DEFENCE FLIGHT SAFETY BUREAU
DFSB

NEW WAYS OF THINKING ABOUT RISK
Our new 3-part series

WHAT ARE WE MISSING?
The human element

CRASHWORTHINESS LESSONS
From the Second World War

2026|02

Spotlight



JUST ENOUGH REALISM

Virtual-reality technology in safety training

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Comments, contributions, etc, are invited from readers in the interests of promoting aviation safety as widely as possible throughout Defence, and may be addressed to:

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Printed on PEFC certified paper.

Front-cover image:
A trainee conducts familiarisation training on the virtual-reality AH-64E Apache at Army Aviation Training Centre, October 2025 (Brayden Cureton)

Image composition by Jason Rogers

October 2026

FOREWORD

It is my pleasure to bring you this edition of *Spotlight*, my first as Director of the Defence Flight Safety Bureau (DFSB).

This edition examines Defence-aviation safety through the interconnected lenses of human performance, risk management and training. While the topics vary from cockpit decision-making and emergency preparedness to lessons from history, the common theme is that aviation safety depends on our ability to learn, adapt and continually challenge our assumptions.

Readers will embark on a journey through present-day safety challenges, learn lessons from investigations, move through aviation-safety tools and systems, then finish with a book review and historical perspectives. The whole is less a collection of articles and more a conversation about how Defence-aviation organisations can learn, adapt and improve.

We begin with the first of a three-part series, 'New ways of thinking about risk', in which Wing Commander Adrian Willey demonstrates – through the lens of a close call during a training sortie – that aviation incidents typically arise from the accumulation of risks, assumptions, and decisions across a system.

Next, in 'Getting the mission done safely', Lieutenant Commander Matthew Urquhart recounts his team's evacuation of Bureau of Meteorology personnel from remote Willis Island in the path of Tropical Cyclone Jasper. Facing deteriorating weather, technical issues and significant operational complexity, the crew successfully applied a structured risk-management process to achieve the mission while keeping everyone – both the civilians and Defence personnel – safe.

In our feature article, 'Just enough realism', Captain Jack Dutton explores how Army Aviation is using innovative synthetic training and virtual-reality technology to develop competence, confidence and safety awareness at scale.


(Department of Defence)

In 'What are we missing?', using Qantas Flight 1 as a case study, Dr Adrian Park asserts that while aviation-safety systems often focus on rules, procedures and regulations, it is human qualities, decisions and practices that are responsible for the success of the vast majority of flights. Expanding on this human element, 'Equipping our international partners' highlights how DFSB's International Aviation Safety Officer course is helping to enhance our global allies' aviation-safety capabilities.

The next section looks to history for enduring lessons. 'Crashworthiness lessons from the Second World War' by former Director DFSB Group Captain Paul Long demonstrates how wartime research and innovation forever changed how aviation engineers approached survivability. It is a short but fascinating study.

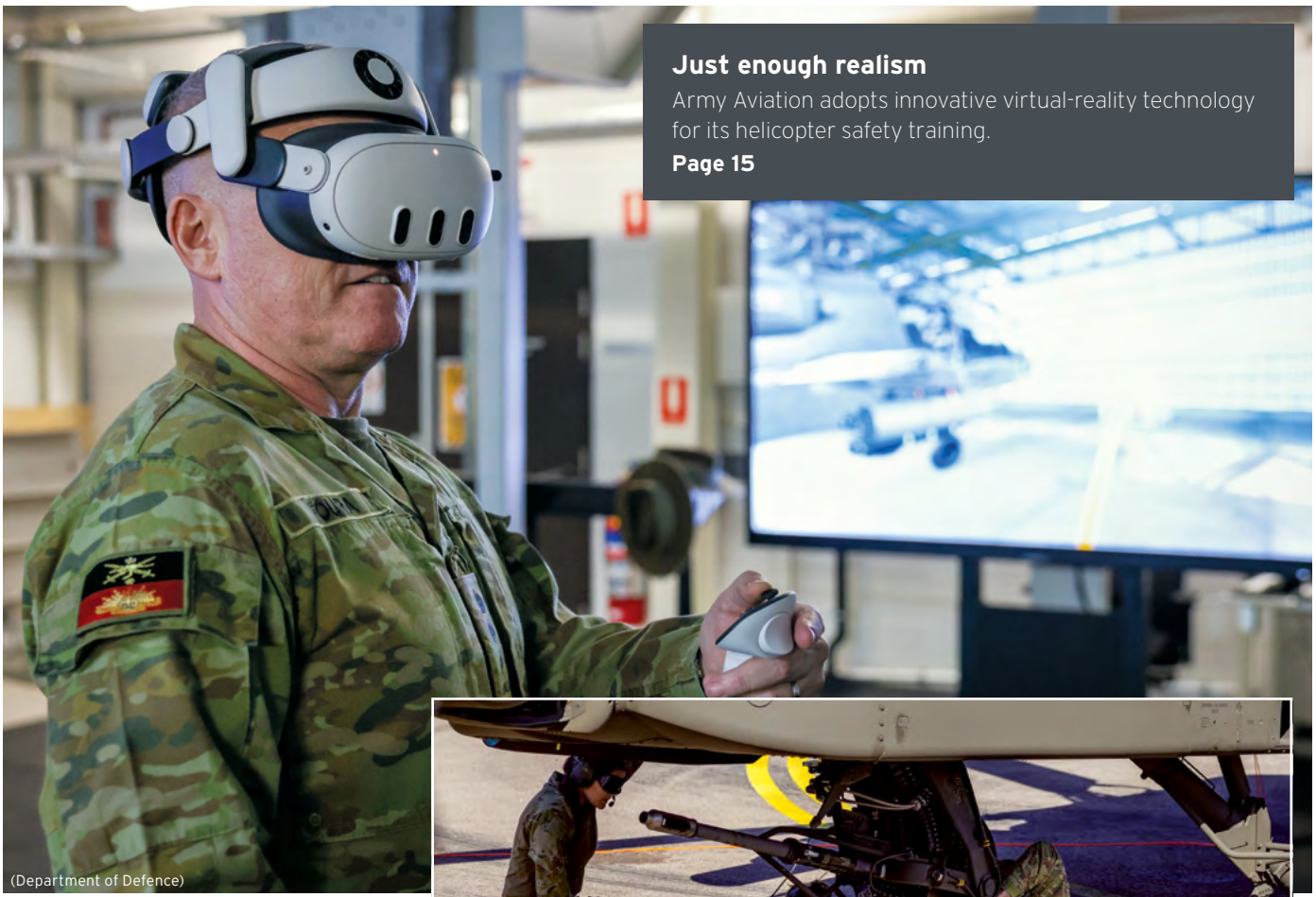
In our new review section, we assess *The Killing Zone: Airplane accidents and lessons for survival* by Paul A Craig and how Australian Defence aviators can benefit from its survival lessons. This section includes a callout for *Spotlight* readers to share their own reviews of books, movies and more.

Finally, in 'Why didn't he eject?', Dr Mark Lax explores the enduring mystery of why a pilot did not eject from his doomed Sabre in 1968 during the Korean War.

I encourage you to read and reflect on these articles written by your Defence-aviation colleagues, discuss them within your teams, and consider how to apply their lessons. Together, we can improve how we deliver capability while protecting our people and preserving our force.

Group Captain Paul Carpenter, CSM
Director DFSB

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New ways of thinking about risk: Part 1

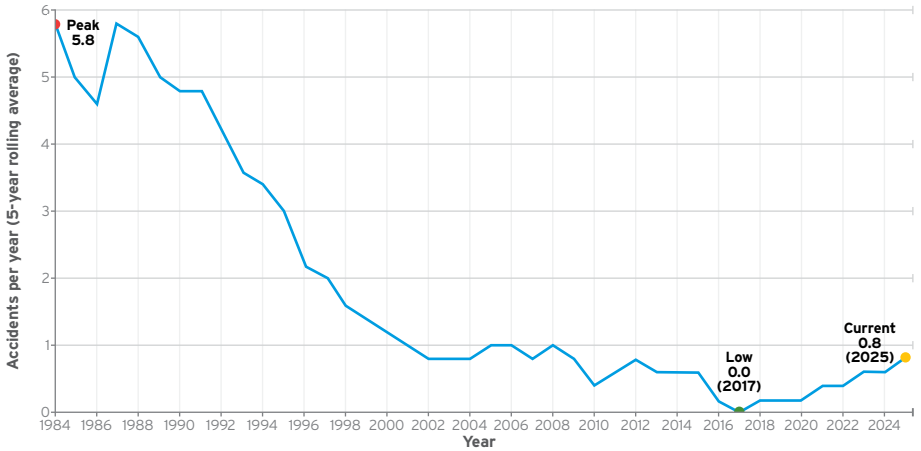
By Wing Commander Adrian Willey

Series summary

DESPITE SUSTAINED EFFORT across the Defence Aviation Enterprise, deficiencies in risk management continue to affect Defence units, military air operators, and the Defence Aviation Safety Authority. These shortcomings are frequently identified as contributing and, in some cases, causal factors in aircraft accidents. Hazards are not always adequately considered despite being known, likelihood is often underestimated, and controls prove ineffective due to weak or untested assumptions.

Defence aviation has achieved an extraordinary reduction in fatal and hull-loss accidents during the past four decades. However, the rate of improvement has plateaued and recent years have shown an increase from historical lows, suggesting that Defence needs to adopt new approaches to risk and safety. Current risk policy and training, largely delivered through the Strategic Safety Centre[1], requires more depth and a system context. Previous initiatives to improve aviation risk management have tended to be reactive, fragmented, and event-driven, rather than the result of sustained strategic reform.

Accidents are rarely caused by a single hazard or risk. More often, they emerge from a complex accumulation of risks, assumptions, decisions and interactions



Defence-aviation fatal and hull-loss accidents (five-year rolling average), 1984–2025

The result is a risk-management landscape characterised by disparate frameworks, systems, and tools: a 'Risk Archipelago'[2]. The absence of consistent risk standards across aviation domains complicates safety-performance measurement, undermines assurance activities, and restricts the effective transfer of organisational learning derived from incident and accident investigations.

Without a modern, unified approach to aviation risk management, existing deficiencies will likely continue to contribute to aviation incidents and accidents.

This three-part series argues that a unified and modernised approach to aviation risk management can improve risk prioritisation, enhance decision-making, and deliver more consistent safety and capability outcomes:

- Part 1 will explore risk from first principles, establishing a common foundation of meaning, significance, and language
- Part 2 will introduce a structured methodology to improve risk prioritisation, framing, and decision support
- Part 3 will examine risk at the system level, including aggregation, transfer, and system behaviour.

Prelude

I was instructing on the sixth and final night of a command trainer that had taken us through New South Wales, Queensland, and as far as the Papua New Guinea Highlands. Conditions were ideal for night-vision goggle training and before recovering to RAAF Base Richmond, I elected to conduct a series of low-level manoeuvring exercises.

The student captain was performing well, so I progressively increased the difficulty by creating terrain 'problems' that required modified manoeuvres. The solution was straightforward enough: if the projected flight path intersected rising terrain, the pilot would reduce the angle of bank to maintain terrain clearance, before re-establishing the turn.

On the third sequence, however, the student did the opposite. Rather than reducing bank angle to clear a ridgeline, he rolled aggressively to 70 degrees of bank, exceeding the aircraft bank limit. We were flying a C-130J weighing more than 50 tonnes: hardly an aircraft I would describe as nimble. At that point, we neither had the space to turn away from the terrain, nor the roll rate to return the aircraft upright to clear the ridge. I immediately took control and simultaneously rolled the aircraft level while pulling to climb.

Most aircraft are not designed to roll and climb at the same time due to excessive wing stresses. The C-130J is no exception. The manoeuvre likely overstressed the aircraft but, at that moment, I had more immediate concerns than structural limits.

The ridgeline barely passed beneath us.

We ceased training for the night and returned to Richmond. The silence in the cockpit during the 20-minute flight home was deafening. As the adrenaline subsided, I found myself mentally retracing the sequence of events. My uncomfortable realisation was that the near miss had not begun with the student's final control input: it had started much earlier. Individually manageable risks had quietly begun to accumulate as far back as when I first designed the training course, and arguably even earlier, through a squadron culture that strongly encouraged role expansion and operational challenge. It had developed through a series of assumptions about capability, decision-making, fatigue, trainee performance and supervisory margins. I have been involved in many safety occurrences, but rarely one where I could trace so many of the contributing risks back to my own decisions: from course design and sortie planning through to the final recovery sequence. Humbling.

That experience reinforced a lesson I have since seen repeated in accident investigations, safety-assurance activities, and organisational decision-making across Defence aviation: accidents are rarely caused by a single hazard or risk. More often, they emerge from a complex accumulation of risks, assumptions, decisions, and interactions that remain invisible until the final moments before failure. Yet much of our risk management remains linear: individual hazards are identified, risks are assessed, and controls are applied, largely in isolation. The interactions

between risks, assumptions and decisions are often far less visible, and much harder to analyse.



This series explores how we think about those risks, how we prioritise them and understand them in a system context, and how we can better manage them before they become accidents.

Part 1: The rise of risk

Risk management can appear deceptively simple and one of many considerations routinely processed by operators and decision-makers. Across Defence aviation, personnel apply established processes to identify hazards, assess likelihood, and accept or tolerate potential consequences. Defence-aviation organisations have embedded risk-management practices since the 1990s and further strengthened them through integration with the *Work Health and Safety Act 2011*.

Risk management is now a central tenet of Defence-aviation safety-management systems and a critical mechanism for preventing capability loss. It provides accountable managers with the means to understand and accept risk, implement controls, and evaluate their effectiveness over time.

However, evidence from Defence Flight Safety Bureau investigations into Class A and B occurrences – including hull losses – consistently identifies failures in risk management as contributing or causal factors[3].

Furthermore, the expansion of risk management has also introduced significant complexity. Platform risk profiles may contain hundreds of risk statements and thousands of causal pathways, each with supporting analyses and treatments. Defence aviation operates within interdependent evolving systems which are characterised by uncertainty, capability change, and environmental variability.

This complexity is driving new thinking in several key areas:

- how risks are framed and contextualised
- how likelihood is estimated under uncertainty
- how risks are prioritised and compared
- how risks interact within and across systems.

Defining risk

Every Defence-aviation activity is undertaken to generate or employ capability. Whether supervising maintenance, conducting training, or delivering humanitarian aid, each task delivers benefit while simultaneously introducing the possibility of adverse outcomes.

Risk, in its simplest form, is the chance of something undesirable occurring.

Risk is inherently forward-looking: essentially a forecast of possible outcomes. In a sense, risks represent the starting point of investigations where the accident has not yet occurred. Assessing whether a task's potential benefit (often called task significance) outweighs its associated risks is the essence of a risk decision. Viewed this way, risk is not a hazard, event, or consequence in isolation, but a relationship between uncertainty, assumptions, and future outcomes.

At its core, risk acceptance is a value judgement: 'Is what I'm about to do really worth it?'

Risk analysis seeks to inform this judgement by improving understanding of likelihood, consequence, and causal pathways.

Risk management, as defined in the Defence Aviation Safety Regulation, is the structured

In Defence aviation, the 'edge' is often obscured by uncertainty, changing conditions and evolving system performance

seven-step process of reducing risk 'so far as is reasonably practicable'. It includes:

- risk analysis: understanding probability, consequence, and causal pathways
- safety-risk management: reducing or eliminating risk (if reasonable), deciding whether or not to proceed, and ongoing monitoring.

Risk and capability: understanding the 'edge'

Risk can be visualised through the analogy of a racetrack bordering a cliff edge. With full knowledge of the environment, hazards, and system capability, a driver can optimise their performance while maintaining an appropriate safety margin. This knowledge can also inform further questions, such as, 'How important is winning?' and 'How high is the cliff?'

In Defence aviation, this analogy becomes significantly more complex:

- the 'edge' is often obscured: creating unknowns and uncertainty
- the edge can crumble: environmental conditions change dynamically
- the driver is unpredictable: system performance varies across personnel and equipment
- the need to win is often greatest when track conditions are least certain: interactions between risks evolve over time.

The training exercise I described in the Prelude illustrates this concept well. As the sequences unfolded, the location of the 'edge' became increasingly uncertain. The aircraft's performance was known, but the student's response to a rapidly developing terrain problem was not. Supervisory intervention remained available as a recovery option, but only within a narrowing window of time and space. In hindsight, the edge had not moved; my understanding of where it was had been incomplete.

This system uncertainty – sometimes described as opacity[4] – reduces our ability to accurately judge and maintain proximity to the edge. In a previous *Spotlight* article, Lieutenant Colonel Drew Burkitt describes this edge as the 'threshold of negative outcome', where individual risk 'vectors' potentially combine to exceed this threshold[5].

Improved understanding of environment and capability reduces this uncertainty and enables more informed positioning relative to the edge. The true objective of risk management is therefore not simply to minimise risk, but to consistently maximise capability while avoiding accidental losses.

Measuring effectiveness in risk management

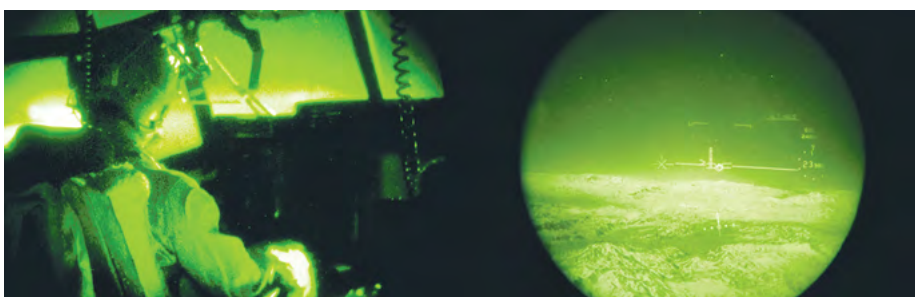
The consequences of failure in aviation are tangible: loss of life, equipment, and capability. The effectiveness of risk management, however, is far harder to measure.

The absence of accidents does not necessarily indicate effective risk management. Had the sortie concluded before the student's final control input, it is unlikely any concerns would have been raised about the exercise design. The accumulated risks would have remained largely invisible and, crucially, dormant in the system. The near miss exposed them, but they existed beforehand. This is a central challenge for safety practitioners: successful outcomes often conceal underlying risk just as effectively as failures reveal them. Outcomes are influenced by chance, incomplete information, and hidden system interactions, making it difficult to distinguish good performance from good luck.

In many respects, accidents are easier to study than successful operations because the accident forces hidden assumptions into view. The opposite is also true. Overly conservative approaches and inefficiencies may go unnoticed:

- controls may be ineffective or redundant
- capability may be unnecessarily constrained
- risk may be transferred rather than reduced.

Evaluating risk management from a system-thinking level provides dual benefits: improving safety and reducing risk-aversion waste.



What the operator sees is limited; system opacity hides the complex interactions shaping outcomes beyond our field of view (Department of Defence)

The elements of risk

Hazards and escalating factors

Hazards are sources of potential harm. While some hazards are obvious (for example, a spinning propeller), others are subtle or context-dependent (for example, an oxygen canister that accepts a nitrogen fitting). Hazards are

often the very things that make aviation possible. Engines, fuel, oxygen systems, and aircraft themselves all provide enormous operational benefit while simultaneously retaining the potential to cause harm. In other words, hazards can help us and hurt us at the same time, and the trickiest hazards are inseparable from capability.

Certain hazardous conditions – such as fatigue or environmental factors – act as escalating factors. These do not directly cause harm, but can:

- increase the likelihood of an event
- reduce control effectiveness
- worsen consequences.

Escalating factors are often overlooked or mitigated by weak assumptions. Failure to account for escalating factors often leads to overconfidence in risk assessments. Importantly, escalating factors often exert influence gradually rather than suddenly. In the Prelude, fatigue from a demanding training week, confidence in a high-performing student, reduced supervisory margin during manoeuvring, and increasing task complexity were not direct hazards in their own right. Collectively, however, they progressively escalated the likelihood that a single error would evolve into a dangerous situation.

Likelihood, confidence, and uncertainty

In Defence aviation, precise probability calculation is rarely possible. Instead, we estimate likelihood using imperfect methods, such as historical data and comparative analysis. While useful, these methods can only produce incomplete information, causing likelihood estimates to be inherently unreliable. As Daniel Kahneman observed, humans tend to assume that 'what you see is all there is'[6]: a cognitive bias that leads decision-makers to overrely on available information while underestimating what is unknown.

Prior to the near miss, my confidence in the exercise had been reinforced by repeated successful iterations. The student had performed well. Previous sequences had unfolded as expected. The weather was favourable. What I could see suggested the probability of a student error (and it remaining uncorrected) was very low. What I could not see was how quickly multiple assumptions could fail simultaneously once the situation departed from expectation.

The second limitation of likelihood estimation is simply variation due to randomness. To illustrate this, our Advanced Aviation Safety Course students conduct a probability exercise involving divers exposed to the risk of shark attack. Participants consistently observe that:

1. exposure matters: low-probability events will occur given sufficient repetition
2. outliers emerge through randomness: outcomes deviate significantly from predicted probabilities over time
3. luck is asymmetrical: when consequences are terminal, there is a limit to how unlucky systems can be, but no limit to how lucky they can be.

The implications are clear: likelihood estimates can create a false sense of certainty. Chance, however remote, always is a factor.

To counter this, we evaluate likelihood using a confidence measure, reflecting the quality of supporting evidence:

Key question: What evidence gives us confidence this likelihood estimate is accurate?

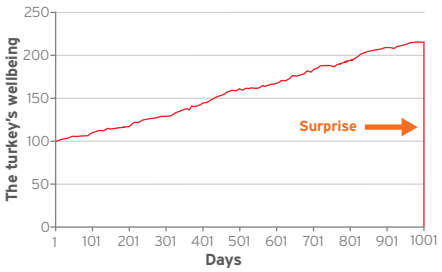
Controls, assumptions, and the Thanksgiving turkey

Controls are policies, procedures, and systems that are implemented to prevent or mitigate risk. Their effectiveness depends on underlying assumptions, which are often implicit and untested.

The terrain exercise relied on numerous assumptions. I assumed the student would make the more common error of under-banking. I assumed that I could judge a safe distance from terrain to call the turn. Lastly, I assumed I had sufficient opportunity to intervene. None of these assumptions were unreasonable individually – indeed, I made them on the basis of past experience – but together they eroded control effectiveness to dangerous levels. The collective assumptions had never been tested in aggregate, let alone evaluated over multiple exposures.

The life of the Thanksgiving turkey[7] illustrates this problem. For the first thousand days of its life, the turkey is fed and kept safe. Every day reinforces its assumption that it is secure.





1001 days in the life of a Thanksgiving turkey

But on day 1001, that assumption proves catastrophically false. Surprise! What the turkey sees is not all there is.

The lesson is that past experience does not guarantee future outcomes, particularly in complex systems. This is the problem of inductive reasoning. Risk management must therefore scrutinise both controls and the underlying assumptions.

The PSOE framework, originally designed for regulation evaluation, provides a method for evaluating risk controls:

- **present**: exists when required
- **suitable**: appropriate for the hazard
- **operating**: consistently applied
- **effective**: demonstrably reduces risk.

Equally, assumptions should be actively challenged:

- What conditions would prove this assumption false?
- What conditions would render this control ineffective?
- What successes could be providing a false sense of control effectiveness?

Consequence and causal clarity

Effective risk analysis requires:

1. unambiguous consequences
2. complete causal pathways from trigger to outcome.

A common failing during analysis is the tendency to imply rather than explicitly state risks. Without clearly defined consequences, effective control design becomes impossible.

Likewise, risks should be considered as causal chains. Workforce shortages, for example, do not directly cause accidents; they influence intermediate failures that must be clearly articulated. In other words, something has to cause the workforce shortage, and the workforce shortage then has to cause something (or multiple things). The better the understanding of the causal chain, the more easily a system can disrupt it.

The student captain's 70-degree bank angle did not cause the near miss I described in the Prelude. It was merely one event within a much longer causal chain. Understanding that chain reveals numerous opportunities where the outcome might have been altered long before the final control input.

In the next part of this series, I will explore determinism in more depth, but for now, it is important to recognise that gaps and inferences in causal reasoning create overconfidence in existing controls and reduce opportunities to interrupt accident sequences.

Conclusion

Risk management is a foundational element of modern aviation-safety systems, yet its application within Defence aviation has the tendency to sidestep the challenges of complexity, uncertainty, and a consistent approach.

The training sortie I described in the Prelude remains a useful reminder that risk is rarely created at the point of failure. By the time the aircraft approached the ridgeline, most of the critical decisions, assumptions and trade-offs had already been made. The final error merely revealed a collection of risks that had been quietly accumulating throughout the system. Understanding how those risks emerge, interact and become visible is the central challenge of aviation risk management.

This article has argued that risk is not simply a procedural requirement, but a forward-looking discipline concerned with understanding uncertainty, clarifying causal pathways, and enabling informed trade-offs between capability and safety. Key limitations include overreliance on weak assumptions, imprecise likelihood estimation, inadequate consideration of escalating factors, and difficulty in assessing control effectiveness. Recognising and factoring for these limitations is an important first step towards improving risk-management systems.

Fundamentally, risk management is not about eliminating uncertainty, but about making uncertainty visible, measurable, and actionable.

If risk emerges through the interaction of assumptions, decisions, controls and uncertainty, then the next challenge is determining which of those factors deserves the greatest attention. Part 2 of this series will introduce a structured methodology for prioritisation, framing, and decision support: addressing the critical questions of not just 'What risks exist?', but 'Which risks matter most and why?'

Endnotes

[1] Defence Aviation Safety Authority and Defence Flight Safety Bureau.

[2] Hood, Christopher and Jones, David, eds. *Accident and design: Contemporary debates on risk management*, Routledge, 2003, 3–5.

[3] Aviation Safety Investigation Reports: MH-60R CFIT 2021, MRH-90 Ditching 2023, F/A-18F Near Collision 2022.

[4] Taleb, Nassim Nicholas. *The Black Swan: The Impact of the Highly Improbable With a new section: 'On Robustness and Fragility'*, Vol. 2, Random House trade paperbacks, 2010, 198.

[5] Burkitt, Drew. 'Risk reversal: Shaping up risk', *Aviation Safety Spotlight*, 2025, 16.

[6] Kahneman, Daniel. *Thinking, fast and slow*, Macmillan, 2011.

[7] Taleb, 40–41.

Feature image:
C-130J Hercules aircrew from No 37 Squadron conducting a tactical night operation over New South Wales using night-vision goggles, 2020

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Getting the mission done safely

By Lieutenant Commander Matthew Urquhart

HMAS *BRISBANE* had just departed Cairns on her way home to Sydney post our regional-presence deployment in December 2023. The team were looking forward to flying the last hours off the aircraft to achieve our phase servicing window and completing some landing safety officer training for two additional aircrew, including a new flight commander (FLYCO), who had joined in Cairns. We were aware that Tropical Cyclone Jasper, a category-five system, was tracking towards Cairns and we were keen to get as far south as we could to clear the bad weather. After eight months of operating onboard, the Flight was well integrated and very comfortable with embarked aviation, as was the ship.

We were aware that Tropical Cyclone Jasper was tracking towards Cairns and we were keen to get as far south as we could

The task

In the afternoon of the first day out of port, the ship re-embarked the aircraft as we sailed south, after the aircraft had cleared customs at RAAF Base Townsville. The crew conducted further flying into the evening, but returned to the ship early to conduct a medical evacuation into Townsville and return to the ship. While this resulted in a longer-than-anticipated duty day, flying was scheduled for the following afternoon, giving plenty of time for rest.

However, the next day, the ship got the call that we were being tasked with the evacuation of four personnel from a Bureau of Meteorology (BoM) weather station at Willis Island, approximately 250 nautical miles (nm) east of Cairns and some 300 nm back to the north. Initial calculations indicated that if the ship made best speed and we launched the aircraft at close

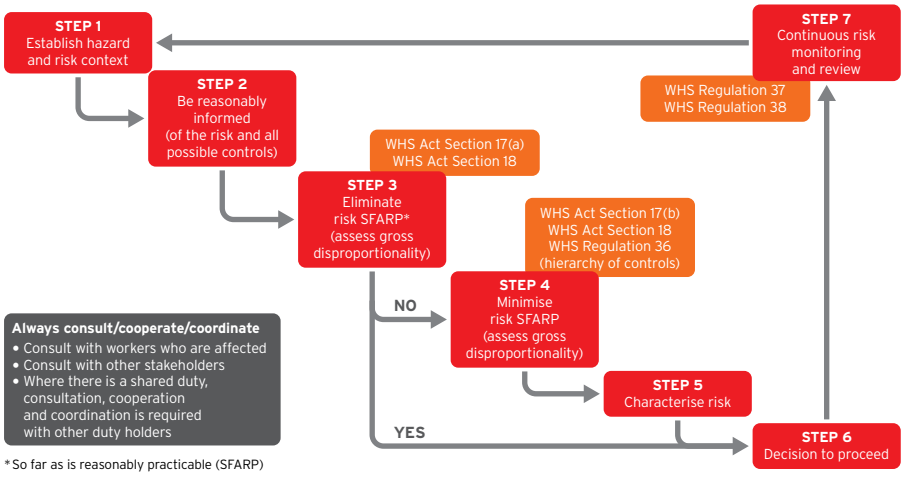


(Department of Defence)

to maximum range, we could complete two trips, with two passengers per lift, and achieve the mission that night. However, we would be conducting both sorties in complete darkness. Further complicating matters was that in our anti-submarine warfare configuration, we only had seating for one passenger in the back, plus the sensor operator (SENSO), who was required both for the confined-area landing on the island and for embarked operations. There was insufficient time to reconfigure the aircraft to allow an additional seat to be fitted. Where to start?

The risk-management process

The seven-step risk-management process provided a useful framework for the whole team to consult, cooperate, and coordinate our plans based on the developing situation. The context we had was limited by our initial direction of achieving 'ASAP' and the consequences articulated by our tasking agency of four



Safety risk-management process



potential fatalities or serious injuries if the task was not conducted.

The risk context gave important consideration of elimination controls, by not conducting the task, and the assessment of gross disproportionality. The weather conditions were not suitable for a boat recovery, with no harbour and large breaking waves on the beach. There were no land-based aircraft capable of reaching the island in the weather conditions. Fortunately, we received a very thorough landing-area reconnaissance pack from the Queensland Ambulance Service helicopter, based at Cairns, which had landed at the island several weeks prior to conduct a refuel on their return from rescuing a passenger from a ship offshore. The pack also contained information that highlighted other hazards that needed to be considered. The landing area was a reasonably tight sandy area, with no aviation facilities or lights, bordered by diesel-fuel tanks on one side and hydrogen tanks on another. For added complexity, the 500 m by 150 m island is home to a reported 10,000 birds. What could possibly go wrong?

Without implementing risk-control strategies, the task would have required a long overwater flight at night, with passengers who had not completed Helicopter Underwater Escape Training, and the SENSO sitting on the floor without a crashworthy restraint. Both conditions would require a risk assessment, and the lack of restraint would require command clearance. Multiple trips to bring one passenger at a time, eliminating the requirement for the SENSO to be out of a seat, would have created another hazard in significantly exceeding crew duty. In addition, we had the considerations of an unfamiliar landing pad at night, with birds, dust and obstructions: all potential hazards. Fortunately, the ship established communications with the BoM personnel on the island, who were all capable, calm and in good health at the time.

Characterisation of these risks led to an assessed consequence of 'critical' combined with a likelihood of 'improbable', resulting in a risk level of 'medium', above what I or the squadron commanding officer (CO) could accept in accordance with our risk-management authority (RMA) delegation from Commander Fleet Air Arm (COMFAA). To try to mitigate the risk, we gathered further information from meteorologists at Joint Operations Command and determined that the weather system would likely impact the island in the afternoon of the following day, giving a brief window in the morning to potentially achieve the task. We passed the risk assessment to COMFAA, with our recommendation to push the task until first light the following day. He supported our decision and we adjusted our plan to a course of action with an assessed lower residual risk.

The new course of action had a launch at dawn, with the ship closed to within 5 nm of the island, dropping our second SENSO on the island to brief and manage the passengers, and then take one passenger at a time back to the ship. The daylight mitigated our hazards of unseen birds, dust and obstructions, as well as the underwater-egress hazard, which was also reduced by all personnel having a crashworthy seat. While the risk-management process had put us in a position where we were much more likely to achieve the mission with a lower risk level, it presented other hazards to consider, such as time pressure and worsening weather.

The mission

We traversed the aircraft to prepare for launch as the sun rose. The crew discovered during post-start checks that



HMAS *Brisbane*'s MH-60R helicopter takes off for the evacuation, 9 December 2023 (Leading Seaman Daniel Goodman)


(Department of Defence)

one of the engine's anti-ice systems was not indicating correctly. While we were not anticipating icing conditions in the balmy North Queensland weather, the engine anti-ice valve performs other important roles. On start and at low power, the valve opens to vent excess bleed air out of the engine. If the valve fails to open, the engine may flame out at very low-power settings. At high-power settings, the valve is held closed to ensure full power is available and, if it remains open, a significant loss of power will be experienced on the affected engine. The engines seemed to be performing as normal, but the indicator remained off. The circuit breaker for the indication system had popped and could not be reset.

Time for some more risk management! The context had already been established, but the weather was now poor and deteriorating, with ship pitch and roll approaching limits. I discussed the issue with the crew involved – the maintenance team, the non-flying crew and our additional aircrew – to ensure I was reasonably informed. After troubleshooting, we determined that we were confident the system was operating correctly with only the indication fault present and, if it failed to open, sufficient power would be available to safely complete an approach to the ship or island. To eliminate the hazard and replace the degraded system, we were looking at about four hours of maintenance work and, even then, this would not help if the issue were in the wiring harness. This would likely not leave enough time to complete the mission before weather deteriorated beyond limits. As the degradation could affect flight safety, there was no option to defer the defect. We implemented mitigations, including increased frequency of monitoring engine parameters to determine if the system had failed, and the flying of single-engine profiles to mitigate against a loss of power. After being suitably informed regarding the hazards associated with the defect, and the implemented mitigation controls, the residual risk was assessed as low. As such, I briefed the CO and issued a command clearance in accordance with my RMA delegations.

The crew safely completed the task within the risk-control framework, albeit suffering a bird strike on the third run: another operational risk-management story for another day! We recovered all four BoM personnel to the ship as well as our second SENSO. Throughout the mission, all parties continued to review the developing weather situation and aircraft performance as well as any further information to ensure the implemented risk controls remained effective. We also confirmed the risk assessment remained accurate and the Decision To Proceed remained valid.

The lessons

It can be challenging to reinforce immediate or deliberate risk-management techniques fully in the training environment, as external advice is generally readily available (sometimes too readily) and the context of the task less urgent. Fortunately, my decisions were supported and I found this event to be an example of how the risk-management framework can empower operators at all levels to provide 'buy in', make the right decisions, accept risk at the right levels, and get the job done in the safest way possible. I am grateful that I was able to use the risk-management framework to enhance the decision I made as FLYCO, and hope the lessons I learned and the risk-management framework can help others make sound decisions.

This article was previously published in the 2024 edition of *Touchdown*.


A crewmember escorts an evacuee from the helicopter (Leading Seaman Daniel Goodman)


Commanding Officer HMAS *Brisbane* welcomes the evacuees onboard (Leading Seaman Daniel Goodman)

Scan the QR codes to view footage of the Willis Island evacuation, 9 December 2023

Just enough realism

By Captain Jack Dutton



(Department of Defence)



REALISTIC TRAINING remains the gold standard in Defence-training environments. In the aviation context, synthetic-training devices have a long history of helping to achieve this realism goal. While these devices may range in complexity from the lower tier of consumer-grade electronics all the way up to the higher tier of customised simulators and procedural trainers, in practice, higher-tier systems dominate aviation training.

Aside from the obvious fidelity and quality advantages of higher-tier synthetic-training devices, they offer some additional benefits. Firstly, they are often accompanied by governance and accreditation requirements; secondly, they have already undergone some pre-assessment or a formal test-and-evaluation process for suitability. In other words, they are risk-managed from day one.

Risk-managed synthetic training is *trusted* synthetic training. This trust ensures confidence that the trainees who emerge from synthetic-training environments will operate in the real world competently and safely.

Unfortunately, these higher-tier synthetic-training devices come with a catch: expense. Their acquisition and sustainment costs limit quantity. This constrains throughput, speed and distribution.

Army Aviation is familiar with this conundrum as it strives to simultaneously introduce the UH-60M Black Hawk and the AH-64E Apache. The training system needs content delivered rapidly and at scale across a distributed workforce, at a time when the supply of training aircraft and higher-tier devices remains limited. This dichotomy has necessitated innovation and a fresh look at what lower-tier synthetic training can offer.

Army Aviation Training Centre (AAvnTC) has leaned into this challenge. It has started by asking its training system a new question: what happens when the goal of synthetic training moves from realism to *just enough* realism?

Risk-managed synthetic training is *trusted* synthetic training

Innovative ideas are one thing – could Army Aviation execute them?

AAvnTC was fortunate to have both the technical capability and the necessary instructor buy-in to deliver on its goal of leveraging new synthetic-training opportunities. One of the most enthusiastic sources of this support was from the groundcrew and aircrew trades, arguably stemming from their historical neglect in the synthetic-training domain. Although many opportunities presented themselves, at the forefront of demand was a call for synthetic aircraft-familiarisation training.



Synthetic familiarisation training in the classroom at Army Aviation Training Centre, 26 April 2026 (Communication Education and Learning Technology Section)

Aircraft familiarisation is a well-known safety requirement in Defence-aviation training. It is a prerequisite to working around an aircraft and teaches the basics of identifying hazards and locating components. It was a logical starting point for synthetic innovation as it was perceived to be both technically viable in scope, and would address a real speed and scale issue for safety training. A synthetic Apache-familiarisation training product seemed like the most logical starting point as it presented the most immediate pressure.

The development process for synthetic Apache familiarisation required a multidisciplinary collaboration between instructional designers, developers and instructors. This collaboration was sustained throughout development at AAvnTC at Swartz Barracks in Oakey, Queensland: subject-matter expertise was available literally down the hall from the developers. This close collaboration ensured that discussions around graphical fidelity, procedural flow, timing allocation, instructional cues and assessment methods were ongoing discussions between the developers and the anticipated end users.

Many interesting design decisions were made during this development period, but one of the most interesting choices was the election of the 1:1 life-sized virtual twin of the Apache. While many other display options were available, instructors leveraged synthetic training's unique ability to convey spatial understanding of the proportions of the Apache airframe. During this process, the areas requiring the highest graphical fidelity became apparent and, in contrast, the areas which did not require this fidelity were stripped back. This balance of graphical fidelity ensured smart use of computer power to render the most fit-for-purpose graphical model. It turns out the definition of *just enough* realism means tracing development against the training need.

This development would ultimately culminate in the delivery of synthetic Apache-familiarisation training at AAvnTC long before any viable live options: a significant milestone for the training system. However, this outcome was never a foregone conclusion of development; it needed to survive the classroom.

If we build it, they will come. Right?

A synthetic-training device needs to work not only in theory, but in practice: for the instructors and trainees at the coalface of the training system. In other words, the product was built, but could it actually deliver in a real classroom?

Synthetic Apache familiarisation would need to prove it could align to training-management requirements and be practical in the classroom. It would also need to stand up to test and evaluation for risk management.

To prove it could align to training-management requirements, the aviation groundcrew and aviation aircrew learning-management packages sat at the heart of the synthetic-training content. Learning-management packages are Army's version of curriculum. Their role is to set the learning and assessment standards for on-the-job performance expectations. These expectations –

The definition of *just enough* realism means tracing development against the training need



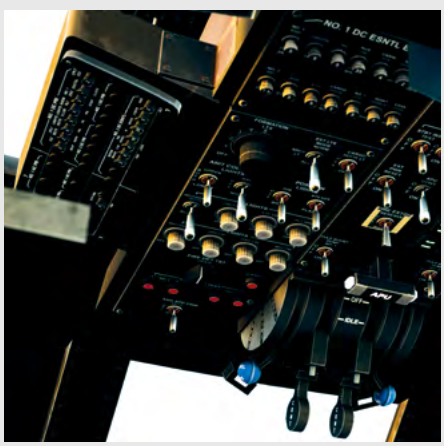
Hands-on in the classroom

Classroom practicality meant ensuring a smooth training and instructional experience. The instructional approach was the familiar Defence model: see, demonstrate, do. At first glance, this may seem rigid; however, the culture of aviation training tends towards a modern approach, with openness to discussion, inquiry and interaction being welcomed as a vital aspect of developing technical skill. The training environment, by contrast, was completely nontraditional: it was a large open space with a carpeted floor, ringed by ottomans. At the centre was the synthetic-training headset with touch controllers. This headset broadcast its content to a large projector screen on one side of the room. The individual at the centre undergoing the synthetic training was the focus of the classroom and the projector gave everyone in the room the situation awareness to know what they were looking at in the synthetic environment.

The class began with a quick primer on using the headset and controllers to see, move and interact in the synthetic environment. Following that, the instructors began the training. In the first stage of the lesson, the instructors used the synthetic aircraft to orientate the class and demonstrate the key familiarisation-training tasks. Following this demonstration, the class were given handouts and confirmed their understanding of hazard identification, component location and safe movement around the airframe.

Next up, it was the trainees' turn. The trainees entered the synthetic environment and replicated the procedure, to reinforce the training that had just been demonstrated and discussed. Those not in the headset were not passive observers; they observed their classmates complete their synthetic serials as they listened to instructor feedback, read out procedural steps from handouts, contributed to class discussions and called out steps to their colleague, if requested, while waiting for their turn.

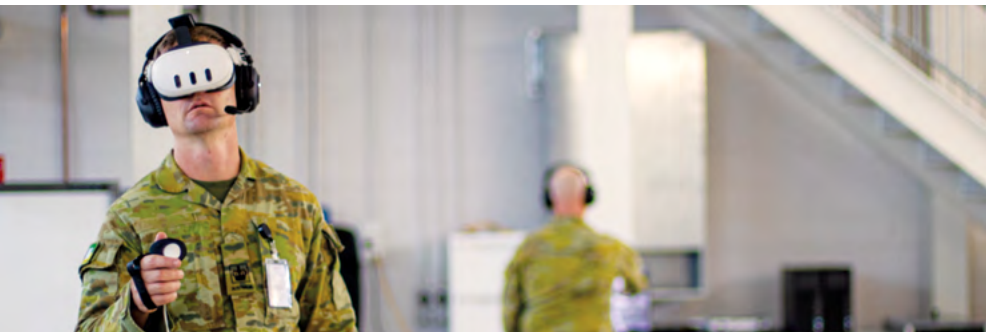
The final stage was the critical one and the moment that every experienced instructor looks for: the moment to step back. This is the most important moment because trainees take on the role of instructors, thereby demonstrating they understand the content. The instructor transitions completely into the role of facilitator and observes as trainees demonstrate that, firstly, they understood the content by showing they could call out accurate advice to one another, and secondly, they had the ability to recognise hazards, identify components and engage in safe work practices in the synthetic-training serials. The performance metrics set by the learning-management package had therefore been achieved.



UH-60M Black Hawk flight controls in the synthetic-training environment (Communication Education and Learning Technology Section)

It is worth noting at this stage that despite this skill demonstration in the synthetic environment, the combination of instructor preference, unfamiliarity with the Apache airframe, and learning-management package compliance requirements has necessitated that the summative-assessment standard remains at the live-aircraft level. Consequently, no official competencies for Apache familiarisation have yet been issued as a result of synthetic training alone: it currently exists only as a training tool.

Masthead image:
Synthetic familiarisation training in the classroom at Army Aviation Training Centre, 26 April 2026 (Communication Education and Learning Technology Section)



A trainee conducts familiarisation training on the virtual-reality AH-64E Apache at Army Aviation Training Centre, October 2025 (Brayden Cureton)

such as identifying aircraft components, recognising hazards, and demonstrating safe work practices – all needed to be demonstrable in the synthetic-training environment. Instructors would need to see these tasks being performed to an acceptable standard, and trainees would need to emerge feeling confident they had acquired the necessary skills. In the end, all of the content required to demonstrate these skills was inserted into the synthetic environment, and compliance with learning-management package standards was assured. The next step was making synthetic Apache familiarisation a viable tool in the classroom.

From innovation to authorised training

A large obstacle had been overcome: the instructors and trainees were on board. The final hurdle was where lower-tier synthetic training usually struggles: risk management or, more accurately put, risk acceptance. It was ironic that authority to innovate was readily granted, while official approval to use the resulting innovations was, in some ways, more difficult to obtain.

Test and evaluation would provide the system for formal risk management for synthetic Apache familiarisation. Instructor and trainee support was vital; however, they are not training-system risk owners. Synthetic Apache-familiarisation training needed *trust*. A test-and-evaluation plan was developed to provide this to risk owners, and testing commenced in two phases.

The first test phase occurred in February 2026 and used experienced aviation groundcrew as an initial 'beta test'. The test was primarily focused on hardware performance and represented a chance to identify critical technical or functionality issues if they arose. It also provided an opportunity to address any content issues that may need correction. This cohort was perfectly suited to providing this feedback due to their experience as qualified aviation groundcrew instructors. This ensured the feedback was informed by their understanding of familiarisation performance standards and the viability of synthetic-training tools in that context. This initial test had the added benefit of representing no actual risk to the training system if things went awry: everyone was qualified and interested in providing professional expertise to ensure a better synthetic-training tool.

The second test phase occurred in April 2026 and used experienced aviation groundcrew again; however, this time, it was a cohort of 'trainees' undergoing Apache aircraft type-transition training. In other words, they were individuals who were already qualified on other aircraft who needed to learn the Apache. This time, it was a legitimate training need which included Apache familiarisation as part of the usual retinue of initial safety training. Fortunately again, the actual risk was quite low if performance standards were unable to be met, as these 'trainees' were all pre-qualified on other aircraft and knew intimately the risks of working around live aircraft. Despite this experience, this cohort's feedback was vital as it could be used to infer the likely performance of the synthetic Apache-familiarisation training once it is in the hands of initial employment trainees.

So the testing had been conducted and the test data had been collected, collated and assessed. This process culminated in a report and decision brief that provided the detailed system-performance overview, negative training risk analysis, and the recommendations and endorsement mechanisms for the risk owners: an enormous oversimplification worth its own separate discussion.

In the end, test and evaluation had provided the assurance mechanism to facilitate the formal integration of synthetic Apache familiarisation into the training system as a training tool. Synthetic Apache familiarisation had crossed a threshold: it had become *trusted* synthetic training.

Reflections on a long journey: is the verdict still positive?

AAvnTC had successfully integrated an innovative idea – a synthetic-training tool – into the aviation-training system: an enormous achievement on its own. Beyond this, it acquired enthusiastic support across the training system, and this synthetic-training tool has subsequently been employed in later initial employment training cohorts. This has included personnel from non-aviation trades who may require Apache familiarisation to work around the aircraft. The feedback remains positive across the three key stakeholders: trainees, instructors and commanders.

Trainees have found the synthetic-training experience to be intuitive and engaging (the word 'fun' might have even been used); but most importantly, they reported increased confidence in their ability to safely work around a live aircraft. This confidence is a by-product of synthetic training's ability to facilitate endless repetition opportunities: a feature that trainees continue to praise.

The instructors have echoed these sentiments through their observation of classroom performance. They note that the trainees learned the content quickly and easily; furthermore, instructors observed training outcomes comparable to those achieved through live familiarisation training. Another interesting observation was that synthetic training potentially improved learning outcomes for some trainees, due to the aforementioned repetition opportunities.

The opportunities represented by this synthetic training have resonated with commanders. If similar training products could be developed and scaled, there would be system-level benefits. The immediate potential win was a reduction in administrative overhead associated with securing access to live aircraft for relatively simple introductory safety training.

Moving from devices to systems

The journey towards synthetic familiarisation training has only expanded at AAvnTC. A synthetic Black Hawk familiarisation-training equivalent has undergone the same journey and is now being employed in the classroom to positive results. Synthetic familiarisation training has moved from a novel training device to a permanent feature of the training system. There are issues that remain; however, they are system challenges rather than capability challenges.



UH-60M Black Hawk in the synthetic-training environment (Communication Education and Learning Technology Section)

While these lower-tier synthetic-training devices have proved their worth as capable, risk manageable and worthy of training-system integration, they often have no formal sustainment-funding systems to support them. Ironically, although these systems represent 'pennies on the dollar' to maintain, compared to their rather resource-gluttonous high-tier equivalents, even these minimal costs are not covered: this means unit operational budgets picking up sustainment-training liabilities. This is part of the value of sharing stories, such as this one, to show where innovation has brought us and where awareness needs to move next.

Conclusion

AAvnTC has leaned into the opportunity presented by lower-tier synthetic-training devices and developed something valuable: *trusted* synthetic training. The idea of *just enough* realism is not a compromise in training standards; it is a deliberate balance between training need and risk management. The experience at Swartz Barracks demonstrates that lower-tier synthetic training can be integrated safely when supported by appropriate assurance activities.

Lessons

1. Synthetic training does not need to be an individual learning event: classroom collaboration and peer instruction are instrumental to success.
2. Own place at own pace: self-directed repetition is a valued confidence-builder.
3. An instructional approach remains decisive: instructor preparation determines synthetic training's classroom role.
4. Some sensible boundaries remain for synthetic training: physical and environmental.
5. Blended learning remains the most viable approach: synthetic training works best as a tool in the instructional toolkit, not as a replacement for any one part.

Synthetic familiarisation training has moved from a novel training device to a permanent feature of the training system



What are we missing?

By Dr Adrian Park

DO YOU EVER WONDER if our systematised safety regulations are systematically missing something?

In the incessant 21st-century demand for more safety rules, more safety procedures, more safety audits and more safety policies, I worry we are comprehensively missing something: something essential. This is a potentially worrisome place to start, since my past piloting, instructional and

boardroom roles have been all about obeying and administering said rules, procedures, audits and policies. It is even more worrying when one considers this article is in Defence's flagship aviation-safety publication: a safety publication aiming, no doubt, to promote those safety rules, safety processes, safety audits and safety policies. But bear with me for a moment as I express a serious question (and thanks, *Spotlight*, for being willing to publish my question!).

As background, I want to take us back to the 1980s movie *Rain Man*. In the movie, Charlie (Tom Cruise) learns his estranged father has died and left all of his multimillions to Charlie's autistic brother, Raymond (Dustin Hoffman). Charlie inherits his father's car and some rosebushes. The disproportionately distributed inheritance makes it important for Charlie to engender a healthy relationship with his now-rich brother. In a famous conversation (which was, for reasons soon to be obvious, edited out of competitors' inflight movie offerings), Raymond rejects pretty much every major American airline as a means of getting to Los Angeles. He does so by reeling off crash stat after crash stat.



***Rain Man*, 1988**
(Metro-Goldwyn-Mayer/United Artists)

'All airlines have crashed at one time or another,' says the exasperated Charlie. 'It doesn't mean they're not safe.'

'Qantas,' says Ray, without missing a beat in his statistical monotone. 'Qantas never crashed.'

Apart from public-relations gold for Qantas, and apart from the fact Qantas actually had fatal, hull-losing accidents prior to the jet age[1], the intriguing question Charlie and Ray raise is this: what if there really was an accident-free, maybe even an *accident-proof*, operator?

This would lead to even more intriguing questions: what is this operator doing differently to everyone else? What safety secrets do they have access to that no one else does? What are they *not* missing?

If *Rain Man* was the only thing shaping our safety worldview then, for 11 years, we might have actually believed Qantas had indeed achieved safety perfection. In 1988 (when *Rain Man* was released), we might ven have believed we could go to this airline and study its 'accident proofness'. That is, until 23 September 1999, when the iconic Qantas Flight 1 (QF1) touched down too fast, with too much power, in the middle of a thunderstorm.

Among other things, QF1's incident showed clearly that safety is not just statistics. Safety is not just reputation. Safety is not just history. Safety is something more. Which brings us back to my question. What is this 'something more', and are our safety policies encouraging it? With more than 20 years of civilian regulatory development since QF1 ran out of runway at 160 km/h, I think we have an answer and the answer is challenging.

QF1's 8.5-hour flight from Sydney to Bangkok in Thailand had been routine until air-traffic control (ATC) warned of a thunderstorm over Bangkok Airport: visibility was at 4000 m in heavy rain. The warning prompted the first officer (FO) to suggest Plan B: a go around and a hold to the south if the rain was 'bad' on final. The captain, having landed in far worse conditions, replied that 4 km visibility was fine and it was 'just a shower'. Nonetheless, the aircrew changed the autobrakes setting from 2 to 3 and began slowing the 747-438 for approach.

By 3000 feet (ft), the airspeed had decreased to 200 knots (kt) and the autopilot had captured the glide-slope. A short time later, the aircrew selected the landing gear down and at 2200 ft, QF1 slowed to 182 kt. The aircrew deselected the autopilot and auto-throttle and changed

Safety is not just statistics. Safety is not just reputation. Safety is not just history. Safety is something more

the flap setting to 20 degrees. Over the radio, ATC broke through, speaking to an aircraft that had just landed.

ATC: *'Runway wet … braking action reported by Airbus 33 as good.'*

What they did not mention was visibility had been alternating between 'good' and 'really bad' and a company callsign had just gone around.

On QF1 – now at 770 ft and 166 kt – the FO began noticing something unusual:

QF1 FO: *'The aircraft doesn't want to slow down.'*

Caught in the storm currents, QF1 was getting high and fast, with the visibility getting worse. At 200 ft and 164 kt, QF1 entered heavy rain: *really* heavy rain. The rain was so loud it was recorded by the cockpit voice recorder *over* the slipstream and the engine noise. The windshield wipers vainly tried to clear the great curtains of water, but the runway environment became completely obscured.

QF1 CAPTAIN: *'You're getting high now … you happy?'*

asked the captain.

QF1 FO: *'Ah … yes,'*

the FO replied, rather uncertainly.

The pause showed he was not 'happy'. Even a 747 with the respected red kangaroo on the side cannot disrespect Mother Nature. The fact was the FO and the aircraft were struggling to maintain the glide slope.

QF1 CAPTAIN: *'Get it down, get it down. Come on … you're starting your flare.'*

The captain's voice was rising in its urgency but there was no immediate response from the cognitively loaded FO. The aircraft ballooned past the threshold at 169 kt: 20 kt above target speed and 30 ft above target height.

QF1 CAPTAIN: *'Go around!'*

The captain made the call as QF1 touched down.

The FO dutifully advanced the thrust levers. At the same time, the rain cleared and the entire runway was suddenly visible. It was a visual sucker punch. On seeing the suddenly emergent runway, the captain decided to abort the go around and, unannounced, pulled the thrust levers to the idle stop. But in the heat of the moment, he missed the number-one engine lever. It remained at flight power.

QF1 was now halfway down the 3.7-km runway and still travelling at 153 kt. Three engines were at idle, one at power and none at reverse thrust. Worse, because the number-one engine was above idle speed, the autobrakes



Qantas Flight 1 in its final resting place beyond the runway, Bangkok, 1999 (Australian Associated Press)

disengaged. The FO noticed the aircraft was not slowing nearly enough and then noticed the number-one engine was still at flight. He pulled the lever back to idle at the same time as hitting the manual brakes. The tyres promptly began aquaplaning on the standing water. Braking action was definitely not 'good' as advised by Bangkok ATC.

The pilots' attempts to slow the aircraft were to no avail. Physics would not allow that much mass and momentum to pull up before the end of the runway. The aircraft ran out of runway doing 96 kt (178 km/h) and out of stopway at 88 kt (162 km/h). At the end of the runway, QF1 ploughed through a section of the instrument-landing system antenna, onto wet soil, and came to an abruptly boggy stop on the embankment of the perimeter road some 200 m beyond the stopway, with its nose wheel collapsed.

There were no serious injuries, but the aircraft was a near write off and required $100 million in repairs.

Here are the findings of the Australian Transport Safety Bureau (ATSB) and here again my introductory question rears its obtrusive head:

- The flight crew did not use an adequate risk-management strategy for the approach and landing.
- The FO did not fly the aircraft accurately during final approach.
- The captain cancelled the go around by retarding the thrust levers.
- The flight crew did not select (or notice the absence of) idle reverse thrust.
- The flight crew did not select (or notice the absence of) full reverse thrust.
- The flight crew did not consider all relevant issues when deciding not to conduct an immediate evacuation.
- Some crewmembers did not communicate important information during the emergency period.[2]

'The flight crew *did not*' … 'the FO *did not*' … 'some crewmembers *did not*'. There are a lot of 'did nots' – which are all reasonable findings (as were the many latent systemic failures) – but here is my point: if we constantly analyse, dissect and scrutinise the 'did nots', what do we miss? The obvious answer is the 'dids'.

Consider this observation from Erik Hollnagel in his work *Safety-I and Safety-II: The Past and Future of Safety Management*:

> An unintended but unavoidable consequence of associating safety with things that go wrong is a lack of attention to things that go right.

Hollnagel points out that when we conceptualise safety as the absence of harm, damage or danger, this invariably leads to analysis, dissection and scrutiny of things that have gone wrong (the 'did nots') which then leads to more rules, more procedures and more policies: which then becomes the engine for a 'regulate and legislate' culture. But rarely does investigation involve analysis, dissection and scrutiny of things that have gone (and are going) right which might, instead, lead to a 'train, trust and verify' culture.

Ask yourself this question and I think you will empathise with my point. Of all the words written last calendar year in the name of safety (or quality) management, how many were in the service of things going right? How many analysed, dissected and scrutinised the 99.9999996 per cent of operations done well (the world's non-accident rate for airlines)?

Consider again QF1 – and every other Qantas flight and every other modern-airline flight – and the hundreds of thousands of actions done well over and over again. They would outnumber the wrong, the 'bad', the erroneous, by millions to one and yet they tend to remain relatively unexamined. Should we not seriously wonder what is at the heart of these ongoing successes?

The investigation into QF1 was one of the most comprehensive ever conducted by the ATSB. In their own words:

> By July 2000, more than 45 files (each containing 200 documents), more than 500 photographs, and over 1100 emails of information had been collected. The next step was to draft the investigation report

In the civilian world, we now have about 2.2 million words of core regulations (up from about 550,000 words at the time of the QF1 accident).

If we constantly analyse the 'did nots', what do we miss? The obvious answer is the 'dids'



Qantas Flight 1's collapsed nose wheel and damaged airframe, Bangkok, 1999 (Australian Associated Press)

In just one year as a safety director at a midsized aviation company, I sent and received approximately 1.5 million words worth of emails. If you have any sort of managerial role, you probably did the same. And that word count does not include the (probably) millions of words of vocational know-how in manuals, instructions and handbooks which we are supposed to assimilate and apply as aviation professionals. Conservatively, this puts our 'safety word count' up around five million.

Some call this word mass *War and Peace*, but it is at least *eight* of Tolstoy's classic novels because *War and Peace* is a 'mere' 600,000 words.

All this leads me back to my opening question: in our five million safety words, are we missing something essential?

QF1 represents literally 0.000004 per cent of the worldwide accidents in a non-accident rate of 99.999994 per cent, yet it resulted in almost gleeful media coverage as Qantas desperately tried to reframe the accident as an 'incident'. Sure, it was newsworthy, and sure, it was probably a case of many wanting to cut down the red-kangaroo poppy, but from a safety perspective, the real story was: how did Qantas manage *not* to have an accident in the jet age until QF1?

Qantas's safety record, and the QF1 blot on that record, shows that safety rules can never be safe without people. Safety rules, safety processes, safety audits and safety policies are just inanimate words on a page that do not bring safety. It is people, at the decisive moment, over and over again, who bring safety.

One time in four million, the aircrew made the wrong decision and overran the runway but, over and over again, to the millionth degree, Qantas crews (and non-Qantas crews around the world) make the right decision at the right moment. All this is a key lesson for our increasingly congested regulatory environment: if safety rules, safety procedures, safety audits and safety policies are to be authentically safe, they must never congest, complicate, or confuse the humans at the centre of aviation.

I have dedicated six years of PhD research[3] to understanding true accident-proofing safety and while there is much I could say about the subject, the simplest thing is that while rules, processes and policies are an important part of safety, they are not its heart and soul. The heart and soul of safety is the heart and soul of safety-savvy operators: the heart and soul of determined, courageous, humble and prudent people.

Yet it is hard to find even a single mention (let alone an informed examination) of these safety attributes – these 'vigilance virtues' – in all of the many tomes of aviation-safety policy and regulation (hence my PhD). We might not ever truly be accident-proof operators, but we can most certainly be safety-savvy operators: seeking to create rules and procedures that empower the best of our team while disempowering the worst. Operators ensuring our safety words are neither too many nor too few: operators ensuring our safety words enhance, not congest, the awareness of the frontline operators who are the true deliverers of safety.

I wonder what Ray from *Rain Man*, with his finely honed common-sense safety instincts, would think of the post-QF1 years of policymaking where 66,000 words every year, for some 20 years to 2025, were added to our civilian-aviation regulations. Would he consider these safety word increases 'safe'? We can never know for sure, but I suspect if I were to provide Ray with our regulations, policies, audits and investigations and said, 'here is safety!', he would not buy it. And I do not think we should either.

The cautionary tale for Defence from QF1, and the congested civilian regulations, is that Defence, perhaps now more than ever, needs to ensure its aviation professionals are empowered – not congested – by their regulatory safety words.

Endnotes

[1] https://www.flightsafetyaustralia.com/2020/11/qantas-the-safety-story/

[2] https://www.atsb.gov.au/investigations/199904538

[3] 'How safe are the safety regulations and what does safety mean anyway? How aviation accidents provide a reality-based conception of safety and why it matters.' PhD thesis, Dr Adrian C Park (available on request)

Scan the QR code to learn more about the Australian Transport Safety Bureau's investigation into the QF1 incident, Bangkok, 1999

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I want to improve the safety culture of my unit, in particular because of the kind of operations we have been tasked to do: fighting insurgents while helping keep operational pilots safe

SQUADRON LEADER (SQNLDR) **Ijaduwana 'Iju' Seheimi Tsakr from the Nigerian Air Force (NAF) was one of the 2025 attendees of the Defence Flight Safety Bureau's (DFSB) International Aviation Safety Officer (I-ASO) course, held each year in Canberra.**

As commanding officer of the NAF's No 152 Operational and Combat Operations Wing, SQNLDR Tsakr serves as a pilot and instructor – with the callsign 'Dragon' – on the TAI/Agusta Westland T129 ATAK helicopter. He has deployed on multiple operations throughout Nigeria and neighbouring countries, often in support of the region's ongoing fight against insurgents and terrorists.

SQNLDR Tsakr reflected that the NAF nominated him to attend the I-ASO course 'so I can improve the safety culture of my unit'.



Squadron Leader Tsakr during his visit to Canberra, 2025 (Tamara Robinson)





01 | 02 | 03

01: Squadron Leader Tsakr participating in the International Aviation Safety Officer course, 2025 (Tamara Robinson)

02/03: Other participants of the International Aviation Safety Officer course, 2025 (Tamara Robinson)

'In particular, because of the kind of operations we have been tasked to do,' SQNLDR Tsakr said. 'Fighting insurgents … [while] helping keep operational pilots safe.'

The I-ASO course provides both theoretical and practical training, equipping participants with a comprehensive understanding of aviation-safety principles, incident-investigation methodologies and reporting requirements, as well as emergency-response procedures. Twenty-six students attended the 2025 course, representing the African Union and 12 nations from across the Indo–Pacific and Middle East, including Cambodia, Indonesia, Jordan, Lebanon, Malaysia, the Maldives, Pakistan, the Philippines, Papua New Guinea, Sri Lanka, Thailand and Tonga. SQNLDR Tsakr was the only participant from Nigeria on the course and was visiting Australia for the first time.

'When I was nominated and saw Australia with my own eyes, I was so excited,' he said.

'What I like most about this course is the instructors. They are very friendly … that is commendable. The course I am in, they made it interactive; open for us to contribute our best. I think that's one of my favourite things about it.'

The NAF is one of Africa's largest air forces, with more than 18,000 personnel. Since its establishment in 1964, it has played a significant role in countering regional terrorism and insurgency, while also contributing to broader security and military operations. Although Nigeria is a former member of the British Commonwealth and the NAF was initially modelled on the Royal Air Force, the service has evolved to reflect Nigeria's unique culture, traditions and operational requirements.

'Africa has a culture of a "steep slope",' said SQNLDR Tsakr. 'So when you're teaching – cause I'm an instructor – when you're teaching, [the students are] seeing you as superior; they're not seeing you as that person [who has] that knowledge first. So you have to break that ice with them … You have to let them know that you're actually open to teach[ing] them.'

The DFSB and RAAF are committed to running the I-ASO course to strengthen the aviation-safety capabilities of international air force partners and to enhance relationships with current and future coalition allies.

'The DFSB-led I-ASO continues to strengthen partnerships between Australia and its regional neighbours,' said Major Andrew Jones from DFSB's Education and Training team.

'The program aims to share expertise and enhance collective aviation-safety knowledge across the region. As partner nations expand their capabilities and operate in increasingly complex environments, the importance of robust air-safety practices is growing significantly. Initiatives such as the I-ASO course play a vital role in fostering collaboration and ensuring a shared commitment to aviation safety.'

Within this context, SQNLDR Tsakr reflected on the safety lessons from the course that he could immediately apply in his role within the NAF.

'The hierarchy controls for risk management: that's something that I've learned here and I think it will be useful back home in Nigeria,' he said.

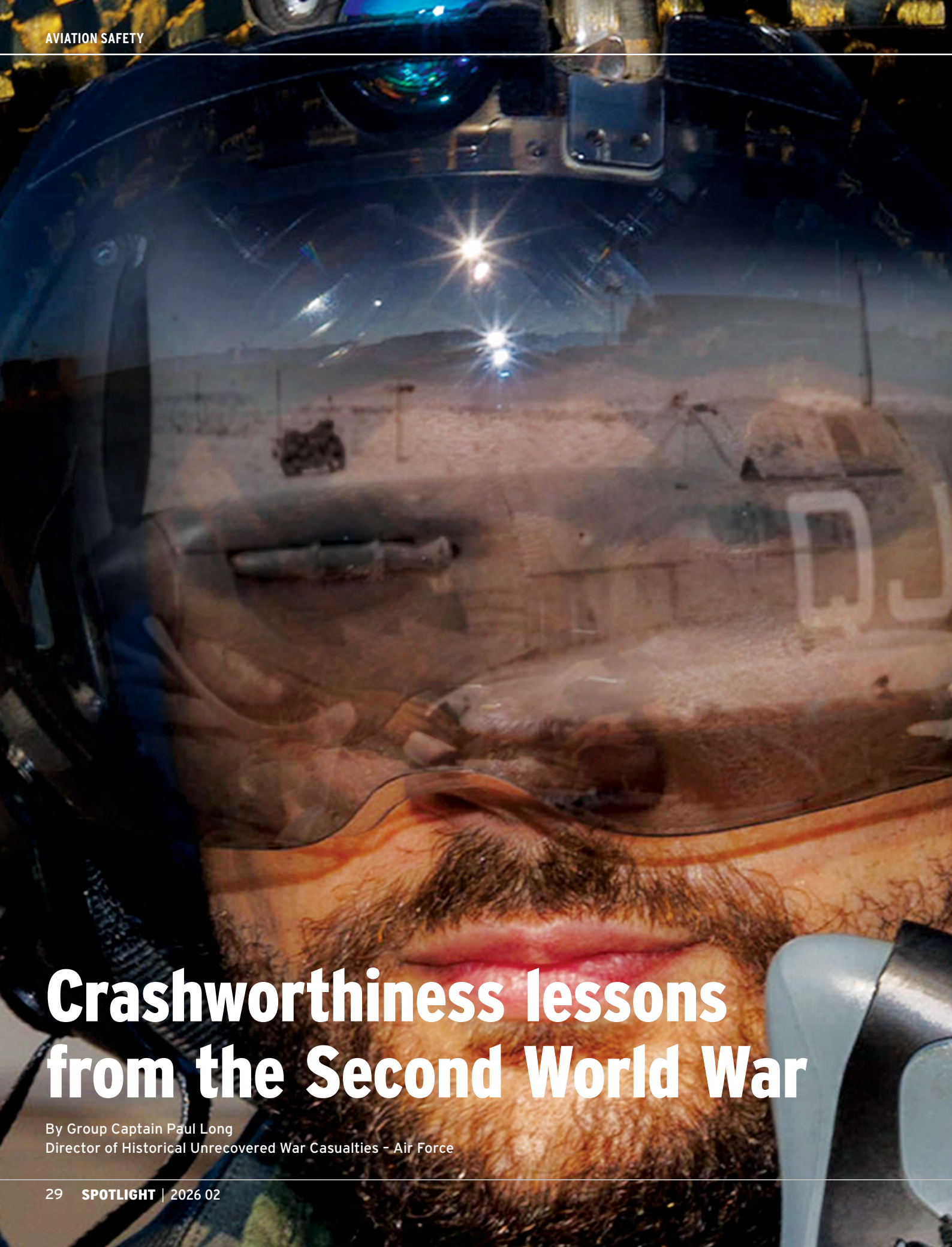
'Because although, yes, we have a safety system, we don't have exactly the risk-management hierarchy controls. That's something I can take back home to enrich our safety culture.'

The I-ASO course explores ways to improve not only the technical aspects of aviation safety, but also the human factors that influence decision-making and performance. One lesson grounded in psychology that particularly resonated with SQNLDR Tsakr was the fallibility of human memory.

'Now I understand that when you do an investigation, you might actually feel that you've asked a [reliable] key eyewitness,' he said. 'But the eyewitness might … get some things wrong which are unintentional.

'So we understand that you don't just base your investigation on a key witness … you have to interview them; you have to get to know how they saw it, what's their point of view.'

For course information, visit the DFSB intranet site or contact the DFSB Education and Training team via the QR code or dfsbet@resources.defence.gov.au



Crashworthiness lessons from the Second World War

By Group Captain Paul Long
Director of Historical Unrecovered War Casualties – Air Force



(Australian War Memorial and Department of Defence)

DURING THE SECOND WORLD WAR, aviation engineering faced a brutal reality: combat losses were staggering, but non-combat training and landing accidents were also claiming thousands of lives. This crisis forced military designers and medical researchers to pivot from merely making aircraft fly faster, to making them survivable when they crashed. The innovations born in this era laid the foundation for modern crashworthiness, shifting the focus of engineering towards protecting the human body during catastrophic impacts.

The birth of crash-injury research

Before the 1940s, aviation safety had focused almost entirely on preventing structural failure. If an aircraft crashed, injuries were viewed largely as inevitable acts of fate. Hugh DeHaven, an American survivor of a pre-war mid-air collision, challenged this assumption. In 1942, backed by the United States military, DeHaven founded the Crash Injury Research project at Cornell University.



(Australian War Memorial)

By analysing hundreds of survivable military crashes, DeHaven discovered that the human body could withstand incredible deceleration forces if properly 'packaged'. His team proved that most fatal injuries were not caused by the impact's G-forces, but by the body striking rigid or sharp objects inside the cockpit or cabin. This breakthrough completely redefined aircraft interior design.

The human body could survive incredible forces; it was often the aircraft's interior that turned a survivable crash into a fatal one



A pilot at the controls of a P-51D Mustang aircraft, circa 1942–5 (World War Aviation)

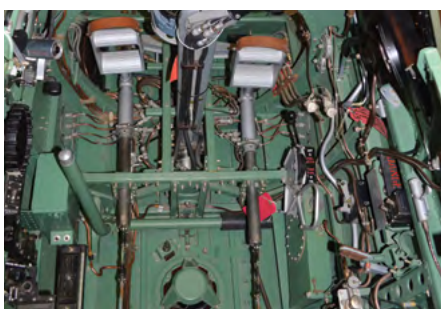
Packaging the pilot

DeHaven's research triggered rapid, practical modifications to military cockpits. Engineers began clearing the strike zone in front of the pilot: removing sharp knobs and instruments, and control columns that caused severe head trauma during sudden stops.

Simultaneously, restraint systems underwent a massive evolution. Early war aircraft relied on simple lap belts that allowed a pilot's torso to snap forwards violently upon impact. To fix this, engineers introduced the shoulder harness and military-grade inertia reel. These systems locked securely during sudden deceleration, keeping the pilot firmly anchored to the seat and preventing their head from striking the dashboard.

Reinforcing the airframe

Crashworthiness also required structural changes to the aircraft itself. Designers realised that the cockpit needed to act as a survival cage. Cockpit floors and seat mounts were reinforced to prevent them from collapsing upwards into the pilot during hard or belly-landing impacts. Furthermore, the introduction of self-sealing fuel tanks fundamentally altered post-crash survival rates. By lining fuel tanks with layers of vulcanised rubber, bullet holes and impact tears would instantly swell shut when exposed to escaping fuel. This single innovation prevented thousands of post-crash fires, which had historically been the leading cause of fatalities in otherwise-survivable accidents.



Cockpit floor of Supermarine Spitfire LF.Vc 'AR501' (G-AWII), circa 1942 (Alan Wilson)



Australian-made self-sealing fuel tanks being readied for installation in the wings of Bristol Beaufort aircraft, 1943 (Australian War Memorial)

Did we learn?

To prepare the C-130J for operations in Iraq and Afghanistan in the early 2000s, I participated in (and, as I became more senior, later conducted) Battleworthiness Boards on an as-required or annual basis. In the early days, they were very frequent! These Boards were particularly useful in focusing attention on all of the lessons and designs from DeHaven that had evolved since the Second World War.

They were also relevant as the C-130 community had lost one of our own in 2005, when Flight Lieutenant Paul Pardoel was shot down over Iraq with a hit to the wing while flying C-130s with the Royal Air Force. That aircraft had not been fitted with the modern equivalent of rubber fuel-tank lining: explosion-suppressant foam (ESF), which is a highly porous polyurethane foam installed inside fuel tanks to prevent catastrophic explosions, mitigate fuel spray and stop fuel from sloshing around. The Australian fleet at that time was not fitted with ESF either – a key lesson had been forgotten in the relatively quiet 1980s and 90s – but this was quickly rectified.



A piece of fire-suppressant foam from a C-130 Hercules (Royal Air Force)

A lasting legacy

The rush to protect pilots during the Second World War permanently changed how the world approached transportation safety. After the war, DeHaven's military research was declassified and shared with the public. The concepts of energy-absorbing structures, secure restraint systems, and de-lethalised interiors moved directly into commercial airliners and, eventually, cars. Every time you buckle a three-point seatbelt, or a car crumples in an accident, we are benefitting from the crashworthiness lessons we learned in the skies during the Second World War.

And remember: the present has a past, and the future has a present.

Scan the QR code to read the Royal Air Force's Board of Inquiry report on the crash of C-130 XV179 in Iraq, 30 January 2005

YOUR WORDS CAN HELP KEEP US ALL SAFE



(Department of Defence)

We welcome articles, ideas and leads that provide meaningful insights into Defence-aviation safety and operational excellence, including:

- **case studies of aviation incidents**, including near misses and human factors in mishaps
- **strong safety leadership and reporting culture**
- **innovations in aviation maintenance, operations or risk management**
- best practices in **aviation training and simulation**
- safety lessons from **exercises and multinational operations**
- **aviation-safety evolution** and lessons for today
- **policy and regulatory updates** from DFSB, DASA or related bodies
- **your personal reflections or experiences** that have shaped your aviation-safety awareness
- **your reviews of books, movies, podcasts** (and more!) with strong safety messages.

Please email your articles, ideas and leads to **dfsb.pm@defence.gov.au**

Thank you for your continued support in strengthening aviation safety throughout Defence

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The Killing Zone: Airplane accidents and lessons for survival



THE FLIGHT-INSTRUCTOR AUTHOR of this textbook wrote it with a simple aim: to reduce aviation accidents. The content addresses general aviation – not military or commercial – with a focus on the United States (it consequently uses American spelling). However, many of its lessons can be applied universally across aviation, with separate chapters dedicated to takeoff and climb, approach and landing, pilot distraction, runway incursion, mid-air collision, fuel management, pilot mental health, pilot physical health, night flying, controlled flight into terrain, automation and artificial intelligence, airmanship, and more.



Figure 8-2: The pilot of this aircraft typically flew with the canopy partly open. This wreckage shows the canopy fully open, p. 157 (National Transportation Safety Board)

The Killing Zone is a comprehensive textbook, heavy with statistics, graphs and maps for the technically minded, and content from aviation-incident investigation reports. It juxtaposes this technical content with many case studies, often drawing from several to make a specific point. In fact, one strength of including so many case studies is using them to compare and contrast the different ways in which different pilots responded to similar aviation challenges (culminating in which pilots walked away and which pilots were not so lucky). 'In a way, the definition of an experienced pilot is a pilot who has simply survived themselves,' Craig asserts.

Mini-lessons are scattered throughout the textbook, for example, on G-force and centrifugal force (what they are, what they mean for the handling of an aircraft, and their effect on a pilot's body and brain), and industry-specific jargon such as 'sterile cockpit', with explanations and examples. In this way,



Figure 2-7: This aircraft went into a spin and crashed, p. 36 (Federal Aviation Administration)

even those who are new to aviation – or those who learn best when stepped through lessons – can understand its teaching.

Craig's writing style, while formal, frequently offers advice for what readers should do if they find themselves in various situations. His priority message is 'safety first' as he advises readers not to fly under certain conditions: for example, 'The only certain defense [sic] against getting caught in known icing conditions in an unprotected airplane is to stay on the ground.' However, this approach is contrasted with his rule that pilots are expected to adhere to certain professional standards: 'You cannot tell the [air-traffic] controller to give you some slack because this is your first time in the clouds.'

The chapter on pilot mental health can be challenging to read, and includes a series of case studies of tragic incidents in the civil domain. This chapter ends with the phone number for the (US-based) Suicide and Crisis Lifeline, and Australian readers are encouraged to consider their own psychological health and available support resources before reading this chapter.[1]

On a lighter note, the 'pilot personality self-assessment exercise' at the end of the textbook is a comprehensive multiple-choice quiz more entertaining than might have been expected in an otherwise serious textbook. A sample of just two questions follows:

It is three o'clock in the morning and you are stopped at a red light (that may be stuck). There are no other cars around. What should you do?

1. Look both ways and go.

2. Wait for the light to turn green.

3. Call the police and report a broken traffic light.

The world would be much better off if:

1. People would just be more like me.

2. Everyone would just mind their own business.

3. We could all be friends.

Craig is quick to point out, 'This is an *unscientific* assessment, so do not base all your career plans and a future flying solely on this exercise! But it is interesting to see how it comes out.' The exercise is a note of levity at the end of this intensive (and often intense) work.

'In flight,' writes Craig, 'we are largely architects of our own disasters.' *The Killing Zone* is his effort to minimise such disasters, by providing evidence-based analysis of, and lessons drawn from, aviation-incident data, investigation reports and case studies. **Recommended reading.**

The Killing Zone

Paul A Craig
Third edition, 2026

Pros

- Its impressive breadth of analysis and teaching, which aims to reduce aviation incidents.
- This third edition has the benefit of having been refined following two previous editions.

Cons

- A focus on general (not military) aviation, firmly embedded in the US aviation system, makes it of less relevance to Australian Defence aviators.
- While it includes many photos and graphs throughout, this book is text-dense, formatted as a single column with few line breaks. Bring your reading glasses.

[1] Defence All-hours Support Line 1800 628 036; Lifeline 13 11 14; Suicide Call Back Service 1300 659 467

Have you read a book lately with an aviation-safety message? Or seen a movie depicting an aviation incident that made you think (or cringe)? We welcome reviews of all forms of media (books, movies, podcasts, artworks, etc).

Email your review to dfsb.pm@defence.gov.au

The definition of an experienced pilot is a pilot who has simply survived themselves



Why didn't he eject?

By Dr Mark Lax

(Department of Defence)

THE SETTING is the circuit area of Royal Thai Air Force (RTAF) Base Ubon, Thailand. The date: 3 January 1968. The aircraft: Royal Australian Air Force (RAAF) Sabre A94-986.

At about 1045h, after the engine apparently failed at about 500 feet, A94-986 crashed just over a nautical mile (nm) short of the threshold of runway 05, the active runway that day. The pilot, Pilot Officer (PLTOFF) Mark McGrath, failed to eject and was killed, as was a young Thai girl when the aircraft crashed into her farm. So why had PLTOFF McGrath not pulled the ejection handle?

In the late 1960s, Australia deployed No 79 Squadron (79SQN) and its F-86 Sabre aircraft to Ubon, an RTAF base in support of the Thais during the Communist uprisings in Laos



RAAF Sabre based at RTAF Base Ubon, Thailand (Department of Defence)



and Vietnam. At that time, Australia was a signatory to the South-East Asia Treaty Organization (similar to the North Atlantic Treaty Organization), with its intent to deter Soviet and Chinese aggression. Under Australian Government restrictions, Australians could defend Thailand but not participate in the war against North Vietnam.

In 1968, Ubon was also home to the United States Air Force's (USAF) 8th Tactical Fighter Wing, whose F-4 Phantom aircraft regularly flew missions into North Vietnam to bomb targets in Hanoi and on the Ho Chi Minh trail. 79SQN would regularly practise intercepts on the returning Americans as long as they remained within Thai airspace. The Australians were no doubt frustrated watching the Phantoms come and go.

On this day – 3 January 1968 – there would be no American intercepts, but a training exercise in the form of a four-aircraft versus two-aircraft tactics mission. PLTOFF McGrath was detailed as Falcon Golf 4. His commanding officer, Squadron Leader (SQNLDR) Dennis Stenhouse, had rated him as an average Sabre pilot for his relatively limited 164 hours of flying time on the Sabre (and 463 hours of flying time in total). SQNLDR Stenhouse later told the Court of Inquiry that, on the day of the accident, PLTOFF McGrath had appeared 'fit, alert and apparently capable of completing his assigned mission'.

The weather was fine and cloudless with a 12–15-knot wind from the northeast. The mission was duly briefed, with Falcon Golf (the four aircraft) against Falcon Zulu (the pair). Once airborne, both sections contacted the USAF ground control, split to about 40 nm apart, then were vectored to intercept: at this point, the fight was 'on'. Falcon Golf's lead pilot was Flying Officer (FLGOFF) Pete Dickens who later recalled that, as well as briefing on their tactics, he had covered emergency procedures and radio failure, and ordered a 'fan break' to position the four aircraft for the circuit. He too stated PLTOFF McGrath had appeared fit to fly.

The mission proceeded as planned and, with the intercept exercise completed, all six aircraft returned to the circuit. Falcon Zulu landed first, followed shortly afterwards by Falcon Golf. At this stage, all seemed well with Falcon Golf. After landing, FLGOFF Dickens saw Falcon Golf 2 and 3 behind him, but he could not see Falcon Golf 4. After calling on the tower frequency and receiving no response, the tower then advised him that Falcon Golf 4 had crashed.

Twenty-six witnesses were called to the inquiry, including nine Thais (who had lodged claims for losses to property) and five Americans. Most of the Australian witnesses provided evidence as to the serviceability of the aircraft, the briefing, the squadron's operating procedures, the circuit traffic, and PLTOFF McGrath's physical and mental state on the day. Several aviators had also seen the crash in the far distance.



Aerial view of RTAF Base Ubon, Thailand, 1971 (Department of Defence)

The mission proceeded as planned, and all six aircraft returned to the circuit. At this stage, all seemed well



435th Tactical Fighter Squadron F-4 Phantoms at RTAF Base Ubon (Department of Defence)

The sixth witness – Major (MAJ) Tom Farris, a pilot with the 435th Tactical Fighter Squadron who had been sitting in the cockpit of his F-4 at the holding point to runway 05 with a good view of the landing pattern – recalled for the inquiry that:

> each aircraft turned base normally and the pattern looked good. No. 4 was in a good position and proceeded normally until the final turn onto runway heading. About halfway through the turn, the nose dropped, and he began to lose height more rapidly. He continued to turn but disappeared behind some low trees without making runway heading. As the aircraft disappeared from my view, I notified the tower on ground frequency that an F-86 had crashed southwest of the field.

When questioned further by the members of the court, MAJ Farris stated that he believed the aircraft had not stalled as there had been no wing drop, nor had the aircraft fallen away as might be expected in a stall, nor had there been any smoke trail.

> My first thought as he began to lose height was that he had lost an engine. I believe the pilot was still controlling and flying the aircraft, but [was] unable to arrest the downward motion.

With MAJ Farris's statement and that of the Thai farmers, who had been below the final flight path and had heard engine problems, it seemed to have been a clear case of engine failure.

Not so. The fact that PLTOFF McGrath had made no emergency radio call citing engine failure, and that his oxygen had been set to 100 per cent, now raised the question of incapacitation. Had he flipped the oxygen to 100 per cent just before losing consciousness and simply flown into the ground?

What was the court's finding?
A local Thai protest had begun almost immediately after the crash, so approval had been given to remove the wreckage as soon as possible. This meant the court – after a brief onsite inspection – had to rely on photographs and a wreckage-distribution plan. With engine failure suspected, the engine was sent to the Commonwealth Aircraft Corporation in Melbourne for inspection. Their finding was that the engine had been operating under power at 6000 revolutions per minute when it had hit the ground. No engine failure.



Exhibit F-8, front fuselage and engine (National Archives of Australia)

That left the court with a dilemma. Pilot error or incapacitation, or engine failure?

The president of the court was Wing Commander (WGCDR) Keith Martin, DFC, an experienced fighter pilot who, after considering the facts and witness reports, found that 'the most probable cause of the accident was a compressor failure which occurred whilst the pilot progressed around base leg'. This would have produced loss of power but not engine failure. Concentrating on recovery and landing the aircraft, combined with inexperience, could have led to PLTOFF McGrath flying the aircraft into the ground. What was also clear was

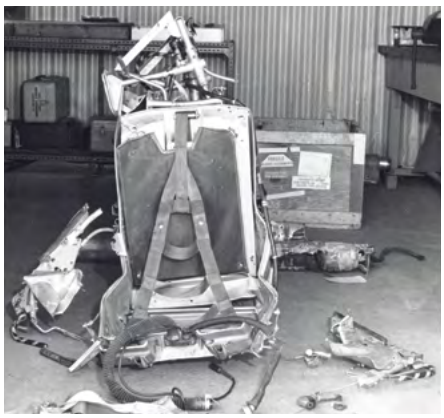


Exhibit F-11, front view of ejection seat (National Archives of Australia)

that PLTOFF McGrath had not tried to eject at all during his fatal descent.

The final say went to the Director of Flying Safety, WGCDR Jack Kinninmont, another experienced fighter pilot who disagreed with the court's findings and considered, 'that the accident was most likely initiated by the pilot stalling or semi-stalling the aircraft at some time during the turn onto final approach'. That was what he sent to the Deputy Chief of Air Staff, and the case was closed.

The question of why PLTOFF McGrath had not initiated ejection can never be answered. Had he done so as soon as he realised the aircraft was not under his control, it may have saved him. So, as to why he had not ejected, we will never know.

Scan the QR code to read the Court of Inquiry report on the crash of Sabre A94-986, Thailand, 3 January 1968



2027 courses

Aviation Safety Training Courses

ASO
Aviation Safety Officer course

COURSE AIM
To graduate Unit ASOs, Maintenance ASOs and Flight Senior Maintenance Sailors.

PREREQUISITES
Personnel who are required to perform the duties of an ASO. ASMS Practitioner course#, RM Foundation course#, ASO Online ADELE course#.

COURSE DESCRIPTION
This one-week face-to-face course delivers the final components of ASO training. The course provides theory and practical exercises in the broad topics of the Defence Aviation Safety Management System, risk management, human factors, the Defence Safety Analysis Model, safety-event investigation and reporting.

AASC
Advanced Aviation Safety course

COURSE AIM
To graduate personnel capable of managing an advanced safety system and performing complex investigations.

PREREQUISITES
Personnel who are required to perform Safety Manager duties or provide aviation-safety advice to Command.

COURSE DESCRIPTION
This one-week intensive course provides theory and practical exercises in advanced incident investigation, risk-management application and evaluation, hazard identification, aviation-emergency response, and data analysis for substantive aviation safety and organisational safety. This course is conducted in collaboration with UNSW and graduates who opt in will receive 6 units of credit upon completion.

NTS
Non-Technical Skills workshop

COURSE AIM
To support collaboration, promote consistency in approach, and enhance effectiveness of NTS training across Defence aviation.

PREREQUISITES
Personnel involved in the development and delivery of NTS training.

COURSE DESCRIPTION
NTS workshops provide an opportunity for personnel to come together to exchange ideas, share experiences, and discuss emerging issues and best practice in relation to NTS training.

IASI
Initial Aviation Safety Investigation course

COURSE AIM
To develop members to support their ASO in conducting aviation incident-level investigations.

PREREQUISITES
Any personnel who are involved with Defence aviation. There is no restriction on rank, and Defence civilians and contractor staff are also welcome to apply.

COURSE DESCRIPTION
This course starts as a self-paced online course and culminates with a half-day face-to-face practical session. It provides theory (taken from the ASO(I) course) on the Defence Aviation Safety Management System, generative safety culture, error and violation, the Defence Aviation Safety Analysis Model, and aviation-event investigation and reporting. Interested personnel should contact their ASO.

For further details, including locations and dates, visit the DFSB intranet site or email dfsbet@resources.defence.gov.au

Nominations from individual units or candidates will not be accepted. Nominations are to be forwarded with the Commanding Officer's endorsement to:

- **Air Force:** relevant Wing Aviation Safety Officer, or for CSG, Staff Officer Safety HQCSG
- **Navy:** Fleet Aviation Safety Officer
- **Army:** Army Safety Section, DOPAW, AVCOMD.

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#It is a student's responsibility to enroll in and complete these courses prior to attending the ASO course. (Images: Department of Defence)



(Images: Department of Defence)

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Advanced Aviation Safety Course
Date: 9–13 November 2026 **Location:** Canberra

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