The MRH90 Taipan

daltz lays out the story of Navy's capable but much troubled Taipan maritime support helicopter

The Australian version of the European NH90 tactical transport helicopter, known in service as the MRH90 Taipan, was a highly capable but very complex, software rich, multi-role helicopter operated by Army and Navy for around 15 years. Taipan flying operations commenced in Australia in 2007 with Navy achieving initial operational capability in the maritime support helicopter role in February 2015. It was withdrawn from Navy service in 2022. The Taipan achieved initial operational capability with Army in December 2014 and Army ceased flying it in 2023. Full operational capability was not achieved by either Service before the Taipan was withdrawn. Navy nominally held six Taipans on charge (rotated out of the total fleet of ultimately 47 aircraft, hence the Army camouflage scheme) that were flown by 808 Squadron, headquartered at HMAS *Albatross*. Navy aircrew, engineers and maintainers undertook the same Taipan training as Army, provided by the Army Aviation Training Centre at Oakey. Army also had two full-motion, level-D (the highest level of civil accreditation) Taipan simulators, one at Oakey, the other at Townsville, for conversion and recurrent aircrew training that Navy aircrew also used.

***Above**: Taipan A40-014 lands on HMAS Tobruk, September 2012 (of note, this aircraft, when back in Army service, sparked the Orroral Valley bushfire near Canberra in January 2020 when its landing light ignited tinder dry grass during an outfield landing. The fire went on to burn 82,000 hectares of the Namadgi National Park - the aircraft also suffered fire damage to the composite fuselage but was repaired and flew on until 2023). [Navy image]*

Australia's selection of the Taipan can be traced back to the Howard government's Defence 2000 White Paper. While seeking to maintain and develop an integrated and balanced joint force, the White Paper set forth a predominately maritime defence strategy. In support of this strategy, the White Paper foreshadowed the procurement of an additional squadron (described as 'about 12 aircraft') of troop-lift helicopters with a particular view to enhance the operational capability of the troop transport ships HMA Ships *Manoora* and *Kanimbla,* that had been acquired second hand from the US Navy in the mid 1990s.

Within a year of the White Paper's release, the US was attacked by terrorists on 11 September 2001 and, just over another year later, terrorists exploded two devastating suicide bombs in Bali's main tourist district on 12 October 2002. These two major terrorist attacks, combined with growing concerns about the proliferation of weapons of mass destruction, led the government to update the Defence White Paper in 2003, elevating the priority on acquiring and accelerating counter-terrorist capabilities, including the acquisition of more capable troop-lift helicopters.

808 Squadron

808 Squadron has a storied history in both our Navy and the Royal Navy. Formed in 1940 as a Royal Navy fighter squadron, it flew in the Battle of Britain and supported the D-Day landings. It was commissioned into our Navy in 1950, where it earned its Korean battle honour in 1951 flying Sea Furies from HMAS *Sydney*. After a short hiatus, in 1955 the squadron recommissioned with Sea Venoms flying off HMAS *Melbourne* until 1958. Some 55 years later, the squadron was recommissioned in 2013 to operate six Taipans in the maritime support helicopter role. The squadron's mission was to parent three Taipan flights at sea. The Taipans were returned to Army in 2022 and the squadron now parents operational

Above: *The Taipan predecessor, the Sea King Mk 50/50A, operating in the maritime support helicopter role picking up stores from HMAS Tobruk as part of Operation Stabilise off Timor Leste, December 1999 [AB Simon Metcalfe].*

Project AIR 9000

A key outcome of the 2000 White Paper was the creation of a new Defence Capability Plan (which survived with regular updates until it was replaced by the Defence Integrated Investment Program in 2016). The Plan introduced AIR 9000, a multi-phase program that consolidated a number of disparate projects and stood up new projects designed to modernise and rationalise Defence's helicopter fleet. Phase 1 of AIR 9000 was the development of an ADF Helicopter Master Plan, which was subsequently first issued in 2002. Phase 2 of AIR 9000 was the procurement of 12 additional troop-lift helicopters, as per the White Paper. Other AIR 9000 phases relevant to the Taipan story included Phase 4 – the replacement of Army's troop-lift S-70A-9 Black Hawks; and Phase 6 – the replacement of Navy's maritime support Sea King Mk50/50As.

In May 2003, Defence released a request for proposal to three manufacturers for 12 troop-lift helicopters under Phase 2 of AIR 9000. Proposals were received from AgustaWestland (now Leonardo) for the EH101 Merlin Mk2 commando variant, Eurocopter (now Airbus Helicopters France) for the NH90 tactical transport variant, and Sikorsky for the S-70M (Sikorsky's commercial designation for the UH-60M Black Hawk). The EH101 was set aside by the end of 2003 and the evaluation was completed focussing on the two remaining proposals, expanded to cover not only Phase 2 but also Phase 4 (Black Hawk replacement). At the time, both the NH90 and the S-70M were in early production with considerable development and testing (on both) still underway.

Following the evaluation, Defence drafted a submission for the Minister for Defence recommending government select the S-70M. On direction from the Minister, Defence developed two further draft submissions, initially asking government to choose between the two options (both were considered suitable with different pros and cons) and then recommending the NH90 (MRH90 Taipan). In August 2004 (on the eve of the caretaker period ahead of the October 2004 federal election), government approved and announced the procurement of 12 Taipans under just Phase 2 of the program at a cost $954 million (including facilities).

AIR 9000 phases

Phase 1: ADF Helicopter Master Plan
Phase 2: Additional troop-lift helicopters (MRH90)
Phase 3: S-70B-2 Seahawk mid-life update (cancelled)
Phase 4: S-70A-9 Black Hawk replacement (MRH90)
Phase 5A: Medium lift helicopter upgrade (CH-47D)
Phase 5C: Medium lift helicopter replacement (CH-47F)
Phase 6: Sea King replacement (MRH90)
Phase 7: Helicopter aircrew training system (EC135)
Phase 8: Future maritime attack helicopter (MH-60R)

Pre-AIR 9000 projects

AIR 87: Armed reconnaissance helicopter (Tiger)
SEA 1405: S-70B-2 Seahawk FLIR and ESM
SEA 1411: ANZAC ship helicopter (Seasprite)

Post-AIR 9000 projects

LAND 4502: Rapid procurement of additional CH-47F
LAND 4507: MRH90 rapid replacement project (UH-60M)
SEA 9100: Improved embarked logistics support helicopter (additional MH-60R absorbing maritime support helicopter role)

Over late 2005/early 2006, Defence developed two parallel business cases for the procurement of either more Taipans or a separate fleet of S-70M for Phase 4 (Black Hawk replacement) and Phase 6 (Sea King replacement). Based in large part on rationalising Defence's fleet of helicopters, a key plank in the ADF Helicopter Master Plan, Defence recommended the purchase of a further 34 Taipans, which was agreed by government in April 2006 at an additional cost of $2.565 billion. This brought the total number of Taipans on order to 46 – a 47th aircraft was added to the contract in 2013 at no cost as an offset against contract delays.

The NH90

The acronym NH90 is derived from an ambitious multi-national European program launched in the 1980s to design, build and deliver a common NATO Helicopter for the 1990s. The NH90 is manufactured by a consortium of four European aerospace companies operating as NHI (NATO Helicopter Industries). It is available in two parent variants: as a tactical transport helicopter – optimised for over land battlefield transport; or as the NATO frigate helicopter – optimised for maritime anti-submarine and anti-surface warfare. Both share a common fuselage, flight controls and general layout. The Taipan was an Australianised version of the German Army's NH90 tactical transport helicopter variant.

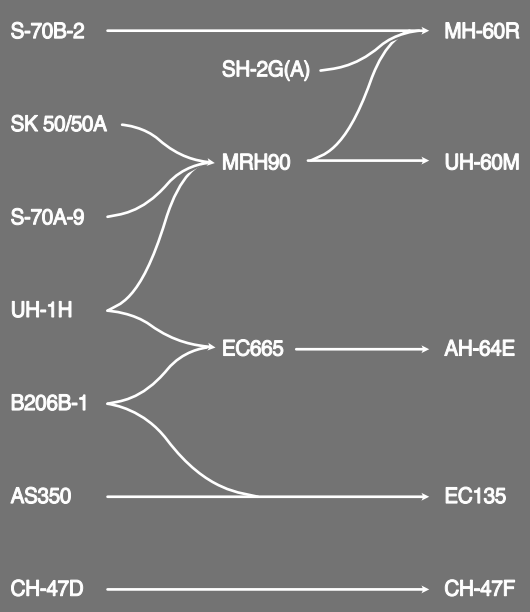
The NH90 is a conventional twin-engine helicopter with a maximum take-off weight of 10,600 kilos. It has a large, composite fuselage capable of accommodating up to 20 troops in crashworthy seats with two sliding side doors and a tail ramp. The 16.3 metre diameter main rotor (four composite blades rotating anticlockwise viewed from above) is powered by either two RTM 322 or two GE T700 turboshaft jet engines (the most common engine choice is the RTM 322, which is what powered the Taipan) and controlled via a quadruplex fly-by-wire flight control system (the NH90 was first operational helicopter to be fully fly-by-wire). It is equipped with a modern, night vision compatible glass cockpit with advanced, integrated avionics and the TopOwl helmet mounted sight and display system.

The NH90 maiden flight took place at Eurocopter's Marignane production facility in France in December 1995. The first customer

ADF helicopter fleet in 2000

S-70B-2 Seahawk:	16
SH-2G(A) Seasprite:	(11)
Sea King Mk 50/50A:	7
S-70A-9 Black Hawk:	36
UH-1H Iroquois:	21
EC665 Tiger:	(22)
B206B-1 Kiowa:	41
AS350B Squirrel:	23
CH-47D Chinook:	5
In service:	**149** (+33)
Number of types:	**9**

ADF helicopter pathway



ADF helicopter fleet in 2026

MH-60R Seahawk:	23 (13)
UH-60M Black Hawk:	17 (23)
EC665 Tiger:	22
AH-64E Apache:	4 (25)
EC135:	15
CH-47F Chinook:	14
In service:	**95** (to be 134)
Number of types:	**6** (to be 5)

Taipan by the numbers

Crew: 2 pilots, 2 aircrewmen

Capacity: 20 seated troops or 12 medevac stretchers; cargo hook: 4,000 kg (8,820 lb); rescue hoist: 270 kg (595 lb)

Length: 16.13 m (52 ft 11 in)

Empty weight: 6,400 kg (14,110 lb)

Max takeoff weight: 10,600 kg (23,369 lb)

Main rotor diameter: 16.3 m (53 ft 6 in)

Main rotor area: 208.699 m^2 (2,246,42 ft^2)

Powerplant: 2 x Rolls-Royce Turbomeca RTM322-01/9 turboshaft engines; each 1,662 kW (2,230 hp)

Maximum speed: 300 km/h (160 kN)

Range: 800 km (430 nm)

Endurance: 5 hours

Service ceiling: 6,000 m (20,000 ft)

Rate of climb: 8 m/s (1,600 ft/min)

deliveries were of the tactical transport variant to the Bundeswehr in December 2006. NHI has delivered 525 NH90s (of both variants) to 14 different countries (although four, including Australia, have either retired or are in the process of retiring their NH90s early) and the fleet has accumulated over 460,000 flying hours worldwide.

Taipan contracts

The initial acquisition contract for 12 Taipans was signed with Australian Aerospace, a wholly owned Eurocopter subsidiary headquartered in Brisbane, in June 2005 for a fixed price of $846 million. The contract negotiations were complicated by the fact the tendered offer was based on a combined Phase 2 and 4 requirement (40 aircraft) and had to be disaggregated to reflect the government approval for just Phase 2 (12 aircraft). The first four aircraft were to be imported complete from Europe with the remainder imported in kit form and assembled in Brisbane by Australian Aerospace (in the same facility assembling Army's Tiger armed reconnaissance helicopters). The first aircraft was to be delivered by December 2007 and all 12 by the end of 2009. These aircraft were to be operated by the 5th Aviation Regiment in Townsville (and allow 12 Black Hawks to be redeployed to form the 6th Aviation Regiment at Holsworthy supporting counter-terrorist operations, an important focus of the updated White Paper).

The initial sustainment contract (covering the first 10 years of operations from 2007 with rolling extension options) was signed with Australian Aerospace in July 2005 for $748 million – it was not linked to the acquisition contract in any meaningful way which was to cause friction as the delivery program encountered issues and became delayed. Australian Aerospace was both the Taipan Authorised Engineering Organisation and a Taipan Approved Maintenance Organisation. A strategic partnering program agreement was also signed with Australian Aerospace in July 2005 for $16 million that had the effect of outsourcing a number of Taipan planning and oversight activities that would normally be performed by the internal Defence Taipan System Program Office to Australian Aerospace.

In June 2006, the acquisition and sustainment contracts and the strategic agreement were amended to include the scope of the now approved Phases 4 and 6, covering an additional 34 Taipans, at a fixed price of $2.1 billion. In October 2006, the contracts were further

***Above**: First flight of the first Taipan, in France, 2007.*

NHI

NHIndustries is a French headquartered SAS (simplified joint-stock) company owned in partnership by Airbus Helicopters, Leonardo, and GKN Fokker Aerospace. It was set up in 1992 as a partnership between (then) Eurocopter (France) (31.25%), Eurocopter (Germany) (31.25%), Agusta (Italy) (32%), and Stork Fokker (the Netherlands) (5.5%). The parent countries provided the initial development funding.

There is an agreed workshare between the four founding companies that applies to both production and sustainment (reflecting the ownership percentages). Airbus Helicopters (France) is the lead partner for the tactical transport variant; Leonardo is the lead partner for the frigate helicopter variant. There are three main NH90 production lines: Marignane in France, Donauwörth in Germany and Cascina Costa in Italy, although final assembly has also taken place in Brisbane, Patria in Finland and Albacete in Spain.

Despite the partnership, Airbus Helicopters and Leonardo remain fierce competitors in the civil and military helicopter market which creates an inherent friction within NHI. The company, and the governing body (the NATO Helicopter Management Agency), are multi-national consensus driven organisations, which adds complexity to decision making and reduces agility in addressing issues quickly – both issues that affected the Australian experience.

amended, at an additional cost of $82 million, to include important Taipan support systems (ground mission management system, software support capability, electronic warfare self-protection system, flight test instrumentation system, and part task training systems). In December 2007, CAE Australia was contracted to provide two level-D, full-flight mission simulators at a fixed price of $181 million.

Due to a range of issues, discussed below, the acquisition and sustainment contracts were further modified through two deeds of agreement. Deed 1 was negotiated to address a range of engineering and technical issues, while deed 2 was negotiated to address reliability and sustainment issues and better link (and incentivise) the sustainment contract with the acquisition contract. Deed 1 was agreed in October 2011. Deed 2 proved more challenging to agree and wasn't finalised until May 2013.

Problems emerge

Given Australia was looking at the program in the early to mid-naughties and the NH90 still wasn't in operational service with any NATO nation (and wouldn't be until 2007), perhaps that should have been the first amber caution. To be fair, at the time the UH-60M was still under development as well, and to meet the Phase 2 timelines the aircraft would have been delivered with the legacy UH-60L cockpit. The US Army's common avionics architecture system fully glass cockpit was not ready and any follow-on orders would have entailed operating a mixed fleet of aircraft with very different cockpits, at least for a reasonably long period of time. The Sikorsky offer was also based on remanufacturing the existing fleet of S-70A-9 Black Hawks, which were relatively low time airframes, to the UH-60M baseline.

From the outset, NH90 program immaturity in Europe created enormous risk for the Taipan project in Australia – much of which was realised over the life of the program. Taipan airworthiness certification was dependent on European certification for the German NH90, which by August 2007 was already delayed. Ultimately, 13 special flying permits were issued in Australia to cover early Taipan acceptance, training and evaluation flying before the Taipan was issued an Australian Military Type Certificate in April 2013 – 52 months later than originally forecast.

The aircraft baseline configuration was also slow to mature. This led to aircraft being accepted in incremental 'product baselines.' While the first four aircraft (assembled in Europe) and the first Australian assembled aircraft were delivered on time, they were in an interim,

Airbus Australia Pacific

Airbus Australia Pacific have had an operating presence in Australia for over 40 years. They have traded as Australian Aerospace, Airbus Group Australia Pacific and Airbus Australia Pacific. The company is a wholly owned subsidiary of Airbus France and is headquartered in Brisbane. It covers Airbus's military and civil product lines, spanning fixed wing, rotary wing and space.

As Australian Aerospace, the company ran two final assembly lines at its Pinkenba site on the southern side of Brisbane airport - one for the Tiger armed reconnaissance helicopter and the other for the MRH90 Taipan. At its peak, Airbus Australia Pacific employed over 1000 workers.

non-compliant ‘product baseline 1’ configuration. The next eight aircraft were accepted in ‘product baseline 2’ configuration and all would require retrofit to the contractually compliant (but still operationally limited) ‘product baseline 3’ configuration (the time taken to retrofit these 13 aircraft to the final product baseline 3 configuration ended up averaging over 400 days per aircraft).

Poor system reliability and spares support restricted early flying operations and would dog the Taipan for the rest of its service life. This impacted aircrew and maintainer training and affected certification activities, the conduct of acceptance testing and operational evaluation. In part, resolving the issue surrounding spares support was hamstrung by workshare agreements set in Europe between the four aerospace companies (and each parent nation) when NHI was formed. This, coupled with internal competition for parts from the NH90 production line, created chronic shortages in critical spares and extended component repair and overhaul timelines (with most major components having to be returned to Europe for repair and overhaul under the workshare agreement). Aircraft deliveries were also affected by this issue, with the 46th aircraft (as well as the 47th) delivered in June 2017, 35 months later than originally contracted (as part of the schedule remediation in deed 2, aircraft 15 and 17 were assembled in Europe, the June 2017 delivery date agreed in deed 2 was achieved).

Equally, as a brand-new design, the European engineering agencies initially, and quite sensibly, set conservative maintenance periodicities that produced high maintenance hours per flight hour. Unfortunately, the program did not mature as quickly as envisioned and the maintenance periodicities were slow to be extended, significantly driving up the cost of ownership and generating prolonged maintenance downtime across the fleet. Ultimately, the Australian Strategic Policy Institute calculated that the Taipan was costing $50,000 per hour to operate; an unsustainable outcome in the long-term.

In April 2010, a Taipan suffered an inflight engine failure 30 minutes out of RAAF Base Edinburgh. While the aircraft was safely recovered to Edinburgh, the incident led to the first fleet-wide grounding of the type - then Lieutenant Commander Paul Hannigan (who would go on to command both 808 Squadron and HMAS *Albatross*), was the aircraft captain on this flight; his story of this incident is on page 6 (a second inflight engine failure occurred during an Army night training flight in March 2023 that resulted in the aircraft ditching in Jervis Bay, fortunately without loss of life). The grounding was lifted after four months as the cause of the engine failure emerged (uneven engine cooling after a normal post-flight shutdown followed by a restart within three hours allowed compressor blade rub on the casing, leading to an engine failure). However, this incident, together with a range of persistent technical issues, subsequently led to the suspension of aircraft deliveries from Australian Aerospace in November 2010.

Above: *An 808 Squadron Taipan over flying Cann River in Gippsland as part of Operation Bushfire Assist 19-20, January 2020 [Navy image].*

An independent Defence ‘gate review’ of the project in February 2011 found multiple issues with the project and made a number of significant recommendations. As a result of the gate review, AIR 9000 Phase 2/4/6 was added to the ‘Projects of Concern’ list by the Minister for Defence Materiel in April 2011 – it would remain a project of concern until the project, which was still running, was cancelled in 2023 as the Taipan was removed from service. The two deeds that were negotiated with Australian Aerospace to improve contract performance and address technical issues were a direct result of the gate review. Aircraft deliveries restarted in October 2011 after Australian Aerospace signed deed 1.

Aircraft deliveries were suspended again in February 2012 for five months as an issue with the aircraft’s cargo hook emerged. This issue, discovered during the initial first of class flight trials conducted by Navy with HMAS *Manoora* in 2009 and reconfirmed during first of class flight trials with HMAS *Choules* in 2012, centred on the compatibility of the cargo hook with the rigid strop used by Navy to make vertical replenishment at sea safer for deck crews. The hook bight was too shallow to accommodate the rigid strop and required a complete redesign of the hook that still was not completely resolved by the time Navy stopped using the aircraft.

Early Navy trials also highlighted corrosion issues with the aircraft which were surprising given the predominately composite nature of the aircraft’s structure. A study conducted by Navy in 2009 found that many of the aircraft’s metal components were poorly protected

Above: *HMAS Adelaide's embarked Taipan conducts a VERTREP from HMAS Supply during Operation Tonga Assist, January 2022 [LSCSO Rye Huckel].*

against corrosion and degraded quickly in the maritime environment. While protective procedures were developed to manage this issue, they also added to the maintenance burden at sea.

Another issue to affect Navy operations arose during the first of class flight trials in the *Canberra* class amphibious ships (introduced from 2016). While the Taipan was a stable and manoeuvrable aircraft over the deck, and the ship/helicopter operating envelopes were impressively large, the aircraft could experience significant blade sail while starting and stopping the rotors (the *Canberra* class has an aircraft carrier flight deck 53 feet above the water line with steep slab sides that exacerbated this trait). Ultimately, wind across the deck was limited to 45 knots during rotor starting and stopping.

Army still had a number of issues that needed to be resolved before the Taipan could be a fully effective battlefield helicopter and support special operations, including issues with TopOwl performance, the placement of the gun in the side doors (as well as the design of the gun mount), the design of the sniper bar, the design of the fast roping and rappelling device, the width of the cabin seats (too narrow for soldiers wearing standard webbing), low ground clearance, an infra-red search light that could be seen in the visible light spectrum and the performance of the electronic warfare self-protection system. Frustratingly, many of these issues were still unresolved by the time the Taipan was withdrawn from service.

Navy operating the Taipan

Despite the issues Navy experienced, the Taipan was an effective maritime support helicopter, well-liked by the crews flying and maintaining them. The maritime support helicopter primary role, in both peace and war, is to be the logistics connector between ships at sea, and ships and the shore, or, as it has sometimes been called, delivering 'padres and potatoes.'

The primary method of moving stores between ships at sea is to under-sling them by helicopter from flight deck to flight deck while the ships steam in company (called vertical replenishment or VERTREP). Stores are typically built up in pallets with a load weight of around 2,000 pounds per pallet. The pallets are then rigged for external load lifting by placing them in a cargo net and attaching a rigid strop. On ships other than dedicated replenishment ships (such as the *Supply* class), the pallets are generally prepared by the flight, led by the aircrewmen - ship staff will normally prepare the loads on the replenishment ships. A typical replenishment at sea will have the receiving ship alongside the supplying ship as liquid stores are transferred by hoses connected between the ships. At the same time, the replenishment of solid stores is done by VERTREP. It is not unusual for over 100 pallets to be lifted from the supplying ship to the receiving ship as part of this process (with the empty pallets, nets and strops VERTREPed back as an external load in groups of 10 to 15 or so).

As ships might also need some unique parts transferred from time-to-time that are unsuitable for using the standard 2,000 pound pallet arrangement, Navy operates an exclusion based approach to lifting external loads. This allows Navy crews, with the appropriate training, to assess and rig loads on a case-by-case basis apart from some specific items that are listed not to be externally load lifted (ie; excluded from aerial delivery). The broader Defence approach is an inclusive approach, where the *only* loads that can be lifted are those approved (and included on the list of approved loads together with how they are to be rigged) by the Air Force's Air Mobility Training and Development Unit. The exclusion approach allows Navy to respond quickly to emerging demands - perhaps the most famous case being the Defence response to the 1994 Sydney bushfires where Navy helicopters were able to deploy quickly and use under-slung water buckets (sourced from commercial operators) to attack the fires threatening Sydney and surrounds while Army helicopters could not as the water buckets were not an AMTDU approved load.

Personnel are also transferred between ships, preferably by landing on the flight deck of both ships. Where this is not possible, winch transfers are done. Search and rescue, and medical evacuation, round out the maritime support helicopter roles and the Taipan was particularly well suited in meeting these requirements.

All Navy helicopters also perform a range of secondary roles and the Taipan was no exception. Many of these roles relate to Defence aid to the civil community, especially disaster relief and humanitarian assistance. With its large cabin, precise handling, and high capacity winch and cargo hook, Navy Taipans made a significant contribution to several major domestic and international disaster relief and support missions.

Flying the Taipan

Lieutenant Commander Steve Brown is one of the Fleet Air Arm's most experienced Taipan pilots and flying instructors; here's his view on flying the aircraft:

"Having accumulated more than 6,000 flying hours across a range of military and civilian helicopters, including the Gazelle, Lynx Mk 7, Sea King Mk 4, Sea King Mk 50, EC135 and limited experience on the MH-60R Seahawk Romeo, I regard the Taipan as the most capable helicopter I have flown.

The Taipan represented a significant step forward in rotary-wing aviation. Its fly-by-wire flight control system, advanced avionics, digital cockpit and highly integrated aircraft systems provided a level of capability and crew support well beyond that of previous generation helicopters. While the Taipan's introduction into service was not without its challenges, its performance in the air consistently demonstrated the potential of a modern, digitally integrated helicopter.

From a handling perspective, the Taipan was an exceptionally stable and precise aircraft. The fly-by-wire system reduced pilot workload while providing handling qualities that inspired confidence in both routine and demanding flight regimes. Despite its size and lift capacity, the aircraft remained agile and responsive, allowing it to perform effectively across a broad range of operational tasks. Once airborne, it was evident that this was a helicopter designed around capability, safety and mission effectiveness.

Throughout approximately 1,600 flying hours on type, I operated the Taipan in training, evaluation and operational roles. One of the most significant developments during this period was the introduction and maturation of operations using night vision devices within the Fleet Air

Above*: Practicing landing in dusty conditions, September 2012 [LAC David Cotton].*

Torque split, call Nr!

Captain Paul Hannigan, RAN

I was the aircraft captain of the Taipan that had the first engine failure back in 2010.

I do remember we were about 80 nautical miles north-east of RAAF Base Edinburgh enroute to Broken Hill for our first planned refuel in the transit of the aircraft back to Townsville over a couple of days. I was in the left hand seat navigating with a paper chart as in the early days the digital map generator was not cleared for navigation. My copilot in the right hand seat had engaged the 4-axis autopilot (pitch, roll, yaw and altitude) and was sat hands-off enjoying the view like me. We were full of fuel and had six maintainers, their kit and a bunch of maintenance gear loaded in to the back of the aircraft – on launch we would have been fairly close to the aircraft's maximum take-off weight (10,600 kilos) as we departed using a running take-off. We were cruising along at about 140 knots (pretty good for a helicopter) and 3000 feet.

Out of the blue, the left hand engine just let go, yawing the aircraft violently and inducing a significant pitch nose down – I remember seeing the windscreen full of paddocks – no sky! I had never seen my offsider move so quickly in the years we had been working and flying together (he was pretty laid back and chill for an Army Aviation Major and qualified flying instructor – a former Air Force F-111 technician who spent his formative years cleaning out F-111 fuel cells). I still chuckle to myself today when I relive that moment and see him grasping for the cyclic, collective and yaw pedals with a look on his face that probably mirrored mine! It really was a 'holy f**k' moment! There was no doubt we had RECOGNISED something had gone wrong.

As my trusty copilot fought to CONTROL the aircraft whilst establishing a SAFE FLIGHT condition, I was faced with the task of CONTAINING the malfunction – doing the 'bold face' immediate actions in the checklist – CHECKING FOR DANGEROUS INDICATIONS and DIAGNOSING what had happened. But here was the challenge – the Taipan was not the trusty analogue steed the Sea King was for me and I found myself quickly overloaded with all the captions, bells and whistles this digital, glass cockpit machine was capable of giving me. Where was that simple Sea King triple taco that would tell me what my engines and rotor speed (Nr) were doing? I saw a fire warning and as I started the immediate action drill for engine fire the indication disappeared leaving me with a number of warnings and cautions that I now needed to decipher. I really did feel that it was all happening around me – very different to being in that controlled, safe space the simulator provides for emergency handling checks. What the simulator can't ever simulate is that 'holy f**k we're going to die' moment where the adrenalin courses through your body and your amygdala hijacks your actions whilst it decides on whether this is a FIGHT, FLIGHT or FREEZE survival moment.

There was no real doubt we had an engine failure but was it on fire? The fire warning had come and gone and I was now faced with a 'Christmas tree' of warnings and cautions. I set about the immediate actions for engine failure with my heart beating out of my chest. After what seemed like an age, we had the aircraft and malfunction under control. I should just add that when I checked on the maintenance team in the back they all looked pretty concerned and were very quiet. Unlike the Sea King flight reference cards, which dictate the aircraft should LAND AS SOON AS POSSIBLE after an engine failure (ie; pick a field), the Taipan emergency checklist had a more relaxed approach, requiring the aircraft LAND AS SOON AS PRACTICABLE, which kind of went against the grain for a former Commando Sea King guy who would by now be looking for a paddock to land in. Consequently, we decided as a crew that we would fly the 80 miles back to RAAF Edinburgh where we would have a nice long runway and a few fire engines to meet us. This was undoubtedly the right decision as we were still very heavy (yes we could have ditched fuel but what an environmental catastrophe that would be!) and we didn't want to risk a roll over on landing in a paddock miles from anywhere. Every minute thereafter I remember my anxiety about why had the engine failed and would the remaining engine also fail? During the cruise back to RAAF Edinburgh I also remember looking at the fuel management panel almost at the same time as my copilot and noticing I had missed closing the fuel shut-off valve to the failed engine as part of the immediate actions - the copilot, now having reverted to his laid back, chilled demeanour, casually leaned forward and closed it for me - I still chastise myself for missing that to this day!

The 80 mile transit back to RAAF Edinburgh was done pretty much in silence as we contemplated the single engine running landing that we must execute flawlessly if we were to walk away from this experience. What I haven't mentioned is that the Taipan's fully automated digital engine control (FADEC) system was awesome and did exactly what it said on the tin, and all that despite the pilots. When the engine failed, the FADEC system immediately spun the good engine up to take the load and maintain Nr – we pilots didn't need to do anything. The other point of note is that those RTM322 engines pushed out 2400 shaft horse power per engine, almost 50 percent more than the Sea King's old trusty Gnome engines that I knew and loved. So what? Well, when we established ourselves on final to the longest runway at RAAF Edinburgh in our broken but still very capable Taipan, with the copilot flying a text book single engine approach and me monitoring the power and ground speed, I thought we might get very close to running out of power but that turned out to be nowhere near the case at all – the single RTM322 had more than enough power to ensure that we kissed onto the runway with a huge power margin that surprised both the old Sea King pilot and the old Black Hawk copilot who had found themselves to be on the receiving end of the very first Taipan RTM322 engine failure. The big breath that the six maintainers in the rear cabin had been holding was suddenly expelled as us pilots fist-bumped and smiled at each other with some relief as we taxied clear of the main runway with a convoy of fire trucks and emergency vehicles in trail.

The aircraft remained at RAAF Edinburgh for months whilst the investigation was underway, eventually establishing that asymmetric cooling of the compressor shaft led to thermal bowing and consequent 2nd stage compressor tip rub, fracture and eventual failure. I was subsequently corrected by engineers on a number of occasions when referring to the engine failure as 'catastrophic' because those fractured compressor blades were retained inside the engine compartment and didn't penetrate the engine cowling. In fact it was a fractured compressor blade being ingested through the engine in the first instance that gave me the initial fire warning which subsequently disappeared. I will still argue to this day, from a pilot's perspective, the engine failed catastrophically – there was no way it was going to produce power to maintain Nr and that is all a helicopter pilot should really ever care about. The fact that NHI initially tried to blame us pilots for the engine failure is an entirely different story.

***Background**: HMAS Adelaide's embarked Taipan delivers aid to Atata Island during Operation Tonga Assist, January 2022 [LSIS David Cox].*

Arm. Initial training was conducted using ANVIS goggles before later transitioning to the TopOwl helmet mounted sight and display. Pilots and aircrewmen were trained from the ground up in night vision operations, establishing a capability that significantly enhanced operational effectiveness in the maritime environment. The program was conducted without incident, reflecting both the professionalism of the instructors and the commitment of those undertaking the training.

As with many complex and highly computerised aircraft introduced during the early twenty-first century, the Taipan was not without design shortcomings. During the early years of service, aircrew occasionally encountered software anomalies, system faults and unexplained glitches. These issues were often less mechanical than digital in nature and reflected the increasing dependence on integrated avionics and software-driven systems. On more than one occasion, the solution seemed akin to the aviation equivalent of ‘control-alt-delete,’ with a reset restoring normal functionality.

The flight management system was another area that generated mixed opinions among operators. It was undoubtedly capable, providing extensive navigation and mission-management functionality, but it was not always intuitive to use. Mastery required experience and familiarity rather than instinct. At times it seemed that pilots had to adapt their thinking to the logic of the system, rather than the system adapting to the operational requirements of the pilot. Nevertheless, once understood, it became a powerful tool that contributed significantly to the aircraft's overall capability.

Another issue that emerged during the aircraft's early operational life involved GPS alignment and navigation-system accuracy. This was not initially recognised as a major concern until embarked operations commenced. Aircraft aligned to a ship's position could experience navigation discrepancies when the ship had moved significantly overnight. What appeared acceptable in a static shore environment became much more apparent when operating from a constantly moving maritime platform. These experiences highlighted the unique challenges of introducing a sophisticated digital aircraft into the naval environment and reinforced the importance of operational testing at sea.

Where the Taipan truly distinguished itself was during operational support to humanitarian assistance and disaster relief missions. During Operations *Fiji Assist*, *Vanuatu Assist, Tonga Assist, Bushfire Assist 19-20* and *Queensland Flood Assist*, the aircraft's capabilities were consistently demonstrated in demanding real-world conditions. Its combination of payload, cabin volume, range and modern avionics made it ideally suited to moving personnel, emergency responders, medical equipment and relief supplies into affected areas. In environments where infrastructure had been damaged and communities isolated, the aircraft proved both effective and reliable.

These operations showcased the Taipan at its best. For those who flew and supported it, the aircraft demonstrated a level of capability and operability that was difficult to match. Its ability to sustain operations while carrying substantial loads over significant distances made it a valuable asset during humanitarian crises and highlighted the practical benefits of its modern design.

The Taipan also proved itself during environmental training and operations across some of Australia's most demanding conditions. In the Northern Territory, the aircraft performed particularly well during dust landing training around Darwin, where degraded visual environments presented significant challenges to both pilots and aircrew. The combination of the aircraft's flight-control systems, cockpit displays and crew procedures provided an excellent platform from which to develop and refine these skills. Equally memorable was the opportunity to many Fleet Air Arm pilots and aircrewmen to their first aviation operations in snow-covered environments. For a generation of naval aviators whose experience had largely been confined to maritime and tropical conditions, these deployments provided valuable operational experience and further demonstrated the aircraft's adaptability across a wide range of climates and operating environments.

Viewed within the broader history of naval aviation, the Taipan represented an important step in the evolution of military helicopter operations. It bridged the gap between the analogue aircraft that had served previous generations and the highly integrated digital platforms that define contemporary aviation. While not a perfect aircraft, it introduced technologies, operating concepts and capabilities that would become standard in future generations of military helicopters.

My lasting impression of the Taipan remains overwhelmingly positive. No aircraft is without flaws, and the Taipan certainly presented challenges during its introduction and maturation. However, when judged on its handling qualities, operational utility, lift capability, advanced flight-control systems and overall performance, it stands apart from any other helicopter I have flown. Whether operating from ships at sea, conducting humanitarian assistance and disaster relief missions, training in the dust of northern Australia, or introducing crews to flight operations in snow-covered terrain, the Taipan consistently demonstrated its versatility and capability. Despite its imperfections, it remains, in my experience, the most capable helicopter of my flying career and an important chapter in the history of our Fleet Air Arm.”

Maintaining the Taipan

Warrant Officer ATV Chris ‘Haggis’ Hagedoorn was one of the Fleet Air Arm’s most experienced Taipan maintainers; here’s his view on keeping the Taipan airborne:

“Having a background of maintaining analog aircraft with a paper based publication system, I was thrilled to be selected to complete maintainer training on the NH90 in France. The training consisted of classroom theory and was consolidated by becoming familiar with the physical aircraft. At the time I remember the emphasis on the aircraft’s low maintenance hours to flying hours. It turned out naive of me to think this at the time. The French, however, expected, and intended to operate their NH90s in this manner. An example of this maintenance program was a before flight servicing with a periodicity of every 14 airframe hours or 7 days, where basically all it was was levels and pressures checked, with no major panels being opened. This all changed when Australian Aerospace and the ADF took responsibility of the airframe.

On return to Australia, I was posted to the 5th Aviation Regiment in Townsville. We slowly took acceptance of multiple aircraft while building our maintainer workforce. It seemed a perfect world, with Army and Navy involved in this capability together, although obviously Army was the larger stakeholder. Operating the same platform across two services has its challenges with Army looking at everything from a land based operating environment and Navy, obviously, skewed towards all things in the maritime environment.

Sadly our IETP (interactive electronic technical publications) were in their infancy. Every maintenance process would be marred by incomplete or no information. An EAR (engineering advice request) would be raised and sent to Australian Aerospace, who, in turn, routinely sent it on to NHI for answers. It was slow and frustrating to complete maintenance in these early days.

***Above**: HMAS Success’s embarked Taipan winches a sailor to the casing of HMAS Collins, April 2019 [LSIS Jake Badior].*

Over these first few years, we slowly developed our processes and continued to grow our workforce. It was starting to become evident that maintenance was not only referenced from the IETP, but maintainers also had to scroll through EAR responses and the inevitable additional special technical instructions delivered by NHI to make sure all the maintenance requirements were captured. I have so much respect for our maintainers during these times as they really had to have their heads on a swivel with understanding the complete, complex and sometimes conflicting technical documentary landscape before even swinging a spanner.

Whilst working with the Army we conducted first of class flight trials in preparation for embarked operations. This is where more issues were raised. Here we were taking a land based airframe and trying to fit it into a maritime environment. Once again, Navy maintainers worked tirelessly to adapt the aircraft to this environment. We worked with Australian Aerospace and NHI to develop salt laden environment servicings in order to protect the airframe during maritime operations.

As end users of this capability grew in Australia, it became increasingly evident that in addition to the quality and quantity of additional maintenance information, there was also a shortage of spares required to complete servicings. It is my opinion only, but I believe that the original contract for spares was never sufficient enough to fulfil capability requirements.

By now the Taipan was being flown from Brisbane, Oakey, Nowra and Townsville with all the operating bases competing for the required spares. It got so critical that weekly online meeting were held to determine who would get what as required for operations. We determined in order to hold logistics to account, we would limit the use of carried forward unserviceabilities. This had profound effects when they realised that aircraft would remain hard down until spares arrived.

In addition to the ongoing shortage of spares, the aircraft were also going through a regime of software upgrades. This added to maintenance complexity as you now had to be aware of what level of software each tail number was at in order to obtain the spares with aligned software status.

CAMM2 , a computer based aviation maintenance program, was where maintenance was tracked, completed and reflected for everyone to see. It also tracked the software status of each airframe at the time. This program was an established Defence tool used across multiple military aircraft types. CAMM2 is very reliant of maintainer data input and continually required assessment. This being said, the Taipan capability had the option of using the NHI program called GLIMS (ground logistic information management system). Once again in my opinion, this program was better suited for use with the Australian variant of the NH90 as it was purpose built for this airframe. GLIMS is an advanced asset and maintenance management software system developed by Leonardo specifically for the NH90 fleet. It supports fleet maintainers by analysing flight data, tracking component health, and optimising preventative maintenance planning.

As the years progressed, we embarked the aircraft into many ships. With embarkation came further difficulty and additional maintenance to land operations, especially to prevent deterioration of the airframe in a salt laden environment. Further to this, it was determined that deck landings increased wear on the airframe, so in addition to counting normal landings, a ‘K’ factor was added to deck landings that impacted embarked servicings. An example would be that one deck landing was worth multiple shore landings. This K factor addition also resulted in fewer landings prior to major undercarriage servicing – not something that is easy to do at sea with the ship required to maintain within suitable pitch and roll limits for undercarriage maintenance. The one bonus to being embarked was that flights were given priority for spares amongst all Taipan operators. This often was a matter of robbing Peter to pay Paul, as a well worded URDEF (urgent defect notice), would almost be guaranteed to lead to cannibalisation of an aircraft ashore in order to support the embarked flight.

I still believe and saw the Taipan as a great capability let down by a poor logistical pipeline. This airframe proved itself resilient over many operations through the extreme hard work of maintainers and operators alike. I would suggest that people with negative thoughts regarding this aircraft, talk to the maintainers who actually worked on it – I do believe that, as frustrating as the process could be, the maintainers, for the majority, loved the platform. I would also suggest that across all complex Defence aviation platforms, maintenance hours far exceed flying hours.”

TopOwl Helmet Mounted Sight and Display

Helmet mounted sight and display systems have been around since the 1980s. Essentially, they consist of three main elements: a helmet that provides the wearer with protection and audio and voice connection to the aircraft while also serving as a mounting platform for head-worn accessories; relay optics that transfer imagery and symbology to the eye (that can be either monocular - providing the image to just one eye, or binocular - providing the image to both eyes); and a head tracker.

The Taipan (and Tiger) were equipped with the Thales TopOwl helmet-mounted sight and display. On the Taipan, this integrated ‘see-through’ system projected flight symbology, aircraft forward looking infra red (slaved to the pilot’s head movement) or night vision from image intensifier tubes mounted on the side of the helmet onto a lens in front of the pilot’s eyes with a 40° field of view while allowing the pilot to see through the projected image to the real world outside. This is different to ‘direct-view’ devices, such as night vision goggles, where what the pilot sees is the enhanced view alone (with flight symbology overlaid depending on the application) looking directly through the image intensifier tubes - it is difficult to ‘look around’ the image intensifier tubes to see the instrument panel or take advantage of any peripheral cues that may be present outside the enhanced field of view.

The development of these systems has two points of origin: the first was the development of night vision systems for pilots, which began in the 1950s; and second was the development of integrated helmet cueing systems or head tracking, which began in the 1960s, primarily as a way to aim weapons off boresight.

After initially looking at infrared to enhance night vision in the 1950s, in the 1960s technology emerged that amplified the light available at night (effectively through electron multiplication). By the 1970s, this ‘image intensifier’ technology had been refined to be practicable to wear attached to a pilot’s helmet. This technology has continued to improve, but is still limited by its relatively narrow field of view (imagine looking through a pair of zero magnification binoculars). Mounting the image intensifier tubes on the front of the helmet also upsets the balance of the helmet (even with the battery velcroed to the back), which can lead to crew fatigue and neck strain.

In the 1990s, in an effort to better integrate image intensifier tubes with pilot helmets, experiments began mounting the tubes on the side of the helmet with the image then projected onto a see through lens in front of the pilot’s eyes. In the US, the results of these experiments were considered unacceptable, in Europe the results were considered promising. The principal issue with mounting the tubes on the side of the helmet is an effect called hyperstereopsis. Humans have evolved with binocular vision that is good at judging distance. In adult humans, the centre of our pupils are around 65mm apart (give or take a few mm either way). Part of the way we judge distance is by sensing (unconsciously) how much our eyeballs have to ‘angle in’ or converge to focus on an object. Placing the image intensifier tubes on the side of the helmet is the equivalent to quadrupling the apparent distance between our eyeballs, which increases the convergence and makes our brains think the image is much closer than it really is. This is a powerful effect at first but the system relies on our brains adapting, which, amazingly, they do.

Head tracking can be achieved through a variety of methods including optical systems (typically based on infrared emitters on the helmet), electromagnetic, sonic (using ultrasound) or inertial. In most applications a hybrid approach is employed, combining two or more tracking methods. In helicopter applications, one of the first helmet cueing systems to reach operational maturity was the Honeywell integrated helmet and display sight system, with early demonstration flights taking place in the mid 1980s (and is still used in Apache). It uses an electro-optic head tracking system, allowing the main gun, or the forward looking infrared, to be slaved to the pilot’s head motion - where the pilot looks, the weapon or sensor is aimed. TopOwl, which emerged in the early 2000s, has a similar head tracking system, allowing (in the Taipan) the nose mounted forward looking infrared sensor to be slaved to the pilot’s head movement (in the Tiger, the gun can also be slaved to the pilot’s head movement).

Inside Australian Aerospace

David Prest is an aviation historian and author. He was one of the co-authors of the recently released book on our A-4 Skyhawks. David was hired by Australian Aerospace, with one other, in 2006 to write a corrosion control manual for the Caribou. After that, he worked in the Caribou continuing airworthiness section until transferring over to the Taipan section when a crash in PNG caused the Caribou to be retired early. This is his story:

"I worked in the continuing airworthiness section for the Taipan for approximately 18 months from 2008, and my part of the story only deals with that period and may not be applicable after that. I left Australian Aerospace of my own accord in 2010.

The contracts written for support of the Taipan (and the Tiger) were, in my opinion, grossly deficient and based on the mistaken premise that Australian Aerospace, as a wholly-owned subsidiary of Eurocopter, would have full access to the design data. This was not so. The contracts were not specific enough and included a requirement for an Australian Military Type Certificate which automatically meant that all Eurocopter NH90 in-service documentation was unapproved for our aircraft. The contracts regrettably did not acknowledge this.

The Taipan was assembled [and then maintained] in a hangar complex separate to Australian Aerospace's main technical building. The hangar complex was located inside the Brisbane Airport boundary, but on the opposite (southern) side to the main terminals. The continuing airworthiness section, that is the technical side of keeping the aircraft flying, was located in the main technical building over the road from the hangar complex and outside of the airport boundary (in the Brisbane suburb of Pinkenba).

Taipan assembly was underway for the whole time I was at Australian Aerospace. Completely broken down Taipan kits would come out from Europe for assembly at Pinkenba and, once complete, the aircraft would be towed at night to the main hangar for test flying and acceptance. It was not uncommon for the kits to be short of parts, resulting in the robbing of parts from a number of kits to make up a complete kit. After some time, a team was sent to France to receive the kits before they were shipped, perform a parts inventory and then, if needed, rob parts from the main production line to ensure that only complete kits were sent to Australia.

While I was there, none of the Taipan continuing airworthiness staff were offered any NH90 training courses to build our knowledge and so had to rely on incomplete maintenance manuals for information. We were not permitted access to assembly drawings but there was an Australian Aerospace field representative with the Army at Townsville we could access for information. If our representative in Townsville couldn't help us, queries had to be sent to France. If we wanted to see an aircraft to gain some knowledge, we could, after gaining approval, view aircraft on the assembly line, but it was well less than an ideal arrangement.

Complicating the picture at the time were the varying manufacturing standards evident in the kits from the different European manufacturers and the Australian standard. A good example of this was the safety standard associated with bolt thread protrusion. In Australia, the standard was two complete threads for safety but the Italian made parts only had a little more than one thread protrusion.

The technical publications were also pretty deficient in those early days. Any change to the publications had to be devised in Australia, then sent to France for approval with an interim amendment received and a formal amendment being introduced into the electronic manuals at some time. Even for relatively simple things, such as how to reinstall a panel, the turn around time from France could take over seven days. Meanwhile, aircraft sat on the ground and frustration built.

In my time, the Taipan section had a high turnover of staff. Australian Aerospace also had an interesting composition of staff with lots of French engineers, a smattering of Italian and German engineers and a range of ex-Defence personnel. I commuted from the Gold Coast and typically worked from 0600 - 1500 to avoid the worst of Brisbane traffic, which in the end just stopped making sense to me."

The demise of the Taipan

The early retirement of the Taipan from Navy and Army was not due to a single factor but rather a combination of issues, both related to the Taipan capability and external to it. While the Taipan was in many respects an ideal platform for the roles envisioned, it was hampered by some significant issues. The program was far more immature at the time Australia committed to it than was understood. The problems with the aircraft were many and were slow to be satisfactorily resolved. Supply chain issues led to poor availability, compounding the complexity of maintaining the aircraft and increasing the maintenance hours per flight hour.

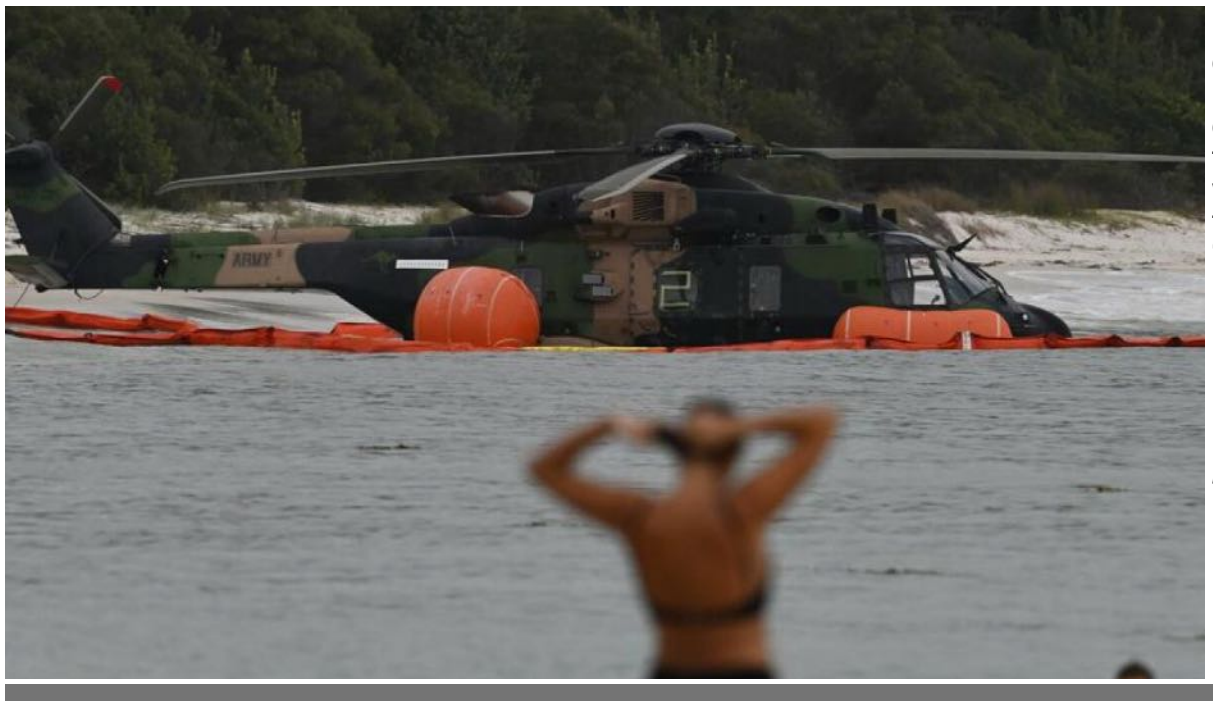
There can be no doubt it was also an expensive aircraft to own. In 2019-20, the government approved annual sustainment budget for the Taipan fleet was $255 million. That year, Defence planned to fly 9670 hours across the Taipan fleet; it achieved 5168.4, an under-fly of 46 percent. That equates to $49,000 per flying hour (this is a very crude and simplistic analysis but it illustrates the point). In 2020-21 the approved annual sustainment budget was $285 million against a planned 7950 annual flying hours; Defence achieved 5400, an under-fly of 28 percent. That works out at a high level cost per flying hour of $53,000. Not only is $50,000 or more per flying hour unsustainable, the cost was heading in the wrong direction.

Externally, in 2020 the government initiated the Defence Strategic Review, culminating with the release of the 2020 Force Structure Plan. With a focus on lifting the lethality of the ADF, the Plan foreshadowed increasing the number of maritime combat helicopter flights at sea from eight to 14. This led to project SEA 9100, that would increase the number of MH-60R Seahawks from 24 to 36, absorbing the Taipan's maritime helicopter support role in the process. With this $2 billion project approved by government in March 2022, Navy handed back its Taipans to Army in April 2022.

Following Navy's lead, Army then sought to replace the Taipan through an accelerated purchase of 40 UH-60M Black Hawks. Government approved this project (LAND 4507) in January 2023 at a cost of $2.8 billion with an expectation that the Taipan would be withdrawn from service by the end of 2024. The crash of A40-040 off Lindeman Island on the evening of 28 July 2023, in which sadly all four crewmembers perished, grounded the fleet again and a decision was made to bring forward the planned withdrawal date of the fleet to the end of 2023, without the fleet ever returning to flying status (you can read a précis of the accident investigation report in the December 2025 Slipstream here).

It was such an ignominious end to Defence's Taipan chapter for an aircraft with so much potential. As part of the disposal process, Defence sought buyers for the aircraft in the international market place; none were forthcoming. Defence contemplated donating the aircraft to Ukraine, but noting the aircraft's complexity and logistic requirements (far more complex than the Ukraine's transition to the F-16, which is a well supported type in Europe and still took over two years), this option was not pursued. In the end the aircraft were harvested for critical components to support the international NH90 user community and the remaining hulks were disposed of.

On a more positive note, the Fleet Air Arm Museum has been gifted a Taipan helicopter for display with the aircraft expected to arrive in Nowra in later in 2026. Hopefully it will be on display by the end of 2026 as a fitting reminder of the incredible effort of the aircrew and maintainers who toiled so hard to make the capability work and faithfully lived up to 808 Squadron's motto "strength in unity."



***Left**: Army Taipan A40-025 after being towed to shallow water following an engine failure in the hover at night over Jervis Bay, March 2023. The picture illustrates the highly effective flotation gear fitted to the Taipan. All crew and passengers survived. This accident happened four months before the fatal Taipan ditching off Lindeman Island in July. Of note, the Seahawk Romeo is not equipped with flotation devices.*

Tragedy in the dark

What happened on the night of 28 July 2023 that took the lives of four Army aviators in a Taipan crash off Lindeman Island?

On the night of 28 July 2023, four Taipans assigned to the Army's 6th Aviation Regiment were operating out of Proserpine Airport in Queensland as part of Exercise *Talisman Sabre.* At a little after 10pm, the Taipans departed the airport to conduct a ground force pick up from Lindeman Island. Twenty-two minutes later, one of the four aircraft crashed out of formation into the sea, fatally injuring all four crewmembers.

This tragic accident is of interest to our community for at least three reasons:

- there is a cadre of Navy aircrew and maintainers who operated the Taipan on 808 Squadron over the period 2013 to 2022;
- the accident happened at night, overwater, from low-level – the Fleet Air Arm's natural operating environment; and
- there is also a cadre of Navy aircrew who flew Wessex and Sea Kings in formation at low level at night overwater on very similar mission profiles throughout the 1980s under the auspices of Operation *Bursa*.

The accident is the subject of five separate but overlapping investigations or inquiries: an aviation safety investigation by the Defence Flight Safety Bureau; a coronial investigation by the Queensland Coroner; a Senate inquiry by the Legal and Constitutional Affairs References Committee; an investigation into the four workplace fatalities by Comcare; and an independent inquiry by the Inspector General of the ADF. The Defence Flight Safety Bureau released its investigation report into this tragic accident in May 2025. The report and enclosures (with some minor redactions) are available **here**. The Legal and Constitutional Affairs References Committee inquiry report was tabled in the Senate in September 2026; it is available in full **here**. The Comcare investigation report is subject to public interest immunity but the Senate compelled the release of elements of the report which can be viewed **here**. The Queensland Coroner and the IGADF are yet to publicly report their investigation and findings.

Defence aviation safety investigation

So, what did the aviation safety investigation determine?

The accident aircraft, A40-040 (callsign Bushman 83), had been accepted into service in 2016 and had accumulated 1108 airframe hours. It had been serviced appropriately and was configured for overwater operations and night formation flying (of note, the Taipan's night formation lights are augmented by stick-on, battery operated, infra-red strip lights reminiscent of the cyalume chemical lights Navy used to stick on the Wessex and Sea King for counter-terrorist night formation flying). Analysis of the wreckage and the flight data recorder showed no evidence of an aircraft malfunction or system failure prior to impact.

The accident crew consisted of two pilots and two aircrewmen. The aircraft captain had been flying for nine years and had amassed a little over 1700 hours, of which nearly 1400 hours were on type. He had logged 514 hours in command and 373 hours using night vision devices. The copilot had been flying for three and a half years, amassing 576 hours, of which 383 hours were on type and 120 hours using night vision devices. The senior aircrewman was a very experienced aviator and instructor with nearly 3500 flying hours gained over 20 years. The junior aircrewman had logged just under 700 flying hours over four years, almost all of it on Taipans. The investigation found the crew were fit, qualified and current to fly.

The day of the accident had started for the aircrew at 1pm, with the mission briefing commencing at 2 (all times are local). It was an unhurried and uneventful preparation. The mission was a four-ship ground force extraction from Lindeman Island with the timing to depart the airport and then an overwater holding point between the Cape Conway Peninsular and Lindeman Island being signalled by the ground force. In the days prior to the accident the crew were supporting a predominately night flying program. It is likely that the crew had built up a sleep debt living in 18 stretcher, non-air conditioned tented accommodation adjacent to the airfield. The investigation found that the crew were exposed to a level of fatigue considered sufficient to affect their performance.

On the day of the accident, the sun set at 5:46pm and the near to full moon, which had risen well before sunset, would set at around 2am the next morning. A light southerly wind was blowing and visibility was good under scattered cloud at 1200 feet with a more heavy layer of cloud at 3000 feet – but there were also passing showers that would bring periods of reduced visibility and where the heavier cloud could be encountered much lower. This made for a dark night at low level without much of a visible horizon, but still within the acceptable limits for this kind of mission by crews using night vision devices. The investigation found that it is likely that the weather conditions at the

time of the accident resulted in reduced visual cues that affected the pilots' ability maintain formation and spatial orientation.

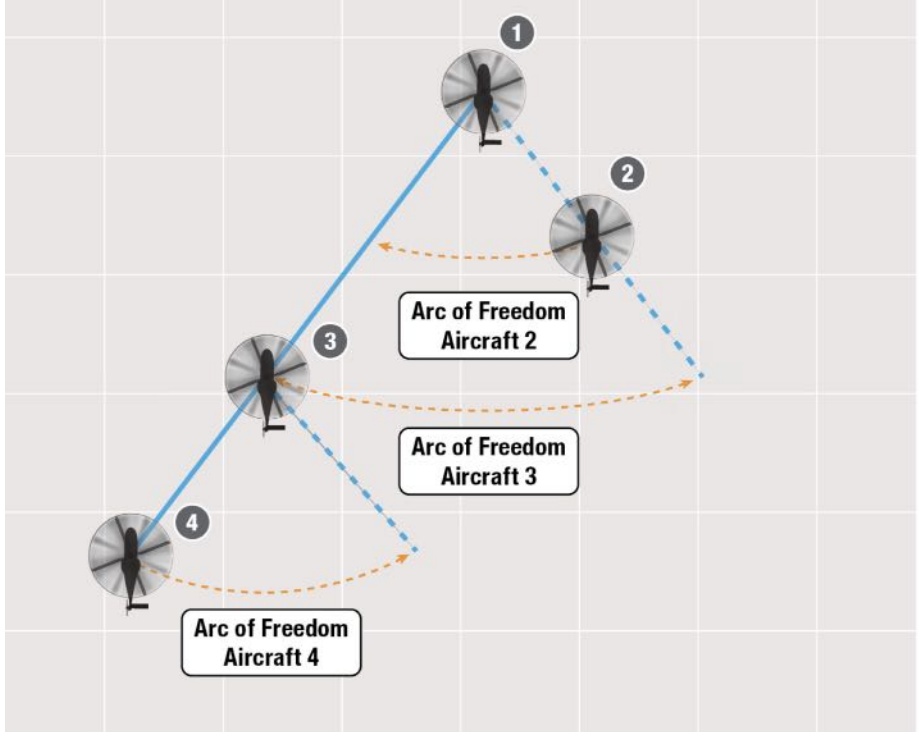
The front seat crew were using the TopOwl helmet mounted sight and display system, incorporating night vision and flight symbology projected onto the inside of each pilot's visor. While there has been some discussion around the introduction and updating of TopOwl (see the discussion in the Senate inquiry report below), the investigation concluded that the system was unlikely to have contributed to the pilots' loss of spatial orientation.

The crews joined their aircraft a little before 8pm with main engine start occurring just after 9pm. As planned, all four aircraft were hot refuelled before departure, leaving the airport at 10:14pm. The transit was flown in 'loose' heavy left formation (where the pilots visually judge the formation spacing between aircraft to be 2 to 5 rotor diameters or around 30 to 80 metres, rotor tips to rotor tips), with the accident aircraft in the number 3 slot. The transit was conducted visually at around 400 feet over land, with a planned descent to 200 feet over water as formation approached the holding point. Low cloud and shower activity on the coast led the formation leader to alter the planned route to the holding point, flying south around Cape Conway overwater rather than the more direct route that cut across the peninsular over land. Once at the holding point, the plan was to enter a right-hand holding pattern until cleared in for the ground force pick up. Approaching the holding point, the presence of showers dictated a further change to a left-hand holding pattern. Shortly after rolling out of the second left-hand turn, which was flown through a passing shower, the accident aircraft was seen by the number 4 aircraft to briefly climb and then sharply descend to impact the water.

Analysis of the cockpit voice recorder allowed the investigation to determine that the copilot, flying from the left-hand seat, was in control of the aircraft for the transit. Maintaining formation position was challenging given the dark night under cloud, poor horizon, passing showers and the copilot having to look 'across the cockpit' to keep the preceding two aircraft in sight (which entails looking over the instrument coaming and around the windscreen centre pylon). Throughout the transit, the aircraft captain was mentoring and supporting the copilot from the right-hand seat with the aircrewmen providing advice on station keeping and weather in the area from the cabin.

Approaching the holding point through a shower while descending in formation to 200 feet created a high workload for the copilot and aircraft drifted high, prompting the captain to take control and increase the descent rate to reposition the aircraft back in formation. Forty-five seconds later, the formation entered the first left-hand turn of the holding pattern to settle on the outbound track for around a minute before turning left again to track inbound. It is evident from the cockpit conversation that the captain intended to settle the aircraft back in the number 3 formation slot before handing control back to the copilot after flying the second left-hand turn, through a passing shower, and stabilising on the inbound leg of the holding pattern.

Flying in tactical formations like heavy left, the following aircraft have reasonably wide arcs in which they are free to manoeuvre – they don't have to maintain a fixed formation position relative to the preceding aircraft. At night with reduced visual cues it can sometimes be difficult



***Above**: Arcs of manoeuvre freedom in heavy left – Bushman 83 was flying in the number 3 slot.*

to fully exploit the arc and the investigation concluded that the front seat crew were focussing on maintaining an apparent 'echelon' position on number 2, rather than manoeuvring in the arc and taking line cues from number 1 and spacing cues from number 2. This made the left turns more difficult as it put the number 3 aircraft on the inside of the turn, requiring a pitch up to slow down (because of the shorter ground track on the inside of the turn) and a further reduction in power to drop down to maintain the echelon position as the formation turned towards it. To achieve this the captain was continuously releasing the autopilot's engaged collective height hold function. The captain was also still demonstrating the formation position to the copilot with him 'following through' on the controls, meaning both front seat crew were focused on the sight picture outside the cockpit towards the number 2 aircraft – no one was monitoring the instruments inside the cockpit.

Shortly after commencing the second left turn, left pedal was introduced, causing the aircraft to yaw left. This went unnoticed by the crew. The nose was raised to just under 6° nose up as speed was washed off by around 6 or 7 knots to maintain relative spacing on the inside of the turn. The aircraft also commenced an undetected climb above the plane of the formation – to a point where the copilot lost sight of number 2 under the nose of the aircraft. During the climb, and also undetected by the crew, the nose attitude progressively changed from 5.8° nose up to 4.7° nose down – almost a 10° degree pitch down – and airspeed increased from 77 knots to 109 knots. The investigation concluded that this would have maintained the 'perceived' position of number 2 in the windscreen for the captain as on the right level while the actual position by this time was well above number 2.

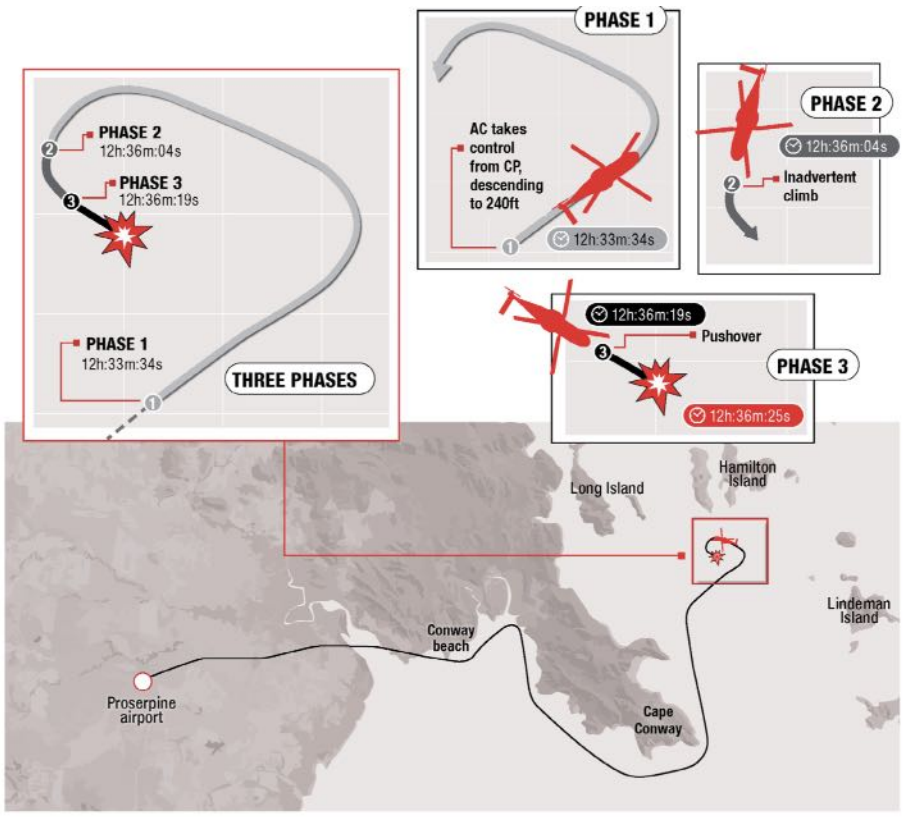
***Above**: The investigation concluded that the pilots had a perceived view that they were on the same level as the number 2 aircraft in the formation when their actual position was well above the number 2 aircraft.*

Nine seconds after the undetected climb commenced, and two seconds after the copilot lost sight of number 2, the captain initiated a rapid roll to the right before quickly rolling back to the left – the investigation concluded that this most likely indicates that the captain at this point had also lost sight of number 2 and was attempting to regain visual contact with it.

Just four seconds later, the captain initiated a large forward cyclic input (almost to the forward control stop). The investigation found that this was likely the captain intending to pitch the nose down to regain visual on number 2 while still perceiving the aircraft to be around 5° nose up and on the inside of the turn to number 2. The result was a push over that took the aircraft from 5° nose down to 27° nose down and from +1G to -0.02G. Airspeed and rate of descent rapidly increased. A roll to the right commenced shortly after the push over, most likely indicating an avoiding action the captain initiated on reacquiring sight of number 2 in a position much closer than expected (due to the difference in airspeed – number 2 was maintaining around 80 knots while number 3 was accelerating through 120 knots at this point) – the investigation estimated number 3 passed close below and astern of number 2. The roll to the right was exacerbated by the low G condition reducing control power (the captain reversed the roll control input as the bank angle passed 25°, but the roll continued to 48°).

The aircraft was now unrecoverable. It impacted the water six seconds later at almost 30° nose down and at over 140 knots with rate of descent approaching 6000 feet per minute. The captain had been in control of the aircraft for less than three minutes. No one survived the impact.

The investigation concluded that it is likely that both the captain and the copilot experienced unrecognised spatial disorientation as the aircraft yawed and climbed above number 2 in the initial stages of the second left turn in the holding pattern. The climb and subsequent



***Above**: The formation flight path from Proserpine airport and the last manoeuvres of Bushman 83.*

changes in pitch attitude, altitude and airspeed went unrecognised and created an environment where everything felt normal, despite the aircraft's increasing deviation from the crew's perceived flightpath. Unaware of their growing loss of spatial orientation, the crew were surprised by the unexpected loss of sight of number 2 and likely had reduced spare capacity to interpret and respond appropriately in a timely manner. The investigation found that once the push over occurred, the crew did not have enough time to recognise the loss of spatial orientation, reorientate and recover before impacting the water.

Formally, the investigation found the primary cause of the accident was unrecognised spatial disorientation leading to controlled flight into terrain. It is important to note that the investigation actually generated 196 findings, indirect findings and observations and made 46 recommendations – the report is well worth reading.

Senate inquiry

In February 2025, the Senate referred an inquiry into the fatal Taipan accident to its Legal and Constitutional Affairs References Committee (the Senate has several standing committees, including the Foreign Affairs, Defence and Trade References Committee, but as the inquiry was to cover compliance with regulation; Comcare investigations, including any referrals to the Commonwealth Director of Public Prosecutions; and the appropriateness of the decision not to prosecute any matters arising from the accident, the inquiry was referred to the Legal and Constitutional Affairs committee).

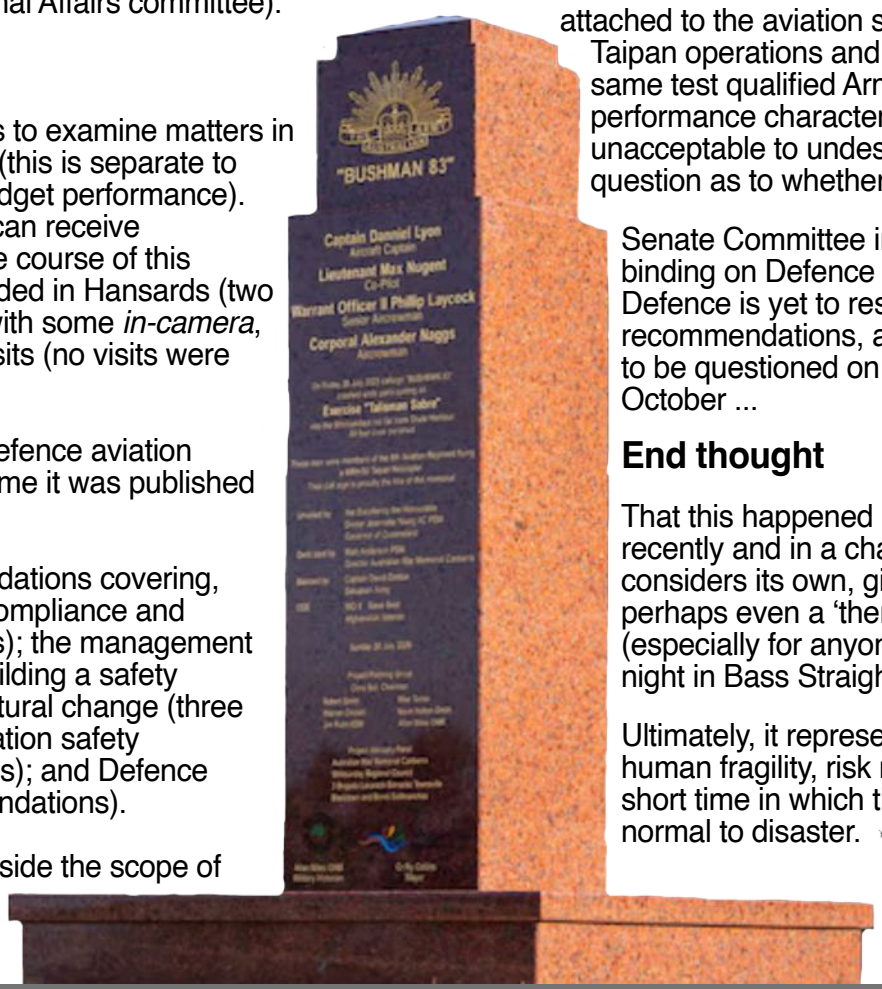
So, what is a Senate inquiry?

Senate committees conduct inquiries to examine matters in detail and report back to the Senate (this is separate to Senate Estimates, which looks at budget performance). As part of this process, committees can receive submissions (14 were received in the course of this inquiry), hold hearings that are recorded in Hansards (two public hearings were held together with some *in-camera*, or private, hearings), and conduct visits (no visits were reported).

The Committee had access to the Defence aviation safety investigation report from the time it was published in May 2025.

The Committee made 15 recommendations covering, broadly, Army aviation's regulatory compliance and safety culture (two recommendations); the management of fatigue (one recommendation); building a safety culture (one recommendation); structural change (three recommendations); the Defence aviation safety investigation (three recommendations); and Defence bereavement support (five recommendations).

Defence bereavement support is outside the scope of the accident investigation (but I think we all know the Department of Veterans' Affairs has some room for improvement ...).



In terms of safety culture and fatigue management, the Committee drew similar conclusions to the Defence aviation safety investigation, although there was an expanded look at Comcare's investigation and subsequent briefings to the Commonwealth Director of Public Prosecutions relating to potential breaches of the *Work Health and Safety Act* associated with fatigue management. The Director of Public Prosecutions, as reported by the Committee, twice declined to bring charges.

The Committee diverged from the Defence aviation safety investigation in two key areas, both related to the use of the TopOwl helmet mounted sight and display system.

The Defence aviation safety investigation found that it was unlikely that TopOwl contributed to the pilots' loss of spatial orientation. The Committee examined both the decision to release TopOwl software version 5.10 into service and whether pitch and roll cues displayed to the pilots through TopOwl, when seen 'off-axis' (that is, when not looking directly ahead), could have contributed to pilot disorientation.

The Army Aviation Test and Evaluation Section performs a role similar to Navy's Aircraft Maintenance and Flight Test Unit. In assessing TopOwl v5.10 for release to service, AATES determined it posed an 'unacceptable risk to flight safety.' This determination related to the assessed high risk of disorientation when viewing TopOwl pitch and roll symbology when looking 'off-axis,' especially in poor flying conditions. (Flight test organisations typically use a four level scale in reporting assessed system performance characteristics: satisfactory, undesirable, unsatisfactory, and unacceptable. Systems assessed with unacceptable characteristics are not normally released to service until the unacceptable characteristics have been remedied – the risks posed by unacceptable characteristics are typically so high they are not suitable for other forms of mitigation.)

In releasing TopOwl v5.10 into service, Army considered AATES's assessment, as well as the results of an operational evaluation and the certification of TopOwl v5.10 by the German military airworthiness authority. Based on this evidence, Army reassessed the performance risk as 'undesirable' and TopOwl v5.10 was released to service with additional risk controls in place (such as briefings and targeted training). The Committee noted that an unacceptable system performance assessment by either the Air Force or Navy flight test organisation would be unlikely to be challenged in such a manner.

In examining the Defence aviation safety investigation assessment that TopOwl was unlikely to have contributed to pilot disorientation, the Committee heard evidence that this assessment was based on a view, supported by simulator reconstructions, that both pilots would have been looking forward, that is, on-axis, throughout the manoeuvres to regain visual contact with the aircraft ahead in the formation. The Committee also heard that the subject matter expert attached to the aviation safety investigation to advise on Taipan operations and systems, including TopOwl, was the same test qualified Army aviator who had reassessed the performance characteristics of TopOwl v5.10 from unacceptable to undesirable. The Committee posed the question as to whether this constituted a conflict of interest.

Senate Committee inquiry recommendations are not binding on Defence or the other organisations mentioned. Defence is yet to respond publicly to the recommendations, although Defence officials can expect to be questioned on this matter at Senate Estimates in October ...

End thought

That this happened in an aircraft that Navy flew until quite recently and in a challenging environment that Navy considers its own, gives us all pause for thought and perhaps even a 'there but for the grace of god' moment (especially for anyone who flew Op *Bursa* missions at night in Bass Straight).

Ultimately, it represents a tragic but salient lesson in human fragility, risk management and the remarkably short time in which things in our business can go from ops normal to disaster.