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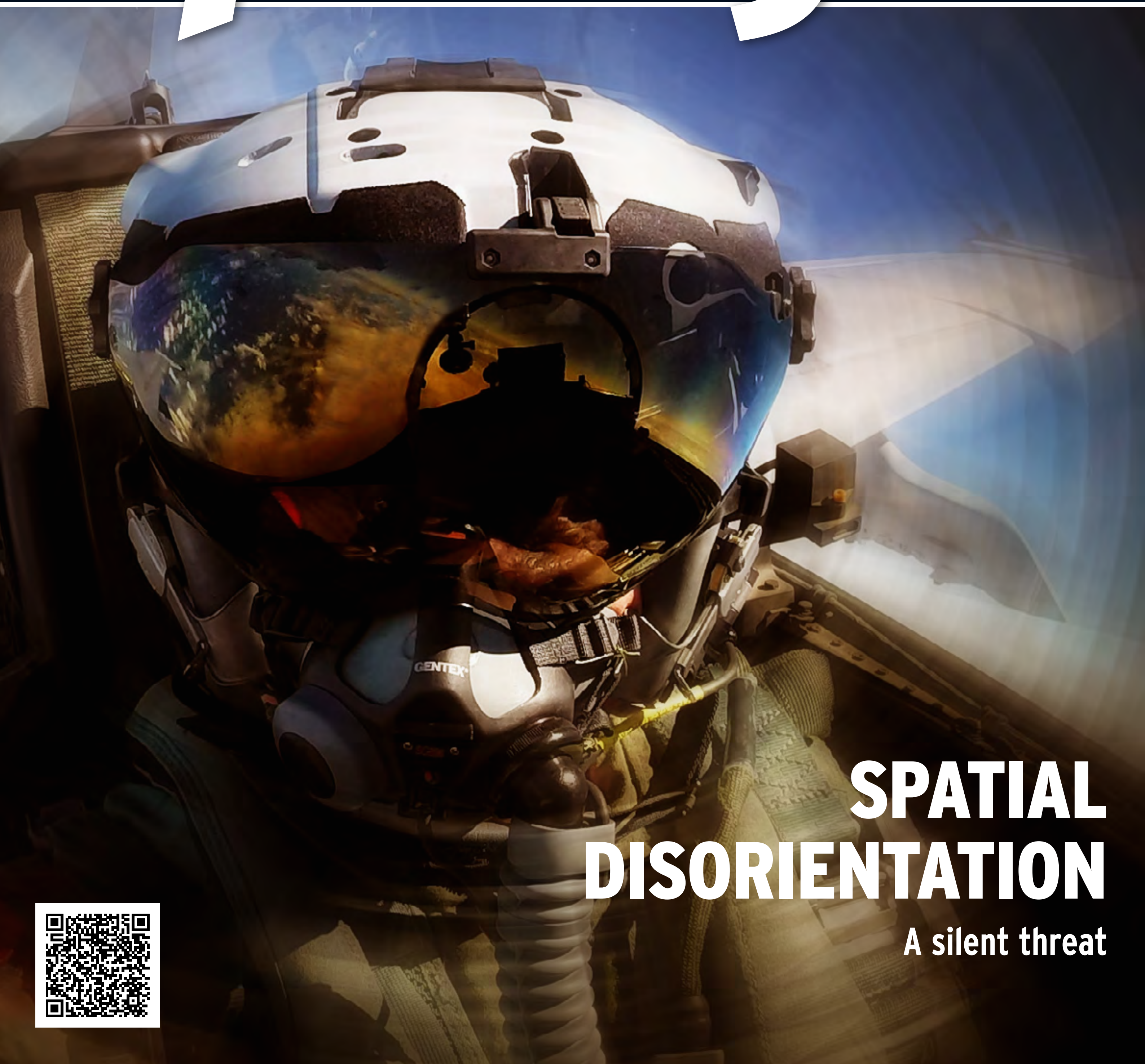
Spotlight



SPATIAL DISORIENTATION
A silent threat

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RECYCLED CONTENT

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FOREWORD

WELCOME TO THE first edition of *Spotlight* for 2025. Recent DFSB aviation accident investigations highlighted that a major contributing factor to the key sequence of events was impairment of the crew's ability to perceive, comprehend and project the status of the aircraft.

Noting that human contribution often provides safety barriers and sources of recovery in complex systems, the question remains whether procedures, systems and equipment were optimised to cater for the variability of human performance, or provided sufficient margins to recognise and recover from a breakdown in situation awareness (SA).

This edition of *Spotlight* draws attention to human performance limitations in the context of Defence Aviation operations – a complex system. Humans are themselves complex systems.

Any interaction between a human and technology, regardless of whether the technology itself is simple or complicated, changes the nature of the whole human-technology system, making it a complex system. Complex systems, such as Defence Aviation, are often subject to random and unpredictable events due to the multiple and changing influences and interactions within the system. Of particular note is the human contribution that often provides the important safety barriers and sources of recovery in a complex system.

Human performance is how people perform tasks and represents the human contribution to system performance. It is the outcome of the interaction between human capabilities and limitations, which affects safety and efficiency in aviation. Human performance is variable and can be influenced by factors such as stress, fatigue and cognitive limitations.

Human performance limitations, including physiological and cognitive factors, can affect SA. One such consequence or outcome of human performance limitations is human error, often resulting from loss of SA.

Loss of SA in aviation occurs when a pilot's ability to perceive, comprehend and project the status of the aircraft is impaired. Perception is the ability to see, hear and sense information through the aircraft's instruments, visual cues and communications. Comprehension is understanding the significance of the perceived information and its relationship to the overall situation. Projection is anticipating the likely outcomes based on current conditions and decisions.

Training, education and integration of human factors and non-technical skills into aviation operations improves human performance and reduces human errors, as well as promoting the development of procedures, systems and equipment that are optimised for human performance.

I encourage readers to consider whether procedures, systems and equipment within your respective domain of Defence Aviation operations provide robust safety barriers with an acceptable margin of error to cater for the variability of human performance in complex systems.

Very respectfully,

GPCAPT David Smith
Director DFSB

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Spatial disorientation: A silent threat

By the Defence Flight Safety Bureau (DFSB) Research and Human Factors team

WHAT IS SPATIAL disorientation (SD)?

The standardised definition of SD defined by the Air Standard Coordination Committee is:

> *...a variety of incidents occurring in flight where the pilot fails to sense correctly the position, motion, or attitude of the aircraft or of [themselves] within the fixed coordinate system provided by the surface of the earth and the gravitational vertical.*

In simple terms, SD can refer to a situation where pilots (and possibly other aircrew) have developed an incorrect perception of how they are oriented in relation to the ground and other aircraft. Usually in these cases, confusing environmental circumstances have made the sensory systems that provide information about our spatial orientation unreliable.

SD is a major cause of fatal aviation accidents, and much of what we know about the incidence of SD comes from aircraft mishap data.

Matthews and colleagues estimated that between 1991 and 2000, 20–30% of US aviation accidents were due to SD, with a fatality rate three times that of non-SD accidents[1]. The authors acknowledged the importance of mishap data in drawing attention to what was clearly a major human factors issue in aviation.

To proactively address this problem, they developed the United States Air Force (USAF) Spatial Disorientation Survey to learn more about the frequency with which pilots experience SD and the effect SD has on performance. Variations of this survey, along with newer surveys developed by other researchers, have contributed to a growing body of knowledge on types of SD, their causes, training methods, and preventive techniques.[2,3]

The RAAF Institute of Aviation Medicine (IAM) has conducted investigations of SD, paying particular attention to training methods that may help to prevent or overcome SD.

How did DFSB examine SD?

To enhance our understanding of SD within the Defence Aviation Community, DFSB gathered information on incidences of SD, their severity, and the effectiveness of SD training.

SD type	Total	Pilots only	Heritage	Pilots only	Surveillance	Pilots only	Air combat	Pilots only	Training	Pilots only	Air mobility	Pilots only	Rotary	Pilots only	Other	Pilots only
N (Overall)	821	649	11	11	56	54	145	115	132	129	124	124	337	203	16	14
Leans	53%	56%	18%	18%	46%	48%	82%	83%	65%	64%	46%	46%	42%	49%	19%	21%
White out	12%	12%	0%	0%	11%	11%	10%	9%	8%	8%	15%	15%	14%	16%	7%	8%
Blending	40%	43%	27%	27%	32%	33%	36%	37%	44%	45%	39%	39%	44%	54%	7%	8%
Sloping	44%	49%	36%	36%	39%	41%	46%	50%	55%	55%	50%	50%	40%	48%	27%	23%
Coriolis	24%	25%	9%	9%	13%	13%	38%	39%	36%	37%	19%	19%	19%	20%	13%	8%
Blackhole	43%	50%	9%	9%	59%	61%	47%	52%	48%	49%	65%	65%	32%	43%	13%	8%
Takeoff	26%	30%	18%	18%	30%	31%	43%	47%	36%	37%	35%	35%	12%	12%	13%	15%
Pitchdown	14%	16%	18%	18%	21%	22%	19%	20%	18%	19%	19%	19%	8%	8%	7%	8%
G-excess	15%	16%	18%	18%	5%	6%	37%	38%	23%	23%	11%	11%	5%	5%	7%	8%
Autokinesis	29%	30%	9%	9%	29%	30%	21%	20%	30%	30%	30%	30%	34%	37%	13%	15%
Misleading	34%	36%	18%	18%	31%	32%	30%	31%	29%	29%	33%	33%	39%	49%	20%	23%
Loss of SA	52%	54%	36%	36%	31%	32%	59%	61%	57%	57%	46%	46%	55%	59%	40%	38%
Giant hand	6%	6%	0%	0%	5%	6%	3%	4%	9%	9%	6%	6%	6%	7%	0%	0%
Elevator	8%	8%	0%	0%	5%	6%	5%	5%	8%	8%	6%	6%	12%	12%	0%	0%
NVD	40%	38%	0%	0%	4%	4%	47%	47%	5%	5%	35%	35%	61%	68%	7%	8%
Drift	30%	30%	9%	9%	9%	9%	11%	1%	10%	10%	13%	13%	58%	73%	13%	7%
Vertigo	11%	10%	9%	9%	5%	6%	4%	4%	11%	11%	5%	5%	18%	19%	0%	0%

NB: Results 1 standard deviation above the SD type average are highlighted orange

Table 1: Percentage experiencing SDs by aircraft category

It did so as part of the 2024 *Snapshot*, an annual survey that collects data on a wide range of workplace issues, including factors impacting safety.

The section of *Snapshot* addressing SD events used definitions drawn from the USAF Spatial Disorientation Survey[1] and a more recent survey administered by the RAAF IAM.

SD was defined as:

> *The incorrect perception of one's linear and angular position and motion relative to the plane of the earth's surface or another aircraft that affected your performance, situation awareness or workload – however slight that effect may be.*

All respondents were asked to rate the effectiveness of the SD training they had completed. Respondents then indicated whether they had undertaken Defence-related flying duties in the last three years. To improve the prospects of accurate recall and reliable data, this item filtered out respondents who had no recent flying experience.

Respondents then indicated how frequently they had experienced a list of 17 SD types, using a response scale with five options: Never (1); Rarely (2); Seldom (3); Occasionally (4); Frequently (5). To assist respondents, a description of each SD type was available. Respondents were also asked to rate the severity of their most recent SD experience and the severity of their worst SD experience. They were advised to answer the SD frequency and severity questions based on their experience over the past three years on their primary aircraft type.

What were the results?

A total of 831 respondents met the specified criteria, representing 25 Defence Aviation aircraft types that were assigned to seven aircraft categories: Heritage (N = 11); Surveillance (N = 56); Air combat (N = 145); Training (N = 132); Air mobility (N = 124); Rotary (N = 337); Other (N = 16).

The key findings were:

Overall. A significant proportion of respondents (86%) reported experiencing at least one of the 17 possible SD types or situations listed in Table 1 during the last three years on their primary aircraft type. Some respondents (37%) reported experiencing more than five of the SD event types. Interestingly, Table 1 suggests that, with the exception of the Rotary Wing category, aircrew reported experiencing SD at almost the same rate as pilots.

Top three. The most frequently encountered SD types or situations were the Leans (53%), Loss of situation awareness (SA) (52%), and Sloping clouds or terrain (44%).

Recency and severity of latest SD experience. Incidentally, 30% of respondents reported experiencing SD in the six months prior to the survey, and 43% of respondents had experienced SD in the previous 12 months. The majority of respondents rated the severity of their most recent SD event as 'Minor', which meant flight safety was not at risk.

The full DFSB Spatial Disorientation Research Report is available to view on the DFSB Research and Human Factors intranet webpage. Consistent with SD research conducted in civilian and foreign military settings, the report draws attention to SD as an enduring and significant hazard to Defence Aviation safety. It also highlights important differences between aircraft types and operational contexts.

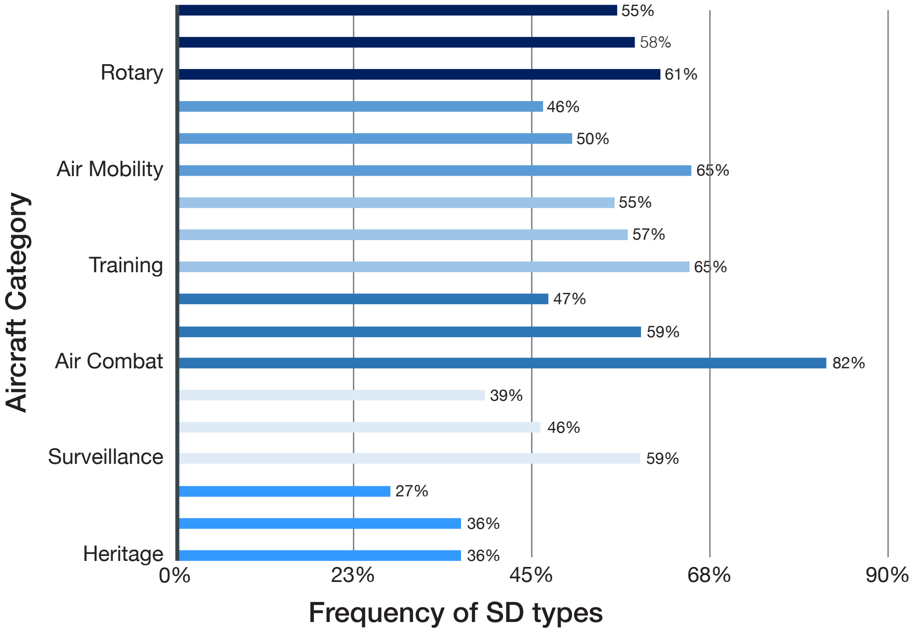

Figure 1: Top three SD types or situations for aircraft categories

Only 2% of most recent SD events were rated by respondents as 'Significant', meaning flight safety was not at risk, but could have been jeopardised under different conditions. No respondents rated their latest SD event as 'Severe' (that is, flight safety was at risk). It is worth noting that the length of time since respondents' last SD experience may have diminished their sense of risk.

Severity of worst SD experience. When reporting their worst experience, as opposed to their most recent, respondents made more use of the 'Significant' and 'Severe' options. A noteworthy proportion of respondents (15%) rated their worst SD experience in the past 3 years as 'Significant'. A further 2% rated their worst SD experience as 'Severe'. There were large differences based on respondents' aircraft category. For instance, the majority of 'Severe' SD experiences were among the Rotary Wing and Air Combat categories.

Difference between aircraft categories. There were differences in the most common types and frequency of SD between aircraft categories. There were also differences among the aircraft types within each category. The top three SD types or situations for each aircraft category can be found in Figure 1.

Type of SD training. Most of the respondents (93%) reported completing some form of SD training, with the lecture format featuring strongly. Many respondents completed multiple forms of SD training. DFSB were not able to explore the timing and sequencing of training.

Effectiveness of SD training. All aircraft types gave favourable ratings to training. Overall, approximately 72% found the training effective, and a further 18% rated it as helpful to some extent. The lowest ratings came from the Rotary Wing and Air Mobility categories.

What are the implications?

The results gleaned from this exploration have revealed a somewhat obvious, yet still critical, conclusion: SD experiences are an unpleasant fact in aviation. The literature is also very clear on this point, outlining that any pilot or aircrew member can experience SD at any time. The triggers are located in the environment, not in the pilot. However, there are some individual differences in pilot reactions to these triggers.

Training in relation to SD is also highlighted in the literature. DFSB explored the impact of training by checking whether there was any relationship between training and experiencing different types of SD. It was found that Loss of SA SD was more likely in situations where training was ineffective, but this was a weak effect from a statistical point of view and needs further support. This trend was more evident in the Rotary Wing group, where 24% of those who rated training as ineffective, reported a Loss of SA SD compared to 12% of those who rated training as effective. This result was statistically significant ($p<.05$).

These findings bring to light the importance of training in relation to SD. The high ratings for the effectiveness of training suggest that the current program is met with approval, but DFSB suggests some further observations and training recommendations based on the findings from the *Snapshot* survey and broader SD literature:

- The first type of training should aim at educating pilots on the causes and symptoms of SD. The list of known SD types is not extensive and there are coherent and consistent descriptions of the various types in the literature. Such training would promote heightened awareness of SD-producing conditions and early recognition of signs that individuals may be succumbing to these conditions.
- The second type of training should involve simulator-based experiences to mimic actual SD conditions, also called Scenario-Based Training and Upset Prevention and Recovery

Training. It could involve exposure to complex flight scenarios that simulate the conditions leading to SD, such as flying in degraded weather/visual cues, experiencing equipment failures, or managing high workloads. The focus of such training would be on maintaining, or re-establishing, spatial orientation in difficult circumstances. Such training in controlled conditions would assist individuals to recognise SD phenomena quickly and either maintain or recover spatial orientation.

- The third type of training should concern the external aids that pilots can call upon to help them overcome the threats posed by SD situations. This is often called Augmentation Training and involves external aids supplementing the skills acquired by the individual. The aim would be to reinforce the principles of Instrument Flight Rules Training, fundamental to which is the practice of relying on instruments rather than senses when SD situations are encountered and recognised.
- At a more general level, training in non-technical skills (NTS) can assist pilots to deal with unpredictable events, such as SD. NTS refers to those human performance skills that promote reliable and effective task performance in complex work systems. To be effective, NTS training must move beyond the classroom, to focus on skills-based performance such as maintaining SA, decision-making, communication and the management of available resources. This involves active practice, assessment and feedback on NTS performance.
- There is a need for training to cover situations where pilots have not recognised SD situations, or have recognised them but succumbed. Confusion, narrowed attentional focus, and high stress levels are common in such situations – but recovery may still be possible, even in what may be dire circumstances. Stress Exposure Training can be helpful in such situations.
- Continuation training is important. SD training cannot be a one off activity when, as we can see from this survey, there may be a year or more between SD events.

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Beyond training – the need to anticipate, avoid and communicate

While the high ratings for the effectiveness of existing SD training programs are encouraging, preventative and recovery controls to minimise SD-related risks extend beyond classroom-based training and vary across operational and organisational contexts.

Anticipate, avoid and communicate

Given the unpredictable nature of flying conditions and the link between conditions and the likelihood of experiencing SD, assessing SD risk factors should form part of mission planning and pre-mission briefings (anticipate). Similarly, when flying conditions change, there is a need to be proactive and avoid SD with increased vigilance, enhanced crew coordination and increased instrument crosschecks (avoid). In crewed environments, the importance of communicating early when encountering conditions that may lead to SD or experiencing difficulty maintaining SA cannot be overstated (communicate).

The Australian Transport Safety Bureau (ATSB) Transport Safety Report An Overview of Spatial Disorientation as a Factor in Aviation Accidents and Incidents (2007) remains a useful and comprehensive resource. The report provides an explanation of the various types of SD in the aviation environment, and suggests strategies for managing the risk associated with SD events.

Enjoy the bad news

By Leonie Gall

PROFESSOR SIDNEY DEKKER was one of the most sought-after 'celebrities' at the PACDEFF conference in 2024, which he kicked off with the first key note address about his take on human factors in aviation safety. Generous with his time, he was more than happy throughout the conference, to sit and have a chinwag with those who sought his counsel about many a topic.

Professor Dekker is Director of the Safety Science Innovation Lab at Griffith University in Brisbane. Stanford has ranked him among the world's top 1% most influential scientists since Newton. He is also is an avid piano player, and a trained mediator and Chaplain.

Perhaps most importantly for our purposes, Professor Dekker is a pilot who has flown 737s for an airline on the side of his day job. As a scientific safety expert, Professor Dekker's views on aviation safety – whether civil or military – are strong, and he speaks about them with conviction and as someone who knows his stuff.

'One of the things that always strikes me about Defence flyers and the people around them who make flying possible,' Professor Dekker says, 'is that they don't just work for themselves; maybe not even really for the mission or goal, although, that's super important.

'A fairy tale starts at the beginning. A war story starts in the middle.'

Sidney Dekker

'They fly for the buddies around them. That's what they give a damn about. That's what really motivates them to go the extra mile, to look out a little bit more, to maybe even deviate from process to pursue some other part of the mission and the safety of their colleagues.'

Professor Dekker has written some 20 books, many about safety, including the two celebrated, *Safety Differently* and *Just Culture*. Both have also become documentaries, which he co-directed. Along with these titles, he coined the terms 'Safety Differently' and 'Restorative Just Culture' in the 2010s, which have since turned into global movements for change.

'We all know in our hearts, to get stuff done, in a mission context, there's always going to be a difference between the processes imagined and the processes executed,' Professor Dekker says. 'You have to adapt; the world is not as friendly, to fit our exact predictions of how it's going to be. You might indeed encounter an enemy who thinks very differently about what the outcome should be and so adaptations are necessary.'

When it comes to aviation safety, Professor Dekker's message in lots of respects is quite simple at its core, but requires some unpacking.

A safety culture is a culture that allows the boss to hear bad news.

'When we reflect on something that hasn't gone well, it becomes very easy to reduce the issue, the failure, the incident, down to a binary action or inaction on the part of some person on the front line,' Professor Dekker says. 'If only this person had zigged versus zagged, then it wouldn't have happened, or things would have gone differently.

'If only this person had noticed this particular piece of data, versus that. If only they had seen that thing that we now know is so incredibly important. In hindsight, we always know what's important. Mission success comes down to more than somebody zigging versus zagging. Mission failure comes down to more than somebody zigging versus zagging.'

Professor Dekker suggests that one of the worst things that leaders can do in this situation is act immediately and perhaps confuse strong leadership with swift action.

'In the wake of an incident, that is stupid,' Professor Dekker says. 'And I want to say to all the leaders out there – and all the leaders incoming, because there are many in the Defence force – don't! Sit on your hands for a bit. Sit back, relax and enjoy the bad news;

unless of course there's immediate trauma to be attended to.'

The idea is that you pause and consider, not rush in and attribute blame to those on the frontline (often junior staff) and attach consequences that can be seen as punitive.

'It could be unwise, because one of the things that obviously happens if you respond like that to incidents, is people shut up,' Professor Dekker says. 'They get conditioned to be careful about what they say. As we know: a safety culture is a culture that allows the boss to hear bad news.

'As a leader, anything you do to put downward pressure on people's willingness to contribute, and people's willingness to disclose and people's courage to share, is harmful to your safety culture, and you're shooting yourself in the foot.

'What we know from the 1970s onwards, is that disasters don't get bred on the front line. They get bred in the leadership suite, they get bred in the administrative back-end of your operation, they get bred in how we source missions, how we provide people with process that matches what they have to do out there.'

Professor Dekker's presentation at PACDEFF explored these very ideas; for example, that leadership and systems have a major impact on the flying experience of pilots and the outcome of missions. His observations of what constitutes a just culture align with his leadership view.

'Put people first,' Professor Dekker says. 'Focusing on impacts, needs and obligations is a very appropriate way to do it. It makes you into a leader who cares, who gives a damn. Which is always a leader who hears more, who gets more accounts, more accountability.

'Allow people to tell their stories. Have a curious poise rather than a judgemental one. Say, "I want to learn, I want to understand this. We're here to succeed, we're here to set you up for success. If there's things that we're not doing to make that so, I need to know."

'And very often those who are involved with the front line, one of the things they often say is, "I want to do everything I can for somebody else not to have to go through this." Well, that's not going to happen if leadership behind them doesn't change the conditions under which choices were given to these people.'

Once you understand the impacts of an event, and what needs have arisen, you can then put the 'right heads around the table' and discuss how you are going to meet subsequent obligations.

'I don't think it is wrong at all to ask, for those who were at the front line, to say, "Look, yes, you've been impacted by this and you have lots of needs and we understand that, but you also have obligations",' Professor Dekker says. 'You have obligations to tell others about this. You have obligations to tell others how not to do dumb stuff. How not to get in a situation like this, to the extent that you could help it.

'I have never met a practitioner at the front end of these sorts of operations, particularly in Defence, who doesn't have a strong sense of duty ethic, but also a strong sense of control. They really want to contribute, unless they are pummelled over and traumatised by their own organisation.'

Engaging those on the front line can be very empowering, and it can also be very healing for them.

'If you as a leader engage people who were involved in telling their story, in giving their account, you help and empower them to improve, but also prevent others from running into the same sort of problem; it's a very powerful thing to do as a leader.

'I think that sort of creation of justice has a much more communal sense to it, which is what you want and who you are. You look out for each other, and that's the most important thing.'

Professor Dekker's work has well over 20,000 citations and many today will recognise his ideas and concepts in, for example 'HOP', 'Learning Teams', the 'New View', and more.

Scan here to discover more about Professor Sidney Dekker

Professor Sidney Dekker, PhD, MSc, MA, delivers the keynote address 'Just Culture & Safety Differently', at the 2018 Australian Defence Force Fuel Symposium

Risk reversal: Shaping up risk

By MAJ Drew Burkitt

ON 11 NOVEMBER 2020, during Exercise Vigilant Scimitar, two MRH-90s carrying 24 Australian Army members passed within 40 feet of each other. Weeks earlier, I sat among peers during a safety discussion focused primarily on this upcoming exercise. Our concerns included many of the contributing factors that did almost lead to a collision — night vision, combined operations recency and proficiency, pressure to achieve qualifications, and distractions. Yet, during this discussion, we didn't understand the actual risk or know the procedures to adequately communicate these concerns to adjust the exercise design.

In hindsight, our assumptions and contextual alignment of risk were poor. However, our risk appetite was inflated.

This article explores three aspects that dominate my reflection on that incident in a transformation of traditional risk management: assumptions, alignment, and intelligence. As risk is platform agnostic and universally enduring, these aspects will be considered against Defence Aviation operations in general, regardless of training or operational focus. This offers the opportunity to consider risk in two less attributed ways, while providing a concept to use risk to drive excellence.

Assume the best and worst

All Defence events and activities start as an idea in the mind of a General or a convincing subordinate. These ideas are stoked until they transform into a plan, inevitably detailed over many pages. While the perfect adherence to Defence writing standards can be mesmerising, it's worth remembering that all plans must use assumptions to gain maximum value from available data. It follows that the better the

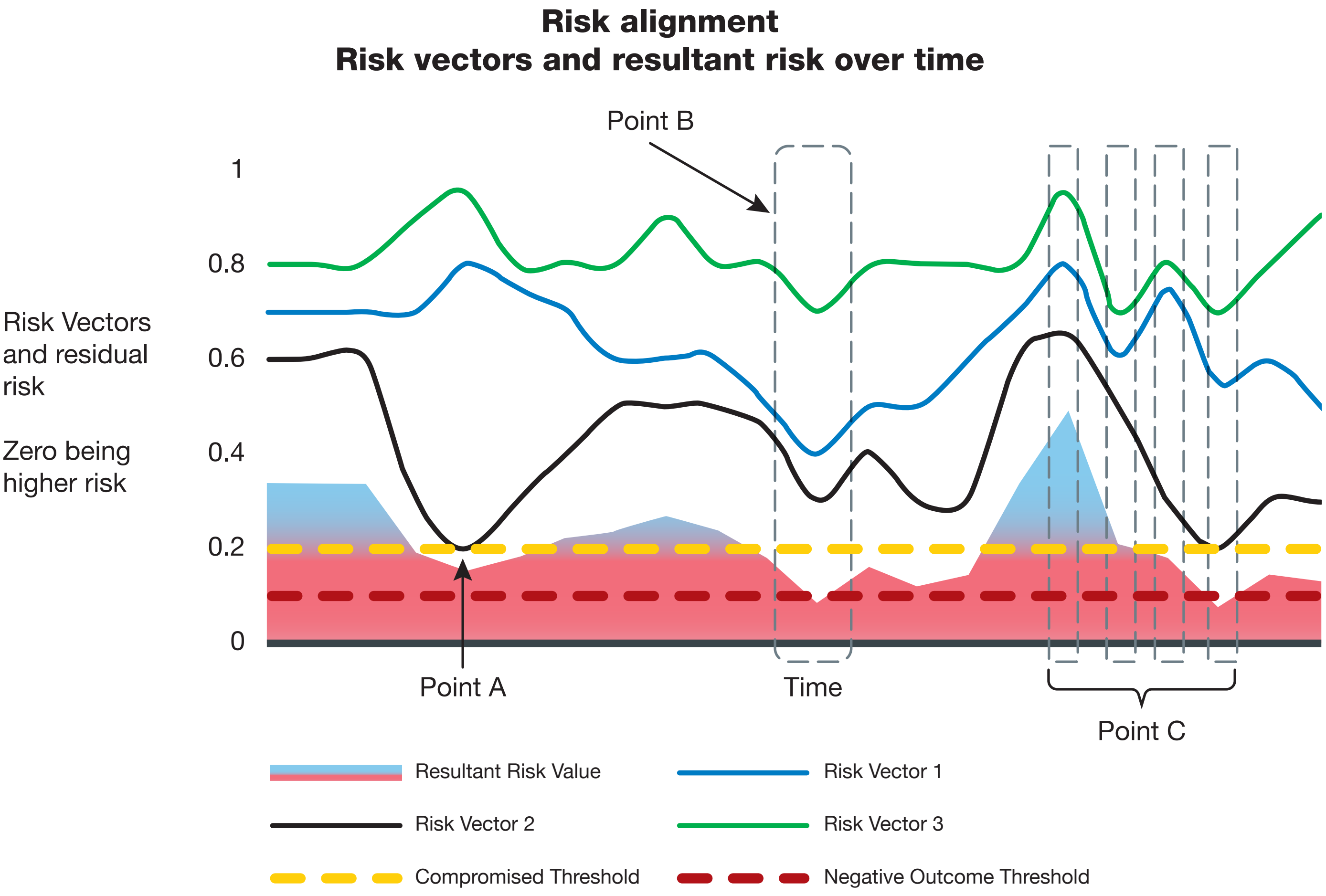

Figure 2: Risk alignment

assumptions, the stronger the plan and the higher the likelihood of success.

Unfortunately, assumptions often become the 'white space' of planning considerations that magically assure the other vital considerations. But assumptions are not facts. Facts can be considered the things that are objectively true right now (considered 100% true), while assumptions are the things that may be true but cannot be proven valid at the time (considered less than 100% true) (Hoffman, 2017, p 150).

Assumption-based planning is essential in dynamic decision-making (Commonwealth, 2018, p 11), and without certainty, assumptions must be provided with an estimate of likelihood (Tetlock, Gardner, 2015, p 54). How likelihood is considered is critical to understanding the use of assumptions. During planning or execution, humans can influence assumptions, knowingly or unknowingly. This interference can be caused by several biases, especially anchoring bias, an illusion of control, and overconfidence (Hoffman, 2017, pp 70–83). As these biases percolate with our analysis, the most robust assumptions might be less reliable than initially considered.

- **Anchoring bias:** the first piece of data sometimes sets the following analysis's baseline.
- **Illusion of control:** humans tend to exaggerate our ability to influence external events.
- **Overconfidence:** success can lead us to place too much faith in our expertise.

Also, the unreliability of assumptions should be considered when evaluating other planning data. Aviation operations, through a need for efficiency, can often develop silos of parallel work. As the silos converge, the effects are no longer in parallel and are instead in series – stacking their effects (Aircraft Owners and Pilots Association, 2022). In this environment, interactions with partnering assumptions can become significant. An example of assumption stacking can be seen in Figure 1, which demonstrates the effect of stacking five silos with strong assumptions

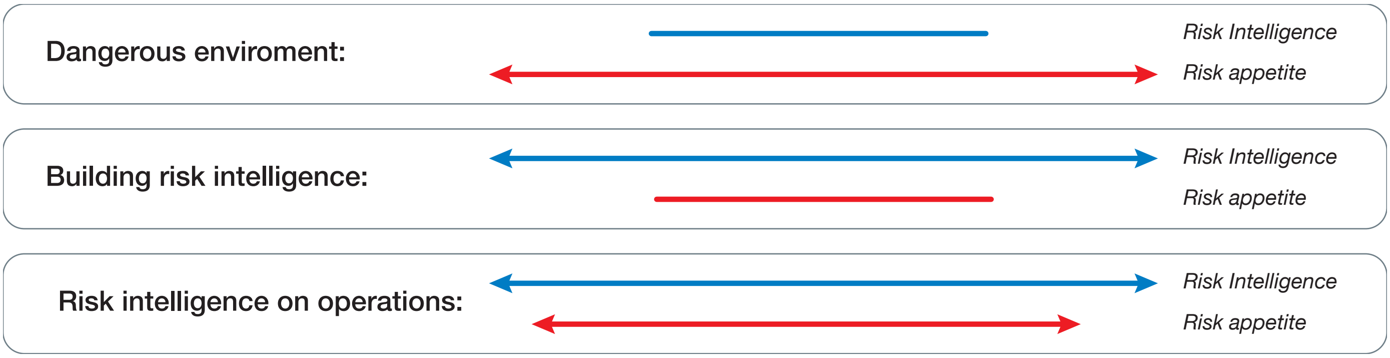

Figure 3: Risk intelligence and risk appetite

(90% accuracy) and those with less validity (70% accuracy).

Strong assumptions

Stacking five assumptions, each considered very likely to be accurate (90% accuracy)
0.9 x 0.9 x 0.9 x 0.9 x 0.9 = 59%
(considered somewhat likely to be accurate)

Less strong assumptions

Stacking five assumptions, each considered moderately likely to be accurate (70% accuracy)
0.7 x 0.7 x 0.7 x 0.7 x 0.7 = *17%*
(considered moderately unlikely to be accurate)

Figure 1: Assumption stacking

This simple equation shows that assumptions can significantly reduce assurance when dependent on other assumptions in series. Therefore, the result of any assumption, particularly those with dependencies, must be considered a risk.

When silos combine

As assumptions are inherent in aviation operations, safety must be assured by managing the risks they present. In many ways, the regulations, rules, and procedures that cascade throughout Defence Aviation move assumptions to fact while reducing risk and improving operations. However, not every scenario has a matching rule set to compensate for the many assumptions present during planning and execution. Instead, assumptions can be considered risk vectors always present within our operating systems, with their risk levels varying over time due to contextual changes (Figure 2). In most cases, due to our safety management systems, these vectors remain within a zone of system control. However, an individual vector can coalesce into a position where it compromises the safety system – these often result in safety events and are evident in Aviation Safety Reports (ASRs).

As these vectors are rarely stagnant, understanding their change in risk level may assist in achieving improved risk management. Many ASRs readily identify the contributing factors (considered risk vectors for this article) that existed within the organisation for some time before the incident. While individual risk vectors might compromise the safety system (Figure 2, Point A), an alignment of risk vectors can spike the recognised risk level towards the threshold of negative outcomes (Figure 2, Point B) – a position equating to Class A incidents.

It is essential to acknowledge that contextual alignment does not guarantee a negative outcome; rather, it indicates a potentially higher likelihood of occurrence. A risk alignment assessment can consider the various assumption data to map risk-vector alignment by considering contextual aspects of these risk vectors. In doing so, the specific context of risk can be identified along with an objective likelihood of a negative outcome (Figure 2, Point C).

The right amount of certainty

Risk intelligence implies linkages to intelligence quotient (IQ) and even emotional quotient (EQ). Like these, risk intelligence relates to our ability to gauge the limits of our knowledge and assess probabilities more accurately (Evans, 2013, p 2). It is a human endeavour that can be developed if we accept there are limits to our knowledge of risk and use educated guesses (assumptions) that are characterised and communicated in a common language (risk management plans) (Evans, 2013, p 12) to increase this intelligence. To do so, risk must be considered continually and at various levels.

Assessing risk at multiple levels appears daunting and unrealistic – though opportunities are present daily within our aviation system. Risk intelligence is likely decaying within aviation because we do not embrace the ability to improve our risk intelligence incrementally. Instead, every safe failure (ASRs, for example) and stretch goal

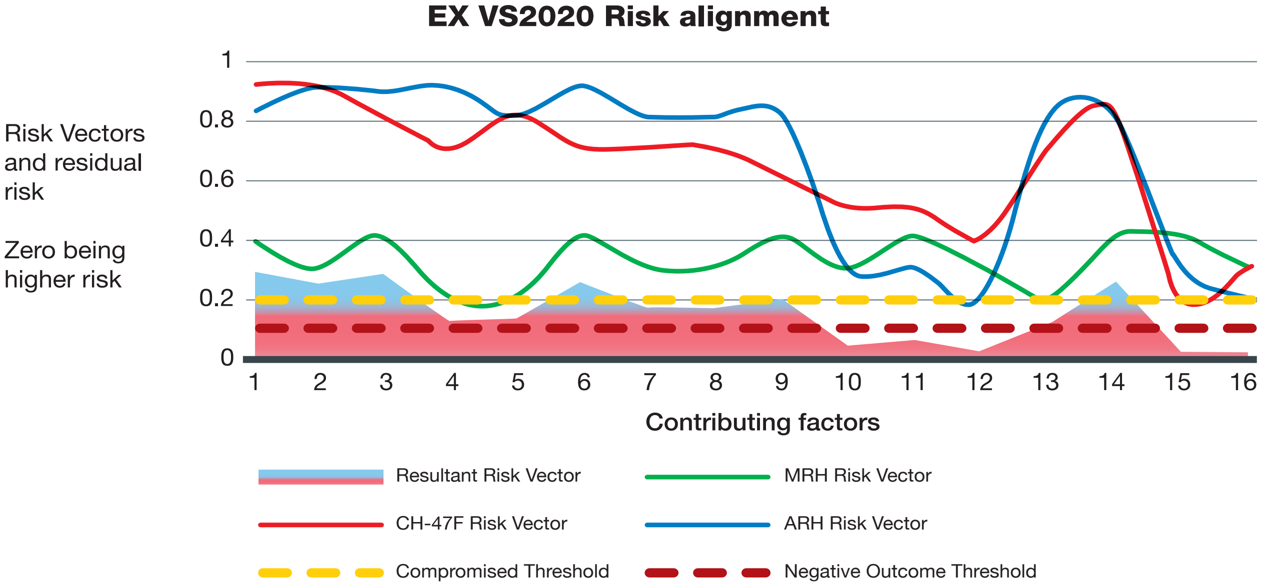

Figure 4: Exercise Vigilant Scimitar 2020 — subjective risk vector consideration

(exercises) could validate assumptions and probabilities, improving risk intelligence captured in risk assessments and controlled through procedures. Actively enhancing our knowledge of risk in this way could unlock the ability to move risk identification before the occurrence or realisation of risk. While early risk identification can be considered the panacea of risk management, it's aimless without the context of risk appetite.

Risk appetite has immediate connotations of unsafe or risky behaviours, better defined as an emotional trait that describes people's comfort with taking risks (Evans, 2013, p 28). As flying operations are human endeavours, risk appetite should be a pairing metric that coexists with risk intelligence. For example, low-risk intelligence and high-risk appetite can easily be considered dangerous environments where people can find themselves outside their ability (Figure 3). Conversely, if risk intelligence in an actively improving system enlarges the overall organisational risk intelligence base, risk appetite could be increased safety in training and operational environments. Risk intelligence and appetite are dynamic, influenced by our ability to comprehend the validity of assumptions and contextual risk alignment.

Our comfortable, quintet-coloured risk management practices might be undermined by our inability to make accurate, informed assumptions. The dependencies that these assumptions require within our systems may stagnate within their silos, unaligned and untested. As a result, our risk intelligence falters – hidden behind tabulated likelihood/consequence risk assessment tables. Assumptions-based planning and risk awareness are nothing new. However, their attribution towards finding a dynamic, flexible and intelligent way to operate with risk will improve our pathway to excellence.

In a subjective example of the Exercise Vigilant Scimitar 2020 incident in Figure 4, the strength of assumptions related to 16 contributing factors relevant to the exercise have been assessed and plotted. The risk vectors for item 10 (mixed aircraft formation recency) and 12 (mixed aircraft formation experience) can be easily seen as creating significant residual risk values, as can 15 (pressure to obtain qualifications) and 16 (cultural alignment of units).

With the ability to consider risk vectors, their relative strength and alignment, it's worth considering what this may mean for proactively identifying areas of concern. Could this assessment have been used during that safety meeting to communicate our risk intelligence and risk appetite?

How do your risk vectors shape up?

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Cumulative fatigue in the maritime aviation domain

By LEUT Maxwell Morey

THE NATURE OF duties as an embarked maritime combat helicopter pilot are unique, demanding and ultimately rewarding. Their primary means of value to the ship are as an operator of an advanced sensor and weapon-system air vehicle. This creates a struggle between being required to contribute as a member of ship's company, embarked flight, and as an aircraft Captain responsible for the safe return of the crew. It is no surprise that this generates various levels of fatigue, which increases the underlying risk in maritime aviation operations.

Life at sea blends a complex combination of intrinsic and extrinsic stress/fatigue factors. These include work demands, biological factors, organisational factors and 'life away from work' factors. Primarily, these issues arise from being on a floating piece of metal in tough environmental conditions. Disruptions to circadian rhythm, demanding aircraft captaincy, long work hours, detailed operational orders and dislocation from

The unique nature of life at sea generates many layers of additional workload and fatigue on individuals.

family life come together to place significant stress and fatigue on naval aircrew. Figure 9-1 from the *Aviation Non-Technical Skills: Fundamentals for Aviation Professionals Guidebook* summarises the relationship of these well.

The impact all of these factors have on performance is wide and varied. Some examples of how they manifest include reduced attention, decreased vigilance, slowness in perception and faulty short-term memory. All of these are congruent with the statement from the guidebook (p 33) that, 'Environmental factors, unusual events, excessive workload and stressful situations put pressure on people and increase probability of error'. Increasing the probability or likelihood of these errors directly increases the risk in conducting flight operations.

In order to assist with controlling the risk of operations, fatigue prevention strategies are an essential element in the Aviation Safety Management System of embarked aviation operations. Broadly, they involve a twofold approach to managing and preventing fatigue. They relate to both the individual worker and the organisation. Individuals can assist with self-care such as sleep hygiene, thorough nutrition, hydration, exercise, being aware of fatigue factors and communicating fatigue issues with their workgroups. Organisations can assist by having minimally disruptive work routines, ensuring the nature of duties are scoped, positively managing individual fatigue levels and having supervisory investment in prevention and management.

The unique nature of life at sea generates many layers of additional workload and fatigue on individuals. For those that need to crew aircraft, they have many essential functions impacted by these layers and factors of fatigue. Being aware of and implementing fatigue prevention strategies is an essential element to ensuring ongoing safe operations of maritime combat aviation.

Scan here to discover more about fatigue management

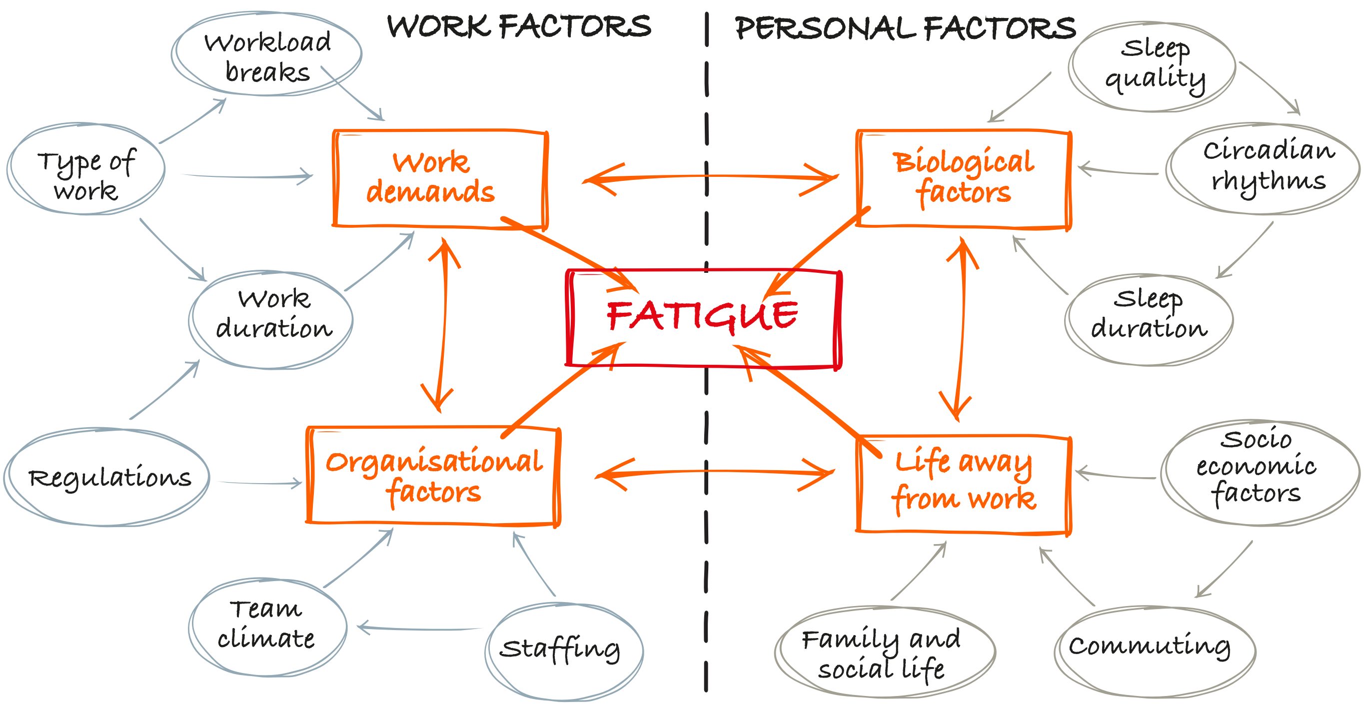


Figure 9–1. Workplace and personal factors that may contribute to employee fatigue (Adapted from Hobbs, Avers & Hiles, 2011)

Seeing the light

A NAVY MH-60R (ROMEO) Seahawk helicopter was conducting a night vision device (NVD) recovery to HMAS *Brisbane* in the Philippine Sea on 13 October 2021, when the aircrew experienced NVD blooming, lost all visual reference with the ship, and impacted the water. All occupants egressed safely.

What happened?

On completion of a day's flying operations, adverse sea and weather conditions precluded leaving an MH-60R on HMAS *Brisbane's* deck overnight. The aircraft needed to launch for one circuit in order to allow it to be placed into the ship's helicopter deck handling system. It was dark, the clouds were low, and the weather was degraded. The aircrew were using NVDs.

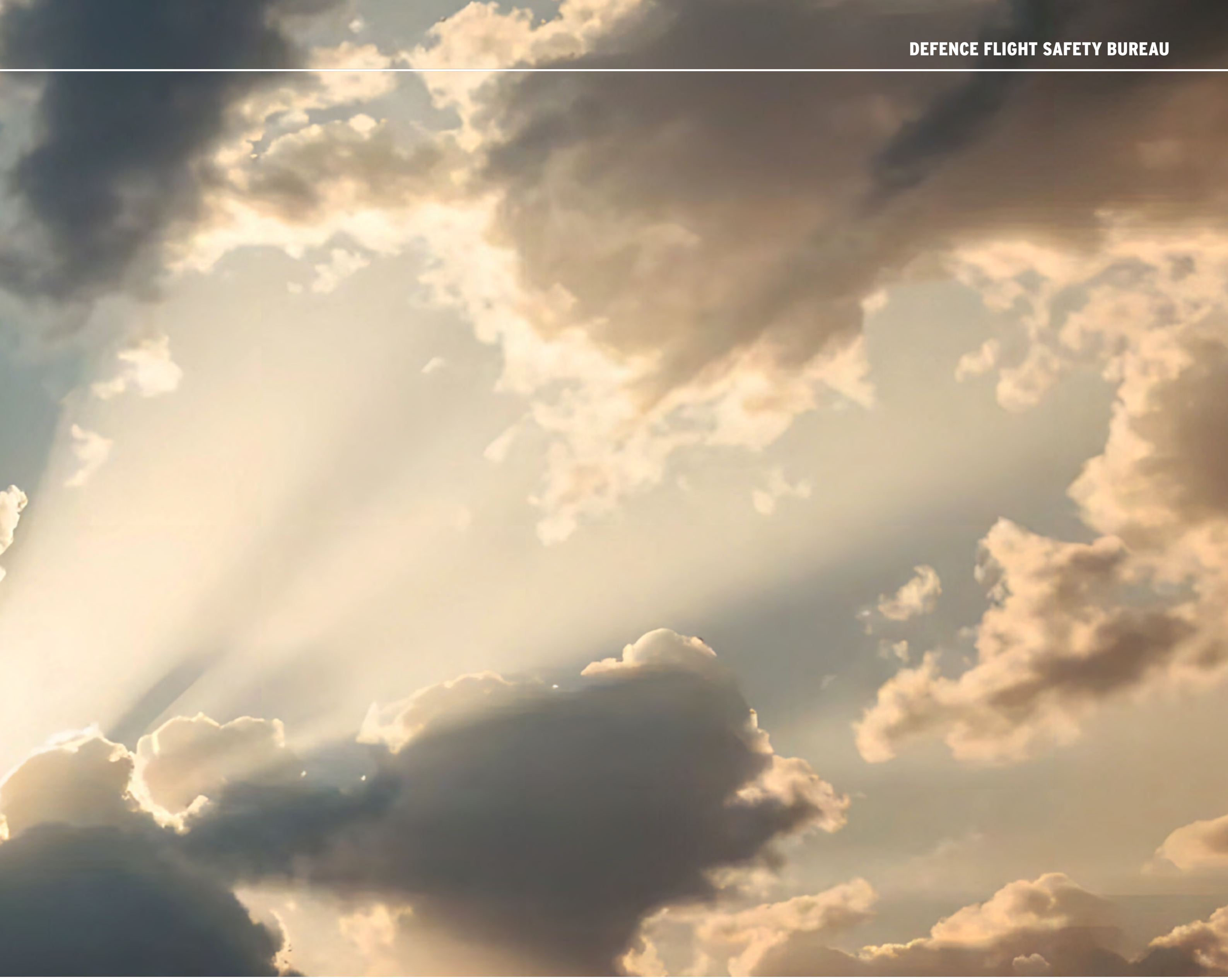
While waiting to launch, the aircrew observed strong infrared (IR) illumination from a ship's CCTV camera mounted above the helicopter control station. They requested its deactivation and, when the IR illuminator extinguished a short time later, assumed its deactivation was the result of their request.

Following a normal launch and circuit, and during the final approach, the aircrew were again exposed to IR illumination from the same CCTV camera. This significant distraction removed the aircrew members' primary visual reference with the ship, as the IR light caused the phenomenon referred to as 'blooming'.

NVDs are sensitive to any source of energy in the visible and near IR spectrum, which can have either a positive or detrimental effect. In this instance, the effect was detrimental.

The aircrew continued the approach and requested deactivation of the IR illuminator, which they expected to occur as quickly as it had prior to launch.

However, the IR illumination remained present, and the distraction allowed an increasing aircraft rate of descent to go unnoticed. The events culminated in



controlled flight into terrain 19 seconds after the IR illuminator's activation. The helicopter sank within minutes of hitting water, to an unrecoverable depth.

The aircrew successfully escaped the ditched aircraft and were rescued by the ship's boat 43 minutes after impact.

This event was deemed a Class A aviation safety incident, and investigated by the Defence Flight Safety Bureau (DFSB).

Aircrew learnings

Since this event, positive learnings have featured in the journey to addressing the Findings and Recommendations of the investigation

CCTV screenshot before, during and after activation of IR illuminator pre-accident

report. Significantly, aircrew involved in the incident have shared their experience with colleagues at 723 Squadron and with the wider MH-60R community. Two of the aircrew have described their egress experience as part of an educational production, and were professionally filmed at the HMAS *Albatross* Helicopter Underwater Escape Trainer (HUET) pool. This is now being used during HUET training.

As part of sharing their experiences, the aircrew have outlined the following learning highlights from the incident:

- the value of fully and correctly following the actions and procedures learned in HUET drills
- how shock and disbelief (that the accident has happened) can delay and affect your response
- the importance of early activation of visual distress and location devices
- the risk associated with making assumptions.

There is a requirement to assess risk, particularly in 'normal' operations.

Main 'take-outs'

Those involved in and associated with this event have a number of significant take-outs, which include:

- Despite robust training and proactive Safety Management Systems (SMS), accidents can still happen; and it will be when least expected.
- There is a requirement to assess risk, particularly in 'normal' operations. This strategy will ensure an ongoing 'so far as reasonably practical' assessment as new technologies, policies, procedures and ideas are developed.
- Aviation facilities play an important role in a modern aviation safety system; ship facilities now fall under DASR 139.

Action taken so far

The Aviation Safety Investigation Report (ASIR) contained 305 findings, 59 recommendations, and four Completed Actions.

While the investigation was underway, Headquarters Fleet Air Arm responded to emergent issues by creating 21 Proactive Actions.

Commander Australian Fleet accepted all the ASIR's Recommendations (which were transitioned into Actions), and established an O6-led Working Group (co-Chaired by Deputy Commander Fleet Air Arm and Deputy Commander Surface Force) to drive the 84 (ASIR + Proactive) Actions to completion. There has been a broad organisational response across many domains.

In July 2024, acting Commander Australian Fleet closed the O6-led Working Group; and as at March 2025, 82 of 84 actions had been completed.

Still to do

The two Actions to be completed are:

- Introduction of options for MH-60R automated approach procedures that reduce aircrew workload.
  - The approved Emergency Low Visibility Approach (ELVA) currently uses the aircraft's automatic approach feature, and remains an option for embarked aircrew to mitigate risk.
  - The Romeo Group Standards Cell explored whether modification of the ELVA could provide a technique that is usable in a broader set of environmental conditions.

Aircraft Maintenance and Flight Trials Unit (AMAFTU) completed an Operational Evaluation on a Restricted Visibility Approach and identified a number of deficiencies. AMAFTU evaluated and proposed two alternate procedures for consideration by Romeo Group Standards Cell.

- Review of ADF aviation risk management awareness training and software improvements.
  - DFSB has reviewed Learning Management Plans for aviation risk management education and training, and undertaken a Training Needs Analysis of DFSB-sponsored aviation safety courses (as a subset of the revision of Defence Aviation Safety Regulations – Safety Management Systems) and to withdraw the Defence Aviation Safety Manual). Software improvements related to risk management are not currently within the scope of near-term upgrades of Sentinel by Work Health and Safety Branch, and are yet to be considered more holistically for Sentinel's transition to future Enterprise Resource Planning software solutions.

Scan here for further detail about this event and subsequent investigation in *Spotlight* 03 2023 – Special Edition: The how and why, summarising DFSB's recent investigations

A snapshot of completed Actions (ASIR + Proactive)

- improvements to aircrew Aviation Life Support Equipment underwater escape training
- requirement for aircrew NVD compatibility for external ship navigation lighting
- updates to orders, instructions and publications, including Flying Guides, Standing Instructions and ANP3300 – Fleet Aviation Procedures
- updated procedures, including:
  - providing Sensor Operators with flexibility to stow the 'forward looking infrared' late in the approach to embarked landing
  - launching directly into the Hotel position
  - an MH-60R Restricted Visibility Approach procedure (utilising the Automatic Approach capability)
- scenarios for Aviation Sea Safety Assessments (ASSAs) and Flight Instructor Training now incorporate actions for lost helicopter scenarios
- ditched Helo procedures incorporated into both ASSA and Unit Readiness collective training
- availability of, and training for Landing Safety Officer/ Helicopter Control Officer using, Binocular NVD on air capable ships
- prioritising the establishment of aviation subject matter experts within the Surface Force (and Support Force) SMS and increased aviation safety focus within SURFOR
- guidance for ship Command teams about decision-making considerations required for approving operations to a clear deck on the DDG class of ship
- procedures that ship Commands must consider prior to approving the launch of an aircraft
- greater clarity on when a ship should cancel a landing clearance
- establishment of the MH-60R Noteworthy Risk Working Group
- update of Federal Aviation Administration risk management template
- the review and transfer of MH-60R risk management documents from units to the Group
- updated Hazard Assessment Report for MH-60R Crash Protection
- clarifying the function of ships' 'Man Overboard/Rescue' boat (rather than as an aircraft 'Crash Rescue' boat).

Job crafting could change your career experience

By Syeada Imam Hossain

DEFENCE AVIATION PERSONNEL contend with numerous priorities and tasks on a daily basis. While these demands can be conducive to building drive and resilience to thrive in a challenging environment, excessive amounts can take a toll on employee relationships with work and engagement.

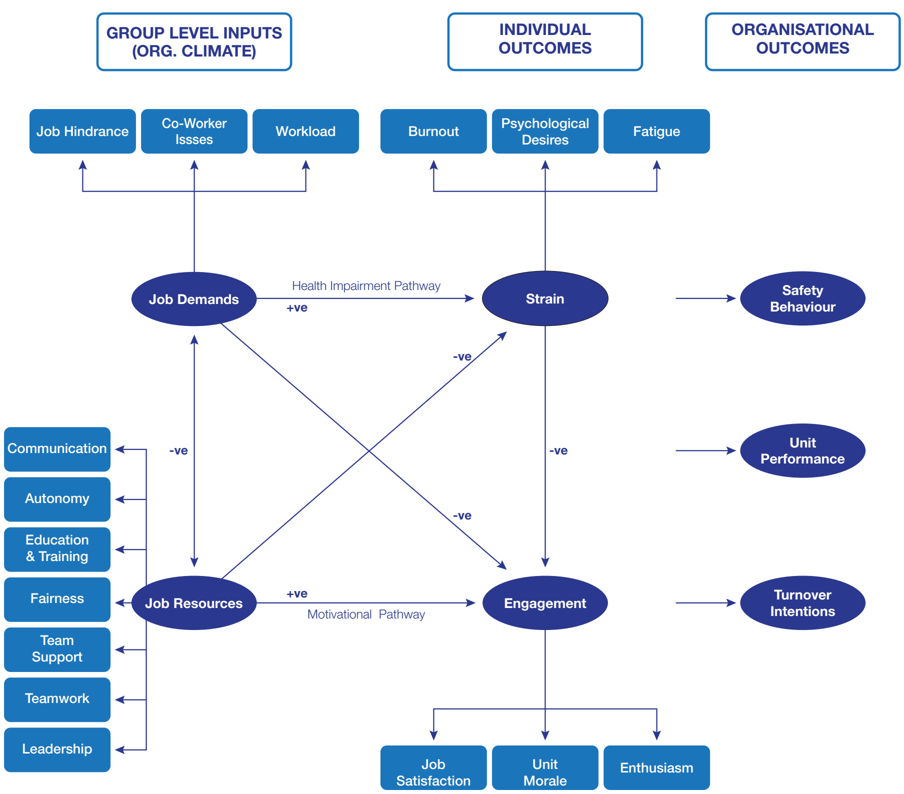
It may seem far-fetched to suggest that you can adjust the demands of your job and in turn influence your experience at work, but it turns out the answer may lie in the act of job crafting.

What is job crafting?

In the early 2000s, Professors Jane Dutton and Amy Wrzesniewski interviewed 28 janitorial staff of an American midwest hospital on how they coped with the demands of their jobs. Through these interviews, they discovered interesting ways these employees took existing job demands or expectations and modified them to complement their needs, skills, and preferences. For instance, a janitor reported rearranging paintings on the walls of coma patients' rooms, and another noted they placed extra boxes of tissues in the rooms, hoping to create positivity.

The authors coined these acts as 'job crafting'. Essentially, this comprises 'actions employees take to shape, mould, and redefine their jobs'.[1] This can include changing the way you think about your relationships with the tasks of your job or modifying the interactions and connections you have with others at work. It is a fluid process that allows you to cultivate greater compatibility between your attributes and your work environment.

When discussing strains at work, the Job Demands-Resources (JD-R) model[2] is often used. The model outlines that there are two forces acting upon an individual in work settings: job demands (for example mental, emotional and physical demands such as job hindrances, co-worker issues, and workload) and job resources (for example support, autonomy and training). If high job demands exhaust an employee's mental and physical resources, it may lead to outcomes related to strain (for example, psychological distress, fatigue, and burnout). Conversely, if resources outweigh demands, then individuals are likely to exhibit outcomes related to engagement (for example, job satisfaction, unit morale, and performance). Viewed through the lens of the JD-R model, job crafting can be thought of as employees adjusting their job demands and resources to influence different outcomes, such as engagement and performance.



Job Demands-Resources Model (JD-R)

How does job crafting work?

So how would job crafting work in practice? Defence personnel exist within an organised military structure and, as a result, must follow specific rules, regulations and orders. It may be reasonable to assume that work within this space is not conducive to job crafting. However, employees can reframe their work and create new avenues for mastery even in low-autonomy or high-demand jobs.[1] In 2020, there was a study investigating job crafting behaviours of firefighters, who work within a similar structured, high-demand, and team-focused environment.[3] Using the Job Crafting Scale,[4] these behaviours were defined as:

- increasing structural job resources (for example, 'I try to learn new things at work')
- increasing social job resources (for example, 'I ask my supervisor to coach me')
- increasing challenging job demands (for example, 'When there is not much to do at work, I see it as a chance to start new projects').

It was found that firefighters who engaged in job crafting behaviours exhibited a greater sense of meaning at work, and better engagement and performance as a result. Increasing structural job resources (that is, seeking

team or supervisor support) was found to be the highest contributor to job performance. This was explained by difficult job demands, potentially prompting the process of resource seeking, which consequently facilitates performance. Another finding was that job crafting also had a large influence on work meaning. Work meaning was considered to be particularly important for firefighters, given their strong group identity and the fact that their work provides inherent value to society.

How can job crafting be applied to Defence Aviation?

The Defence Aviation environment has comparable elements to that of fire fighting – there is similar strong social bonding within teams, and relationships with colleagues and leaders become integral to employees maintaining meaning and engagement with their daily work. Defence personnel may also gain work meaning from their shared drive to meet a greater purpose or cause (for example, contributing to capability and safety). Comments provided by respondents in the 2024 DFSB *Snapshot* survey outlined robust team connections and enjoyment working within groups of highly dedicated and talented people. Respondents also noted being motivated and engaged at work due to its challenging, yet rewarding, nature.

Finally, there was considerable praise for the overall leadership and command structure, with specific mention of the dedication of managers and supervisors. We can accordingly use the findings from the firefighter study[3] and *Snapshot* sentiments to inform how you can leverage positive aspects within your work to perform job crafting behaviours and even influence safety outcomes as a result.

In safety-critical industries such as Defence Aviation, time and workload or task pressures may lead to situations of diminished safety due to employees being unable to dedicate cognitive and time resources to safety efforts. For example, under conditions of high workload, there is greater propensity for errors and violations. However, job crafting may encourage safety behaviours by enhancing an employee's store of resources and ability to tackle hindering job demands, thus allowing them to invest more towards safety efforts and initiatives.

Commanders or managers can even use results from the *Snapshot* survey to job craft within their unit and influence outcomes like unit engagement, morale, and, ultimately, safety.

In a meta-analysis of 203 studies[5] looking at the relationship between job demands and resources, and organisation and safety-related outcomes, it was found that job resources such as job autonomy and support promoted engagement which, in turn, predicted working safely. This was because people with greater support and autonomy tended to exhibit higher commitment to an organisation and were therefore more willing to follow the organisation's safety regulations.

Another study suggests that being aware of one's personal accountability and broadening one's role through job crafting is projected to make employees more motivated to see safety initiatives as part of their work and participate in voluntary actions aimed at improving safety behaviours.

Commanders or managers can even use results from the *Snapshot* survey to job craft within their unit and influence outcomes like unit engagement, morale, and, ultimately, safety. For instance, while they may not be able to change a particular job demand (for example, workload), they may still be able to help employees face that demand by manipulating job resources that are captured by a particular scale (for example, introducing education and training opportunities based on the unit's interests or needs, or improving autonomy within the unit). They could even attempt to improve a single item if it is shown to be a particular resource concern in the survey (for example, 'Leadership provides the help and support I need').

While it is true that some jobs may provide more opportunities for crafting than others, there is always a situation where you can begin small changes to make your job more engaging and meaningful. You can undertake subtle adjustments of investing in relationships with people that you get along with best, taking on tasks that align with your skills or interests, or looking at ways that existing tasks and responsibilities may provide you with personal meaning or purpose. This can help you change your work environment to better suit you and help you find the resources needed to adapt to different demands.

Job crafting behaviours

- Seeking social resources
  - ongoing performance feedback
  - engaging in interactions that encourage collaboration
  - seeking coaching from teammates or leaders
  - organising or attending work related social functions
  - mentor new employees
  - making friends with people at work with similar skills or interests
- Seeking structural resources
  - actively participating in training and activities that facilitate development and skill variety
- Seeking challenges
  - working on projects that are personally stimulating or challenging and choosing to take on additional tasks
- Optmising hindering demands
  - changing the scope or type of tasks to complete

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THE AIRSPACE TRAFFIC DILEMMA

By FLTLT Janet Mulder

AIRSPACE INFRINGEMENTS (AIs) and Runway Incursions (RIs) are common occurrences of compromised aviation safety seen in air traffic management operations. Most, if not all occurrences are errors, not violations.

Technical advancements and globalisation

Over the last century, modernisation has generated increasing levels of ground and air traffic alongside higher complexity of airspace design, a variety of airfield and airspace users with competing goals and the introduction of Remotely Piloted Aircraft Systems. With high-traffic Class D aerodromes around Australia, such as Archerfield nearby Brisbane, or Jandakot south of Perth bordering major Class C and military aerodromes, and smaller airfields situated underneath or inside restricted airspace, it is unsurprising that congestion occurs.

The sheer increase in volume of air traffic combined with complicated airspace designs required to meet the demands of plentiful users, logically accounts for human error leading to episodes of incursions. Aviation safety reporting facilitates the ability to monitor the frequency of AIs and RIs, with a declining prevalence observed within military airspace. Measures taken to reduce occurrence rates include airspace and airfield designers implementing Traffic Management Plans and identifying hotspots of infringements and incursions to publish for users in readily available publications.

Inadequate knowledge and understanding

Poor training and pre-briefing remain substantial contributors to AIs and RIs due to a lack of knowledge and understanding of the environment worked within. This is particularly apparent in newly endorsed drivers or civilian pilots. If skills are not of second nature, personnel may be easily distracted or lack extensive knowledge of their newly attained proficiencies.

At Amberley tower, I observed a maintenance vehicle almost incur Runway 15/33 with an aircraft on final approach for Runway 15 and the pilot broadcasting their intentions to land. The driver stated on the Common Traffic Advisory Frequency (CTAF), 'Crossing Runway 33,' to which a controller on opening watch immediately transmitted, 'Hold short of the runway due to an aircraft on final approach,' and to call the tower immediately.

The controller queried whether the individual had heard the pilot's transmission. They confirmed they had, although did not see an issue as they were crossing on Runway 33, believing it was a different runway.

During Exercise Vigilant Scimitar, a driver almost incurred the runway with a civilian King Air on final approach outside of controlled

The sheer increase in volume of air traffic combined with complicated airspace designs required to meet the demands of plentiful users, logically accounts for human error leading to episodes of incursions.

hours, due to monitoring the tower frequency instead of the CTAF. Controllers in the deployable tower, who were unofficially monitoring the traffic situation following their shift, concluded that they were on the incorrect frequency and instructed the driver to hold short.

Some users do not consider the worst-case scenario and the ramifications of such simple decisions, which could essentially be as catastrophic as a ground or airborne collision. Controllers now provide presentations and contact numbers to external flying organisations. They encourage questions to enhance understanding and foster positive relationships within the aviation community. Some companies implement entering military restricted airspace as part of their training continuum. For example, trainee pilots studying through the Qantas Group Pilot Academy based at Toowoomba Wellcamp Airport are required to plan through Amberley's airspace and run through the process of requesting a clearance for Archerfield Airport. This process allows trainees to learn, practice and consolidate skills in a controlled environment with an instructor before they are required to undertake them alone or in higher stress environments.

The 'sky police'

Fear of Air Traffic Control can prevent users from seeking clarification if underconfident. Pilots of infringing aircraft will often hang up during post-incident calls when they realise they are speaking with a member of the Air Force. Controllers are cognisant to explain that the reason for contacting them is to find the root cause for why the infringement occurred and to brainstorm strategies to prevent reoccurrence, reiterating that the intent is to keep everyone safe. We would rather individuals ask Air Traffic Control to repeat, simplify, or explain an instruction in plain English in place of standard phraseology via the radio or through a phone call instead of making assumptions that may lead to unsafe events.

While statistics depict AIs and RIs on the decline, recommendations and actions in place must continue to be implemented, monitored and reviewed due to the continual rise of aviation movements in our future.

SNAPSHOT SURVEY

UNDERSTANDING THE CHALLENGES

A number of DFSB-led safety investigations have found suboptimal Flight Authorisation and inadequate Flying Supervision as contributing to safety events.

In response, DFSB included targeted questions in the 2024 *Snapshot* Survey to better understand the challenges faced by aircrew in these positions. Using thematic analysis, this supplementary report highlights the issues experienced by those who perform Flight Authorisation and Flying Supervision, providing avenues to improve the effectiveness of these critical roles.

You can view this report through the Defence Protected Network.

On a cloudy day

By FLTLT Stephen Johns

IN 2016, I was heavily into general aviation aircraft. I was in the final stages of building my own replica World War II fighter and had recently completed my private pilot training. I was flying regularly to build experience. My 5-year-old son loved flying and it was quite common for him to accompany me on these flights. I thoroughly enjoyed his company, and it was a great way to spend time together.

On the day in question, we headed off to the airport around 0800. The journey to the airport was 15 minutes and the skies were clear towards the coast, with some clouds at altitude in the direction of the airport. We had a slight time pressure to be home by 1100 for a family event, but our expected flight time was only 45 minutes. It was a 30-minute return trip to home.

Light fog was predicted for weather at the airport, which was due to clear by early morning, as well as scattered clouds at 2000 ft to the west and north. We arrived to find local fog still in place.

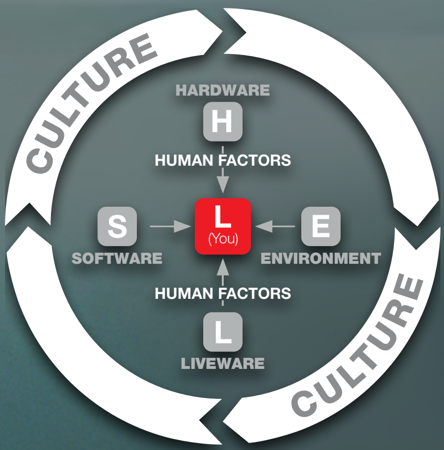
We pre-flighted the plane and taxied over to the fuel bowser. After refuelling, we parked on the grass to make a decision about the fog. Several other pilots were waiting with their aircraft, among them the Chief Flying Instructor (CFI) for the aero club. Visibility on the ground was quite good; however, the biggest difficulty from ground level was identifying what was fog and what was cloud. Had the fog cleared and were we seeing high cloud, or were we looking at fog? The Terminal Airfield Forecast (TAF) said that the fog should have cleared and I had seen how nice it was to the east when I drove in.

While we were waiting, a microlight took off, conducted half a circuit and flew off. That was enough for me. We hopped in, taxied out to the runway and departed on Runway 05. Shortly after take-off, I began a left-hand turn and as I looked out the left window I saw the ground suddenly disappear and reappear in patches of white.

I immediately levelled out and pulled tighter on the turn, at which point the ground became clear again and the visibility to the horizon returned. At this point, I realised the cloud was lower than predicted and some fog was still in the area. As the skies ahead were clear and met Visual Meteorological Conditions, we continued our flight to the coast and returned approximately 35 minutes later.

Approaching the airfield from a distance and level with the cloud base, it was apparent that there was significant cloud overhead the field at approximately 2000 ft above ground level (AGL), but the fog had fully cleared. We approached at 1500 ft AGL and conducted a normal circuit and landing. On the drive home, I kept thinking about how close we had come to flying into cloud in a non-Instrument Flight Rules (IFR) rated aircraft with a non-IFR rated pilot.

Using the C-SHELL model, I will break down some of the factors which led to this event.



C-SHELL model

Culture

I found risk management as a private pilot to be much less formalised than I was generally accustomed to in the military aviation environment. During my private pilot training, weather data interpretation was the largest unexplained area. It was not uncommon to hear of pilots 'scud running' home under weather and pushing the limits successfully. The CFI who was present on the day had advised me several times during my training that the TAF was overly cautious and had sent me off on training flights where I would otherwise have stayed home.

Software

I had access to, and used, the latest aviation weather reporting, charts and rules for flight.

Hardware

The aircraft was serviceable and within its annual calendar check. I had conducted a thorough pre-flight inspection and pre-flight checks before departure.

Environment

The weather was highly localised on the day and became worse towards the rising terrain to the north of the airfield. There was no wind, which meant the duty runway was 05, which faced towards controlled airspace several miles to the north and worsening/lowering cloud.

Liveware (crew and other personnel)

As the pilot in command, I relied on the inputs from senior pilots, my interpretation of weather reports, other aircraft and my limited experiences to date. Of note, I generally avoided questionable weather where possible, and therefore had limited exposure to interpreting marginal conditions.

Prior to the event, I drove through the intended flight path and observed clear skies and unlimited visibility.

I felt slight time pressure to get away which may have influenced my decision to not wait longer.

I felt that the departing microlight had confirmed my belief (hope?) that the fog had cleared and believed that the CFI would have intervened had he felt the conditions to be unsafe.

I was at a dangerous stage of my flying where I had enough experience to believe I understood what I was doing but not enough experience to understand how much I did not yet know.

There were several critical events that occurred that day, which could have prevented the event.

- I should have consulted the CFI and discussed the cloud. This was a good opportunity to learn from the experienced pilot and to improve my own decision-making skills.
- I should not have allowed my experience of the good weather to the east to influence my decision to fly into the weather in my immediate area.
- I allowed the decision of the microlight pilot to influence my decision through confirmation bias. I did not consider the vastly different flight profiles of our two aircraft.
- I could have spoken to the microlight pilot over the radio for an update on conditions, but did not.
- I could have waited for the weather to have clearly improved or gone home.

Conclusion

In 2016, I was moments away from flying in to cloud with my 5-year-old son on board. According to the magazine *Flight Safety Australia (January-February 2006)*, Visual Flight Rules pilots (and passengers) on average have 178 seconds to live following flight into cloud or reduced visibility.

My failure was due to inexperience, time pressure and a desire to press on despite the risk. I allowed myself to be swayed by confirmation bias and by a belief that the weather would dramatically improve soon after take-off. Several times in the years following this incident, I have recalled this event and used the experience to make better judgements.

By WGCDR Alf Jonas

A JOINT INITIATIVE OF the Australian Society of Air Safety Investigators (ASASI) and the New Zealand Society of Air Safety Investigators, the aim of the Australian and New Zealand Societies Air Safety Investigators (ANZSASI) conference is to provide ongoing professional development for aviation industry professionals working in the field of aviation safety and accident investigation.

The origin of the ANZSASI Annual Seminar dates back to the inaugural Regional Seminar event run in Brisbane in 1997. In the current era, the seminar is hosted on an annual rotation basis between the Australian and New Zealand societies.

One of the two bi-annual Asia Pacific Cabin Safety Working Group (APCSWG) seminars is held on the Friday preceding the ANZSASI conference.

The ANZSASI professional development conference is aimed at experienced and early career air accident investigation professionals,

Air accident investigation professionals attending the ANZSASI 2025 conference

as well as aviation safety professionals and academics interested in air accident investigation. University-level students interested in air accident investigation are also encouraged to attend.

ANZSASI 2025 – Surfing the Future of Safety: Investigating Change for Better Outcomes

The 2025 ANZSASI Conference, held at the University of New South Wales (UNSW) campus in Kensington, Sydney, from 30 May to 1 June, marked a major milestone in regional collaboration and innovation in the air safety investigation community. Hosted this year by ASASI, the event brought together over 75 delegates from government, academia, industry, and international bodies.

Following the 2025 theme of Surfing the Future of Safety: Investigating Change for Better Outcomes, the program featured a strong blend of technical rigour, operational insight, and forward-thinking analysis, covering a broad range of case studies, regulatory challenges, and safety frameworks.

Angus Mitchell, Chief Commissioner of the Australian Transport Safety Bureau (ATSB), opened the conference with a keynote address reflecting on recent complex investigations in Australia, emphasising the growing need for data-rich methods, digital literacy, and interagency collaboration.

David Clarke, Chief Commissioner of the New Zealand Transport Accident Investigation Commission (TAIC), offered a timely exploration of artificial intelligence (AI) as a tool in the future of safety investigation in his keynote presentation Unlocking New Potential: AI in Safety Investigations.

Commissioner Clarke's keynote captivated the audience with its clear-eyed view of both the promise and complexity of integrating AI into investigation practice. Drawing on case study material, research partnerships, and TAIC's early-stage work, Clarke highlighted how AI can be used to rapidly process vast volumes of flight data, identify patterns across incident types, and even assist in visual reconstructions of aircraft behaviour during accidents.

David Clarke,
Chief Commissioner of TAIC

About ASASI

The Australian Society of Air Safety Investigators (ASASI) was established in 1978 following an inaugural meeting in Melbourne, Victoria, to better represent air safety investigators in Australia. ASASI now has over 150 members and hosts a biennial conference with the New Zealand Society of Air Safety Investigators (NZSASI). It is affiliated with the International Society of Air Safety Investigators (ISASI).

About NZSASI

NZSASI is affiliated with the International Society of Air Safety Investigators (ISASI). In October 1984, a group of New Zealand-based ISASI members successfully bid to host the 1986 ISASI seminar, held in Rotorua that October. NZSASI was officially established at its inaugural meeting in Auckland on 3 September 1987. The most recent ISASI seminar hosted by NZSASI took place in Auckland in 1996.

Clarke was careful to note that AI is not a replacement for investigators but a powerful augmentation tool – one that can accelerate routine analysis and free up human expertise for complex judgment and interpretation.

His remarks also touched on emerging ethical and legal questions surrounding the use of AI-generated insights in formal findings and how transparency and explainability will be critical in maintaining public and judicial confidence in investigation outcomes.

Saturday's program featured high-profile cases and technical studies, including UPRT Australia's fascinating analysis of Loss of Control In-Flight events and the science behind the training program. The ATSB provided two presentations on the Sea World mid-air collision, with insights from an ATSB investigator's perspective and, secondly, survivability aspects.

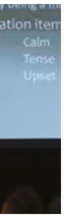
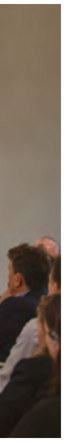
Delegates were treated to thought-provoking papers from Airbus on international collaboration, a UNSW research study on Runway Incursions through a human factors lens, and a presentation by Professor Graham Braithwaite from Cranfield University exploring global developments affecting the investigation profession.

Group Captain David Smith
Director Defence Flight Safety Bureau

Group Captain David Smith of the Defence Flight Safety Bureau opened Sunday's session with a keynote review of recent Defence investigations. The keynote was followed by diverse presentations on engine failure, small turbine analysis, runway safety, and international practices in family assistance and investigative modelling.

Culture, connection, and community

Beyond the technical sessions, the conference offered opportunity for professional networking and knowledge-sharing. The Friday evening welcome reception at the Royal Hotel Randwick brought together 55 attendees and partners, while the conference dinner on Saturday

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01: Alf Jonas, ASASI President
02: Angus Mitchell, Chief Commissioner ATSB
03: Peter Budd, Investigator Wave Choices
04: Shane Tobin, Director UPRT Australia
05: Jon Michael, Rolls Royce
06: Greg Hood AO **07:** Attending delegates.

08 09 10 11

08: Lee Ungermann, Senior Transport Safety Investigator, ATSB
09: Kerryn Tiddy, Specialist Business Continuity and Emergency Response, flydubai
10: Jim Burtenshaw, NZSASI President
11: Attending delegates.

evening featured a moving keynote address from Greg Hood AO, former ATSB Chief Commissioner, who reflected on his time leading the agency through key moments such as the MH370 search.

Notably, the conference included strong attendance at the pre-conference APCSWG session, which brought together 64 participants for presentations from regulators, subject matter experts, and operators. The ASASI Executive also welcomed five UNSW aviation students, continuing the society's tradition of mentoring and encouraging the next generation of investigators.

Yan Yan, PhD student
UNSW School of Aviation

Reflections and the road ahead

As the aviation industry faces renewed challenges – from operational recovery post-COVID to the emergence of new platforms and risk environments – the role of the investigator is evolving rapidly. As Clarke articulated, AI is no longer a speculative tool of the future but a present-day force reshaping how we understand and respond to accidents.

The 2025 ANZSASI Conference made clear that the investigation community is both ready and willing to adapt – while holding fast to its core principles of independence, rigour, and public service.

As delegates departed UNSW, many did so with fresh ideas, renewed networks, and a shared sense that the work of safety investigation is entering a new chapter – one powered not just by technology, but by the enduring human drive to learn, improve, and protect lives.

Scan here to discover more about ANZSASI

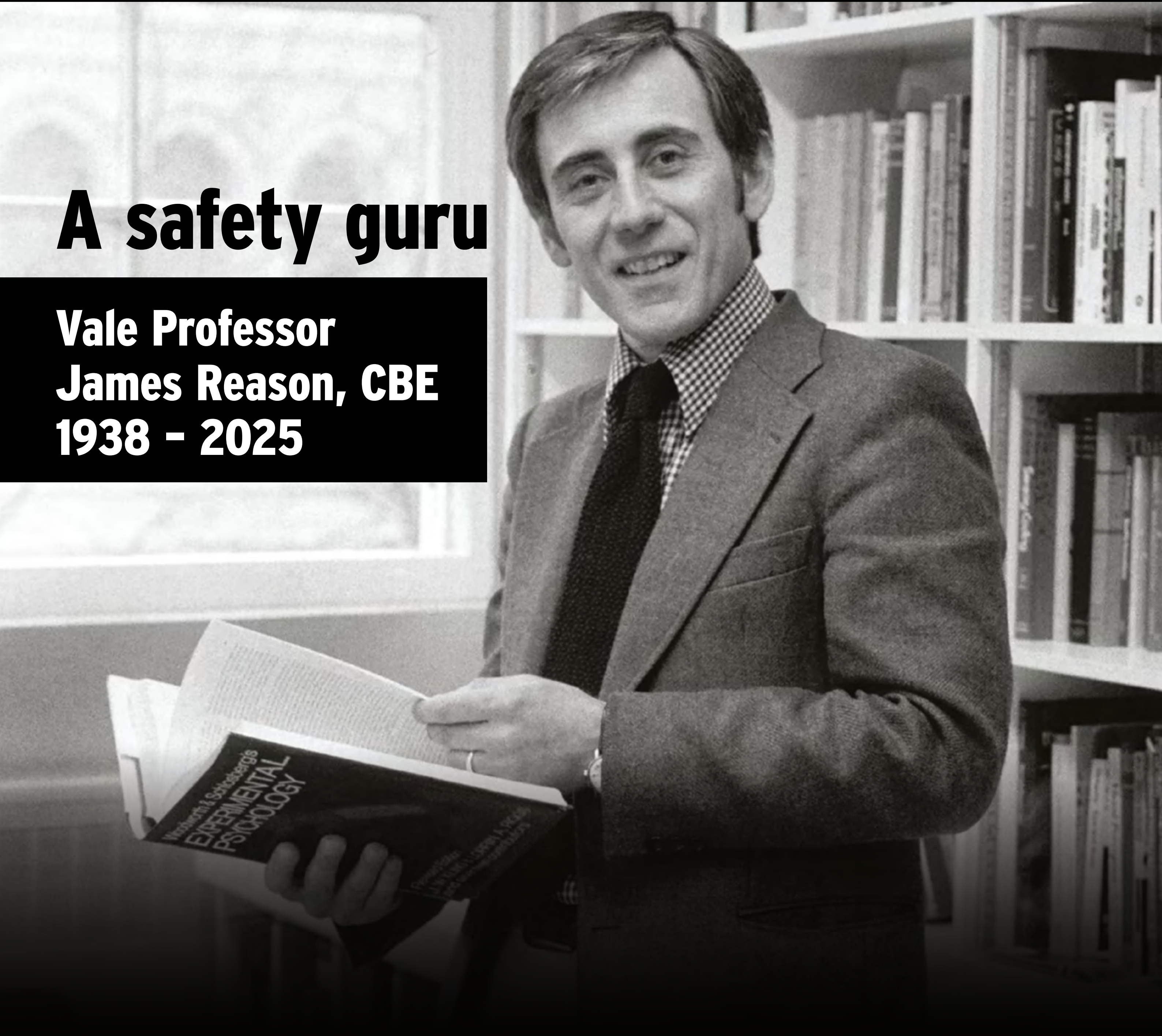
About ISASI

The International Society of Air Safety Investigators (ISASI) is the parent body of ASASI and NZSASI, dedicated to improving global aviation safety through the exchange of ideas, information, and best practices in accident investigation. Founded in the US in 1964, it became international in 1977 and now includes members and affiliated societies across over 35 countries.

ISASI actively promotes collaboration, knowledge sharing, and professional networking in the air safety investigation community.

A safety guru

Vale Professor James Reason, CBE 1938 - 2025



THE DEFENCE FLIGHT SAFETY BUREAU (DFSB) would like to pay its respect to Professor James Reason, who died on 5 February 2025 at age 86, after a long and distinguished career in the fields of system safety and human error.

Professor Reason's work transformed the way Defence Aviation considered human error, safety culture and safety investigations, and continues to be fundamental to the methods we still apply in the aviation safety domain.

His work began to be incorporated into Defence Aviation in the mid-1990s, after a series of significant and tragic aviation accidents in the early half of the decade, and shortly after the Bureau of Air Safety Investigation (the predecessor to the Australian Transport Safety Bureau) adopted his accident causation model (widely known as the 'Swiss Cheese Model').

The Defence Safety Analysis Model, based on his accident causation model, underpins our safety reporting systems and our incident investigation methodology. His work in safety culture leaves an enduring mark on the way we communicate,

Image © Susan H. Anderson / The New York Times. Used for editorial purposes under fair dealing.

understand and learn from the many aviation safety events that happen each year.

WGCDR Alf Jonas has a long career in Defence Aviation and safety and is familiar with Professor Reason's work. He recounts the previous Chair of the US National Transport Safety Board, Robert Sumwalt, likening Professor Reason to key figures that represent entire fields of study – like Albert Einstein is synonymous with physics and Sigmund Freud with psychology.

'James Reason is in that same ilk of individuals that have changed the way humans look at safety and managing safety,' WGCDR Jonas says.

'He was big on safety management systems; that's his biggest impact I would say, on not only aviation but medicine and other high-reliability, and high-risk organisations. He's been instrumental in highlighting safety and systems to those organisations.'

Professor Reason's impact was broad ranging. He began exploring how humans think and make mistakes, after he accidentally plonked cat food into his teapot, when distracted making tea. This led to a fascination with 'human factors' and extensive research into human error.

'The University of Texas conducted a study on aviators in an airline cockpit environment and I believe the study revealed up to 80 mistakes that a crew make in a single duty period,' WGCDR Jonas says. 'Many of those mistakes are little errors, but everyone makes a mistake in something or another during the day.

'Professor Reason deep-dived to see why it is that humans make mistakes, and by "peeling layers of onion" back, he was able to work out non-technical skills that were involved.'

Safety culture was also a key focus for Professor Reason. A 'just' culture was part of his safety culture knowledge base. 'He defined a "just" culture as being reasonable and fair,' WGCDR Jonas says. 'Any time you put a human into the equation, there is a culture. Professor Reason's studies included culture, the results of which have been rolled out into Defence.'

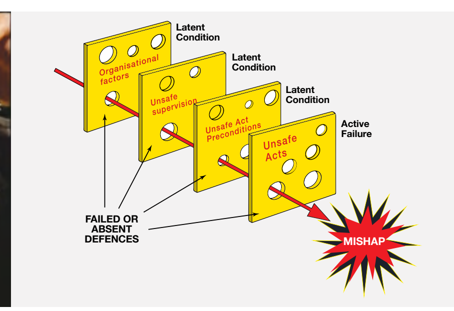
DFSB itself has a direct link to James Reason via psychologist, the late Dr Rob Lee – previous Chief Commissioner of the Bureau of Air Safety Investigation of Australia and reserve Group Captain for DFSB's predecessor, the Directorate of Defence Aviation and Air Force Safety.

'Having spent time and working with Professor Reason, Dr Lee introduced the accident causation model to Australia,' WGCDR Jonas says. 'He's like Australia's father of that theory put into practice.'

WGCDR Jonas heard from Dr Lee's partner that it was Dr Lee who coined the term Swiss Cheese. 'Anecdotally, my understanding was that Professor Reason didn't, at least initially, like that description,' WGCDR Jonas says. 'I can just imagine glasses of red wine around a table with Professor Reason, Dr Lee and Professor Patrick Hudson talking about Professor Reason's model and Dr Lee saying, "That looks like Swiss cheese".'

Professor Reason's concepts continue to live on. WGCDR Jonas says through his research and work, all safety systems are reliant, ultimately, on Professor Reason's model. 'There are other models and other great researchers in that field of safety, but Professor Reason's model is long-standing and has been proven in a variety of industries; medicine as well as aviation in particular, and rail, everywhere,' WGCDR Jonas says.

Professor Reason's legacy will influence Defence Aviation for many years to come, as we continue to strive for a generative safety culture, proactively learning and strengthening our systems, and working together to make safety part of everything we do.



Professor James Reason's (1990) Swiss Cheese Model

Aviation Safety Training Courses

Course	Course Aim	Prerequisites	Course Description
ASO (I) Aviation Safety Officer (Initial) course	To graduate Unit ASOs, Maintenance ASOs and Flight Senior Maintenance Sailors.	Personnel who are required to perform the duties of an ASO.	This course is delivered as two separate weekly components (the first is online; the second is face-to-face) with a one-week break in between. 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.
ASO (A) Aviation Safety Officer (Advanced) course	To graduate Base, Wing, Regiment, Fleet, Group and Command ASOs.	ASO (I) practical and applied experience as an ASO (or equivalent).	This course provides theory and practical exercises in the broad topics of the Defence Aviation Safety Management System, human factors and risk management, and base/unit emergency response.
NTSF Non-Technical Skills Facilitator course^ ^The NTS Trainer Course (213653) has been renamed NTS Facilitator Course (213653).	To graduate members with the knowledge and skills to facilitate NTS Training.	Defence Aviation Non-Technical Skills Foundation (110038) or equivalent IAW the Defence Aviation Safety Manual.	This course trains students in the skills and knowledge for facilitation of NTS Initial, Continuation and Awareness Training. The course also introduces students to scenario-based training and assessment techniques.
AIIC Aviation Incident Investigator course *Available upon request	To develop members to support their ASO in conducting aviation incident-level investigations.	Any personnel who are involved with Defence Aviation. There is no restriction on rank, Defence civilians and contractor staff are also welcome to attend.	This one-day course provides theory (taken from the ASO(I) course) on the topics of the Defence Aviation Safety Management System, generative safety culture, error and violation, the Defence Aviation Safety Analysis Model, and aviation safety event investigation and reporting. Interested personnel should contact their ASO.

For further details concerning location and up-to-date course dates visit the DFSB intranet site or email dfsbet@resources.defence.gov.au

All courses are generally oversubscribed, 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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