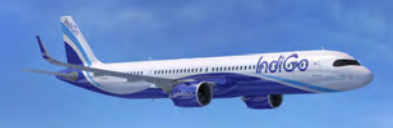
Bredol is a secure, cloud-based damage reporting platform that expedites the sharing of inspection content and reports between all stakeholders in the aviation maintenance industry. Designed to handle data from any inspection tool, Bredol is now integrated within dent & buckle's aviation damage tracking platform. According to Erik Klas, CTO, Brees, the company plans to develop similar Bredol integration interfaces to other popular maintenance software systems, at no additional cost to end-users.

"We created Bredol to address a chronic current need in how the aviation industry shares damage analysis amongst stakeholders," says Klas. "Over the past few years, airlines, MRO and OEMs have continued to rapidly embrace the inspection and reporting

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## GROWING STATURE



Indian Low Cost Carriers (LCCs) IndiGo and SpiceJet have benefited by the demise of Jet Airways but both airlines have been hamstrung with unforeseen problems related to their aircraft fleets. IndiGo has been particularly troubled by the continued problems with Pratt & Whitney PW1000G geared turbofan (GTF) engines that power its A320neo fleet. SpiceJet has been stymied by the continued grounding of its Boeing 737 MAX aircraft fleet.

In the meantime, our schedule remains intact," the airline said in a statement. IndiGo has also confirmed reports that its A320neos had four mid-air engine stalls in a week, that had caused aircraft to turn back.

IndiGo's CEO Wolfgang Pösch-Schauer detailed some of the issues faced by the airline during a financial results conference call in October. Speaking on IndiGo's PW1000G engines he says: "There are three main issues remaining to which we are on a good track. One is the third stage, low-pressure-turbine where all our aircraft delivered from May 2019 onwards are using new material. And there is no time limit for us. So, for all the aircraft already delivered, we have time to change all these planes with new material. Second is the issue with main gear box which is fixed. There was a required software change which is done already. And the last element or

#### IndiGo Brakes Setbacks

The directive issued by India's Directorate General of Civil Aviation (DGCA) in November, highlights the difficulties that IndiGo is facing with its PW1000G engines. The latest DGCA directive requires that all operating A320neos in India should have LPT3 modifications installed on both engines for operation post 31 Jan 2020. The LCC has now initiated an engine change program in accordance with the directive given by Directorate General of Civil Aviation (DGCA). "We are confident that we are able to meet this directive and are able to sustain our current schedule. IndiGo currently operates on its fleet of 58 A320 NEO family with around 45 percent of its engines modified. We are working with both P&W and Airbus on mitigation so that we have enough modified spare engines by January 31, 2020.

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the number three is the transient vibration, which happens due to the nature of this engine. And all regulatory authorities outside India have a requirement, if it's below a certain threshold, there is no maintenance activity required. We, however, have taken a more cautious approach and we are fulfilling that."

He states that the in-flight shutdown rates with the engine has come down to 0.01 per thousand engine flight hours. "However, there is one limitation that I want to mention is the extended range operations if you have an airport outside India. Right now, every airport must be reachable on our flight track within 60 minutes. For neo aircraft, we can't use extended range, which goes up to 120 minutes. So, our international operation will be having a more restricted route, which we are doing," said on the call.

Despite these troubles, the LCC placed a firm order for 300 A320neo Family aircraft in late October. IndiGo will acquire a mix of A320neo, A321neo and A321XLR aircraft as part of the latest order, which takes its total orders with Airbus to 750. The choice of engine manufacturer for this order will be made at a later date. IndiGo is the first Indian airline to order the A321XLR, unprecedented extra range of up to 4,700nm (with 30 percent lower fuel burn per seat compared with previous generation competitor jets). "IndiGo has brilliantly demonstrated the relevance of the A320neo for leading low cost operators, and the A321neo - and now the A321XLR - pro-

vide our operators with the logical next step in cost efficiency, passenger comfort and market coverage," said Christian Scheerer, Airbus Chief Commercial Officer.

IndiGo was one of our early launch customers for the A320neo and is now the biggest customer for the single-aisle jetliner. The LCC took delivery of its first A320neo in March 2018 and today has a fleet of 87 A320neo, 7 A321neo, 128 A320XLRs and 22 ATRs. IndiGo will start retiring its A320XLRs from 2020 and by 2022, IndiGo's A320neo Family fleet overtake the A320neo fleet. IndiGo also received its first A321neo in October and the aircraft was also Airbus 1,000th A320neo family aircraft delivery. IndiGo's A321neo will be powered by Pratt & Whitney PW1300G turbofan engines. The aircraft is configured in a 229-seat layout. IndiGo has contracted aircraft lessor CDB Aviation for nine Airbus A321neo jetliners. CDB Aviation anticipates the remaining eight aircraft to be handed over by the end of January 2020.

IndiGo reported a net loss of Rs 10,620 million for the quarter ended Sept 2019. The lower profitability was mainly contributed by mark to market loss due to capitalization of operating lease liabilities, re-assessment of accrual estimates for future maintenance cost and one-time adjustment owing to adoption of lower tax rates. Aditya Pandey, IndiGo's new CFO informed during the conference call. IndiGo extended the losses of most of its existing A320neo Family jetliners beginning 2016 and also got around 50 used aircraft from the secondary market. The engines of these older aircraft had to undergo their second shop visits which are significantly more expensive than first shop visits and these created maintenance cost spikes for the company. IndiGo is India's largest passenger airline with a market share of 48.2 per cent as of September, 2019. It also has a 59% market share in the domestic cargo business in India. The LCC operates to 60 domestic destinations and 23 international destinations.

**SpiceJet in Growth Mode**  
SpiceJet appears to be far away from the problematic days in 2016, when the airline was

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which exclusive freighter aircraft. SpiceJet added 27 Boeing 737 NGs, four Bombardier CRJ-900s and one B737 freighter between April and June 2018. The airline has launched a number of new flights and enhanced frequencies on its international network from the key metros of Mumbai, Delhi and Hyderabad to global hotspots such as Jeddah, Bangkok, Colombo, Hong Kong, Dubai and Dhaka. The airline is now operating flights from Mumbai to the Saudi capital city of Riyadh which earmarks the airline's 10th international destination.

#### MAX Trouble

SpiceJet has been severely impacted by the grounding of its B737 MAX fleet which has limited the carrier's ability to increase its yields owing to passenger disruptions and re-accommodation, while simultaneously increasing its fixed costs on this category of aircraft. "We are happy that we were able to minimise passenger inconvenience by quickly filling the capacity gap created in India's aviation sector. The results would have been vastly better but for the painful grounding of the MAX aircraft. We look forward to their swift return to service in the near future that will help SpiceJet increase its margins and provide a superior level of service," says Ajay Singh, Chairman and Managing Director, SpiceJet.

SpiceJet continues to incur various costs with respect to its 737 MAXs and in the quarter ended June 30, 2019, the airline announced that it had received Rs 114 million towards aircraft and supplemental lease rentals as other income, on account of 737 MAXs inability to undertake revenue operations. "This is a part recognition of the total reimbursements, on which the Company is working with the aircraft manufacturer, towards various ascertained costs and losses incurred by the Company on this aircraft," SpiceJet says.

To cater for the loss of its 737 MAX fleet, SpiceJet commenced operations with additional flights on its existing B737 NG & CRJ-900 fleet. The airline increased increasing the daily utilisation of these fleets to 15-16 hours per day and 13-14 hours per day respectively. It also inducted 27 Boeing 737 NGs between April 01, 2019 and June 15, 2019. The carrier had also announced it would cater for the increase in traffic during the winter season by inducting 5-10 Boeing 737 NG aircraft and 3 CRJ-900 aircraft during October 2019. SpiceJet had hoped that its grounded Boeing 737 MAXs would resume normal operations by July/August 2019. ■

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