AUSTRALIAN AVIATION

Australian Defence Business Review

AVALON 2017 SHOW DAILY

FRIDAY MARCH 3

NEXT-GEN RAAF

KC-30 hits FOC

The KC-30A Multi-Role Tanker Transport (MRTT) has achieved final operational capability (FOC) in Royal Australian Air Force service, Chief of Air Force Air Marshal Leo Davies announced at Avalon on Thursday.

"It is quickly becoming the tanker of choice," Air Marshal Davies said of the KC-30A.

"We are now there where the aircraft has done so many receiver clearances that, having spoken to the Minister for Defence over the last couple of days, I would like to take this opportunity to declare final operational capability for the KC-30A MRTT in the Royal Australian Air Force," AIRMSHL Davies told a media briefing.

"There has been a lot of hard work that has gone into its development, but ... there is a lot more that this aircraft can do. Now that we have FOC we are able to go into that next smart phase [of developing CONTINUED PAGE 3 >

F-35 arrival highlights a new beginning for Australian aerospace manufacturing

Not far from where the F-35A will touch down on Friday to make its Australian debut sit a number of forgotten buildings.

These hangars in a back corner at Avalon Airport were once hives of activity in the late 1980s and early 1990s as the then Government Aircraft Factory built Australia's then 'new' frontline fighter - the F/A-18 Hornet (now known as the 'classic' Hornet).

And while Australia is no longer in the business of manufacturing complete aircraft, Australian industry is once again hard at work contributing components and assemblies for the RAAF's newest fighter.

Manufacturing of the F-35 is a truly global concern involving thousands of faces beyond the single helmet that will occupy the cockpit. In Australia alone, more than 50 companies have contributed to the F-35 program with contracted values in excess of $800 million as of December 2016.

The range of components and support equipment is diverse. Airframe and engine components, avionics, composites, courseware, support equipment, tooling, the list goes on. The CTOL F-35A's vertical tail (VT) is a prime example. CONTINUED PAGE 3 >

SHOW HIGHLIGHTS

HEAD TO HEAD?

IAI PITCHES FOR AIR 7003

Page x

BATTLE TESTED

AH-64E AT AVALON

Page xx

A FIRST FOR AUSTRALIA AND SECOND TO NONE

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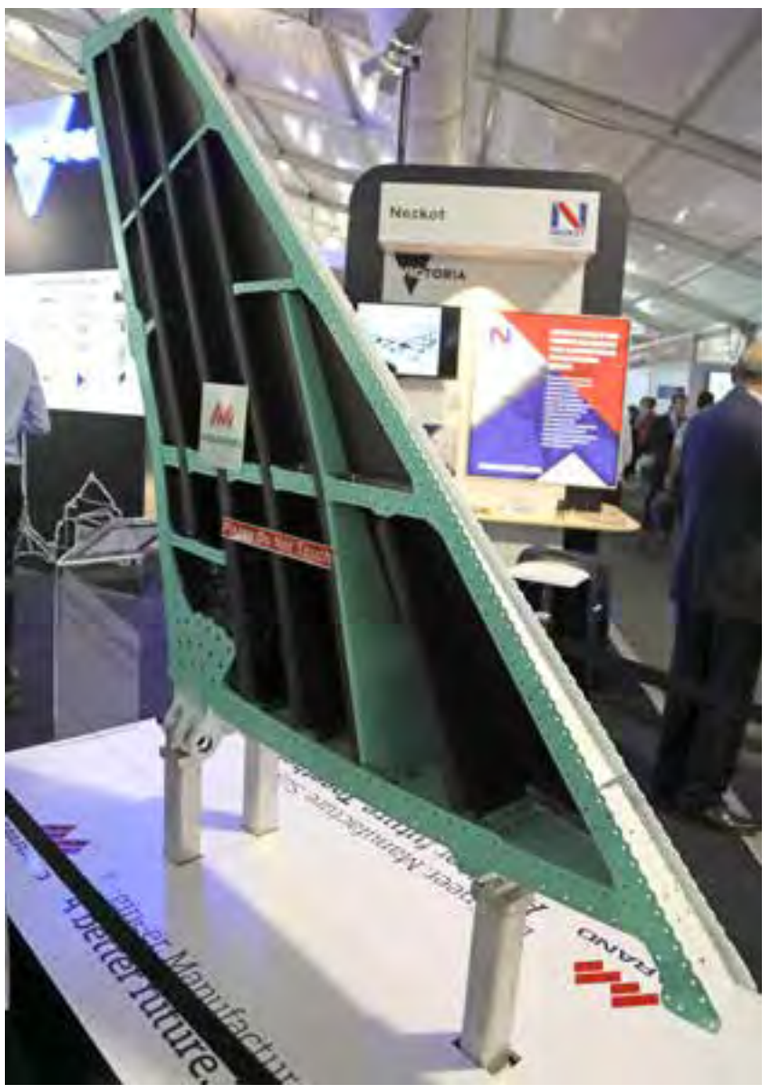
F-35 ARRIVAL - CONTINUED FROM PAGE 1 Victoria-based Marand Precision Engineering assembles the aerostructure at its Melbourne factory using Adelaide-based BAE Systems Australia-built titanium frames and composite skins from Sydney's Quickstep.

Marand boasts operations in both Moorabbin and Geelong and has involvement well beyond the vertical tail. While the Geelong site sits within the old Ford Motor Company plant, Moorabbin is used for assessment, testing and validation of its products. Managing director David Ellul explains that the company's involvement dates back to 2002 and has grown to also include an Engine Installation and Removal Trailer of which 67 have been built to date and exported. Marand also produces aerospace tooling and since 2002 has been responsible for more than 3,000 tools. Even when the F-35 program is complete and the aircraft is operational, Marand will provide ongoing support to the non-flying equipment.

Marand is just one company in a network of Australian F-35 project partners that have grown the Australian aerospace industry. And while the sound of tools may have gone silent in the Avalon hangars of yesteryear, a new generation can be heard in the roar of the F-35.



KC-30 FOC - CONTINUED FROM PAGE 1 the aircraft],"

the Chief observed.

"This tanker has come a long way since its introduction, undertaking significant operational, test and evaluation activities with a range of coalition aircraft, including United States Air Force F-35A Lightning II aircraft. This was a vital test of the KC-30A, to ensure we are prepared for our future force, including our F-35A arriving in late 2018."

Defence Minister Senator Marise Payne also noted the significance of the KC-30A achieving final operating capability in a statement on Thursday.

"This is a significant milestone for the fleet, which is now able to refuel a range of aircraft from our Air Force and our international partners," Minister Payne said.

"The KC-30A has been an outstanding asset over Iraq on Operation Okra, having offloaded over 74 million pounds of fuel to coalition aircraft, including Australia's F/A-18A Hornet and E-7A Wedgetail aircraft. It is on the frontline, making sure the Hornets can take the fight to Daesh effectively.

"Just one KC-30A can support the deployment of four fighter aircraft over 5,000km, with 50 personnel and 12 tonnes of equipment. It is an extremely versatile aircraft that is suited to the long ranges of the Australian continent."

The Avalon Airshow also saw the announcement of a research agreement between the RAAF and Airbus to further develop the KC-30A's capabilities.

Airbus says the agreement will result in expanding upon the KC-30A's core transport and refuelling capabilities to support the RAAF's transformation into a fully-integrated force, capable of tackling complex contemporary defence and security challenges.

"The KC-30A offers tremendous combat potential at the heart of the integrated Air Force of the Future, including using the platform as a Communication Node, to maximise air power delivery," Fernando Alonso, Head of Military Aircraft at Airbus Defence and Space said.

The agreement's first milestone is the joint development of the automatic air-to-air refuelling (A3R) concept.

Automating boom refuelling contacts reduces potential risk by minimising operator workload, and increases operational efficiency by cutting the time for each contact. The system requires no additional equipment in the receiver aircraft, Airbus says.

CAF described the capability to undertake automatic air-to-air refuelling as "somewhat mind-boggling".

The RAAF currently operates five KC-30As from Amberley. A sixth aircraft is due to be delivered in the third quarter of 2017 with a seventh to follow in late 2019.

MANAGING EDITOR & PUBLISHER
Gerard Frawley

EDITORIAL TEAM
Jordan Chong, Robert Nutbrown, Trevor Thomas, Max Blenkin, Paul Sadler, Tim Frawley, Owen Zupp

DESIGN & PRODUCTION
Daniel Frawley

ADVERTISING & MARKETING
Louise Harry

PHOTOGRAPHERS
Seth Jaworski & Paul Sadler

PUBLISHER
Phantom Media Pty Ltd
ABN: 50 112 691 666
PO Box 3926,
Manuka ACT 2603,
Australia.

Phone: (02) 6232 7474
Fax: (02) 6260 6747
mail@australianaviation.com.au

Printed by Bluestar.

Martin-Baker Australia to set up shop in Newcastle to support F-35 ejection seats

When everything else has broken or failed, the one thing that absolutely has to work is the escape system.

That adage certainly held true for Steven Andrews and Peter Batten (pictured) when they pulled the ejection handle on a PC-9 and Mirage, respectively, as well as the other 7,512 lives that have been saved thanks to ejection seats made by UK-based Martin-Baker.

The UK company has supplied ejection and crashworthy seats to the Australian Defence Force since the 1950s and the company will be featured in ADF aircraft for many years to come as the Royal Australian Air Force (RAAF) receives a number of new aircraft types.

That includes the ejection seats fitted to the RAAF F-35A Lightning II fleet.

To that end, the company has established a local arm, Martin-Baker Australia, which is setting up facilities just outside Newcastle for maintenance, repair and overhaul (MRO) work on the F-35A to be based at RAAF Base Williamtown.

Martin-Baker Australia managing director Andrew Eden said his team would be able to offer "cradle-to-grave" services for the various platforms in Australia, with all the spares and servicing able to be done here more quickly and efficiently.

"Historically, Air Force has always maintained our products themselves and they have had a large body of people to do that," Eden said on Thursday at the company's stand at the Australian International Airshow at Avalon, which features the F-35A ejection seats.

"What we've found is, over time that cadre of people that are experienced has shrunk and shrunk and we can actually do a much more efficient job by bringing this into one facility and supporting all the aircraft types through one facility."

The Australian company is also keen to bring MRO work on seats for its other Australian Defence Force aircraft – PC-9, Hawk 127, F/A-18A/B classic Hornet, F/A-18F Super Hornet, EA-18G Growler, PC-21, P-8A Poseidon and HATS EC-135 – into a single facility.

The director of business development and marketing for UK-based Martin-Baker Andrew Martin said there was a lot of potential for future growth both locally and within the region.

"We are confident the business that we can generate here, and more importantly the value for our customers, will allow the business to grow and flourish over the next few years," Martin said.

"Our aspirations don't stop with just doing the work here in Australia," Martin said.

"There are 2,500 seats in service in the Australasian region and when this company is delivering all the different support programs it will be in a position to compete for some of the other seat work that's carried out in the region."

"We hope that it won't just be a domestic service, it will be an international service as well."

Martin-Baker Australia's initial operations are still in their infancy – the company currently has four staff working alongside managing director Eden.

However, that was expected to grow as it assumed responsibility for the other ADF platforms alongside the F-35A work.

"The capacity that we have right now to service seats could cover two of our platform types," Eden said.

"We don't have an MRO contract right now. We have the assignment on JSF but that is not actually turning any spanners or hardware.

"We really are just starting out but we come from a pedigree that is well proven."

QinetiQ and DST Group begin composites damage research

QinetiQ Australia and the Defence Science and Technology Group have started work on collaborative research in the area of composites testing and analysis to model and predict damage growth in ADF aircraft.

This is the first research project to be launched under a strategic alliance agreement signed in March 2016 that builds on the longstanding partnership between the organisations, representing a commitment to undertake collaborative research and development in areas that are of strategic importance to the ADF, QinetiQ stated.

Over the next few years, engineers from QinetiQ and DST Group will test and analyse composite structures in ADF aircraft to gain a better understanding of the causes, characteristics, detectability and growth of damage,

and will develop methods for predicting the life of damaged structures.

"The combined strength of QinetiQ Australia's team of aircraft structural integrity engineers with DST Group's scientific innovation will aim to bring real capability outcomes to the ADF's current and future fleet," QinetiQ Australia managing director Greg Barsby said.

Chief engineer at QinetiQ Australia, Michael Houston, said: "Composites, in particular carbon fibre reinforced polymers, are increasingly being used for significant structural components in both commercial and military aircraft.

"Together with DST Group, we will utilise our decades of experience in ASI and structural testing to develop damage assessment methods that will allow the ADF to maximise the benefits that composite structures offer."

Chief Defence Scientist Dr Alex Zelinsky stated: "Collaborating with QinetiQ Australia on this research project has excellent potential to deepen our understanding of the performance of composites and how they fail in service, leading to improved detection and modelling techniques. This will result in significant savings and capability enhancements for the ADF."

Under the strategic alliance, QinetiQ Australia and DST Group will also support the ongoing professional development, retention and career progression of each organisation's staff through training activities and employee rotations.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Certification imminent for Australia's Airvan 10

When the original GA8 Airvan – now the Airvan 8 – first appeared on the market, the Australian-built utility aircraft was praised for its functionality and commonsense approach to the tasks its design was aimed at. Now, the Airvan 10 has emerged, sharing a common philosophy but taking a sizeable step forward.

In developing the Airvan 10 there was a genuine attempt to maintain as much commonality with the Airvan 8 as possible and this is evident in its basic appearance. The common traits of good propeller clearance, sizeable doors, a central aisle between seats and a wing high enough to back a fuel drum laden vehicle beneath, still remain.

However, the Airvan 10 announces its difference with the presence of a dominant turboprop engine out in front. The Rolls-Royce 250B-17 produces 450shp while burning around 100 litres/hour, making it the most economical 10-seat turboprop in its class. Beyond the enhanced performance, the turbine engine addresses the growing issue of ever-reducing stocks of avgas in many parts of the world. Countries where this is a problem such as India, Africa and South East Asia are also potential markets for a 10-seat utility aircraft such as the Airvan 10.

The Airvan 10 can carry more than a tonne of cargo, which is around 200kg more than its predecessor. The rear cargo door is also sizeable enough to accommodate the loading of a pallet – common sense emerges again. Additionally, a cargo pod can be fitted beneath with a capacity of 25 cubic feet (0.7m^3).

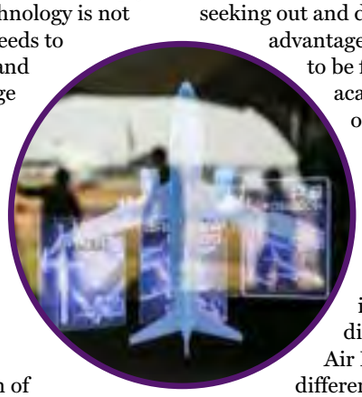
The aircraft will capably fulfil the traditional utility roles of freight, parachute operations, scenic work, search and rescue and so on. However, with an endurance of eight hours and a spacious interior it could also potentially meet the specifications for very specialised roles such as surveillance.

Emerging from Gippsland Aeronautics, today the company behind the Airvan is Mahindra Aerospace. Proudly based in Latrobe Valley, Victoria, the company's Airvan 10 has been five years in reaching imminent certification and is the result of significant investment by Mahindra. Bringing a new aircraft type to life is a major process, even when building upon the strong heritage of the GA8. Now with final type certification imminent, the Airvan 10 is not only ready to take on the marketplace, with its Rolls-Royce turboprop it can take on the world.

RAAF looks to the future with hologram marketing

The Royal Australian Air Force's first large-scale hologram video has been unveiled at the Avalon Airshow, bringing the service's vision of the future to life in 3-D.

"In a rapidly changing and unpredictable global environment, simply having the latest technology is not enough; Air Force needs to be agile, integrated and able to better leverage the capabilities of our technologies, systems, partners and people," said Group Captain Pete Mitchell, co-director of Plan Jericho.



"This hologram represents our vision of becoming a fifth-generation force. We don't want to just use traditional methods to communicate about transforming into a fifth-generation force, we seek to communicate our plan for that transformation in new and innovative ways to inspire and capture the imagination of our workforce and partners."

GPCAPT Mitchell explained that Plan Jericho is building an innovation and collaboration 'ecosystem' that is designed to transform the RAAF through the application of innovation tools to solve complex problems, seeking out and delivering capability advantages wherever they are to be found, whether from academia or industry, or perhaps from a start-up company.

"Creativity and innovation come from many different places, and the Jericho approach is to meaningfully disrupt traditional Air Force; to do things differently," GPCAPT Mitchell said.

"In our exploration of potential collaborative partners, Air Force saw an opportunity to engage with creative technology agency S1T2 to help us push our message further and with deeper reach through the development of this hologram."

The RocketRoute to Jet A1

Air BP says operators will be able to save time and cut paperwork when purchasing fuel thanks to the launch of its partnership with flight planning technology company RocketRoute in Australia and New Zealand.

In October 2016, Air BP teamed up with flight planning technology company RocketRoute to allow operators to order and pay for fuel online via an app.

Following the initial launch in Europe, the partnership has now expanded down under, with fuel able to be purchased online with a credit card at Air BP's manned locations in Australia and New Zealand.

Air BP chief executive for Asia Pacific Alex Wilson said the app had great potential for the entire industry.

"There is no manual handling, there is no paper, there is no account opening processes. All that is gone for us and for the customer," Wilson said at Avalon on Thursday.

"It's no different to uber or any cutting edge, digital-enabled service. That's what is exciting."

Wilson said Air BP had 121 sites across Australia and New Zealand, with about 80 per cent of the Australian sites manned.

While the app was for now restricted to manned Air BP locations in Australia and New Zealand, those using the technology in the US were able to purchase fuel from a wider number of locations thanks to an alliance between Air BP and other fuel providers.

Wilson was hoping that this would eventually also be the case in Australia.

And future iterations of the app were likely to include the ability to purchase fuel at unmanned Air BP locations, as well as other airport services.

"Our vision is that this will become a completely integrated app," Wilson said.

The RocketRoute app processed more than 120,000 flightpaths in calendar 2016 and its co-founder Kurt Lyall said the decision to partner with Air BP reflected the fact that flight planning and fuel purchasing went hand in hand.

"If customer makes a flightplan in RocketRoute they have all the details available for fuelling," Lyall said.

"Or the customer can just use the fuel service and order through there as well."

Air BP purchased a minority stake in RocketRoute in 2016.

Battle tested AH-64E Apache comes to Avalon

Back in 2001, Australia opted to buy the Eurocopter Tiger instead of the US Apache but now Boeing is pitching the latest generation Apache, the AH-64E, as a potential Tiger replacement.

Should Australia head down that path, it would tick many boxes – it would be a FMS purchase with aircraft produced in the same multi-year contract as the US Army which is acquiring 690 E-models out to the mid 2020s.

That would mean Australia paying around the same price as the US Army. Further, the Apache is a mature capability with more than 2,200 produced since 1984. So far 278 E-models have been delivered in the US and to international customers.

Mark Ballew, Boeing's director of sales and marketing for attack helicopters, says Apaches have flown more than four million flight hours and more than 1.1 million combat hours.

The latest E-models are operating in Afghanistan today.

"It is combat proven and battle tested," he said.

The Army's 22 Tigers only achieved full operational capability last April. Far from a mature capability, Tiger required substantial development which delayed its entry to service. Australian Tigers haven't yet fired a shot in anger though French Tigers have deployed operationally to Afghanistan.

The 2016 Defence White Paper foreshadowed a replacement capability, though it didn't specify whether that could be an upgraded Tiger or a new model.

To show off the new Apache at Avalon, Boeing flew one from the US aboard a chartered Antonov An-124 freighter.

Ballew said the E-model, though appearing identical to the D-model, offered improved speed, range, endurance and payload, better interoperability and fire control. Depending on mission requirements, the Apache can carry a lethal selection of weapons including Hellfire and Stinger missiles.

Demonstrating the improved capability to operate with other platforms, the Apache at Avalon linked to the video feed from a Scan Eagle remotely-piloted aircraft. With that capability, a Scan Eagle could watch over an enemy position for up to 16 hours, providing imagery to an Apache for a successful attack.

Ballew said the Apache would still be flying in 2060.

"We have been delivering on time and on budget since 1984. This is the most lethal, most survivable, most sustainable aircraft. It is flying around the world today," he said.

"Boeing has a long and proud history with Australia. We have proven that we come and work with Australia. We don't just sell aircraft and say good luck.

"You get the world's best attack aircraft and you get long-term support from a company like Boeing and increased jobs in country. And you are going to be able to operate with all the other countries flying it right now." A Boeing spokesman said the AH-64E Apache could provide Australia with the industry-leading, battled-tested, armed reconnaissance and attack helicopter that the Commonwealth needs.

"With unmatched firepower, the Apache can meet virtually any mission requirement in land and littoral environments and provides aircrews with enhanced situational awareness through its integrated Intelligence, Surveillance and Reconnaissance capabilities," he said.

"For long-term value, the AH-64E Apache's modernisation roadmap combined with Boeing Defence Australia's proven sustainment capabilities can keep Apaches flying well into the 2060s."

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IAI seeks head-to-head shootout with General Atomics

Israel Aerospace Industries (IAI) is at the Avalon Airshow on a mission to demonstrate that the Heron TP is a viable option that should be considered to meet the Australian Defence Force's requirement for an armed unmanned aircraft.

"Give us the chance to compete, to see our capabilities, to compare, to see the benefit that we can bring with our system," said Shaul Shahar, IAI executive vice-president and general manager, Military Aircraft Group.

Shahar told the Show Daily on Thursday that IAI plans to partner with a leading Australian defence company that would act as the prime on its bid for the AIR 7003 project, while the Israeli defence and aerospace company would be playing the role of subcontractor, bringing "significant work-share" to Australia.

IAI is looking at three or four candidate companies, and two to three months from now it expects to be in a position to announce the local company it is teaming with.

"Heron TP can integrate whatever the Australian customer will ask to integrate; if it has a requirement we will fulfil the requirement," Shahar said.

Talking about the capabilities of the Heron TP, he said IAI offers "the same or better in any aspect in any domain" when compared with the Type-Certifiable Predator B system from General Atomics Aeronautical Systems.

The Heron TP has been in active service with the Israeli Air Force since 2010, and is on display in Australia for the first time.

Australia is seeking to acquire an armed, medium altitude, long endurance unmanned aircraft to provide an integrated and persistent intelligence, surveillance and reconnaissance (ISR) and attack capability to support ADF and coalition forces.

General Atomics demonstrates new cockpit for RPA pilots

General Atomics Aeronautical Systems is giving visitors to the Avalon Airshow the chance to take control of a virtual remotely-piloted aircraft (RPA) system.

The company's Advanced Cockpit Ground Control Station (GCS), which is intended to replace all existing legacy systems, features changes to the human machine interface to make it easier to use and the fusion of enhanced situational awareness information.

Taking a flight in the Advanced Cockpit GCS, the pilot enjoys a 270-degree field of view, with a video feed from the nose of the unmanned aircraft overlaid on the simulated landscape.

After a quick runthrough of basic flying manoeuvres, performing a touch-and-go landing on a simulated runway is a straightforward procedure given the high degree of automation built into the system.

For some, the experience of flying an unmanned aircraft might seem similar to playing a video game, but for pilots with significant hours amassed in manned aircraft, the immersive experience is said to induce the feeling of flight.

Here at Avalon, General Atomics is also displaying a real MQ-9 Reaper medium-altitude, long-endurance RPA that the company uses for pilot training and in the development of new products.

General Atomics' Advanced Cockpit GCS is part of the package being offered to fulfil the requirements of the AIR 7003 armed unmanned system project.

Air Affairs to provide three Alpha Jets for ADF training

Air Affairs Australia and Discovery Air Defence Services (DA) have teamed up to provide three Alpha Jets for Australian Defence Force training.

The pair will deliver the three aircraft under Air Affairs' existing Jet Air Support contract commencing in the third quarter of 2017, Air Affairs said at the Australian International Airshow at Avalon on Thursday.

"Three fully-crewed and maintained Alpha Jets will be based at RAAF Williamtown to provide 'red air' for Royal Australian Air Force training, Joint Terminal Attack Controller (JTAC) training for the Australian Army and anti-surface training for the Royal Australian Navy," the company said.

"Operations, maintenance and logistics for Alpha Jets in Williamtown and at Albatross Aviation Technology Park (AATP) Nowra will be supported by an integrated Air Affairs and DA Defence team."

Air Affairs managing director Chris Sievers said: "The capabilities and expertise of both companies will be combined to deliver highly representative threats and training to produce specialist trained and competent RAAF, Army and Navy combat personnel."

Discovery Air Defence president Paul Bouchard added: "Discovery Air Defence and Air Affairs are proud to be selected by the Australian Government to bring our combined capabilities and experience to improve the operational readiness of the Australian Defence Force."

Melbourne company Titomic showcases the future of aerospace manufacturing

Advanced materials and additive manufacturing specialist Titomic is displaying its new 3D printing technology at Avalon.

The innovative 3D printing technology – called Titomic Kinetic Fusion (TKF) – produces titanium components of virtually any shape and size more rapidly and at a considerably lower cost than conventional manufacturing methods, the company says.

Based in Melbourne, Titomic has the exclusive global rights to commercialise the TKF process for load-bearing structures in titanium and its alloys, with a patent pending. The technology was initially developed in partnership with the CSIRO in Melbourne. Critically, the process does not melt or vaporise metal particles, and, as such, energy consumption is significantly lower than standard metal casting or forging technologies.

Jeff Lang, director of technology at Titomic, said TKF technology was poised to dramatically change the way many aerospace components are produced.

"High energy consumption, high material wastage and extensive machining times drive up the cost of producing aerospace parts," he said.

"TKF overcomes a range of challenges that current metal-based 3D printing and additive technologies face, including low-build speed rates, build size restrictions, and heat related distortions."

To highlight the broad application range of the TKF technology, a scaled-down model of an aircraft wing spar was grown from titanium. The part was built up with a machining allowance on an aluminum base and finish machined. In contrast to the machining down of a solid block of titanium, less than 15 per cent of the final part weight ended up as chips or swarf, resulting in significant cost savings for the production of various components.

Lang said its investment in state-of-the-art equipment presented Titomic with the opportunity to significantly disrupt the aerospace parts manufacturing industry.

"This new additive manufacturing platform means Titomic will be able to process most metals and alloys used in the aerospace, defense and automotive industries," he said. "Furthermore, with deposition rates of materials approaching 50kg per hour the technology can be integrated into a variety of existing production environments."

Titomic is planning further capital-raising initiatives for the coming months, including a potential market listing on the ASX.

SynFlyt could make GA simulators the norm

When SynFlyt CEO and engineering director Ross Maclennan first envisaged a flight simulator nearly a decade ago, he wanted it to be different to those already available. At first glance, the white modular SynFlyt simulator on display at Avalon appears to have met that initial goal.

The Sydney-based company is displaying a 'beta' version of SynFlyt at Avalon, which is more advanced than a prototype, but a forerunner to the production model that will commence this July. Through an interchangeable console, the 3-degree full-motion simulator can be configured to represent a range of aircraft from the Cessna 172 to the Citation Mustang and even gliders.

The most obvious element of SynFlyt is that the device is effectively a sphere, rather than a 'box', which functionally and aesthetically lends itself to the concept of flight in three dimensions. A patented system facilitates maximum contact with the rollers on which the device is mounted for smoother motion.

Beaming from four ceiling-mounted projectors, satellite imagery fills the 210-degree wrap-around screen with a realism that surpasses the similar computer-generated imagery that is normally used. With such access to satellite imagery, every runway or bush strip in the world can be called upon for training purposes. Sitting inside, even when stationary, it is easy to become immersed in the virtual world around you. There is the ability to overlay a range of weather conditions on the scenery, from thunderstorms and rain to wind and sleet. SynFlyt-designed software is employed on a tablet to provide not only functionality within the simulator, but as a simple and secure means to access training data and provide feedback.

Traditionally, the greatest commercial hurdles to the proliferation of general aviation simulators have been twofold – capital outlay and physical space. Recognising this from the outset, Maclennan has organised a zero cost placement scheme with an ongoing commission arrangement which includes full technical support. In the matter of flight schools finding enough available space to house the simulator, SynFlyt has thought outside the box. Its device is durable and designed to be fixed to a slab outdoors, with a back-up battery and air-conditioning unit to be situated beneath the stairs.

The value of simulator training at all levels of aviation cannot be underestimated. Beyond being merely cost-effective it allows the instructor to stop, rewind and repeat with ease, while relevant currency can be easily achieved.

Australian-designed from the ground up and answering the major questions often posed by flight schools, SynFlyt has the potential to make general aviation simulators the norm.

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Without Precedent – the story of Australia's first Purple Heart

Phillip Zupp was a mostly uneducated farm boy who always wanted to fly.

But when told the approaching end of the war meant no more pilots were needed, he decided to become a commando, subsequently serving in New Guinea and then, when the war did end, in atomic bomb devastated Hiroshima as a member of the occupation force.

But he still wanted to fly and rejoined the RAAF in 1948 – gaining his wings just in time for the Korean War which opened in June 1950.

The RAAF's 77 Squadron, on occupation duties in Japan, was soon into battle and Sergeant Zupp followed in November 1951, flying 201 combat sorties on Meteors.

Even after leaving the RAAF in November 1956, he still wanted to fly, joining Qantas and then Airlines of NSW, instructing the next generation of pilots and flying an air ambulance.

Even after retiring, he made the occasional charter flight until cancer claimed him in 1991 at the age of 65.

The story of this fine Aussie pilot has now been told by his son Owen Zupp, himself a pilot, now with Qantas and with 20,000 hours at the controls. He's also a regular contributor to *Australian Aviation*.

His book is titled *Without Precedent*.

"It was a project a long time in the making, wanting to find out those stories he hadn't shared with everyone. By speaking to all his comrades in the Army and the Air Force, the picture came together," he said.

"There was a lot he had hadn't told me and there was a lot he told me in fragments. I was able to piece together those fragments when they were seen in a complete pictures with the other veterans."

One story he never told his family related to his Purple Heart, the US medal for servicemen killed or wounded in action.

That was awarded for a ground attack mission in February 1952 when enemy fire damaged his aircraft and he was wounded by flying fragments of metal and perspex from his canopy. In what was described as "outstanding courage and superior airmanship" he nursed the aircraft back to base.

He was the only Australian awarded the Purple Heart in the Korean War. Although the intention to award this honour is fully documents, the Americans never got around to actually presenting the actual medal.

Copies of *Without Precedent* are on sale at the *Australian Aviation* stand at Avalon.

Pushing it to the limit – a USAF F-22 Raptor makes a high speed pass during its display at the airshow yesterday. Note the circular shock wave forming around the aircraft's engine intakes as the Raptor heads towards the sound barrier. SETH JAWORSKI

RAAF F-35 weapon options – spoiled for choice?

When Australia's new F-35 Lightning II Joint Strike Fighters enter service from late this decade, the RAAF will be almost bewildered for choice when it comes to weapons to put on them.

Right now only a modest selection of missiles and bombs are fully integrated for use on F-35. The aircraft has a gun but it won't actually fire.

That all changes as F-35's existing combat system Block 3i software is upgraded to Block 3F, giving the planned full range of warfighting capabilities. That's scheduled for early next year.

To show off just what the RAAF could carry, Raytheon has pitched its range of weapons which are either fully integrated for use on F-35 now or soon will be.

Raytheon international business development executive Mark Noyes says Australia's F-35As will be equipped with Raytheon's AIM-9X short range air-to-air missile, the latest version of the venerable Sidewinder, first flown in the early 1950s.

Medium range air-to-air capability will be provided by the AMRAAM, a missile that has seen constant development since the 1990s. Precision bombing capability is to be provided by the laser-guided Paveway GBU-12.

All three weapons are already in the RAAF inventory.

The latest Paveway versions also include GPS guidance and improved guidance logic to allow it to attack targets travelling up to 120 km/h.

Raytheon is now finalising development of the GBU-53/B, an even smarter bomb which is set to enter US military service this year. This is a small diameter bomb featuring a tri-mode all weather seeker – millimetre wave, imaging IR and a semi-active laser – with an ability to tell tracked from wheeled vehicles.

An F-35 can carry eight of these weapons internally or 16 on under-wing hardpoints.

Raytheon is also integrating the US Navy's AGM-154 Joint Stand-Off Weapon (JSOW) for carriage in the F-35 weapons bay. And it's also working with Norwegian firm Kongsberg to integrate the Joint Strike Missile (JSM), to give the F-35 a capability to hit ships up to 300nm away.

Australia has contributed funds towards the development of this missile to give RAAF F-35s an anti-shipping capability.

Scan Eagle still keeping watch

The Scan Eagle was the first tactical remotely-piloted aircraft system operationally deployed by the Australian Army with service in Iraq demonstrating the immense potential of this new capability.

Australian Scan Eagles conducted route surveillance, flying ahead of patrols to look for insurgent attack and in one case spotted a group of insurgents in the act of firing rockets at the British base in Basra.

After firing, the insurgents speedily packed up their rocket launch rail then headed up the road to try again – by which time a Dutch F-16 was on their case, a JDAM ended their plans for a second shot.

Scan Eagle, a product of Boeing-owned Insitu, remains in Australian Defence Force service but now with the Royal Australian Navy as a ship-born capability for ocean surveillance.

Insitu Pacific managing director Andrew Duggan said Scan Eagle continued to develop, with sensors shrinking, allowing more to be incorporated in a much smaller package.

"Capabilities that you used to have to fit on something the size of a Predator or Reaper are coming down in size. Optically, something we can fit on a 20kg UAV is pretty exciting."

The Navy is now fielding the new ViDAR, Insitu's solution to the challenge of searching large areas of

ocean for small elusive targets, such as small wooden boats.

That's an optical system which scans a 30km swathe of ocean. The system marks objects of interest which can be examined in more detail by the Scan Eagle's main sensor. The Navy trialled this off Christmas Island last year with good results.

Scan Eagles can now fly for up to 15 hours.

"What we tend to find is we actually run out of crew endurance before we run out of aircraft endurance. The crew can only sit there for so long before you need to swap them out," Duggan said.

Another innovation is a new 50cc engine developed in collaboration with West Australian firm Orbital for use on small UAVs. That's more fuel-efficient and more reliable. This comes in a module which also contains the fuel tank – if there's a problem, the old unit can be simply removed and a new one slotted in.

Traditionally, small UAVs have required a catapult launch rail and cable capture system, a substantial amount of infrastructure for a warship. Insitu has developed a quadcopter which lifts the Scan Eagle straight up, then releases it. On Scan Eagle's return, the quadcopter lifts the cable for capture.

That means Scan Eagle could operate from a jungle clearing or from an urban backyard.

"You get all the benefits … of vertical takeoff and landing with fixed wing endurance," he said.

Duggan said the Navy was now working out the correct mix of UAVs for the new warships it's acquiring, including new frigates and offshore patrol vessels (OPVs). That could include large rotary-wing UAVs such as the Fire Scout and small fixed-wing UAVs such as the Scan Eagle.

He said Insitu was now consulting shipbuilders to fully integrate the UAV system into the vessel.

"We have some conceptual designs we are working on at the moment with the three competitors for the future frigate and three competitors for the OPVs.

Duggan said Scan Eagle had been designed to be a robust tactical UAV.

"But you really don't want to over-engineer so you get to the tipping point where adding more and more redundancy will make it a multi-million dollar aircraft. There comes a point where you say enough is enough. It's not disposable but it's not exactly the end of the universe if you lose one or two here or there," he said.

Babcock launches operations cell as demand increases

Babcock has set up a new national air operations cell at its Regional Support Centre in Adelaide to assist with its forward planning and daily operations.

The new cell supports Babcock's 12 bases and can track its fleet of 26 helicopters in real time which provide emergency services, search and rescue, law enforcement, surveillance and marine pilot transfer operations across Australia, including into the oil and gas regions of the country's north-west.

"We are constantly forward planning to identify any potential crewing, aircraft and maintenance issues before they happen," said John Boag, Babcock's managing director of onshore and offshore aviation businesses. "Our team covers both aircrew and engineering support, so that they can back up one another and mitigate risk."

Boag says he has seen an increase in demand for the company's helicopter transportation for oil and gas and medevac services since opening a hangar at Darwin Airport in June last year.

"Being proximate to several liquefied natural gas projects means that we are a natural choice. From Darwin, we support oil and gas customers with Sikorsky S-92s to transport passengers, travelling in tandem formation for increased safety."

In Western Australia, Babcock has recently added an additional AW139 to its fleet to support demand from the resources sector. Its latest AW139 is being prepared to comply with contract and safety requirements before commencing operations shortly.

Avanti's big door for medevac

Piaggio Aerospace has announced it will provide its Avanti EVO aircraft in medevac and other special missions configuration with an enlarged cabin door as an option. The Avanti Evo is the third generation of the popular Piaggio P180 Avanti.

There are currently 220 P180 aircraft worldwide and more than 10 per cent of those are equipped for aerial ambulance operations. These aircraft are either in dedicated aeromedical configuration or equipped with a 'quick change' kit which allows a P180 to be converted for the specialised role in less than two hours.

The twin turboprop's 'pusher' layout makes for a substantially quieter cabin which is ideal in aeromedical operations. Consequently, communications can be at conversation level without the need for headsets and cables.

Boasting a top speed of just over 400kt at 31,000ft and a range of 1,500nm which can be stretched to 1,800nm with an additional fuel tank, the Avanti can reach remote townships quickly and quietly.

The new, enlarged door is of the same basic design as that found on the existing model aircraft, but with an additional 12cm of width. Additionally, on the ramp the aircraft sits quite low to the ground, further adding to the ease with which patients and equipment can be loaded and unloaded.

Aeromedical operations are a specialised field of endeavour and the newly-announced enlarged door is yet another feature in the Avanti EVO's catalogue that highlights its suitability to the role. The ability to bridge large distances quickly and quietly is preferred in all branches of passenger transport, but when those passengers are patients it becomes all the more important.

EXECUTIVE JETS

ExecuJet takes on Sydney FBO

Business aviation operator ExecuJet has taken over the Fixed Base Operations (FBO) at its Sydney Airport facility.

The FBO was previously operated by Universal Aviation and includes a passenger lounge, private meeting rooms and a customs and border processing area. The facility was refurbished about a year ago.

ExecuJet vice president for Asia Pacific Darren McGoldrick said the move to bring the FBO under the company's control would support growth at Australia's most populous city.

"The timing was right for both companies due to a retirement within Universal and we were keen to do something there," McGoldrick said on Wednesday.

"It has been an investment that we have made and now it is exciting that we get to now operate it. As an operator we were the largest customer of the FBO so we are now controlling our own operation, our own destiny in that regard.

"As an operator we understand some of the issues that need to happen in a successful FBO as well and hopefully that gets rolled out for the benefit of all the customers."

ExecuJet said the Sydney FBO would employ 20 staff, such as management, ramp coordinators, customer service agents and administration staff.

The company has about 100 people working in Australia across aircraft operations, pilots, flight attendants, engineers, administration and sales. There were a further 50 people working at its Asian bases, including in Bali, Jakarta, Kuala Lumpur, Hong Kong and Singapore.

"From an aircraft management perspective across the Asia Pacific region, we've got 21 aircraft that we manage and operate on behalf of owners," McGoldrick said.

"Of that, there's nine that are available for charter."

The expansion in Sydney comes as the company celebrated 10 years of operations in Melbourne this week.

ExecuJet's base at Melbourne's Essendon Airport is an FBO and also does maintenance, repair and overhaul (MRO) under Civil Aviation Safety Authority (CASA) Certificate of Approval, New Zealand Civil Aviation Authority (CAA) approval and is a US Federal Aviation Administration (FAA) Part 145 Repair Station.

ExecuJet is an authorised service centre for Hawker Beechcraft, Gulfstream, Bombardier and Embraer at Melbourne. It also conducts maintenance work at its Sydney and Perth facilities.

"We have been in business for a long time, we are experienced in managing and operating and maintaining aircraft," McGoldrick said.

"Certainly I think the depth of our knowledge about the market, about the products from an operational and support and service level does mean that people can talk to us, we can offer that broad range of support for them and that's what we do for our customers."

Pacific Aerospace's E-350 Expedition promises to be the king of the payload

New Zealand's Pacific Aerospace is using the Avalon Airshow to highlight its recent acquisition of the E-350 Expedition bushplane.

Originally manufactured by the Canadian-based 'Found' company, Pacific Aerospace recently acquired the rights to the E-350 plus assets such as tooling that will allow it to build the aircraft at its Hamilton factory.

The Expedition sits well with the Pacific Aerospace family as the smaller sibling to its turboprop P-750. Like its big brother, the Expedition is a sturdy single-engined airframe, built as a workhorse with the ability to operate into bush airstrips. However, the Expedition is a five-seat high-wing aircraft and piston-powered by a Lycoming IO-580-B1A.

Inspection of the Canadian-built Expedition on display at Avalon shows the design is a testament to practical thinking. Inside, the cabin is large and angular. The floor is industrial and the rear row of seats are extremely easy to remove and replace. The doors are big, allowing oddly-shaped items to be loaded without great difficulty. Furthermore, the rear doors top corners are 'clipped', allowing them to open when the flaps are fully down, a very worthwhile asset in the event of an emergency landing. Like the doors, the windows are very big which would lend the aircraft to scenic work and search and rescue (SAR) operations alike. Its ability to sit atop floats also opens up a wealth of opportunities.

Vortex generators, big flaps and a significant wing cross-section all speak of lift generation and short field performance from an aircraft with a MTOW of 1,724kg and 680kg useful load. In the cockpit the two yokes have a common central mount and the trim wheel and rudder pedals are sturdy and functional. From a pilot's perspective, there is a lot of headroom, easy access and egress and an impressive glass instrument panel is also available.

Pacific Aerospace is intent on taking the Canadian product and 'productionising' it, as it describes it. The company explains that its goal is to install definite constant processes into the manufacture of their aircraft and to that end one of their first airframes will be used to define and put these processes in place.

The Expedition is an aircraft that says what it means on first meeting. It is evidently an aircraft that is built to work and its design suggests durable functionality.

Pacific Aerospace's goal is to build three airframes in 2017, growing to 10 the following year.

Given what the E-350 Expedition has to offer, such a goal would seem to be well within reach.

Virtual Viper on display

A popular exhibit inside the trade halls at the Australian International Airshow is the combined Bell Helicopter and BAE Systems Australia stand featuring the AH-1Z Viper cockpit demonstrator, highlighting, virtually, the attack helicopter's capabilities.

Bell is pitching the Viper as a potential replacement for the Australian Army's fleet of 22 Tiger Armed Reconnaissance Helicopters (ARH).

"We have several FMS campaigns on the go with the Viper – Australia would be one of them," said Bell Helicopter's regional director for international military business development, John Woodbery at the airshow on Wednesday.

"We are in a very healthy discussion as an industry OEM with the ADF discussing options and ideas. We are both getting a lot out of it. Whether or not it comes to fruition or not I can't say, but the interaction has been healthy."

Bell signed a teaming agreement in February 2016 with BAE Systems Australia at the Singapore Airshow which would see BAE provide maintenance and support services for the AH-1Z in Australia.

"They have a good history of maintaining aircraft for the ADF – that's what drew us to them," said Woodbery.

"They are also very responsive to the customer and we are in the process of looking at options for the ADF and its ARH replacement. I think it's a unique challenge for BAE to start helping the ADF to think through some of their sustainment at sea options for their aircraft."

To date, Bell has delivered around 70 out of the 179 Vipers required by the USMC. With a small number of airframes in service, securing a spare AH-1Z to bring to Avalon was an impossible task, so Bell's high-fidelity cockpit simulator was the next best thing.

"The Viper is not like an Apache where there's a fleet of about 1,200 out there. It is not easy for us to bring one to the airshow to show it off down under. However, the simulator allows us to demonstrate its weapon system and to talk people around the cockpit layout."

The *Avalon Show Daily* had the chance to fly in the simulated battlefield from the front seat of the Viper simulator. With its right-side mounted cyclic, rather than the usual centre positioned cyclic, the Viper takes a little time to get used to. So Bell's lead H-1 production test pilot Tim Mouw takes over and demonstrates firing the Viper's AGM-114 Hellfire missiles on four armoured vehicle targets hiding over 4km down range.

Next, Mouw selects the Viper's 70mm unguided rocket from the weapon system to engage a soft vehicle target. While a Viper aircrew would be wearing a Thales TopOwl Helmet Mounted Sight Display, instead for the cockpit demonstrator, presented on the display screen ahead and above of the cockpit is a diamond-shaped symbol which the weapon system has calculated. Mouw raises the nose to put the cross-hair into the diamond's centre and fires off some rockets at an elevated trajectory.

Falling almost vertical on to its targets, the rockets claim a kill. A few rounds from the Viper's turret-mounted M197 20mm cannon, the same cannon installed on Boeing's Hornet aircraft but sans three barrels, burst onto the remains of the vehicles to further ensure the kill is completed.

While returning to the amphibious assault ship stationed a few nautical miles off shore, Mouw engages an enemy attack helicopter en route with one of two AIM-9 air-to-air missiles carried by the Viper.

Indeed, the Zulu is the only attack helicopter in the world with a fully-integrated AIM-9 missile capability.

"I think we are just as lethal if not more so than say the Apache because of the AIM-9," said Woodbery. "The AIM-9 does more than just provide air cover for the guys on the ground once they are ashore. It also augments air defence of the ship."

Woodbury said the AH-1Z is due to make its way to Australian shores in 2018 as part of a future USMC Marine Rotation Force-Darwin (MRF-D) rotation to the Northern Territory.

"We see a lot of potential for the Viper," said Woodberry. "Asia Pacific is one of those exciting places where we have several tier one allies that are all building amphibious capabilities and building a habitual relationship with the United States Marine Corps and they're all looking at the same technology and the interoperability aspects."

TAE wearable technology wins innovation award

Australian engineering services company TAE recently began trials of fountx, which it describes as wearable assisted technology comprising a headset that includes a camera, microphone and eye-level display screen powered by a computer inside a backpack.

The technology allows a qualified expert to remotely monitor and instruct someone through engineering or maintenance tasks from hundreds, if not thousands, of kilometres away.

The fountx technology was recognised with a civil industry national innovation award at the Avalon Airshow on Thursday.

TAE chief executive Andrew Sanderson said it allowed engineers to turn a two-day exercise into a one-hour job.

"As people aren't being trained or they are leaving the aviation industry, you will have less and less certified people," Sanderson said on Thursday.

"So what this will allow us to do is bring a lot of our knowledge that is sort of locked up at times inside our own facilities and actually have it readily available for people to use or access out in the operational space.

"This way you have a way of projecting one person's expertise further, like a multiplier."

Sanderson said TAE was working with the regulator on certification around signing-off work that was checked by experts via fountx.

"If someone is doing a job and they have recorded it, it is great record of what they have done that an expert 1,000 kilometres away can actually be doing the certification of that job," Sanderson said.

"Certification is authorising the aircraft to return to service. I have seen what that person has done, they have followed the manuals, they have followed my instructions, I am happy that it is certifiable.

"We have to work with the regulator to get through that."

TAE, which became 100 per cent Australian-owned in 2015 when Air New Zealand agreed to sell the firm to its Australian management team, is also hoping to sell the technology to other companies.

In March 2015, TAE was selected to undertake maintenance, repair, overhaul and upgrade work for the Lockheed Martin F-35A Joint Strike Fighter's Pratt & Whitney F135 engines from its facility at RAAF Base Amberley.

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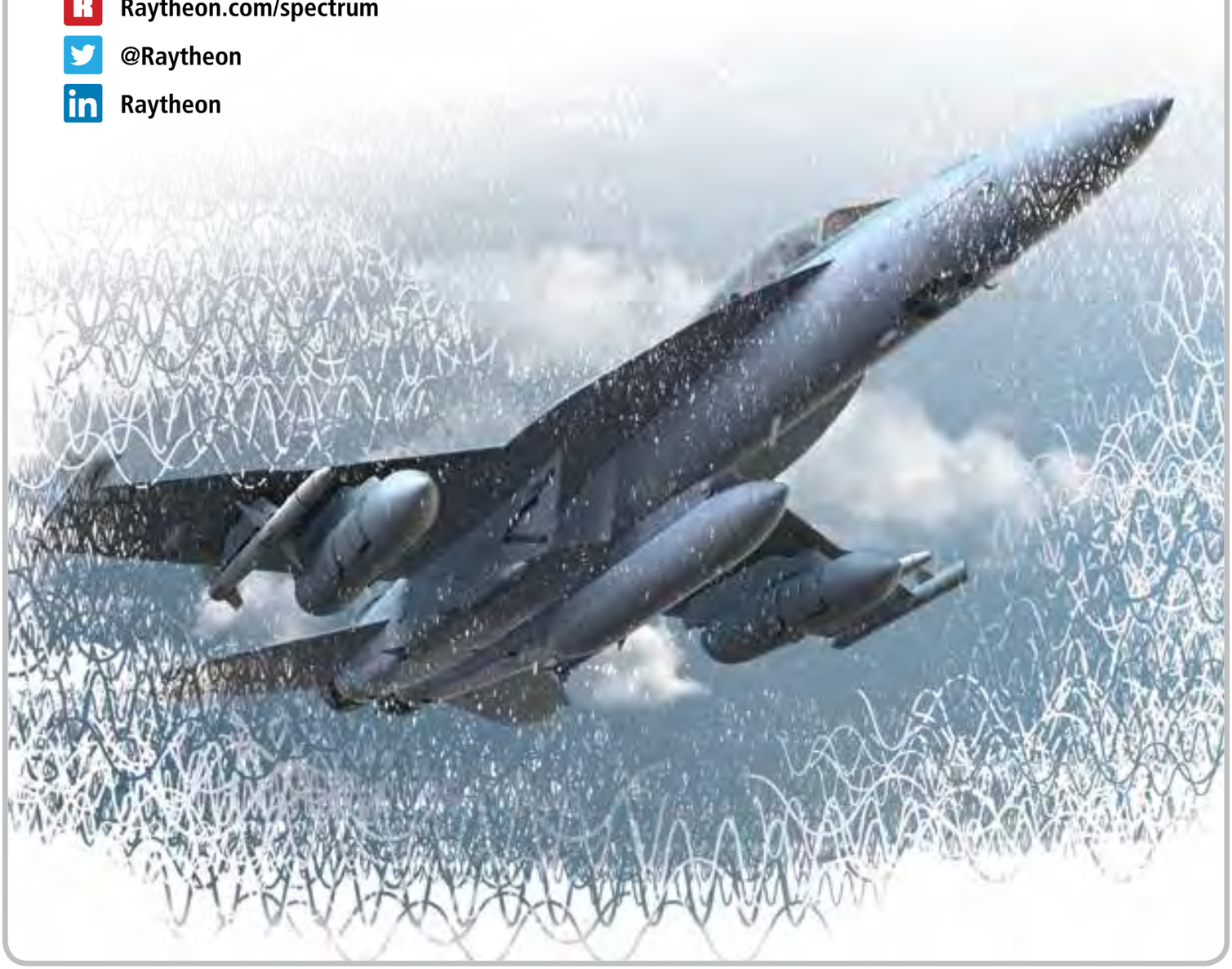

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