

WINGS

AUTUMN 2023
VOLUME 75 NO.1

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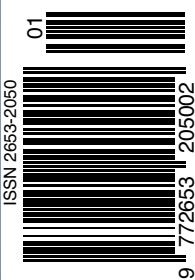
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MANAGING EDITOR'S MESSAGE

WELCOME TO another bumper edition of *Wings*; we had a number of contributions that required a few extra pages and I thank the authors for their commitment.

Avalon 2023 was a roaring success, with record attendance from both exhibitors and the aerospace interested community. Our report on the air show outlines a few of the innovative technologies developed by industry in recent years and illustrates a sample of the enthralling flying demonstrations.

Our roaming technology editor, Gregor Ferguson, has presented a detailed account of the contenders for Joint Project 9102, an ambitious aspiration by the ADF to acquire and operate a sovereign, space-based communications network. Lockheed Martin Australia has been awarded the contract to develop and build the network, with a number of Australian enterprises, some global leaders in their field, embedded in the LM team.

Once again, we have used QR codes to link to selected short video presentations to add a little dynamics to our features; please scan the codes as you progress through the magazine to add another element of appreciation to the associated story.

The *Wings* team hopes you again enjoy the magazine.

Ron Haack, Wings managing editor

WINGS EDITORIAL DEADLINES 2023

Wings welcomes editorial submissions and letters to the editor. Please note the following deadlines for submissions.

EDITION	DEADLINE
Winter (June)	17 April
Spring (September)	17 July
Summer (December)	16 October

Please send submissions and letters to: managing.editor@wingsmagazine.org, including your name and details. Submissions maybe edited for length and clarity. We cannot guarantee all material will be published.



AIR FORCE ASSOCIATION

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LETTERS

I THOROUGHLY ENJOYED *Wings'* coverage of aerobatic teams (Summer 2022 edition). However, I would like to mention one more that was never given a name.

When I was posted from HQ 224 Group KL to 3SQN, Butterworth, in January 1961, the then CO, WGCDR Cedric Thomas, decided an aero team was needed to 'show the flag', so to speak. I was fortunate to be assigned the leadership with Geoff Jenkins and Phil Dunn as members; it was but a three-aircraft team. The first international display was at Don Muang (Bangkok) on 5 March 1961 and then on to Saigon for a display on 8 March and again on 12 March. We had been invited to South Vietnam to celebrate the South Viet Nam Air Force (SVNAF) first birthday. Interestingly, the French were also invited – the first time they had returned since independence. We did our display over the Mekong in front of the Majestic Hotel, as did the French. But they had Super Mysteres and managed to over-exuberantly break the sound barrier at very low level. As a consequence, nearly all the windows in the main street were broken, as were several toilet bowls at the hotel where we were staying and part of

the ceiling fell onto their grand piano.

We had a great time as the guests of the SVNAF, but the French were told to leave immediately. The dinner that night at the French Ambassador's residence was a very quiet affair; we were the only guests.

Back at Butterworth, we were then assigned to support the Singapore Air Day on 11 April and we were the 'star' act at the opening of their new International Airport, Payer Lebar.

It was a great privilege to be part of an RAAF representation overseas.

Pete Scully



ABOVE 3SQN aero team: Geoff, Pete and Phil.

FORMER WAAAF SERGEANT JOAN SYMONS turned 100 on 28 February 2023.

Joan enlisted in December 1942 as a clerk and was discharged in March 1946 after postings to No.5 Service Flying Training School Uranquinty, NSW and RAAF Headquarters Townsville. Her final posting was to the legal branch in Sydney where, as a stenographer, she recorded evidence at the Court-Martial of Wing Commander Clive 'Killer' Caldwell.

Joan's father, later Squadron Leader W.J.Symons MBE, enlisted in the RAAF at Point Cook in 1925 after service in the British Army in WWI, and retired in 1950.

Joan married Flight Lieutenant Les Sullivan in 1957, later Wing Commander SOGT, now 98 years old. Joan followed Les around Australia and to England on service postings during their happy marriage. They have a son, William and daughter, Faith, and two grandchildren and are in good health for their age and now live in an Aged Care Centre in Wheelers Hill Victoria. They are probably the only living couple with service in WWII in both the RAAF and the WAAAF.

William Sullivan (son)

EDITOR'S NOTE: *Best wishes to Joan and Les from Wings, we are delighted to have you as part of the RAAF family..*



ON THE COVER

A RAAF F-35A Lightning II aircraft performs an aerial display at the Australian International Airshow 2023.

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AIR FORCE ASSOCIATION

PRESIDENT'S DESK

AFA WA HAD A MOMENTOUS DAY ON 24 FEBRUARY when

its Aviation Heritage Museum added a retired RAF Tornado GR4 to its collection of aircraft (see page 14 for more). I was pleased to attend the event at which Chief of the Air Staff RAF, Air Chief Marshal Sir Michael Wigston KCB, CBE, ADC formally gifted the aircraft. The Association's Patron, Air Marshal (Ret'd) Mel Hupfeld AO, DSC spoke about the enduring relationship between the two air forces and the recent warlike operations in which they were both involved. Air Commodore Robert Lawson OAM Director History & Heritage Branch represented CAF and commented on the WA Division's remarkable achievement in procuring the much-desired war horse. It was an absolute pleasure to witness the event and to be among like-minded people.

It seems 2023 is going to be a wonderful year for the Association with yet another monumental achievement following a unanimous vote by the national board to endorse the new national constitution that will support the 'company's' restructure approved last year. The revised AFA Ltd Constitution makes the Association a beneficial



organisation that supports veterans and families. The restructure and new constitution is a milestone achievement akin to the morphing of the Australian Flying Corps Association into the Australian Flying Corps and Royal Australian Air Force Association that occurred early during WWII. I'd

like to publicly thank Air Commodore (Ret'd) Peter McDermott, Brigadier (Ret'd) Jim Campbell and Peter Colliver for their untiring efforts developing the constitution. The Association's commitment to its members remains, but we have a broader set of objects to enable us to do much more.

The number of homeless veterans and those without stable or permanent accommodation has been questioned for many years. However, there is empirical evidence that around 5,500 thousand at any one time require some form of housing support. Many of those veterans and/or families are likely to have other issues that also require consideration. One of our projects is to provide emergency/temporary accommodation with a wraparound support service. We now have a creditable, contemporary company structure that will enable the Association to raise funds from

a variety of sources to deliver that type of support service. AFA Vic and AFA WA are currently working on the homeless task.

Peter Colliver, Peter McDermott, Deanna Nott and I are the transition directors of the revised national board. We are continuing our directorships until they expire over the next 18 months or so. Nominations for additional directors will be sought shortly. Advice on elections will be made known to all members.

Carl Schiller
National President

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AIR FORCE ASSOCIATION

EDITED BY Bob Treloar

South Korean air REFUELLING AGREEMENT

LAST NOVEMBER, the RAAF and the Republic of Korea Air Force (ROKAF) signed an arrangement formalising their cooperation in air-to-air refuelling operations. The arrangement provides an opportunity for alignment of procedures and to promote interoperability between the two air forces.

The ability to transfer fuel between aircraft to sustain and prolong an air presence is critical to the projection of air power. The deployment of a ROKAF KC-330 tanker to Australia for Exercise Pitch Black was the most recent refuelling interaction between the RAAF and ROKAF.

Source: Australian Department of Defence



ABOVE ROKAF KC-330 tankers and RAAF F-35A Lightning II fighters in formation.

RAAF acquires MORE SUPER HERCULES

THE US DEPARTMENT OF DEFENCE has approved the purchase of 24 Lockheed Martin C-130J-30 Super Hercules airlifters by the RAAF, at an estimated cost of more than \$6.3 billion. The agreement includes missile warning systems, infrared countermeasures and other equipment and technology for the aircraft.

The C-130J-30s will be used by the RAAF to replace its ageing cargo fleet and enhance the Air Force's logistic capabilities.

It has also been announced that the US Air Force plans to build dedicated B-52 bomber facilities at RAAF Base Tindal, Northern Territory. Rotating the long-range bombers into Australia has been common practice since the 1980s.

Source: Defence News



RAAF C-130J on the tarmac at RAAF Base Richmond.

Illawarra AIR SHOW

AUSTRALIAN MILITARY AVIATION was on display at the 2022 Wings Over Illawarra Air Show, held at Shellharbour Airport, NSW, last November. The flying and static displays entertained a crowd of more than 35,000 people over the two-day event.

Highlights included an aerobatic demonstration by an F-35A Lightning II, displays by No.100 Squadron historic aircraft, which flew in from Point Cook and the Temora Aviation Museum, and the Roulettes' six-aircraft formation team display.

Source: Contact



ABOVE An Air Force C-130J Hercules at the Wings Over Illawarra air show 2022. Photo: LAC Tsakisiris.



New aircraft for Defence

DEFENCE WILL REPLACE AGEING AIRCRAFT over the next few years.

Two new Boeing 737-800 VIP aircraft will replace the existing pair operated by No.34 Squadron since 2002. The aircraft will join three recently acquired Dassault Falcon 7X business jets based in Canberra.

After the 2024-25 financial year, the RAAF will begin to withdraw and replace the fleet of Beechcraft King Air 350 aircraft based at RAAF East Sale, Victoria, operated by No.32 Squadron to support Air Force Air Combat Officer and Navy Aviation Warfare Officer training conducted by No.1 Flying Training School.

The two Lockheed AP-3C Orion signals intelligence aircraft with No.10 Squadron at RAAF Edinburgh will be replaced by the first of four MC-55A Peregrine Intelligence, Surveillance, Reconnaissance and Electronic Warfare aircraft being acquired under Air 555 in the 2023-24 financial year.

The first Northrop Grumman MQ-4C Triton high-altitude, long-endurance unmanned aerial system will enter service in the 2024-25 financial year.

Airbus Helicopters Tiger Armed Reconnaissance Helicopter will remain in service with the Army until 2026, to be replaced by Boeing AH-64E Apache Guardian attack helicopters, acquired under Land 4503. The first of 29 Apaches will be delivered in 2025. The Navy ceased flying the NHIndustries MRH 90 Taipan in April 2022 and the platform will be replaced with 12 additional Sikorsky MH-60R Seahawk under Sea 9100 Phase 1 (Embarked Logistics Support Helicopter Capability).

Source: *Australian Defence Magazine*



ABOVE Boeing B737-800.

CHILLING REPAIRS


LATE LAST YEAR, the Royal New Zealand Air Force (RNZAF) replaced a faulty propeller on a C-130H tactical transport in sub-zero temperatures in Antarctica. The work was conducted in an ice shelter, which afforded protection in the brutally cold conditions. The New York Air National Guard, which operates an LC-130H at Antarctica's Williams Field, provided equipment and support.

Source: *Flight Global*



LEFT An ice shelter erected around the defective engine protected the repair team. Photo: RNZAF.







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Warbirds in mid-air accident

TWO AIRCRAFT, a Bell P-63 King Cobra and a B-17 Flying Fortress collided during the Wings Over Dallas Air Show last November. It is not known whether a mechanical fault prevented the pilots from taking evasive manoeuvres. Six people were on board the two warbirds.

B-17 Flying Fortress's first saw combat in 1941 during the bombing campaign over Europe. Boeing built nearly 7,000 in various models, while a further 5,700 were built by Douglas and Lockheed. Most were scrapped after the war, and only a few models survive today. The smaller P-63 King Cobra fighter was developed by Bell during WWII and was primarily flown by the Soviet air forces.

Source: *Australian Aviation*



ABOVE The fireball at the crash site.



Amphibious assault ship USS *Tripoli* departs Naval Air Station North Island, California in April 2022.

'Lightning Carrier' DEMONSTRATION

THE US MARINE CORPS' 'LIGHTNING CARRIER' concept has been demonstrated with the operation of 20 F-35B Lightning II fighters from an America-class amphibious assault carrier, USS *Tripoli* (LHA 7). The concept does not change the standard make-up of an Amphibious Ready Group and Marine Expeditionary Unit. However, the exercise demonstrated the potential to use amphibious assault ships to provide the naval and joint force with lethal access, collection, and strike capabilities with fifth-generation short take-off/vertical landing aircraft in future operations.

Tripoli is the second America-class landing helicopter assault ship. Optimised to support rotary and fixed-wing operations, *Tripoli* carries twice as much aviation fuel, 30 percent more aviation ordnance and, with an expanded hangar bay, more space to perform aircraft maintenance than its Wasp-class predecessors.

Source: *Naval News*

Air USA becomes RAVN Aerospace

RED AIR PROVIDER, AIR USA has adopted a new name, RAVN Aerospace. The company provides adversary air, close air support and Joint Terminal Air Controller (JTAC) as well as intel, surveillance and reconnaissance training.

Four former RAAF Pilatus PC-9/A trainers used for JTAC training and 38 F/A-18A Hornet aircraft will be delivered to RAVN Aerospace during 2023/2024.

Of the original 75 Hornets operated by the RAAF, four were destroyed in accidents and eight will be preserved at RAAF bases and aviation museums. The Royal Canadian Air Force now operates 25 former RAAF Hornets and 38 F/A-18s will be delivered to RAVN Aerospace.

Recent RAAF upgrades to the Hornet fleet included replacement of the original radar with Raytheon's AN/APG-73, integration of equipment including Saab's Elta EL-L/8222 electronic countermeasures pod, Northrop Grumman's AN/AAQ-28(v) Litening AT (advanced targeting) pod, and MBDA ASRAAM within-visual-range air-to-air missiles.

Source: *Scramble Dutch Aviation Society*



ABOVE The RAAF announced the sale of its retiring fleet of McDonnell Douglas F/A-18A/B Hornets in March 2020. Photo: SGT Pete Gammie.

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B-21 Raider at the unveiling.

B-21 RAIDER UNVEILED

THE US DEPARTMENT OF DEFENSE unveiled the B-21 Raider late last year. The first strategic bomber to be introduced into service in more than three decades, the B-21 will serve as the backbone of America's bomber force. The US Air Force expects to acquire a minimum of 100 B-21s.

The B-21 Raider will serve within a larger family of systems to prosecute conventional long-range strike, intelligence, surveillance and reconnaissance; electronic attack; communication; and other roles. It is nuclear capable and designed to accommodate manned or unmanned operations, and will be able to employ a broad mix of stand-off and direct-attack munitions.

Source: US Department of Defense

Canada finalises F-35 DEAL

THE ROYAL CANADIAN AIR FORCE has committed to buy 88 F-35A Lightning II fighters with the first deliveries in 2026 and with full operational capability of the fleet expected between 2032 and 2034.

The estimated cost, \$20.54 billion, includes a training program, associated equipment, sustainment set-up and services, as well as the construction of facilities in Bagotville and Cold Lake.

Source: Australian Defence Magazine



RAAF F-35A at Exercise Pitch Black 22. Photo: Nigel Pittaway.

RNZAF receives FIRST P-8A POSEIDON



RNZAF P-8A Poseidon.

THE ROYAL NEW ZEALAND AIR FORCE (RNZAF) took delivery of the first of four Boeing P-8A Poseidon maritime surveillance aircraft to replace its six ageing P-3K2 Orions in a deal worth about \$1.5 billion. No.5 Squadron will operate the aircraft, relocating from Whenuapai Air Base (north of Auckland) south to Ohakea Air Base (two hours north of Wellington).

Boeing Defence has developed four variants of the aircraft: P-8A Poseidon for the US Navy; P-8I Neptune for the Indian Navy; Poseidon MRA1 for the RAF; and the P-8 AGS, an airborne, ground surveillance variant proposed for the US Air Force to replace its E-8 Joint Surveillance Target Attack Radar System fleet, a platform evolved from the B-707 airliner.

The P-8 is currently in operation with the US Navy, Indian Navy, RAAF, RAF and Royal Norwegian Airforce. The Republic of Korea and German navies have the aircraft on order.

Source: Simple Flying

F-35 Lightning II

FIGHTERS BOUND FOR EUROPE

THE US DEPARTMENT OF DEFENSE AND LOCKHEED MARTIN have finalised a \$30 billion contract to deliver up to 398 F-35 Lightning II aircraft to European air forces. The agreement includes 145 Lot 15s, 127 Lot 16s, and 126 Lot 17s for Finland, Belgium and Poland respectively.

According to Lockheed Martin, Lots 15 to 17 are the first tranches equipped with the company's Technical Refresh-3 (TR-3) package under the Block 4 capability requirement. TR-3 involves a new integrated core processor with enhanced computing power, an updated memory unit, and a panoramic cockpit display.

Meanwhile, the German Ministry of Defence has separately announced the procurement of 35 Lockheed Martin F-35 Lightning II Strick Fighter aircraft. Germany is the ninth country to join the foreign military sales program. The agreement includes a comprehensive package of engines, role-specific mission equipment, spare and replacement parts, technical and logistic support, training and armament.

The first eight aircraft will be delivered in 2026, and is believed to be financed by a 100 billion euros appropriation for the German armed forces created in the days following the Russian invasion of Ukraine.

Sources: *Australian Defence Magazine; The Defence Post*



Line-up of F-35 Lightning II fighters.



Black Hawk purchase

CONFIRMED

THE ARMY'S TROUBLED FLEET of MRH 90 Taipans will be replaced by 40 UH-60M Black Hawk helicopters. As part of project Land 4507-1, Australia will acquire the Sikorsky Black Hawks from the US government for an estimated \$2.8 billion.

Delivery of the helicopters will commence this year and they will operate from Oakey, Qld and Holsworthy, NSW, supported by a blended maintenance workforce. Australian industry will be involved in logistic support, warehousing services, training, maintenance and engineering services, as well in the aircraft's global supply chain.

Source: *Australian Defence Magazine*



ABOVE UH-60M Black Hawk. Photo: LMA.

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RQ-4B Global Hawk.

Japan's first

GLOBAL HAWK

THE JAPAN AIR SELF-DEFENCE FORCE has reinforced its intelligence, surveillance and reconnaissance capabilities with the first of three Northrop Grumman RQ-4B Global Hawk surveillance platforms.

The RQ-4B will enable continuous surveillance during "times of threat" and contribute to interoperability with allied forces. Other customers for the RQ-4 are NATO, South Korea and the US Air Force. The US Navy and RAAF operate the MQ-4 Triton maritime patrol variant.

The RQ-4 can operate at altitudes up to 60,000ft for more than 32 hours with a range over 22,800km. It carries a synthetic aperture radar and a high-resolution electro-optical/infrared camera to gather long-range imagery day and night.

Source: *Flight Global*

Swarm WARFARE

THE ISRAELI DEFENCE FORCE has announced its intention to use swarms of drones in combat. A combination of new developments in drone technology and the proliferation of drones is changing the face of drone warfare with groups of different types of drones working together to accomplish military objectives.

Source: *APDR*



US Soldiers test of up to 40 drones in a swarm at the National Training Centre in Fort Urwin, California. Photo: US Army.



ABOVE An Army MRH 90 Taipan from the 5th Aviation Regiment. Photo: LAC Oliver Carter.

New Army

AVIATION COMMAND

THE AUSTRALIAN ARMY established a new Aviation Command in December last year to better support land, amphibious, special operations and the Joint Force.

A requirement arising from the 2020 Defence Strategic Update and 2020 Force Structure Plan, Aviation Command will coordinate the introduction into service of new helicopters and unmanned aerial systems, and enhance and simplify the management of Army's helicopters – one of the most

multifaceted and resource-intensive capabilities within Army.

Army's aviation capability provides reconnaissance, firepower support, air assault, battlefield surveillance and support in combined, joint and interagency environments. Army operates the Boeing CH-47F Chinook, Eurocopter Tiger armed reconnaissance helicopter, NH Industries MRH90 Taipan multi-role helicopter and leased civil light utility helicopters.

Source: *Army*



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Inspiring the

NEXT generation

ON FRIDAY 24 FEBRUARY, the Air Force Association (WA Division) had the honour of hosting RAF Chief of Air Staff, Air Chief Marshal Sir Michael Wigston KCB, CBE, ADC and Lady Wigston to the RAAFA Club in Perth to officially gift Tornado GR4 ZG791 to the RAAFA Aviation Heritage Museum at Bull Creek, WA.

The ceremony was a tribute to the aircraft and to the relationship between the Royal Air Force (RAF) and RAAF that has been steadfast since the original Imperial gift by the RAF that saw the establishment of the RAAF in 1921.

Air Chief Marshal Wigston shared his own experience flying ZG791, including the tale of a bird strike. But, most importantly, he spoke of the significance of having the aircraft based at the Aviation Heritage Museum alongside a Lancaster, both of which were part of the Dambusters Squadron, and what it means for the next generation of aviators.

"Having an aircraft like this in a museum



is about inspiring the next generation," he said. "Many people who have served or who are still serving today will have joined the Air Force or chosen a career in aerospace, space and aviation because they came to a place like Bull Creek as a four-year-old or five-year-old. [Where] they first realised they were in the presence of an amazing piece of machinery; that smell, that sight, those sounds – and at that point they became hooked on aviation. That spark of inspiration about what they wanted to do was laid there. For me it was the Royal Naval Air Service Museum, in Yeovil, and I remember it today, I still remember those smells when I first came close to an aircraft."

The aircraft was officially assigned to the RAAFA Aviation Heritage Museum with the unveiling of a plaque by Sir Michael and



ABOVE The official party with the Tornado-GR4 ZG791 in the display marquee at Bull Creek.

RAAFA-WA President Clive Robartson AM.

Mr Robartson thanked the RAF for the gift, the only Tornado GR4 to be gifted to a museum outside of the United Kingdom, and to all of those involved in the delivery and rebuild. He made particular mention of the RAF Joint Aircraft Recovery and Transportation Squadron team who flew out to Perth to reconstruct the aircraft and share valuable knowledge on its care with museum volunteers.

"Be assured that we will look after this grand lady and that in our care she will undoubtedly out live all of us," he said. "We commit to caring for her. Thank you Royal Air Force for this special gift to the nation."



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AIR FORCE ASSOCIATION

Bombing of Darwin

COMMEMORATION

ON SUNDAY 19 FEBRUARY 2023, RAAFA Tasmania hosted an afternoon tea to commemorate the 81st Anniversary of the Bombing of Darwin. Special guest was 102-year-old FLTLT Brian Winspear AM, RAAF (Ret'd) who was on the Darwin airfield preparing to take off when, at 9.58am, aircraft of the Imperial Japanese Navy attacked the field from carriers stationed north of the Australian mainland.

There were two raids on Darwin that morning and throughout the next six months or so, Darwin endured 43 air attacks that delivered more bombs on the city, caused more property damage and killed more people than the raid on Pearl Harbor two months prior.

The very next day, Brian Winspear was airborne in his Hudson aircraft to attack the Japanese ships around Melville Island. They found and engaged the fleet, including the carriers, and escaped virtually unharmed due to the absence of Japanese aircraft; the only opposition was mainly anti-aircraft and machine gun fire.

Brian went on to serve throughout the Pacific War with No.2 Squadron RAAF and he is the last surviving RAAF aircrew member with active service in the Pacific Theatre.



ABOVE State President of RAAFA Tasmania, SQNLDR Alan Robertson (Ret'd), presents FLTLT Winspear with a Certificate of Recognition to attest to his participation in the defence of Darwin on that critical day in 1942.

Anzac Spirit

YEAR 10 STUDENT OLIVIA BROOK won a 2022 South Australian Premier's Anzac Spirit School Prize for her entry about her great-great uncle, WOFF Joseph Colwyn Kelly, who served as an Air Gunner with 10 Squadron and was lost over the Bay of Biscay in 1943.

The Anzac Spirit prize encourages South Australian Year 9 and 10 students to research an Australian who served in one of the world wars, and the Sunderland Branch of AFA Victoria was proud to help Olivia with information about her great-great uncle.

Olivia was presented with an award certificate and medal last November and will participate in a 12-day study trip to Darwin in April. She was also given a tour of 10 Squadron by Commanding Officer WGCDR Maz Jovanovich, and introduced to the P-3C Flight Simulator, which she successfully landed several times.

The Sunderland Branch congratulates Olivia.



ABOVE Olivia, her mum and instructor Marc Smith in the simulator.



WGCDR Jovanovich presents FSGT Ton with the Dudley Marrows Memorial Trophy

Dudley Marrows Memorial Trophy

TEN SUNDERLANDERS, all from interstate and members of 10 Squadron, attended the 2022 Dudley Marrows Memorial Trophy Dinner in the Air Force Room at the Naval and Military Club in Adelaide.

All of the trophy nominees demonstrated the courage, integrity, compassion and leadership that characterised FLTLT Dudley Marrows DSO, DFC, Chev.LH. The final three nominees were CLP Elisha Blogg, FSGT Shaun Ton and CPL Darren Malyon. The Trophy was awarded to FSGT Shaun Ton, an Airborne Electronics Analystist – Electronic Warfare 3 with No.10 Squadron.

FSGT Ton consistently displayed exceptional technical mastery and, in combination with leadership, social mastery and organisational understanding, has continuously made unparalleled contributions to 10 Squadron and Air Force. He has gained qualifications recognised beyond the squadron and reserved for only the most exceptional instructors.

FAREWELL AND WELCOME

ON 18 JANUARY, Air Force Association (South Australia) hosted an informal reception at the Combined Ex-Services Mess, Torrens Parade Ground, Adelaide to farewell AIRCDRE Ross Bender and welcome his replacement, AIRCDRE Adrian Maso, as the Senior ADF Officer Edinburgh and Senior Air Force Representative in South Australia.

SA Governor, Her Excellency, The Honourable Frances Adamson AC, was guest of honour and delivered a farewell speech to AIRCDRE Bender. Other dignitaries attending included SA Minister for Veterans Affairs Geoff Brock, state member for Bragg Jack Batty, Senator David Fawcett, federal member for Spence Matt Burnell and City of Playford mayor Glenn Docherty. AVM Darren Goldie, Air

Commander Australia, and WOFF Raylee Scott, Air Command Warrant Officer also attended, along with more than 50 other friends and colleagues from across the Adelaide Defence, veteran, heritage and aerospace community.

For the past two years, AIRCDRE Bender served as Commander Air Warfare Centre, RAAF Edinburgh, the Senior ADF Officer Edinburgh Defence Precinct and the Senior Air Force Representative South Australia. In those capacities, he ensured RAAF Edinburgh and the Air Force Association worked closely together to deliver commemorative presentations, to promote and preserve Air Force heritage and to provide Air Force veteran support. AIRCDRE Bender's collaboration was key to the delivery of the SA community-



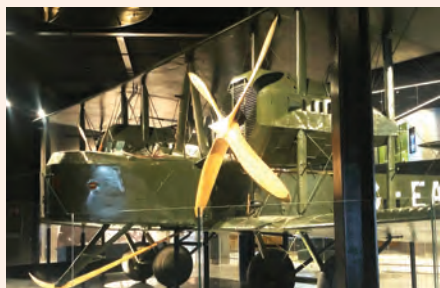
ABOVE AIRCDRE Ross Bender speaking at his AFA-SA hosted farewell from Adelaide with AFA-SA Secretary, Dr Warwick Raymont.

based Air Force Centenary celebration in 2021 and the annual Air Force birthday, Bomber Command and Battle of Britain commemorative services.

AFA-SA thanks AIRCDRE Bender for his support and wishes him the very best for his return to Canberra and future endeavours in the service of our nation. Meanwhile, the Division warmly welcomes AIRCDRE Maso and his wife Kylie and looks forward to continuing the excellent relationship with RAAF Edinburgh in veterans support, Air Force commemorations and Air Force heritage over the next several years.

VICKERS VIMY

in its new home



ABOVE The Vimy in Adelaide's airport terminal. Photo courtesy David McGuinness.

READERS MAY RECALL WINGS' 2019 series featuring Sir Ross Smith's account of his epic 1919 flight from England to Australia in a Vickers Vimy bomber.

In 2019, heritage, veterans and Defence organisations collaborated to conduct a year-long Epic Flight Centenary celebration. A key goal of the project was to secure the placement of the famous Vickers Vimy in a new state-of-the-art facility in the Adelaide Airport terminal. The aircraft had been displayed in a purpose-built Sir Ross and Sir Keith Smith Memorial building at the airport since 1958, but its location, some

distance from the airport terminal, had lost its amenity.

Following expansion of the airport terminal in 2021, relocating the Vimy into the terminal became a reality. The aircraft made the 2km journey by road last May and the exhibition was opened on 19 December.

Adelaide Airport rightly considers the Vimy to be "one of the world's most prized aviation exhibits". It can be viewed for free, daily from 8am to 8pm.



Scan the QR code to view photographs of the relocation project by Artlab Australia.



Scan the QR code to read about the history of the Vimy's public displays over the past century in Melbourne, Sydney, Canberra and Adelaide.

EDITED BY John Kindler

\$74M AIR DEFENCE CENTRE

LOCKHEED MARTIN AUSTRALIA (LMA) has announced plans to invest \$74 million to create a secure National Integrated Air and Missile Defence Ecosystem, recommending the centre be located at Williamstown, NSW.

Missile defence systems are designed to shoot down incoming cruise and ballistic strike missiles. Lockheed Martin has three such systems which it is likely to seek to adapt for Australia.

The company said the proposal was made in parallel with its bid for Defence's \$2.7 billion Joint Air Battle Management System to be delivered under Air 6500, but is not dependant on that being successful. LMA and Northrop Grumman Australia have been down-selected for a role as the Commonwealth's strategic partner for Air 6500 and both have submitted bids.

Part of the \$74 million investment will be seed money to kickstart research and development activities to ensure the capability can be grown and begin to develop a sovereign industry. The facility will be run by the Commonwealth.

Sources: *Australian Defence; Newcastle Herald*



Leonardo lands Spartan contract




LEONARDO HAS WON a \$70 million contract to replace and upgrade the radio capability on Australia's C-27J Spartan fleet. Australia currently has 10 Spartans operated by No.35 Squadron from RAAF Base Amberley, focused on peacetime operations such as search and rescue and aeromedical support.

Air Vice-Marshal Leon Phillips, head of aerospace systems division, said, "Upgrading the cryptographic radio function of the C-27J platform will ensure ongoing availability of secure communications, including interoperability with key strategic partners and intelligence networks, and increased overall safety for Australian Defence Force personnel."

Source: *Defence Connect*




ABOVE C-27J Spartan.



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SA rocket gets final touches

FOUR SOUTH AUSTRALIAN COMPANIES are putting the final touches on the VS03 mission that will launch a rocket and state-of-the-art payloads to space from SA before the end of the year.

Southern Launch, ATSpace, Asension and Inovor Technologies have collaborated on the mission that will see an ATSpace Kestrel I rocket launched from the Southern Launch Whalers Way Orbital Launch Complex near Port Lincoln in November.

The Kestrel I launch vehicle, a 10m, two-stage, sub-orbital rocket, will reach an altitude of more than 200km on a trajectory over the Southern Ocean, with a total flight time of approximately 10 minutes. On board the rocket will be an Inovor Technologies spacecraft integrated with payloads designed by Asension and Southern Launch.

During the flight, Southern Launch, Asension and Inovor Technologies will monitor their payload and test communication protocols.

Quickstep secures six-year F-35 contract

NORTHROP GRUMMAN CORPORATION has awarded NSW-based Quickstep Holdings a six-year contract to produce airframe components to support global F-35 operations.

The firm orders secure Quickstep's F-35 order book through 2025. Northrop Grumman manufactures the centre fuselage for all three F-35 variants and Quickstep was first integrated into Northrop Grumman's global supply chain in 2012.

Source: Defence Connect



A RAAF F-35 manoeuvres at full thrust.

Local SME

SPEEDS UP BOEING

SYDNEY-BASED DC ROBERTS AIRCRAFT has significantly reduced repair times for H135 helicopter starter generators since securing a contract to support Boeing Defence Australia's Helicopter Aircrew Training System team.

The generators were previously sent overseas for repair under Airbus' global H135 repair program, with an average turnaround time of 18 weeks. Since joining Boeing's repair program, DC Roberts Aircraft has helped repair 15 starter generators over an average of just seven weeks.

Source: Defence Connect



RAN H135 helicopter.

© Commonwealth of Australia

NOVA FLIGHT LAB COURSE

NOVA SYSTEMS HAS launched a new course for Queensland engineering students that provides airborne demonstrations of flight mechanics and aircraft stability and control.

The Flight Lab course targets undergraduates and post-graduates interested in the aviation environment and provides students with an introduction to the practical techniques used by flight testers to determine the longitudinal stability and handling qualities of an aircraft.

The course is overseen by Nova Systems flight test engineers who offer insights to the impacts of varied aircraft design and the requirements for longitudinal and manoeuvre stability.

Nova Systems is looking to expand the program to more academic organisations.

Last year, the company announced plans to spend an initial \$2 million to establish

a local "centre of excellence" to support research, digital technologies, training and ideas for the local workforce. It aims to facilitate collaboration between defence, industry and academia to develop an integrated joint force test and evaluation and capability assurance resource.

Source: Australian Aviation



ABOVE A typical light twin cockpit.



Macquarie Uni commissions THERMAL CAMERA

Artist's impression of the Eris rocket
deploying a satellite into orbit.

MACQUARIE UNIVERSITY'S Australian Astronomical Optics Division has signed an agreement with Gilmour Space Technologies for construction and delivery of a thermal camera payload. The new Australian-made thermal camera could be used for many applications, including water quality monitoring, bushfire detection and weather monitoring.

The sovereign space technology is to be integrated into a Gilmour Space satellite, set to launch in late 2023 as part of an all-Australian payload sensor suite — Macquarie's inaugural contribution in the "new space era".

Gilmour Space recently completed the final set of qualification tests for its Sirius rocket engine, paving the way for the launch of its Eris rocket next year. Eris will be powered by five Sirius rocket engines — a hybrid rocket engine that uses both a liquid oxidiser and a proprietary solid fuel. The Eris launch will be the first attempt at an orbital launch by an Australian-designed and constructed rocket.





Source: *Defence Connect*

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SpaceX takes Aussie satellites TO SPACE

A **SPACEX FALCON 9** rocket launched from Cape Canaveral in January carried 114 satellites, including five of the largest Australian satellites to go to space.

SpaceX's Transporter-6 mission is the company's sixth dedicated small-satellite rideshare mission. Payloads included a huge range of CubeSats, microsats, PicoSats and orbital transfer vehicles that are loaded with small spacecraft to be deployed at a later date.

The 300kg Australian-made satellites were designed and constructed by Canberra-based company Skykraft, which plans to launch another 195 satellites over the next two years to establish a constellation to deliver an air traffic management (ATM) system it is developing.

One of the key offerings of Skykraft's ATM system is that it will capture automatic dependent surveillance signals to track aircraft locations across the globe. Additionally, it will provide a link for VHF data and voice communications between air traffic controllers and aircraft when they are more than 400km from land.

The launch was the 200th successful blast-off to space for SpaceX, and the Falcon 9 first stage's 15th flight, which ties it for the record of most re-used rocket.

Source: spaceconnectonline.com.au



ABOVE SpaceX Falcon 9 leaving the launch pad.



Black Sky Crew with a TM229 Cyclone Missile.

BLACK SKY TESTS GUIDED WEAPONS

QUEENSLAND-BASED BLACK SKY AEROSPACE, Australia's only producer of solid rocket fuel and common tactical boosters, has successfully launched a prototype long-range missile from the back of a privately owned Mercedes Benz Unimog.

The 3.7m long, 229mm diameter TM229 Cyclone training missile was fired remotely from a custom weapon pod, manufactured in Australia and mounted on the back of the ex-Army light truck. A total of nine guided weapons were tested, four from the company's new POD system.

Those initial launches will enable the company to improve its next tranche of missile tests, expected to take place over coming months.

Source: *Defence Connect*

WA Space Radar unveiled

LEOLABS HAS UNVEILED its fully operational West Australian Space Radar (WASR), part of the planned expansion of its global space radar network of 10 independent radars across six sites. The WASR site hosts two US manufactured S-band active phased array radars that add critical surveillance capability for the Southern Hemisphere.

With the collaboration of the LeoLabs Kiwi Space Radar in the South Island of New Zealand, WASR will enable superior tracking and monitoring of median to high inclination resident space objects. The two radar sites will increase LeoLabs capacity to discover new objects including lethal, small debris that is currently non-trackable.

Source: spaceconnectonline.com.au



LeoLabs space radar.

F-35A maintenance FACILITY EXPANSION



THE AUSTRALIAN GOVERNMENT has signed a \$100 million facility service deed with BAE Systems Australia to support the country's existing fleet of F-35A Lightning II aircraft. The RAAF has received 57 F-35 fighters with delivery of all 72 aircraft expected by the end of 2023.

The deed will be executed by expanding the number of maintenance bays at the company's South Hangar facility, Newcastle Airport, NSW from two to six. Associated work is expected to support nearly 750 direct/indirect local employment opportunities by 2025.

The government is planning to further increase maintenance bays at the facility from 2026.

Source: Airforce Technology



LEFT F-35A Lightning II on the tarmac at BAE Systems Maintenance Facility, Williamtown.

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Niche-trades workforce for RAAF Edinburgh

DEFENCE AND AIRBUS AUSTRALIA PACIFIC have signed an Edinburgh Aerospace Intelligence Surveillance and Reconnaissance (ISR) Enterprise Common Services Deed to develop a common niche-trades workforce at RAAF Base Edinburgh, South Australia.

Established in 2021, the Edinburgh Aerospace ISR Enterprise was designed to create an integrated industry base to support the ADF's P-8A Poseidon, MC-5 Peregrine and MQ-4 Triton capabilities.

The initiative provides a framework to increase the efficiency of a workforce to support multiple small fleets of aircraft and provides a basis for the extension of support to additional platforms if required.

Source: Defence Connect



BELOW A No.11 Squadron P-8 Poseidon.



Upgrades for Growler

TRAINING RANGES

THE GOVERNMENT HAS AWARDED

Australian radar company CEA Technologies a \$277 million contract to provide advanced capabilities for electronic warfare ranges under Project Air 5349 Phase 6 – Advanced Growler, which is delivering vital upgrades to the RAAF's EA-18G Growler Electronic Warfare aircraft and associated ranges.

It is the first contract awarded under Phase 6, which will include: co-operative development of the Next-Generation Jammer weapon system with the US Navy to gradually replace the ALQ-99 Tactical Jamming System; aircraft modifications including sensor upgrades; new longer range and more advanced anti-radiation missiles; anti-radiation

missile war stock; upgrades to the electronic warfare training ranges capability; and facility upgrades at Amberley, Qld, and the Delamere Air Training Area, NT.

The project, which has an approved budget of more than \$2 billion, will ensure commonality with US Navy Growlers.

The EA-18G Growler is an electronic attack aircraft capable of disrupting, deceiving or denying a broad range of military electronic systems, including radars and communications.

Source: Australian Defence



ABOVE A No.6 Squadron EA-18G Growler.

Local Sea Sparrow

MISSILE CONTRACTS

BAE SYSTEMS AUSTRALIA has awarded contracts to six Australian companies to provide critical hardware and software sub-assemblies to Block 2 of the global Evolved Sea Sparrow Missile (ESSM) program.

The ESSM is billed as a medium-range surface-to-air missile developed to protect warships from advanced anti-ship cruise missiles.

The local companies awarded contracts are Ronson Gears, Electromold, Calm Aluminium, Rosebank Engineering, Toolcraft Australia and Russell Symes and Co.

Source: Defence Connect



RIGHT Evolved Sea Sparrow emerges from a vertical launch cell.



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NEXT GENERATION SatCom

JOINT PROJECT 9102 WILL PROVIDE AUSTRALIA WITH A FULLY SOVEREIGN MILITARY SATELLITE COMMUNICATIONS SYSTEM.

WORDS
Gregor Ferguson

AUSTRALIA'S AREA OF MARITIME RESPONSIBILITY covers approximately 10 percent of the globe, from the equator down to the Antarctic and from mid-Indian Ocean to the Western Pacific. Australia's strategic interests extend even further. The Australian Defence Force (ADF) needs to be able to operate effectively wherever those strategic interests demand. Hence Joint Project 9102 – Australian Defence Satellite Communication System, a \$6.9 billion acquisition for which five companies were shortlisted as potential prime contractors.

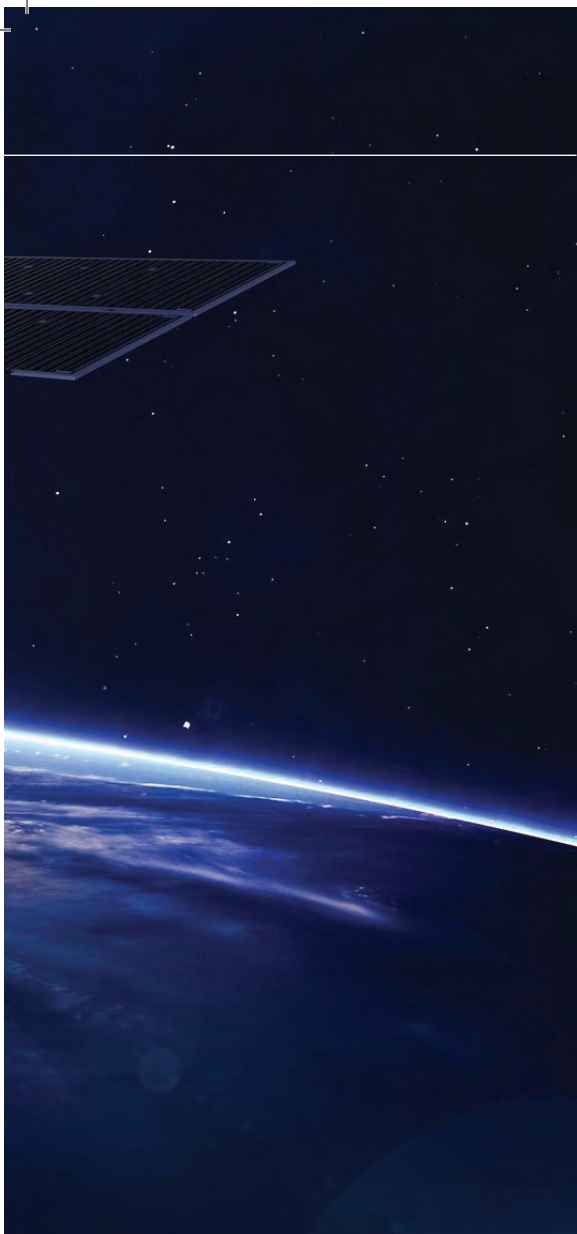
On April 3, the Department of Defence announced Lockheed Martin Australia as the preferred bidder for JP9102 Ph1.

The JP9102 prime contract will see the ADF acquire, for the first time, a fully sovereign military satellite communications (MilSatCom) capability that enables it to communicate across global distances

without requiring the support of other defence forces or military communications payloads on civilian satellites. From the late-2020s onwards, the ADF will own a constellation of up to four communications satellites located in geostationary orbit (GEO) and providing pole-to-pole coverage, along with the ground stations and supporting infrastructure necessary to operate them.

Some of the ground infrastructure already exists. It was established to support ADF MilSatCom installations and upgrades under different projects, many of them sub-phases of JP2008. Those projects included a dedicated defence payload aboard the Optus C1D civilian communications satellite; a dedicated wideband global SatCom (WGS) military satellite; and several more ad hoc SatCom solutions from suppliers such as Inmarsat and Intelsat as contingencies and opportunities emerged.

The WGS communications satellite was



manufactured 10 years ago by Boeing Satellite Systems, El Segundo, California, as the sixth of the Pentagon's planned 12-strong constellation of WGS satellites. By paying for one of them, the ADF was granted access to the entire network.

A MilSatCom satellite in GEO can weigh up to six or seven tonnes and has a design life of about 15 years, unless it can be refuelled and updated in orbit. Once it's up there, the only thing more expensive than in-orbit servicing is total replacement. So, any changes in the functionality of a MilSatCom network is delivered through software changes, mainly on the ground, though some modification can be implemented as software uploads to an orbiting satellite.

That reality, and what it means for sovereignty, drove the solutions put forward by the five teams shortlisted for JP9102. It's unlikely that a launcher capable of putting a six-tonne satellite into GEO will be operational in Australia in the relevant timeframe, so most solutions were based on relatively low-risk (nothing in space is risk-free), proven satellites and launchers such as the US Delta IV, SpaceX Falcon and European Space Agency Ariane rockets. The ADF requires communications links in several wavebands: ultra-high frequency (UHF), very-high frequency (VHF), X-Band and Ka-Band. And it needs a satellite operations centre. Defence hasn't

specified exactly how many satellites it requires, nor who would build them, nor where and when they would be launched – those features were part of the proposals submitted by the five contenders.

Another layer of complication is Australia's need for a sovereign industry base, both to support its growing defence capabilities and to act as one of several pillars for a stronger national economy. But that won't happen overnight: "Developing a world-class, globally competitive space industry takes time," warns Airbus Defence and Space Vice President Marketing and Sales, Ben Bridge.

In light of the rapid development of space technology, and of Australia's own space-industry capabilities, the door is open for a high-low mix of GEO and possibly low earth orbit (LEO) satellites. The latter could be manufactured in, and launched from, Australia, providing a focused, responsive capability as unforeseen contingencies will probably demand, though it seems likely the core MilSatCom capability will still be based on a relatively low-risk adaptation of an existing constellation in GEO. However, much of Australia's initial contribution will be on the ground, providing space segment and network management systems, antennae, ground infrastructure and software.

Illustrating that reality, two Australian SMEs were selected by all the prime



ABOVE Lockheed Martin's Next Generation Overhead Persistent Infrared geosynchronous earth orbit Block 0 early missile warning satellite.
Photo: Lockheed Martin.



RIGHT Lockheed Martin satellite station near Armadale, NSW.
Photo: Lockheed Martin.



contractors: Perth-based Blacktree Technology and Sydney-based Clearbox Systems. The former is a world leader in the development of radio frequency (RF) SatCom systems. Blacktree has been supplying the ADF for decades and provides UHF antennae for the UK's Skynet 5 program. It will provide the JP9102 High Mobility Ground and Control Segment – the UHF-SatCom portion of each proposal, according to managing director and co-founder Joel Nevin.

Clearbox Systems is a global leader in the design and delivery of the control segment of SatCom networks. The control segment allows a customer to operate and manage the complete set of SatCom resources covering ground (modems and antennae), spectrum (transmissions) and, most recently, the space segments (satellites).

LOCKHEED MARTIN SPACE

Lockheed Martin Space's proposed solution is commercial-in-confidence but, the "contract terms and requirements point to sovereignty and the winning contractor will need to deliver an Australian-focused solution with significant and enduring investment in space capability for future procurements and programs in Australia," David Ball, the company's Regional Director Australia and New Zealand, said prior to the announcement of Lockheed Martin as preferred bidder.

The company won't disclose the number or type of satellite to be offered, or from where they'll be launched, but unsurprisingly, they will be manufactured in-house by Lockheed Martin, incorporating significant Australian components such as Ronson Gears' actuators for the solar panels in the flight hardware. The supporting ground and control infrastructure will be manufactured in Australia using Australian-made products, where possible, said Ball.

The company believes JP9102 could be extended to include position, navigation and timing (GPS), remote sensing and missile warning so its proposal is designed to accommodate additional technologies and functionality easily. The baseline system will deliver 290 jobs directly and many more indirectly. Those jobs will focus on critical skills for all Defence programs including network and software engineering, systems engineering and



LEFT From left, Blacktree Technology director Joel Nevin, chief technology officer Joe Nevin and defence advisor Pat Hall at Blacktree Technology, WA in 2019.

Photo: CPOIS Damian Pawlenko.



BELOW Engineers prepare GOES-S for acoustics testing at Lockheed Martin, Littleton, Colorado, in November. Photo: Lockheed Martin.



program management, said David Ball. By investing in JP9102, the Commonwealth will have trained employees at its disposal for any future program, not just space or MILSATCOM.

The company's local supply chain includes Av-Comm, Blacktree, Calytrix, Clearbox Systems, Conscia, DXC Technology, EM Solutions, Inovor Technologies, Linfox, Ronson Gears and Shoal Group.

The other four contenders for the JP9102 prime contract were Airbus Defence & Space, Boeing Defence Australia, Northrop Grumman Australia and Optus.

AIRBUS DEFENCE & SPACE

Airbus proposed a constellation based on the company's Skynet 5 and 6A MilSatCom systems, either in operation (Skynet 5) or development for the UK, and adopted an Aboriginal name for its bid: Team Maier. The company described it as a battle-proven, low-risk system with enhancements to meet all of the ADF's requirements, already interoperable with both the UK and US MilSatCom systems,

as well as those of other Five Eyes and allied nations.

Team Maier's JP9102 bid went above and beyond investing in a local space ecosystem, said Airbus, and promised to contribute \$437 million and 1,400 new jobs to the Australian national economy through to 2032. Airbus has a track record in helping develop indigenous and sovereign capabilities, for example in the United Arab Emirates, where, over a 10-year period, it has helped create a sovereign space capability from scratch.

Australia's sovereignty was addressed by Airbus's local footprint and local supply chain that would have included five Indigenous businesses and 12 Australian SMEs. Team Maier's aim was that by the end of 2032 all activity would be undertaken by Australians in Australia as a true sovereign asset.

Team Maier's supply chain included Clearbox Systems which would have led the design and development of the JP9102 SatCom management system. The Airbus proposal also engaged 42 other Australian SMEs.

BOEING DEFENCE AUSTRALIA

Boeing Defence Australia's (BDA) primary focus was alignment with the massive investment the US government has made in capabilities such as the WGS program and Boeing's own history of manufacturing narrowband UHF payloads for other peoples' satellites. Boeing's program manager for JP9102, Kathryn Burr, told *Wings*, there was a strong overlap between the WGS program and the Commonwealth's requirements on JP9102, so it made sense to leverage other peoples' investments.

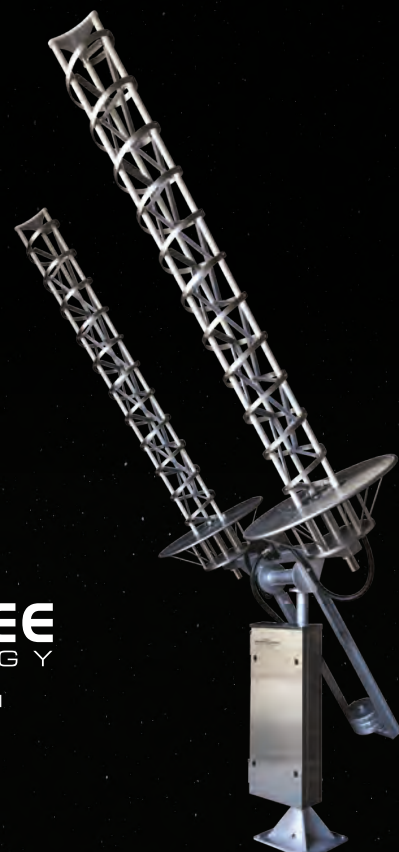
Next year, Boeing will launch WGS-11 which, she said, is significantly better than the earlier satellites – it has twice the throughput capacity and was the rough basis for the JP9102 bid. The Boeing JP9102 proposal included two wideband satellites and two narrowband satellites, to be built in El Segundo, the biggest satellite manufacturing facility in the US, though the launch site wasn't identified.

Noting the Commonwealth had implementation issues with the ground

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LEFT X-band and Ka-band antenna systems at Kojarena, WA.

segment for its earlier JP2008 MilSatCom program, Boeing teamed with ViaSat to ensure the JP9102 ground segment would be delivered as quickly and smoothly as possible.

The Boeing proposal for JP9102 included software developed in Australia and derived from that applied to the earlier Currawong tactical communications system acquired under JP2072. Kathryn Burr said that element was a key part of the sovereignty sought by the Commonwealth, which she defined as absolute command and control of the assets by the Commonwealth and complete freedom to evolve and change the system without reference to any other government or contractor.

As well as Blacktree and Clearbox, the company's local supply chain included some key SMEs: Sydney-based Quickstep Holdings, which would manufacture several composite components; and 3D printer Titomic, which is working with Boeing through a Commonwealth Modern Manufacturing Initiative grant to develop so-called green titanium with reduced energy needs. Green titanium has huge potential in space systems manufacturing. Also in the supply chain was Saber Astronautics, to work on artificial intelligence and spacecraft diagnostics as well as on flight operations and management at a secure commonwealth facility.

NORTHROP GRUMMAN AUSTRALIA

Northrop Grumman Australia's proposal for JP9102 used its own family of SatCom satellites and teamed with space industry giants Inmarsat (the second largest SatCom provider to the RAN) and L3Harris (to provide the Australian wide multi-band terminal), but the company didn't say where its satellites would be launched.

The enduring benefits of the proposal included sovereign control, operation and sustainment of the MilSatCom capability and the development and sustainment of a resilient Australian space industry.

Northrop Grumman planned to integrate its own satellites into the solution through a flexible technical architecture, and use its Australian systems integration, advanced mission visualisation and demonstration facility, Parallax Labs, to sustain the mission system. That, combined with sovereign, on-demand access to Inmarsat's Global Express satellites, would have given the ADF the ability to assign sovereign capacity and coverage immediately as a mission developed.

Northrop Grumman Australia's supply chain included local companies Blacktree, Clearbox, EM Solutions and Vocus; and international firms AECOM, Inmarsat and L3Harris.

OPTUS

What's a telephone service provider doing priming a Defence project? Well, aside from the fact it teamed with Raytheon Australia and Thales Australia, which both have considerable space expertise, Optus owns and operates what was at the time the biggest civil-military MilSatCom satellite ever launched, the Optus C1D. It has been managing SatCom operations from its Belrose site in Sydney for nearly four decades: it has unique Australian expertise in managing space operations from a local ground control station.

Since 1985, Optus has been Australia's major satellite provider, launching 10 satellites, operating 13 spacecraft, and providing support to over 100 international space programs. Since 2003, Optus has controlled the C1 Satellite which incorporates critical capabilities for Defence.

Optus was to be prime systems integrator, Raytheon was to manage the ground segment, SATCOM certification and test and evaluation while Thales would be responsible for much of the training, simulation and cybersecurity. Mitsubishi Electric Corporation was to build the satellites (it built the Optus C1D and more than 70 other satellites as a prime contractor and provides flight hardware for another 500 spacecraft). Optus' proposal also sought to use the specific expertise offered by local SMEs Blacktree and Clearbox. [W](#)

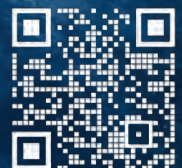
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WORDS Gregor Ferguson

SILENT WATCHER

TWO AUSTRALIAN COMPANIES HAVE ESTABLISHED A GLOBAL LEAD IN THE DEVELOPMENT OF SMALL VERY HIGH AND ULTRA-HIGH FREQUENCY WAVEBAND RECEIVERS AND PROCESSORS FOR TACTICAL SURVEILLANCE.

AN ACTIVE RADAR PROVIDES high-fidelity tactical awareness, but at a potential threatening cost – detectability. As soon as a radar goes active, its location and state can become known. In fact, a radar transmission is detectable by a potential adversary long before it can actually form a reliable return on the adversary. Anything with an active radio frequency (RF) transmitter can be detected, simply because the radar or communications system is radiating electromagnetic (EM) energy.

And if two or more detectors can sense the source emissions, then not only does an adversary know, in the case of radar, that an active search is in progress, but the location of the transmission source is compromised and it can be observed or attacked.

Hence the growing importance of passive radar and its status as one of Defence's 14 Strategic Industry Capability Priorities. Hence also the emergence of a global market for the relatively new surveillance technology which one South Australian company, Silentium Defence, estimates is worth about \$19 billion.

Passive radar is the ability to build situational awareness using RF emissions from other, non-associated sources that are reflected off potential targets and detected by a passive receiver antenna array which can't be detected as it does not transmit. That confers a significant tactical advantage. Furthermore, passive





radars are reliable because they have no moving parts, and there is no radiation hazard associated with them.

Equally important is avoiding the need for a spectrum license: in today's regulatory environment every electronic emitter needs some form of license, if only because the available EM spectrum is becoming crowded and radio emitters need to be deconflicted for safety and integrity, especially in urban settings. No license, no radar – unless it's passive.

The downside is that the radar's antenna and signal processing system must be carefully designed to work with a very low signal strength and mitigate very high levels of interference and EM noise, particularly in built-up areas.

A GLOBAL LEAD

Fewer than 10 companies worldwide have developed passive radar products thus far. In Australia, two companies have established a global lead in the development of small very high and ultra high frequency (VHF and UHF) waveband receivers and processors for tactical surveillance: Silentium Defence and Daronmont Technologies, both based in Adelaide, South Australia.

Both companies got their start in passive radar by commercialising some intellectual property (IP) created by the Defence Science and Technology Group (DSTG) at Edinburgh, SA. That IP focused on detecting targets illuminated by the most pervasive of RF signals – TV and radio

signals in the VHF and UHF wavebands. Those are everywhere, including space, so the companies' antennas are designed to monitor those wavebands.

Most companies developing passive radars in those wavebands focus on long-range surveillance, which means designing large, immobile and very visible antennas. Daronmont and Silentium started off instead by developing smaller, portable surveillance systems for the ADF.

Daronmont Technologies was established in 1998 to commercialise high-frequency surface-wave radar technology developed by DSTG, says Business Development Manager Lee Stanley. The company now employs nearly 100 staff in four states and territories and its strengths in signal processing, algorithm development and systems integration have given rise to a number of related products, including communications electronic support measures equipment for the Royal Australian Navy and other naval customers in Canada and New Zealand.

After working with DSTG on passive radar for several years, including some long-range aspects, Daronmont saw the opportunity to commercialise DSTG's technology in 2017. The company won a \$7.9 million contract from the Defence Innovation Hub to develop a prototype soldier-portable passive radar system for the Army, complete with a small processor and a collapsible antenna.

That solution was designed to partially replace an obsolescent portable active radar



LEFT Defence passive radar for space domain awareness. Photo: Silentium.



OPPOSITE PAGE The Murchison Wide Array.

system. It was completed successfully, and the technology and performance demonstrated by Daronmont has the ADF contemplating potential applications for passive radar across multiple domains. The software-based operating system Daronmont developed for the Army can also be adapted, so the core building block for a family of passive radar products now exists.

Daronmont also developed the Passive Experimental Transportable Radar (PETRA), for DSTG. The PETRA system consists of an omni-directional passive radar antenna mounted on a 6m ISO container that is fully ruggedised, electronically shielded and air conditioned. The container is actually a crew shelter enabling the integration and fusion of multiple passive radar feeds and can be carried by road, sea or air (in a C-17 or C-130) to anywhere it is needed.

OPERATIONAL APPLICATION

One of the first operational applications of passive radar by the ADF could be in Defence's Project AIR 6500, the Joint Air Battle Management System to be selected later this year. Defence will choose between bids from Lockheed Martin Australia and Northrop Grumman Australia. Both Silentium and Daronmont have been selected by those two prime contenders as part of their respective Australian supply chains. Silentium will be the passive radar provider in each bid, while Daronmont will deliver the smart, containerised command, control, communications, computers and intelligence (C4I) systems.

Silentium was formed in 2017 by two DSTG researchers, Dr James Palmer, the CEO, and Simon Palumbo, the chief technology officer, who saw the commercial potential of the same passive radar IP that Daronmont Technologies had licensed. The two founders went through the CSIRO's commercialisation accelerator program, ON Accelerate, to develop the business and entrepreneurial skills needed to compete in the surveillance marketplace and set about developing their own take

on passive radar. They started a spinoff company, Silentium Defence, and won a license to commercialise the same core technology as Daronmont.

An early success was Silentium's small, man-packable MAVERICK-M radar for the Army. It is battery powered and provides 360-degree coverage. Another early success was the longer-range MAVERICK-S radar, an ultra-wide field of view system designed for space surveillance. It can detect both satellites and debris and provides sufficient accuracy to enable single-orbit determination of new resident space objects.

Today, Silentium employs nearly 60 people, says Dr Palmer, it is recruiting another dozen and is executing a 10-year technology roadmap across three main market segments: Defence (air and space surveillance); space; and commercial – meaning functions such as critical infrastructure protection, especially in urban areas, carry no risk of interference, have no need for a spectrum license and – where it matters – no electronic footprint to be detected.

DEMONSTRATED VALUE

"Passive radar is at a critical junction for Defence, recognised as a Sovereign Industrial Capability Priority," says Simon Palumbo. "All three [Defence] services have demonstrated the value of passive radar, and now is the time to expedite delivery into the hands of the people who can use it the most, the ADF and our allies."

Daronmont Technologies' Passive Radar Product Manager, Mike Callen, agrees and adds that Australia needs a tighter relationship between end users and innovators in order to get new capability more quickly into warfighters' hands and help build a sustainable defence industry. He points out that Australia is also a small market in global terms. Real growth will need exports in order to build volume and scale, he says.

A relatively new entrant in the passive radar field is Nova Systems which last year teamed with Curtin University's International Centre for Radio Astronomy Research (ICRAR) in Western Australia to develop a new capability for space domain awareness (SDA). That capability uses FM broadcast signals and is designed to collect big data from space sensors but can detect aircraft if required and can also receive direct communications from space-based transmitters in the 50-300MHz range.



The prototype, located at Nova Systems' new Space Precinct in South Australia's Mid North, is based on the Curtin University-led Murchison Widefield Array, a low-frequency radio telescope developed for the CSIRO. It enables the company to monitor space weather, including solar mass ejections.

Nova Systems' passive radar technology allows it to see horizon to horizon and then cue other sensors to take a more detailed look at targets of interest, says Andrew Mannix, Nova Systems' Executive General Manager Mission Solutions.

"I've been astonished at just how quickly the Nova Systems/Curtin University team has been able to adjust the algorithms and tune the radar to produce some amazing data," says Mannix.

"Together with Nova Systems, we will perform specific space domain awareness [SDA] missions, 24 hours a day, seven days a week, as required by potential clients including the Australian Defence Force," says ICRAR's deputy Executive Director, Professor Steven Tingay.

The RAAF, through Joint Project 9360, will develop a single, properly integrated SDA capability to strengthen the ADF's objectives in space.

An initial 512 antennas are being established at Nova's Space Precinct, which also hosts several satellite ground stations, supporting local and international clients to cater for the data download needs of the ever-increasing number of satellites and constellations. Once the SDA facility is complete, more than 2,400 antennas will be installed, with advanced electronics and software systems, the

majority of which will be manufactured in Western Australia.

German radar, IFF (Identification Friend or Foe) and communications company Hensoldt also has a passive radar capability. The firm's Twinvis passive radar offers the same advantages as those manufactured by Silentium and Daronmont, but Hensoldt adds that the Twinvis radar, because it uses the same radio and TV broadcast signals, can also detect some stealthy aircraft that would be undetectable using other, conventional radars. The sensor has an update rate of 0.5 seconds, can detect targets at speeds up to Mach 4 and can track up to 5g manoeuvres. It is not a part of either of the two AIR 6500 bids, but the company is looking for opportunities in Australia and elsewhere.

Hensoldt doesn't have a big profile in Australia but has a significant relationship with the University of Tasmania with whom it collaborates on sovereign SDA through the Greenhill Observatory north of Hobart and other radio telescopes on the Australian mainland.

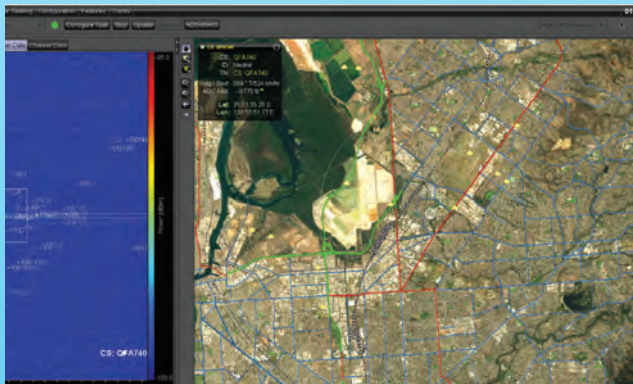
The story of Silentium, Daronmont and Nova demonstrates a couple of sovereign initiatives: DSTG has been good at 'horizon-scanning' – spotting technologies that could be either a threat or opportunity (or both) and then seeding sovereign research into those opportunities; and all three companies have had to invest in technology development over a period of years before they could build a viable product. They may have looked like overnight successes, but their success came after years of hard work – and the same applies right across the technology spectrum. **W**



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A
RETURN
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Paul Bennet Airshows Wolf Pitts Pro at the Australian International Airshow 2023.

IMES

THIS YEAR'S RETURN OF THE AUSTRALIAN INTERNATIONAL AIRSHOW AND AEROSPACE & DEFENCE EXPOSITION, SAW A RECORD-BREAKING TURNOUT. GREGOR FERGUSON REPORTS ON SOME OF THE DISPLAY AND EXHIBITION HIGHLIGHTS.

THE AUSTRALIAN INTERNATIONAL AIRSHOW AND AEROSPACE & DEFENCE EXPOSITION, or Avalon 2023, to use its more common name, was the first

Avalon Airshow in four years, thanks to COVID-19. Despite missing the chance to help the RAAF celebrate its 100th birthday in 2021, the organisers reported a record-breaking turnout: 794 participating exhibitor companies, 48,516 industry-day attendances, 281 delegations from 38 nations, 22 air force chiefs and 14 other personal representatives.

The RAAF used the opportunity to fly every aircraft in its inventory and demonstrate to the Australian public (some 200,000 people on Friday, Saturday and Sunday) just what their taxes pay for.

While there were lots of manned aircraft at Avalon 2023, much of the interest was in unmanned systems and surveillance.

STARS OF THE SHOW

The undoubted stars of the show were the eight supersonic T-50B Golden Eagle jets of the Republic of Korea Air Force (RoKAF) formation display team, the Black Eagles. Under team leader Major Eun-Ho Yang, the team flew a sparkling sequence of eight-ship close-formation aerobatics, two-ship opposition manoeuvres and solo handling displays.

Their 20-minute presentation climaxed in a team manoeuvre called the Taegeuk, in which they recreate the yin and yang emblem on the South Korean flag with coloured smoke trails.

Unsurprisingly, the Black Eagles were awarded the CEO's Trophy for the Best Overall Avalon 2023 Display.

The team also flew a friendship flight with the RAAF display team; the Roulettes' six Pilatus PC-21s flying alongside the Korean team along the Great Ocean Road and then over Melbourne for a flypast before opening the flying display at Avalon. The Roulettes



South Korea's Black Eagles.

were their usual precise, professional selves under team leader SQLDR Mark Keritz and blending two of the world's top formation display teams was not a challenge.

Like the Roulettes, the Black Eagles recruit from regular air force flying instructors. The Wonju-based T-50B Golden Eagles they fly are operated by the 53rd Air Demonstration Wing of the RoKAF's 239th Aerobatic Flight; the team draws its logistics support from the co-located 8th Fighter Wing.

The KAI T-50 Gold Eagle, along with the Boeing/Saab T-7, Leonardo M-346 and the venerable BAE Systems Hawk 127, is a contender to provide the airborne element of the RAAF's planned fast-jet conversion and training system once the current Hawk-based system reaches its life of type.

AUSSIE INVADER 5R

One of the highlights of the show was Rosco McGlashan's world land-speed-record contender, *Aussie Invader 5R*. Supported in part by the RAAF Association and carrying the *Wings* magazine logo, the Aussie Invader team was busy raising both money and awareness of the forthcoming land-speed record attempt.

Aussie Invader 5R is designed for a target speed of 1,000mph on the ground. It boasts a bi-propellant liquid-fuel rocket motor producing 62,000lb of thrust, making it the most powerful car ever built. And if it succeeds in reaching 1,000mph, or Mach 1.3, as planned, it will also be the fastest.

The timing of a record attempt depends on how quickly the team can find the additional \$3 million required to finish

configuring the engine and fuel system, conduct functional tests and physically get to a track. There are just five possible tracks, two of them in Australia – the car needs to run on baked clay, not salt, about 30km long and 1km wide.

Built in Perth, WA, *Aussie Invader 5R* weighs 9.2 tones with a full fuel load of 2.8 tonnes and can accelerate from 0 to 1,000mph in just over 20 seconds.

At maximum speed, *Aussie Invader 5R* will cover the measured mile in just 3.5 seconds. At those speeds pneumatic tyres simply burst: *Aussie Invader 5R*'s single-piece wheels, built by sponsor Calm Aluminium, are made from aerospace-grade aluminium to cope with the stresses of turning at 10,000 rpm and experiencing centrifugal forces of 50,000g at the rim.

Driver and perennial land speed record hopeful Rosco McGlashan was supported at Avalon by the distinctive, pink prime mover from supporter Pilbara Heavy Haulage Girls Group, which delivered the vehicle from Perth in one 40-foot and one 20-foot ISO container – all it takes to move *Aussie Invader* around. Rosco was also selling signed copies of his biography, *Rosco The Fastest Aussie on Earth: The amazing true life story of Rosco McGlashan* (see review, page 82).

GHOST BAT BREAKS COVER

Avalon 2023 was in effect the public debut of the Boeing MQ-28A Ghost Bat, an uncrewed combat air vehicle that was originally unveiled in model form, and to much fanfare, at Avalon 2019.

The aircraft on display in 2023 was the real thing. Formerly known as the Loyal Wingman, it is designed to fly



TOP SiNAB Phoenix ISR pod.

ABOVE Chief of Air Force Air Marshal Robert Chipman with the Silentium Defence team.

LEFT *Aussie Invader 5R* en route to Avalon.



Scan the QR code to view a video which provides a graphic illustration of the almost instantaneous thrust produced by an engine similar to the rocket installed in *Aussie Invader 5R*.



autonomously alongside manned aircraft, carrying weapons and/or sensors to increase the battle space that a fighter package can dominate and significantly reduce the risk to a human pilot. Its first flight was on 27 February 2021 and a robust flight test schedule is currently underway.

Ghost Bat is the first Australian-designed, developed and manufactured military combat aircraft in half a century. Developed by Boeing Australia in co-operation with the RAAF and the Defence Science and Technology Group (DSTG), it is described by the RAAF as a 'pathfinder' for the integration of autonomous systems and artificial intelligence (AI) to create smart human-machine teams.

The Ghost Bat will have a 3,700km range, 'fighter-like performance' (undisclosed) and is a semi-stealthy platform that can carry weapons as well as intelligence surveillance and reconnaissance (ISR) sensors in rapidly changeable nose pods. It will enable Defence to investigate factors such as desirable levels of automation and autonomy, use of AI and the human-machine teaming concepts that ensure Australia meets its legal and ethical obligations.

At Avalon 2023, Boeing announced its Ghost Bat local supply chain had risen from 35 to 55 companies. Boeing also signed an extension to an existing memorandum of understanding with BAE Systems Australia, which is responsible for the Ghost Bat's vehicle management system (VMS). A young BAE Systems Australia engineer won the prestigious Avalon 2023 Young Innovator Award for his work developing the vehicle control algorithms for the VMS.



LEFT
Boeing Ghost Bat.



BELOW
The Roulettes in 'Form'.





BELOW SYPAQ Systems Corvo precision payload delivery system drones.

BOTTOM BAE Systems Mantis.



CORVO DRONES TO UKRAINE

Melbourne-based SYPAQ Systems is delivering its Corvo™ precision payload delivery system (PPDS) drones to the Ukrainian Armed Forces. Made of specially coated cardboard with elastic bands holding its detachable wing in place, the Corvo PPDS has been in production for Ukraine for some time and the company is now building 100 kits a month.

The exact size and value of the order hasn't been disclosed: the most SYPAQ is authorised to say is that the unit price is somewhere between \$1,000 and \$5,000 each.

"PPDS is an Australian capability that will help the Ukrainian people defend their country, and is proof of the world-leading autonomous systems capabilities in Australian industry," says the company's CEO Amanda Holt.

Developed in Melbourne in partnership with Army and under a \$1.1 million Defence Innovation Hub contract, the Corvo PPDS is a low-cost, expendable drone for the delivery of supplies and equipment into areas traditional logistics capabilities cannot reach.

The PPDS comes flat packed and can launch, fly up to 120km and land autonomously, removing the cognitive load on a soldier during operation. Following feedback from end-users in Ukraine, the system has also been adapted for ISR missions.

BAE STRIX UAS

BAE Systems Australia and partner, Perth-based SME Innovaero, launched Australia's first domestically designed, manufactured and armed vertical take-off and landing uncrewed air system (UAS), STRIX™, at Avalon 2023.

BAE Systems has an extensive history of developing autonomous systems, including the UK-designed Taranis and Mantis uncrewed autonomous demonstrator aircraft, for which the company's Australian subsidiary developed the VMS. The STRIX VMS is already in use aboard other platforms, including the MQ-28 Ghost Bat for the RAAF's autonomy program.

Innovaero is a 100 percent Australian-owned aeronautical design, certification and manufacturing business. Recent UAS designs include the Fox, a contender for later phases of Project SEA129 Ph.5, and the OWL (one-way loitering) airborne munition.



TOP STRIX armed vertical take-off and landing UAS.

ABOVE BAE Systems Australia RAZER.



Scan the QR code to watch a video about STRIX.

A hybrid, tandem-wing, multi-domain and multi-role UAS designed for high-risk environments, STRIX is designed to carry a 160kg payload over 800km and can be used for a variety of missions including air-to-ground strike and persistent ISR. STRIX will accommodate a range of existing munitions, including all-new types such as the RAZER, which BAE Systems Australia also launched at Avalon 2023. It could also act as a 'loyal wingman' for military helicopters and could be operated from a helicopter to expand the mission set and protect aircrew in high-threat environments.

"STRIX could be ready for operational service as soon as 2026 and work is already underway on a STRIX prototype," says BAE Systems Australia CEO Ben Hudson.

RAZER PGM

With the Defence Strategic Review believed to be just a few weeks away, BAE Systems Australia used Avalon 2023 to launch a new sovereign munition concept, RAZER, a low-cost air-launched precision guided munition (PGM) wing/body kit and tail unit.

The RAZER kit, a set of fold-out wings and a powered GPS/INS guidance control and navigation system is designed for lightweight 40-50kg unguided munitions to be launched from uncrewed combat air vehicles, such as the STRIX, or from manned helicopters.

RAZER allows for effective employment of inexpensive, normally short-range munitions from a stand-off distance

to mitigate the vulnerability of the launch platform.

MBDA IS BACK

European guided-weapons company MBDA is set to re-open its office in Canberra as it positions itself for an Australian market that will be shaped by the Defence Strategic Review and AUKUS Pillar 2.

MBDA plans to build on the deep relationship it established with the RAAF and DSTG (formally Defence Science and Technology Organisation) as a result of the RAAF's ASRAAM air-air missile program. The company is also a partner in the Australian Missile Corporation which is positioning itself to win a substantial part of the manufacturing work associated with the sovereign guided-weapons and explosive ordnance enterprise.

On display at Avalon 2023 was a range of MBDA air-launch and ground-launched weapons, many already in service and combat proven.

The Brimstone, a 50kg, 1.8m anti-tank missile has seen more than 700 firings with a 98 percent success rate and is now integrated for internal carriage on the F-35B. It has a tandem-shaped-charge warhead and the company says it can defeat all known conventional and reactive armour.

Another contender for ADF adoption, MBDA's SPEAR is a turbojet-powered weapon, derived from Brimstone, which weighs less than 100kg but has a range of 140km (greater than the US small-diameter bomb) and an AI-enabled radio-frequency seeker that grants it an anti-ship capability.

The Meteor beyond visual range air-to-air missile is in service or on order for all six MBDA partner nations and is currently being integrated with Italy's F-35A. The ramjet-powered Meteor boasts a 120km range and the largest no-escape zone of any missile in its class. Thanks to its lock-on-after-launch capability, it also has a 360-degree engagement envelope and over the shoulder capability.

PHOENIX POD

Sydney-based SiNAB showcased its Phoenix ISR pod. The self-contained, battery powered Phoenix Pod is a core component of SiNAB's Phoenix Joint-Terminal Air Controller (JTAC) training solution (PJTS) developed to help the ADF train its JTAC crews.

Phoenix incorporates a high-resolution EO/IR sensor, laser pointer and designator and multiple air-to-ground communication

systems including secure voice and data (combat net radio/variable message format), Link16, video down link and mobile ad-hoc network.

The PJTS provides all the functionality required to carry out a digitally aided close air support mission, from transmitting nine-lines and target-sorting messages to providing a complete suite of long-range electro-optic and infrared cameras that facilitate the find, fix, track, target, engage and assess tactical doctrine.

The Phoenix Pod can also be used anywhere aerial surveillance is critical for decision-making, such as bushfire and search-and-rescue support operations.

GA-ASI & LEIDOS

General Atomics Aeronautical Systems, Inc. (GA-ASI) and Leidos have agreed to continue the successful airborne-surveillance business relationship established in 2006 between GA-ASI and Cobham Australia. Leidos acquired Cobham's Special Mission business in October 2022.

The relationship emerged in response to a proposed Defence Armed Remotely Piloted Aircraft System, and the Australian Border Force future crewed/uncrewed airborne surveillance system under the Civil Maritime Capability Program.

GA-ASI was set to sign a \$1.3 billion contract with the ADF for a squadron of MQ-9B SkyGuardian armed, medium-altitude long endurance UAS under Project AIR7003 Ph.1. The acquisition was cancelled unceremoniously in 2022 to free up funds for the Australian Signals Directorate's \$9.9 billion Resilience-Effects-Defence-Space-Intelligence-Cyber-Enablers (REDSPICE) program. The MQ-9B SkyGuardian program could be revived in the Defence Strategic Review.

Meanwhile, at Avalon 2023, GA-ASI publicised its Gambit family of four autonomous UASs. Developed under the US Air Force Research Laboratory's (AFRL) Project Vanguard. Gambit employs a core platform with common hardware: landing gear, avionics, core chassis and other essential UAS functions on which mission-specific configurations may be added.

Gambit 1 would be a long-endurance ISR platform with high aspect-ratio wings, designed to fly ahead of other UASs or manned strike packages.

Gambit 2 would be similar, but with air-air weapons and a resultant drop in endurance.

Gambit 3 would be similar to Gambit 2, but optimised for a complex combat role, including fighting integrated air defence systems and fifth-generation combat aircraft.

Gambit 4 would be a stealthy combat reconnaissance model, tailless and with swept wings, optimised for specialised, long-endurance missions

The use of advanced manufacturing technologies such as 3D printing has reduced the cost of producing prototypes by more than an order of magnitude, the company says, and made it possible to meet aggressive AFRL schedules for producing flight-test prototypes.

HYPERSPECTRAL OPTICAL RADAR

Melbourne-based start-up Arkeus launched its hyperspectral optical radar (HSOR), a sovereign, Australian-made, maritime ISR sensor system developed for the Royal Australian Navy (RAN).

The HSOR is set to revolutionise situational awareness from drones and manned aircraft, by slashing current exploitation time for hyperspectral imagery from days or hours to mere seconds, according to the company.

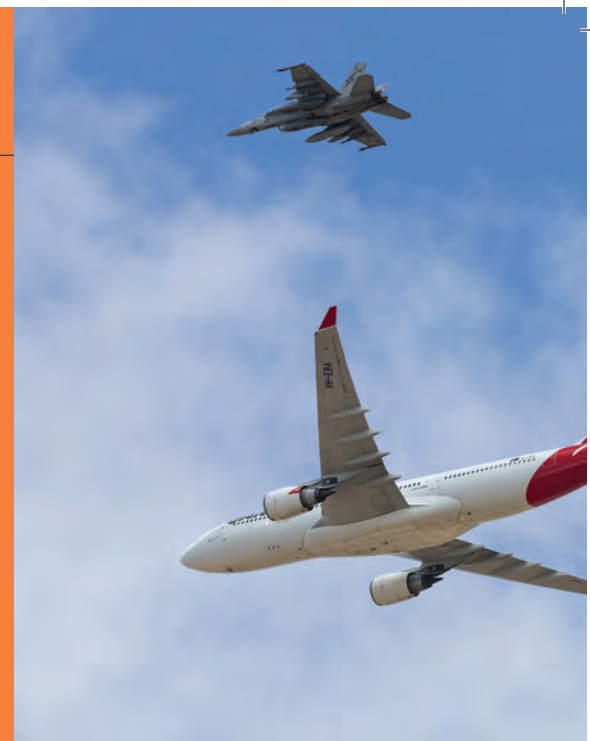
Developed under contract for Defence, with sponsorship from the RAN, the HSOR also offers a new level of precision when it comes to information processing allowing operators to filter and define objectives specific to mission requirements rather than manually processing a stream of raw data.

The HSOR is small enough to fit within the size, weight and power constraints of a tactical UAS, says Arkeus, anticipating considerable interest within Australia as well as the US, Europe, the Middle East and the Asia Pacific.

INNOVATION AWARDS

The organiser of the Avalon Airshow, AMDA Foundation Limited, is a not-for-profit organisation with an altruistic purpose, to encourage and support the development of Australian industry capability, which is why it has been running its prestigious Innovation Awards program for a decade.

This year, the Avalon 2023 SME Innovation and Young Innovator Awards climbed in value to \$50,000 and, in a first for the air show, both the national and the SME innovation awards were won by the same company, Melbourne-based 1MILLIKELVIN Pty Limited. The company was recognised for its world-leading work developing an imaging camera system that provides a



AIRSHOW PLANNING

AMDA Foundation, an Australian not-for-profit corporation, was established to promote Australia's technology resources through industry expositions. The Avalon International Airshow Aerospace & Defence Exposition is one of the platforms organised by AMDA to achieve that objective.

While AMDA organises the industrial elements and features of the expo, military participation and detailed planning and management of military participation, both ADF and foreign, is delegated to the Australian International Airshow Lead Planner, GPCAPT Catherine 'Catie' Williams AM.

GPCAPT Williams cut her teeth in the Air Force as the first female Air Traffic Controller. She served as Base Commander at Tarin Kowt, Afghanistan, displayed strong leadership and developed great rapport with her subordinates; such that she was affectionally known as "Atilla the Hen".

As Avalon 2023 happened to overlay International Women's Day, GPCAPT Williams arranged for an aircraft formation comprising a Qantas Airbus A330 and two RAAF Super Hornets, all crewed by women to overfly the show in recognition of the contribution by women to aviation. The airshow Ring Master and all Air Traffic Controllers in the Avalon control tower for the overflight were also women.



✈️
LEFT A Qantas Airbus A330 and two RAAF Super Hornets, all crewed by women, overflying Avalon.

✈️
BELOW The Black Eagles in a diamond formation.

BOTTOM Innovaero Fox.

full-colour representation of the stress on a mechanical structure under load, such as the airframes of aircraft and helicopters.

The Young Innovator Award was presented to BAE Systems Australia Melbourne engineer Callum Rohweder for his work developing the core guidance, navigation and control algorithms at the heart of the Australian-developed VMS for the Boeing MQ-28A Ghost Bat UAV.

INNOVATION PITCHFEST

The following day, the Avalon 2023 Innovation Pitchfest saw three 'pitchers' awarded prizes for their engaging presentations. Twenty pitches covered a diverse range of Australian innovations and technologies, from training systems and virtual reality to satellite control, laser systems and software solutions to fleet management.

A seven-strong judging panel chose the three winners:

Best Innovation – Dr Nigel Greenwood, TheMachineGenes Group, for speed with which their lightweight AI platform can be trained and then used to determine engine performance characteristics with very little flight time.

Best Aerospace Innovation – Henry Bilinsky, MicroTau, for its shark-skin-style riblet sheeting for aircraft wings to reduce drag and enhance the ability of the aviation industry to reduce its carbon footprint.

Best Pitch – Anne Bettens, Deneb Space, for a satellite control system, based on reaction motors, that is miniaturised, more power efficient and incorporates sensors that provide for navigation as well as orientation. **WI**

NOTE: The author is also convenor of the Avalon 2023 Innovation Awards.



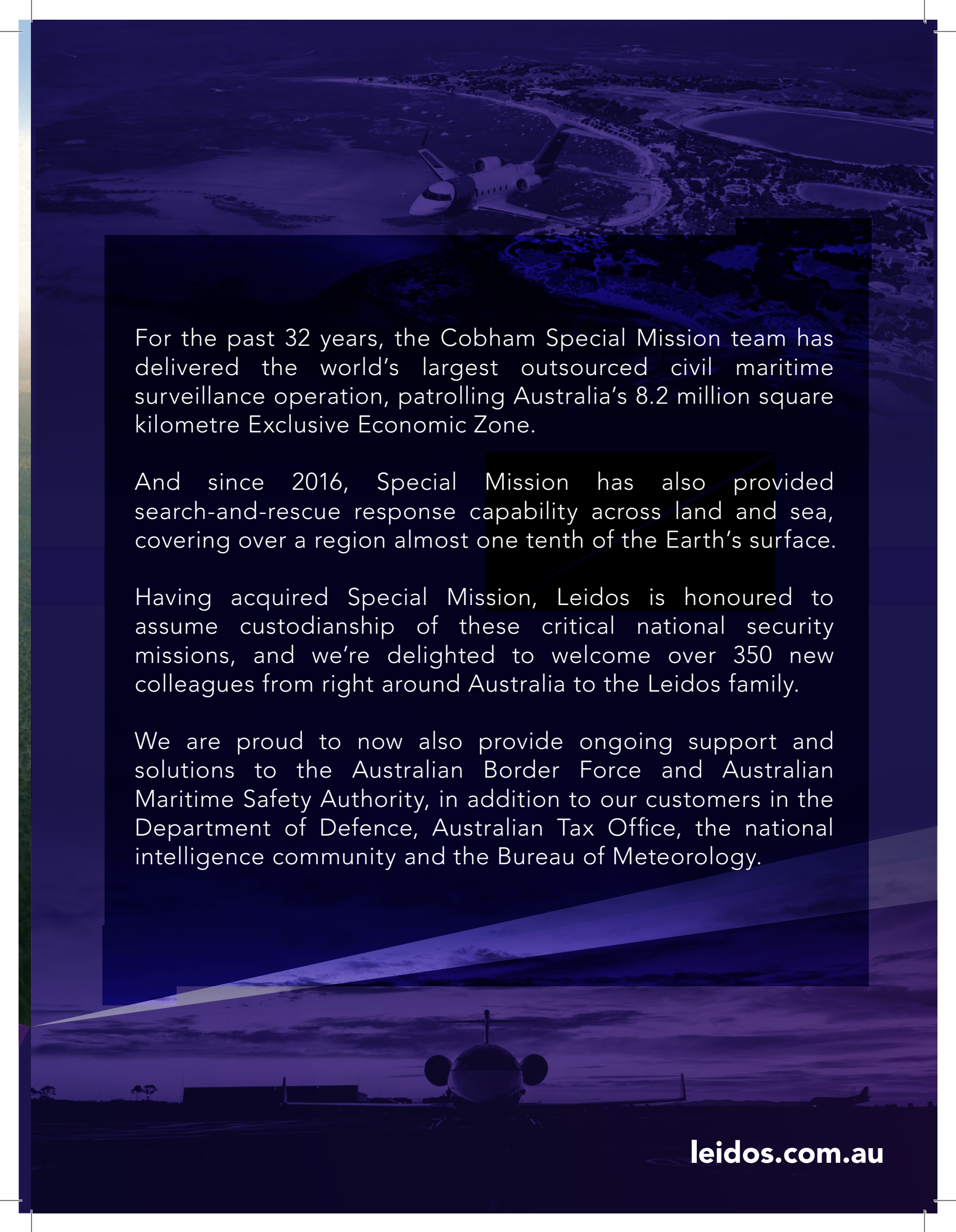
Scan the QR code to view a video about innovation award winner 1MILLIKELVIN.



Scan the QR code to view a video by Young Innovator Award winner Callum Rohweder.

World-leading aviation
and technology solutions
across civil, defence
and intelligence.



An aerial photograph of a coastal region, likely in Australia, showing a small aircraft on a runway. The image is overlaid with a dark blue semi-transparent rectangle containing white text. The background shows a coastline with a bay, a runway, and some buildings.

For the past 32 years, the Cobham Special Mission team has delivered the world's largest outsourced civil maritime surveillance operation, patrolling Australia's 8.2 million square kilometre Exclusive Economic Zone.

And since 2016, Special Mission has also provided search-and-rescue response capability across land and sea, covering over a region almost one tenth of the Earth's surface.

Having acquired Special Mission, Leidos is honoured to assume custodianship of these critical national security missions, and we're delighted to welcome over 350 new colleagues from right around Australia to the Leidos family.

We are proud to now also provide ongoing support and solutions to the Australian Border Force and Australian Maritime Safety Authority, in addition to our customers in the Department of Defence, Australian Tax Office, the national intelligence community and the Bureau of Meteorology.



HOME-MADE WINGS

WORDS Michael Nelmes

100 YEARS OF AUSTRALIAN AIRCRAFT PRODUCTION FOR THE RAAF.

AUSTRALIAN AIRCRAFT PRODUCTION had its humble beginnings in 1909. George Augustine Taylor, founder of the Aerial League of Australia and a proponent of Lawrence Hargraves' earlier experiments with box-kites, set up a small facility at Surry Hills in Sydney where he produced two gliders.

The next developments came just after World War I. The Australian Aircraft & Engineering Company set up a factory at Sydney's Mascot to license-build Avro 504K biplanes, including six built for the RAAF in 1922 from Australian timber.

In 1930-31, the Larkin Aircraft Supply Company (LasCo), with a factory and airfield at Coode Island in Melbourne, built 32 de Havilland Gipsy Moths for the RAAF. LasCo had previously designed and built the first Australian airliner, Australia's first metal aircraft, in 1929, a decade before the Wirraway. In 1933, it produced the first multi-engined airliner to be designed and built in the southern hemisphere.

That period also saw General Aircraft Company (Genairco) produce a unique de-Havilland/Avro hybrid biplane at Mascot, NSW. Genairco was superseded in 1933 by Tugan, whose general manager was SQNLDR Lawrence Wackett (later WGCDR Sir Lawrence Wackett KBE DFC AFC). Wackett had headed the RAAF Experimental Aircraft Section at Randwick in 1924-31 and designed the successful Wackett Widgeon flying boat during his tenure. Resigning from the RAAF, Wackett worked at Cockatoo Island naval dockyard in Sydney to design a twin-engined airliner, the Codock, for Charles Kingsford

Smith. Returning to Tugan, he designed its successor, the Tugan/Wackett Gannett, seven of which were built at Mascot and, in 1935, made history as the RAAF's first locally designed and built aircraft.

COMMONWEALTH AIRCRAFT CORPORATION

Wackett, a strong advocate since the 1920s for a local industry, has been called the father of Australian aircraft manufacture. Its godfather, then, was perhaps Essington Lewis, general manager of BHP iron and steel company. In 1935, Lewis returned home from a fact-finding tour of Europe convinced of two things: war between Germany and Britain (and therefore Australia) was on the way, and Britain may not be able to supply Australia with all its aircraft requirements. He lobbied the Australian Government to establish a modern aircraft industry.

The following year, Wackett toured Europe, including Germany, and America as part of a mission to select an aircraft type that would be within Australia's capacity to produce. Wackett recommended the North American Aviation NA-16/NA-33 training aircraft, forerunner of the famous T-6 Texan/ Harvard trainer.

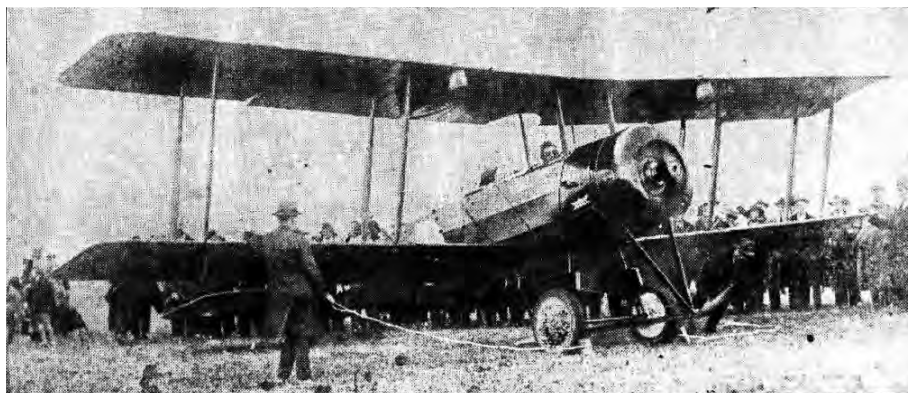
With the involvement of Essington Lewis of BHP and Laurence Hartnett of General Motors-Holden (GMH), and of Broken Hill Associated Smelters and Imperial Chemical Industries, the Commonwealth Aircraft Corporation (CAC) was formed as a private company in October 1936. GMH in particular, headquartered at Fisherman's Bend

at Port Melbourne, gave the company the experience of its executives and production engineers in running factories and subcontracting. A manufacturing license was secured from North American Aviation – a major departure from the traditional choice of Britain as the source of all things aviation – and within a year a factory and airfield had been completed at Fisherman's Bend near the former LasCo site at Coode Island. CAC acquired the Tugan company's assets as its core and, with it, Wackett as managing director.

CAC began production in a remarkably short time, setting to work on a modified version of the North American trainer. Named Wirraway (an Aboriginal word meaning challenge), it featured a new tail section and other refinements including the ability to carry armament. Some component production was outsourced to various firms, such as Richards Industries in Adelaide which produced Wirraway wings (and later parts for the Beaufort, Beaufighter and Lincoln).

The Wirraway, its Pratt & Whitney engine also license built by CAC, entered service just before the outbreak of war in 1939. It was not only the RAAF's new advanced trainer but also a general-purpose aircraft capable of army co-operation, dive bombing and (marginally) air defence operations.

A scare in 1940, when aluminium supplies from the USA had not arrived, was allayed when Canada stepped in with supplies of both ingots and fabricated metal. Wirraway production continued, and by 1946 totalled 755 aircraft. Three other CAC aircraft followed the Wirraway



OPPOSITE CAC Wirraway production at Fisherman's Bend in 1940. Photo: Australian War Memorial.



LEFT The Daily Telegraph of 17 June 1922 reported CAPT Nigel Love test-flying his company's first Avro 504K.



RIGHT The Fisherman's Bend factory complex with the airfield shared by CAC and DAP. Photo: State Library of Victoria.



BELOW Lieutenant Lawrence Wackett flew with Nos 1 and 3 Squadrons, Australian Flying Corps, from 1916. Photo: Australian War Memorial.



into production before war's end. The Wackett Trainer, intended for intermediate pilot training to follow on from Tiger Moths, was the company's first wholly locally designed aircraft, and the RAAF's second (after the Wackett Gannet). The next was the Boomerang, adapted from the Wirraway by Friedrich 'Fred' David in just a few months. Using 65 percent Wirraway parts, the Boomerang was an 'emergency fighter' designed with the expectation that imported fighters would not be arriving for some time. Though inferior to Japanese fighters, it nevertheless had good manoeuvrability (out-turning and out-climbing the Kittyhawk and Airacobra) and cannon armament. In the end it was not needed for air defence, as imported Kittyhawks and Spitfires fulfilled that role. The Boomerang instead served in the army co-operation and reconnaissance roles in New Guinea.

CAC also license-built and overhauled US Pratt & Whitney aero engines at Lidcombe in Sydney. The single-row Wasp radial engine powered its Wirraways, while the Twin Wasp powered its Boomerangs as well as the Department



of Aircraft Production (DAP) Beaufort bombers (see page 48).

In late 1942, the government started looking for a replacement for its Kittyhawk fighters and the following January, Secretary McVey of the DAP led an overseas mission (which included Lawrence Wackett) to evaluate the options. After assessing the Spitfire, Thunderbolt and Mustang, the latter was chosen as the best all-round fighter and the least problematic to build. McVey's mission recommended CAC build Mustangs, thus continuing its relationship with North American Aviation. Production got underway in 1945, slightly too late for CAC Mustangs to see war service, and ran for six years to supplement some 300 US-built Mustangs previously supplied. A few CAC-built Mustangs saw action in the Korean War alongside their US-built counterparts.

Two other CAC designs of note (though built only as prototypes) were the Woomera and CA-15. Both were interesting designs but were not needed. The Woomera was a stop-gap light torpedo-bomber designed in case of supply holdups of imported types. The one-off CA-15 was a Fred David design of 1943, with plenty of power up front courtesy of a Rolls-Royce Griffin V-12 engine. Despite its 720kph (390kt) level flight speed, the CA-15 was considered deficient as piston-engine fighters were rapidly becoming obsolete by 1946 when it first flew.

CAC POST-WAR

The jet age killed off the CA-15 and CAC entered that age with another North American Aviation design – the Sabre. Contracts were signed in 1951, not long after the type had first appeared in action in US service over the Korean peninsula. CAC improved on the US design by using the more powerful, locally built Rolls-Royce Avon jet engine, replacing the machine-gun armament with a pair of 30mm Aden cannons, and increasing its ordnance and fuel capacity. The first Avon Sabre flew in 1953 and replaced the Meteor and Vampire as the RAAF's fighter for a decade until it was replaced by the Mirage III.

From 1945, CAC built more than 100 Rolls-Royce Merlin V-12 engines for its Mustangs and for the GAF Lincoln bomber (see page 48). In the 1950s, CAC built Rolls-Royce jet engines: Avons for the Sabre and GAF Canberra bomber, Nenes for the de Havilland Vampire, and Vipers for the Macchi trainer. In the 1960s SNECMA Atar engines, wings and tail-fin assemblies for the GAF Mirage, and in the 1980s General Electric F404 engines for the F/A-18 Hornet, joined the CAC production lines.

The CAC-designed Winjeel replaced the Tiger Moth and Wirraway as the RAAF's trainer in 1955. The next big CAC project was the Italian-designed Aermacchi (Macchi) MB.326H jet, which flew in 1967. The Macchi was originally intended to replace both Vampire jet and Winjeel piston-engined trainers but it was

decided the jets were too advanced for elementary training. The New Zealand-built piston-engined CT-4 instead replaced the Winjeel, while the Macchi saw service both as a lead-in fighter trainer and with the Roulettes aerobatic team until replaced by the Pilatus PC-9 turbo-prop trainer.

In the 1980s, CAC became Hawker de Havilland Victoria, which later became a subsidiary of Boeing Australia.

DE HAVILLAND AIRCRAFT

The second Australian company to supply wartime aircraft to the RAAF was the Australian subsidiary of Britain's de Havilland Aircraft Company (DHA). After moving from Melbourne to Sydney's Mascot Airfield in 1939, DHA began production of more than 1,000 Tiger Moth training biplanes, while the GMH factory at Pagewood near Mascot built their Gipsy Major engines.

The Tiger Moth supplied the Empire Air Training Scheme – not only for the RAAF but supplemented supplies for the other British dominion nations as well. A monoplane de Havilland trainer, the Moth Minor, also joined the production line, and de Havilland also produced propellers for

the wider Australian aircraft industry.

The combination of a new DHA assembly plant at Bankstown, and the availability of Sydney factories and workshops such as GMH at Pagewood and the Beale piano factory at Annandale, led to production of wooden Mosquito fighter-bombers and photo-reconnaissance aircraft in 1943. DHA and GMH underestimated the complexities of the aircraft's laminated timber construction and quality control, and several Mosquito aircraft suffered catastrophic in-flight structural failure of the wings (built at Pagewood). That was one reason for its very low production rate, which did, however, keep the Bankstown DHA factory operating until 1948 when production turned to the RAAF's first operational jet, the composite wood-and-metal Vampire. Vampires were built in interceptor, fighter-bomber and two-seat trainer variants.

In 1965, DHA became Hawker de Havilland following a merger with Hawker Siddeley, and its aviation division became Hawker Pacific in 1980. During 1987-91 it assembled Sikorsky Blackhawk



TOP A de Havilland test pilot takes a Tiger Moth on its first flight at Bankstown in 1940. Photo: Australian War Memorial.

ABOVE DAP Beaufort Mk.VIII production at Fisherman's Bend. Photo: Boeing Australia.

THE PROPELLER ERA

AIRCRAFT (* Indigenous designs)	COUNTRY OF ORIGIN	PRIMARY ROLE	ENTERED RAAF SERVICE	NO. BUILT FOR RAAF**
CAC Wirraway*	Australia/USA	General purpose	1939	755
DHA Tiger Moth	UK	Elementary trainer	1940	1090
DHA Moth Minor	UK	Trainer / liaison	1940	42
CAC Wackett*	Australia	Intermediate trainere	1941	202
CAC Woomera*	Australia	Torpedo-bomber	N/A (flown 1941)	2
DAP Beaufort	UK	General reconnaissance torpedo-bomber / transport	1941	700
DHA Dragon	UK	Light transport	1942	87
DHA Glider*	Australia	Light transport	1942	8
CAC Boomerang*	Australia	Fighter / army co-op	1943	250
DAP Beaufighter	UK	Strike fighter	1944	365
DHA Mosquito	UK	Fighter-bomber / photo-recon	1943	212
CAC Mustang	USA	Fighter	1944	200
CAC CA-15*	Australia	Fighter	N/A (flown 1946)	1
GAF Lincoln	UK	Heavy bomber / anti-submarine	1946	73

helicopters, initially for the RAAF and then for the Army when it took over rotary-wing assets.

DEPARTMENT OF AIRCRAFT PRODUCTION

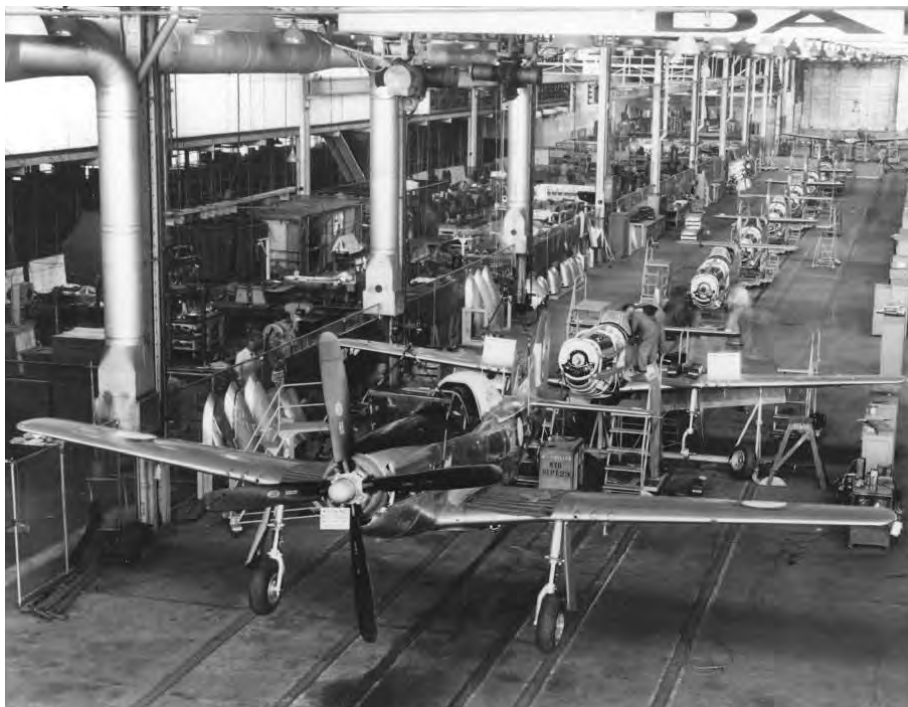
CAC's Pratt & Whitney Twin Wasp engine powered not only its Boomerang, but also the RAAF's primary wartime general reconnaissance/bomber aircraft, the British twin-engined Bristol Beaufort. In March 1939, a British air mission visited Australia and, perturbed that CAC had chosen an American design for its first product, decided that British interests should prevail by recommending that Australia – though not CAC – assemble Beauforts to supply both the RAAF and the Royal Air Force.

The production of 700 Beauforts, each assembled from 40,000 parts, at a peak rate of one per day was a prodigious undertaking for Australia's small industry at the time. It is all the more remarkable considering that material and support from Britain stopped in mid-1940, before production began. Seven factories were commandeered or built, including the GMH automobile factory at Woodville, South Australia, and state government railway workshops in Victoria, NSW and SA. Some 600 sub-contractors were engaged.

To co-ordinate it all, and to provide the centralised assembly plants and staff, a new government department and division was created: the Department of Aircraft Production (DAP), headed by 'industrial dictator' and soon-to-be Director-General of Munitions, Essington Lewis. DAP's Beaufort Division was headed by GMH director John Storey, and factories were soon built at Fisherman's Bend (next to CAC) and at Mascot.

Thus, with the beginnings of an aircraft industry at the start of the war, Australia was in good stead in case supplies from Britain, which was suffering its own precarious war constraints, ran out. But the RAAF could not rely entirely on local production. Aircraft supplies were supplemented by large deliveries of US and British aircraft, the latter initially for the Empire Air Training Scheme (Tiger Moths, Ansons, Oxfords, Battles) but from 1942, combat types including Spitfires.

Forty-six Beauforts were converted to 'Beaufreighter' transports, and the next aircraft on the DAP production line



in 1944 was the Beaufort's strike-fighter development, the Bristol Beaufighter. While British-built Beaufighters had served in the RAAF since 1942, Australia was now building its own version of the most formidable ground attack aircraft available in the war against Japan.

Official historian D.P. Mellor wrote that aircraft production was one of the great achievements of Australian industry. Through the war years CAC, DHA and DAP between them built some 3,500 aircraft of 12 types, and CAC nearly 3,000 engines of three types.

GOVERNMENT AIRCRAFT FACTORIES

The McVey overseas mission of January 1943 had recommended that Avro Lancaster heavy bombers be built in Australia. During 1944-45, a DAP team spent some months at the Avro factory at Manchester in England becoming acquainted with the Lancaster Mk.IV, which was soon renamed Lincoln as it was largely a new aircraft. Although the war had been over for a year when the first fully Australian-made Lincoln was completed, and the RAAF had been drastically downsized, in the emerging Cold War climate the RAAF kept its order in place. Replacing the US-built Liberator in RAAF service, the Lincoln bomber was the largest and most complex aircraft yet built in Australia.



TOP CAC Mustang assembly line.
Photo: Tony Lyons via Monash University.

MIDDLE CAC Boomerang production at Fisherman's Bend.

ABOVE DAP Beaufighter over Melbourne, November 1944.
Photo: Australian War Memorial.

Its replacement, the English Electric Canberra twin-jet bomber, was chosen by a delegation to Britain headed by the Chief of Air Staff, Air Marshall George Jones. Canberras began coming off the production line at GAF's new factory at Avalon, Melbourne, in 1953. Again, subcontractors were used extensively – the railway workshops of NSW and SA, Chrysler Australia in Adelaide, and many others. The Canberra was a quantum leap in RAAF strike capability and performance. In fact, a production aircraft's delivery flight to Australia from England in 1952 set speed and altitude records for the route. The Mk.20 version built by GAF was based on the British-built Canberra B.2 but included refinements such as a reduction in crew from three to two, and integral wing fuel tanks.

Also in 1952, a radical GAF product, the Jindivik, first flew. It was a pilotless, radio-controlled drone – a UAV in today's jargon – used to provide a representative target for guided missile tactical training and

development. Apart from the RAAF and RAN Fleet Air Arm, Britain was a primary customer and a number were supplied to both the USA and Sweden. In terms of numbers produced and longevity on the production line (spanning over 40 years), the Jindivik was one of GAF's most successful products.

As a replacement for the Sabre fighter, in the early 1960s Australia initially considered the American F-104 but instead turned to France for its next fighter platform: the Mach 2-capable Dassault Mirage III. The Australian version, designated Mirage IIIO, differed in detail from the Mirage IIIE and was produced by GAF at Fisherman's Bend. Wings, tail fin and engines were made by CAC and final assembly and test flying was completed at Avalon near Geelong. The first 15 aircraft included imported French components. Fifty of the GAF/CAC Mirages were built as interceptors, 50 as ground attack aircraft, and 16 as Mirage IIID two-seat trainers using imported fuselages.

The GAF Nomad utility aircraft, powered by twin turboprop engines, has been one of the most controversial Australian-designed aircraft due to serious concerns with its structural integrity and flight characteristics. Of the 172 built, most saw civil or Army use in Australia, the Pacific and North America, while only five saw RAAF service over 20 years from 1977.

The US firm McDonnell-Douglas provided the design for the next GAF product, the twin-engined, twin-tailed F/A-18A Hornet fighter-attack aircraft which was chosen in 1981 over the single-engined General Dynamics F-16 fighter. The RAAF ordered 75 Hornets, including F/A-18B two-seat trainers. Again the engines were license-built by CAC. The first 'classic' Hornet was delivered in 1984 and the last example was delivered to RAAF Base Williamstown in 1990 by test pilot Ron Haack (*Wings* managing editor).

Hawker de Havilland's Aerostructures business builds composite and metal components such as trailing edge flaps

THE JET ERA

AIRCRAFT	COUNTRY OF ORIGIN	PRIMARY ROLE	ENTERED RAAF SERVICE	NO. BUILT FOR RAAF**
DHA Vampire	UK	Fighter / fighter-bomber / trainer	1949	7110 (6 for RAN)
GAF Canberra	UK	Bomber	1953	48
CAC Avon Sabre	USA	Interceptor / fighter-bomber	1954	112
CAC Winjeel*	Australia	Trainer / Forward Air Control	1955	62
GAF Pika*	Australia	Piloted trial drone	N/A (flown 1950)	2
GAF Jindivik*	Australia	Target drone	1952	72
GAF/CAC Mirage III	France	Interceptor, attack, trainer	1965	116
CAC Aermacchi MB326H assembly	Italy	Lead-in jet trainer	1967	97 (10 for RAN)
GAF Nomad*	Australia	Utility	1977	5
GAF/ASTA F/A-18 Hornet	USA	Fighter-attack, trainer	1985	73
ASTA Pilatus PC-9	Switzerland	Advanced trainer	1987	67
BAE/ASTA/HDHV Hawk Mk.127	UK	Lead-in fighter trainer	2000	21

CAC – Commonwealth Aircraft Corporation; DHA – de Havilland Aircraft (Australia); DAP – Department of Aircraft Production; GAF – Government Aircraft Factories (formerly DAP); ASTA – Aerospace Technologies Australia (formerly GAF, now Boeing Australia); BAE – BAE Systems (formerly British Aerospace); HDHV – Hawker de Havilland Victoria (formerly CAC, now a subsidiary of Boeing Australia)

* Indigenous designs

**Production figures include initial examples assembled from imported components



for the F/A-18E and F Super Hornet global fleet, as well as for the C-130J Hercules and various Boeing and Airbus airliners.

ASTA

In 1987 GAF was corporatised and renamed Aerospace Technologies of Australia (ASTA), before being bought by Rockwell (now Boeing Australia). The Australian Government’s long involvement with military aircraft production thus came to an end. ASTA’s first new production was the Pilatus PC-9, a turbo-prop powered advanced trainer from the same Swiss company which had provided the Porter for the Army during and after the Vietnam War. As was the case with the Mirage, CAC built the PC-9’s wings.

In 1997, Britain’s BAE Hawk lead-in fighter trainer was the next aircraft chosen for RAAF production. The majority, 21 examples, were assembled from imported and Hawker de Havilland Victoria manufactured components at RAAF Williamtown near Newcastle, NSW, while their jet engines were assembled by Qantas Defence Services.

BEYOND 2000

Since the Hawk, and until the recent MQ28-A Ghost Bat development, Australian aircraft industry had turned more to component and systems

manufacture and conversion work than entire aircraft design and development. At RAAF Base Amberley near Brisbane, four Boeing 737 airliners were converted to Wedgetail Airborne Early Warning & Control aircraft, while Qantas Defence Services at Brisbane converted four Airbus A330 airliners to RAAF KC-30A Multi-role Tanker Transport aircraft.

Some 17 Australian companies produce electronic and airframe components for the growing global F-35 Lightning II fleet. The Ghost Bat story is beyond the scope of this article and will be covered in a future feature.

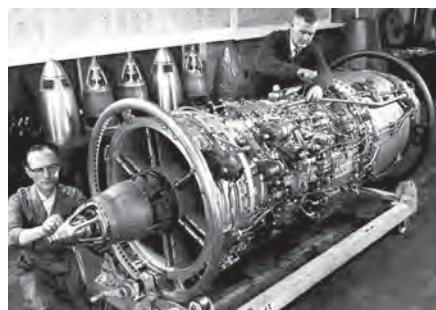
The timber and fabric workers who built the half-dozen Avro biplanes for the RAAF at Mascot, 100 years ago this year, would be proud of the industry they started. **W**



Scan the QR code to view a three-minute 1944 documentary about Australian Mosquito production.



Scan the QR code for a link to a 28-page historical working paper on the Australian aircraft industry by AVM Brian Weston.



TOP F/A-18 Classic Hornets on the GAF assembly line at Avalon, Vic.

MIDDLE SNECMA Atar engine at CAC, 1965. Photo: State Library of Victoria.

ABOVE CAC Macchi production in 1970. The Navy Macchis would be transferred to the RAAF in 1983. Photo: National Library of Australia.



A MODEL AIR FORCE



THE ACT SCALE MODELLERS SOCIETY CELEBRATED ITS 50TH ANNIVERSARY WITH DISPLAYS FEATURING RAAF AIRCRAFT.


TWO UNIQUE RAAF CENTENARY displays were staged in 2022 by the ACT Scale Modellers Society with assistance from the Air Force 100 team and History and Heritage – Air Force, as part of the society’s annual ScaleACT model competitions and exhibitions at Kaleen UC High School.

The main exhibition, staged last November, included one or more of every aircraft type to have served with an ‘A’ number in the RAAF since 1921 – some 400 models of more than 150 types. A smaller interim display the previous February showcased models of all RAAF current inventory aircraft, as well as a historical set of RAAF formation aerobatic team aircraft.

The November exhibition included theme displays of multiple examples of iconic aircraft types such as the Dakota, Meteor, Hercules, Macchi, Mirage and F-111, with background aircraft sounds providing atmosphere.

The society has a relatively large contingent of current and former RAAF personnel, and 20 members contributed models from far and wide, notably from Melbourne and Adelaide. Where possible they were built from plastic kits, but in cases where those were not available, diecast metal or resin pre-made models substituted.

Through the displays, many hundreds of visitors had a unique opportunity to view in miniature the entire past and present inventories of RAAF aircraft: from the wood-and-canvas biplanes of 1921 to the present-day F-35 Lightning II and UAVs.

The displays were held over from 2021 due to COVID, and fortuitously coincided with the society’s 50th anniversary year. 

Michael Nelmes

PHOTOS: John Purcell, Nick Hutchin & Michael Nelmes.



WORDS Michael Nemes



GETTING INTO THE
S W I N G

CONTINUING OUR SERIES ON THE TECHNOLOGICAL DEVELOPMENTS THAT PAVED THE WAY FOR AMERICA'S SPACE PROGRAM, WE LOOK AT FURTHER ADVANCES OF THE 1950S.

THE BELL X-5

Variable-sweep or 'swing-wing' technology first appeared in Britain as far back as 1931, on a Westland tailless swept-wing aircraft, though only conceived for adjusting longitudinal trim. The idea was later promoted in Britain by Sir Barnes Wallis after World War II as a solution to another problem: how a high-speed aircraft with swept-back wings could also develop sufficient lift at low speed for safe landing and take-off.

As is true of a number of innovations in aviation, a German World War II design pioneered the use of variable wing sweep angle on a high-speed aircraft: the Messerschmitt P.1101 jet fighter. Only one prototype was partially built, and its wing angle was only manually adjustable on the ground. Had it flown, one of three settings between 35 and 45 degrees would have been selected before each flight test, so the optimum angle could be found for best performance at a range of speeds. After the aircraft was captured in its factory just before war's end, it was sent to the Bell Aircraft Corporation in New York for study.

In 1947, using a modified scale model of its X-1, Bell tested the feasibility of variable-sweep wings in a wind tunnel. Tests proved promising and the company proposed that it produce 24 fighter interceptors for the US Air Force (USAF), based on the P.1101 but with in-flight variable sweep capability of between 20 and 60 degrees. Bell developed a complex mechanism to compensate for the change in position of the centres of gravity and pressure as the wing pivoted: the entire wing assembly moved fore and aft on rails inside the fuselage. Later swing-wing aircraft instead used the National Advisory Committee for Aeronautics (NACA) innovation of positioning their pivot points outside the fuselage.

Bell built two X-5s to prove the concept, and they were test-flown extensively from Edwards Air Force Base by the USAF and NACA during 1952-55. All the scheduled



flight tests were completed, generating a useful knowledge base around the effects of different wing sweep angles. Test pilots included notable names such as Joe Walker and Scott Crossfield, and Neil Armstrong who made its final flight.

Unfortunately, the aircraft proved difficult to fly. In particular, recovery from a spin was difficult and sometimes produced the disconcerting phenomenon of aileron reversal. In 1953, one of the X-5s, flying with maximum (60 degree) wing sweep, entered a spin from which it did not recover – with a fatal result for its Air Force test pilot, CAPT Ray Popson. With the spin problem unresolved, and the Air Force belief the aircraft was too small to carry the firepower and fuel required of an effective fighter, Bell's proposed fighter interceptors never materialised.

CONVAIR X-6

By far the largest and heaviest X-planes conceived would have been the two X-6s, converted from the giant Convair B-36H Peacemaker, had they been produced. The B-36, Strategic Air Command's intercontinental bomber, had first flown a year after WWII. In 1951 it was selected as a test platform for a new powerplant which would give bombers unlimited range and endurance.

The X-6 concept was to be part of the Aircraft Nuclear Propulsion program and General Electric was to design its nuclear-powered turbojet unit, designated P-1. Under Project MX-1589, the USAF was to co-sponsor the program with NACA and

BELL X-5 SPECIFICATIONS

LENGTH: 10.16m

WINGSPAN: 10.21m unswept;
6.32m at maximum sweep

WING AREA: 16.26sqm

GROSS WEIGHT: 4,480kg

MAX ALTITUDE: 42,000ft

RANGE: 1,200km

MAX SPEED: 1,160kph

FLIGHT PROGRAM: 1952-55 (133
flights by USAF and NACA)



Scan the QR code to view a short video of the Bell X-5 in flight.

the Atomic Energy Commission, which was to develop the airborne R1 nuclear reactor. To support the project, a nuclear complex was built at Convair's Fort Worth, Texas plant. First flight was projected to occur in 1957.

The water-moderated, air-cooled reactor was designed to replace the combustion sections of a bank of four General Electric J53 turbojet engines mated to the X-6. In their new nuclear-powered form, the engines, designated X40, would be mounted beneath the X-6's mid-fuselage. Their 'fuel' was a radioactive core containing 65kg of enriched uranium and 1.6 tonnes of aluminium, stainless steel and water.

The B-36's six piston engines and four J47 turbojets would be retained to provide a known source of power while the nuclear engines were evaluated. Take-off and landing would be achieved with the conventional engines, while the reactor remained shut down and the four J53 turbojets were run at idle on kerosene. After climb to altitude, the reactor would gradually be brought up to criticality at which point the X40s would take over.



The NB-36H, a shield-test aircraft for the planned X-6, featured a modified forward fuselage. Note radiation symbol on the tail. Photo: USAF.

While the X-6 did not eventuate, a top-secret Nuclear Test Aircraft (NTA) was produced. When the Carswell Air Force Base in Texas was hit by a tornado, many B-36s were destroyed or damaged. One of the damaged aircraft was converted into the NTA for testing radiation shielding for the crew. It was designated the NB-36H, or Convair Crusader. A 16-tonne, megawatt-power nuclear reactor, dubbed the Aircraft

Shield Test Reactor, was carried in the bomb bay. The fuselage was modified to accommodate a series of water-filled tanks as the primary radiation shield and the aircraft's forward fuselage featured a new nose section containing a 12-tonne lead-and-rubber lined crew capsule. A 100mm thick, 2m diameter lead disc at the forward fuselage rear bulkhead and a windshield of 150mm-thick glass shielded the crew from

the reactor's lethal radiation. The NB-36H made 47 radiation monitoring flights during 1955-57, the only known American use of an airborne nuclear reactor. In the 1960s, the Soviet Union had a similar program of its own, using a modified Tupolev Tu-95 (Bear) bomber.

The massive weight penalty imposed by the reactor, water and shielded crew capsule and the need to carry an operational effective payload raised the question of the feasibility of the nuclear power option.

USAF interest in the idea of nuclear-powered bombers was at its height in 1955 with the establishment of a weapon system development program (WS-125A) based at Wright-Patterson Air Force Base, Ohio. The goal of WS-125A was the creation of a fleet of supersonic, nuclear-powered bombers within a decade. Despite huge expenditure, interest wound down by 1958 and an airborne nuclear powerplant was never introduced into service. The competing conventionally powered jet bomber program (WS-110A), on the other hand, did produce results: a pair of prototypes of the remarkable but ill-fated North American XB-70 Valkyrie Mach 3 bomber.

Had operational nuclear-powered bombers been produced, they would likely have been converted not from the piston/jet hybrid B-36 but from its all-jet development, the YB-60. One of those was actually built and flown in 1952. Like the Boeing B-52 which won the contract for which Convair was vying, the YB-60 was powered by eight J57 engines and featured swept-back wings. **W**



RIGHT Lead-encased cockpit being installed in the NB-36H, 27 April 1955. It would also have been a requirement in the X-6. Photo: USAF.



BELOW The swept-wing, all-jet Convair YB-60 lands at Rogers Dry Lake in California's Mojave Desert in 1952. Photo: USAF.



THE DRACO MARS ROCKET

Although a nuclear-powered aircraft never eventuated in the halcyon days of aeronautical development in the post WWII years, the concept moved into space – although, of course, with rocket rather than jet propulsion. Nuclear thermal rocket engine tests were conducted in the late 1960s under NASA's Nuclear Engine for Rocket Vehicle Application and Rover projects.

NASA and the US Defense Advanced Research Projects Agency (DARPA) are now collaborating to demonstrate a viable nuclear reaction engine. The program, dubbed Demonstration Rocket for Agile Cislunar Operations (DRACO), is an enabling capability for future NASA crewed missions to Mars.

The plan is to develop and demonstrate the technology as soon as 2027, in preparation for crewed missions to Mars. The rocket would reduce travel time and, therefore, supply requirements as well as risk to astronauts. Faster and more efficient transportation technology will

help NASA meet its 'Moon to Mars' objectives to transport material to the Moon and, eventually, people to Mars. Other benefits include increased science payload and higher power for instrumentation and communication.

In a nuclear thermal rocket engine, a fission reactor is used to generate extremely high temperatures. The engine transfers the heat to a liquid propellant, which expands to a gaseous state and is exhausted through a nozzle to propel the spacecraft. The rocket can be three or more times more efficient than conventional chemical propulsion.

NASA's Space Technology Mission Directorate will lead technical development of the engine to be integrated with DARPA's experimental spacecraft. DARPA will lead the overall program.

Collaboration between the two agencies dates back to the Saturn V rocket that took humans to the Moon in 1969. More recently it has focused on robotic servicing and refuelling of satellites. Knowledge and experience from many previous space nuclear power and propulsion projects will be leveraged, and recent advances in aerospace materials and engineering will be utilised.

NASA, the Department of Energy (DOE), and industry are also developing advanced space nuclear technologies for multiple initiatives to harness power for space exploration. Through NASA's Fission Surface Power project, DOE has awarded three commercial design efforts to develop nuclear power concepts that could be used on the surface of the Moon and, later, Mars. Beyond DRACO, another commercial design effort will advance higher temperature fission fuels and reactor designs for a nuclear thermal propulsion engine, supporting a longer-range goal for increased engine performance.

Source: NASA



An artist's concept of DRACO.

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- CAC CA-27 Sabre (A94-901)
- P2V-7 Neptune (A89-273)
- Douglas C-47 (A65-94, A65-95, A65-90 - now N2-90)
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Image: © Hars Aviation Museum



Image: © Hars Aviation Museum



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CARIBOU

THE SEARCH FOR

VM-JML

ON 28 AUGUST 1972, A RAAF CARIBOU CARRYING 25 PNG ARMY CADETS WAS REPORTED MISSING ENROUTE FROM LAE TO PORT MORESBY, INSTIGATING A SEARCH AND RESCUE MISSION. **GRAHAM CHRISTIAN**, CAPTAIN OF RESCUE IROQUOIS A2-490, RECOUNTS THE EVENTS.

IN EARLY AUGUST 1972, a detachment of Bell Iroquois UH-1H helicopters from No.5 Squadron RAAF Base Fairbairn ACT was deployed to Goroka in the Papua New Guinea (PNG) Highlands to support a mapping survey by the Army.

At the beginning of the detachment, two aircraft deployed to Lake Kopyago to recover two damaged 9 Squadron Iroquois to Wewak and then returned to Goroka to rejoin the survey support operation.

On the afternoon of 28 August, RAAF Caribou VM-JML (A4-233) carrying 25 PNG Army cadets was reported missing enroute from Lae to Port Moresby. Search and rescue (SAR) response was activated and under the command of FLGOFF Tony Lea a detachment of two Iroquois (A2-487 and A2-490) from the Goroka base, along with air and ground crew, was assigned SAR duties, to base out of Lae.

Departing Goroka for Lae at first light on 29 August, the detachment commenced operations in their assigned search areas between Lae and Wau.

There were operational reasons the Iroquois were based at Lae – partly logistics and partly geographic. Wau was the last known position of the Caribou before it was listed missing and, due to the changeable weather and low cloud base, it was not known whether the aircraft had continued past Wau (toward Port Moresby) or turned back toward Lae. Because of the large fuel consumption of two Iroquois operating from dawn until dusk, Lae (about a 20 minute flight from Wau) was the logical base and was directed as such by RAAF Headquarters Port Moresby.

Search Headquarters advised that the Australian Army would base a Sioux (small three-seat observation helicopter) and



small fixed-wing aircraft at Wau to join the search, as they could use the available Avgas fuel supply (for piston engine aircraft). Iroquois have a jet engine and require Avtur (jet fuel), supplies of which were not sufficiently available at Wau. However, as time progressed some Avtur supplies (in 44 gallon drums) were flown into Wau by Caribou to allow the Iroquois to refuel and extend the search operation.

Several other aircraft were involved in the search, including Caribou (from a permanent detachment based in Port Moresby), a C-130 Hercules transport and a long-range P-3 Orion maritime surveillance aircraft. The Orion searched throughout the first night hoping to pick up radio signals from the missing Caribou, or from survivors. It was a huge team effort with a wide geographic area to be searched, as allocated and coordinated by Headquarters. (As an aside, there



Recovering a damaged
9 Squadron Iroquois from
Lake Kopiago, PNG.

CREW OF CARIBOU VM-JML (A4-233)

CAPTAIN:

FLTLT Graham Thomas

CO-PILOT:

PLTOFF Gregory Ebsary

LOADMASTER:

CPL Gary Power

ARMY LIAISON OFFICER:

Captain Robert Loftus.

The crew, along with 20 cadets,
perished in the crash.

THE SURVIVORS:

Patrick Tau Gau, Joseph Fragi,
Nicholas Fabila, Anthony Kolou
and Chris Maraga.

Having survived the crash, Nicholas
Fabila died the day following the rescue.

Fifty years after the accident, The
Reverend (retired) Patrick Tau Gau and
Joseph Fragi, a retired lawyer, are living
in PNG. Chris Maraga became a major
in the PNG Army and died in 2010.
Anthony Kolu died in 2018.



BELOW The search area, circled on map.

has been some misrepresentations by individuals about the deployment of various search elements, but that is likely due to those personnel being unaware of how search resources are efficiently managed and coordinated.)

During the search phase, the two Iroquois would depart Lae at dawn, search an allocated area prior to arriving at Wau to refuel, and return to Lae at dusk. Most of the Iroquois aircrew had extensive helicopter flying experience, including recent intensive operational flying in the Vietnam War. The flying conducted, during the rescue in particular, was largely successful due to the experience of those crew and their ability to work as a team in what were very demanding conditions. I will list, at the end of this narrative, all the RAAF Iroquois crew (I can recall) who participated in the search and the rescue.



HISTORY. CARIBOU SEARCH

As the search operation progressed, both Iroquois conducted methodical searches between Lae and Wau along all possible tracks the Caribou may have flown. We had local Kiaps on board and visited all settlements in the region to ask villagers if they had seen or heard a Caribou fly over. That gradually progressed as we built a picture of where the Caribou had flown (and where it had not) until it was determined it had not turned back toward Lae but apparently continued on beyond Wau toward Port Moresby, passing through the Kudjeru Gap in the high ranges.

It was later confirmed that was where the Caribou had flown, but encountering descending clouds and poor visibility the pilot attempted to turn back toward Lae but was unable to turn tightly enough in the confined valley, nor outclimb the rising terrain, and impacted the steep-sided valley walls.

On the afternoon of 31 August 1972, an Army Sioux helicopter piloted by Terry Hayes reported sighting some cadets walking along a ravine (the Kopera River). An Army Pilatus Porter, piloted by Ian Sinnott, replaced Hayes as he departed the area for fuel. Tony Lea (captain of A2-487) refuelled at Wau and proceeded to the area with guidance to the exact location provided by Ian, who then departed for Wau.

I was captain of A2-490 and after refuelling at Wau and having a maintenance problem rectified, proceeded to the rescue area shortly after Tony.

The trees in the rescue area were up to 100m high and with a winch cable length of about 80m maximum, required the rescue helicopters to descend between the treetops and below the overhanging canopy to enable the winch cable to reach the ground. Tony lowered his crewman Ken Tanswell and a local Kiap by winch to assist the recovery of survivors in the ravine. Late in the afternoon, failing light, increasing rain and unfavourable wind made the rescue a very demanding operation. Those conditions, combined with a high-density altitude, saw the Iroquois operating at its maximum performance limits which, without a very experienced crew working as a team, could have had dire consequences.

Tony winched out three survivors initially, then following guidance provided by one of the survivors (Patrick Tau Gau) retraced their path to the site of the crashed Caribou, some distance away. Tony lowered his observer (Stan Flack) by winch



who, equipped with a radio, searched the site for survivors.

After Tony had moved from the ravine rescue to the crash site, I moved 490 in and winched a fourth survivor and Ken Tanswell from the ravine, then flew to the crash site.

Tony, after lowering Stan Flack to the crash site and now low on fuel, departed in 487 to take the three survivors to Bulolo and refuel. I replaced Tony at the crash site. With my crewman Ray Morrison operating the winch, we descended below the jungle canopy settling into a hover with the nose of the aircraft sitting in the upper branches and only 2-3m of clearance in place around the main and tail rotors. With only a few turns left on the winch drum, we managed



TOP A2-487 at village near Garaina, seeking witness reports; had a Caribou flown over?



ABOVE A2-490 at the newly cleared helipad, near the Caribou crash site, 2 September 1972.



FAR RIGHT A2-490 at Bulolo Golf Course on the morning after the rescue.

to get Ken Tanswell, with a two-way radio and the Stokes litter (stretcher) to the crash site. Ken and Stan located the last survivor and checked the wreckage and surrounding areas confirming there were no other survivors. Weather conditions and the light continued to deteriorate, with the jungle cover so thick that at no time was I able to see the crashed Caribou. We eventually winched out the last survivor in the Stokes Litter, leaving Stan and Ken on the ground to be recovered by Tony Lea's crew in 487, which had just arrived back on site, after flying his survivors to Bulolo and refuelling at Wau.

Stan Flack described his experience being winched down to the crash site: "Dropping into a hole in the jungle when it was raining, dark and windy, not having a clue of what lay ahead... on the ground under the aircraft was dangerous as the down wash was breaking limbs off the trees. That combined with the lack of light, steep slope and very wet layer on the ground made it interesting. For my first time winch it was a very fast wake-up call."

As we departed the crash site with the last two survivors on board, it was almost dark and we needed the searchlight to help define the treetops as we flew toward Wau, some 15 minutes flight away – with the 20-minute fuel warning light already illuminated. Considering the severity of injuries to the last survivor, we requested approval to refuel at Wau and fly on to Lae "special night VFR" where there were better medical facilities than in Bulolo. The request was quite correctly denied by HQ as too risky, considering the hazardous terrain and prevailing bad weather between Wau and Lae.

We landed at Wau airstrip after dark and carried out a running refuel from 44-gallon drums of Avtur (engine and rotors turning while refueling). We then flew to Bulolo, having arranged for a group of cars to shine their headlights onto the golf course near the hospital, so we could land and get the survivors there as quickly as possible. Our crew stayed overnight in the Bulolo hospital and next morning returned to Wau for fuel. Tony Lea and his crew on A2-487 returned after dark to stay in Wau for the night. Unfortunately, the last cadet rescued in the Stokes litter died the next day.

On the day following the rescue, 1 September, both Iroquois ferried Army engineers from Wau to the crash site and winched them down so they could prepare a helipad nearby and begin the recovery

of those deceased, and later, to fly in RAAF crash investigators to determine the factors leading to the crash. Over the next few days, both Iroquois and crews continued to recover the deceased to Wau.

On 4 September, both Iroquois relocated to Port Moresby where, on 5 September, they flew the deceased to their various villages for interment.

As stated earlier, there were many people and aircraft involved in the search for Caribou VM-JML. All who participated worked diligently to determine the Caribou's flight path after its last reported position before communication was lost, and to then coordinate a search in a large area of uncertainty.

Considering the steep terrain and heavy jungle cover at the crash-site it was incredible that survivors were located and then rescued. **W**

POSTSCRIPT: The author provided this story, in consultation with the SAR crews involved, in response to a request from the families of the survivors to commemorate the 50th anniversary of the loss of Caribou VM-JML and its crew and passengers. Unfortunately, the article was not loaded into the compilation for the Summer 2022 edition of Wings and missed publication. To the crews involved in the SAR, the survivors and the family and friends of those who perished, I unreservedly apologise for that omission.

Ron Haack, managing editor

THE RESCUE OPERATION CREW

IROQUOIS ONE:
A2-487 (three survivors rescued)

CAPTAIN:
FLGOFF Tony Lea,

CO-PILOT:
PLTOFF Michael O'Loghlen

CREWMAN:
LAC Neville Pratt

OBSERVER:
FSGT Stan Flack

IROQUOIS TWO:
A2-490 (two survivors rescued)

CAPTAIN:
FLGOFF Graham Christian

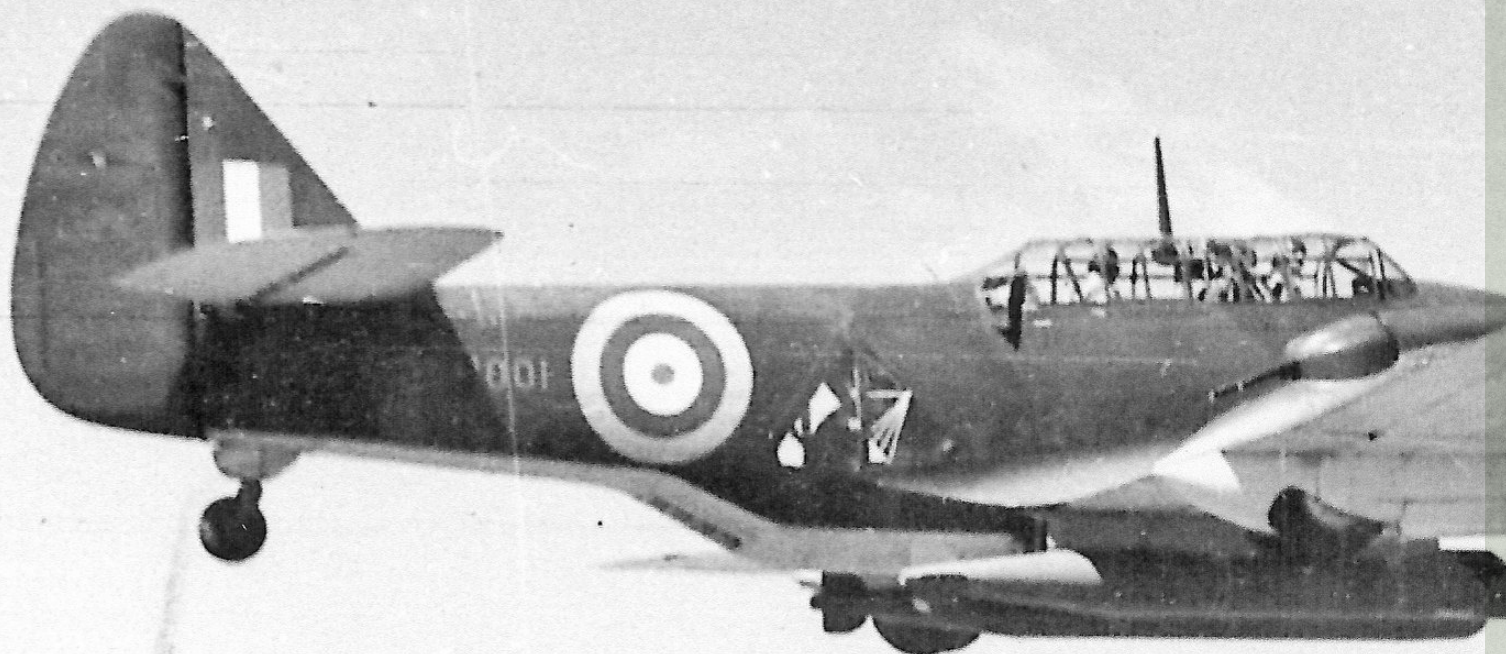
CO-PILOT:
FLGOFF Ron Bishop

CREWMEN:
LAC Raymond Morrison,
LAC Ken Tanswell

OBSERVER:
FLGOFF Chris Young

SUPPORT GROUND ENGINEERS:
FSGT Stan Flack, CPL Rob Gee, LAC Gordon Watt, plus three others





T O R P E D O TRAINING

HMAS ALBATROSS, NSW IS WELL KNOWN AS A NAVAL AIR STATION, BUT IT BEGAN AS A RAAF STATION EARLY IN WORLD WAR II.

IN 1938, in the wake of Sir Edward Ellington's critical report on the state of Australia's defence readiness, Minister for Defence G.A. Street announced an expansion program which included construction of coastal airfields at Nowra and Moruya Heads, NSW. A survey was conducted and RAAF Station Nowra, located for its proximity to the naval station at Jervis Bay, was duly constructed and ready by July 1941. However, it was not occupied by the RAAF for almost a year because, just before the Pearl Harbor attack of 7 December 1941, it was decided to upgrade base facilities to handle air-dropped torpedoes.

The RAAF's use of torpedoes in the Pacific theatre was not particularly successful. In 19 torpedo attacks over 15 months before the last on 4 December 1943, RAAF Beaufort bombers produced mostly inconclusive results. But it is

understandable that the RAAF should pursue a torpedo capability, given the successes by both sides in the war's early years. The Royal Navy's Fleet Air Arm attack on Taranto Harbour in Italy, and the Japanese attacks on Pearl Harbor and on HMS *Prince of Wales* and HMS *Repulse*, were evidence of the torpedo's potential. Such successes were no doubt in the minds of RAAF planners when they chose to dedicate RAAF Station Nowra to the training and use of the torpedo.

BASE TORPEDO UNIT

Base Torpedo Unit (BTU) was formed at Nowra in September 1942 by amalgamating Torpedo Range Section and Torpedo Workshops, which had been functioning there since May. BTU provided torpedo technical and logistic support and training – at least until mid-1943 with the arrival of No.6 Operational Training Unit



(60TU). A US Navy (USN) detachment was also involved in BTU torpedo training and maintenance, evidently because the Mk XIII torpedoes used were USN stores.

Initial trials conducted from a satellite airstrip created at Jervis Bay exposed the poor reliability of the complex weapon, despite it being the standard torpedo in the USN inventory. Another problem was that the Mk XIII was 25 percent wider than the British Mk XII torpedo for which the Beaufort's torpedo bay had been designed; special and unique suspension equipment had to be installed. Catalinas, on the other hand, carried torpedoes under their wings and could accommodate the Mk XIII. Both dummy (concrete) and live torpedoes were handled by BTU; the former had to be recovered from underwater following training exercises.

The RAAF's use of torpedoes declined during the war, as their limited effectiveness (gauged, in part, by the trials at Jervis Bay) was not considered to be worth the cost and necessary resources. From late 1943, Mobile Torpedo Sections that had been deployed to operational areas (primarily supporting Beaufort and Catalina units in northern Australia and New Guinea) returned to Nowra.

BTU was involved in the development of an Australian-built torpedo, but the weapon did not see action. A third aircraft type which might have carried Mk XIII or Australian torpedoes, had it not been cancelled after only two prototypes were built, was the CAC Woomera torpedo/dive bomber.



ABOVE CAC Woomera with torpedos.



BELOW Base Torpedo Unit.



A PIECE OF RAAF HISTORY

RAAF Station Nowra was formed during the darkest stage of WWII. Invasion appeared imminent and our defences were unprepared, with many assets and personnel deployed overseas.

The airfield was originally intended for dual RAAF/civil use, but wartime activity put an end to the latter. The RAAF in fact chose Jervis Bay as the preferred site for an airfield, but politics intervened. RAAF Station Nowra became one of the largest air bases in Australia, and the only one to conduct air-launched torpedo training and trials.

Station personnel peaked in 1943 at 1,500, including 100 Women's Auxiliary Australian Air Force technicians. Aircraft establishment stood at 36, including 23 Beauforts which were each flying up to 600 training hours a month. Supporting the base torpedo operations were dozens of trucks and fuel tankers, as well as three recovery boats. A multinational base, Nowra involved not only the RAAF and RAN but also the US Army Air Corps and Navy, the Royal Navy and Netherlands East Indies Air Force.

BTU and No.6 OTU constantly trialled different release heights and speeds in an unsuccessful attempt to overcome the deficiencies of the Mk XIII torpedo. Striving to improve the operational performance of the system, Nowra personnel visited the Beaufort squadrons fighting on the front line. In the Australian military tradition, they fought with what they had.

All the while, enemy submarines were active off the NSW coast. Nineteen merchant ships were sunk and 10 more damaged, with 214 lives lost. RAAF Station Nowra was the primary staging point for anti-submarine patrols. In mid-1944, the patrol role, begun earlier by RAAF Anson's and Dutch B-25s, was taken over by Kingfisher floatplanes of No.107 Squadron RAAF operating from St George's Basin.

Cris George



Two Torpedo Maintenance Units were briefly based at Nowra: No.1 relocated from Breddan, Queensland for a month in 1944 before disbanding; and No.2 which formed at Nowra but moved to the Northern Territory after just two months. Their tasks were to provision, maintain and store torpedoes, and also to administer mobile torpedo sections.

22ND BOMBARDMENT GROUP

In June 1942, the Townsville-based US Army Air Force (USAAF) 22nd Bombardment Group (BG), flying B-26 Marauder medium bombers, sent a detachment from its 19th Reconnaissance Squadron to Nowra for torpedo training. The B-26 Marauder Historical Society records that USAAF Captain Allen, conducting torpedo trials on Perth's Swan River with a B-26, ...wired Melbourne that he was returning to begin instructing torpedo operations at the Anti-Submarine Warfare School established at Nowra. His arrival there was a surprise, as no such school existed, and it was his job to establish it.

Four B-26s arrived at Nowra for a three-week torpedo course, after which another eight participated in a second course. The deployment had been scheduled for 1 June, but a B-26 had crashed at Nowra

JOHN RAEURN BALMER OBE DFC RAAF

On 18 March 1942, Wing Commander John Raeburn 'Sam' Balmer assumed command of No.100 Squadron, which was equipped with Australian-built Beauforts and the first RAAF squadron to be armed with the USN Mark XIII torpedo.

Balmer's exploits in the South-West Pacific established him as a leader. He was appointed OBE in June. On the night of 25-26 June, he took charge of a strike against a Japanese steamer in New Guinea's Huon Gulf. The assault was carried out at low altitude and pressed with great determination, but a later analysis failed to confirm the vessel's sinking. In October, he led the squadron's torpedo bombers from Milne Bay, Papua on an ambitious 950-nautical-mile (1759km) flight to attack enemy ships sheltering off the Shortland Islands, near Bougainville.

He arrived in England in June 1943 and became commanding officer of No.467 Squadron, RAAF on 18 August. It was a bad time for the squadron; seven of its 21 Lancasters were lost that month. Balmer flew his first operation on the night of 27-28 August in a raid against Nuremberg which cost Bomber Command 4.9 percent of the attacking force. He led his unit against Hanover on 22-23 September and 18-19 October, and against Berlin on 18-19 November and 15-16 February 1944. His next German target was Frankfurt on 18-19 March. Thereafter, the RAF concentrated on pre-invasion objectives in occupied France; Balmer took part in four such strikes in March-April. He was awarded the Distinguished Flying Cross in April for his skill, efficiency and devotion to duty; his promotion to temporary group captain was gazetted on 4 May.

Balmer was known as a sardonic man who was intolerant of fools and of over-conservative authority; his subordinates regarded him as a 'dynamic' commanding officer. On the night of 11-12 May 1944, he attacked a military camp at Bourg-Léopold (Leopoldsburg), Belgium. His aircraft did not return.

Article by John McCarthy, Australian Dictionary of Biography, Volume 13, 1993.

that day, apparently due to the state of the runway. Interestingly, on 4 June a pair of Hawaii-based B-26s from the 22nd BG had taken part in an unsuccessful torpedo attack on the Japanese fleet at the start of the pivotal Battle of Midway.

By 15 July 1942, six planes and seven crews from the 22nd BG arrived for training as torpedo bombers and the unit was named the 1st Torpedo Squadron. Pilots were less than enthused about using the B-26 as torpedo-bombers. They felt the 2,000-pound torpedo slung underneath with only a few inches of ground clearance and operating from typically rough airfields was asking for trouble. In addition, they were eager to re-join their comrades in combat bombing operations.

The crews were not all bored though. The local Nowra newspaper reported:

Yesterday morning when the 'birds' came home to roost, they skimmed the tops of houses in the town, much to the alarm of residents. Among the complaints received at this office, mostly from womenfolk, are that choice lemons were blown off trees in a garden; another, that the force of the slipstream blew paint off a roof, while a lady, suffering from lumbago, was seen disappearing down an air-raid shelter headfirst.

NO. 100 SQUADRON

Courses in torpedo attack techniques for Beaufort bomber crews began with crews from No.100 Squadron, commanded by WGCDR John Balmer. The torpedo bomber force focused on night employment of the weapon. A Beaufort equipped with air-to-surface-vessel radar

THE GLADIATOR'S SALUTE

The first CO of RAAF Nowra was (then) Wing Commander John M. Lerew RAAF. As Commander of the RAAF detachment at Rabaul on 21 January 1942, equipped with one Hudson and five Wirraway (only two were fitted with bomb racks), he had been ordered to attack the invading Japanese force of 45 ships and more than 200 aircraft. WGCMR Lerew is reported to have had some understandable trepidation about this tasking and originated the now famous signal to Air HQ: "We who are about to die salute you". He is recorded to have expressed the 'Gladiator's Salute' in the original Latin. The response from HQ is not known.

Cris George



ABOVE Torpedo preparation in the open.



OPPOSITE PAGE Technicians and their tools in the BTU workshop.



ABOVE LEFT RAF B-26 Marauder and British Mk XII torpedo ground clearance.

LEFT Moving torpedoes from storage to the workshop

would locate the target and illuminate it with flares, enabling armed aircraft to carry out an attack. Torpedo attack was an exacting art, involving the dangers of low-level flying over water in formation – initially down to 50 feet and at very slow airspeed. A torpedo attack was one of the most dangerous combat missions, particularly in the face of the target's anti-aircraft defences.

NO.7 SQUADRON

In August 1942, No.7 Squadron RAAF began moving from Bairnsdale, Victoria to Nowra under the command of WGDCR John Lerew, famous for his role in the defence of Rabaul, New Britain earlier in the year. The purpose of the move was conversion from Hudson bombers to Beauforts, with torpedo training an element of the conversion course. Mock attacks were made on HMAS *Broome* and HMAS *Tamworth*, and on a rescue launch. Some attacks were made in co-operation with B-25 bombers of the Canberra-based No.18 (Netherlands East Indies) Squadron, which was also supported by Nowra's torpedo facilities. After a month, 7SQN moved north to Townsville for operations against submarines and shipping but executed those missions with ballistic bombs rather than torpedoes.

NO.73 SQUADRON

On 2 September 1942, the first Avro Anson bombers of No.73 Squadron arrived at Nowra from Cootamundra, NSW to conduct submarine patrols. The threat to Australia's eastern coastal shipping was very real. Not only had Sydney Harbour been attacked by Japanese submarines in May, but during the first half of 1943 eleven ships of various nationalities were sunk and another half dozen damaged. Even a German U-boat was posing a threat along the eastern seaboard.

Some of 73SQN's search flights were in response to sightings of enemy submarines, or actual attacks. On 11 April 1943, FLGOFF Jim Swan and crew watched as a merchant ship disintegrated from a torpedo attack.

NO.6 OTU

No.6 Operational Training Unit (OTU) formed in June 1943 at Nowra to continue training Beaufort bomber crews in torpedo attack techniques, and to co-operate with

FORGOTTEN BASE

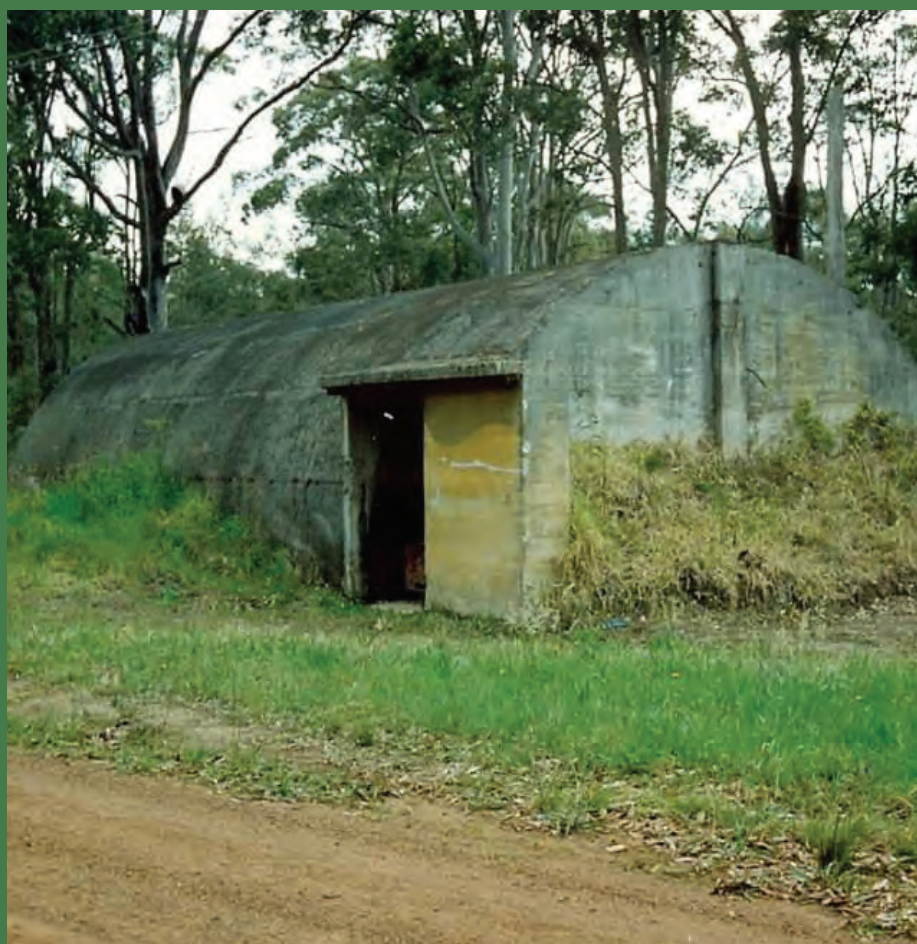
Today nine bunkers and other buildings, including the generator house and torpedo workshop, remain on the northern side of BTU Road. They stand as relics of a desperate time in our history, but are unacknowledged and closed to public access.

The many torpedo storage and workshop facilities were widely dispersed, in order to minimise damage in case of an explosion. They take up much of the present-day length of BTU Road between the Princess Highway and Nowra Hill.

Three or four bunkers, presumably for storage of live torpedo warheads, remain on private land on the south side of the road. Other structural relics include: a wireless telegraphy and direction finding station on the corner of Cabbage Tree Lane and Albatross Road; a weapon pit west of HMAS *Albatross* airfield; and a bunker south of the threshold of runway 08.

Recently, Shoalhaven City Council's Local Environmental Plan listed the torpedo workshop and a bunker as heritage sites. Although no monument to RAAF Station Nowra exists, a memorial to RAAF, RAN and RN service personnel killed in training at Jervis Bay has been established behind Jervis Bay Maritime Museum. RAAF accidents claimed over 30 lives, primarily Beaufort crewmen with No.6 OTU.

Cris George



ABOVE A surviving RAAF torpedo storage bunker south side of BTU Road.



BTU in trials. It aimed to train 18 aircrews per month, plus ground crews: 20 Fitter IIE(T) torpedo ground specialists every six weeks, as well as Aircraft General Hands (Torpedo) every three weeks. The Chief Ground Instructor and many other personnel were from the US Navy. Peak personnel strength was 570 officers and men. By the time the unit disbanded in April 1944, 120 Beaufort crews and 300 technicians had been trained.

ACCIDENTS

A number of aircraft crashed in the Nowra area during the war. Three accidents came in just two days, 9-10 March 1942, involving P-40 Warhawks of the 49th Fighter Group USAAF: two forced landings in fields, the third an accident just after take-off in which an 18-year-old girl and her horse were killed. Then in October, a RAAF Beaufort lost a propeller and crashed on landing. Jervis Bay also saw a number of crashes including eight RAAF Beauforts which came down in or near the bay.

The most infamous crash, due to it being caught on film by war correspondents, was a mid-air collision of two Beauforts on 19 April 1943. At completion of practice torpedo attacks on HMAS *Burra Bra*, they made a low, fast pass and climbed to start a 'Prince of Wales Feathers' formation routine (a

climbing 'bomb burst'). A wing of one Beaufort severed the tail of another and both aircraft plunged into the bay with eight fatalities.

WAR'S END

As torpedoes were no longer a RAAF weapon, control of RAAF Station Nowra was transferred to the Royal Navy's British Pacific Fleet on 15 September 1944, and it briefly became HMS *Nabbington*. BTU continued torpedo support, now for the carrier-based RN Fleet Air Arm Avenger torpedo bombers. On 31 August 1948, HMS *Nabbington* became HMAS *Albatross*, and home to the newly formed RAN Fleet Air Arm.

But the RAAF was not yet done with Nowra. In 1952, the RAAF element of the Australian Joint Anti-submarine School formed there, with Lincoln and Neptune aircraft training in submarine surveillance. In 1986, the school was renamed Australian Joint Maritime Warfare Centre. **W**

Michael Nelmes, compiled from material supplied by CAPT (Rtd) Cris George and RAAF Historical records.



Scan the QR code for brief footage of the tragic collision over Jervis Bay of the two Beaufort bombers.



TOP BTU technicians posing for a group photo during a smoko break.

ABOVE Mk XIII torpedos on the BTU assembly line.



WINGS OVER WATER

THE FLEET AIR ARM MUSEUM CAPTURES THE ROYAL AUSTRALIAN NAVY AVIATION STORY WITH A UNIQUE COLLECTION OF AIRCRAFT, ARTEFACTS AND MEMORABILIA.

WORDS

Stuart Harwood
(Manager & Senior Curator)

OPERATING AIRCRAFT TO SHIPS on an unforgiving ocean is, by its nature, far more hazardous than landing at an aerodrome. Since 1948, the Royal Australian Navy (RAN) Fleet Air Arm (FAA) has provided air combat power to Navy at sea.

The Fleet Air Arm Museum adjacent HMAS *Albatross*, Nowra, NSW, is dedicated to all those who, through duty and sacrifice, served their nation as members of the RAN FAA. The museum seeks to tell their story through sharing our unique collection of aircraft, artefacts and memorabilia.

HUMBLE BEGINNINGS

Take a look at an overhead photo of any military airbase in the world. You almost always see the odd derelict aircraft behind a hangar, in an out of the way spot under a tree, in a compound or on the fire training ground. They may be the remains of an accident, a hangar queen robbed of all useful parts or simply an obsolete warbird: the detritus of progress, forgotten and left to rot.

Such was the case in the early 1970s at the RAN's sole airbase, HMAS *Albatross* on the south coast of NSW. At that time a group of enthusiastic Navy Aviation personnel started gathering the airframes and other aviation relics from around *Albatross*, lest they be lost to time and the elements. In 1974, the group received much needed support when the Commanding Officer initiated a project to establish the Australian Naval Aviation Museum. And so, from humble beginnings with a small collection of Navy aviation relics, five obsolete RAN aircraft and a team of enthusiastic volunteers, what was to become the RAN Fleet Air Arm Museum was born.

Fittingly housed in an obsolete World War II prefabricated hangar, the museum was officially opened on 2 December 1974 by the 'father' of the FAA, Admiral Sir Victor Smith KBE, CB, DSC, RAN. Opened to the public a few months later, the museum's collection grew rapidly as FAA veterans dusted off and donated relics of their service.

TRACKER FIRE

In December 1976, the FAA suffered a significant blow when the majority of the Grumman S2 Tracker fleet was lost in a hanger fire at HMAS *Albatross*. Replacement aircraft were purchased, and, in 1978, the museum collection was moved from D Hanger, which was required for the replacement operational aircraft, and to another WWII-era building. However, the aircraft remained in the open, exposed to the elements. Following the Tracker fire, increased security closed the base to the public and, in late 1981, the museum was moved to its current location on the 'Dummy Deck', a vast slab of concrete on the edge of the base, laid down in 1949 for practise in aircraft carrier flight deck procedures.

The Navy team worked tirelessly through the 1980s to raise funds for the construction of a large hangar, function centre and retail shop. Over \$8 million was raised through corporate and private donations and material from building companies was donated. On 6 June 1990, the Australian Naval Aviation Museum Foundation was formed to operate the museum and fulfil an ambitious charter to tell the story of Australian naval aviation.

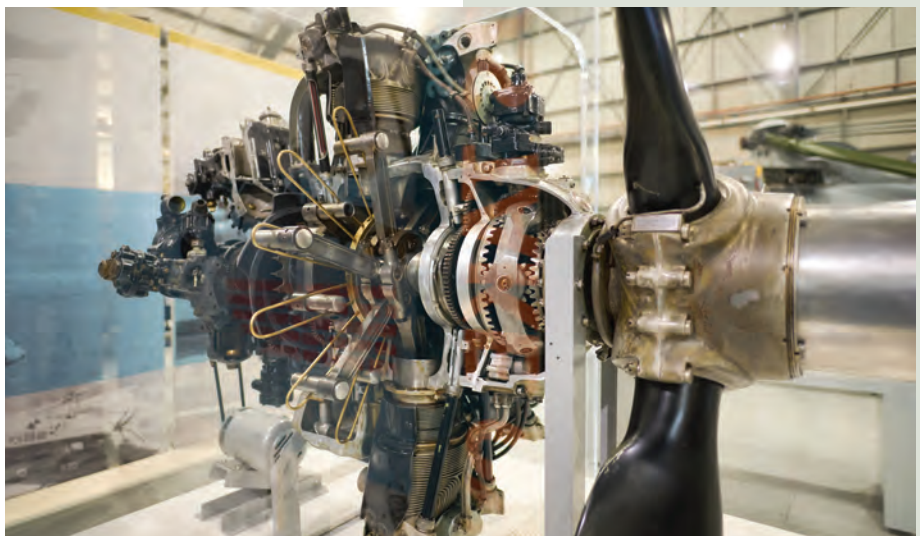
EXPANDED CHARTER

In 2000, the foundation broadened the museum's charter, which now covered all aspects of aviation history in Australia. The institution was renamed Australia's Museum of Flight. While the expanded collection encompassed all aspects of Australian aviation, an abiding interest in collecting, preserving, interpreting and commemorating Australia's proud naval aviation heritage was maintained.

On 1 September 2006, stewardship of the collection returned to the Navy and the establishment was renamed the Fleet Air Arm Museum, and its charter returned to the preservation and sharing of FAA heritage.

AUSTRALIAN NAVAL AVIATION: A BRIEF HISTORY

The RAN has operated aircraft at sea since WWI, when three Australian cruisers served with the Royal Navy in the North Sea. By 1918, each carried a Sopwith fighter of the Royal Naval Air Service. Launched from a wooden platform constructed over a main gun



turret, the aircraft had to land ashore or 'ditch' near a friendly ship at the completion of its mission.

In 1929, Navy commissioned the seaplane carrier HMAS *Albatross* (II); designed to carry nine RAAF Supermarine Walrus aircraft. Those aircraft had RAAF pilots and maintainers, and Navy observers and telegraphist/air gunners.

During WWII, the RAN cruisers *Australia* (II), *Canberra* (II), *Sydney* (II), *Perth* (II) and *Hobart* (II) were all equipped with catapults and RAAF Seagull V amphibians. The two Armed Merchant Cruisers *Manoora* (II) and *Westralia* (II) also carried Seagull Vs.

THE FLEET AIR ARM

The success and growth of naval aviation during WWII revealed a need for a RAN Fleet Air Arm, the formation of which



TOP The C-47 transport suspended over the two 'Huey' UH-1 helicopters.

ABOVE Cutaway Twin Wasp air-cooled radial aero engine.



OPPOSITE PAGE Museum front façade, adorned with crest and motto 'Guard the past'.



TOP Sea Venom with Sycamore helicopter, Sea Fury and Firefly fighters in the background.

ABOVE The Wessex has all its hatches open.



LEFT UH-1B Iroquois representing RAN Helicopter Flight Vietnam, which was integrated with a US Army assault helicopter company – hence the honour roll naming both US Army and RAN personnel killed in the Vietnam War.

was approved in July 1947 by the Commonwealth Defence Council. The acquisition of two light fleet carriers from the UK, along with the establishment of two naval air stations and three air groups, was approved by cabinet in August of that year.

HMAS *Sydney* (III) arrived in Australian waters in May 1949, with the 20th Carrier Air Group embarked. In less than 18 months, *Sydney* and her Air Group, operating Fairey Fireflies and Hawker Sea Furies, deployed as part of the United Nations Forces opposing the invasion of South Korea. *Sydney* deployed a second time in 1953 to monitor the Korean armistice.

Sydney's sister carrier HMAS *Melbourne* (II) was commissioned in 1955. Modified with an angled flight deck, steam catapult and mirror-assisted landing system, *Melbourne* heralded the introduction to the FAA of pure-jet and turboprop aircraft in the form of the de Havilland Sea Venom FAW Mk.53 all-weather fighter and Fairey Gannet AS.1/4 anti-submarine aircraft, respectively.

In 1964, acquisition of the Westland Wessex 31A anti-submarine helicopter provided a significant boost to *Melbourne's* ability to provide defence in depth against submarine threats.

Technological developments during the 1950s and 1960s saw aircraft and systems become obsolete almost overnight. In 1969, the Douglas A-4G Skyhawk fighter-bomber and Grumman S-2E Tracker anti-submarine aircraft replaced the Sea Venom and Gannet, and by 1976 the upgraded Wessex 31B was replaced by the Westland Sea King Mk.50. The A-4's payload capability and the S-2's wingspan made these the largest aircraft that could operate from *Melbourne*.

The federal government decision not to replace *Melbourne* when she decommissioned in 1982 meant the end of naval fixed-wing aviation at sea. While the FAA continued to operate fixed-wing aircraft in training roles from ashore until 2000, its combat capability comprised helicopters operating from frigates and support ships.

Navy commissioned its first Guided Missile Frigate (FFG) in 1980, initially operating Bell 206B-1 and Aerospatiale AS350B Squirrel light utility helicopters for ship integration development. The

introduction of the Sikorsky S-70B-2 Seahawk anti-submarine helicopter in 1989 saw a quantum leap in FAA capability. The Seahawks and utility Squirrels were quickly pressed into active service aboard FFGs and other support ships during the 1990-91 Gulf War.

The FAA, now operating the advanced Sikorsky MH60R Seahawk maritime combat helicopter and rotary-wing unmanned aerial vehicles continues to provide critical combat capability to the fleet from aboard Landing Helicopter Dock ships, destroyers, frigates and replenishment vessels.

OVER LAND & SEA

The FAA's contribution to Australia in conflict has been significant. In the Korean War *Sydney's* Air Group conducted bombing and close air support missions, and in the Vietnam War RAN Helicopter Flight Vietnam flew air mobile operations. There has been near-continuous FAA presence aboard RAN ships in the Middle East through Gulf Wars I and II, and years of enforcement of UN sanctions against Iraq.

Less recognised but equally important are its contributions to peacekeeping, security and humanitarian operations. Far too numerous to list, international deployments have included the Sinai Peninsula, East Timor, Bougainville and Aceh province, Indonesia. Domestically, the FAA has provided support to Australians after natural disasters such as Cyclone Tracy in Darwin in 1974, conducting rescues and food drops during floods, and fire-mapping and water-bombing operations during bushfires.

VISIT US

The Fleet Air Arm Museum displays 25 heritage aircraft and hundreds of artefacts, bringing to life the FAA's 75-year history. Located 9km from Nowra in the beautiful Shoalhaven, the museum is open from 10am to 4pm Tuesday to Sunday, and most public holidays except New Year's Day, Good Friday, Christmas Day and Boxing Day. For more details see navy.gov.au/heritage/museums/fleet-air-arm-museum. **W**



ABOVE RIGHT Gannett ASW turboprop aircraft showing its complex folding wings.



THE MUSEUM COLLECTION

MODEL	REGISTRATION	TYPE
Aerospatiale AS350BA	N22-015	Helicopter
BAE Kalkara	N28-007	Bomber
Bell 206B-1 Kiowa	N17-013	Helicopter
Bell UH-1B Iroquois	N9-822	Helicopter
Bell UH-1H Iroquois	0.16290	Helicopter
Boeing Insitu ScanEagle	Composite airframe	Drone
Bristol HR50/51 Sycamore	RAN XD653	Helicopter
CAC Aeromacchi MB326H	N14-077	Jet trainer
CAC CA-25 Winjeel	A85-460	Piston-engined trainer
de Havilland FAW.53 Sea Venom	RAN WZ937	Jet fighter
de Havilland T.22 Sea Vampire	RAN XG766	Jet trainer
Douglas C-47 Skytrain	N2-43	Transport
Fairey Gannet AS.4	RAN XA434	Anti-submarine
Fairey Firefly AS.6	RAN WD826	Maritime surveillance
GAF Jindivik Mk.3B	N11-609	Target drone
Grumman S-2G Tracker	N12-153582	Maritime surveillance
Hawker Sea Fury Mk.11	RAN VW623	Fighter-bomber
McDonnell Douglas A4-G Skyhawk	N13-154993	Jet fighter / attack
McDonnell Douglas TA4-G Skyhawk	N13-154911	Jet trainer
Pilatus PC9	A23-028	Turboprop jet trainer
Sikorsky S-70B-2 Seahawk	N24-001	Helicopter
Sopwith Pup	Replica	Fighting scout
Westland AH-1 Scout	RAN WS101	Helicopter



PAPA LUIGI'S

STORY

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A CHANCE MEETING ON A TRAIN INSPIRED PETER RING TO REFLECT ON THE CHALLENGES OF MAINTAINING ONE'S VALUES.

TRAVELING ON A TRAIN BETWEEN SYDNEY AND NEWCASTLE, which takes about 2½ hours, I got talking to a chap who was about my age – pretty old. I noticed a tattoo on his leg and as he looked like the last person who would have a tattoo, I became curious. The man's name was Luigi and he turned out to be a great grandfather whose family call him Papa Luigi. This is Papa's Luigi's story, mostly in my words, as it evolved while we chatted.

Luigi had recently turned 80 and his family had thrown him a monster birthday get together on a rural property. You could tell he was very attached to his family; his partner, kids, grandkids and great grandkids. All good souls with generous natures.

On the second day of the get together, Luigi's 29-year-old granddaughter, Maria,

asked him to sit on the back deck with her so she could give him a surprise birthday present. Maria is a mum of two, has her own business and is happy in her conventional but thoughtful life.

Sitting on the deck, Maria told Luigi, with great passion and intent, a story about owls. The story, plucked from many sources, was about the owl symbolising wisdom. My new friend said he and Maria had, over the years, talked about many of life's situations. He thought those conversations made them both a bit wiser and he enjoyed them immensely.

Luigi said when Maria told him about the owl, she became a bit sentimental. She said Luigi had helped her gain some wisdom and had given her an interest in learning from life. She believed the owl symbolised their relationship. She then produced her own pencil drawing of an owl.

Luigi enjoyed Maria's 10-minute narration about her owl, where she highlighted the personal qualities she liked in it: wisdom, knowledge, guardianship, mystery, intelligence.

To honour Luigi's 80th birthday, Maria said she had searched for a present that would help him retain the sense of adventure she believed was his hallmark. She said she had struggled to find a present that would be a truly new experience for him, but finally had an idea: "Papa would you come with me right now while we both get tattooed with my owl?".

Luigi stopped talking for a minute and appeared to be a bit emotional. He then went on, "I was totally astonished and could not speak straight off". He considered himself conservative and did not want a tattoo at his age, so he shocked himself when he readily replied, "Yes, I would love to go with you".

He thought Maria may have been a little shocked too because she then gave him lots of opportunities to say no if he did not feel comfortable with getting a tattoo.

I asked Luigi if he had reflected later on his self-confessed conservative character saying yes so quickly. His wisdom took me by surprise. He said that for many years he had believed he needed to be driven by his life's purpose and his personal values. He had grown to believe that if what was put in front of him measured up to his purpose and values, then that gave him a lot of freedom to

What lies behind us
and what lies before us
are tiny matters compared
to what lies within us.

Ralph Waldo Emerson

positively contemplate all things: even ones that were out of the ball park.

"My principles seem to have evolved from my life," Luigi reflected. "Principles such as supporting people, having affinity for others, openness, being curious,

learning from others, looking for the qualities in others, listening, never using lies to protect myself, bending over backwards to collaborate, acknowledging other people's strengths and always being approachable".

Luigi said that if he had those values at all, it was because at least 90 percent of their existence evolved from relationships. When others had loyalty as one of their qualities, it rubbed off on him. When others in his life practiced commitment, he saw the value of that. Supportive behaviour was triggered by others showing him support. Listening to others was triggered when he saw how much people listening to him improved his confidence. He learned that respectfully challenging decisions that were judged by many to be incompatible with a happy life and good teamwork was a very necessary personal practice.

Luigi had me reflecting. I looked at my life and found instances where I had challenged authority because implementation of some decisions compromised my values, particularly when it was one of my leadership values that I thought was vital to people's dignity. Those instances mainly involved situations where fair and equitable treatment became an issue.

I also had to learn how to be non-confrontational with the people who needed to address such issues. As soon as you become confrontational in matters such as those, a successful result becomes much more difficult.

I came to believe that my values should not be just words on a list to pay homage to. Values were about my involvement and how my involvement improved my life and others lives. Values were a starting point and an end point that is possibly never reached. Values need to evolve and then to evolve again and again. But they only evolve through other people and situations. The challenge is not just to have a value but to find out the dimensions of that value and if it really should be regarded as a value.

Papa Luigi had my mind ticking over. Maintaining your value of fair and equitable treatment of people in a team you are leading becomes a different challenge when threatened with a severe

outcome. Then you need courage and support to get through it.

There are many examples in all our lives of our values being tested, for example if the results might be loss of your job, income or promotion in carrying out your leadership responsibilities. You need courage to live up to your values. Maintaining values will be constantly challenged while getting a job done,

at ways to make others' ideas work. To promote equality as humans. He said we all have different rankings in life and that sometimes causes feelings of inferiority or superiority whereas rankings generally should just signify a role. Luigi said all that is easy to say but difficult to sustain in life.

He said our behaviour should create the path of least resistance to our purpose. Before I surrendered to the temptation of

Keep your thoughts positive, because your thoughts become your words. Keep your words positive, because your words become your behaviour. Keep your behavior positive, because your behavior become your habits. Keep your habits positive, because your habits become your values. Keep your values positive, because your values become your destiny.

Mahatma Gandhi, Open Your Mind, Open Your Life: A Book of Eastern Wisdom

earning money and frequently by your own fears of standing out from the mob.

The test is not just practising your values but exploring them. The most effective teamwork and success in the most extreme circumstances happens when the inner space is strong. The inner space cannot be strong unless the outer space is in order for you. Values manifest themselves in creating a very supportive outer space.

Values are a journey toward an end point. The bit between the starting point and possibly an end point is the true challenge, the true adventure. It can make your adrenalin run.

Papa Luigi continued by talking about how living his values was a glimpse of how the whole of his life had manifested itself so far. He said your behaviour should develop the trust that is so necessary in life; not so much what you say but what you do. Your body language needs to be positive and endorsing, always delivering feedback with affinity. Helping people look

pulling his statement apart, I found myself thinking about what creates the most resistance in life. To me it is where there are poor relationships.

Values are not finite, they are not easy to sustain and you will need to be in a supportive environment to uphold them. And yet any supportive environment probably stems from all parties having values.

Papa Luigi said yes to his tattoo because it valued an important relationship and because it reflected his many lessons learned from others. I visualise his tattoo now and it reminds me of what is important.

We all need to think more about relationships in our lives and whether we need to be more discriminate in dealing with each and every relationship. We are all so different and each of us needs customised communication.

I said goodbye to Papa Luigi with great reluctance when he got off the train five stops before mine. **W**

A LIFE IN FLIGHT

A TRIBUTE TO ONE GIANT LEAP AUSTRALIA FOUNDATION COFOUNDER ROBERT CARPENTER OAM.

ONE GIANT LEAP AUSTRALIA FOUNDATION (OGLA) has carved a place as one of Australia’s leading STEM (science, technology, engineering and maths) education organisations. The epicentre of the organisation’s success has been the collective experience and expertise of directors Bob and Jackie Carpenter. Together they have passed knowledge and skills to young people in Australia and internationally to help create the workforce of the future.

Sadly, Bob Carpenter OAM passed away suddenly on 18 February 2023. With tragic irony, Bob recently recalled his experience in flight and, more recently, STEM education.

Bob’s parents wanted him to be the first in his family to attend university, but the then 15-year-old had other ideas. In 1963 jobs were plentiful and Bob began his career in the Commonwealth Bank. When Australia changed to decimal currency in 1966, Bob helped change records during a four-day bank shutdown. With no computers and few adding machines, the change-over was not easy and internal customer pressure took its toll. Bob recalled, “that led to my decision on the following Monday to leave the bank. I had, since the age of seven, been interested in model aircraft and aviation, so I rang the Defence department and asked if there were any positions available.”

Bob joined the RAAF in January 1967 as an adult trainee. “I was successful in the first few courses and ended up training as what was then a Radio Technical (Air), little did I know that would lead to a 25-year career,” he said. “After training, I was posted to Amberley Air Base in Queensland and that led to a posting to 2 Squadron in Vietnam in 1970 where I worked on Canberra bombers.”

During that time, Bob purchased and build the first of his many radio-controlled aircraft. “I couldn’t fly the aircraft that I built, but I taught myself to fly from a soccer field one street back from the active flight line.” During the war, many American servicemen noticed his expertise and called on Bob to assist in their own building and model flying ventures.

On return from Vietnam in 1971, Bob was posted back to Amberley where he worked on the F-4 Phantom fighter bombers Australia leased while awaiting delivery of the F-111 aircraft. During that time, Bob established the RAAF Amberley Model Aircraft Club which stills exists. He was subsequently posted to the US for training on the F-111 and spent the next four years maintaining the aircraft.

In 1976, after being promoted to sergeant, Bob applied to become a flight engineer on the C-130 Hercules aircraft, and was “the first radio technician to

become a flight engineer at 36 Squadron”.

During his time as flight engineer, Bob was part of a crew of up to five people. “Over the years through training and practical experience I came to understand the benefits of teamwork and collaboration, key components of our STEM training today,” Bob said.

A large portion of his C-130 experience involved humanitarian efforts in medivac rescues and natural disaster support throughout the Asia Pacific region. He was eventually promoted to Flight Engineer Leader and awarded the Medal of the Order of Australia (OAM).

His model aircraft enthusiasm was never far away. As part of Antarctica base support in the early 1980s, Bob’s team landed on the Ross Sea ice shelf, which presented a unique opportunity. “I was able to take a radio-controlled aircraft with me and, after refuelling and reloading the C-130 (with approval from the control tower), became the first person to fly a radio-controlled aircraft in Antarctica.”

While working his way through tertiary education to his MBA, Bob sought opportunities outside Defence. In 1992, he was hired by the newly established Asia-Pacific Training and Simulation (APTS) company as their chief engineer in Singapore. He relished the challenge of setting up a new facility and developing





the courses required. Having completed his MBA and after seven years with APTS, he bought the company and continued for another six years.

In 2006, Bob decided to move back to Australia and retire, but retirement didn't last long. "In 2008 I became the project manager for the block upgrade program on the RAAF's C-130J aircraft. The role involved working with six other countries on the project." In 2016, after 50 years working within the C-130 family, Bob joined forces with wife Jackie running the One Giant Leap Australia Foundation.

Jackie had been involved in STEM training since 2006 when she obtained a fully sponsored tour to Space Camp USA provided by Honeywell, "the only Australia teacher selected with a cohort of 268 teachers from around the world", Bob said proudly. "The trip changed her world and from that time our goal has been to bring a similar concept of Space Camp to Australia."

This year, that concept has become a reality as part of the Department of Regional NSW's investment initiative, Our Region, Our Voice for Regional Youth.

The program is a unique and immersive experience that will provide highly engaging STEM and aerospace education to young people in regional NSW. Touring regional NSW, "Aerospace Camp" will include: Astronomy and the Australian night sky, Australia's contributions to space exploration, the Artemis Missions, habitats on the Moon and Mars, rockets, rovers, virtual reality, drones and robotics.

During the four-day program, participants will work with and experience technologies such as flight simulators, robotics, drones and virtual reality which

they may not have regular, or any, access to.

One Giant Leap will be working in collaboration and cooperation with local schools and community groups and the camp will be open to students aged 12 to 14, with the successful students fully accommodated.

Bob recognised that theory learned in the classroom must be supplemented with wide-ranging practical experience to ensure that graduating students are able to think laterally as part of a team to overcome the challenges of their roles. "We supplement the curriculum with experiential learning," he explained. "STEM-based education derived from my engineering and management expertise, as well as Jackie's many years in education, has led to the development of many innovative activities that are being complemented by educators, industry, parents and, more importantly, the students that they are aimed at."

Aerospace Camp and other ongoing OGLA Foundation projects are Bob's legacy and will have lasting effects on the next generation of space and STEM professionals. More information about OGLA and Aerospace Camp can be found at onegiantleapfoundation.com.au/aerospace-camp. [W](#)

*Michael Davoren,
OGL Media and Communications*



TOP Bob had a lifelong interest in radio-controlled aircraft.



LEFT Bob Carpenter.



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<https://onegiantleapfoundation.com.au/>



THE RobotX



BELOW One of the teams working on their RobotX Maritime Autonomy Challenge entry.

CHALLENGE

ALL HANDS WERE ON DECK AS THE NEXT GENERATION OF ROBOTICISTS TOOK ON A MARITIME AUTONOMY CHALLENGE IN SYDNEY.



TWENTY TEAMS OF ASPIRING maritime autonomy specialists from universities across five continents descended on the Sydney International Regatta Centre last November to take part in the biennial RobotX Maritime Autonomy Challenge.

RobotX 2022 was hosted by RoboNation, a US-based not-for-profit organisation. The Australian Department of Defence partnered RobotNation, in collaboration with the US Office of Naval Research and with support from Defence's Next Generation Technologies Fund.

RobotX is designed to promote student interest in autonomous robotic systems with an emphasis on the science and engineering of cooperative autonomy. Innovators are invited to create autonomous vehicles that operate across air, land and water to answer real-world challenges. The goal of the challenge is to expand the community of researchers and innovators capable of substantive contributions to the emerging field of autonomous and uncrewed, multi-domain vehicles.

Defence scientist Dr Brendon Anderson says competitions such as RobotX are

helping to create the next generation of robotics specialists. "Exposing students to real-world technological challenges will build skills and professional networks that will follow them into their professional lives, as autonomous systems play an increasing role in future defence capability," he says.

Each RobotX team was given the same basic boat platform, a 5m Wave Adaptive Modular Vehicle (WAM-V) manufactured by Marine Advanced Research – a unique craft with suspension and articulation systems that allow the vessel to move with the waves while maintaining a stable central platform. The teams were then responsible for developing the propulsion and control systems and sensors, to convert the standard boat into a genuine autonomous marine system that could complete a course without human intervention.

In addition to creating an autonomous surface vessel, the RobotX teams were required to develop and integrate an uncrewed aerial vehicle (UAV) to assist with various challenging tasks. Tasks varied from "follow the path", where WAM-Vs needed to navigate between a series of buoys while

avoiding obstacles placed at random in the task area, through to "UAV replenishment", during which UAVs were to collect a small, coloured tin from a floating helipad and deliver it to another floating helipad. One of the most complex challenges, "wildlife encounter", involved three floating platforms representing a platypus, a turtle and a crocodile. The autonomous vessel needed to identify the animal and then react and manoeuvre around it in a way specific to the animal. Each creature was represented by a unique spectral signature, only detectable with a hyperspectral imaging camera.

Team Minion from Embry-Riddle Aeronautical University, USA, was crowned RobotX 2022 Champion, with Bumblebee Autonomous Systems from the National University of Singapore taking out second place, followed by Team NYCU from National Yang Ming Chiao Tung University, Taiwan, with the University of Sydney Sealions team coming in fourth.

In a tweet at the end of RobotX 2022, RoboNation stated the 2022 Maritime RobotX Challenge could be summarised with one word – teamwork. [W](#)



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WORDS Paul A Rosenzweig OAM

INSPIRING CADETS THROUGH FLYING EXPERIENCES

THE AUSTRALIAN AIR FORCE

CADETS (AAFC) provides an opportunity for young Australians to learn to fly through two streams of aviation training – gliding and powered flying. Thanks to support from Air Force, the AAFC aviation program enables Cadets to have a safe, positive and educational aviation experience, designed to expose and inspire interest in the aerospace industry through theoretical study, practical handling of an aircraft in flight, and aircraft engineering.

Aviation Operations Wing (AOW) delivers flying pathways to Cadets through both streams. AOW’s mission is to “inspire and develop young people in an air and space environment to achieve and maximise their potential to contribute to Australia’s future success”.

Opportunities across the country are supported by the Elementary Flying Training School (EFTS) and Gliding Training School (GTS), two elements of AOW, and where necessary approved service providers. AOW aims to provide every Cadet with an immersive aviation experience – at no cost.

Two recent training campaigns illustrate the scope and depth of the AAFC flying training program.

GLIDING

Gliding flying trains pilots to smoothly coordinate flying controls to achieve positive and accurate manoeuvres and performance. It also develops a high degree of spatial and situational awareness and respect for other airspace users.

GTS operates the AAFC’s fleet of DG1000S gliders, a two-seat, high-performance basic soaring trainer, with a two-piece canopy. The DG1000S is ideal for exposing Cadets to the physical, cognitive and organisational

aspects of flying in a safe and predictable environment. Balaklava Glider Training Flight, one of three GTS units, has continued to offer flying training opportunities to South Australian Cadets despite COVID constraints.

After attending a series of continuation training weekends, the current cohort of aviation trainees joined gliding courses at Balaklava Airfield during the school holidays, beginning the journey to a first solo flight.

Pre-solo flying trainee CUO Mithusha Kulatunga, from No.613 Squadron (RAAF Edinburgh), described the winch launch: “You’ll be going up at 45 degrees, very, very, very quick, then you’ll be feeling quite a bit of Gs. It’s just quite breathtaking”.

Leading Cadet Tegan Revolta, 16, also a member of that cohort and a graduate of the Gliding Theory Training Course was selected by the Flight Commander of Balaklava Flight, Flight Lieutenant (AAFC) Ian Wright, to receive an Aviation Operations Wing Safety Medallion. The safety medallion is awarded to a trainee assessed as displaying a significant level of safety practices and knowledge during a flying course.

FLTLT(AAFC) Wright said: “Leading Cadet Revolta has displayed a high



understanding of safety required during the gliding activities that he has been involved in. He ensured that less-experienced cadets were monitored and guided during safety-critical periods”.

LCDT Revolta’s efforts to improve his aviation skills through the AAFC home training curriculum and gliding training contributed to the Skills section of his Bronze Award in the Duke of Edinburgh’s International Awards. He completed the requirements for his Bronze Award last year and is continuing this year as a Silver Award participant; his aviation skills development again contributing to that Skills section of the program.



ABOVE A still image from an AAFC gliding video produced by Air Force Headquarters.



BELOW LEFT Aviation trainee LCDT Tegan Revolta receives an Aviation Operations Wing Safety Medallion from FLTLT(AAFC) Ian Wright.



Scan the QR code to view a promotional video showing the excitement of gliding, produced by Flight-Lieutenant Christopher Moon, a strategic communications advisor and digital content producer at Air Force Headquarters, who attended one of Balaklava Flight’s continuation training weekends earlier this year.



Scan the QR code for more information about the gliding opportunities available with the Australian Air Force Cadets.

POWERED FLYING

The AAFC's powered flying programs are conducted by EFTS through its three hubs – Amberley Flight, Queensland, Richmond Flight, NSW and Point Cook Flight, Victoria. The AAFC's fleet of Diamond DA40 NG Star aircraft are registered to the Commonwealth of Australia, maintained by Cadets Branch – Air Force, and flown by qualified AAFC instructors.

Flying opportunities include non-

instructional Cadet Aviation Experience flights, Pilot Experience flights under the supervision of a qualified flying instructor, and Cadet Flying Training according to the CASA Recreational Pilot License curriculum.

Towards the end of last year, Richmond Flight held its first powered flying course since emerging from COVID restrictions.

Flight-Lieutenant Kate Hobson, flying instructor and Deputy Head of Operations-

Power for AOW, reported: "It was a very successful camp, albeit no-one went first solo due to five days of poor weather including two thunderstorms (one with hail)".

Shortly after the camp, on a continuation flying weekend, Cadet Corporal Adil Shaikh from No.338 (City of Shellharbour) Squadron became the first Cadet from 3 Wing (NSW) to go solo in a Diamond DA40 at RAAF Base Richmond.



LEFT FLTLT Kate Hobson of EFTS presents CCPL Adil Shaikh with his Solo Power Flight patch after his first solo flight in a Diamond DA40 NG Star aircraft at RAAF Base Richmond.



Scan the QR code for more information, and to download the AAFC Powered Flying brochure.

HONOURING THE FALLEN

THROUGHOUT AUSTRALIA ON THE 11TH HOUR of the 11th day of the 11th month, Remembrance Day ceremonies are held to honour the fallen. A significant number of those ceremonies are supported by Australian Defence Force Cadets.

Modbury High School in South Australia, for example, held a moving and respectful Remembrance Day assembly on Friday 11 November last year. Air Force Cadets from No.604 Squadron (Hampstead Barracks) provided an Honour Guard and Flag Orderly, and a Catafalque Party carrying innocuous .303 Short Magazine Lee Enfield rifles representative of the two world wars and post-WWII operations in Japan, Korea, Malaya and Malaysia.

Earlier in the year, Air Force Cadets also supported the annual Malaya & Borneo Veterans Day service of commemoration held by the SA & NT Branch of the



National Malaya & Borneo Veterans Association Australia Inc. The service in Adelaide on 26 August was conducted in the presence of Her Excellency the Honourable Frances Adamson AC, Governor of SA and SA/NT Branch Patron.

Among the fallen commemorated were 13 RAAF personnel who lost their lives on operational service during the general period of the Malayan Emergency and the Indonesian Confrontation with Malaysia.

Many of the participants in those two commemorations were aviation trainees, including Cadet Sergeant Jesse Isaac who had already qualified for the First Solo

Badge and Cadet Pilot Badge through powered flying training undertaken privately. Appointed Cadet Flight Sergeant late last year, Jesse was announced as one of three Cadet Sergeant Eleanore Tibble Pilgrimage awardees, to participate in an activity in New Zealand later this year.



ABOVE Aviation trainee CSGT Jesse Isaac, wearing his First Solo Badge (powered flying) during rehearsals for the 2022 Malaya & Borneo Veterans Day Service on 26 August 2022.



EACH JANUARY, the NSW Group of the Australian Air League (AAL) holds a nine-day flying camp to provide cadets with the opportunity to kickstart their flying training at its Air Activities Centre, Camden Airport, southwest of Sydney.

With 32 student pilots from 11 squadrons across NSW, the 2023 camp was the biggest to date. Cadets arrived with a wide range of flying experience. For some, it was their first camp and opportunity to experience the taste of flight. For others, it was an opportunity to build on their training from previous camps and to catch up with friends.

Returning student pilot Sqn.Sgt. Lara Wilbow from Doyalson Squadron on the Central Coast attained her camp goal of flying her training area solo. "I flew out to Warragamba Dam and then back via Bringelly, which was really exciting. My next goal is to complete my recreational pilot's license."

For cadet Alora Clark and L/Cdt. Ethan Lobwein-Caron of Sutherland Shire, it was their first flying camp.

Ethan's interest in flying was inspired by his father. "My dad was a commercial pilot and instructor and has been very supportive of me," Ethan said. "For a career, I am looking to become an aeronautical engineer while also completing my pilot's license."

Alora joined the Air League last year. "One of my friends was in the Air League and recommended I join. I went on a squadron camp and did a trial instructional flight, which was also my first time in a light aircraft." Asked about her most memorable flight so far, she quickly answered: "When I learnt about stalling! I was a bit nervous, but the instructor showed me how to recover and keep the aircraft under control."

With the centre's fleet of two Cessnas and a Piper Warrior and three cross-hired aircraft, the cadets achieved some

impressive statistics for the nine days: 191 flights; 201.1 flight hours; 482 landings (including touch and goes); 1,683 litres of fuel burnt; most flights in a day – 30.

Some of the achievements during the camp included:

First Solo: Lachlan Haack – Camden Sqn; Elliot Powell – Manly Sqn; and Toby Ong – Canterbury Sqn.

Area Solo: Lara Wilbow – Doyalson Sqn.

Recreational Pilot License: Adam Glowacki – Sutherland Shire Sqn.

All of that would not have been possible without the help of the instructors, engineers and camp staff who volunteered to train cadets and maintain the aircraft. Support crew at the camp included eight camp staff and a roster of 20 volunteer instructors.

For several instructors, including Michael Kornaus, January 2023 was their first camp. "I started in 2018 doing my commercial pilot's license full-time on the Gold Coast, along with a multi-engine instrument rating and an instructor rating," Michael said. "Last year, I saw the call out for volunteer instructors for the Air League, so I applied, and after doing a check ride and renewing my instructor rating, I drove down for the camp. I've done 17 hours on the camp so far and should do about 20 hours all up. I've really enjoyed the camp."

The Camden Air Activities Centre was established by the NSW Group of the Air League in 1986 and provides cadets with the opportunity to undertake air experience flights and flying training throughout the year, as well as the annual flying camp. With a fleet of training aircraft, including a Piper PA-28 Warrior, Cessna 172 and Cessna 152, it has provided thousands of air experiences flights and training hours to members of the League, helping to achieve the League's motto *A Vinculo Terrae* – to be "free from the bonds of the earth".



ABOVE Cadets and officers celebrating the end of camp.



TOP Instructor Charles Droudis congratulates Cpl Toby Ong of Canterbury Sqn on flying his first solo in VH-LRA.

ABOVE Student pose with their favourite aircraft, Cessna-152 VH-SOX.



AIR COMMODORE FRANK EDWARD BURTT OBE

1 January 1941 – 29 January 2023

FRANK BURTT WAS born in Tully, Queensland, and educated at Babinda State School and as a boarder at Church of England Grammar School 'Churchie' in Brisbane. He joined the RAAF in July 1962 and, on graduation from the School of Air Navigation on 16 August 1963, he was commissioned as a Navigator and posted to RAAF Amberly to begin his flying career.

He joined No.6 Squadron flying Canberra Bombers and then No.2 Squadron in Butterworth, followed by an operational posting to Phan Rang, Vietnam with No.2 Squadron.

Frank's flying career included postings to No.6 Squadron, Amberley, flying F-4E Phantoms, No.1 Flying Training School as an instructor before returning to No.6 Squadron to fly F-111A and F-111C aircraft.

Over his 33-year career in the RAAF, Frank served in numerous appointments. He attended Canadian Forces Command and Staff College and Joint Services Staff

College and was a member of Directing Staff RAAF Staff College Fairbairn.

Appointments in Canberra included Director General Service Conditions and Director of Military Education and Training at the Australian Defence Force Academy. He was the first Officer Commanding RAAF Williams in Melbourne and Chief of Support at Air Headquarters, Glenbrook prior to his retirement on 31 December 1995.

During his career, Frank was awarded the Officer of the Order of the British Empire; General Service Medal 1962 – Malaya Peninsular; Vietnam Medal; Defence Force Service Medal with 3rd Clasp; National Medal; Republic of Vietnam Medal; and Returned from Active Service Badge.

After retirement from the RAAF, Frank served as a member of the Veterans Review Board from 1998 until 2014. He was also past Patron of the B24 Liberator Memorial Fund.



AIR VICE-MARSHAL WILLIAM HENRY SIMMONDS AO

25 October 1930 - 19 January 2023

AIR VICE-MARSHAL WILLIAM 'BILL' SIMMONDS AO was born and educated in Perth and began his RAAF career as a cadet on the first course at RAAF College Point Cook on 21 April 1948. His first flight was in a Tiger Moth in June 1950. Graduating on 12 December 1951, he was appointed to a commission with the presentation of Wings by Prime Minister Robert Menzies.

Posted to No.77 Squadron in Korea in

April 1952, and after less than a two-week jet operational conversion to the Meteor at Iwakuni, Japan, the squadron's base, he began operations, predominantly in the ground attack role. While the squadron was successful in that role, vulnerability to intense ground fire was high; 40 pilots and 54 aircraft were lost during the war. Seven more pilots became prisoners of war.

Operating from Kimpo on 8 May, Bill engaged and shot down a MiG over the North Korean capital, Pyongyang; the last Australian to do so in combat. He was awarded a Mention-in-Despatches and a USA Air Medal, the citation of which read in part: *Pilot Officer William H. Simmonds distinguished himself by meritorious achievement while participating in aerial combat as the pilot of a Meteor aircraft, flying missions against the enemy in Korea from 24 April to 10 May 1952. Despite intense enemy ground fire and adverse weather conditions these attacks, at dangerously low levels, were pressed home with vigour.*

On his return to Australia, Bill flew Mustangs and Vampires with No.25 Squadron at RAAF Pearce for a short period, before selection for exchange duty with the RAF. He served with No.20 Squadron for two years flying the Canadair Sabre Mk4 at Oldenburg in Germany, returning to Australia as our most experienced Sabre pilot.

After a posting to Training Command, he flew Avon Sabres from December 1959 with

No.78 Wing at Butterworth for three years, followed by a posting as a weapons pilot at Aircraft Research and Development Unit.

After completing No.18 Course at RAAF Staff College in 1964, Bill was posted to the staff of the United States Air Force Academy, followed by a joint intelligence staff appointment in Canberra.

He returned to No.77 squadron in June 1969 as Commanding Officer following a conversion to the Mirage. For the RAAF Golden Jubilee displays, the squadron formed the first Mirage Aerobatic team, the Deltas. Bill flew one of the two solo aircraft during displays around Australia.

After staff postings at Headquarters Williamtown, RAAF Academy and Air Force Office, Bill was appointed to command RAAF Williamtown in 1979, where he served until his promotion to Air Vice-Marshal in October 1981 and appointed the Commander of the Integrated Air Defence System, Butterworth, Malaysia. He returned to Canberra in 1985 to be appointed Chief of Air Force Operations and Plans, where he served until his retirement in May 1987.

During his career he was appointed an Officer of The Order of Australia and was Mentioned in Dispatches. He was awarded the Australian Active Service Medal 1945-75 with Clasps 'MALAYA' and 'KOREA'; General Service Medal 1918-62 with Clasp 'MALAYA'; Korea Medal; United Nations Service Medal Korea; and the United States of America Air Medal.



AIR MARSHAL JOHN WILLIAM NEWHAM AC

30 November 1930 - 27 December 2022



JOHN WILLIAM 'JAKE' NEWHAM

was born and educated in Cowra, NSW. He joined the RAAF in 1951, graduating as a Sergeant on No.7 Pilots Course in

1952. He completed fighter training at RAAF Williamtown and was posted to Korea. He was commissioned in 1953, while serving in Korea.

After a Meteor conversion in Japan, he subsequently flew the aircraft on operations in Korea with No.77 Squadron. He returned to Australia and was then posted to No.78 Wing, on garrison duty in Malta, flying Vampire fighters.

After Malta, he completed the Flying Instructors Course at RAAF East Sale then served as an instructor at the RAAF College and No.1 Basic Flying Training School. For a brief period, he served as ADC to the then Governor-General, Sir William Slim.

After graduating from FCI course on Vampires in 1957, he completed the Sabre conversion and in 1958 was posted to No.3 Squadron as a Flight Commander. When the squadron deployed to Butterworth, he flew Sabres on operational missions against communist terrorists during the Malayan Emergency..

Jake returned to Williamtown as the Chief Flying Instructor at No.2 (F) OCU until selected to command the Western Australia University Squadron. He graduated from No.18 Staff Course at RAAF Staff College in 1964. Following a staff tour at No.81 Wing Headquarters, Williamtown, he completed a Mirage conversion in December 1966 and was posted to No.3 Squadron, assuming command a year later. Although anticipating leading the squadron when it deployed to Butterworth, he was instead promoted to Group Captain with a move to Canberra as Director of Personnel Services. That was followed by command of Aircraft Research and Development Unit and subsequently, Officer Commanding RAAF Base Laverton.

Selected to command No.82 Wing, he trained on the F-111C in the United States and led the first ferry flight across the Pacific to Australia. His clear mandate from the then Chief of Air Staff was to not 'bend' any aircraft, given the delays and controversy surrounding the F-111. He succeeded!

After a posting at Amberley, Jake moved to Headquarters Operational Command at RAAF Glenbrook as Staff Officer Operations, and, on promotion to Air Commodore, became Senior Air Staff Officer. He studied at the Royal College of Defence Studies in London in 1978, returning to Air Force Office as Director General of Operational Requirements. In 1980, he was promoted to Air Vice-Marshal and appointed Chief of Air Force Operations and Plans, after which he was appointed as Head of the Australian Defence Staff in Washington, DC. He was appointed as an Officer in the Order of Australia during that tour.

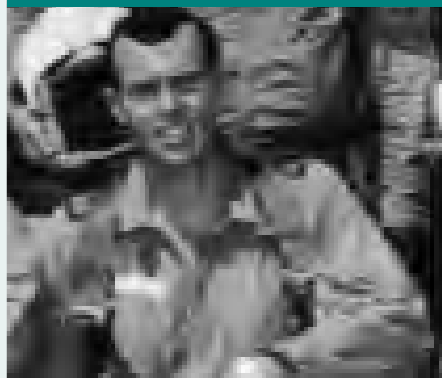
He returned to Canberra as the Deputy Chief of the Air Staff and, in March 1985, he was appointed Chief of the Air Staff (CAS). During his term as CAS, he was elevated to Companion of the Order of Australia, the nation's highest honour. He retired from the RAAF in July 1987, but his working life transitioned into many activities. He held two company directorships and was the chairman of the Ryder-Cheshire Foundation in Australia 1990-2002.

In his retirement, Jake was an avid and active supporter of many causes and organisations. He was a member of the Fighter Squadrons Branch and supporter of the Air Force Association both in NSW and nationally. Always giving, seldom asking. He was ever available to give others the benefit of his experience through sound advice and quiet encouragement. He inspired so many to be better leaders. Above all, he was a thorough gentleman.

Source: Fighter Squadrons Branch & friends.

AIR COMMODORE PETER WILLIAM GROWDER

7 May 1946 - 5 February 2023



PETER GROWDER ENLISTED as Cadet Aircrew in 1967, undertaking training at the School of Air Navigation in Queensland. He was initially posted to No.82 Wing, RAAF Amberley. He flew in Canberra Bombers in Vietnam, and he also flew in F-4 Phantoms.

In 1973, he was one of the crews to bring the first fleet of F-111C aircraft to RAAF Base Amberley, flying tail number A8-130. Posted to No.6 Squadron, he was crewed with FLT Lt Dave Rogers in a F-111C aircraft on 25 October 1978 and ejected when flying over the Hauracki Gulf, near Auckland, when a wheel-well fire was detected. He subsequently completed a United States Air Force Exchange in Washington, and held several junior staff appointments

He served as Director of Personnel – Officers, Commandant of RAAF College, and undertook post graduate studies at the National Defence College in Canada. He was appointed as Officer Commanding No.82 Wing and, on promotion to Air Commodore in 1996, was appointed Director General Personnel – Air Force. In his final appointment in Air Force, Pete served as Commander Headquarters Strike Reconnaissance Group at Amberley from 1997 to 2000. He was widely regarded as an incredible leader and mentor to many.



LEFT FLTLT Peter Growder as part of the RAAF 1SQN Formation Team. Photo: Noel Ryan.



AIR COMMODORE KENNETH NEAL BIRRER AO

2 October 1951 – 13 January 2023

BORN IN BRISBANE, KENNETH NEAL BIRRER, known as Ken to his family, friends and colleagues, was educated at Stafford State School in Brisbane and then Laverton and Werribee High School in Victoria. Ken's father Des was an Air Force member and the family spent most of Ken's formative years in Victoria. Given his father's background and his interest in aviation (Ken had joined the Air Training Corps when he was 14) he selected the Air Force as a career and was appointed to the PAF on 13 January 1969.

He initially began training as a Communications Engineering Cadet at RAAF Frognall in 1969, but transferred to aircrew in 1970. In January 1971, Ken joined No.6 Air Electronics Officers Course at the School of Air Navigation and graduated Dux of his course in December 1971.

His initial posting was to No.11 Squadron on P-3B Orion aircraft. In mid-1976, he was selected for exchange duties in the United Kingdom flying Nimrod MR1 aircraft at No.120 Squadron RAF Kinloss, Scotland.

That was at the height of the Cold War and operations were conducted 24 hours a day. A significant aim of the NATO powers was to closely monitor all Soviet units, with particular attention on the whereabouts of the Soviet nuclear ballistic missile submarine fleet.

After two and a half years flying with the RAF, Ken returned to No.11 Squadron RAAF Edinburgh. That was followed by an instructional tour with Maritime Air Training Squadron, later 292 Squadron, where he instructed on the P-3B and P-3C Orion.

Promoted to Squadron Leader late in 1982, he was posted to Canberra as Staff Officer Operational Requirements at Air Force Headquarters. That was followed by another flying tour back at Edinburgh as Flight Commander No.11 Squadron, which

was by then equipped with the P3C.

He was promoted to Wing Commander in 1988 and posted back to Canberra to the Directorate of Personnel Officers in a policy development appointment. Ken then spent much of his career in the personnel field where he had a natural talent.

A command appointment followed as Commanding Officer Base Squadron East Sale, where he was awarded the Member of the Order of Australia.

A posting to the USAF Air War College followed, before promotion to Group Captain and appointment as Director of Personnel Officers.

After post-graduate studies in 1997 and a further staff appointment as Director of Military Strategy, Ken was promoted to Air Commodore and appointed Director General Joint Education and Training.

His final tour in the Permanent Air Force was as Director General Personnel Air Force until his retirement in 2005.

Ken continued to contribute to the Air Force in the Reserve until 2018, conducting many reviews, all of which were in the personnel field. His natural talent and dedication to that latter period was rewarded as an Officer of the Order of Australia.

Ken was an excellent leader and a talented staff officer, and he was well respected.



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AIR FORCE ASSOCIATION



REVIEW BY Bob Treloar

AUSTRALIA'S SECRET ARMY

By **MICHAEL VIETCH**,
Hatchette Australia; RRP \$26.75

AUSTRALIA'S SECRET ARMY is the story of a small group of men who, in the hour of their country's greatest peril, chose not to flee but to turn and face the enemy.

After an abortive attempt in the 1920s, it was not until the eve of World War II that Naval Intelligence embarked on the establishment of a coast watching system to fill a gap in its intelligence capability to the north of Australia.

Eric Feldt, a former Naval officer and then District Officer in New Guinea, was enlisted to form the Coast Watch organisation. By the time Japan had entered the war, Feldt had recruited, trained and deployed 100 Coastwatchers, men with extensive experience in the islands, supported by teams of loyal locals across the Solomons, Bougainville and Papua New Guinea.

A small team of Coastwatchers pulled off a remarkable evacuation of the remnants of Lark Force at Rabaul, more than 350 soldiers who had been abandoned by the Australian Government.

The hardships, dangers and the threat of torture if captured were endured by the Coastwatchers. The ingenuity, steadfastness and bravery of those men is vividly described against the backdrop of the war across the archipelagos. In many cases, the intelligence reported by the Coastwatchers was the difference between victory and defeat, survival or death.

While there have been several books written about the Coastwatchers, Michael Veitch has shone a new light on an organisation attributed as a significant element in the defeat of the Japanese. To quote Admiral Halsey, the Coastwatchers "saved Guadalcanal and Guadalcanal saved the Pacific".



REVIEW BY Bob Treloar

STRONG TO SERVE

By **JOSEPH MACK**
Big Sky Publishing; RRP \$32.99

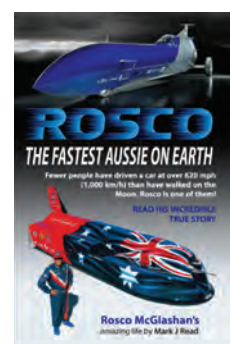
STRONG TO SERVE is the motto of No.130 (Punjab) Squadron RAF and this book was written not only to recount the personal history of Fred Riley, but to provide overdue recognition of the squadron's distinguished wartime record.

Formed in June 1941, in part as result of a donation from the Punjab district of India for the purchase of 12 Spitfires, No.130 Squadron flew from England against the V-1 threat until it was transferred to the Continent in September 1944, where it served with distinction until war's end.

Graduating as a Sergeant Pilot from the Empire Air Training Scheme, Fred trained as a Spitfire pilot and was posted to No.130 Squadron in October 1943. During his time with the squadron, Fred completed more than 100 operational sorties including fighter sweeps, bomber escorts, defensive patrols and armed reconnaissance missions. He flew covering sweeps over the Normandy beaches on the D-Day offensive and escorted General Eisenhower's aircraft during a VIP visit to France. He also flew escort missions for troop-carrying aircraft on Operation Market Garden.

While flying cover operations over US Army forces during the Battle of the Bulge, Fred was shot down by friendly force flak. Badly injured, he spent time in a US hospital in Paris until he discharged himself and returned to his squadron. Intercepted by the squadron doctor, he was again hospitalised and spent four months in a body cast for a fractured back, before being repatriated to Australia in October 1945.

Strong to Serve provides an insight to the daily slog of operational flying and the toll it took on aircrew. It contains the dry humour of the serviceman and is excellent reading.



REVIEW BY Neil Smith

ROSCO: The Fastest Aussie on Earth

By **MARK J READ**
Amazon KDP Australia; RRP \$29

ROSCO is the 'warts and all' story of Rosco McGlashan, as told to his friend and marketing manager Mark Read. Retaining much of Rosco's down-to earth vernacular, Mark leads readers to feel they're having a chat with Rosco over coffee (or a beer).

I can introduce this book no better than by quoting Mark Read's opening words: *...you're about to read the true story of one man's life, who has become a motor racing legend in many people's eyes. It's a story of highs and lows, good and bad, and triumph over adversity, but most of all, it's a story of the human spirit and endeavour of someone who never gives up.*

In his youth, Rosco spent time in state-run homes and remand centres. At 17, he was in prison, but found "salvation through his love of speed and raw horsepower".

The book follows Rosco's quest for the illusive world land speed record on a shoe-string budget. We learn about his introduction to jet- and rocket-powered bikes and cars, his world travels and his design and construction of a car around a surplus jet engine from a RAAF Mirage IIIO, leading to his first bold attempt on the record. Sheer bad luck with weather denied him the record before it was broken by the supersonic *Thrust* SSC from the UK.

There follows an amazing account of Rosco's quest to snatch the record from the UK in a car that can travel at 1000mph (Mach 1.3).

I have known, admired and supported Rosco for some 45 years and consider him a good mate. *Wings* is a member of his 1000mph Club and our logo appears on the car. While perhaps now biased as a result, I can honestly say all readers will enjoy this book. While Rosco's ultimate goal is yet to be achieved, I commend it as an easy-to-read, entertaining adventure story and a wonderful example of Aussie innovation and determination.

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