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TRANSCRIPT OF PROCEEDINGS
TRANSCRIPT-IN-CONFIDENCE

INSPECTOR-GENERAL AUSTRALIAN DEFENCE FORCE INQUIRY INTO THE CRASH OF A MRH-90 TAIPAN HELICOPTER IN WATERS NEAR LINDEMAN ISLAND ON 28 JULY 2023

PUBLIC INQUIRY

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AVM G HARLAND AM CSC DSM

COL J STREIT, with MAJ L CHAPMAN and FLTLT A ROSE, Counsel Assisting

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COL N GABBEDY, representing MAJGEN Jobson
COL S THOMPSON, representing BRIG D Thompson
LTCOL D HEALEY, representing BRIG J Fenwick
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MS K MUSGROVE, representing the Commonwealth

0930, FRIDAY, 9 MAY 2025

DAY 57

TRANSCRIPT VERIFICATION

I hereby certify that the following transcript was made from the sound recording of the above stated case and is true and accurate

Signed	.....	**Date**	.....	(Chair)
Signed	.....	**Date**	.....	(Recorder)
Signed	Epiq Australia Pty Ltd	**Date**	15/06/25	(Transcription)

EXHIBIT LIST

Date: 09/05/2025

Number **Description** **Page No**

WITNESS LIST

Date: 09/05/2025

Name Of Witness **Page No.**

MS McMURDO: Yes, FLTLT Rose.

FLTLT ROSE: Good morning, Ms McMurdo, AVM Harland. We're recommencing with Dr Adrian Smith.

<DR ADRIAN MICHAEL SMITH, on former affirmation

<EXAMINATION-IN-CHIEF BY FLTLT ROSE, continuing

MS McMURDO: Yes, thank you very much, Dr Smith, for your accommodating the needs of the Inquiry with adjusting your schedule and so forth. It's greatly appreciated.

DR SMITH: No worries, ma'am.

FLTLT ROSE: Could I ask that the witness please be given Exhibits 146A and B, Exhibit 227, and 228. And just in case people are watching today on the live stream that weren't watching on Wednesday, could you just confirm your full name again?

DR SMITH: Adrian Michael Smith.

FLTLT ROSE: And your current occupation?

DR SMITH: I'm the Principal Adviser at Decision Support Flight at the Royal Australian Air Force Institute of Aviation Medicine.

FLTLT ROSE: Thank you. And we commenced your evidence-in-chief on Wednesday. If you can turn to page 29 of your report of 22 April.

DR SMITH: Sorry, what page?

FLTLT ROSE: 29.

DR SMITH: Yes.

FLTLT ROSE: And if you look at paragraph 116 and following paragraphs, this is where you've set out that you read Dr McGrath's – or Dr Braden McGrath's report to the Defence Flight Safety Bureau, and you also read his statement to the Inquiry. Is that correct?

DR SMITH: That's correct.

FLTLT ROSE: And you observed the evidence he gave to the Inquiry.

DR SMITH: That's correct, yes.

FLTLT ROSE: That was in both the Public and the Private Hearings.

DR SMITH: Yes.

FLTLT ROSE: And generally, you concur with the findings in his report.

DR SMITH: I do.

FLTLT ROSE: Now, we won't go into what those findings were in this forum in the public space, but I do want to ask you some specific questions about the training that can be delivered to aircrew to mitigate the risk of spatial disorientation. So if you turn to page 40 of your report.

DR SMITH: Yes.

FLTLT ROSE: Paragraph 151.

DR SMITH: Yes.

FLTLT ROSE: You state that the Institute of Aviation Medicine briefed the Commander Aviation Command in April 2024 on training to mitigate the risk of spatial disorientation.

DR SMITH: That's correct.

FLTLT ROSE: By "Commander Aviation Command", do you mean MAJGEN Jobson?

DR SMITH: That's correct, yes.

FLTLT ROSE: Now, you've included your presentation to MAJGEN Jobson at Enclosure 7 of your report.

DR SMITH: Yes.

FLTLT ROSE: And that sets out the best practice training based on your analysis of what the British Army, the US Army, and NATO panels offer to their aircrew.

DR SMITH: Correct, yes.

FLTLT ROSE: Now, if you go to page 41, paragraph 154(b)?

DR SMITH: Yes.

FLTLT ROSE: You state that the focus should not be on how to maintain spatial orientation, rather on how to recover from disorientation.

DR SMITH: That's correct, yes.

FLTLT ROSE: Page 42, paragraph 158 and following, you set out the various training that you think should be offered to aircrew in their initial foundation training, their conversion training when moving from one aircraft type to another - - -

DR SMITH: Correct.

FLTLT ROSE: - - - their periodic refresher training, and then their ongoing application to knowledge in scenario-based training.

DR SMITH: Correct.

FLTLT ROSE: Now, if you go to page 46, paragraph 173, you state that as far as you're aware, Army Aviation did not ask the Institute of Aviation Medicine to be involved in the drafting of the Special Flying Instruction that we understand will be issued shortly on the Maintenance of Spatial Orientation course.

DR SMITH: That's correct. We first became aware of the draft maintaining spatial orientation course Special Flying Instruction in about February-March of this year but not reaching out to get support from the Institute of Aviation Medicine, I don't know what other Aviation Medicine support they may have engaged, because Army does have their own Aviation Medicine advisers.

FLTLT ROSE: But as far as you understand, it wasn't the Institute of Aviation Medicine.

DR SMITH: It wasn't through the Institute of Aviation Medicine.

FLTLT ROSE: And this is despite there being a Defence Aviation Safety Regulation stipulating the Military Air Operator coordinate Aviation Medicine related training with the Institute of Aviation Medicine.

DR SMITH: Correct.

FLTLT ROSE: So I understand from that evidence that you would have expected to be contacted, and welcome that opportunity to inform discussion about the contents of the Special Flying Instruction?

DR SMITH: A draft document is in draft form, and it is a living document. so we have been engaged since February-March in the draft, reviewing the draft, and putting input, and we've engaged with the person identified to manage the introduction of that course. We weren't involved in the early development of the draft, but along that timeline, we have been involved in the discussion about the draft course.

FLTLT ROSE: And just to be clear, in February and March, when you obtained a copy of that draft, was that because you asked for it, or was it offered to you from Aviation?

DR SMITH: We reached forward and asked for a copy.

FLTLT ROSE: Was there any resistance in providing it to you?

DR SMITH: I don't believe so.

FLTLT ROSE: If you go to paragraph 177, that's where you set out the evidence that you've just given, but in paragraph 177, I'll read what you've written. This is a quote. You believe:

> *The draft MSO –*

which is the Maintenance of Spatial Orientation course –

> *describes a robust training program that is broadly in line with evolutions in spatial disorientation training in US Army and British Army Air Corps and echoes the proposal the Institute of Aviation Medicine had put forward as contemporary best practice in the briefing to Commander Aviation Command in April 2024.*

DR SMITH: Correct.

FLTLT ROSE: Are you aware when that SFI will be introduced?

DR SMITH: I'm not aware of the details of that, no.

FLTLT ROSE: Now, you referred to before that you've been put in touch with the person who's been tasked to coordinate this Maintenance of Spatial Orientation course.

DR SMITH: Correct, yes.

FLTLT ROSE: They're at the School of Army Aviation.

DR SMITH: Yes.

FLTLT ROSE: That's in Oakey.

DR SMITH: Yes.

FLTLT ROSE: Or in Holsworthy?

DR SMITH: At Oakey.

FLTLT ROSE: And they've contacted you recently to obtain your input on the content of that course.

DR SMITH: Correct. So we've had a couple of telephone conversations, and then they came to the Institute for a face-to-face meeting. We spent a couple of hours talking about spatial disorientation training, and the maintaining spatial orientation course in particular with a detailed discussion about what supports IAM could provide to Army to underpin and have input into the course development.

FLTLT ROSE: I take it that will be an ongoing discussion over time in terms of it being an iterative process to introduce the course and then improve it over time?

DR SMITH: Yes, the plans are that we'll keep in touch with the person that's coordinating the course.

FLTLT ROSE: You also state that the Institute of Aviation Medicine has offered to conduct a spatial disorientation survey to shape the operationally relevant scenarios for that training.

DR SMITH: Correct.

FLTLT ROSE: You've given evidence, over the course of the six or seven months you've been giving evidence to this Inquiry, about the Human-Machine Interface and the fact that aircraft are becoming more complex over time. What's your view then, with the increasing complexity of the aircraft, on how that affects the human, or the pilots, the aircrewman operating the aircraft, and the workload that we'll be placing on them in the future and how that will affect them cognitively?

DR SMITH: Army aircrew are incredible individuals, and they deliver a great capability to a high standard of excellence and professionalism. But we have to remember that they are, at the end of the day, humans, and they get tired, and they're at risk of developing fatigue. Their visual system has got limitations. Their vestibular system has got limitations and they're at risk of developing spatial disorientation.

There are limits on their cognitive capacity, and that cognitive capacity can be degraded by internal and external factors, and the cognitive capacity can be saturated or overloaded by cognitive demands, and when we place aircrew in complex operational environments, and ask them to conduct a mission in challenging conditions, sometimes the limits of the human condition can be unmasked, and can manifest in ways that can compromise flight safety.

And that's not meant to be a criticism of individuals. It's not a slight on their professionalism or their competence or degrading their character, but from an aeromedical point of view, I'm just very cautious not to frame as "mistakes" or "errors" or "lapses in judgment" or "poor decisions" those factors that are a natural expression of the human condition that is pushed to the limits, or beyond the limits, of their normal experience.

And as you've said, the – early in my evidence to the Inquiry, I was asked about human-centred design and what that meant, and I gave a typical definition from an engineering point of view, but if you considered human-centred design in a systemic way, then what I would say is that if we want to harness the strengths and capabilities of aircrew to deliver effective capability in complex aviation systems, that we have to understand where their limits lie and where the weaknesses of human physiology and cognition lie and make sure that those weaknesses and limitations are bridged by an effective operational framework, tools, training, and technologies to make sure that those human limitations don't get unmasked and manifest as a latent or active failure that can contribute to an accident.

So we really do need to appreciate that humans have got limits, and as we push humans to the edge of their endurance, they will exceed their capacity, and they will degrade flight safety. But by anticipating those and working around them and providing them with support and technology, then we can try and maintain the safety of the aviation system at the same time as we're trying to harness their capabilities.

And as modern aviation is becoming increasingly complex, we do need to understand that aircrew are operating in an increasingly cognitive space. They're operating systems and monitoring systems as much, if not more so

than physically flying the aircraft. And so we have to make sure that the ruleset, the operational framework, the endurance limitations, the crew duty limitations, currency and recency requirements that have been developed on the basis of legacy platforms, and have served well for decades, remain fit for purpose to support aircrew in these challenging cognitive environments of modern aviation.

FLTLT ROSE: So will this new spatial disorientation training that you're working on, and a scenario-based training include scenarios where aircrew are cognitively overloaded?

DR SMITH: My understanding of the spatial disorientation scenarios for the British Army is that they do place aircrew in circumstances where they have degrading visual conditions. Not necessarily to the point of entering instrument meteorological conditions but not optimal visual conditions and becoming increasingly degraded, and at the same time, increasing their workload and providing cognitive distractions to place the aircrew in a position where they may recognise that there are red flags and risk factors saying, "There's degraded visual conditions and the workload is really high, and I'm aware that I am at capacity", and encourage them to transition early on to instruments rather than wait until they enter an unusual attitude or become disorientated, hope that they recognise their state of disorientation and then try and recover. So that's bringing the decision point forward earlier in time at a lower level of workload.

FLTLT ROSE: I want to ask you some final issues, some miscellaneous issues, within your report. So in terms of the G-forces that were experienced by the aircrew of Bushman 83 on the evening of 28 July 2023, you were provided with a copy of the report from Michael Grant from the Defence Science and Technology Group about the G-forces measured in the aircraft.

DR SMITH: Yes, I was.

FLTLT ROSE: Now, we can't discuss that report in this forum. But in terms of G-forces generally, what is the impact of, say, G-forces at about zero or one G-forces on aircrew flying helicopters?

DR SMITH: Human tolerance to G in a fast jet environment, we're very familiar with that, and aircrew are – like, we know what the effects are at four and five, seven, eight, and at nine G. So that's the level of G that fast jet operators are routinely exposed to, and we know what effects, what human tolerance is associated with those levels of G.

The level of G in this environment were fractions of a G, which is well below the level that would cause any physical impairment in terms of inability to speak, inability to operate equipment, difficulty moving your hands or your arms. So the absolute level of G exposure was miniscule compared to human tolerance.

So from that point of view, there will be no effect in terms of the physical application of the G. However, the G-forces would be at a level that would stimulate or could stimulate the vestibular organs and provide you with a sensation of movement. So you may still perceive the G but not to a physically debilitating level, and it may be associated with a sensation – so negative G may make you feel a little bit lighter in the seat, but not to the extent that you're going to have physical consequences as a result of that exposure.

FLTLT ROSE: I want to ask you some questions now about stereovision. If you turn to page 49 of your report, paragraph 191.

DR SMITH: Yes.

MS McMURDO: Could I just clarify then, you don't – your opinion is that the G-force involved in this crash would not have been a significant – or prior to this crash, would not have been a significant factor in - - -

DR SMITH: The G-forces involved in this scenario, from what I have seen, would not have caused G-LOC or render somebody unconscious or unable to act on the basis of the physical expression of that G-force.

MS McMURDO: And can I say also would not be a significant contributing factor to the spatial disorientation?

DR SMITH: The sensation of G could stimulate the semicircular canals and the otolith organ, so it can stimulate your vestibular senses and contribute to disorientation.

MS McMURDO: Could possibly have contributed to it.

DR SMITH: Yes.

MS McMURDO: Thank you.

DR SMITH: In a degraded visual environment.

MS McMURDO: Yes.

DR SMITH: Yes.

MS McMURDO: Thank you.

FLTLT ROSE: Back to just paragraph 191. You note that Dr Gavrilescu from the Defence Science and Technology Group, who gave evidence to the Inquiry last August, and COL Brock gave evidence in March, both stated that the ADF should include stereovision testing in its aircrew selection process.

DR SMITH: Correct.

FLTLT ROSE: Now, you take a different view, but before we get to that different view, I just want to take you to paragraph 189.

DR SMITH: Yes.

FLTLT ROSE: You note that the ADF only has a stereovision standard for aerial refuelling officers and not for aircrew.

DR SMITH: For aerial refuelling officers are a subset of aircrew, but not for the broader aircrew.

FLTLT ROSE: Sorry, for pilots and aircrewman.

DR SMITH: Yes.

FLTLT ROSE: And that's consistent with forces in Five Eyes nations?

DR SMITH: No. So the in other Five Eyes nations, they do have a stereovision standard for all aircrew.

FLTLT ROSE: If you go to page 50, paragraph 193, this is where you explain your differing view. You think that it would be hasty to introduce a stereovision standard for aircrew – all aircrew, I'll say – without careful consideration because deselecting applicants on the basis of stereovision will likely reduce the pool of prospective recruits and you'd need to develop the evidence basis for screening out persons who would not pass that test.

DR SMITH: Correct. So we would need to justify to Defence what is the problem that we are eliminating by excluding people with a certain stereo – well, exceeding a certain stereovision or what is the benefit that we are gaining by selecting people. Just removing people from the selection pool because they don't meet a numerical limit is not evidence based.

FLTLT ROSE: And then you set out at page 51, at paragraph 197 – I'll read out your reasons for this:

> *Given the substantial impact on the size of the selection pool for prospective aircrew, it's worth emphasising:*
>
> *(a) the criteria used by partner air forces are not evidence-based thresholds measured against a defined operational performance or safety outcome;*
>
> *(b) the tests of stereovision available to community optometrists and ophthalmologists are not sensitive to the visual requirements of Aviation, only dynamic fusion reserve has shown to predict performance on stereovision tasks;*
>
> *(c) there's no evidence that imposing a stereovision standard using existing tests available in the community will confer any benefit to training, operational performance, or safety;*
>
> *(d) imposing a standard will, by necessity, exclude otherwise desirable applicants who, in the current model, would have demonstrated adequate visual performance to pass all training and currency requirements for the role.*

DR SMITH: Correct.

FLTLT ROSE: And then at paragraph 198, that's where you note that periodic re-testing of stereovision of current aircrew would also be a challenge.

DR SMITH: Correct. So your stereovision changes with age, but along with age comes experience. And so if you're a member of aircrew, as your stereovision degrades or changes with age, if you're continuing to perform your task, the slight and gradual insidious change in your stereovision is then accompanied by experience and other coping mechanisms. So to apply a standard stereovision threshold that would apply to 20 to 25-year-olds to a 40-year-old or a 45-year-old who is currently performing their role to an adequate standard with repeated testing would be excluding people on the basis of a number, not on the basis of performance.

FLTLT ROSE: One final topic. It's about the symbology on the Head-Up Display. You've heard evidence about the different types of symbology that can be projected on to the visors in TopOwl version 5.10?

DR SMITH: I've heard some of the evidence. I haven't heard all of the evidence, and I'm not overly familiar with the TopOwl 5.10 configuration.

FLTLT ROSE: So I take it from that that you haven't actually looked through a visor yourself and seen what the symbology looks like?

DR SMITH: That's correct.

FLTLT ROSE: But have you read research about symbology and the uses of symbology, the reasons why it was introduced and for performance reasons?

DR SMITH: Yes. So helmet-mounted symbology has been around for a couple of decades, and there are a number of guidelines and standards that apply to the design configuration of helmet-mounted symbology.

FLTLT ROSE: Now, you've heard evidence about the cognitive capacity needed to interpret the symbology using the foveal view from Dr McGrath?

DR SMITH: Yes.

FLTLT ROSE: What does the scientific research say about the effectiveness of symbology and the advantages or disadvantages it can provide to pilots?

COL GABBEDY: Well, objection. That's a very broad question. This witness should found his knowledge of the scientific research before he answers it.

MS McMURDO: Well, all right. Well, we can do that.

FLTLT ROSE: What scientific research have you, yourself, looked into on the basis of symbology in Head-Up Displays?

DR SMITH: So I reviewed the 1997 NASA Design Guide for helmet-mounted symbology, and that was referred to a couple of days ago. I've reviewed the US Army Aeromedical Research Laboratory "Helmet-Mounted Symbology: Perception, Vision and Cognition Considerations", and I have looked at the Military Standard 1472H which is the Design Criteria Standard for Human Engineering, and a number of scientific papers from the US Air Force Air Force Research Laboratory, their vision sciences team looking at symbology.

FLTLT ROSE: And of the basis of what you've read in those papers, what is it that you understand the research says about the effectiveness of

symbology in terms of what it can provide as an advantage to a pilot and potentially what it could contribute as a distraction to a pilot?

DR SMITH: So helmet-mounted symbology – as a general principle, not necessarily referring specifically to TopOwl – but helmet-mounted symbology allows pilots to minimise the time physically looking inside and outside that comes with a time cost. There's a finite time that it takes to lower your head and look inside, look at the various instruments, gain situational awareness, and then look outside again.

When you have the flight information presented through helmet-mounted symbology, then that allows you to maintain external visibility but, with an attentional shift, look at the symbology. So as Dr McGrath talked about, the symbology is projected on the visor or a display system; it's projected in a way that makes it seem like it's floating out in front of you, and you just have to shift your attention rather than physically moving your head and your eyes.

The symbology is presented generally in a way that has the symbology distributed to the peripheral aspect of the visual field, and having a central area that is not cluttered and the symbology is presented at a level of brightness that allows it to stand apart from the background in a number of different backgrounds so that you can identify it from the background, but not so bright that it obscures the background, and not so bright that it is a distraction in itself.

But when you have two sources of visual information, there is a discipline required to make sure that you maintain a balanced scan of the instruments and the external view. In the same way as you would maintain a disciplined scan with looking inside of the instruments and looking outside. So there is a discipline to looking at the symbology.

Now, when you're looking off boresight, the various standards are quite clear that the intent of symbology when looking off boresight should be to give the pilot enough information to allow them to maintain spatial orientation and situational awareness, but not to provide them with an ultimate source of information so that they can control the aircraft off boresight. So a number of the Standards refer to maintaining spatial orientation, being aware of a drift into an undesirable position, and then going back on to your Primary Flight Display to correct the attitude of the aircraft.

In terms of your focal vision, your focal vision is approximately two to five degrees of your visual field, which is half your thumbnail width at arm's length. That's the area that you're actually focusing with when

you're looking at your visual field with your focal vision. So when you're looking at symbology where it is distributed over a 40 degree field of view, you are still visually scanning the different parts of the symbology using your focal vision.

A number of research experiments have demonstrated that non-distributed flight referencing systems are much more effective in allowing pilots to maintain a spatial orientation and allow them to recover quicker and more accurately with fewer reversal errors if they're using a non-distributed flight referencing system rather than a distributed flight referencing system.

A distributed flight referencing system is a traditional mapping of the flight instruments projected onto the display and that display is then distributed across the visual field, the 40 degree visual field. So it's because it's distributed you are physically scanning the different parts of your visual field to get the information.

A non-distributed flight referencing system is a small icon that is five degrees of your visual field so you can view it without scanning and, as an icon, that has got sufficient attitude and bank information and air speed and altitude information in one icon that allows aircrew to maintain spatial orientation much more effectively than using a distributed flight referencing system.

That being said, I'm not aware that there is a non-distributed flight referencing system built into commercial symbology. That's a research demonstration that if you don't have to scan across a visual field, that your recovery and maintenance of spatial orientation is a lot more effective.

The papers also agree that having symbology that requires additional training or cognitive processing to interpret that is over and above the basic training received by aircrew in instrument flying adds a delay and potential for confusion, ambiguity – and so if you're looking at a flight display, a Helmet-Mounted Display, where what would normally be interpreted as a pitch ladder is now displaying a bank indication, that that can take additional time and effort and a requirement for training to a high level of proficiency to not revert back to your basic understanding of what a flight display should be.

And so the strong preference, from an aeromedical and human factors point of view, is that off boresight should provide aircraft with only the information that they need to maintain spatial orientation and situational awareness. Ideally to remove the forward-looking display symbology when you look off boresight beyond a certain degree and replace that with a non-distributed flight referencing system. But if that's not achievable,

that there is a strong preference for the display symbology to be aircraft referenced in the direction of flight, not externally referenced in the direction line of sight.

FLTLT ROSE: Is it your intention that the Institute of Aviation Medicine work with Army Aviation, potentially within this Maintenance of Spatial Orientation course through the School of Army Aviation, on issues like the optimum amount of information that should be on a symbology set?

DR SMITH: I don't think that that's really within our remit. So the design of display symbology is firmly within the remit of DST Group, Aviation Vision Enhancement – so Dr Gavrilescu - - -

FLTLT ROSE: Defence Science and Technology.

DR SMITH: Sorry, Defence Science and Technology Group, and so Dr Gavrilescu is currently working with another Defence group looking at optimising the design of the symbology set. So that is very firmly within what DST is capable of doing.

FLTLT ROSE: Those are my questions in evidence-in-chief.

AVM HARLAND: Just a question on the training. What you've described there is some detail about displays, conformal, non-conformal, and different types. With the evolution of technology in ADF aircraft, is there a suite of education and training that effectively brings people up to date with the various positives and downsides of these displays and how to manage themselves around it?

DR SMITH: I'm not aware of general training about different sorts of symbology sets. From a purely academic point of view – I know what they are from a medical point of view where we talk about different sorts of symbology. As a general rule, I've been reluctant to provide aircrew with training that is not directly relevant to the tools that they are currently using, and if they've got a tool, I would prefer to train them about that tool, not talk about all the other tools that they don't have.

AVM HARLAND: So you'd prefer the training to be specific to the displays that they have. So a follow-on question from that then, for the aircraft in the ADF, Army Aviation included, that do have Helmet-Mounted Displays, have you engaged with or do you intend to engage with them to discuss, again, the positives and negatives of these displays and how they might consider operating with them to reduce risk of spatial disorientation?

DR SMITH: That is a very timely question because I'm mindful that the MRH-90 has been retired, and with that, a lot of platform and equipment specific issues will be put on the shelf, but the human is still a human in the loop and will remain a vulnerability for the Black Hawk, the Apache and other aircraft that will follow.

And so the lessons that have been learnt from the evolution of TopOwl in terms of visual requirements and some of the issues related to symbology will also apply equally to new and future platforms and so we do need to make sure that we properly understand the human limitations with using various symbology sets and the impact that that has on their cognitive capacity to make sure that we provide symbology that doesn't overwhelm normal aircrew beyond their normal experience.

AVM HARLAND: So do you think there would be benefit looking forward in having the Institute of Aviation Medicine engaged by the users of helmet-mounted displays in the future to effectively go through the research and then walk them through the various hazards that may be present in those systems?

DR SMITH: I would say that the Institute of Aviation Medicine is one agency that can provide support and advice to Army or any FEG about the human aspect of the technology that you're using especially where it relates to vision and imposes a cognitive burden. I am aware and want to say that Army has a very strong team of Aviation Medicine specialists and Aviation psychologists and so Army can get very good advice from their own team of experts.

IAM is another resource that can be accessed. Very happy to support Army and support the Aviation Medicine and aviation psychology team, and then DST as well. So DST both from a vision sciences point of view, but also from a human sciences point of view are able to provide expert scientific and technical advice in that.

The most important thing is to actually see that there is a need to understand the impact of vision technology on the human and understand how the human interacts with that technology. Once you have flagged that as an issue, then there are a number of different ways that that issue can be explored.

AVM HARLAND: Yes, thank you for that. Because we have heard from various witnesses throughout the course of this Inquiry. There's been some difference in opinions on how the TopOwl symbology would be used, the notion of the situational awareness versus the Primary Flight Display and what that means. I don't think it's been clear throughout the Inquiry and

we're just exploring what we might be able to do in the future to make that more clear.

DR SMITH: Yes. So one of the – well, a comment that's made in a number of the different references/guidelines is that although there is a potential for spatial disorientation when you have got ambiguous symbology looking off boresight, the experiments that they did to try and control the aircraft by looking at off boresight symbology was not representative of what they believe the common practice is, which is if you detect that you have entered an unusual attitude, you don't look at the off boresight symbology; you should look at your Primary Flight Display.

And so from a human factors point of view, we have to make sure that people are trained to a high level of proficiency so that when they are overloaded and overwhelmed and cognitively saturated, that they revert to recent training rather than revert to the primacy of training which is you look at your instruments and fly off your instruments.

AVM HARLAND: And we heard evidence from a senior QFI just recently that when you're flying in formation, that can be somewhat more complex because the nearest threat to your aircraft is the other aircraft, and that's the one you need to deal with first before you can potentially go to your Primary Flight instruments.

DR SMITH: Yes. So I'm not a pilot, and, you know, airmanship is a discipline that is best addressed by a pilot. So the balance of when do you look at your instruments and when do you look at the other aircraft in formation flying is not something that I can really address. But I suppose it is really important to flag that in – I think in the "Official: Sensitive" report, I accepted the DFSB finding that the - - -

FLTLT ROSE: I'm sorry, we may not be able to talk about the DFSB findings in this forum.

DR SMITH: Okay. So I'm just talking about symbology in general.

MS McMURDO: But haven't they been published?

DR SMITH: Not as it relates - - -

MS McMURDO: They've been published, haven't they?

DR SMITH: Not as it relates to the accident.

FLTLT ROSE: Sorry, just the fact sheet. Yes, you're right.

MS McMURDO: Yes, I think so. I think there has been a published report. So I think we can refer to the DFSB finding.

DR SMITH: Well, I won't go into the details, but - - -

MS McMURDO: No, no. No, but generally about the findings.

DR SMITH: But DFSB made a comment that they were looking forward, and so in that respect, I'm just talking about symbology in general, not that it was a contributing factor in particular.

AVM HARLAND: Just switching gear and – if I may – just yesterday we had a conversation about duty times, rest periods, and then when a duty time commences, and I think you were listening in at that stage. I'd like your opinion or your thoughts on the idea of when a duty time starts and effectively how your body starts to know that you're on duty and how you effectively start moving through that, in this case, a 14-hour duty day.

DR SMITH: Probably to start with, I would say that fatigue accrues when you're awake, and to an extent, you're still accumulating fatigue in your time of continuous wakefulness is from when you're awake, not when you're at work.

AVM HARLAND: Yes.

DR SMITH: So that's an important aspect to remember. But from a human performance point of view, when you start thinking about work and you start addressing work, well then, your mind is engaged in a work mode for the period of time that you're actively pursuing those actions and then for a period of time afterwards. So from a purely human factors point of view, that doesn't apply to a clock; it's when you start thinking about work and actively managing a work duty requirement. But fatigue itself accumulates when you're awake, not necessarily when you're on duty.

AVM HARLAND: So in the case that we heard where an individual was considering a personnel administration issue prior to the nominated stand to duty time by approximately roughly two hours or thereabouts, does the body know the difference between when you start that or when you've got a set duty time, when you're doing aircrew duties, or does your body just know that it's started work and it's cognitively engaging in that process?

DR SMITH: I would say that from a human factors point of view, when you're working on work-related activities, it doesn't matter whether you're at home or at work, and it's not about a clock time, it's about how your

mind is cognitively working and that burden of workload and the pressure of what you're trying to manage is a human factors dimension. So that's not a locational or a time-based consideration. Does that answer your question?

AVM HARLAND: I think so. And one final question. Can your body tell the difference between doing aircrew-related duties and other more general service-related duties in terms of fatigue?

DR SMITH: There is a background level of just being awake, and then there is focused being awake when you're working. I don't think – and then the complexity of the duty can increase, and the workload demands that are placed on you. So depending on the level of duty that you're working on, there may be different levels of fatigue that you're accruing as time goes by, but when you're working on work-related activities, then you are at an elevated level of fatigue accrual.

AVM HARLAND: Okay, that sounded very helpful. Thank you.

FLTLT ROSE: There was one item I overlooked. I'd hand the witness a document. I also have a copy of the document for each of the Chair and Deputy Chair. Is this an article titled, "Actigraphy-Driven Biomathematical Fatigue Modelling in British Military Rotary-Wing Pilots", published in the Aerospace Medicine and Human Performance Journal, Volume 96, No 3, in March 2025?

DR SMITH: Correct. That is, yes.

FLTLT ROSE: And just a brief summary of it is: a study of fatigue in British military rotary-wing pilots was conducted to determine the utility of actigraphy-driven fatigue modelling in the Military rotary-wing environment. Is that correct?

DR SMITH: Correct, yes.

FLTLT ROSE: And the study involved 40 pilots, and the data – or the SAFTE scores – the SAFTE-FAST scores, I think it is – were shown to decline for night flying, especially if landing after 2200, with increasing subjective levels of fatigue, and it showed that the relationship between SAFTE, as in SAFTE-FAST, and the Samn-Perelli Scale scores in subjects weakened after 2200, or 10 pm.

DR SMITH: Correct.

FLTLT ROSE: I tender that article. Sorry, and I should say this is one of the articles that you referred to on Wednesday during your evidence that you had read it, and you spoke to it in your evidence on Wednesday.

DR SMITH: Correct. And apologies for not including it in my written submission, but it only just came to light. So it was only published last month.

FLTLT ROSE: I tender this article.

MS McMURDO: The article, "Actigraphy-Driven Biomathematical Fatigue Modelling in British Military Rotary-Wing Pilots", by Pelham, Tongeren, Arnold, and Cocco, is Exhibit 230.

#EXHIBIT 230 - ARTICLE TITLED, "ACTIGRAPHY-DRIVEN BIOMATHEMATICAL FATIGUE MODELLING IN BRITISH MILITARY ROTARY-WING PILOTS", BY PELHAM, TONGEREN, ARNOLD, AND COCCO

FLTLT ROSE: That's the evidence-in-chief.

MS McMURDO: Thank you. Applications to cross-examine?

LCDR GRACIE: Ma'am.

MS McMURDO: Yes, LCDR Gracie.

<**CROSS-EXAMINATION BY LCDR GRACIE**

LCDR GRACIE: I indicated no questions this morning, but there is one topic. Doctor, as you know, I represent the interests of CAPT Danniel Lyon of Bushman 83.

DR SMITH: Yes, hello.

LCDR GRACIE: I just want to touch on something that you covered with the symbology and want to tease out some concepts to make sure that at least my understanding of it is clear. With symbology, in terms of information as presented to a pilot, as I understand it, there's two broad types of display: there's the conformal display or the display that's relative to the axis of the aircraft. Is that, in broad terms, correct?

DR SMITH: Correct, yes.

LCDR GRACIE: You can't have both, I don't think, unless the pilot is looking in a conformal display directly in front.

DR SMITH: The guidelines do actually talk about having overlapping frames of reference and how confusing that is. So there is the potential to overlap them, but I don't want to talk about that, yes.

LCDR GRACIE: Generally they're separate. I understand. And with the conformal display, or conformal attitude presentation, the appearance for the pilot is dependent upon that pilot's line of sight, isn't it?

DR SMITH: Correct.

LCDR GRACIE: And so if I'm understanding it correctly, one of the things that would assist in an investigation into spatial disorientation or situational awareness is data referencing the line of sight of the pilot if it was available.

DR SMITH: If you were wanting to understand the presentation of the symbology that the pilot may have been referring to in a spatial disorientation accident, then that would be useful.

LCDR GRACIE: It would be useful?

DR SMITH: Yes.

LCDR GRACIE: Yes, okay. Because if the line of sight of the pilot was not aligned with the body axis of the aircraft, then the attitude information may in that scenario not always be, what, correct?

DR SMITH: I wouldn't rush to say what's correct or not; it is a feature that has been displayed, and it is displaying the position of the horizon, but that will be displayed as a bank rather than the traditional way of looking at a pitch ladder where it's displayed as pitch. Now, the understanding of a pilot or their ability to interpret that and respond to that can be improved with training to a high level of proficiency. But the Standards say that that adds and the Military Standard 1472 Design Criteria for human engineering actually says display symbology should have the lowest cognitive demand and not require additional memory processes.

LCDR GRACIE: Right. So is a non-conformal display more fatiguing for a pilot than the more traditional body-axis display?

DR SMITH: I would say that insofar as something is likely to be more fatiguing if it has a high workload and cognitive demand, and you're having to apply that cognitive demand to visualise and interpret a complex display, I would expect that to be more fatiguing. That's my expectation.

LCDR GRACIE: Just to break it down into simple terms, so a non-conformal display, because it requires that cognitive processing, would be more fatiguing than the traditional body-axis information.

DR SMITH: The guidelines say that because pilots are so familiar and trained to a very high standard to interpret and understand and respond to a traditional pitch ladder for attitude information, that there is less burden when they are looking at that in other configurations. There's no additional processing over the top; they're just responding to what they see and what they have been trained to respond to.

LCDR GRACIE: Because in that traditional body-axis concept, it doesn't matter which way the pilot's looking; the display will always appear as if the pilot is looking out the front.

DR SMITH: Correct.

LCDR GRACIE: I understand. There was also some evidence to this effect that brightness actually assists in dealing with fatigue, that the brighter the symbology, the less tiring for the pilot. And is that something that you're across?

DR SMITH: I'm not aware of any study that would – so I don't know if there are any studies that have looked at that specifically.

LCDR GRACIE: And one other thing: of course the quality of your NVD is also going to determine the level of fatigue during your flying.

DR SMITH: I would expect that any visual cues that you are having to spend additional effort to try and capture and interpret would increase the cognitive workload and contribute to fatigue.

LCDR GRACIE: All right. Thank you, Doctor.

MS McMURDO: Any other applications to cross-examine?

CMDR JONES: Yes, ma'am.

MS McMURDO: LCDR Jones.

<CROSS-EXAMINATION BY CMDR JONES

CMDR JONES: Dr Smith, my name is CMDR Jones. I appear for the interests of D19, the erstwhile Commanding Officer of the 6th Aviation Regiment. Now, when you prepared your report of October last year, that's Exhibit 76, you undertook a biomathematical modelling using the SAFTE-FAST model, didn't you?

DR SMITH: I did, yes.

CMDR JONES: Do you have a copy of Exhibit 76 in front of you, or – there you go. It might make it a little bit easier for you.

DR SMITH: Thank you.

CMDR JONES: Now, you had done a one-day course on SAFTE-FAST on 24 September last year. That's the case?

DR SMITH: Correct.

CMDR JONES: And that was for the purposes of preparing this report.

DR SMITH: Correct.

CMDR JONES: And while you may have been familiar with the model – that is to say, SAFTE-FAST – before that time, this was your first time of actually being on the tool, so to speak, and prepping a model yourself. Is that right?

DR SMITH: Correct.

CMDR JONES: Now, you readily accept that there are a number of limitations on your report that are a result of the nature of the SAFTE-FAST model. In particular, that SAFTE-FAST is not to be used as a go/no go decision-making tool.

DR SMITH: Correct.

CMDR JONES: And that's because it's not sufficiently accurate for assessing whether a particular individual does in fact have the particular level of fatigue and the associated cognitive impairment.

DR SMITH: I would agree with that in part.

CMDR JONES: Because it's based on averages of a population, not the particular individual's circumstances.

DR SMITH: Correct.

CMDR JONES: In fact, that's the major limitation of biomathematical models is that they are based on averaged fatigue ratings that don't account for wide variability amongst individuals.

DR SMITH: I think that I would probably characterise that they are based on population data, but the output shows the average and the distribution. So but you are correct in saying that the individual, I don't know where that individual lies within that band.

CMDR JONES: No, quite. And in fact, that's what the DFSB Fatigue Management Guidebook says as much.

DR SMITH: Yes.

CMDR JONES: And that's a reference to Exhibit 199. Now, as a consequence, you readily accept that the model – that is to say, a SAFTE-FAST model – or its outputs, I should say more accurately, could overestimate or underestimate the degree of fatigue of a particular individual.

DR SMITH: The SAFTE-FAST outputs describe what you would expect in a population.

CMDR JONES: No, sorry, my question is – actually hear my question. You accept, don't you that the model could overestimate or underestimate the degree of fatigue of a particular individual.

DR SMITH: Yes.

CMDR JONES: That's what you say at paragraph 21(a) of your report.

DR SMITH: Yes. So the output is a population. Where in that population or where in that band an individual lies, it could be over, or it could be under.

CMDR JONES: That's right.

DR SMITH: Yes.

CMDR JONES: And hence it could underestimate or overestimate.

DR SMITH: Yes.

CMDR JONES: Now, one of the other limitations of the model is that it can't account for any strategic use of caffeine.

DR SMITH: Correct.

CMDR JONES: And it's well established, isn't it, that caffeine improves cognitive function?

DR SMITH: Correct.

CMDR JONES: And I noticed you had been sitting in for much of the evidence, but you heard the evidence of D9 that he mentioned that he used caffeine consistently with fatigue management policy to manage his fatigue to that extent.

DR SMITH: I don't remember that, but I'll accept that.

CMDR JONES: Well, that's one witness at least who was aware of the strategic use of caffeine, which is part of – it's discussed in part of their fatigue management training, isn't it?

DR SMITH: It is.

CMDR JONES: Now, if CAPT Lyon had caffeine shortly before the relevant flight, that would have improved – well, it follows – his cognitive functioning.

DR SMITH: Yes.

CMDR JONES: But we don't know whether he did or not; there's no evidence of it, and similarly, even if he had, it can't be accounted for in the model.

DR SMITH: Correct.

CMDR JONES: Now, the SAFTE-FAST model assumes that an individual needs at least eight hours of sleep, doesn't it?

DR SMITH: It does, yes.

CMDR JONES: And that assumption is key to the sleep debt calculation that underpins the cognitive impairment calculation that you've reached, doesn't it?

DR SMITH: Yes. On reporting the outputs of SAFTE-FAST, and that's the assumption that's built into SAFTE-FAST.

CMDR JONES: That's right.

DR SMITH: Yes.

CMDR JONES: But you'd agree with me that the latest science is that healthy adults need at least seven hours' sleep per night.

DR SMITH: I'll accept that.

CMDR JONES: You accept that?

DR SMITH: Yes.

CMDR JONES: And to that end - - -

DR SMITH: Sorry, we generally have to talk about a population. So individuals may require seven, but some may require longer.

CMDR JONES: No, quite.

DR SMITH: But, yes, I accept that.

CMDR JONES: And let's discuss that. Now, I'll show you a document. Now are you aware of the American Academy of Sleep Medicine?

DR SMITH: Yes.

CMDR JONES: That's the peak body for sleep medicine specialists in the United States.

DR SMITH: Yes.

CMDR JONES: And are you aware of the Sleep Research Society.

DR SMITH: Yes.

CMDR JONES: United States. Again, it's a well-recognised institute that studies sleep in the United States.

DR SMITH: Yes.

CMDR JONES: And you see, this is a consensus – that document I've just shown you – is it not, a consensus statement of those two bodies and it says that adults should sleep seven or more hours per night on a regular basis to promote optimal health.

FLTLT ROSE: Perhaps my friend should point out which paragraph where he says - - -

CMDR JONES: No, that's the – he can see it there. It says, "Consensus statement", et cetera.

DR SMITH: At bullet point 1, yes.

CMDR JONES: Yes. Which accords with what you just agreed that the latest science is it's at least seven hours a night for healthy adults. Now, you're familiar with the expression "short sleep"?

DR SMITH: I'd like to understand what you mean, but - - -

CMDR JONES: Yes. So it - - -

MS McMURDO: Do you want to tender that?

CMDR JONES: I will. Actually, yes, I can do that now. I was proposing to do it at the end, but I'm happy to tender it now, ma'am.

MS McMURDO: Will be Exhibit 231. And what is it – a consensus statement, is it? Consensus statement of the American Academy of Sleep - - -

CMDR JONES: American Academy of Sleep Medicine and Sleep Research Society.

MS McMURDO: Dated? Is there a date on it?

CMDR JONES: I can hand up my copies afterwards.

#EXHIBIT 231 - CONSENSUS STATEMENT OF THE AMERICAN ACADEMY OF SLEEP MEDICINE AND SLEEP RESEARCH SOCIETY

CMDR JONES: Now, short sleep is often referred to as six hours or less, is that something that you're familiar with, that expression and that notion?

DR SMITH: I'm not familiar with it but I'm happy to see where you go.

CMDR JONES: You're familiar with the Sleep Health Foundation in Australia?

DR SMITH: Yes.

CMDR JONES: Can I show you a document? Thank you. And you'll see there, there's a table in summary form for different cohorts of the population according to age, and again, you'll see for adults 26 to 64 years of age – that's the cohort with which we're concerned in this Inquiry – again, it reflects that position of the consensus statement we've just mentioned that it's at least seven hours' sleep for adults.

DR SMITH: I would say that this says that adults will have between seven and nine. Some may have seven, some might need nine, some might need eight.

CMDR JONES: Again, we accept that there's a wide variability amongst individuals. I don't think that is in contest.

DR SMITH: No.

CMDR JONES: But, again, it reflects that it's at least seven hours is the recommended minimum.

DR SMITH: No, I think that some individuals might need seven, but some individuals might need eight or nine, and if somebody who would normally need eight or nine only gets seven, then they would be at a relative disadvantage. So the range of a population (indistinct).

CMDR JONES: So let's explore that. You say that a person that gets seven is at a relative disadvantage to someone that has nine hours' sleep?

MS McMURDO: May. He said they may.

DR SMITH: No, no, somebody who would normally need nine - - -

CMDR JONES: Quite.

DR SMITH: - - - who only gets seven is having two hours less than what they would normally need, but in a population, some individuals will have seven, and some individuals will have nine. So I accept that in a population, it is between seven and nine.

CMDR JONES: That's right. But again, reflecting the bottom of that range, the recommendation is at least seven.

DR SMITH: For some individuals.

CMDR JONES: Well, no, the consensus statement – and you accepted earlier - - -

DR SMITH: Yes. The consensus statement, yes.

CMDR JONES: - - - is at least seven.

DR SMITH: Yes.

CMDR JONES: And you'll see the next column says, "May be appropriate: six hours", as on the bottom "up to 10 hours", depending on the circumstances, I imagine.

DR SMITH: Yes, so I would like to understand what they mean by "appropriate" and "circumstances", and I would propose that the level of fatigue that may be acceptable to somebody who is working in a shop may not be acceptable to somebody in a high risk, high workload environment. So what would be "appropriate", I would like to contextualise what that means as it would apply to Military aircrew.

CMDR JONES: But, again, it's also reflective of the matter which I don't understand you disagree with that there is wide variability amongst the population about amount of sleep that is needed.

DR SMITH: Yes.

CMDR JONES: For example, Winston Churchill was famous for the amount of sleep or lack thereof every night, but would nap during the day. You're aware of his example?

DR SMITH: Yes. And napping is a very good strategy, and I congratulate him for it.

CMDR JONES: Well, he managed to do okay.

MS McMURDO: Yes, but not all his decisions were unanimously agreed over his lifetime, so - - -

CMDR JONES: His output was prodigious. I'd like to be able to do half of it. I tender that.

MS McMURDO: 232.

#EXHIBIT 232 - SLEEP HEALTH FOUNDATION DOCUMENT

CMDR JONES: Now, can I show you another document, Dr Smith. This is published by the Australian Government, namely the Australian Institute of Health and Welfare, which I understand to be a part of the Department of Health. This was published in November 2021, and what I wanted to draw your attention to in particular was the last page which is Table 2, and it reflects a study that's cited in the footnotes of the average sleep duration and prevalence of sleep problems by age in the Australian population.

DR SMITH: Yes.

CMDR JONES: And you'll see that sleep time – and this is expressed, of course, in averages – for the cohort of 25 to 34-year-olds, the average sleep time of that cohort in the Australian population is 7.1 hours. Do you see that?

DR SMITH: Yes.

CMDR JONES: I tender that.

MS McMURDO: Exhibit 233.

DR SMITH: But that's a reflection of how much sleep people are getting.

CMDR JONES: Yes.

DR SMITH: And those people will be under pressures, and it is about, you know, prevalence of sleep problems, so just because the average of people in a population gets seven hours, doesn't mean that that is optimum for those individuals.

CMDR JONES: Well, no. No, that's quite right. But if you look at the table itself, it reflects what proportion of that cohort has: short sleep, which is six hours or less; long sleep, more than 10; poor quality sleep or obstructive sleep apnoea, insomnia, restless legs, which are sleep-related problems or conditions.

DR SMITH: Yes, but they're all included in the average of seven.

CMDR JONES: Yes. No, quite.

DR SMITH: Yes.

CMDR JONES: No, quite.

DR SMITH: So I don't see seven hours on this table as being a goal. That's a reflection of - - -

CMDR JONES: No, no, no, I'm not suggesting it is. What I'm suggesting is what it says is that it's an average of the Australian population of that cohort how much sleep they're getting and also the degree to which that cohort has a sleep-related condition.

DR SMITH: Yes.

CMDR JONES: That's what it reflects.

DR SMITH: Yes.

CMDR JONES: I tender that.

MS McMURDO: Yes, Exhibit 233.

#EXHIBIT 233 - AUSTRALIAN INSTITUTE OF HEALTH AND WELFARE DOCUMENT

CMDR JONES: Now, for example, what – just dealing with this – the extent to which the quantity of sleep is relevant particularly for the model, because it's not in dispute in the medical community that the two elements of sleep – there's a qualitative and a quantitative aspect to it.

DR SMITH: Correct.

CMDR JONES: And at the moment, we're just talking about the

quantitative aspect. Now, you heard the evidence of D10 that on the evening of 28 July 2023, he was fully alert, wide awake. You heard that evidence?

DR SMITH: I heard that evidence, yes.

CMDR JONES: Which is a reflection of the Samn-Perelli Scale, is it not?

DR SMITH: Yes.

CMDR JONES: It's a one to seven scale.

DR SMITH: Yes.

CMDR JONES: With one being fully alert, wide awake, and seven being totally exhausted.

DR SMITH: Yes.

CMDR JONES: Barely able to function.

DR SMITH: Yes.

CMDR JONES: And his evidence which is exhibited to his statement shows that he was averaging about seven hours' sleep a night.

DR SMITH: Correct.

CMDR JONES: And that rather demonstrates two things, does it not? First that that's consistent with the consensus statement and the recognition in the medical community that at least seven hours is required for optimum health.

DR SMITH: Correct.

CMDR JONES: And, secondly, it rather demonstrates the inherent limitations of the SAFTE-FAST model. Which it - - -

DR SMITH: The SAFTE-FAST model is built on an assumption of eight hours of sleep.

CMDR JONES: Eight hours. Exactly right.

DR SMITH: And I accept that.

CMDR JONES: Now, it follows, does it not, that the model would - - -

MS McMURDO: Sorry, did you want to say something further, Dr Smith?

CMDR JONES: Sorry.

DR SMITH: Are you going to get to – I thought that D10 was also sleeping outside the main tent because there was snoring inside the main tent and they couldn't sleep, therefore they erected a Jet Tent.

CMDR JONES: Well, now, that wasn't the effect of his evidence, in fairness to you and to him. His evidence after the second night, he moved into a Jump Tent. But otherwise was experiencing the same environmental circumstances as everybody else.

DR SMITH: There was - - -

MS McMURDO: Well, his evidence - - -

DR SMITH: D10 did talk about snoring.

CMDR JONES: No, there's certainly evidence that there was snoring.

DR SMITH: Yes. So it's the fact that somebody got good sleep sleeping outside in a separate tent, I'll take that in context.

CMDR JONES: Yes. And you heard the evidence that those tents were – they had numerous of those tents which were available to anybody that wanted to use them. You heard that evidence?

DR SMITH: I've heard that, yes.

CMDR JONES: But it follows, doesn't it, from the propositions with which you have agreed that the SAFTE-FAST model would overstate fatigue levels if the individual was getting seven hours of sleep and was well rested?

DR SMITH: It would, yes.

CMDR JONES: Because anything less than eight hours' sleep is calculated as a sleep debt with associated decline in cognitive function.

DR SMITH: That's how the model works, yes.

CMDR JONES: Now, I'm sure you're familiar with the concept of sleep latency?

DR SMITH: Yes.

CMDR JONES: And that refers to the time it takes when – to use a colloquial expression – your head hits the pillow, and you fall asleep.

DR SMITH: Yes.

CMDR JONES: Now, you would agree with me that it's widely accepted that for healthy adults, sleep latency is between 10 and 20 minutes.

DR SMITH: I agree that, yes.

CMDR JONES: And, in fact, a recent study – a meta study showed that on average, the mean sleep latency was 11.8 minutes. So you are you aware of that study?

DR SMITH: I'll accept that.

CMDR JONES: You would accept that proposition?

DR SMITH: Yes.

CMDR JONES: I'll tender in due course that study for completeness. Now, you would accept – now you say at paragraph 49(b) of Exhibit 76 – that's your October report that you have in front of you, that's on page 15 – that you say, "experience shows there may be a sleep latency of up to 30 minutes". Do you have that? Have you got your October report there?

DR SMITH: Sorry, what paragraph?

CMDR JONES: Paragraph 49(b). It's on page 15. You see that?

DR SMITH: Yes.

CMDR JONES: But that is not consistent with what you've just accepted of sleep latency being between 10 and 20 minutes for healthy adults and research showing the mean average is actually much lower, about 11.7.

DR SMITH: So that is based on work that IAM had done earlier where there's a difference between lying down with the intention of sleeping and going to bed. And so if people go to bed and are thinking, winding down,

but they're not there with the intent of going to sleep, that's not sleep latency.

CMDR JONES: So what studies are you referring to?

DR SMITH: I would have to pull them out. So the earlier studies that IAM had done on aircrew just showed that - - -

CMDR JONES: That you personally have done.

DR SMITH: No, no, no.

FLTLT ROSE: Perhaps let the witness finish his - - -

CMDR JONES: I'm sorry, I just need to clarify what he's saying.

DR SMITH: Yes, so work conducted by the Institute with a previous human factors specialist. I was just saying people go to bed and if they're on their phone, they're sending messages or whatever, there is a period of time and but that's different to sleep latency.

CMDR JONES: There, no, we're talking about very different things, aren't we?

DR SMITH: Yes.

CMDR JONES: Yes.

MS McMURDO: CMDR Jones, could you show him the document you say you're going to tender, so that he can have a look at it and get some idea as to what it is, please?

CMDR JONES: Yes, ma'am.

MS McMURDO: Just take your time, Dr Smith.

CMDR JONES: Sorry, Dr Smith, this lectern is not conducive, as my friend LCDR Gracie was saying, in conducting a cross-examination with documents. Do you see that study?

DR SMITH: Yes.

CMDR JONES: That was the study I had adverted to in my earlier question, isn't?

MS McMURDO: Just give him some time to look at it.

CMDR JONES: Yes, no, no. I'm quite happy, ma'am, for him to look at what it's about. Perhaps the abstract is the quickest way to see what it's about.

DR SMITH: Thank you. Yes, and I accept that. But also know that when we're dealing with averages, as you would appreciate, when you're dealing with averages that overestimates and underestimates about half the population.

CMDR JONES: That's the very thing of an average, isn't it?

DR SMITH: Yes. And this does say that the confidence interval goes up to 18 minutes.

CMDR JONES: That's right. It certainly is - - -

DR SMITH: So I accept that the average is 11.

CMDR JONES: That's right. And you'd recognise that what they've done there is a systemic review of the research of 110 healthy adult cohorts, which is quite extensive, isn't it?

DR SMITH: Yes.

CMDR JONES: I tender that.

MS McMURDO: That'll be 234?

UNIDENTIFIED SPEAKER: Yes.

MS McMURDO: So what is that described as, please?

CMDR JONES: I'll read that out.

MS McMURDO: What's it headed, Dr Smith? What is - - -

CMDR JONES: It is, "Normal multiple sleep latency test values in adults: A systematic review and meta-analysis", and it's published in the Journal of Sleep Medicine, Volume 109, 2023, at page 143.

MS McMURDO: Thank you.

#EXHIBIT 234 - RESEARCH ARTICLE TITLED "NORMAL MULTIPLE SLEEP LATENCY TEST VALUES IN ADULTS: A SYSTEMATIC REVIEW AND META-ANALYSIS" PUBLISHED IN JOURNAL OF SLEEP MEDICINE, VOLUME 109, 2023, AT PAGE 143

CMDR JONES: And you'll see that those researchers are all from the University of Toronto in Canada, a well-known university.

DR SMITH: Okay.

CMDR JONES: You wouldn't disagree with that?

DR SMITH: I won't disagree with that.

CMDR JONES: Now, your assumption in preparing the SAFTE-FAST model was that – and we'll use CAPT Lyon as the example – that he was asleep one hour after he was finishing duty late at night. That's your assumption you've made.

DR SMITH: Correct. And I think that was based on a document that I was provided that actually talked about the normal pattern in the camp at the time, and that there was some evidence in there saying that other people thought that the interval between landing and going to sleep was about an hour.

CMDR JONES: Right. Well, I'm not sure of that evidence or whether it's been established, but we'll explore that in anyway. But that's at paragraph 47(b), that's where you state very clearly your assumption in that regard.

DR SMITH: Yes.

CMDR JONES: Now, for example, on the night of 27 July, CAPT Lyon finished duty at 0100. That's the evidence.

DR SMITH: Okay.

CMDR JONES: And that's in your report. And you then have assumed that CAPT Lyon was asleep at 0200, consistent with your assumption.

DR SMITH: Okay.

CMDR JONES: And you'll see that at table 1 at page 14 of your report.

DR SMITH: Yes.

CMDR JONES: Now, you've got no reason whatsoever to believe that he didn't go straight to bed from after finishing duty, do you?

DR SMITH: I would have to look at the information I was provided, but I - - -

CMDR JONES: Well, you can take it from me, there's no evidence at all to suggest that he didn't go straight to bed.

DR SMITH: Okay.

CMDR JONES: And bearing in mind two things, it was 0100. He'd been working all day, and it'd follow, as a reasonable assumption, that at that time, he was tired.

DR SMITH: Yes.

CMDR JONES: And he, in the evidence, is unequivocally that he was a highly professional pilot and a very serious officer who took his duties seriously.

DR SMITH: Correct.

CMDR JONES: Now, if you had adopted the scientific consensus on sleep latency, then it would be safe to assume that he was asleep certainly by 0130, wouldn't it?

DR SMITH: So I've got here – so I've written down that the - - -

CMDR JONES: No, sorry, just so you understand, in fairness to you, my question, he finished duty at 0100. He didn't have to drive home; he had to walk a very short distance to his tent.

DR SMITH: Yes.

CMDR JONES: You accept that?

DR SMITH: I accept that, yes.

CMDR JONES: And he was tired, and he was for all intents and purposes ready for bed.

DR SMITH: Yes.

CMDR JONES: And you would agree with me that if you adopted the consensus on sleep latency, he would certainly have been asleep by 0130.

DR SMITH: My table says that there was texts, so on the basis - - -

CMDR JONES: Sorry, we'll come to that. Can you just answer my question?

MS McMURDO: Well, he's trying to.

CMDR JONES: Well, he's not, ma'am, he's not answering my question.

MS McMURDO: He's trying to answer your question. Let him answer. Yes, Dr Smith.

DR SMITH: So I established a sleep time of 2 o'clock based on the information I was provided that was that sleep time would be reasonable for an hour after finishing duty, and I've got a note that there was texts. So I would have used the earliest of that information, so I would need to go to the reference, but I've got a comment that that time was reinforced by a text. So if there was texting at about that time, like, "See you tomorrow. I'm going to bed", or whatever – and I can't recall without looking at paragraph A23 to 25. But I've got a note that there was texts, and that's how I reached that (indistinct).

CMDR JONES: Well, I want to come to that. I will come to that. I just want to see whether you accept the proposition that I've put that if he was finished duty, he was tired, he was going straight to bed at 0100, if you adopt the consensus on sleep latency – let's call it 15 minutes.

DR SMITH: Yes.

CMDR JONES: For want of a better average. He would have been asleep by 0130.

DR SMITH: I think that's possible based on what you've said.

CMDR JONES: Yes. Now, you mentioned – well, in fact it'd be likely. It'd be reasonably likely to make that assumption, would it not, based on the science?

DR SMITH: If he went to bed at 1 o'clock, then I would expect him to be asleep soon after that.

CMDR JONES: Yes.

DR SMITH: All other things notwithstanding.

CMDR JONES: Exactly. Now, let's explore the - - -

MS McMURDO: What (indistinct) finished duty at 1, is it?

CMDR JONES: Yes, 0100. That's right.

MS McMURDO: 0100. Well, we don't know what he did then.

CMDR JONES: Sorry, ma'am?

MS McMURDO: We don't know what he did then. Whether he went to the bathroom, whether he looked at his phone, whether he read a book.

CMDR JONES: Well, ma'am, there's - - -

MS McMURDO: There's a lot of unknowns here.

CMDR JONES: Well, that would be speculation. What I'm saying - - -

MS McMURDO: There is a lot of unknowns here.

CMDR JONES: Quite. But what I'm doing, ma'am, in fairness to the witness, is exploring the assumptions upon which his report is based and whether they are consistent with the evidence and science.

Now, there's no evidence at all that CAPT Lyon did anything else. Now, you mentioned - - -

MS McMURDO: Nor is there any evidence that he immediately jumped in the stretcher and went and closed his eyes and went to sleep.

FLTLT ROSE: At this point, I have to say there is evidence. Perhaps my friend would refer to Annex B in the Letter of Instruction for the December report which resulted in the January - - -

CMDR JONES: I'll get to that. I'm well aware of that, my friend. No, no.

FLTLT ROSE: Well, it's not fair to say there's no evidence of what CAPT Lyon did after 1 am on that morning, because there is.

MS McMURDO: That's true. There is, yes.

FLTLT ROSE: There is text messages and data use - - -

CMDR JONES: Well, let's go to that now then. Do you have your instructions of 6 December 2024? It's at Annexure B, dated 6 December 2024. It's what FLTLT Rose just mentioned. It's your January report, but the instructions themselves we're talking about are dated 6 December.

DR SMITH: All right.

CMDR JONES: They appear at Annex B.

DR SMITH: Annex?

CMDR JONES: B.

DR SMITH: B?

CMDR JONES: Bravo.

DR SMITH: Yes. Annex B?

CMDR JONES: B. Yes. It should be titled, "Summary of the probative evidence to the" – sorry, correction – "Summary of the Probative Evidence the Inquiry has Obtained to Date Regarding CAPT Danniel Lyon's Sleep/Rest/Wake Timings". Do you see that?

DR SMITH: That's not Annex B on mine.

CMDR JONES: That should be Annex B to your January report.

MS McMURDO: Show the exhibit to the witness.

CMDR JONES: Could the witness be shown his addendum report, 31 December, and that is – sorry, 31 January, my mistake. That's Exhibit 146.

MS McMURDO: He's got Exhibit 146. If you could show CMDR Jones Exhibit 146, please. Yes, show it to CMDR Jones and let him find what he's looking for.

CMDR JONES: Sorry, 146A. 146A are the instructions. They don't seem to be annexed to your report. Here they are. Yes, here they are. Actually marked with a tab B.

MS McMURDO: That might have been 146B, was it?

CMDR JONES: So 146A is the – the instructions have been tendered separately, ma'am. But they actually appear as an annex to his report.

MS McMURDO: 146A was the Letter of Instruction and 146B the further statement.

CMDR JONES: That's right. Do you have them there, Dr Smith?

DR SMITH: Yes.

CMDR JONES: Now, if you turn over to – the pages aren't numbered, but it's the third page. You'll see the date of 26 July 2023. Do you see that?

DR SMITH: Yes.

CMDR JONES: Paragraph 19.

DR SMITH: Yes.

CMDR JONES: It says CAPT Lyon sent Mrs Lyon a message at 0027 hours saying:

> *Just getting into bed, babe. Boots are wet. Tomorrow's going to suck.*

Do you see that?

DR SMITH: Yes.

CMDR JONES: So that's the last text message of that evening at 0027. So there are no later text messages that night, and certainly not at 0200. Do you accept that?

DR SMITH: Yes.

CMDR JONES: Now, your assumption - - -

DR SMITH: Sorry, can I - - -

CMDR JONES: Yes?

DR SMITH: At paragraph 25, is the text message saying – well, a reference to a text message saying, at about 7 am on the morning of the 27th, "I got into bed at 2 am", that morning.

CMDR JONES: Yes, well, there's no – that is not in evidence, that message.

DR SMITH: But this is the instruction that I was given.

CMDR JONES: Yes, I understand that. But that's not in evidence.

DR SMITH: So I'll just clarify that the basis of the 2 o'clock was this comment saying, "I went to bed at 2 o'clock".

CMDR JONES: Okay.

DR SMITH: That's the basis of my assumption.

MS McMURDO: Now, this isn't a court. This isn't a court. This is an Inquiry. Please, CMDR Jones, don't badger the witness. I know you've got a job to do. Get on and do it, but please - - -

CMDR JONES: No, I do want to be fair to the witness, and I do appreciate the distinction - - -

MS McMURDO: Well, you're not doing a very – necessarily doing a good job of it at the moment.

FLTLT ROSE: I should also just say when you said there's not in evidence, there is – that text message is annexed to the statement of Caitland Lyon.

MS McMURDO: You say you want to be fair to the witness, well, please do so.

CMDR JONES: I'm endeavouring to do so, ma'am.

MS McMURDO: Thank you.

CMDR JONES: Now, if you go to the night of 28 July – I've just been informed that, ma'am, you might want to take a morning tea

adjournment. It's 11 o'clock now. Before I'm about to start another day, did you – of the evidence - - -

MS McMURDO: How much longer will you be?

CMDR JONES: Half an hour. I'm in your hands, ma'am.

MS McMURDO: Do we need to have the adjournment now? I think we do, don't we?

FLTLT ROSE: I think we do. I think we do in terms of some issues that we need to do during the morning tea break. But I also note that MAJ Chapman has some documents to tender, and he has to leave for a flight at 11.30. Would it be appropriate to just interpose MAJ Chapman's about 10 minutes of tendering before we return to Dr Smith?

MS McMURDO: Well, maybe should we do that now?

FLTLT ROSE: I think that might be wise.

MS McMURDO: Yes. Sorry to interpose this, but for the convenience – are you content, CMDR Jones? There's a flight to be got.

CMDR JONES: Ma'am, I'm absolutely in your hands.

MS McMURDO: You're free to go, Dr Smith, for a few minutes.

DR SMITH: All right.

MS McMURDO: We're going to do some tendering of documents, and we'll resume after the mid-morning break.

DR SMITH: Okay. Thank you.

MS McMURDO: Thank you. You can leave everything there. We'll sort that out later.

<WITNESS WITHDREW

MAJ CHAPMAN: I'm grateful to the Inquiry and to my learned friend. Ma'am, I have nine documents to tender. I might hand them up and describe them in turn. The first is referred to as the HMSD Required Training ADELE Compilation. It's an unclassified document. The Inquiry

will recall evidence from both BRIG Fenwick and MAJGEN Jobson to the effect that pilots undertook training with respect to HMSD 5.10 upgrade, and that it included an ADELE package. I tender that. It's a record produced by Avn Command concerning the completions of training. It's - - -

MS McMURDO: And, sorry, this is training under the ADELE system logistic management, is it?

MAJ CHAPMAN: It is the record of ADELE training with respect to HMSD 5.10.

MS McMURDO: 235.

#EXHIBIT 235 - HMSD REQUIRED TRAINING ADELE COMPILATION

MAJ CHAPMAN: Please the Inquiry. The second document I hand up is referred to as the OT-CRM record. The Inquiry will also recall evidence from BRIG Fenwick and COL Lynch, among others, to the effect that they were not aware as to whether the OT-CRM risk register was updated. I tender this document produced by Avn Command, noting it does not refer to any risk entry in respect of HMSD 5.10.

MS McMURDO: 236.

#EXHIBIT 236 - OT-CRM RECORD

MAJ CHAPMAN: The third document, Chair, is a minute and it is dated 14 February 2019, and it's from DASA. It's the approval of major change to type design, and I tender this document, and it represents the formal approval on behalf of DASA of the major change to type design 14 February 2019.

MS McMURDO: Of?

MAJ CHAPMAN: Of type design.

MS McMURDO: But of what design?

MAJ CHAPMAN: HMSD.

MS McMURDO: HMSD.

MAJ CHAPMAN: 5.10 type.

MS McMURDO: Of the version 5.10.

MAJ CHAPMAN: Yes.

MS McMURDO: 237.

#EXHIBIT 237 - MINUTE FROM DASA, APPROVAL OF MAJOR CHANGE TO TYPE DESIGN

MAJ CHAPMAN: The fourth document, Chair, this is an "Official: Sensitive" document, so I won't describe it, but I can refer to it as the Avn Command Capability Training Implementation Plan dated 7 April 2020. I tender that.

MS McMURDO: 238.

#EXHIBIT 238 - AVN COMMAND CAPABILITY TRAINING IMPLEMENTATION PLAN ("OFFICIAL: SENSITIVE")

MAJ CHAPMAN: The next document, Chair, is the Army Aviation Test and Evaluation Section Flight Test Operations Manual Version 4. It's an unclassified document. And the Inquiry has received extensive evidence concerning how AATES functioned in its role, and I tender that document, which is Version 4, dated 28 June 2019. Which was in place at the time of the accident.

MS McMURDO: Exhibit 239.

#EXHIBIT 239 - ARMY AVIATION TEST AND EVALUATION SECTION FLIGHT TEST OPERATIONS MANUAL VERSION 4

MAJ CHAPMAN: The next document is a DASA Engineering Review Form dated 2 November 2018. It's unclassified. The Inquiry has received evidence that DASA approved the HMSD 5.10 Certification Program Plan

submitted to it by Airbus, and I tender that approval, 1 November 2018 – sorry, 2 November 2018.

MS McMURDO: Exhibit 241.

#EXHIBIT 241 - DASA ENGINEERING REVIEW FORM

MAJ CHAPMAN: The next document, Chair, is the DASR – D-A-S-R – Form 41A Application for Approval of Major Type Design, dated 14 February 2019. It's "Unclassified". And this is the application made to DASA for the major change in type design in respect of 5.10. I tender that document.

MS McMURDO: 242.

#EXHIBIT 242 - DASR FORM 41A APPLICATION FOR APPROVAL OF MAJOR TYPE DESIGN ("UNCLASSIFIED")

MAJ CHAPMAN: The penultimate document, Chair, is the DASA Engineering Review Form dated 14 February 2019. It's "Unclassified". The Inquiry has received evidence that DASA again approved the HMSD 5.10 upgrade as a major change to type design, and this is the form which represents that approval which is related to an earlier document that was tendered. So that's dated 14 February 2019. I tender that.

MS McMURDO: 243.

#EXHIBIT 243 - DASA ENGINEERING REVIEW FORM ("UNCLASSIFIED")

MAJ CHAPMAN: The last document, Chair, is "Official: Sensitive". It is similarly an Engineering Review Form dated 13 February 2024. This concerns a post-accident review undertaken by DASA in respect of the processes they undertook with respect to the approval of the major type design, and I tender that document.

MS McMURDO: 244.

#EXHIBIT 244 - ENGINEERING REVIEW FORM ("OFFICIAL: SENSITIVE")

MAJ CHAPMAN: That's the material, Chair, and I note that was all obviously served on Counsel representing and Airbus.

MS McMURDO: Thank you.

MAJ CHAPMAN: Please the Inquiry.

MS McMURDO: Thank you. We'll adjourn for 15 minutes, thank you.

HEARING ADJOURNED

HEARING RESUMED

<DR ADRIAN MICHAEL SMITH, on former affirmation

<CROSS-EXAMINATION BY CMDR JONES, continuing

MS McMURDO: Yes, CMDR Jones.

CMDR JONES: Thank you, ma'am. Now, where we left off, Dr Smith, was – and I appreciate – just so you understand – that you were writing a report according to your instructions. I accept that with question. What I'm just looking at is what those instructions are.

DR SMITH: Understood.

CMDR JONES: So on the night of 26 July – now, you'll see at paragraph 19 of the instructions – this is what I took you to before the break – the last text message in evidence that night is at paragraph 19, and if you can just take that from me.

DR SMITH: Okay.

CMDR JONES: Okay. 0027. That's the last text message we have in evidence.

DR SMITH: To be fair, I don't know what you mean by "in evidence".

CMDR JONES: Sorry.

DR SMITH: Because here there's reference to another text.

CMDR JONES: Absolutely. But if you can just - - -

DR SMITH: But I'll accept what you're saying.

CMDR JONES: Yes, you understand what I'm saying?

DR SMITH: Yes.

CMDR JONES: And so if we just take that as the starting point, the last text message at 0027 saying that – CAPT Lyon was just saying, "I'm going to bed now". Now, again, in the absence of any evidence, and just take my word for this – assuming there is no other evidence that CAPT Lyon did anything else after 0026 and he went and he did as he said, going straight to bed, then, again, adopting the consensus – the scientific consensus on sleep latency, he would certainly have been asleep between 0045 and 0100, wouldn't he?

DR SMITH: I accept the logic of what you're saying.

CMDR JONES: Yes.

AVM HARLAND: Is it possible to say he was certainly asleep, or is that an estimate?

DR SMITH: Sorry?

AVM HARLAND: You said "certainly asleep". So is it possible to say "certainly"?

DR SMITH: Well, you know, we don't know for certain whether anybody falls asleep, and as the Counsel has indicated, we've got group averages and all of that. So if we're applying a scientific consensus of an average, then, you know, that would be consistent with what's happening. But an individual, I don't know whether they were actually asleep or whether they were ruminating over issues, planning for tomorrow or whatever. So I don't know what actually happened to an individual.

AVM HARLAND: Yes. So it would not be possible to say it's "certain".

DR SMITH: It's not possible to say it's "certain".

AVM HARLAND: Okay. Thank you.

CMDR JONES: Yes, I think we accept that we can only go on reasonable assumptions based on scientific consensus and what objective evidence we have.

DR SMITH: In the absence of any other information.

CMDR JONES: Yes.

DR SMITH: Yes.

CMDR JONES: Now, if we adopt what I've just said that CAPT Lyon on the basis of him saying "I'm going to bed now" and adopting the consensus on sleep latency, and he was in bed at certainly by 0100, which is 34 minutes after he said he was going to bed, that would mean that he would have had between at least seven hours and 45 minutes' sleep because we know that he woke up at – or on your instructions, he woke up at about 0615 in the morning.

DR SMITH: Yes. I'm trying to find the paragraph of that.

CMDR JONES: Sorry. That's in your addendum report of January this year, paragraph 8, and I'll come to this. You had originally assumed a wake time of 0855, and you've adjusted that back to 0615 because there was a use of data.

DR SMITH: Yes.

CMDR JONES: At 0615, and I'll come to that. But you will accept, of course – it's just maths, simple maths – that if he was asleep by 0100 and not 0200, he's had an extra hour's sleep.

DR SMITH: Yes.

MS McMURDO: So, sorry, but he didn't finish work until 0100, did he?

CMDR JONES: No, the text – the evidence is that the last text message that we have is the text message of 0026 saying, "I'm going to bed". And then adopting the consensus on sleep latency, which is between 10 and 20 minutes, even if we just adopt 15 minutes - - -

DR SMITH: That's based on the assumption that that text was "I'm going to bed right now, literally. I am sitting on my bed, lying down". Rather than, "I am going to bed". And there can be a period of time from texting to actually – so there's a lot of speculation on all sides.

CMDR JONES: Well, we'll get - - -

DR SMITH: But I follow what you're saying.

CMDR JONES: Let's explore that.

DR SMITH: Yes.

CMDR JONES: So you agreed that it's a very short distance from where he finished work to where he was sleeping. Well, he didn't have to drive anywhere; he just had to walk a short distance in and go to his stretcher. Now, if it's 0026 and he was just going straight to bed, and if we adopt a 0100 for abundance of caution, it's likely that he would have been asleep by that time adopting the consensus on sleep latency.

DR SMITH: If he went to bed, then I would expect him to fall asleep shortly after.

CMDR JONES: Yes, thank you. So that follows, of course, that he – if that is the case, if we take that basis, then he's had an extra hour of sleep than you have calculated because you've calculated it from 0200.

DR SMITH: I have, based on the information in paragraph 25.

CMDR JONES: That's right. And I'll come to that. But and that would amount to in excess of seven hours of sleep that night.

DR SMITH: Yes.

CMDR JONES: It's, well, seven hours and 45 minutes, and in fact over nine hours if you kept your original wake up time. Because your original wake up time was 0855.

DR SMITH: Okay.

CMDR JONES: Yes. And you've adjusted that to 0615 because of the use of data. Do you recall doing that? Sorry, just so you know what I'm referring to, Doctor, you remember you did a report in January where you were given the instructions that I've just taken you to in part to see whether that affected your calculations.

DR SMITH: Yes.

CMDR JONES: Yes. And you've adjusted the data – sorry, you've adjusted your model and your calculations from an assumed wake-up time of – this appears at paragraph 8(e) of the addendum report of – original wake-up time of 0855, and you've adjusted that to 0615 because you say use of data from 0615 suggests earlier wake-up time than the assumed text of 0855.

DR SMITH: Correct.

CMDR JONES: Now, can I just take you to your instructions, and that's the Annexure B that we had looked at? Could you go to paragraph 24? You'll see that's in red.

DR SMITH: Yes.

CMDR JONES: Can you see it says, most importantly, "CAPT Lyon's mobile showed" – you'll see this at about halfway down the paragraph.

DR SMITH: Yes.

CMDR JONES:

> *CAPT Lyon's mobile showed his first data use was 0615 local time.*

DR SMITH: Correct.

CMDR JONES: And that's the time you've then adopted.

DR SMITH: Correct.

CMDR JONES:

> *It then shows consistent data use throughout the day, and then throughout the night and all through the early morning on 27 July '23 –*

and what I'm about to put to you is most important –

> *It is not clear if his mobile was accessing data automatically during these times or if he was actively accessing the data.*

DR SMITH: Correct.

CMDR JONES: And that is the evidence we've been received from Optus. They said it's impossible for them to tell. Do you understand that?

DR SMITH: I understand that, yes.

CMDR JONES: Yes. So if that's so, if it's impossible to tell whether CAPT Lyon was actively accessing his phone or it was just automatically downloading while he was asleep, you'd agree with me that it's complete speculation that he was actively using it at 0615.

DR SMITH: I don't know that it's "complete speculation". That's the information that I've got that the data usage started at that time. It wasn't before, and it continued throughout the day.

CMDR JONES: Yes.

DR SMITH: And in the first report, I included that as one of the assumptions and one of the limitations of the modelling, so that that's where I got the information from, so it is clear and transparent and auditable where I got the data from. And - - -

CMDR JONES: No, I'm not suggesting for a moment it wasn't - - -

DR SMITH: And that was there as one of the limitations of the data that I was assembling, and this was my best attempt at understanding the data with what I had been given, and as I have indicated, and as I've actually done with this report, if new information comes to light, then modelling is an iterative process, and we can remodel as new and better information comes to light.

CMDR JONES: But what we do have – we do have an actual text message at 0855, of CAPT Lyon – it's his first text message to his wife.

DR SMITH: Yes.

CMDR JONES: And he was obviously a very caring husband because it seems that his practice was one of his last messages before he went to bed was to his wife, and then one of his first messages was to her in the morning. It seemed to be a bit of a practice. Would you accept that, or you're not familiar with the evidence?

DR SMITH: I haven't looked at the regularity of texts, but I will accept that.

CMDR JONES: And so what I'm suggesting, what we do have – what we are certain about is that at 0855, he texted Mrs Lyon. That is unequivocal. But at 0615, the evidence is we don't know whether he was asleep, and the data was being downloaded automatically, or he was awake and actively downloading it. We just don't know that at all.

DR SMITH: Correct.

CMDR JONES: So it would be – and my suggestion to you, that objectively, it would be safer to say that he woke up shortly before he sent the text message at 0855, because we know he was awake at that time, whereas we just do not know he was awake at 0615.

DR SMITH: That would be one way of looking at it. And for some of the other aircrew, I did - - -

CMDR JONES: Sorry, I'm just wanting - - -

MS McMURDO: Excuse me. Let the witness answer the question, thank you.

DR SMITH: I did make that adjustment where, if it wasn't clear, when the data started or whether it was deliberate or not, I did make that adjustment.

CMDR JONES: But if we take the calculation of the 0100 sleep time, which is 34 minutes after he said he was going to bed.

DR SMITH: Yes.

CMDR JONES: And we take the wake time as shortly before he sent the first text message to his wife in the morning, then he's had over eight hours' sleep that night, hasn't he?

DR SMITH: I'll accept that calculation based on those assumptions.

CMDR JONES: And even if we keep the original time of 0615, he's had over seven hours.

DR SMITH: I'll accept that.

CMDR JONES: Now, could I go to – so the night of the 27th and 28th, again, CAPT Lyon finished duty at 0100, and again, you've assumed a 0200 sleep time based on your understanding at least that – or you've assumed that he went to sleep an hour after finishing duty.

DR SMITH: That was based on information that I was provided as a general planning tool.

CMDR JONES: But, again, there's no evidence at all – you can take it from me as an assumption – that he did anything other than go to bed shortly after he finished duty. If you accept that proposition first.

DR SMITH: I'll accept that.

CMDR JONES: And then, secondly, again, assuming the consensus on sleep latency, it would be again safe to assume, based on those two things, that he would have been asleep by 0130.

MS McMURDO: There's no evidence one way or the other, is there?

CMDR JONES: Well, no, but there's no – what we do know is this, ma'am, and Dr Smith, is that CAPT Lyon finishes at 0100. He knew he had duty the next day. The evidence is unequivocal that he was a very professional competent pilot that knew he needed to rest, and there would be no reason to think that, consistent with that attitude and that character he had, that he would have done anything other than go to sleep as soon as he reasonably could. You'd accept that as a reasonable assumption?

DR SMITH: From what I've heard, and what I would believe is that CAPT Lyon was a diligent and professional pilot.

CMDR JONES: Yes.

DR SMITH: And I wouldn't think that he would do anything deliberately to jeopardise that standard.

CMDR JONES: So, again, I'm just exploring the assumptions and the results that follow, that if he was asleep by 0130 on the night of the 27th – that is to say, 0130 on the morning of the 28th – and he was awake at 0705, and we've got the text message that that's based on. Do you remember that?

DR SMITH: Yes.

CMDR JONES: And that's the text message where he said:

I've just woken up, but I'm going to try and get some more sleep.

DR SMITH: Yes.

CMDR JONES: Do you remember that? So at that point in time, he's had five and a half hours' sleep, or five hours and 35 minutes' sleep.

DR SMITH: Yes.

CMDR JONES: And then you've accounted for, in your addendum report, the supplemental sleep of between 0740 and 1000. That's right?

DR SMITH: Yes.

CMDR JONES: So that's an extra two hours and 20 minutes that you've accounted for.

DR SMITH: 1000 or 0930?

CMDR JONES: 0930, was it?

DR SMITH: Yes, my table says 0930.

CMDR JONES: Well, that's almost another two hours. So let's assume it's the two hours. On that assumption, he's had seven and a half hours' sleep, hasn't he? Bed at 0130, awake at 0705, plus the additional sleep between 0740 and 0930.

DR SMITH: Okay.

CMDR JONES: You accept that's just simple, obvious maths?

DR SMITH: Yes, I accept that.

CMDR JONES: Now, on that basis, he's had between 30 and 45 minutes more sleep than you've accounted for – or at least 30 minutes more sleep.

DR SMITH: Based on those adjusted assumptions, yes.

CMDR JONES: Yes.

DR SMITH: But if those assumptions were provided, then I would be happy to remodel.

CMDR JONES: Yes. And so if we see the two nights prior to the 28th – that is to say, the night of the 26th and the night of the 27th – on the propositions that I've put to you, adopting two things: that CAPT Lyon diligently said what he was going to say on the 26th was going straight to

bed, and on the night of the 27th, went to bed as reasonably promptly after finishing duty, both nights, he's exceeded – well exceeded seven hours of sleep. You'd accept that?

DR SMITH: I accept that based on those assumptions, yes.

CMDR JONES: Yes. Now, I just want to now explore with you sleep quality. Because we agree, I think, that there's the qualitative and quantitative aspects of sleep.

DR SMITH: Yes.

CMDR JONES: Now, you've assessed the sleep quality of the aircrew as "poor" in your report.

DR SMITH: I have.

CMDR JONES: But you've also, in fairness, modelled "fair" and "good".

DR SMITH: I have.

CMDR JONES: And so we are all clear about the different categories, "poor", "fair", and "good" quality sleep, "poor" equates to an economy seat in an aircraft, commercial aircraft.

DR SMITH: As it applies to in-flight crew rest facilities, yes.

CMDR JONES: Yes. And that's what we're talking about, aren't we, in these assessments?

DR SMITH: No, I've assessed their ground-based crew rest facilities, but in terms of the - - -

CMDR JONES: No, I appreciate. But in terms of the model.

DR SMITH: Yes.

CMDR JONES: Sorry, I might have confused you.

DR SMITH: Yes.

CMDR JONES: The model adopts the commercial rest facility categories.

DR SMITH: They have, yes.

CMDR JONES: And "poor" equates to an economy seat. And "fair" equates to a lie-flat business seat.

DR SMITH: I think the "economy seat" is a description of the sort of environment that does actually refer to interruptions like noise, temperature control.

CMDR JONES: It does.

DR SMITH: And there are a whole lot of other environmental conditions. It is described as "like an economy seat".

CMDR JONES: Exactly.

DR SMITH: It's got to do with whether it lies down flat, how much space you've got, whether people are walking past you and all that. So there are a number of things that go into describing the different qualities of sleep.

CMDR JONES: That's right. But in the interests of time – I don't want to be here all day with you.

DR SMITH: Me neither.

CMDR JONES: I really don't want to detain you longer than I need to. That is how the guide describes, in brief terms what is meant by "poor", so people have an understanding of what - - -

DR SMITH: Yes.

CMDR JONES: And then a "fair" quality of sleep is assessed as a lie-flat business class seat on a commercial aircraft cabin.

DR SMITH: Correct.

CMDR JONES: And "good" quality sleep equals bunks in a dedicated rest facility onboard a commercial aircraft.

DR SMITH: Correct. And associated with each of those is the number of disruptions that you would expect overnight.

CMDR JONES: That's right. And as one progresses up the scale from "poor" to "good", the fewer the interruptions and that is as a consequence of a number of things, and I'm going to explore them with you now. For

example, it deals with how cool – the temperature. It deals with how dark it is, the noise, and the comfort levels.

DR SMITH: Correct.

CMDR JONES: Now, in terms of the temperature, you've concluded that the conditions were not conducive to restful sleep at paragraph 123 of Exhibit 76 – that's your October report. Do you remember that conclusion?

DR SMITH: Yes.

MS McMURDO: He's just having a look for it now. Just wait a minute.

DR SMITH: At what paragraph, sorry?

CMDR JONES: Paragraph 123.

DR SMITH: Yes, I remember that.

CMDR JONES: You agree with me that the optimum temperature for restful sleep is between 14 and 20 degrees?

DR SMITH: Yes.

CMDR JONES: And you acknowledge that at paragraph 120 of your report.

DR SMITH: Yes.

CMDR JONES: Now, the evidence is that the nighttime minimums of the nights in question was between 16 and 17 degrees.

DR SMITH: I'll accept that, yes.

CMDR JONES: And it didn't reach 20 degrees until 0940.

MS McMURDO: Well, that's outside the tent, of course.

CMDR JONES: No, quite.

MS McMURDO: Sorry?

CMDR JONES: Yes.

MS McMURDO: Yes. Outside the tent.

CMDR JONES: Well, can only be measured outside because we're talking about a meteorological station.

DR SMITH: Well, that measurement can only be derived from outside, it is possible to measure temperature inside a tent.

CMDR JONES: That's right.

DR SMITH: If we were going to try and validate the quality of a crew rest facility.

CMDR JONES: Yes. But the evidence is – and you advert to this, fairly to you, at paragraph 122.

DR SMITH: Yes.

CMDR JONES: That night-time minimum between 16 and 17, and daytime temperature of 20 degrees wasn't reached until 0940, which was after – with one exception being the last night – or, actually, no, that which was after the crew had woken up, or CAPT Lyon in particular had woken up each day.

DR SMITH: Correct.

CMDR JONES: And you'd agree with me it follows that the temperatures at Proserpine on those nights in question were perfect or ideal temperatures for sleep.

DR SMITH: I'll accept that.

MS McMURDO: Outside the tent. Outside the tent. We don't know the temperatures inside the tent.

CMDR JONES: Well, we can only go with, ma'am, what we know objectively.

MS McMURDO: The outside of the tent is the temperature. Yes. We don't know the internal temperature.

CMDR JONES: Yes, I'm not suggesting that's anything other than the outside temperature. Secondly, the second qualitative factor of assessing sleep quality is darkness.

DR SMITH: Yes.

CMDR JONES: And you had concluded that letting light into the tent is not conducive to sleep.

DR SMITH: Yes.

CMDR JONES: Now, were you aware of the fact that many – or the evidence is that many of the aircrew had eye masks? Have you heard that evidence?

DR SMITH: I've heard that evidence, but I don't know how common it is. But I've heard the evidence.

CMDR JONES: And you agree – and I think you even mentioned this in your report – that the use of eyeshades or eye masks obviously significantly ameliorates that detrimental impact of light.

DR SMITH: Yes.

CMDR JONES: Now, during the periods that CAPT – I'm just using CAPT Lyon as the example because the evidence concerning him seems to be the most reliable, perhaps – he was going to sleep when it was – to adopt a colloquial expression – pitch dark.

DR SMITH: I'll accept that, yes.

CMDR JONES: And sunrise – if you accept, take it from me – sunrise wasn't until 0638.

DR SMITH: Yes.

CMDR JONES: On each day. So for the vast majority of the period that the aircrew were sleeping, it was dark. Do you accept that?

DR SMITH: I accept that.

CMDR JONES: And if they were wearing eyeshades, then as the sun rose, that would ameliorate any difficulties they might have had – or interruptions, perhaps, that they might have had as a result of the sun.

DR SMITH: Yes.

MS McMURDO: Is there daylight before sunrise?

DR SMITH: Sorry?

MS McMURDO: Is the daylight before sunrise?

DR SMITH: Well, sunrise is a meteorological phenomenon when you can see the sun. It is light before then, yes.

MS McMURDO: Thank you.

CMDR JONES: It's not sunlight because the sun's below the horizon prior to sunrise, by definition.

DR SMITH: Yes.

MS McMURDO: But it's daylight.

CMDR JONES: Now, just so you know, there were five witnesses who mentioned that they were using eyeshades. They were D2, D7, D9, D10, D14, which would rather suggest, would it not, that it was a common – it was relatively common to use eyeshades.

DR SMITH: I don't know how common it is. I accept that some people may. I would like to think that as part of good sleep hygiene practices, that aircrew would have in their tools that they can use to improve their sleep environment, eyeshades and ear plugs would be tools that they can use.

CMDR JONES: And is that part of their when they do their training – and we've heard the evidence about the regularity of it – is that something that is discussed about this is a useful sleep tool?

DR SMITH: So I can confirm that sleep hygiene and tools and strategies to optimise to the best extent the conditions of sleep include eyeshade and earplugs is included as a standard part of the Aviation Medicine training, and it will form part of specific aeromedical guidance that just focuses on ways to optimise sleep hygiene.

CMDR JONES: Now, the next factor is quietness, which you address. And at paragraph 131, you say that the ideal conditions for a restful sleep are less than 35 decibels.

DR SMITH: I accept – yes.

CMDR JONES: And you say that sleep is possible up to 45 decibels.

DR SMITH: Correct.

CMDR JONES: And as an Aviation Medical specialist, am I safe to assume that you're familiar with different aircraft types?

DR SMITH: Yes.

CMDR JONES: And would you agree with me that an A330 would be regarded as a quiet aircraft? It's one of the most modern aircrafts.

DR SMITH: In cabin noise?

CMDR JONES: I'm talking about cabin noise, yes.

DR SMITH: Yes, I accept that.

CMDR JONES: And you're aware that at cruising altitude, an A330 has background noise level in the cabin of over 70 decibels. Are you familiar with that?

DR SMITH: I'm not familiar with that.

CMDR JONES: Sorry, I'll show you an article to make good what I've just put to you. Here we go. I'll show you a document, Doctor.

UNIDENTIFIED SPEAKER: We haven't seen any of this material.

MS McMURDO: No. No, none of this complies with the practice direction. It's all supposed to have been provided to Counsel Assisting beforehand.

CMDR JONES: I'm sorry.

MS McMURDO: But never mind.

CMDR JONES: But - - -

MS McMURDO: We'll just get on with it.

CMDR JONES: Well, the witness is here and this is important.

MS McMURDO: Yes, I said we'll just get on with it.

CMDR JONES: Sorry. You'll see there that's a paper from, "Applied Acoustics Journal, Volume 194, 2022", and you'll see there that they've studied – this is a study of the aircraft cabin noise at various times of the aircraft's flight; taxiing, taking off, and cruising. Do you see that?

DR SMITH: Yes.

CMDR JONES: And just so you can see what I was taking you to a little bit earlier, paragraph 3.1, which is on page 3, you see there it refers to the Airbus A330?

DR SMITH: Yes.

CMDR JONES: And if you go at the top of the right-hand paragraph, it refers to the average during cruising of 72.8 decibels, 71.2, and 69.9 respectively, with an average of 71.3.

DR SMITH: I see that.

CMDR JONES: That would occur with, at least in a general sense, what your understanding of the noise level of a commercial aircraft cabin – or, sorry, an A330 would likely be.

DR SMITH: I'll accept that.

CMDR JONES: I tender that, your Honour.

MS McMURDO: Well, I'm just not sure of the relevance.

CMDR JONES: Sorry?

MS McMURDO: What is the relevance of the noise level in an A330?

CMDR JONES: Well, because we're dealing with how quiet the sleep facilities are, and the model is – and whether the – when one compares how quiet it was at Proserpine on the nights in question against the baseline or what the model is calibrated to, that is highly relevant.

MS McMURDO: So is the model calibrated to an A330 – noise levels in an A330? I thought it was just talking about the beds.

CMDR JONES: No, it's talking about aircraft cabins.

DR SMITH: It's talking about the overall contributors to sleep quality based on work that was done in commercial aviation looking at inflight crew rest facilities.

MS McMURDO: So there is some relevance to this then, yes. All right then. I think that one is 244.

UNIDENTIFIED SPEAKER: 240.

MS McMURDO: It's 240? 240. All right. That will be 240, because we got out of sync with some of the earlier exhibits. So that exhibit will be 240.

CMDR JONES: Thank you, ma'am. For completeness' sake, the article is titled, "Assessment of In-Cabin Noise of Wide-Body Aircraft".

#EXHIBIT 240 - ARTICLE TITLED, "ASSESSMENT OF IN-CABIN NOISE OF WIDE-BODY AIRCRAFTS", FROM APPLIED ACOUSTICS JOURNAL, VOLUME 194

CMDR JONES: Now, that would mean that, accepting circa 71 decibels of an aircraft cabin of an A330, which is a modern aircraft, an economy seat, which is the shorthand comparator for "poor" quality, is experiencing that level of cabin noise, that level of ambient noise, aren't they?

DR SMITH: Correct.

CMDR JONES: And, indeed, even a business class seat is experiencing that same level of ambient noise.

DR SMITH: Ambient noise? Yes.

CMDR JONES: Yes. And onboard crew rest facilities – now, they are, you understand, designed to be as quiet as they reasonably can be?

DR SMITH: Sorry, say that again?

CMDR JONES: So the onboard – so we're talking about now the "good" quality sleep comparator, which is the onboard crew rest facility.

DR SMITH: Yes.

CMDR JONES: Now, would you agree with me that they are designed to be no more than about 65 decibels.

DR SMITH: I don't know what they're designed to.

CMDR JONES: Well, can I show you a document? Now, this is the position of the International Federation of Air Line Pilots'

Associations. Will you agree with me that's the peak body for airline pilots around the world?

DR SMITH: Yes.

CMDR JONES: And you'll see it's a technical position about the requirements for an inflight crew rest facility, and that's what we're talking about, are we not, when we talk about the "good" category of sleep?

DR SMITH: Yes, a dedicated crew rest facility that's been fit for purpose.

CMDR JONES: And if you go to paragraph – or page 6, where it talks about noise.

DR SMITH: Yes.

CMDR JONES: You see paragraph C2.1:

> *Background or ambient noise levels within a flight crew rest facility should not exceed 65 decibels.*

DR SMITH: I see that.

CMDR JONES: And you'd accept that that would be the design standard that certainly the pilots are suggested - - -

DR SMITH: I accept that that's the position that IFALPA have put forward.

CMDR JONES: Would it be a fair thing to do to assume that when one is assessing the ambient noise of a "good" rest facility, that 65 or a bit less than 65 decibels would be what it's talking about.

DR SMITH: I think that design standards are – and I haven't seen this paper before, so I don't know the basis on which that 65 was derived, but design standards can reflect the best practice of what is available at the moment, not necessarily the scientific basis at which noise exposure is shown to degrade sleep. So I'm just saying that, just from a scientific point of view - - -

CMDR JONES: Absolutely.

DR SMITH: - - - you've got the level at which noise disrupts sleep, and that is a scientific basis. That then has to be translated into a technical

document. But I don't know the basis on which they derived that 65 decibels.

CMDR JONES: What I suggest to you it would be perhaps self-evident that that Association would be advocating for the best position it could for pilots.

DR SMITH: I accept that as a principle.

CMDR JONES: And they're accepting that it should be no less – sorry, no greater than 65 decibels.

DR SMITH: I accept that.

CMDR JONES: Now, in your report, you've assumed that there were intrusive noise - - -

MS McMURDO: Do you wish to tender that one? That'll be Exhibit - - -

CMDR JONES: Sorry, ma'am. Yes, please, I do tender that.

MS McMURDO: Exhibit 245.

#EXHIBIT 245 - DOCUMENT REGARDING THE TECHNICAL POSITION OF INTERNATIONAL FEDERATION OF AIR LINE PILOTS' ASSOCIATIONS (IFALPA) ABOUT AMBIENT NOISE LEVELS WITHIN A FLIGHT CREW REST FACILITY

CMDR JONES: Now, Dr Smith, you've assumed that in terms of your assessment of how quiet the tent was at Proserpine, that there was intrusive noise of aircraft operations. Do you remember that?

DR SMITH: I put that down as a possibility.

CMDR JONES: Yes.

DR SMITH: Yes.

CMDR JONES: So just to be fair to you, so you know where I'm taking you, it's at paragraphs 131 to 133 of that report. These are the things that you've adverted to as affecting your assessment: intrusive noise of aircraft operations; there was a helicopter landing pad; and a fire alarm. And you conclude that that likely affected sleep quality.

DR SMITH: I actually say in paragraph 132 that there have been statements made alluding to these.

CMDR JONES: Yes.

DR SMITH: So I'm not speculating that may have contributed.

CMDR JONES: No, I'm not – sorry, I - - -

DR SMITH: I'm referring to statements that have attributed those as noise sources.

CMDR JONES: I'm not for a moment suggesting you've done an independent assessment. Sorry. Just, your assumptions, I appreciate, are based on your instructions.

DR SMITH: My assumptions are based on the information that has been provided in statements.

CMDR JONES: But I'm now going to put to you that those assumptions aren't supported, and if you assume that they're not in the ways I'm about to take you to, there were no aircraft operations or any activities whatsoever between 1100 and 0800. You'd accept - - -

DR SMITH: I'll accept that, yes.

CMDR JONES: You'd accept that. There were no air flights, at all, Military or civilian.

DR SMITH: And I think that I refer to that in paragraph 133 where the aircraft movements were between 0930 and 1900 that I was aware of.

CMDR JONES: Yes.

DR SMITH: So I accept that, and I acknowledge it.

CMDR JONES: And all the people in the aircrew tents were on the same shift, so there weren't people coming and going with different shifts. You'd accept that proposition?

DR SMITH: I'm not sure that I accept that because I've heard statements that that wasn't necessarily the case.

CMDR JONES: If you can take it from me that – assuming the evidence – and that's a matter for submission in due course, but the evidence does show that the crew in the – or the members in the tent where CAPT Lyon was sleeping were all on the same shift. If you can take that assumption from me.

MS McMURDO: Well, let's for the purposes of question, assume - - -

DR SMITH: For the purpose of the question, I'll accept that.

CMDR JONES: Yes.

DR SMITH: Yes.

MS McMURDO: - - - without accepting that it is an accurate representation of the evidence.

CMDR JONES: I'm not suggesting for a moment that you need to independently verify that. Just take it from me, for the purposes of the question I'm about to put to you, that – so two things. Those two things: there were no aircraft evolutions, there was not anything else going on at all between at least 1100 and 0900 - - -

DR SMITH: Mm-hm.

CMDR JONES: - - - and there were no different shifts in the tent. You would agree with me that in those circumstances, the noise levels – or the likely noise levels or the tent were considerably less than 65 decibels.

DR SMITH: Based on what you're saying, I can see that, yes.

CMDR JONES: In fact, they'd probably be very likely to be between the 35 and 45 decibels which you've adverted to as being optimum for sleep.

DR SMITH: For ambient noise.

CMDR JONES: Ambient noise.

DR SMITH: Not taking into consideration pedestrian traffic and people talking outside the tent.

CMDR JONES: Yes. Now, dealing with the next – turning to the next factor which you've assessed – or, rather, taken into account in your assessment of sleep quality, is comfort of the sleeping conditions. Now, if you take it from me for the purpose of what I'm about to put to you that

they were sleeping on stretchers which you would agree is a fully reclined position.

DR SMITH: I agree that it's fully reclined.

CMDR JONES: And if you take it from me that most of the witnesses that have been called said they slept well.

DR SMITH: I accept that some people - - -

FLTLT ROSE: That's not a fair – it's a very generalised comment. If he's going to put something like that, he should actually put it properly, that most - - -

CMDR JONES: Well, if I let - - -

FLTLT ROSE: That's not a fair way to put the question.

MS McMURDO: Yes, I don't really know that that reflects the evidence.

CMDR JONES: Well, I am – if I may, ma'am, most witnesses – that is, to say, a majority of witnesses that have given evidence before this Inquiry, their evidence was to the effect that they slept well.

FLTLT ROSE: I object. That is not the evidence as it - - -

CMDR JONES: Well, it is. So just for the sake of the transcript and so you understand where I'm coming from, in fairness to you – I do not want to mislead you – it's the evidence of D1 at T3097; the evidence of D2 at T2465, he said he slept better than he did at home; the evidence of D4 at T3304 to 3305; the evidence of D5 at T2743, he said he wasn't any more tired than on any other day; D6; D7 said he had a decent sleep and that he sleeps better in the field than he does at home at T3162; D10 said he slept better than at home, and in particular, because he had young children at home which often interrupted his sleep, and that's at paragraph 43 of his November statement; and D13, D14, and D16 all said that they had no particular difficulties sleeping.

If you can take it from me that that's what those witnesses said, and we had about four – my count, four witnesses had said they had any difficulties sleeping or staying asleep. So if the evidence is what I've just put to you, namely that a significant number of the witnesses -more witnesses than not said that they slept reasonably well - - -

DR SMITH: I will accept that, however, individuals saying that they slept well doesn't discount other individuals that say that they don't sleep well, and I've got the statement that I was provided with actually says, you know, "Back to sleeping in a stretcher. This is going to be great for my back", and then a comment in paragraph 22 from Mrs Lyon stating that CAPT Lyon had told her he couldn't sleep on the exercise because it was so hot in the tent and he was sharing it with 18 others, his gear was wet, and everybody was walking around while he was meant to be sleeping during the day.

CMDR JONES: That was early – that's several nights before.

DR SMITH: That's the information that - - -

CMDR JONES: No, I appreciate - - -

DR SMITH: So when I made the assessment about the quality of sleep, I (a) didn't have all of the other statements of people saying that they slept well.

CMDR JONES: No.

DR SMITH: But I did have a statement from one of the incident crew members stating here very clearly to me that he did not sleep well. So my assessment of his sleep quality was based on that statement and that's not offset by the number of other people who did sleep well. That doesn't change his statement.

CMDR JONES: No, it doesn't. But if you can take it from me, when one – what we're dealing with here is an assumption of sleep quality, and that can only be based on to some extent what the evidence suggests the level of comfort was. And if what I've put to you is – I accept that about four witnesses said that they had some difficulties either getting to sleep or staying asleep or waking up early.

But if the other ones that I've mentioned said that they slept well and a couple in particular expressly said they slept better than at home, can I suggest, on accepting that evidence – and I'm not asking you to assess whether or not that is the evidence; just accepting that evidence, it would be reasonable, would it not, to say that the sleep – the comfort level was not "poor".

DR SMITH: No, I think that – I don't accept that. I think that the sleep comfort level might be "poor" for some and not "poor" for others, but the impact is experienced by the person and their sleep quality, not by the average. And you don't get average sleep quality by combining people that

have good sleep and people that have bad sleep. You have some people that have better sleep quality than others, and the information that I was provided and the task that I was given was to consider sleep quality in part for CAPT Lyon based on that information, and that's what I did.

CMDR JONES: Well, if you take it from me, if we're talking objectively, you would accept – and I appreciate that they were your instructions, but the evidence equally suggests that for many other aircrew that they slept well.

DR SMITH: I accept that that's the evidence and when you say that looking at it objectively, my version of objective is rather than having some people saying that they sleep well and other people saying that they didn't sleep well - - -

CMDR JONES: You've taken the baseline of the lowest - - -

DR SMITH: - - - a concerted effort to actually do proper sleep studies and actually – you know, if we wanted to say how well does a group of aircrew sleep in different individual tents, small group tents, mass tents, demountables, or hotel, that's something that can be objectively verified and validated so that there is an actual baseline to determine sleep quality. That would be my preferred way of answering this question.

CMDR JONES: Of course.

DR SMITH: In future.

CMDR JONES: Yes, but obviously that was not something that was available at the time.

DR SMITH: No.

CMDR JONES: No.

DR SMITH: And we can strive to do better.

CMDR JONES: That's right. But in terms of just objectively, we're just talking objectively of the circumstances, whilst it's absolutely clear that people had found it uncomfortable and difficult, others didn't.

DR SMITH: I accept that some people did, and some people didn't.

CMDR JONES: So it wasn't objectively – that is to say, that it is more likely than not that most people would find it uncomfortable. Would you accept that, based on the evidence I've just put to you?

DR SMITH: I accept that if we were modelling for a group of people.

CMDR JONES: Yes.

DR SMITH: But in this instance, I was modelling for specific individuals.

CMDR JONES: I appreciate that, thank you, Doctor. Now, the other factor, and final factor, that affects sleep is whether or not it's free from interruptions. And you've addressed that.

DR SMITH: Yes. Although with the sleep comfort, I think a camping stretcher might be lying flat. I think that people – in terms of the comfort of that bed, is something that can be again demonstrated objectively.

CMDR JONES: Objectively. Yes.

DR SMITH: Whether a camping stretcher gives you good comfort or whether that can be improved.

CMDR JONES: Yes.

DR SMITH: So it's not just about lying flat.

CMDR JONES: No, thank you, Doctor.

DR SMITH: Yes.

CMDR JONES: So the kinds of matters that you've adverted to that you suggest may have interrupted the sleep of the members in the tent were things like creaking stretchers, snoring and toilet breaks. Do you remember that?

DR SMITH: Yes.

CMDR JONES: But would you agree with me that they are all things – perhaps not creaking stretchers; let's change creaking stretchers for creaking bed – they're all things that people routinely experience in ordinary life if they sleep with a partner.

DR SMITH: Which parts?

CMDR JONES: Well, instead of creaking stretchers, creaking beds.

DR SMITH: Yes.

CMDR JONES: Beds often creak.

DR SMITH: Yes.

CMDR JONES: Snoring and toilet breaks in the night.

DR SMITH: I agree.

MS McMURDO: Most people only sleep with one partner.

CMDR JONES: Well, yes. It is a law of averages, so let's go with that. But you accept with me that those three things are very common at home when one sleeps with a partner.

DR SMITH: I don't know how common, but I'll accept that they can occur, yes.

CMDR JONES: I think none of us want to admit to snoring, but I think it's probably more common than people would like to admit. Now, in that sense, the nature of those interruptions are of a degree comparable to what one experiences ordinarily, of those nature.

DR SMITH: I would say that they can occur. I don't know whether it's to a comparable degree given 18 people sleeping in a tent, that multiplies each of the infrequent interruptions.

CMDR JONES: Or it might, yes.

DR SMITH: Might.

CMDR JONES: Now, in light of those matters that we've mentioned – how quiet it was, much quieter than a commercial aircraft cabin, it was dark, there were no aircraft evolutions, Military or civilian, et cetera – you'd agree that accepting all those propositions that we've just discussed, that objectively, the sleep quality was better than "poor". It was better than – to use the summary expression – than an economy seat on an aircraft.

DR SMITH: I don't accept that.

CMDR JONES: Sorry, but you've just accepted each of the propositions that I've put to you about the factors that go to sleep quality, and accepting the propositions that I've put to you - - -

DR SMITH: In terms of light and noise - - -

CMDR JONES: Light, noise, exactly.

DR SMITH: Yes.

CMDR JONES: That is objectively more comfortable than an economy seat in an aircraft – commercial aircraft - - -

DR SMITH: Those conditions appear to be better than in an aircraft, yes.

CMDR JONES: So it probably – and I want to suggest to you what they really are is probably somewhere between – adopting the definitions of "fair" and "good" – somewhere between "fair" and "good". Not quite good, but certainly better than – at least, or better than "fair".

DR SMITH: For the sake of this, I'll accept that, and that's why in the modelling I did put forward "fair" as an alternative.

CMDR JONES: And, absolutely, you did. And what you did model was that seven hours of good sleep – sorry, I should mention or ask you this. The model – that is to say, SAFTE-FAST – doesn't allow gradations between each of the "poor", "fair", and "good", does it? It's binary. It's either - - -

DR SMITH: So you choose a sleep window and allocate that a sleep quality. If you wanted to do a highly nuanced sleep quality with variations, then what I would do would be to have a two-hour sleep window of a certain quality followed immediately by a three-hour window.

CMDR JONES: I see.

DR SMITH: So you can break up a window of sleep opportunity and allocate different sleep qualities if that was something that we had a reason to do.

CMDR JONES: And you'd agree that just by nature of the model, it follows that if you improve the sleep quality from somewhere between "fair" and "good", that would materially affect the fatigue rating that the model would produce.

DR SMITH: As we improve the sleep quality, then the impact on fatigue is lessened and your performance improves. I talk about that in here as a way of saying that's why in the design and construction or allocation of crew rest facilities, trying to optimise the quality of those crew rest facilities to optimise the sleep opportunity and sleep quality is a way of reducing fatigue. I accept that.

CMDR JONES: And you've modelled, as you've just mentioned a little while ago, what seven hours of "good" quality sleep discloses, and you've concluded that seven hours of "good" sleep results in a substantial cognitive improvement of – or likelihood of cognitive improvement.

DR SMITH: I accept that, yes.

CMDR JONES: In fact, you've said it increases up to 87.3 per cent from about 76 per cent.

DR SMITH: Correct.

CMDR JONES: So what I want to put to you is this: if you assume – and from the evidence that I've taken you through – that on each night, CAPT Lyon had at least seven hours' sleep, and if that sleep was between fair and good, then it's more likely than not that his – any reduction in cognitive effectiveness would be immaterial.

DR SMITH: I don't accept that because on the one hand, if I was sitting down with Army to have a look at the quality of sleep from a variety of crew rest facilities, then I would be looking at a whole lot of inputs to come up with what was, you know, "poor", "fair", or "good". But in this instance, based on the information that I received about CAPT Lyon and his sleep, I'm not deflected by the law of averages, by everybody else. CAPT Lyon indicated that he wasn't getting good sleep.

CMDR JONES: Well, that's your assumption you've made. Yes.

DR SMITH: No, that's not my assumption. That is what has been conveyed to me: he could not sleep on the exercise because it was so hot in the tent, he was sharing it with 18 others, his gear was wet, and everybody was walking around working while he was meant to be sleeping during the day.

CMDR JONES: Yes. And that - - -

DR SMITH: That's the evidence that I was given.

CMDR JONES: And did you have the - - -

DR SMITH: So when I modelled for CAPT Lyon - - -

CMDR JONES: What's the date that that evidence refers to?

DR SMITH: That was on the 26th.

CMDR JONES: And the evidence is that on the morning of 27 July, CAPT Lyon spoke with Mrs Lyon and said that he – at 9.33 am, after he had just woken up again and said that he'd slept okay. Now, just taking that at face value would, being that he had better than a poor quality sleep.

DR SMITH: I don't know how to interpret that, but on the background of initially saying sleeping in a stretcher was going to cause problems for his back, followed by a detailed description of how difficult it was to sleep two nights later, saying that you slept okay doesn't mean to me that he had a good night's sleep. But I will take that as room for interpretation and potential for remodelling, but that's the assumption that I made is that on the background - - -

CMDR JONES: Absolutely. Yes.

DR SMITH: - - - of poor sleep, sleeping "okay" doesn't mean to me that he had a good night's sleep.

CMDR JONES: But the proposition I put to you – and I'm suggesting that the conclusion is inexorable – that if CAPT Lyon had more than seven hours' sleep – in fact, on the numbers, the calculations that I put to you, it was in excess of – well in excess of seven hours' sleep on the two previous nights. And if that sleep was better than or at least better than "fair" – just the assumption I'm putting to you – it inexorably follows that any decline in cognitive function is not material because – would you agree with that? Just on those assumptions.

DR SMITH: If I were to remodel it and say seven hours of sleep and it was "fair" quality, I would need to look at what those numbers are. So I don't have the model in front of me.

CMDR JONES: But it would follow that it would be better - - -

DR SMITH: It would be better that – it would be than what it was, yes.

CMDR JONES: Yes.

MS McMURDO: These are some things that could be made in Submissions. We had no notice of this. I might have to have an adjournment.

CMDR JONES: I've got five minutes left, ma'am.

MS McMURDO: Are you going to be much longer?

CMDR JONES: Five minutes. I'm almost done. Now, you've - - -

MS McMURDO: The families are waiting to give their statements. The families are waiting to give their statements. I may have to interpose them. I had hoped to finish the Inquiry hearings with the family statements. But if the cross-examination is going to be lengthy – I don't know if anyone else is cross-examining.

COL GABBEDY: Ma'am, I've got about five minutes.

MS McMURDO: All right.

CMDR JONES: Five minutes, ma'am. Now, in addition to the SAFTE-FAST, you did a FRAT analysis as well, didn't you, as part of your report?

DR SMITH: I did, yes.

CMDR JONES: And that's at paragraph 76 you do that. Now, for each of the pilots, you've assessed, as a consequence of that FRAT analysis, that their alertness level on the Samn-Perelli Fatigue score – and remember, that's a one to seven score. We discussed that a bit earlier.

DR SMITH: Yes.

CMDR JONES: With one being fully awake and alert, and seven being totally exhausted.

DR SMITH: Correct.

CMDR JONES: Barely able to function.

DR SMITH: Correct.

CMDR JONES: Now, you've assessed both aircrewman as completely exhausted and unable to function effectively based on that FRAT analysis.

DR SMITH: To correct you, the Samn-Perelli score is one of the outputs of SAFTE-FAST. So based on the SAFTE-FAST modelling.

CMDR JONES: Sorry.

DR SMITH: That is one of the outputs, and I transcribed those outputs across. So that wasn't my assessment; that was me transcribing the SAFTE-FAST outputs.

CMDR JONES: Sorry.

DR SMITH: Based on modelling. Now, taking all of your comments and the different propositions and the possibility of different sleep times, I will take all of that under advisement, and if there is a requirement to remodel the fatigue state based on valid and verified credible information, I'm happy to do that. But based on the assumptions that I have outlined, and based on the modelling that I conducted, SAFTE-FAST output indicated those Samn-Perelli scores. That's where those numbers came from.

CMDR JONES: Absolutely.

MS McMURDO: So I think his point is, Dr Smith, that if you accepted all his assumptions, then the results would be quite different, and they would be more favourable to not being affected.

DR SMITH: Yes. So if there was more sleep and if it was of better quality, there would be less fatigue and I would need to recalculate those FRAT flags to see whether they were green, amber, or red.

CMDR JONES: And but would you'd agreed with me that certainly the Samn-Perelli score of seven – or six and a half I think they were for the aircrew – if someone was completely exhausted and unable to function effectively, that would manifest in physical signs that would be observable, wouldn't they?

DR SMITH: I don't know that that is a reliable indication. So you can feel fatigued without necessarily manifesting it. I don't believe that that is a foregone conclusion that you will always manifest overtly signs of fatigue.

CMDR JONES: Are you aware of studies that have studied visual cues for sleep deprivation?

DR SMITH: Visual cues?

CMDR JONES: Yes. That how people are looking, yawning, losses in concentration, droopy eyes.

DR SMITH: Yes.

CMDR JONES: You'd accept that those physical characteristics would be manifested if someone was completely exhausted.

DR SMITH: If present, then they will be manifest, yes.

CMDR JONES: Yes.

DR SMITH: But I'm saying that they may not always be manifest.

CMDR JONES: But even if they're not manifest, someone that is completely exhausted and unable to function effectively would know that themselves that's what they are. They would feel very, very tired, wouldn't they?

DR SMITH: Yes, but we've already established that people are not good judges of their own level of impairment with a given degree of fatigue.

CMDR JONES: Without training.

DR SMITH: Without training.

CMDR JONES: Yes.

DR SMITH: And I hope we get to talk about that later on.

CMDR JONES: But the level of fatigue – but you're going to feel – what I'm putting to you is this: if you are completely exhausted and unable to function effectively, you're going to feel that. You're going to feel that you're tired.

DR SMITH: I would expect that, yes.

CMDR JONES: Yes. And if you take my assumption that the evidence unequivocally establishes for the aircrewman – and in particular WO2 Laycock, who was a senior soldier who took his duties very seriously – would not fly if he felt anything like that. Would you - - -

DR SMITH: So the evidence that I've – sorry, the scientific evidence that I have reviewed just in the last week, so it hasn't been written down but I would be happy to provide that in a formal report if required, is that

individuals are not good judges of their own level of fatigue, and one of those is that as you become more fatigued, your executive functions, your decision making, your insight, and your judgment can be impaired, and your ability to assess risk itself is impaired.

CMDR JONES: And we keep saying – it's been repeated ad nauseum that individuals are poor without training; that's what the policy says – the document says – Exhibit 33 – are poor judges of their own level of fatigue.

DR SMITH: Yes.

CMDR JONES: But it's just human – I would say, and put it to you, beyond argument that if someone is completely of this level of fatigue, they're going to feel it. Even if – they might not be able to assess themselves on a Level 7, but they're going to feel tired.

DR SMITH: They'll feel tired, yes.

CMDR JONES: Yes. And the same with the pilots. You assessed – or rather, the results for them was one level up: extremely tired and very difficult to concentrate. You would know – you would feel if you had difficulty concentrating, wouldn't you?

DR SMITH: Yes.

CMDR JONES: I have no further questions. Sorry – my last question. If you take, as an assumption, that each of these four members were highly trained professional, serious aircrew that took their duties very, very seriously, you'd accept that proposition?

DR SMITH: I accept that wholeheartedly.

CMDR JONES: Then if they were feeling that degree of fatigue of tiredness, they would have, you would agree with me, more likely than not, said that they were not in a safe position to fly.

DR SMITH: I don't know that I can agree with that because you can feel tired but not appreciate that that level of tiredness would result in a degree of impaired performance that would compromise safety, and so distinguishing between feeling tired and impaired is an important distinction, and that's what the scientific literature shows is that people who feel tired are not able to judge the level of impairment associated with that degree of tiredness.

CMDR JONES: Well, that's why – and I agree with you, the level of impairment. But if we just use the colloquial expression "feeling very tired" one, you would expect a normal human being, particularly someone that's had training – and all of them have had training about recognising fatigue; they might not be experts in it – but with the benefit of their training and if they in fact were having those symptoms or characteristics of that degree of fatigue, they would feel it.

DR SMITH: They would feel tired, yes.

CMDR JONES: Yes. I have no further questions.

MS McMURDO: Thank you. Yes, COL Gabbedy.

<CROSS-EXAMINATION BY COL GABBEDY

COL GABBEDY: Good morning, Dr Smith. I will try and be as quick as possible.

DR SMITH: Good morning.

COL GABBEDY: I'm COL Nigel Gabbedy. I appear for MAJGEN Jobson. Have you read the DFSB report?

DR SMITH: I have read the DFSB report, yes.

COL GABBEDY: Have you had access to the material used by the investigators to compile that report?

DR SMITH: No, I have not. Apart from what I've been provided with in the Inquiry, but I wasn't part of the investigation team. I was given a mature draft of the report before it was signed for a quick high-level, "Are there any war-stoppers that we need to address?" and then we had a focussed meeting about the particular recommendations looking at the Institute of Aviation Medicine, and then I've read the report.

COL GABBEDY: Thank you.

DR SMITH: But I don't have any background information that contributed to the report.

COL GABBEDY: Thank you. I just want to go back quickly to something that was discussed between CMDR Smith – sorry, Jones – and the Chair

about the tents. Now, we were talking about temperature, and the Chair made the comment quite properly on a couple of occasions that temperature outside wouldn't equate to temperature inside necessarily. You recall that discussion?

DR SMITH: I recall, yes.

COL GABBEDY: But we've also had evidence about whether or not the flaps were open. Would you agree with me that if the tent flaps were open, then the outside temperature would be more reflective of the inside temperature?

DR SMITH: I would agree that it would be more reflective, yes.

COL GABBEDY: And if the tents flaps were closed, then morning light would be less of an issue.

DR SMITH: Sorry?

COL GABBEDY: Morning light would be less of an issue. So if the tent flaps were closed, we couldn't make perhaps the same correlation in relation to temperature, but the effect of light would be reduced.

DR SMITH: Correct.

COL GABBEDY: Okay. So I just want to move on to your report of April 2025, Dr Smith. And I just want to explore this issue. It's you that are briefed in your personal capacity; is that right?

DR SMITH: Sorry?

COL GABBEDY: To provide these reports, you're being briefed yourself; is that right?

DR SMITH: Briefed by who?

COL GABBEDY: By the IGADF to provide this report.

DR SMITH: Yes, no, that's to me specifically.

COL GABBEDY: If you look at your report of 22 April 2025 – and I'm sorry if I'm descending into pedantry – you keep saying – okay, I won't read the black bits. You say, "compared to IAM". I mean, what you're referring to is comparing the DFSB modelling to your modelling, aren't you?

DR SMITH: You're talking about the fatigue modelling? Yes.

COL GABBEDY: Yes. So it's your modelling we're talking about here.

DR SMITH: Yes.

COL GABBEDY: It wasn't the Institute that was briefed; it was you.

DR SMITH: I'm the individual that was briefed, but I believe that I was approached as a representative of the Institute of Aviation Medicine. That was – so I'm sorry if that's confusing, but I'm being approached through the Commanding Officer of the Institute, and I'm the individual that has been appointed to support the Inquiry. I've been briefed, but I'm as a representative of the Institute of Aviation Medicine.

COL GABBEDY: But in your reports you make it clear – and I'm looking here at the report of October 2024, paragraph 3 – where you say:

> *The views expressed in this expert report are my own and do not necessarily reflect the official position of RAAF IAM, its parent units, or the Australian Defence Force unless accompanied by official documents.*

DR SMITH: Correct.

COL GABBEDY: So these are your views, aren't they, Doctor?

DR SMITH: Yes.

COL GABBEDY: Now, I just want to look at some of the caveats that need to apply to these reports that you've produced. In your October of 2024 report, you note that it wasn't peer-reviewed.

DR SMITH: Correct.

COL GABBEDY: And you indicate in that report there was a shortness of time; it wasn't possible – that's right, isn't it?

DR SMITH: I would need to have a look at that, but it was certainly from a – if as a normal part of us writing a report, not part of a legal submission, we would socialise that widely internally and externally and make sure that we had a robust input from a number of experts. In this instance, I believe that I was under instructions that this was a legal privileged document; not

to distribute it widely. So that was me writing a report for this Inquiry, and it didn't go through a robust peer-review process as a normal report would.

COL GABBEDY: I understand that. I don't mean that as a criticism, Doctor; I'm just basically identifying the fact that that report – in fact, all of these reports – none of them are peer-reviewed.

DR SMITH: Correct.

COL GABBEDY: None of them have been through that robust process.

DR SMITH: Correct.

COL GABBEDY: And going through that robust process would have produced a more mature document.

DR SMITH: It would have produced a document that had inputs and insights from a number of domain experts.

COL GABBEDY: And, again, looking at the caveats and perhaps issues raised in your report, if we look at the October report at paragraph 2022 – sorry, paragraph 22 of the October report, you note that SAFTE-FAST is not an appropriate tool to assess chronic fatigue. Do you see that reference?

DR SMITH: Correct.

COL GABBEDY: And then at paragraph 33, you say that SAFTE-FAST is not intended to predict actual fatigue in individuals.

DR SMITH: Correct. So its intent is as a fatigue avoidance scheduling tool to look at future fatigue patterns in different scheduling work rate patterns as a way of identifying which work schedules are associated with a high level of fatigue or predicted fatigue or operating at a certain window would be at a higher predicted level of fatigue to give you an opportunity to put in place management strategies to try and reduce that level of fatigue.

That is the intended application, but the valid applications for SAFTE-FAST according to the DFSB Aviation Fatigue Management Guidebook is that it can be used forensically to have a look at fatigue in individuals.

COL GABBEDY: That's not it's intended use; it's a scheduling tool, though, isn't it? It's not intended – in your words – "not intended to predict actual fatigue in individuals".

DR SMITH: No, that's correct.

COL GABBEDY: And you refer to the limitations that are contained in the Aviation Fatigue Management Guidebook Version 1, which appear at the top of page 38, and one of those limitations which isn't reproduced in your report is that, "There's been limited testing (validation) against Military Aviation-specific targets". That's a limitation of this tool in the sort of - - -

DR SMITH: Yes. And I do refer to that in my second-most recent report where I talk about the criterion level of 77 per cent, and how IAM previously – and that's referred to in the DFSB Management Guidebook as well when they're talking about SAFTE-FAST and they say although the default setting is a safety threshold of 77 per cent effectiveness, that that has to be contextualised based on the context of the mission and the difficulties and the workload of a particular profile and duty.

And that for work that DFSB and IAM has done both for – well, for a couple of Air Force units where in consultation with the commanders, they decided that a level of impairment of 23 per cent would not be acceptable for flying in formation or in close proximity or in certain high risk activities; they actually elevated that criterion level to 80 per cent to make sure that Military operations, the impact of fatigue was appropriately balanced.

So that's referenced in the DFSB Aviation Fatigue Management Guidebook and also in one of my subsequent reports where I talk about the importance of not just using the default settings of SAFTE-FAST, but making sure that you appropriately apply the level of risk based on the mission profile.

COL GABBEDY: The other issue with it as a tool to predict individual fatigue is that it looks at a group of the population, which is largely undefined, doesn't it?

DR SMITH: Correct.

COL GABBEDY: And if you look at the paper that was tendered through Counsel Assisting this morning, the paper entitled, "Actigraphy-Driven Biomathematical Fatigue Modelling in British Military Rotary-Wing Pilots", I think this is a paper that you had found.

DR SMITH: Correct, yes.

COL GABBEDY: I'm looking at page 210 of that paper, and it refers to the "healthy worker effect". Would you accept from me, the healthy worker effect is the effect that the group of people that would be aircrew or

pilots are young, fit people who would be at the top end of any modelling when you're modelling a group.

DR SMITH: That is an assertion that would need to be validated. I don't know how aircrew compare in terms of their fatiguability compared to the general population, but from a basic standpoint, cognitive processing is a human characteristic. I would need to validate that claim.

COL GABBEDY: Perhaps if I read the full paragraph to you to help you, Doctor. It says:

> *This study's results could be affected by the healthy worker effect, as one could reasonably assume that Military rotary-wing pilots are an occupational group willing to take challenges such as shift work, on-call duties, and demanding professional situations. Such a workplace fails to select individuals who cannot cope with these stressors. Therefore, care must be taken when extrapolating these results to a wider population.*

Would you agree with me that that suggests that that group of people, Military pilots, fall into the top end of the range when you're using this sort of modelling tool?

DR SMITH: I'll accept that.

COL GABBEDY: And, look, finally, in relation to caveats and concerns, paragraph – or page 60 of the Fatigue Management Guidebook says in the conclusion:

> *Modelling is only one resource and should always be used in combination with other operational data and information that is available in order to assess fatigue risks.*

That's a pretty reasonable statement, isn't it?

DR SMITH: I think that's a very reasonable statement, yes.

COL GABBEDY: The problem we've got here, isn't it, is that that corroborative data just isn't available.

DR SMITH: That's correct, yes.

COL GABBEDY: And unfortunately, what I would suggest that does is means that when we look at your conclusion or finding at paragraph 102,

you've got to, to be fair to you, I would suggest, approach that with a significant degree of caution. And your finding, to be fair to you, says:

> *Based on the information on sleep/wake times provided to me for this report, the indicative outputs of the FRAT and fatigue modelling produced by SAFTE-FAST indicate it is highly likely that all of the incident aircrew were experiencing levels of fatigue that would be considered hazardous in an aviation setting. This includes both pilots as well as the two aircrewman.*

Now, given the significant caveats that we've just gone through in relation to your report, that is a statement that needs to be approached with a great deal of caution, wouldn't you agree?

DR SMITH: Having laid out the assumptions, and the strengths and shortcomings and limitations of the tool, that's the conclusion that I drew, but taking all of those things into consideration, it is a model, and I am commenting on the output of the model based on the inputs that I outlined, and that is one piece of information that sheds some light on the likely degree of impairment; I'll accept that.

And it is as the guidebook says, modelling is one piece of information that goes into an overall decision, but where we have subjective self-assessment that is not accurate, reliable, and robust, and where we have modelling that is based on objective data but on a population and we don't know where individuals lie in there, it really does highlight the importance of trying to find better ways of monitoring fatigue if we don't believe that individual self-assessment is a robust and accurate measure, and there are reasonable concerns about the applicability of modelling either to a general population or to individuals.

Things like looking at blinking measures and eye tracking and pursuit, and cognitive function, there currently are commercially available off the shelf technologies that can objectively monitor fatigue state in individuals – in individuals – and then use that information to provide a decision-maker with objective data about an individual's level of performance related to whatever fatigue they have brought forward, not fatigue that we have modelled or guessed or speculated.

An individual's level of fatigue can be indicated with current commercial off-the-shelf technology. That would then be a much better way of providing a commander with the information that they need.

COL GABBEDY: Thank you, Doctor. I find that very helpful, and if I could just unpack it, tell me whether I've followed you completely. Starting

a conversation about fatigue – and I think we had this conversation last time we spoke together – is a good idea in this context.

DR SMITH: Yes. Fatigue is a very important conversation as long as it can be informed by objective data and evidence-based conclusions, and I do – I am convinced by the scientific literature that individuals' conviction about whether they feel that they can perform – I believe that that is flawed, and not reliable. But if we can inform that conversation with objective reliable data, it's very important.

COL GABBEDY: And there are devices out there that are commercially available that will provide far more accurate information on individual fatigue levels than perhaps using the SAFTE-FAST tool for a purpose for which it wasn't really intended. Would you accept that?

DR SMITH: I accept that, yes.

COL GABBEDY: So it tends to follow, does it not, that using the tool to predict individual fatigue in the way that it has been done here should be approached with a great deal of caution.

DR SMITH: Yes. So this is using a tool, taking – and I think the wording that I used was that in a population of people who had a sleep/wake pattern like I had modelled for the individual aircrew, so I wasn't saying that individual aircrew had that performance, but a population of people with that sleep/wake cycle, we would expect this range of performance, the mean and standard deviations.

So that was all upfront and there as a way of shedding light on the possible level of fatigue within which an individual would fall. But if we can back that up with objective data of your blinking rate or your ability to pursue a target on a screen is validated against this level of impairment, then we can say to individuals, "This person's performance is going to be impaired by this degree".

COL GABBEDY: Thank you, doctor. I have nothing further. Thank you, ma'am.

MS McMURDO: Did you want to tender that article that you – didn't you refer to an article?

FLTLT ROSE: It's been tendered.

MS McMURDO: It's been tendered, thank you. Yes, re-examination?

<RE-EXAMINATION BY FLTLT ROSE

FLTLT ROSE: Just one question. You're familiar, Dr Smith, with the Aviation Fatigue Management Guidebook Version 2?

DR SMITH: I am, yes.

FLTLT ROSE: In fairness to you, it was issued in August 2024, Version 2?

DR SMITH: Yes.

FLTLT ROSE: If you accept from me that on page 55 of that guideline it says:

> *SAFTE-FAST is the recommended biomathematical fatigue model by the Defence Flight Safety Bureau for use within the Defence Aviation context.*

DR SMITH: Yes, I accept that.

FLTLT ROSE: Is it the case that it is the only biomathematical fatigue model currently approved for use in the ADF?

DR SMITH: I can't say that for sure. That is the tool that is available through the DFSB system. The guidebook does talk about other tools, other biomathematical models and tools that are available. When they were evaluated 15 years ago, SAFTE-FAST was the most relevant to Military Aviation because the work was done on Military personnel through the Walter Reed Research Laboratory.

So that was the tool that was most applicable to a Military context, but I don't know whether there are other tools that could be used in a Defence setting. But SAFTE-FAST is the standard tool that we use. As you can see, even noting the comments about a healthy population effect, SAFTE-FAST is still being promoted as the go-to tool by Military operators currently in a scientific article that's a month old. So that still is a valid tool, within the assumptions and limitations.

FLTLT ROSE: Thank you. Those are my questions.

MS McMURDO: Thank you very much, Dr Smith. You're free to go now, thank you.

<WITNESS WITHDREW

MS McMURDO: I think we'll have to have the lunch adjournment.

FLTLT ROSE: I just have two final documents to tender, if I may?

MS McMURDO: Yes.

FLTLT ROSE: I tender a letter from NATO Helicopter Industries to the Defence Flight Safety Bureau dated 22 September 2023, which encloses a report by Airbus dated 22 September 2023, summarising the flight data recorder data received regarding Bushman 83 from the Defence Flight Safety Bureau.

MS McMURDO: 246.

#EXHIBIT 246 - LETTER FROM NATO HELICOPTER INDUSTRIES TO DFSB, AND ENCLOSURE ("OFFICIAL: SENSITIVE")

FLTLT ROSE: And I finally tender an engineering report by Airbus dated 6 September 2023 analysing data from the Crash Survivable Memory Unit from Bushman 83. And this document was referred to in the evidence of Mr Michael Grant from the Defence Science Technology Group. Both of those documents are classified as "Official: Sensitive", so I won't be summarising them.

MS McMURDO: Exhibit 247.

#EXHIBIT 247 - ENGINEERING REPORT BY AIRBUS ANALYSING DATA FROM THE CRASH SURVIVABLE MEMORY UNIT ("OFFICIAL: SENSITIVE")

FLTLT ROSE: I understand that's the evidence for the Inquiry.

MS McMURDO: Thank you. That completes the evidence we're going to receive in the Inquiry. We'll have the lunch break now. When we resume at 1.30, we will be hearing from families of the deceased.

FLTLT ROSE: Thank you.

MS McMURDO: We'll adjourn till 1.30. Thank you.

HEARING ADJOURNED

HEARING RESUMED

MS McMURDO: Yes, COL Streit.

COL STREIT: Thank you, Ms McMurdo. In the Guide to Family and Friends published on the IGADF's website prior to the commencement of our first hearing in February of last year, it invites family members, should they wish to do so, at the conclusion of the Inquiry's hearings to make a statement about their loved one. A number of family members have asked to do that, and the purpose of this afternoon is to engage in that process.

I will identify each family member. Their statement is not evidence and they'll not be asked questions about their statement. It's an opportunity for them to speak. We request, respectfully, a short break between each family member to allow things to reset.

MS McMURDO: Each family member or each family?

COL STREIT: Each family.

MS McMURDO: Thank you.

COL STREIT: Unless otherwise requested.

MS McMURDO: Unless otherwise requested. All right.

COL STREIT: Can I first begin by introducing Mrs Caitland Lyon, who will speak on behalf of Danniel Lyon.

MS McMURDO: Thank you, COL Streit. Thank you, Mrs Lyon.

MRS C LYON: Good morning, Ms McMurdo, AVM Harland, and all those who are present. Thank you once again for giving me this extraordinary opportunity to speak.

Over the course of these nine hearings we have sat together and listened to evidence that at times has almost been unbearable. And yet through it all, the dignity and care by this Inquiry has not gone unnoticed. My family and I are deeply grateful for the way that we have been invited into this process, not as passive observers, but as active participants who matter.

From the very beginning all I've needed is the truth. I pleaded for answers and was so often met with silence or the suggestion that the truth was too difficult or too traumatic or simply not for me to know. I was spoken down

to and made to feel small as though my grief rendered me fragile or incapacitated. But never here. Not once did this Inquiry treat me that way. Never once was I dismissed or patronised. Instead I have felt heard, respected and seen, empowered to share my knowledge and lived experience. I cannot express to you how much that means to me.

I feel that this Inquiry has given me a sense of structure and purpose throughout its proceedings. During this time the families of the four deceased crew have come together, united in our grief and we've been driven by a shared goal. As the Inquiry draws to a close, I know I will feel a deep sense of loneliness without this regular contact and connection I have had with the other families. The sense of unity has been a source of strength.

I also anticipate feeling a loss of direction as I'm now expected to return to my new normal life, one that feels uncertain, without focus that the Inquiry has so kindly provided.

To say this process has been painful is an understatement. It has shaken us to our core. There have been days where I could barely breathe under the weight of it all. Days where I have collapsed, ill, physically ill, from the strain of what we have been uncovering. But that pain was not caused by the Inquiry. It was caused by the unimaginable grief of losing Dan, and the unbearable realisation that his death and the deaths of Max Nugent, Phil Laycock and Alex Naggs was preventable.

The trauma did not begin with this process. It began on 28 July 2023, the day that my husband, the love of my life, the father of our two precious children, was taken from us. The day that shattered our world. And in every way that matters, a part of him, a part of me, died with him.

You didn't get to know Dan the way that we did. Not just as a pilot, but as a man who danced with me in the kitchen, who chased our children down the hall in fits of laughter, who gave every part of himself to his job and the people he loved. Being chosen by Dan was the greatest privilege of my life. And now I carry the privilege of being his voice, sitting here, hearing after hearing in pursuit of the truth and a safer future.

Dan was the heart of our family. He was the laughter in our home, the joy in our days, the calm in our storms. He had a gift for lighting up the room and making everyone feel seen and known and valued. His kindness, his strength, his love. The search for the perfect wave. His grin after sinking a long putt. And on the very rare occasion, his celebration of a St Kilda win. These are the things that we carry with us now.

Dan would have wanted the truth. He would have fought for it, not just for himself but for anyone in his position. He was committed to safety, to integrity and to doing what was right. He was actively pushing for a more balanced workload. I said in my witness statement provided to the Inquiry at the beginning of these hearings that I heard Dan and even his mates say that he believed that someone was going to die. Whatever the reasons behind that belief, those words still haunt me.

Dan trusted that organisation he served so faithfully that would keep him safe in return. He trusted the aircraft he flew had been properly tested and that the equipment he used had been carefully selected and that his wellbeing mattered. He gave everything, even his life.

We've now heard evidence about the MRH platform, training, fatigue, the TopOwl off-axis issues, the performance of the Image Intensifying Tubes, the weather on the night of the mission, changes to crewing and whether or not the aircraft doors were to be opened or closed during night operations. All I can say is that I have full faith in the Inquiry's ability to fairly and thoroughly consider all of the evidence regarding these various elements that came together in the tragic accident on 28 July 2023.

I fully understand and have been long fearful of the risks involved with 6 Aviation roles and responsibilities carried out by our Australian Defence Force and Army Aviation. I know these risks are inherent to the work, particularly doing night flying, at low level, in poor weather conditions. It remains to be seen what was done then and, more importantly, what can be done now to reduce those risks as much as possible for the safety of our aircrew and our ADF pilots.

Behind every aircraft is a person, a family, a future. My children have had to learn far too young what it means to live without their dad. I'm still haunted by the sound of our five-year-old's screams the day that I told him daddy wasn't coming home. He still sleeps beside me every night, curled around his father's pillow. Our daughter was 16 months old when her daddy became her guardian angel. Every time I now hear her three-year-old cries for daddy to come back from heaven my heart shatters knowing she has lived more days crying for daddy than she ever had laughing with him.

This is our reality now. The life we never chose but the one that we must wake up to every day. If you have never known that kind of loss, I am grateful and I sincerely hope that nobody ever does.

To the families of Max, Phil and Alex, who sat beside me, Chadine, Sarah, Marianna and Dan, Sam, Wayne and Di, I'm so sorry we share this

heartbreak. But I am also grateful for your strength, your love and the way you've embraced me and my children throughout this entire process and our grief. Thank you.

To Dan's Counsel representative, Malcolm Gracie. Thank you for being Dan's advocate, for honouring his voice when he could no longer speak, for showing my family such care and respect, and for never giving up in your pursuit for the truth.

To the witnesses and those who came forward with honesty and courage, your words mattered, they were heard, and they will make a difference.

And to you, Ms McMurdo and AVM Harland, thank you for your pursuit, your relentless pursuit, of clarity, for asking hard questions, for taking this seriously. I know the recommendations are still to come, but I thank you for what they represent: a safer future, a better Defence Force, one that learns and grows and remembers those it has lost, because we can do better. We must, for Dan, for his crew and for every family who sends a loved one into the sky, trusting they will come home.

Thank you for your time. That's all.

MS McMURDO: Thank you so much, Mrs Lyon. It means such a lot to us.

MRS C LYON: Thank you.

COL STREIT: Thank you, Caitland. Next we have Mrs Sue Lyon.

MS McMURDO: Yes.

MRS S LYON: I'm grateful for the respectful and professional approach taken by this Inquiry. And a very special thank you to Ms McMurdo, AVM Harland, Counsel representing, Counsel Assisting for their ongoing attention to detail in trying their best to bring us valuable and honest information. I thank the people who have been at the other end of the phone and at the hearings, who have been constant support for all the families.

I extend my heartfelt appreciation to Danniel's legal representative, Malcolm Gracie, for his ongoing attention to detail throughout the Inquiry. Malcolm has been professional, understanding, thoughtful, passionate, thorough, and committed to the task at hand. Thank you, Malcolm, from the bottom of my heart.

I thank the courageous witnesses who were honest with their statements,

answers and reasons to try to bring a confident and fair result. Thank you to the tech guys. You've had a few challenges to overcome and have proven your expertise.

I'd like to take a moment to express my heartfelt thanks to the Nugent family, Max's partner Chad, to Sarah, Alex's partner, to the Laycock family and, last but not least, to my daughter-in-law Caitland for your never-ending love, your care, your patience and support. I am deeply grateful to you all.

The distress I feel, the deep sense of emptiness inside can be overwhelming. Each day brings a different wave of anxiety and anger we are all learning to process. It has been incredibly hard to cope with losing Danniel at such a young age on the night of 28 July 2023, especially so soon after the death of my dad nine weeks earlier. My mum passed away 15 months before that and I lost my husband, Danniel's dad, four years before that.

Andrew and Danniel came into my life when he was four years old. He was a little blond chubby kid who, like his dad, loved St Kilda football team. They drove me crazy as, being Queenslander, I'd only watched NRL. Danniel gained an older brother Troy and a sister Tanya, who he idolised. So much so, Tanya had taken on the middle child syndrome. And that's how well he fitted into our family.

He's loved his nephew and nieces so much. Every time he was with them he found the inner child in himself and caused havoc. Andrew and I were so very proud of his achievements, whether in sport or career. He aimed to be the best at whatever he put his mind to. He was the apple of his dad's eye. He loved Caitland and his babies with every being in his body. They were his life.

Danniel served with dedication, integrity, professionalism, courage, commitment and a strong sense of purpose. He loved being a helicopter pilot. He was a good one at that. He was a kind-hearted, loyal, passionate young man whose presence brought light and laughter to those around him.

He was so caring that, after six months after his dad died, I was to attend a very good friend's family wedding. Danniel sacrificed a weekend with Caitland and Noah and drove to the Hunter Valley to partner me to the wedding. Hence, the selfie. He had grown up with the groom and his siblings and it was a beautiful reunion. And I must say, Danniel loved a party. Any excuse for a party.

When I was ready to unpack some of Andrew's belongings from our move back to Australia, Danniel once again sacrificed a weekend with his family, drove nine hours to my place and we started unpacking boxes, with many

hugs, tears, bursts of laughter, more tears. Lily was a baby at the time, and he was so looking forward to a good night's sleep.

He had his red truck packed to the brim with everything from a mantle clock presented to his grandfather many years ago, to three sets of his father's golf sticks. I had no idea where he was going to fit in that truck as you could see the sides were expanding. I certainly wasn't ready to throw anything out and Danniel was holding onto any and every memory he could of his dad. So, Danniel, the big red truck and all that stuff headed back to Sydney. It's now all in Caitland's garage.

He was a natural, a wonderful son, husband, dad, brother, uncle, friend, an amazing human being. His death has caused immeasurable pain to our family, and we continue to struggle with the loss of a young man whose life was full of promise.

I'm struggling to come to terms with much of the evidence that I've heard throughout this Inquiry. I understand that this is a necessary part of the Inquiry process, and I appreciate the thoroughness with which the Inquiry has undertaken its task. I, myself, have lost faith in our Defence Department, the Army and the DFSB to ensure our pilots and aircrew only operate in safe workplaces.

There are so many questions still to be answered. These pilots and aircrew should be honoured in every way possible and the families supported in all ways for losing their loved ones, especially my two young grandchildren: Noah, seven; and Liliana, three.

How can you put a budget on a soldier's life or death, being killed in the line of duty, whether it's in an exercise training or in a war? Our hope is that the findings from this Inquiry will lead to meaningful change, so no other family has to endure the pain and devastation we have faced.

Danniel's life cannot be returned to us, but we owe it to his memory and to others who serve to ensure that what happened on 28 July 2023 never happens again. I look forward to answers now to explain to Noah and Liliana what happened to their dad, how and why it happened, in the years to come.

Thank you.

MS McMURDO: Thank you very much, Mrs Lyon, for sharing those special memories, and for all your words.

MRS S LYON: Thank you.

COL STREIT: Thank you, Sue. On behalf of Mrs Mary Holloway and Mr John Holloway, can I invite LCDR Gracie to speak?

MS McMURDO: Yes, thank you. Thank you, LCDR Gracie.

LCDR GRACIE: Ma'am, sir, you'll be pleased to know that for once I'm lost for my own words, but I have the honour to read a statement to the Inquiry regarding CAPT Danniel Lyon on behalf of Mary and John Holloway.

We write this statement with broken hearts in memory of our beloved son, CAPT Danniel Lyon, who was tragically killed during Exercise TALISMAN SABRE, Bushman 83, in July 2023.

Danniel was not only an extraordinary pilot and leader, he was an extraordinary man; courageous, kind, compassionate and fiercely devoted to his family. From an early age Danniel set high goals for himself and chased them with determination and a quiet strength that never wavered. He worked hard at school, he worked hard in life, and he worked even harder in his service to Australia.

He rose to become a respected and trusted pilot, an Officer in the Australian Defence Force. But above all his achievements, Danniel was a beautiful son, a proud and devoted father to his two precious children, and a loving, protective brother to his younger sister. His family was the centre of his world.

Danniel's loyalty, his care for others and his deep sense of responsibility shone through in everything he did. He always placed the safety and welfare of his crew first. Those who served with him knew they could trust him with their lives because he led with his heart as much as his head.

Outside his service, Danniel lived life to the fullest. He loved the ocean and found joy and freedom in surfing. He was passionate about Aussie Rules football and wherever he went he brought warmth, laughter and a magnetic spirit that drew people to him.

Our son was admired, respected and loved by all who knew him. His loss has left a hole in our hearts and in the hearts of so many others that will never fully heal. Yet we remain endlessly proud of the son, brother, husband, father, man, and leader he was.

CAPT Danniel Lyon gave so much in his lifetime and he leaves

behind a legacy of love, courage and honour. We will carry his memory with us always and strive to live with the same kindness, strength and spirit that he showed every day.

We respectfully submit this statement in loving honour of CAPT Danniel Lyon's life, his service, and his beautiful soul.

Mary and John Holloway.

Thank you, ma'am, sir.

MS McMURDO: Thank you, Lieutenant Commander, for sharing those words from the Holloways. Yes.

COL STREIT: Ms McMurdo, it's probably time for a short break, if that's convenient?

MS McMURDO: Yes, I think that would be appropriate. We'll have a 10-minute break.

HEARING ADJOURNED

HEARING RESUMED

MS McMURDO: Yes, COL Streit.

COL STREIT: Thank you, Ms McMurdo. We'll now move to hear some words from the Nugent family, and also words made on behalf of the Nugent family. In that regard, can I invite SQNLDR Jonathan Giles to speak on behalf of Mr and Mrs Nugent and Sami.

MS McMURDO: Yes, SQNLDR Giles.

SQNLDR GILES: Madam Chair, I can advise that the Nugent family are currently in the UK, watching online:

On 28 July 2023 Max was exactly where he wanted to be. After years of training he had achieved one of the career goals to be a Special Operations pilot with the 6 Aviation Regiment. He was 24 with the world ahead of him. He was excited to be part of TALISMAN SABRE with his mates, putting the skills to the test. He was doing what he loved.

Sadly, that night, he'll be remembered as a tragedy for our family and for the people that knew and loved Max. Lives were changed that night forever in a way that is immeasurable.

We would like to thank the Inspector-General Australian Defence Force for directing the Inquiry to occur. Thank you, Ms McMurdo and AVM Harland, for your sensitive and fairness throughout the long process. The care with which this has been handled has not gone unnoticed and has brought us to comfort and faith that areas for change will be identified and actioned.

To Jens, Alexandra, Luke, Siobhan, Glenn, Kevin, Simon, Kylie, Hannah and Jo, and the other members who have worked tirelessly behind the scenes. Thank you. It does not seem an adequate word, but please know that the care you've shown us, from a smile at the front door to a packet of Tim Tams, has done a lot to ease the stress and tension of these hard days.

Thank you, Jonathan, for representing Max throughout the proceedings, and Max, Chris and Malcom for representing the other boys and, again, the care and thoughtfulness throughout the process has been appreciated.

To the other families, sorry that this has bonded us together. We understand the loss and pain and grief this accident has caused. While our loss is individual, you'll always be part of our family and always in our thoughts. Although we never got to meet the boys, we've learnt how amazing, strong and beautiful they were. Max, Dan, Phil and Alex will always be together, forever in our hearts.

To our family and friends who showed us unwavering support, thank you from the bottom of our hearts, and also the support from Max and Sami's friends has made this tragedy just that little more bearable.

To Max's Army mates. We've gained a whole new family. Sons and daughters to us and brothers and sisters to Sami, you allow us to feel connected to Max's life and we're his other family. The way you have included us in catch-ups and text messages, phone calls, they mean so much. Max would have been so proud of how you're continuing to live. Just remember, be better.

We'd also like to express our appreciation of both Max's

Commanding Officer, D19, and Officer Commanding, D10, for the bravery in the days immediately after the crash, talking us through the details, then assisting us through the funeral, whilst also having to care and support their Troops, themselves and their families. We'd like to thank them for their continued support.

To Army Command, every decision matters. Throughout the days of evidence, one thing that has constantly come to the forefront is that decisions matter. The decisions that you may make may not matter today, they may not matter tomorrow, but in the moment when things go wrong, these decisions matter. People are your greatest asset. They're not just numbers on a page. They're people with families and lives to live.

We miss him every day. 24 years was not long enough to see his smile, to feel his hugs or to share in the incredible life. We'll never get to see where life would have taken him or share in his joys. He will not be around to witness the amazing woman his sister has become, to see her strengths and share in the joys of raising families together.

The hole this has left will never be filled, but we'll keep living for him and trying to find joy, happiness and peace. We love you, we miss you. We're incredibly proud of Max's service, but please do not let this tragedy be in vain. Forever Bushman 83.

Dan, Marianna and Sami Nugent.

MS McMURDO: Thank you, LCDR Giles. And thank you to the Nugent family for sharing those memories with us.

COL STREIT: Thank you, Jonathan, on behalf of Marianna, Dan and Sami. I now invite Ms Chadine Whyte.

MS WHYTE: One second. First and foremost, I would like to extend my sincerest gratitude to the Honourable Margaret McMurdo, AVM Harland and all Counsel Assisting the IGADF Inquiry. I also wish to express my deep appreciation to the Counsel representing the interests of our six boys. You have all worked tirelessly, with absolute dedication and fortitude, which has not gone unnoticed.

The situation is horrific and there are no adequate words to describe it. All we can ask is that those in support roles, institutions and investigations like this not make an unimaginable tragedy worse. As sadly, that hasn't always been the case, as we have heard in this forum. However, I want to

commend the IGADF team for their professionalism, compassion and commitment to making this process as respectful and humane as possible. So, truly, thank you.

I also appreciate the opportunity to share a glimpse of who Max is. Although it's difficult to capture the full depth of someone in a few pages, especially someone as extraordinary as Max. But I am here today because he mattered, and still very much does.

He was not just a number or a statistic. He was a son, a teammate and a fiercely loyal friend. He was the light in the lives of those who were lucky enough to know him. He had an infectious, goofy smile, usually paired with a magnetic laugh, full of life and warmth. It would fill a room.

Despite being from the North Shore, he self-identified as a concrete cowboy who adored country music and mustered up the courage to live south of the bridge. He was particular, to say the least, about his cooking routine, as recipes were to be followed to the letter and without distraction from me. They would consistently be a well-structured masterpiece that would include a dance break together in the kitchen upon their completion.

He was a coffee connoisseur and he'd wake me up with a coffee each morning. Even on days when he had left for work before the sun came up, a deconstructed iced latte would be left waiting for me in the fridge without fail. It's just who he was. Kind, thoughtful, consistent and dedicated; all without expected praise or recognition. You could count on Max. He was reliable and devoted.

Max lived to fly, but he also quietly dreamt of one day running a farm. He wanted a simple life for us to grow old together amongst the gum trees. I would joke that we were basically already there. Me not being able to hear most of the time and Max being the occasional grumpy man if someone was walking too slowly in front of him.

Although above all else, Max desperately wanted to be a dad. We'd speak about this often and we thought we had it all planned out, not as a distant dream but as something real and something close. We had already started on our journey to make this possible. We were on an upward trajectory. He would have made the most patient, kind, compassionate and deeply loving parent. His gentle, faithful and fun-loving nature was a testament to this. I can't express how broken I am that he will never be able to fulfil his dream of becoming the father and role model he was ready to be.

Max was dependable and devoted to his service and trusted the Australian Defence Force with his life. He had such faith in this system and carried

immense pride because of this. Max idolised his superiors and hoped to follow in their footsteps into Command one day. He truly adored all things Army and would study its history for fun. He loved being a pilot. I feel like he would have excelled beyond his own ambitions had he had the chance.

We speak often in this context about capability, risk and operational readiness, but the loss of Max, Phil, Alex and Dan cannot simply be defined as an unfortunate event or an acceptable risk of duty. They were devoted, highly skilled and incredibly dedicated people who served with integrity and deserved better.

While I understand that in operational environments risk is inevitable, we must never lose the sight of the fact that behind every uniform is a person and behind every person is a family, a life and a future. One second.

These members have loved ones and family that support them, which often goes unseen, yet their support is vital to their wellbeing. When a member serves, we serve. Where they go, we follow. What they go through, we support them to the best of our abilities. And when they die, we grieve. And yet, we can be left out of that conversation entirely. We are left to bear the weight of that loss, that sacrifice, on our own. I'm not asking for recognition in sharing this, I'm asking for understanding, which I hope will elicit change.

To that point, in future, I hope support for members is tailored to their own individual needs, as no family situation is the same. This extends to the partners of those members and contemporary family structures. Now we will carry this for the rest of our lives, as grief is a life sentence. The most striking experience I can offer for your understanding of what this can feel like is the sheer loneliness. Going to call Max out of instinct still after all this time. It's being alone in a room full of people and feeling completely isolated. Being without your person and going home to no one. Walking down aisles for funeral services and memorials for Max, rather than with him, like we had planned.

Max was my person, my future, my safety, the family we chose and the family I had. Max wasn't just a chapter, he was the whole story. Now each morning there is a moment of believing he is still here. It is a comforting moment of peace in the feeling that the love of my life is safe and home. Then the harsh, cold reality hits that he isn't here and never will be. This reality is something I wish no one would have to go through. However, in life, death is inevitable. Yet where it is preventable within the Australian Defence Force, I urge you to do better and to hear us.

Max's life mattered and so does the loss of it. We must preserve their memory, listen and change how we lead and politicise the Australian Defence Force. Let us lead with humility, not above or below, but beside the people who serve and the families that follow them. We cannot change what happened, but we can and must change what happens next.

Please don't let the lives of Dan, Max, Phil and Alex be in vain. Let their legacy be one of change. Thank you.

MS McMURDO: Thank you so much, Chadine.

MS WHYTE: Thanks.

COL STREIT: Thank you, Chadine. Ms McMurdo, we will now turn to hear from the Laycock family. We can take a short break, or if you wish to continue, we can also do that.

MS McMURDO: Perhaps we'll just have a few minutes' break and resume as soon as it's appropriate.

COL STREIT: Thank you.

HEARING ADJOURNED

HEARING RESUMED

MS McMURDO: COL Streit.

COL STREIT: Thank you, Ms McMurdo. I now invite SQNLDR Chris Thompson to speak on behalf of Mr Wayne Laycock and Mrs Di Laycock, and on behalf of Ms Megan Stuart.

MS McMURDO: Yes, SQNLDR Thompson.

SQNLDR THOMPSON: Ma'am, sir.

MS McMURDO: Is everything okay? Yes, SQNLDR Thompson.

SQNLDR THOMPSON: Thank you. On behalf of Di and Wayne Laycock:

At the outset, on behalf of the family, Wayne and I would like to

thank Ms McMurdo, AVM Harland, Counsels Assisting, Jens Streit, Alexandra Rose and members of the Liaison and Welfare Teams from the Office of the Inspector-General of the Australian Defence Force for the professional, sensitive and caring manner in which they have conducted the Inquiry into the crash on 28 July 2023 of Bushman 83, a crash that tragically resulted in the deaths of four aircrew, including our son, Joseph Phillip Laycock. We also thank Chris Thompson, Counsel representing Phillip, who has been a great support and friend during the Inquiry process.

Nothing can bring Phillip and his mates back, but our greatest hope is that the recommendations coming from the Inquiry will be considered seriously and that action will be taken to address those recommendations.

The appearance at our door at 7.30 am on Saturday, 29 July of two unsmiling faces, crisp khaki uniforms and mirror-like shoes was all that was needed. We knew we had lost Phillip. On that day our hearts were shattered, as were the hearts of those with whom we shared the news. Not only was a son lost, but a much loved brother, father, friend and respected colleague.

We have many wonderful memories of Phillip as he grew from boy to man, to soldier, to father. It's tragic, however, that it took the loss of Phillip for us to gather many of the pieces of his life puzzle. Over the last 22 months these memories have been coloured and added to through the stories told by family and friends, amongst those his three young boys. Our grandsons continue to regale us with happy memories and life lessons learnt from their dad. While Phillip's brother Steve has provided us with stories about what the two of them got up to when they were young and while we remained in ignorant bliss.

Steve's more recent stories reveal a couple of brothers and dads living around the corner from each other who regularly shared experiences about their service in the Army, with both being at 6 Aviation for a time, their love for their kids and a passion for coffee and craft beer.

External to the home front and, although Phillip never spoke in detail about his work, we knew he was devoted to his job and that he gave it his all and sometimes more. This was acknowledged publicly in 2014 when Phillip was named Army Aviation's Soldier of the Year for his performance as Squadron Aviation Aircrewman Instructor and in 2016 when he received the Conspicuous Service

Medal for his performance as the Squadron Aviation Aircrewman Instructor in the 171st Squadron at 6th Aviation.

During the Inquiry we have also heard his colleagues describe the high standards he maintained in his job and the respect with which he was held in the Aviation community.

It's no secret that Phillip was wedded to his mountain bike and since the accident the mountain bike fraternity have been a great support. Along with Steve and Phillip's boys and their mum Megan, who continues to be a loved member of our family, we've attended mountain biking memorial events – or Philgrimages – to Mount Stromlo, Canberra and Derby, Tasmania, where we've all laughed with Phillip's mates over many Phil stories of crashes and bike-buying sprees.

While we cherish such memories, we grieve now for the memories that can no longer be made. There will always be a vacant seat at family celebrations and special events, and we would give anything to again experience those uneventful, mundane happenings such as a trip to the shops with Phillip and the boys or making pizza together in the kitchen, or a repeat viewing of Star Wars.

The impact of Phillip's loss on our physical and emotional wellbeing has been significant. The poet, Donna Ashworth, accurately sums up our situation in saying, "You don't just lose someone once. You lose them over and over, sometimes many times a day". Some days it's a struggle for us to complete the most routine of tasks or to hold focus as we are ambushed by a word or image that pushes the accident front and centre once more. Even the most menial task of making our bed every morning takes us back to the day of stripping Phillip's bed in his apartment, knowing he would never sleep there again.

Unfortunately, while we recognise its importance, this lengthy Inquiry has also been a constant grief trigger, as has the related media attention. Furthermore, a good night's sleep is a thing of the past and hardly a day goes by when we don't wake up in the morning or go to bed at night without memories of Phillip and tears in our eyes.

Whilst ever there is love, there will be grief. We know, therefore, that our grief over Phillip's loss is a life sentence. There will always be a deep scar on our family's hearts that will never heal. However, our burden has been lightened by the

overwhelming support from individuals and various groups in many ways.

These people include various past and present members of 6th Aviation and organisations including the Commando Welfare Trust, Legacy South Coast, the Holsworthy Community Support Group, the Special Operations Families Council and North Bondi RSL.

And of course, there are the families of Dan, Max and Alex. Our shared grief for four beautiful young men, taken by the sea, has created an unbreakable lifelong bond. We know they will be friends we turn to in troubled times, because only they can understand the depth of our loss, created by the crash of Bushman 83.

Di and Wayne Laycock.

MS McMURDO: Thank you, SQNLDR Thompson, for sharing those memories from Dr and Mr Laycock.

SQNLDR THOMPSON: I have a second statement, it's from Megan Stuart, mother of Jackson, Connor and Hendricks Laycock:

To the IGADF Inquiry into the crash of Bushman 83.

I'd like to firstly thank Ms McMurdo, AVM Harland, Counsels Assisting, Jens Streit and Alexandra Rose, Director Complex Case Advice, members of the Liaison and Welfare Teams from the Office of the Inspector-General of the Australian Defence Force, namely, CAPT Jo Bastian, Royal Australian Navy, for dedication, professionalism and soft-hearted support. Together we have battled through 22 months of this Inquiry into the crash on 28 July 2023 of Bushman 83 that took away the lives of four loved aircrew, Alex, Dan, Max and Phil.

We lost Phil, a real-life superhero in the eyes of his boys and changing friend of mine. As we've heard throughout this Inquiry, Phil took great pride in working extremely hard. He always aimed high. He loved his job. He wanted the best of everything in life and usually got it. The best for others, the best for himself, the best for his boys.

When it came to life outside work, he found himself going from one action sport to the next – skateboarding, wakeboarding,

snowboarding. In the most recent past it was downhill mountain bike riding with our boys and his mates. Again, nothing but the best would do. And I smile as I write this, we usually joked – all the gear, no idea.

His commitment to learning and excelling came from within. He took on everything he wanted to, once the gear fit. Then would come the next big thing, or best thing to work towards. He lived his life to the full.

I see Phil in our boys every day, and for that I am eternally grateful. They share his heart, his ability to speak up and out loud. Sometimes too loudly. And perhaps in those moments that's my inside voice coming through. They share his dedication to learning, his commitment to working hard and his love of all things wild and action-packed, with their "It'll be all right" attitudes.

Our lives have changed forever, and it is extremely difficult to navigate life without Phil. Our hearts break, just as three other men's family members and friends do the same. It seems very unfair to be in so much pain.

Thank you to all of Phil's colleagues, his Defence family and mates, those who've spoken up that have been involved in this Inquiry. I appreciate your commitment in trying to ensure that a crash like this cannot happen again. I am truly thankful to each and every person who has stuck with us and offered support to our boys and myself during this time.

I know that as difficult as it is for us, it is for you too. The loss of a Military member brings with it multiple days of remembrance, many days filled with heavy hearts. But those days are a reminder that when a superhero leaves behind friends and family, he knows they're all brave enough to keep living a strong, positive life, accepting and striving for nothing other than the best.

Phil knows that together with Di, Wayne and his brother Steve, we will keep his boys, our boys, safe and loved. In great confidence, I know that Phil rests easy knowing his boys will always be the best they can be. His legacy will live on, and his Military commitment made him the man he was, someone we will always be proud of.

Megan Stuart.

MS McMURDO: Thank you very much, SQNLDR Thompson, for

sharing Megan Stuart's memories of Phil Laycock with us.

SQNLDR THOMPSON: Thank you.

MS McMURDO: COL Streit.

COL STREIT: Thank you, Ms McMurdo. I would now invite Ms Sarah Loft to share her thoughts and views.

MS McMURDO: Thank you.

MS LOFT: Good afternoon, Ms McMurdo and AVM Harland. I am Sarah Loft and I am privileged to be Alexander Naggs' partner. You've heard testament to CPL Naggs' – Naggsy's – integrity as a soldier and an aircrewman. Naggsy answered the call to wear his country's uniform at the tender age of 18, giving 5093 days of service that would culminate in him making the ultimate sacrifice.

He was Mr Reliable. Always the first to help, had great playlists pumping in the gym, and whose cheeky grin every morning after PT made everyone's day brighter. Naggsy's death was tragic, but he is so much more than how he died. Rather, Alexander's legacy is how he lived.

Alexander Joseph, who I only ever called Honey, the man who was endlessly entertained by how clumsy I was, the man I'm certain my family preferred to me, he loved that my nanna called him Honey Bunch and never complained when my pop inevitably found a job for him to do when we visited. He thought he'd won the lotto, that his in-laws owned a CrossFit and he trained for free, but maybe not as much after he endured hours of sitting around the kitchen table, losing to my brothers in Skip Bo.

Alex was a simple man, he cared little for the materialistic things but rather found peace in our home life and lazy weekends, making breakfast bagels, taking the dogs for a walk and picking a movie or TV series to watch. Our laughs over Friends and Modern Family were never-ending, yelling "pivot" every time we moved something or finding multiple comparisons to Mitch and Cam.

Not everything came easily to Alex, but through persistence he developed resilience, patience and the strongest work ethic I've encountered to date. He chased his goals with 110 per cent effort, whether that be his career, learning to ice skate or building his life with me. Alex valued his word. If he made you a promise, it was set in stone. To him, a person was defined by their characteristics and integrity of their word.

Alex was the kindest, most thoughtful, honourable and humble man. He is the best person I've ever known. It's been 652 days and I'm still unable to watch Friends or Modern Family, to move Alex's toothbrush from where he left it, or to accept that he's not coming home.

We had a one-year plan, a five-year plan and a retirement plan to grow old and grey surrounded by our grandchildren. Alex never let a day pass without letting me know what our life, what I meant to him. And I know I never let my honey doubt that being with him was the greatest choice of my life.

I want to thank Alex's Counsel representing, Helen Perrottet and Matthew Tyson, for the kindness they've shown and the reassurance they've given and their continued dedication to representing Alex's interests. I want to thank the entire Inquiry team. You've provided continuity of care to us in a trauma-informed way and continue to build our confidence in your ethical conduct and transparency in the pursuit of truth-telling, because Dan, Max, Phil and Alex deserved better.

Thank you to every person who has been of support since the crash of Bushman 83. To Naggsy's friends and work family, thank you for how you've taken me in. You've braved walking our devil Chihuahua Chloe, you helped hang photos for me, even if they are still crooked, and held my hand through endless tears and shown me the mateship, the family that Alex said he'd reenlisted for.

It's imperative to remember that although family members do not wear a uniform, we too serve. Posting orders, Defence housing, deployments and recall, families are there through it all. It is a tragic reality that each time a Defence family waves their loved one off, they may not come home. To lose a loved one in service is even more likely when involved within Special Operations, and our SO Operators and their families work and live within a sensitive space and need to be supported by Command, by policy and by our Government.

To the families of Dan, Max and Phil, we knew and now the world knows that our men were part of the elite. We were strangers thrust together in the most traumatic of ways, yet through this we've laughed together, cried together and shared memories of our men together.

I consider myself lucky to have met each of your loved ones, however brief it was, and will do my part to ensure Dan's, Max's and Phil's names continue to be spoken and their lives and sacrifices be remembered. I hope when my time comes my legacy will be that, as heartbreaking as it is, I've continued to live for both Alex and I and that I wasn't afraid to advocate for

positive change.

I love you, Honey, always. Lest we forget.

MS McMURDO: Thank you, Sarah. Perhaps we should have a 10-minute break. That would be appropriate.

COL STREIT: Yes, Ms McMurdo. Thank you.

MS McMURDO: That's all the family statements?

COL STREIT: It is.

MS McMURDO: That concludes the family statements. We'll have a 10-minute break, and we'll resume with closing statements from the Inquiry.

HEARING ADJOURNED

HEARING RESUMED

MS McMURDO: COL Streit.

COL STREIT: Yes, Ms McMurdo. If I may, for the last time, make some brief closing remarks.

MS McMURDO: Yes, certainly.

COL STREIT: Can I say something to the Australian public and the media? It's important to recall members of the ADF serve our nation and in this way they protect our democracy by defending our nation and our national interests. They are the purple line doing the hard work, often in the background, to keep us safe. Their families shoulder a burden because of their loved ones' service. They all, the families and the men and women that serve in the Defence Force, deserve our unwavering support and gratitude, always.

This is not to say the Australian public and the media should look the other way when things don't work out or they go wrong. It's simply observing that when things do go wrong, the focus should be on what happened and why and how we can help the ADF, so this does not happen again.

Can I say something to the ADF? Be strong. We need to shoulder this load, learn from it, move forward. This is the legacy to Dan, Max, Phil and Alex.

Can I say something to the Inquiry? Can I express my immense thanks and gratitude to the entire Inquiry team, those working tirelessly behind the scenes, including the immense efforts of the administrative support that was provided. For me in particular the legal team, they were the platform on which I stood and was able to perform my function, Alexandra, Siobhan, Glenn and Luke.

To my colleagues, Counsel representing at the Bar table and those who are not here, I have walked in your shoes, I understand the challenges of your role. You have my respect. Take time to recharge. Thank you for your assistance to the Inquiry.

To the families, you are in my thoughts. You have my deepest respect. Thank you.

MS McMURDO: Thank you, COL Streit. I'll now invite AVM Harland to address the Inquiry.

AVM HARLAND: Thank you, Ms McMurdo. And thank you, COL Streit. Thank you to the families for their poignant and beautiful words we heard before in memory of their loved ones, and thank you for the opportunity to say some words as we complete the final hearing of this Inquiry.

The nature of Military Aviation is inherently hazardous, which in turn requires that all involved are acutely aware of the hazards and diligently manage the risks. Military Aviation is unforgiving and when anything goes wrong, the results can be catastrophic. Military Aviation is also, at its heart, a team effort. A Flying Squadron is a tightly-knit team of aviators, technical and support staff who work closely together in an unforgiving environment. The bond formed on a Flying Squadron results in close personal and professional relationships, which often set the foundations for decade-long friendships.

In my experience, the team turn up to work every day to do their utmost to ensure that the aircrew depart and arrive home safely every time. To ensure this, all aspects of Military Aviation must be managed effectively, and critical judgments, decisions and follow-on actions are needed to support continued good outcomes.

These judgments, decisions and actions are typically sound, in my

experience. But when things do go tragically wrong, we must not simply rest on the idea that Military Aviation is inherently hazardous. We must enquire until we understand what happened and analyse what we have found to make recommendations for a better future and, in doing so, learn and improve.

This Inquiry has been a difficult and challenging process aimed at exploring the evidence to establish the facts surrounding the tragic loss of CAPT Danniel Lyon, LT Maxwell Nugent, WO2 Joseph Phil Laycock and CPL Alexander Naggs.

We have been directed to look at the circumstances leading up to the accident, the accident itself, the follow-on response and other relevant factors. We owe a duty and an obligation to the crew of Bushman 83 and all current and future Australian Defence Force Aviators to understand what happened and, where able, make recommendations to eliminate or reduce the possibility of similar losses in future. In doing so, we honour the legacy of Danniel, Max, Phil and Alex.

The witnesses who have assisted and enabled the Inquiry, in good faith and often difficult personal and professional circumstances to provide evidence that may assist the Inquiry to understand what happened and propose actions for an improved future, have been critically important to our progress and they have my gratitude.

Thank you also to Counsel Assisting, the Inquiry team, Counsel representing and the Commonwealth for the productive role they each played as we've moved forward in this Inquiry.

As we draw to a close to the hearings, the impact of the loss of CAPT Lyon, LT Nugent, WO2 Laycock and CPL Naggs is no doubt felt acutely by the family, friends, the Military team of workmates and the Command chain. Sadly, while this Inquiry is an important response to the accident it is only one dimension of this tragedy. The effects of this loss will ripple out over time, and to the families, friends and workmates of the crew, you have my deepest sympathy and condolences. I hope that you will find some peace with this awful tragedy in the future.

In closing, I would like to acknowledge the strength, grace and resilience of the families and friends of the crew of Bushman 83. You are and will continue to be an inspiration and I'm confident the legacy of your loved ones will be carried forward with justifiable pride.

I would also like to acknowledge those who have been quietly providing strength and support in the background to everybody affected by this awful

tragedy. Thank you. Ms McMurdo.

MS McMURDO: Thank you, AVM Harland, for those, as always, wise, thoughtful and insightful thoughts and observations.

This Inquiry received its original Direction from the Inspector-General Australian Defence Force on 31 October 2023 to enquire into the crash of the MRH-90 helicopter in waters off Lindeman Island in which CAPT Danniel Lyon, LT Max Nugent, WO2 Joseph Phillip Laycock and CPL Alexander Naggs lost their lives in the service of their nation during an international training exercise, TALISMAN SABRE '23.

For the past 19 months the Inquiry has examined what we understand to be the most relevant circumstances surrounding or potentially contributing to the crash. We have done so with the deepest respect for the lives, service and sacrifice of CAPT Lyon, LT Nugent, WO2 Laycock, CPL Naggs and their families. They have always been at the heart of our work.

In early 2024 the Inquiry established its website and held its inaugural hearing. In all, the hearing Inquiry has held 56 days, over 11 weeks of hearings, mostly in Brisbane, but also in Parramatta, examining the issues as required by its Directions.

This Inquiry has been ground-breaking in that it is the first IGADF Inquiry to be conducted in public and live-streamed, wherever this is consistent with security classifications and the welfare of the individuals involved. Hearings have been well-attended by members of the public and there have been, on average, 160 recorded logins daily to the live stream. Some days as many as 300.

It has also been conducted in a trauma-informed manner, whenever this is consistent with the obligations of the Inquiry under its Direction, and of Counsel representing, to carry out their ethical obligations to their clients. A trauma-informed approach means that wherever possible, given competing considerations, this Inquiry has been guided by care, respect and a deep sense of responsibility towards those affected. The lives, service and sacrifice of CAPT Lyon, LT Nugent, WO2 Laycock, CPL Naggs and the families who carry the weight of their grievous loss every day have been at the centre of our thinking, planning and decisions.

We have sought to not only honour the deceased aircrew, but also to listen to their families. We have strived to independently gather the clearest possible picture of all contributing causes of the crash, to learn from the tragedy and to explore what can be done to prevent or minimise the chance of a recurrence.

We sincerely hope we have done this while providing the deceased aircrew with dignity, respect and gratitude and their families with support, empathy and some degree of empowerment, sincerely thank the families for all they have done and for the very generous words they gave in their statements earlier.

The Inquiry also thanks the 120 or so witnesses who have given evidence to the Inquiry, either in person or through tendered statements, for their assistance. Some were Aviation experts, some were involved in the fateful flight, others were close friends, colleagues or Commanders of the deceased aircrew. The Inquiry appreciates that these witnesses and their families will also have experienced trauma, grief and the ripple effects flowing from giving evidence relating to this dreadful event. We have done our best to ensure that they too have been provided with independent support. And in that regard, I particularly thank the Army for its assistance.

We hope that future IGADF Inquiries will build on the challenges and lesson learnt in this Inquiry when conducting public trauma-informed hearings of this kind.

I thank the many people who have contributed to the largely seamless conduct of the Inquiry hearings, despite the significant, but not insurmountable, challenges of security classifications, witness welfare and a trauma-informed approach in public live streamed hearings.

My Assistant Chairs, initially AVM Vincent Joe Iervasi AM CSC, and for the bulk of the Inquiry's work and so far and moving forward, AVM Geoffrey Harland AM CSC DSM, it has been a privilege to know and work with each of them. Their knowledge, experience and wisdom has been, and in AVM Harland's case continues to be, extraordinarily helpful.

Counsel Assisting and the small but remarkably efficient legal and administrative Inquiry team, Counsel representing, all those providing assistance and support to the Lyon, Nugent, Laycock and Naggs families, and to the witnesses and their families, the Brisbane Convention and Entertainment Centre where the bulk of these hearings have been so seamlessly held, the hardworking recording and transcription team, the diligent Army team who have quickly and consistently turned around security reviews of thousands of pages of material, the media and the Inquiry Media Liaison Officer for ensuring the non-publication orders and 150 pseudonyms issued for security and welfare reasons were not infringed, and all those who made submissions to the Inquiry. So far the Inquiry has received 72 submissions, eight of which were Confidential, and 23 of which were anonymous.

Some Counsel representing have informed Counsel Assisting that they wish to make submissions to the Inquiry after the close of these hearings. The Inquiry always welcomes submissions.

I direct that any submissions from Counsel representing be provided to the Inquiry and to any affected parties by no later than Friday, 5 June – that is within four weeks – and be no longer than 10 A4 pages in Times New Roman, no smaller than 12 point font, consistent with the Inquiry Practice Note.

The Inquiry has issued over 200 Notices to Give or Produce evidence. I remind those who received Notices to Produce evidence that their obligations to produce all relevant documents remain ongoing. We have also received or issued over 8000 items of correspondence, and growing and I think the exhibit list is now up to about 247.

The hearings have been an important and critical part, but not the only part of the Inquiry's work. In late 2023, prior to the dismantling of all MRH-90 helicopters in Australia, and before the commencement of our hearings, the Inquiry visited Oakey to examine an MRH-90 helicopter and an MRH-90 simulator. The Inquiry also travelled to Canberra to inspect the recovered remnants of the MRH-90 involved in this crash. And late last year we examined the site of the aircrew's Exercise TALISMAN SABRE '23 base at Proserpine Airport to help us better understand the evidence we have received about this.

These hearings will in a few moments conclude. But it is not nearly the end of the Inquiry's work. In Churchillian terms, is it both the end of the beginning and the beginning of the end. The Inquiry still has a great deal of work yet to do, in writing its report and a series of processes to observe to ensure procedural fairness to anyone who may be affected by the Inquiry's findings.

In the immediate future the Inquiry will continue to assess the submissions and material received as it drafts its report. Once it has assessed and dealt with any submissions of Counsel representing, the Inquiry will complete its report in draft and provide relevant portions to any potentially affected entities, who will then have a reasonable time to respond in written submissions.

The Inquiry will then consider and deal with any such submissions. It will then consult with the families on all relevant aspects before presenting its report to the Inspector-General in accordance with our Directions. We presently anticipate that this will occur towards the end of this year. The

presentation of the report to the Inspector-General will be announced on the Inquiry website.

If, when and what parts of the Inquiry report are ultimately published is not a matter for the Inquiry. But families and relevant entities can be assured they will be informed before any publication.

Before Chairing this Inquiry, I had but a shallow understanding of the mighty contribution of our nation, voluntarily given, by the talented women and men of our armed services to keep the Australian community safe. All Australians should understand and honour this service. It has been a great honour of my life to Chair this Inquiry.

Learning of the lives, service and sacrifice of CAPT Lyon, LT Nugent, WO2 Laycock and CPL Naggs and witnessing the strength, courage and resilience of their families and their Military colleagues, friends and Commanders has been a unique privilege.

Of course this Inquiry cannot undo the loss of these four talented airmen or end the grief of their families and friends or lift the heavy burdens weighing on their Commanders, but my sincere hope is that our future report may salvage something positive from their ultimate sacrifice and the unfathomable grief flowing from it and that, through the implementation of our future findings and recommendations, there will be lasting positive change to make Army Aviation safer for those who serve.

Please close the Inquiry hearings.

PUBLIC INQUIRY CONCLUDED