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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

THE HONOURABLE M McMURDO AC
AVM G HARLAND AM CSC DSM

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

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SQNLDR M NICOLSON, representing D10
MS K MUSGROVE, representing the Commonwealth
MR S MEEHAN SC, representing Thales Group Australia
MR J PHILLIPS SC, representing Dr M Gavrilescu

1000, WEDNESDAY, 7 AUGUST 2024

DAY 14

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**	13/08/24	(Transcription)

EXHIBIT LIST

Date: 07/08/2024

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

WITNESS LIST

Date: 07/08/2024

Name Of Witness **Page No.**

MS McMURDO: Yes, COL Streit.

COL STREIT: Good morning, Ms McMurdo and AVM Harland. Just very briefly, a couple of housekeeping matters. First, the video link has been confirmed as working with Detective Inspector Novosel, who will commence – or recommence her evidence shortly. Just in relation to the two other witnesses that are listed today, I'll be requesting just a short adjournment after Detective Inspector Novosel's evidence to address a classification matter that Counsel for the Commonwealth has raised in relation to a witness who's been called next. Second, can I just briefly leave the lectern to allow Senior Counsel for Dr Gavrilescu to announce his appearance.

MS McMURDO: Certainly.

MR PHILLIPS: May it please the Inquiry, my name's Phillips and I sought leave and I was informed last week that I was granted leave to appear for Dr Gavrilescu today. She's here. She's in the building, waiting upstairs with her witness statement. And I just asked my friend to make sure that I was able to introduce myself and for you to know who I was and sitting here.

MS McMURDO: Thanks very much, Mr Phillips. I was going to announce the fact that you have been granted leave to appear in respect of Dr Gavrilescu this morning, or later this morning, before the witness was to give her expert evidence. Thank you.

MR PHILLIPS: That's much appreciated. Thank you very much.

MS McMURDO: Thank you.

COL STREIT: Thank you, Ms McMurdo. I call Detective Inspector Emma Novosel. Hopefully, with fingers and toes crossed, she'll appear shortly on the screen.

<DETECTIVE INSPECTOR EMMA NOVOSEL, on former affirmation

<EXAMINATION-IN-CHIEF BY COL STREIT, continued

COL STREIT: Detective Inspector, can you hear me?

DETECTIVE INSPECTOR NOVOSEL: I can, yes.

COL STREIT: Your solicitor is Madelyn Rologas. Can you hear me?

MS ROLOGAS: Yes, I can. Thank you.

COL STREIT: Thank you. Detective Inspector, the way that I propose to continue evidence is I'll briefly remind you where we left off in relation to your evidence more recently, back on 19 June. And I'll just read a little bit of the transcript so you have an understanding of where we are. Can I, just before I do that, confirm you have your statement before you, your redacted statement? Is that right?

DETECTIVE INSPECTOR NOVOSEL: I do, yes.

COL STREIT: Well, we'll refer to that again as we move forward. So transcript page T1136, commencing at line 14, I say this:

> *At paragraph 31 you say, "Additionally, 8.5.12 of the OMP provides that due to the complexity surrounding aircraft incidents, the QPS investigator should be an ATSB-trained, or seek advice from the ATSB as required." Can you just explain the effect of that part of the QPS Operational Procedures Manual?*

You say this:

> *So my understanding of 8.5.12 is that when there's a report that's been prepared for the Coroner and it's the result of an air crash, that the Forensic Crash Investigators should be involved and they should have some sort of ATSB training, or they should have engaged with ATSB.*

I say:

> *Was there anyone suitably trained, ATSB-trained, on your investigation team that you can recall?*

You say:

> *Not specifically. So Senior Sergeant Narelle Fox of the Forensic Crash Unit in Brisbane, she deployed Senior Constables Cook and Troeger to the Whitsundays for the response. And so I had assumed they were appropriately trained as per the OPMs.*

That ends the quote of the transcript. So do you understand where we left your evidence?

DETECTIVE INSPECTOR NOVOSEL: Yes, I do.

COL STREIT: Excellent. And if I could just take you to paragraph 30 of your statement, and 31. That's, effectively, in terms of the chronology, of where we arrived at. So just picking up on the last piece of evidence you gave the Inquiry before your evidence was adjourned to a later date, and in particular the qualifications of Senior Constables Cook and Troeger, did you later become aware as to whether or not they possessed qualifications to undertake an aviation crash investigation?

DETECTIVE INSPECTOR NOVOSEL: No, I'm not aware of their specific qualifications. But I did understand that both of those officers had experience in the investigation of fatal aircraft incidents.

COL STREIT: Can I take you to paragraph 32, please. You say there:

> *Section 8.5.13 identifies that where an ADF aircraft is involved, that the procedures for the investigation remain the same. Accordingly, Senior Constable Joe Cook and Senior Constable Chris Troeger from the Forensic Crash Unit were deployed to the Whitsunday to assist with the crash component of the investigation.*

And you say:

> *I understood that both of those officers were experienced in the investigation of fatal aircraft incidents.*

Can you just explain to me, or to the Inquiry, rather, your recollection of your engagement with Senior Constable Cook, first, during the course of the investigation that you were involved in?

DETECTIVE INSPECTOR NOVOSEL: So from my recollection, Cook and Troeger arrived at the Whitsunday maybe the day after I did, maybe the late – in the late afternoon of the day I arrived. I understand they had received some sort of a briefing from our local Forensic Crash Investigator, who had had to leave due to a family matter. So, essentially, they were involved in the briefings from when they arrived and we had ongoing conversations about where we were at with their investigation.

COL STREIT: Both of those Senior Constables, did they report to you directly?

DETECTIVE INSPECTOR NOVOSEL: No, they don't report to me directly. They report to – and I want to correct I did say it was Narelle Fox – it's Nicole Fox. She's the Senior Sergeant in Brisbane, and they report directly to her. But while they were in the Whitsunday, they were a part of that investigative response that I guess was allocated to me to look after or supervise.

COL STREIT: Can I just assist in reminding the Inquiry about some of your earlier evidence. So I understood some of your earlier evidence was to the effect that you had the responsibility for the investigation from a QPS perspective for the investigation of the crash of the MRH-90. And that another officer, then Acting Inspector Dyer, had responsibility from a QPS perspective to assist the ADF. Is that correct?

DETECTIVE INSPECTOR NOVOSEL: Yes. So I had responsibility for, I guess, the investigation component of the crash on behalf of the Central Coroner, Magistrate O'Connell. And Acting Inspector Dyer was in charge or had overall command, essentially, of the search and rescue and, later, recovery of the incident.

COL STREIT: That responsibility you had is simply, is it, a recognition of the effect of the Coroners Act, that the Coroner has the responsibility to conduct an investigation into the death of a person in the State of Queensland?

DETECTIVE INSPECTOR NOVOSEL: Yes. Where there's a – where the death falls into the parameters of a reportable death. And this crash fell into those parameters, yes.

COL STREIT: In that way, the Coroner utilises Queensland Police Service Officers to assist in the conduct of that investigation; is that correct?

DETECTIVE INSPECTOR NOVOSEL: Yes, that's correct.

COL STREIT: Queensland Police Service Officers have a responsibility to be responsive to the Coroner's requests and provide information to the Coroner about the progression of the investigation. Is that right?

DETECTIVE INSPECTOR NOVOSEL: Yes, that's right.

COL STREIT: The Coroner can provide Directions to Queensland Police investigators as to specific matters the Coroner may want addressed or investigated; correct?

DETECTIVE INSPECTOR NOVOSEL: Yes, that's right.

COL STREIT: You didn't have direct dealings with the Coroner; that's the Central Queensland Coroner. Is that right?

DETECTIVE INSPECTOR NOVOSEL: Yes, but that's nothing outside of the ordinary. We never have – or I never have direct contact with Magistrate O'Connell. We do it through a Liaison Officer, a Senior Sergeant.

COL STREIT: Is it your understanding that Senior Constable Cook was responsible for providing formal responses to the Coroner by way of particular supplementary forms?

DETECTIVE INSPECTOR NOVOSEL: Yes. As I understand, when Troeger and Cook deployed – and I'm not sure how that arrangement had been reached – but I was under the understanding that Senior Constable Cook would be responsible for the supplementary report to the Coroner in relation to the crash.

COL STREIT: Did Senior Constable Cook – we'll deal with him first. But did Senior Constable Cook raise with you, to your recollection, any concerns he had in obtaining assistance from the ADF in the conduct of his investigation?

DETECTIVE INSPECTOR NOVOSEL: So I guess if we break it down into two parts. There was the, I guess, component where Senior Constable Cook was on the ground in Whitsunday. I understand that there were some frustrations initially about the police trying to – or Joe – sorry, Senior Constable Cook, as an investigator, trying to obtain information in relation to the crash that we usually would have access to if it was not, I guess, a situation that involves the ADF.

I do understand that later Senior Constable Cook, after he'd left the Whitsunday and was preparing his report to the Coroner, which is due 28 days after the incident, that at the time of submitting that report to the Coroner, he was yet to receive any of the information that he had asked for to conduct his investigation.

COL STREIT: In your experience – I'll start again. How long have you been a Queensland Police Serving Officer as at July 2023?

DETECTIVE INSPECTOR NOVOSEL: So a sworn – sorry, July 2023, I would've been just short of being sworn in for 28 years.

COL STREIT: And in terms of that component, as a Serving Officer, what part of that component have you been engaged in criminal investigations?

DETECTIVE INSPECTOR NOVOSEL: Probably 20 years I have held investigative positions.

COL STREIT: And is that the same in terms of providing assistance to the Coroner in relation to fatalities in Queensland?

DETECTIVE INSPECTOR NOVOSEL: Sorry, I don't understand your question.

COL STREIT: So I asked you how long you'd been doing criminal investigations. Of course, the crash investigation is not a criminal investigation; you're facilitating assistance to the Coroner.

DETECTIVE INSPECTOR NOVOSEL: That's right.

COL STREIT: So my question is, how long have you been involved in QPS engagement in providing assistance to Coroners in respect of fatalities in Queensland?

DETECTIVE INSPECTOR NOVOSEL: Well, that's hard to say. That would depend on what jobs I'd been involved in early in my career. But certainly, in an investigative space, we often prepare reports to the Coroners where we can't determine – or where the matter is not criminal and we can't determine a prima facie case. So there'd be multiple times where I've been involved in or overseen a matter that's been referred to the Coroner.

COL STREIT: And in terms of those experiences and the provision of information to the Coroner in a timely fashion concerning a fatality investigation, were there any differences from your earlier experiences in doing that as against what happened in this investigation by QPS concerning the crash of the MRH-90?

DETECTIVE INSPECTOR NOVOSEL: So I think certainly my experience with this incident was different. It was the first time I'd ever been involved in an incident where there was a fatality that concerned a member of the ADF. Certainly, never experienced, I guess, delays like we were experiencing in this matter before.

COL STREIT: When you talk about delays, is there any particular delay of information you are referring to? So, for example, did it concern the delay in the ability to obtain witness statements?

DETECTIVE INSPECTOR NOVOSEL: Yes, that's one complaint.

COL STREIT: Based on your civilian experience, is there a level of importance attached to obtaining a witness statement to a fatality in terms of the best time to do that?

DETECTIVE INSPECTOR NOVOSEL: So certainly I think when we obtain a statement from a witness in relation to a fatal incident, whether it's a crash or otherwise, we always have to take into account the welfare of that witness. But certainly the sooner that you can provide or obtain an account from a witness the better it is. The incident is more fresh in their memory. They're more easily able to recall things that they observed or felt, whatever the information that we're trying to obtain. But certainly as soon as possible is the, I guess, best practice. But we have to work according to each individual incident that we attend because sometimes that's not practical.

COL STREIT: So it's a bit of a balancing act, is it?

DETECTIVE INSPECTOR NOVOSEL: It absolutely is, because we're trying to take care of the welfare of the people that are involved. Often, some of those witnesses have lost people who are very close to them. They've suffered traumatic expose to incidents that they're not used to. So it is a fine line. But it is always best to try and obtain those statements as quickly as possible.

COL STREIT: And is that because memory doesn't get better over time?

DETECTIVE INSPECTOR NOVOSEL: Yes, certainly. And that's my experience. I'm trained in the forensic interviewing of witnesses. And certainly, as time passes, memory can be impacted by any number of things and so it's always best practice to obtain it as soon as possible.

COL STREIT: And is another consideration where you're dealing with a fatality, where there might be multiple witnesses in relation to the fatality, is another consideration to ensure that there's not a risk of contamination of one witness's memory of events by having discussions or extensive discussions with another witness about the same matter?

DETECTIVE INSPECTOR NOVOSEL: Yes, certainly that's something that we try to avoid, if possible. Things like media, other people who are trying to offer them comfort or support can often taint someone's memory without intention too. So it's very important to try and – at least lock down. And when I talk about statements in this case, just a verbal account is something that we would've been happy with as soon as possible.

COL STREIT: If I use the term "group think", do you understand what that term – well, what do you understand that term means?

DETECTIVE INSPECTOR NOVOSEL: Well, I think that if people are around a certain group of people and they're talking about something that's happened, eventually you can, sometimes not intentionally, or intentionally, manipulate someone's recall of an incident.

COL STREIT: A person who's a witness or been exposed to a particular fatality discussing that with others who have had the same exposure runs the risk of having their memory contaminated by another person's memory of the event where there might be a gap. Is that fair?

DETECTIVE INSPECTOR NOVOSEL: Yes, that's fair.

COL STREIT: And so the welfare of the witness, of course, in relation to a terrible event needs to be taken into account. That's correct?

DETECTIVE INSPECTOR NOVOSEL: I think absolutely it does. It'd be unfair for us not to take into consideration a witness's welfare.

COL STREIT: And that needs to be balanced against the importance of getting that witness's best recollection of the event that they've observed to assist in the investigation.

DETECTIVE INSPECTOR NOVOSEL: Certainly.

COL STREIT: So you wouldn't expect, would you, a passage of months to pass before you received a witness statement from a witness to a fatality?

DETECTIVE INSPECTOR NOVOSEL: So I wouldn't expect – sorry, I'm not sure - - -

COL STREIT: So if a passage of months passed from the date of a fatality to when a witness produces a statement, that would not be ideal, would it?

DETECTIVE INSPECTOR NOVOSEL: Well, it's not ideal, but sometimes that's the best that we have. And certainly we will take a statement or account over no account. But again, best practice for us, and certainly in the view of the Coroner, we would obtain these accounts as soon as possible. Often, the Coroner is prepared to accept what the witness is going to say. So that will involve a verbal interaction as opposed to a typewritten, more formal style statement. And then the Coroner can make his decision – his or her decision based on whether or not they will seek a more formal statement or ask for more information from that witness.

COL STREIT: The Inquiry has received evidence to the effect that statements were provided by the Department of Defence to the Coroner from witnesses to the fatality crash at the end of November 2023. So some four months, approximately, after the crash of the MRH-90. That's not ideal, is it, given what you've said earlier about the importance of getting the best evidence from an eyewitness, even balancing a trauma-informed approach?

DETECTIVE INSPECTOR NOVOSEL: Certainly, it's not ideal. But obviously that's something that the Central Coroner had an arrangement with the ADF. I wasn't privy to that arrangement.

COL STREIT: Sure. Can I take you to paragraph 34 of your statement, please. At paragraph 34 you say the forensic response was led by Inspector Tania Spiteri. Did I pronounce her name correctly?

DETECTIVE INSPECTOR NOVOSEL: Yes, Tania Spiteri.

COL STREIT: Tania Spiteri, who holds the position of Central Region Forensic Manager. First, can you just explain what that position is, what it does?

DETECTIVE INSPECTOR NOVOSEL: So Tania – or Inspector Spiteri's responsibility is that she oversees all of the forensic specialist response across the central region. So whenever there's a major incident where there's a fatality or where there's some sort of specialist response required, Tania, or Inspector Spiteri, oversees that response. She's qualified. She's got scientific qualifications, and she manages those specialist police.

COL STREIT: Could I just take you now to paragraph 37, please.

MS McMURDO: Where was she based, Detective Inspector?

DETECTIVE INSPECTOR NOVOSEL: So she's based in Mackay.

MS McMURDO: Mackay. Thank you.

DETECTIVE INSPECTOR NOVOSEL: But she covers the whole central region.

MS McMURDO: Sure. Thank you.

COL STREIT: Can I just take you to your evidence which sits under the subparagraph heading, "What key actions QPS had already been engaged

in prior to my involvement". At paragraph 37 you identify that prior to your arrival at the Whitsundays, you were aware that QPS had been involved in the search and rescue response and that the search had included various assets, including both ADF and Volunteer Marine Rescue vessels. Is that correct?

DETECTIVE INSPECTOR NOVOSEL: Yes. Also, police vessels had been included in that search and rescue.

COL STREIT: Are you able to – you might not be able to, but if you can, can you assist the Inquiry in understanding what your knowledge was when you were briefed as to the role played by the Volunteer Marine Rescue?

DETECTIVE INSPECTOR NOVOSEL: So I'm not specifically right across how the VMR, or the Volunteer Marine Rescue, fit in to the search and rescue activities, but I know from experiences when there's some of incident that we require assistance that is offshore in the ocean, the VMR work closely with the Whitsunday Water Police, who look after our area of coastline, to assist with searches and rescues of people who find themselves in trouble or where there's other assistance that's required offshore.

COL STREIT: Do you know – and again, you may not be able to answer this question – but do you know whether QPS and the Volunteer Marine Rescue in the Whitsundays do any sort of joint training so that they have an appreciation of each other's processes?

DETECTIVE INSPECTOR NOVOSEL: I couldn't say at that time. VMR this year now comes under QPS, so I'm sure that there will be some sort of ongoing training. But I assume that they – they're well known to each other and they work closely together over a number of rescues offshore there. So I'm sure that they are well aware of each other's, I guess, procedures and what's expected of each agency in that space.

COL STREIT: Can I just take you to paragraph 40 and paragraph 41. At paragraph 40 you identify that you were briefed by Detective Sergeant Scells and DSC Carland, DSC Lozach and Senior Constable Webster. They'd attended the Proserpine Airport to obtain statements from ADF personnel involved in the exercise, but the ADF personnel had departed the airport prior to the statements being obtained and personnel returned to Sydney.

DETECTIVE INSPECTOR NOVOSEL: Yes.

COL STREIT: Who is giving you that information out of the members I've just identified?

DETECTIVE INSPECTOR NOVOSEL: So I spoke – so Detective Sergeant Scells, he's the Officer in Charge of Whitsunday CIB. So when I arrived, I spoke to DS Scells and he was the one that advised me that on the Saturday morning after the crash, that DSC Carland, DSC Lozach, and Senior Constable Aaron Webster from the local FCU had attended the Proserpine Air Base to speak to the ADF witnesses, I guess.

COL STREIT: Do you recall whether any of those members expressed – or what do you recall them specifically saying to you about this matter?

DETECTIVE INSPECTOR NOVOSEL: I recall that Scells had told me that it had been difficult to access the people that we considered to be witnesses and that when Carland and Lozach had arrived at the Proserpine Air Base where ADF members were stationed for TALISMAN SABRE exercise, that they found it difficult to access the people that ordinarily thought – we would ordinarily seek to obtain information from in a crash like this, and that they were ready to board an aircraft to return to Sydney.

COL STREIT: Did they mention whether they had engaged with any member of the Defence Force about the matter at that time?

DETECTIVE INSPECTOR NOVOSEL: So at that time, I wasn't aware that they had actually managed to speak to, I think it was three witnesses. I was told they hadn't been successful in obtaining statements and I later learned that they had had the opportunity to quickly speak with three members of the fourth aircraft, I understand – or fourth helicopter in the training exercise, just prior to them leaving on the plane. But there was – I learnt that a couple of days later.

COL STREIT: Sorry, something I should have said to you at the start of your evidence is your statement has been redacted in relation to certain individuals that have protected identity status and they have a pseudonym.

DETECTIVE INSPECTOR NOVOSEL: Yes.

COL STREIT: So if you need to identify who the pseudonym is, then please do so if that becomes relevant. At paragraph 41 you say:

> *I was advised that the arrangements had been made with ADF investigators to obtain statements from every member of the flight on 28 July 2023.*

First, can you just tell me, if you can, what arrangements had been made with which ADF investigator?

DETECTIVE INSPECTOR NOVOSEL: So I understand when I arrived at Whitsundays on Monday, 31 July, I think I've already given evidence that I received a briefing from DS Scells in relation to the activities that had been undertaken. I'd also been in contact with him by phone over the weekend because I was away in Townsville. He had advised me that there was a Liaison Officer from the Military Police. His name was Casey Theissen, I think. I don't know how you pronounce his surname.

COL STREIT: Theissen.

DETECTIVE INSPECTOR NOVOSEL: Theissen. Casey had been working closely with my team at Whitsunday CIB over the course of the weekend and I understood that it was him that had provided DS Scells with the information that those statements were going to be obtained and provided but that welfare protocols, ADF welfare protocols, existed around not being able to obtain those statements on the day, or on the day following, an incident like this.

COL STREIT: Have you ever received any information that explains just what ADF welfare protocols you were told existed as the reason why the witnesses were removed from Proserpine?

DETECTIVE INSPECTOR NOVOSEL: No, I haven't received any advice to that extent. But in an agency – well, in the QPS, I know we have welfare protocols, and so I wasn't going to question how the ADF were looking after their people after such a critical incident. I just accepted that those protocols were in existence when I was told that.

COL STREIT: Might welfare protocols – well, did you have an expectation that if ADF welfare protocols existed in some written form, they might also indicate when a witness might be available to give evidence at a point in time. For example, how long such welfare protocols needed to be in place.

DETECTIVE INSPECTOR NOVOSEL: If I'm honest, I didn't even – it didn't even cross my mind to ask that. We had been – and when I say "we", when I arrived in the Whitsundays and I met Casey Theissen, he told me that processes were underway to obtain the statements, and that they were going to be taken over the course of the next few days.

COL STREIT: If I understand your evidence correctly, the information you received from the ADF, including then PO Casey Theissen, was to the effect that welfare protocols were in place warranting the removal of witnesses from Proserpine, and not be interviewed by police at that time. That's the first point. Do you accept that?

DETECTIVE INSPECTOR NOVOSEL: Yes.

COL STREIT: And the second point is, you had an expectation that statements, or the obtaining of statements, that process was already in train in relation to those witnesses. Is that right?

DETECTIVE INSPECTOR NOVOSEL: Yes, it was my understanding that processes had already been put in place to obtain statements from those witnesses that we considered would be critical to the Coroner. I think in the following days I did clarify that because I think there was a misconception that we were – that this was a criminal matter, as opposed to us acting on behalf of the Coroner. When I say "us", QPS acting on behalf of the Coroner.

And so I did clarify in briefings, and with Casey, and later Lawrence O'Reilly, who relieved Casey Theissen, that we would be – that we just needed an account, that we didn't necessarily need a formal written statement. We just needed an account from those witnesses about what they would say, or what they observed, and if they wanted to take that – if those versions were obtained in an electronic format by way of a conversational piece, or it was a formal statement, we were happy to just get a version.

COL STREIT: Why would it matter if it was a criminal investigation?

DETECTIVE INSPECTOR NOVOSEL: Well, I think if people thought that we were conducting a criminal investigation, they may believe that they could be held at fault, or be subject to some sort of criminal charge.

COL STREIT: Sure. But the police have an obligation to disclose to a person they regard as a suspect when they're conducting a criminal investigation before they speak to them, don't they?

DETECTIVE INSPECTOR NOVOSEL: Absolutely. We have to provide people with their rights, with cautions and their rights, but at no time did we suggest that this was a criminal investigation, and at all times we – when I say "we", certainly I gave information to all of the ADF members that it wasn't a criminal investigation and we were acting on behalf of the Coroner, and we just needed an account, a version, of what the witnesses were going to say happened.

COL STREIT: Can you recall how quickly that matter was clarified and cleared up between QPS and the ADF? Was that simply just a discussion with PO Theissen that sorted that out?

DETECTIVE INSPECTOR NOVOSEL: Certainly, initially, it was with PO Theissen. I do recall Assistant Commissioner Kevin Gutteridge sat in one of the IC briefings that we had, and I specifically remember him addressing the group, which had a number of ADF personnel in it during that briefing, to clarify that this was not a criminal investigation and that we needed these accounts for the Coroner so that he could make a decision; based on where we were going to go with this investigation as far as releasing property back to the ADF, who was going to take carriage of the wreckage, things like that.

So because the crash happened in the shores off Queensland, the Coroner had jurisdiction over that, our Central Coroner, and it was up to him about when pieces of evidence or – not evidence, but property located, things like that, would be released. And having had conversation with Detective Senior Sergeant Lee, who was his Liaison Officer between us and the Coroner, he had indicated to us that it was the Coroner's scene, and the Coroner was waiting for versions, and that nothing was going to happen until he had what he needed to move forward. And so Mr Gutteridge did address everyone in the room to that effect.

COL STREIT: Again, not a memory test, but can you recall a date that might have – that occurred?

DETECTIVE INSPECTOR NOVOSEL: I can't. It would've been in the days – it was before CMDR Pont arrived to lead the task force, but yes, somewhere between.

COL STREIT: The evidence before the Inquiry is, if I remember correctly, GPCAPT Pont arrived about 3 August in Proserpine. So your memory is before he arrives at Proserpine, in any event, you recall Acting Commissioner – sorry, his last name again?

DETECTIVE INSPECTOR NOVOSEL: Assistant Commissioner Gutteridge.

COL STREIT: Apologies, Assistant Commissioner Gutteridge had given a briefing to assembled personnel, including ADF members.

DETECTIVE INSPECTOR NOVOSEL: Yes.

COL STREIT: And made plain that it was not a criminal investigation, it was QPS were assisting the Coroner.

DETECTIVE INSPECTOR NOVOSEL: Yes. And I think because people were very worried about the fact that, you know, detectives were involved,

and usually we investigate criminal offences, and so he was trying to bring the group together and say, "Look, we're not trying to trick you here. This is the process. This is what we need".

COL STREIT: At least from your perspective – I'm not wanting to put words in your mouth, so if you disagree with this, please say so – but at least from your perspective, the misconception by the ADF was clarified very early on in the investigation into the MRH-90 crash.

DETECTIVE INSPECTOR NOVOSEL: Yes, it would've been in those first couple of days after I arrived, if not before then.

COL STREIT: Can I take you to paragraph 43, please? You say that you are aware that on Saturday, 30 July 2023 Detective Sergeant Scells made a request to the ADF via PO Casey Theissen for information in relation to the incident that would form part of the Coronial investigation. Do you know what information was requested by Detective Sergeant Scells?

DETECTIVE INSPECTOR NOVOSEL: So I recall seeing that email. It was a request around personal details about people who'd been on the crashed aircraft, their flight data recordings, the outline of the exercise, or the mission, they'd been on, maintenance records of the aircraft. All the stuff that, I guess, from his – Detective Sergeant Scells is a very experienced investigator, and he would've had an understanding of the information that was sought from the Coroner. So it just would've been to gather an overall picture of the circumstances that found us to have a crashed aircraft, or crashed helicopter.

COL STREIT: Paragraph 45, can I just take you to that, please? You say:

> *I am aware that on Sunday, 30 July 2023 Detective Sergeant Scells made a further request to the ADF via PO Theissen for further information to be sought from witnesses whilst being interviewed by ADF investigators.*

So that appears to be your recollection of a second request made by Detective Sergeant Scells for further information. Do you know what that information request was about?

DETECTIVE INSPECTOR NOVOSEL: I'm sorry, I specifically can't recall at this stage, but I know that there was a lot of – there were a number of requests that were made through PO Theissen in his role as the LO, and at that time he was our point of contact as far as trying to facilitate obtaining the statements or the versions from the witnesses.

COL STREIT: Did Detective Sergeant Scells mention anything to you about any difficulty in getting access to any other information or documents, for example, that might be evidence in the QPS investigation?

DETECTIVE INSPECTOR NOVOSEL: I understand that Detective Sergeant Scells never received any of the information that he'd sought from PO Theissen in relation to this matter.

COL STREIT: Is it correct, at least to your knowledge, that very shortly after the crash the tents, et cetera, belonging to 6 Aviation Regiment at Proserpine Airport were packed up and the whole camp was dis-established?

DETECTIVE INSPECTOR NOVOSEL: I understand that all of the – yes, that the property belonging – especially to the victims was packed up, but certainly, yes, I'm not sure what the timeline was. But I don't think that – I can't recall. I think initially our people had access to some of that property, and we took possession of some mobile phones, I understand. But other than that, yes, it was packed up.

COL STREIT: From your experience in the conduct of investigations in assisting the Coroner, is that unusual, effectively, to have an area which might be relevant to the investigation and information relevant to the investigation essentially boxed up and taken away from police access?

DETECTIVE INSPECTOR NOVOSEL: Yes, it's unusual.

COL STREIT: And that would hamper the police investigation, I take it?

DETECTIVE INSPECTOR NOVOSEL: Yes.

COL STREIT: Particularly in relation to information that might not be recoverable.

DETECTIVE INSPECTOR NOVOSEL: That's true, yes.

COL STREIT: Did you become aware that there were whiteboards in at least one of the tents in relation to the conduct of the mission?

DETECTIVE INSPECTOR NOVOSEL: No, I wasn't aware that there was anything like that.

COL STREIT: Can I take you to your involvement in the crash investigation which commences at paragraph 48? But more particularly, can I draw your attention to paragraph 52 which deals with what happened

on 31 July from your experience? So you physically deployed to the Whitsundays on Monday, 31 July 2023; is that right?

DETECTIVE INSPECTOR NOVOSEL: Yes, that's right.

COL STREIT: And is that when you received a handover from somebody when you first arrived?

DETECTIVE INSPECTOR NOVOSEL: That's when I met with DS Scells and we had, I guess, a face-to-face conversation about what had gone on across the weekend. But most of the stuff – well, most – I shouldn't say "stuff" – most of the information I was provided, I was aware of already because we'd maintained phone contact over the weekend.

COL STREIT: At paragraph 54 you received some information as to who was the Officer in Charge of the exercise involving the crash of Bushman 83; is that right?

DETECTIVE INSPECTOR NOVOSEL: Yes.

COL STREIT: You didn't have any dealings with that particular officer though, did you, you yourself?

DETECTIVE INSPECTOR NOVOSEL: No, I didn't. No.

COL STREIT: Detective Sergeant Scells told you, didn't he, on 31 July 2023 that the investigators – QPS investigators, that is – had established that the pilot on the left-hand side of the fourth helicopter was an eyewitness to the crash, and that the pilot's statement, and three others, were pending. Is that right?

DETECTIVE INSPECTOR NOVOSEL: Yes. Yes, that's correct.

COL STREIT: At 55 you say you know that various supplementary reports were forwarded to the Central Coroner with respect to seeking Directions from the Coroner around obtaining statements from witnesses. Do you recall who provided you that information?

DETECTIVE INSPECTOR NOVOSEL: So, personally, I submitted some supplementary reports to the Coroner. So, like, when you – sorry, when you access the QPRIME record that relates to this crash – and QPRIME is our police reporting computer system – you can see who submitted, I guess, Supplementary Form 1s to the Coroner seeking Directions, or seeking information about how he wanted to proceed, I guess.

And in addition to that, there would've been Supplementary Form 1s about what the Coroner's expectations were as far as if we located human remains or any victims.

COL STREIT: Yes.

DETECTIVE INSPECTOR NOVOSEL: About whether or not he wanted four separate what we call a Form 1 – a Form 1 that relates to each of the victims or did he want them all put on one Form 1, because obviously the HR that we recovered wasn't yet identified. So they were the sort of things that we were asked initially of the Coroner about how he wanted to proceed.

COL STREIT: Now, a Coroner can issue – to your knowledge, in Queensland a Coroner can issue a Direction for a person to provide information to the Coroner, can't they?

DETECTIVE INSPECTOR NOVOSEL: Yes.

COL STREIT: So when you say at paragraph 55:

> *I know that various supplementary reports were forwarded to the Central Coroner with respect to seeking Directions from the Coroner around obtaining statements from witnesses.*

Is the Inquiry to understand your evidence in this way, and that is QPS were forwarding reports to the Central Coroner with respect to seeking his Directions to provide an authority to obtain statements from witnesses?

DETECTIVE INSPECTOR NOVOSEL: Yes.

COL STREIT: And that was necessary, wasn't, it, because the ADF – was that necessary because the ADF was not assisting in making their people available to provide statements?

DETECTIVE INSPECTOR NOVOSEL: Yes. And I think – and that was part of when Mr Gutteridge, AC Gutteridge, addressed the briefing and it was explained. And I explained a number of times to Casey that witnesses are well within their rights to, I guess, decline to give a version, but the Coroner can then issue a Direction that they will provide that information.

So that part of the Coronial process was explained to the ADF about the way forward and so I know that I, personally, had a number of phone calls with Detective Senior Sergeant Lee to explain the difficulties we were experiencing in obtaining these versions or securing the versions and, you know, trying to get his insight about whether the Coroner would issue a

Direction. We just didn't know what his plans were.

COL STREIT: To your knowledge, was there any response by the Coroner's Office to these supplementary reports seeking his Directions to obtain statements?

DETECTIVE INSPECTOR NOVOSEL: So we had submitted a number of, I guess, requests. But what was unusual and I'd never experienced before is that obviously the ADF had nominated a point of contact for the Coroner, and this changed at least twice while I was there. And I was contacted by the Acting Provost Marshal who had identified to me that the Chief of Defence had determined that he would be the primary contact with the Coroner.

And so I submitted a supplementary to the Coroner to advise these were the contact details of the Acting Provost Marshal, and I understand then that the Coroner communicated directly with the Provost Marshal about what he required. So that was unusual. I'd never experienced that before. But obviously I'd never been involved in an incident like this involving fatalities in an ADF exercise. So I assumed that the Coroner was happy with those arrangements because I didn't receive any other advice about – you know, from that point on.

COL STREIT: So, in your experience, pretty unusual for a Coroner in Queensland to have to take the step to, essentially, contact a senior person in the employment of an organisation where the four employees of that organisation were killed?

DETECTIVE INSPECTOR NOVOSEL: Well, I'd never experienced that before. And it was only after I forwarded the Provost Marshal's details via the supplementary report to say, "This is the person who's representing the ADF for any enquiries that you have around the statements or the versions and the way forward, and this is his number", and then, obviously, the Coroner contacted him.

COL STREIT: So, on the face of it, did you conclude, when you were given that information, the Coroner's Office had taken direct action in order to get statements which had not been facilitated by the ADF?

DETECTIVE INSPECTOR NOVOSEL: I can't say what action the Coroner took, but I do know that he was in contact with the Acting Provost Marshal because later I had a further conversation with that gentleman and he told me that he had been in communication with the Coroner.

COL STREIT: I'll just quickly take you to paragraph 81 of your statements.

It's a little bit out of sync, but given you referred to Acting Provost Marshal Shaw, at paragraph 81 you say:

> *On Friday, 4 August, I also had a phone conversation with Acting Provost Marshal Shaw who confirmed that he was communicating with Coroner Magistrate O'Connell. He also advised that 12 airmen had been issued with formal written advice from ADF Legal Division around a request for a version or statement for the Coroner. The airmen had been given until 8 August 2023 to determine their position and seek legal advice. The witnesses were provided advice that if they chose to decline, that the Central Coroner may issue a Direction compelling them to provide a statement.*

So that's your recollection of what Acting Provost Marshal Shaw told you on Friday, 4 August 2023?

DETECTIVE INSPECTOR NOVOSEL: Yes, that's my recollection. And that information is consistent with what we have provided to the ADF from the outset, that the Coroner may issue a Direction for a statement or version to be obtained, even if the witnesses chose to decline.

COL STREIT: Do you recall any additional information provided by Acting Provost Marshal Shaw in that conversation to the effect – or dealing with how long it was anticipated before the statements would be provided to the Coroner?

DETECTIVE INSPECTOR NOVOSEL: No, I - - -

COL STREIT: So he's telling you that, essentially, the aircrew had been given until 8 August 2023 to determine their position and seek legal advice. That's right?

DETECTIVE INSPECTOR NOVOSEL: Yes.

COL STREIT: But you don't recall whether the conversation dealt with the issue about when, reasonably, the Central Coroner could expect to receive written statements?

DETECTIVE INSPECTOR NOVOSEL: No, I think that from recollection, that after the conversation with the Acting Provost Marshal, and that the witnesses had been given until that date, that I just assumed that I would hear further if there was any more action that we were required to take. When I say "we", my investigative team.

COL STREIT: At paragraph 82, while we're dealing with this topic, you say, notably, Detective Sergeant Scells advised you on 6 June 2024 that he had not received any statements from the 12 airmen, or advice from the ADF that they had been provided directly to the Central Coroner. Is that correct?

DETECTIVE INSPECTOR NOVOSEL: Yes, that's correct. And I checked our QPRIME file and there were no statements attached. Usually, when a statement is obtained, or a version is obtained, from a witness in a matter like this, it's uploaded to the file so it's there. Again, this was a unique situation because I knew that the Coroner was in contact with the Provost Marshal. So it was unknown to me whether those statements had ever been supplied to the Coroner.

COL STREIT: So if they have been supplied to the Coroner, this Inquiry understands, by way of evidence, then they haven't been supplied to QPS?

DETECTIVE INSPECTOR NOVOSEL: No.

COL STREIT: Now, can I just ask you briefly about your knowledge of the preparation of a brief for the Coroner for the conduct of an investigation and inquest? First, do you have experience in either compiling or reviewing briefs prepared by QPS to be provided to the Coroner for an investigation or inquest?

DETECTIVE INSPECTOR NOVOSEL: Yes, I do.

COL STREIT: And standard documents that would be in that brief would be any statement from a witness that was relevant to the consideration of the potential causes of a fatality. Is that right?

DETECTIVE INSPECTOR NOVOSEL: Yes.

COL STREIT: So at least as of June of this year, if QPS were required to produce a brief to the Coroner for the purposes of the Coroner's investigation, or if he decides to conduct an inquest, the practical reality is that brief would be absent a substantive part of what would ordinarily be there, namely witness statements. Is that correct?

DETECTIVE INSPECTOR NOVOSEL: That's true, yes.

COL STREIT: Can I return back to paragraph 37, or can I take you to paragraph 37? We've dealt with the issue of the volunteer Marine Rescue and matters concerning the statements. One other question in relation to the involvement of the volunteer Marine Rescue: to your knowledge, did

anyone tell you as to whether or not any member of the volunteer Marine Rescue had collected human remains as a result of their involvement in the search and rescue of the investigation – sorry, as a result of the search and rescue task that they were given?

DETECTIVE INSPECTOR NOVOSEL: So I can't say for sure, but I'd be surprised if they did. I would assume that there were processes in place that if they're involved in a search and rescue and they identify wreckage or human remains, that they would call police to come and take possession of that. It would be unusual. I do know there were a lot of volunteer – a lot of people came out to help on that evening, local people, to assist in the search.

COL STREIT: Can I take you to paragraph 56, please? There, you say on Monday, 31 July 2023, you met various ADF Liaison Officers:

> *These included CMDR Dominic Cooper of the DFSB; PO Casey Tyson, ADF Investigator; and MAJ Scott Moon of Amphibious Operations.*

What was the purpose of meeting those members, if you can recall?

DETECTIVE INSPECTOR NOVOSEL: So those members were the, I guess, relevant Liaison Officers to the Command Room. I met a number of ADF personnel, but they were the people that I recall because I had the most dealings with those people throughout the time that I was deployed to Whitsunday.

COL STREIT: At paragraph 57 you say:

> *During the afternoon briefing, I provided an update in respect of human remains located that day and, in accordance with the police command log, it states I advised that six pieces of human remains had been located thus far.*

I won't identify those human remains, but I will indicate that HMAS *Brisbane* was involved in relation to that matter. Where you say you advised that "human remains had been located thus far", who do you recall providing you that information?

DETECTIVE INSPECTOR NOVOSEL: Senior Sergeant Ritchie Callaghan, who led the DVI response. He would've supplied me with that information. So that would've been part of the wrap-up of the day. Each agency provided an update about what had happened during the day, and so that was part of my briefing because I represented Senior

Sergeant Callaghan from the DVI component of the investigation. So that would've been my job, to brief to the collective Command, about what the outcome of the day had been.

COL STREIT: Can I take you to 1 August and paragraph 64 of your statement? You say in that paragraph that:

> *Senior Sergeant Simpfendorfer and Detective Sergeant Scells made contact with various policing jurisdictions across Australia to identify the locations and possible suitable next of kin for the purposes of ante-mortem interviews.*

DETECTIVE INSPECTOR NOVOSEL: Yes.

COL STREIT: Just in terms of a process, why is that step necessary?

DETECTIVE INSPECTOR NOVOSEL: So I'm not a DVI specialist, but Senior Sergeant Simpfendorfer – I guess because it's such a crucial and difficult qualification, there's members across Australia from multiple jurisdictions that are trained in that DVI component. And when there's an incident like this, where I guess we cross jurisdictions, our local Queensland DVI-trained specialists will reach out to their colleagues across the nation to seek assistance for those ante-mortem interviews. I understand they're fairly specific, they're conducted by people who are trained in that DVI space.

We knew that the victims were from predominantly New South Wales, but I can't recall if some were further. We reached out to those colleagues outside of our jurisdiction to assist with those interviews.

COL STREIT: Can I take you to 2 August at paragraph 66 of your statement? On Wednesday, 2 August 2023, you say you met SQNLDR Lawrence O'Reilly from the Joint Military Police Station. He had received PO Theissen and became the LO for the Military Police.

DETECTIVE INSPECTOR NOVOSEL: Yes.

COL STREIT: Did SQNLDR O'Reilly explain or say anything as to why he was now the point of contact for Joint Military Police?

DETECTIVE INSPECTOR NOVOSEL: I don't recall that I got a specific explanation, just that Theissen had been relieved and he was now assisting O'Reilly. But O'Reilly was to be the point of contact for the Military Police from that time on, and he attended all of the morning and afternoon

briefings as they were scheduled, in Casey Theissen's place, and I didn't see Theissen again.

COL STREIT: You say at 68:

> *The purpose of the meeting was to obtain expert advice from the DFSB team around the recovery, preservation and extraction of the flight data recorder and information recorded in it, so that the information could be presented to the Central Coroner.*

Is that correct?

DETECTIVE INSPECTOR NOVOSEL: Yes.

COL STREIT: When you say "so that the information could be presented to the Central Coroner", can you just explain what you mean in terms of timing, as to when it was anticipated that information would be presented?

DETECTIVE INSPECTOR NOVOSEL: Do you mean to the Coroner?

COL STREIT: Perhaps if I rephrase. The purpose of the meeting was essentially to seek information from the DFSB team around the recovery, preservation, extraction of the flight data recorder. That's the first aspect. Is that right?

DETECTIVE INSPECTOR NOVOSEL: Yes.

COL STREIT: And the second aspect was to facilitate that information from the flight data recorder, if and when recovered at that time, that the information could then be presented to the Coroner. Is that correct?

DETECTIVE INSPECTOR NOVOSEL: Absolutely. We accepted – when I say "we", the QPS accepted from an early stage that the DFSB members, CMDR Cooper and his team, were the experts with respect to the flight recorder. We'd had a number of conversations with them about how they thought that that should be preserved in order to retain the flight – if it was recovered, to be able to recover the crucial data that may give some insight into what was a contributor to the crash.

So the purpose of that meeting – because again at that point in time I don't think that – or especially CMDR Cooper did not understand the process, that the Coroner was the person who essentially owned that wreckage and owned that flight recorder if it was recovered, and that we were trying to work with them to get an understanding of what needed to happen.

Best practice, absolute, you know, what they wanted and how they wanted it to be managed, so that if we did recover it, we'd done everything, practically, to preserve that piece of evidence, but also so that the Coroner had – was well aware of the processes that were going to be undertaken so that he – again, because it was his investigation, to make sure that he consented to those processes and was happy for what had been proposed by the DFSB to occur.

So that's the purpose of that meeting. It was just they were the experts and we were trying to – Cook and Troeger were involved in that meeting as well. We just wanted to make sure that we gave them absolute opportunity, free rein to say, "This is what we need to preserve this evidence and this is – Magistrate O'Connell, this is what we need from you to say that we can do it". So that was the purpose of that meeting.

COL STREIT: Is your recollection that it was intended, if and when the data was recovered – ultimately, at that point in time, it had not been recovered, the flight data recorder. But was it intended that if that data was recovered, that the DFSB would provide the data from the flight data recorder to the Coroner as part of the Coroner's investigation?

DETECTIVE INSPECTOR NOVOSEL: Yes, I understood, that that was the case. I think – and part of that meeting – it was a pretty robust meeting, but it was trying to get CMDR Cooper's team to understand that when we recovered that item, that even though it was an ADF item, it belonged to this crash investigation and that they couldn't just take it without the Coroner giving his consent. And that we just needed to be able to outline to the Coroner what processes were going to be undertaken. And that the Coroner would want – or that the investigation would need the data that – if that recorder was located, which it was, that that data would be supplied to the Coroner.

COL STREIT: When you say there was robust conversation, what do you mean?

DETECTIVE INSPECTOR NOVOSEL: It was trying to get our point across about where, again, the Coroner sat in this investigation, and how important it was to comply with his Directions and that we needed to provide him with as much information as possible to achieve that. I think it was just more it was us – when I say "us", it was me and Cook mainly. Troeger didn't take too much of a – he was involved in the conversation, but it was led by Cook and myself, just trying to explain the importance of what we were asking them to do and why we were trying to – but it wasn't a futile exercise. We understood that they knew what they needed to do,

and we weren't questioning the processes. We just needed them to document it for us, so that we could supply that advice to the Coroner.

Again, a misunderstanding I think about the role that the Coroner played in this incident.

COL STREIT: So was the robustness of the conversation and the misunderstanding, essentially was the – your observation of the matter was that the ADF position was, "The flight data recorder is ours. We don't have to give it to you", and you're effectively telling them, "Yes, you do, because it forms part of the Coroner's investigation and the Coroner owns the wreckage"? Is that a fair summary?

DETECTIVE INSPECTOR NOVOSEL: That's a fair summary, yes.

COL STREIT: Can I take you to paragraph 71? You say:

> *Around midday on Wednesday, 2 August 2023 I spoke with the Acting Provost Marshal Sandy Shaw by telephone. He told me that the substantive Provost Marshal, GPCAPT Terry Lewis, was on leave and that he was performing the Provost Marshal role. Acting Provost Marshal Shaw told me that the Chief of Defence had directed that the Provost Marshal would be the sole ADF contact for the Coroner. I subsequently raised a supplementary to the Central Coroner with that information, including contact details for Provost Marshal Shaw.*

Just in relation to that, when you say you "raised a supplementary", what does that mean?

DETECTIVE INSPECTOR NOVOSEL: So that's just a supplementary report via our QPRIME information system to the Coroner to say, "This is your point of contact". So it's a typewritten report that electronically gets sent to the Coroner.

COL STREIT: At paragraph 73 you say:

> *On Thursday, 3 August I met GPCAPT Jason Pont. He told me he'd been appointed the Commander of JTF1116, which I understood was the ADF Joint Task Force responsible for the ADF response to the ongoing search, recovery and investigation. He became my point of contact with respect to any ADF activity, information sought or investigative matter.*

I just pause there. Your statement deals with your subsequent engagement with GPCAPT Pont over time. But in short compass, can you just explain your engagement with GPCAPT Pont and whether that changed anything in relation to the QPS engagement with the ADF?

DETECTIVE INSPECTOR NOVOSEL: So I think certainly once Jason Pont arrived and explained that he was essentially the overall Commander for the response to this incident, the ADF response, things became – I guess it was easier – not that it had been difficult. That's probably the wrong word. But things became more smoother, I guess. Because if we needed something to happen, I would explain it to Jason and Jason would go and come back to me and say "Yes" or "No", "that can or can't happen". Certainly we had one point of contact, whereas previously we were dealing with Casey, and Dominic Cooper, and Scott Moon. There were a whole lot of representatives that didn't seem to be coordinated by one person.

And I'm not saying that we were – if I want to say – so the QPS from the outset, it was very evident that I was in charge of the investigation. Adam Dyer was in charge of the total. He was, I guess – for want of a better word – the overall Commander as far as the search and rescue and the recovery and the overall, I guess, logistics and everything. That was his responsibility. I guess there was no second-guessing for us who was in charge and who made those decisions up until when Jason arrived.

When Jason Pont arrived, it was a bit – there were a lot of people that had their finger in the pie, and it became much easier once Jason arrived.

COL STREIT: I'll just take you to paragraph 86, which deals with events on 5 August. You say:

> *On 5 August I received advice from the Central Coroner which advised that the recovered MRH-90 helicopter parts may be released to the ADF and the FDR. That is to be provided to the ATSB specialist to retrieve the recorded information from it.*

And I pause there. So ATSB, is that the Aviation Transport Safety Bureau?

DETECTIVE INSPECTOR NOVOSEL: Yes.

COL STREIT: So that's the civilian organisation that conducts investigations into matters concerning aircraft, including aircraft accidents; is that right?

DETECTIVE INSPECTOR NOVOSEL: Yes.

COL STREIT: This, what you've said at paragraph 86, reflects that the aircraft wreckage and the flight data recorder is to be provided to the ATSB specialists. When did the ATSB become involved, to your knowledge, in the investigation?

DETECTIVE INSPECTOR NOVOSEL: And I'm unable to recall the name of the ATSB representative, but when I first met CMDR Dominic Cooper and his DFSB team, there were probably three or four people but I know that there were ATSB representatives in that team. So they deployed early and they were involved with the DFSB.

COL STREIT: Do you know why the wreckage and the flight data recorder were to be provided to the ATSB specialists instead of the DFSB?

DETECTIVE INSPECTOR NOVOSEL: It may well have been to be supplied to the DFSB; I'm not sure. I'm surprised to – I'm not surprised, because it's my statement. But it may well have been provided to the DFSB. I know that the Coroner issued – so following that meeting that I had with Cooper and his team with Cook and Troeger, CMDR Cooper did supply me with the outline of everything they needed to happen.

I submitted that to the Coroner and then the Coroner came back with his Direction to essentially say "Yes, once we recover this – if and when we recover the flight recorder, yes, we're happy for you to undertake these processes you've outlined". So that all came back and, from memory, I probably thought it was the DFSB but I have written in my statement "ATSB". But they were working collectively together on this.

COL STREIT: Sure. And I think you deal with that at the start of your statement as well in terms of your first meeting.

DETECTIVE INSPECTOR NOVOSEL: Yes.

COL STREIT: Observing ATSB personnel in a meeting.

DETECTIVE INSPECTOR NOVOSEL: Yes.

COL STREIT: But I thought I would just seek your further clarification of that matter at paragraph 86.

DETECTIVE INSPECTOR NOVOSEL: There were a lot of people involved that came and went, but CMDR Cooper was the constant in that DFSB/ATSB space.

COL STREIT: Can I take you to paragraph 90? Same day, 5 August 2023, you say:

> *The QPS group were advised by CMDR Post that there was no capacity for the ADF to share the footage, and that a formal request needed to be made by the Central Coroner.*

So your reference to footage there is a reference to video footage obtained by a submersible craft; is that correct?

DETECTIVE INSPECTOR NOVOSEL: Yes. By a ROV that was deployed by the ADF, I understand.

COL STREIT: And did CMDR Post explain to you why there was no capacity for the ADF to – apart from as a bold statement, "We're not going to give it to you", did he explain why there was no capacity for the ADF to share the footage absent a Direction from the Coroner?

DETECTIVE INSPECTOR NOVOSEL: No, he didn't explain that. And I don't want to say he said, "No, we're not going to give it to you", but essentially that was the conversation. They're not the words that he used. But I understood, without a doubt, that we were not going to get our hands on that footage. It was footage that we were not even aware of before a representative of the ADF conducted a media conference, I think on – that that footage had been obtained on 2 August.

The media conference was on 3 August and to, certainly my surprise, but I know to Superintendent Paine, my immediate supervisor's surprise, that the representative of Defence referenced a footage that they obtained from a ROV, which was something that had not been shared with the QPS or the investigative team, or anyone who was working in the IC, that that had been obtained or was in the possession of Defence.

COL STREIT: In the conversation – and only if you recall – but did CMDR Post say anything along the lines of whether the decision was essentially beyond his pay grade; it had been made by somebody else? He was just communicating what the position is, or anything to that effect?

DETECTIVE INSPECTOR NOVOSEL: No, he didn't say that, and I didn't ask. Yes, that had been a difficult day between the two agencies trying to – for the QPS to seek access and view that footage. There seemed to be a number of hurdles in relation to that, and that was the first day. I'd only met CMDR Post briefly but – yes, and I was introduced to him by Pont. So, yes, he didn't explain why we couldn't have it.

COL STREIT: Paragraph 91, you recall some further things that CMDR Post, you say, told you. Last sentence of paragraph 91, you say:

> *We were also told that the recovery of the flight data recorder and sensitive equipment, such as weaponry component, also remained a priority.*

DETECTIVE INSPECTOR NOVOSEL: Yes.

COL STREIT: What did you understand from what the ADF had told you as to what was the priority for recovery of items, including human remains?

DETECTIVE INSPECTOR NOVOSEL: So I understood that the recovery of human remains was a priority for the ADF, as was the recovery of the flight data recorder and the weaponry systems that were on or around that aircraft that was crashed. Yes, and I think that that conversation came about because they were seeking the advice of Senior Sergeant Ritchie Callaghan, who is an expert in the area of, a leading Police Officer in the area of FTDI/MTDI, and they were seeking information from him about how long remains could possibly be sustained at that depth of water with all of those currents and things like that.

And so there was talk around recovery of the FDR and the weaponry system. But certainly there was advice around having to have consultation with the families of the victims because they weren't sure that they had – when I say "they", the ADF weren't sure that they had capability to recover the wreckage.

COL STREIT: Conversation in relation to the recovery of human remains from Senior Sergeant Callaghan, was anything to the effect of the longer human remains remained in the water, the less likely it would be to recover human remains?

DETECTIVE INSPECTOR NOVOSEL: Yes. And that's due to a number of factors. You know, you have the weather and the marine life and currents and things like that. And, from memory, Senior Sergeant Callaghan explained to the best of his knowledge. But, from my recollection, I think he also gave an undertaking that he would seek advice from marine specialists and whatnot.

COL STREIT: We understand, and the Inquiry has received evidence that on occasions the weather was particularly difficult and prevented dive operations. Is that your understanding?

DETECTIVE INSPECTOR NOVOSEL: The weather was difficult.

Unusual for that time of year at the Whitsundays, but certainly there were a number of days where the ADF and the QPS divers were going to work together to try and go down to the wreckage and recover what they could, or get a more accurate, I guess, view of what was presented down there. And there were a number of times where it was just too dangerous for the ADF divers, or the police divers, to go down.

COL STREIT: Can I take you to paragraph 105, 7 August? You say that:

> *Monday, 7 August I chaired the 0730 hours briefing. All agencies were present. Acting Inspector Dyer was also present for the briefing. Following the 0730 hours briefing, I completed a handover with Acting Inspector Dyer and he resumed the PFC position with respect to the QPS involvement and assistance, and the ongoing recovery.*

First, what does PFC stand for?

DETECTIVE INSPECTOR NOVOSEL: So that's the Police Forward Commander.

COL STREIT: Thank you. At paragraph 106 you say:

> *Following the handover to Acting Inspector Dyer, I returned to Mackay.*

Did that conclude your involvement in the investigation upon your return to Mackay?

DETECTIVE INSPECTOR NOVOSEL: Substantially, it concluded my involvement. I continued just to receive briefings. I think Constable Cook sent me his 28-day supplementary report from the Coroner. But certainly after I left Whitsunday, I didn't have any further contact with any ADF members. And after Senior Constable Cook submitted that supplementary, there was no further advice that I received from the Coroner that indicated that he was seeking anything else from the QPS, which led me to understand that he was working directly with Defence.

COL STREIT: Can I take you to paragraph 111, where you deal with contact with next of kin.

DETECTIVE INSPECTOR NOVOSEL: Yes.

COL STREIT: Paragraph 112 – well, 111 you say:

I did not have any contact with next of kin.

DETECTIVE INSPECTOR NOVOSEL: No.

COL STREIT: At paragraph 112, you say:

> *I'm not aware of the arrangements made between QPS and the ADF with respect to notification of the next of kin and family of the aircrew of the crashed MRH-90. It was my understanding that ADF had provided notification to the next of kin of victims of the incident and had appointed Welfare Officers to provide ongoing advice and support for ADF families.*

Do you recall who provided you that information?

DETECTIVE INSPECTOR NOVOSEL: No, I don't recall who provided me that information, but I accepted that that was the case. Like, our organisation, that's my experience, if a member is hurt or injured or worse-case scenario, killed, we would certainly deliver that message to the next of kin, and we would appoint Welfare Officers to ensure that their needs are looked after. I didn't think that there would be any – I had no reason to think that the ADF wouldn't have done that, or it would be any different.

COL STREIT: At paragraph 113 you say:

> *I am aware that Detective Sergeant Scells had contact with Mr Daniel Nugent, who was the father of LT Max Nugent. This contact was to seek assistance in relation to the PIN number on his son's phone to enable forensic examination of the telephone for the Coronial component of the investigation. I am aware that Mr Nugent did not know the PIN number and was not able to assist in that regard.*

Is that right? That's your recollection?

DETECTIVE INSPECTOR NOVOSEL: Yes, I think Mr Nugent supplied a number of possible PIN numbers but they weren't successful for us to gain access to the phone.

COL STREIT: Do you have any further knowledge about any actions taken by Detective Sergeant Scells in relation to trying to gain access to Max Nugent's phone?

DETECTIVE INSPECTOR NOVOSEL: So another officer who is trained in the, I guess, forensic extraction of mobile or digital devices such as that, I understand that they may have attempted to gain access to the phone, but I recall that the phone may have had software that was more advanced than the kit that we had on hand at the Whitsunday Station and that we weren't able to gain access. Then there was later an order – or the ADF sought an order from the Magistrate to return those phones to the family.

MS McMURDO: Did you know that Mr Nugent, LT Maxwell Nugent, had a partner and was there any attempt to contact the partner to find out the mobile phone PIN number?

DETECTIVE INSPECTOR NOVOSEL: I'm not aware of that, ma'am.

MS McMURDO: Okay, thank you.

COL STREIT: Are you aware of the state of the phone that was subsequently sent to Mr Daniel Nugent?

DETECTIVE INSPECTOR NOVOSEL: No.

COL STREIT: Can I take you to paragraph 119 and the matters you identify there, and this is the last part of your statement. It deals with challenges with respect to the investigation. We've addressed some of these matters earlier in your evidence. You say at paragraph 119:

> *Any investigation involving the death of a person is protracted and complex and requires professionalism, patience, commitment, expertise, and empathy. In my 29 years of policing experience, I have been involved in and responsible for homicide investigations, fatal crashes, accidents, unexplained deaths, and sudden deaths. It is my experience that such investigations are always difficult, presenting unique challenges that need to be overcome by investigative teams.*

You then list at paragraph 120, five points about the very challenges in the conduct of the investigation. I won't read them out, but I will simply ask if you could refer to them and just explain those matters.

DETECTIVE INSPECTOR NOVOSEL: So I think from the outset the location and the nature of the crash, and the difficulty surrounding the recovery of the victims, multiple agencies involved. So that certainly was one of – was a big challenge that I saw. The second is – and I've already given evidence, I guess, to this effect to a certain extent – but certainly the understanding between the QPS and the ADF over who owned the

investigation or who was responsible for the investigation. Not so much the recovery part of it; I think we worked well in that recovery space. We all had the aim to try and (a) recover the victims, (b) return them to their families as best as we could.

But certainly in that investigation space there was some difficulties, and it leads into the next point that I made, that a lack of understanding by the ADF, or perhaps of the procedural awareness, or a lack of acceptance that the Queensland State Coroner and his delegates, or our Central Coroner, had jurisdiction over deaths in Queensland. And because this crash had occurred off the waters of Queensland, it fell into our Coroner's jurisdiction. I think that was a big drama, or a big issue early on. I think we got there in the end and people understood that certainly it was a bit of a barrier to start.

Certainly, the fact that I think – and without being critical, but the Defence went into the mode of protecting their people, which is understandable, but in this space not understanding that we were conducting an investigation on behalf of the Coroner and that it wasn't a criminal investigation and we were simply representatives of him. And it was just really difficult not to have – be able to obtain those versions and the statements and the information that we sought. It was a real barrier.

And I think also the fact the confidentiality around matters that are concerned with the entire TALISMAN SABRE exercises, that obviously is privileged information and it was difficult for us to get information around that. Also, the fact that various ADF assets had been deployed at the scene, – for example, the ROV – without our knowledge. Yes, it was difficult.

COL STREIT: You say at paragraph 121 that the noted challenges were able to be overcome, albeit some more easily than others, and that the establishment of the JTF1116 was crucial to resolving many of the challenges encountered in the infancy of the joint agency response and investigation. Communication between the ADF and QPS was enhanced following the arrival of GPCAPT Pont and the JTF1116 team. Is that correct?

DETECTIVE INSPECTOR NOVOSEL: Yes.

COL STREIT: At paragraph 122 you say:

> *As the officer responsible for the coordination of QPS investigative response to the MRH-90 crash, my task was to coordinate specialist QPS expertise, working in a collaborative partnership with the ADF to search for and recover the MRH-90, whilst*

prioritising the repatriation of four airmen who tragically lost their lives in the service of their country. A strong, transparent relationship built on trust in collegial spirit between the QPS IC team and the JTF1116 was instrumental in achieving this outcome.

Looking to the future and having regard to your experiences over that short space of time in relation to the investigation of the crash of the MRH-90, is there anything you think would assist this Inquiry contemplate by way of recommendation to better improve the relationship between – well, to facilitate a better relationship between the ADF and QPS; noting that there are many ADF bases in Queensland?

DETECTIVE INSPECTOR NOVOSEL: Yes. So certainly I just want to reiterate that it wasn't the relationship between the QPS and the ADF in this instance. While at times it was strained, we maintained a really strong working relationship, collaborating with the same aim to repatriate those airmen, and also to recover the wreckage and establish what had gone wrong.

Certainly I think, from my point of view, if I ever found myself – hopefully not – in the same circumstances where I was involved in an ADF fatality, that I would be seeking – I would hope that a task force was stood up earlier, and that we had one single point of contact, and that there was a much stronger understanding of what the Coroner's role in Queensland is. I'm not sure about other jurisdictions, but certainly in Queensland it's important that the ADF understands that we come under the jurisdiction of the State Coroner, and what all of our roles are. I think that was a big problem.

COL STREIT: Thank you, Detective Inspector. That's my questions, Ms McMurdo.

MS McMURDO: Yes, thank you, COL Streit. Any applications to cross-examine? Yes, Ms Musgrove.

<CROSS-EXAMINATION BY MS MUSGROVE

MS MUSGROVE: Detective Inspector Novosel, my name is Musgrove, and I appear for the Commonwealth. Can you hear me okay?

DETECTIVE INSPECTOR NOVOSEL: Yes, I can.

MS MUSGROVE: Thank you. I just have a few questions for you. You were asked some questions in relation to your experience in liaising with ADF in investigations. That's correct?

DETECTIVE INSPECTOR NOVOSEL: Yes.

MS MUSGROVE: And you hadn't had previous experience liaising with the ADF in investigations of this nature, had you?

DETECTIVE INSPECTOR NOVOSEL: No.

MS MUSGROVE: So it was a learning experience for you as well, to be dealing with the ADF.

DETECTIVE INSPECTOR NOVOSEL: Absolutely. It was a learning experience, I think, for both sides. In the Mackay/Whitsunday District, we haven't experienced an incident like this before, and certainly there were a lot of, I guess, lessons that we learnt. But certainly, yes, it was my first experience.

MS MUSGROVE: Thank you. You were asked some questions in relation to the tent at the Proserpine Airport being broken down, and there may have been evidence in there. Do you recall those questions?

DETECTIVE INSPECTOR NOVOSEL: Yes.

MS MUSGROVE: You said that it was unusual in the circumstances. You hadn't come across it before.

DETECTIVE INSPECTOR NOVOSEL: Well, as I've said, this was my first experience with the ADF. It did seem a little unusual, the haste in – to me, with – the haste in which the – because potential witnesses were moved away from us or, you know, sent home. I understood that was welfare-based, but certainly – and then, I guess, not accessing the tents, or whatnot, certainly was different.

MS MUSGROVE: Were you aware that on 29 January (sic) 2023 – so this is before you've actually come down to the Whitsundays – that this is the evidence from - - -

MS McMURDO: That is 29 July.

MS MUSGROVE: July, my apologies. PO Theissen, at the time, has given evidence that about 1.15 pm on 29 July 2023 he attended the non-Defence

Training Area adjacent to Proserpine Airport, and there engaged with members of the Queensland Police Service. Were you aware of that?

DETECTIVE INSPECTOR NOVOSEL: Yes. I understand that the investigators, Lozach and Carland – and Aaron Webster was the FCU – that they'd liaised – that they'd gone to that area. And I can't recall if I knew that PO Theissen was there as well, but I knew that those three members had definitely gone to the campsite on that Saturday.

MS MUSGROVE: Were you aware that PO Theissen had actually quarantined some evidence, some personal effects, of the aircrewman and also evidence within the Command tent at that time?

DETECTIVE INSPECTOR NOVOSEL: I'm not - yes, I'm not specifically aware that that's what he did, but I know that obviously we did recover – there were mobile phones recovered from the personal property of some of the victims. So I would assume that by that – I guess the fact that we had those phones, that some sort of search had been undertaken or that someone had provided those phones to us.

MS MUSGROVE: So you are probably not aware then that after quarantining that material and maintaining a picket, that PO Theissen then handed that area and that material over to QPS for their investigative purposes.

DETECTIVE INSPECTOR NOVOSEL: Yes, I'm not aware of that; I didn't know.

MS MUSGROVE: But obviously that would be appropriate if QPS are there to investigate.

DETECTIVE INSPECTOR NOVOSEL: Yes.

MS MUSGROVE: That the ADF, through PO Theissen, has actually provided them access to that area, and that evidence, for them to then carry out the investigations that they require.

DETECTIVE INSPECTOR NOVOSEL: Yes, certainly I'm not aware of any issues that were raised in that space. It was just access to the witnesses.

MS MUSGROVE: Thank you. I have no further questions.

MS McMURDO: Thank you. Any other applications to cross-examine? COL Gabbedy.

<CROSS-EXAMINATION BY COL GABBEDY

COL GABBEDY: Thank you, ma'am.

Detective Inspector, my name is COL Nigel Gabbedy. I appear for MAJGEN Jobson, the Commander of Army Aviation. I've just got a few short matters for you. You were talking in the start of your evidence about the statements that were required from members who were present at the time. Do you recall that?

DETECTIVE INSPECTOR NOVOSEL: Yes.

COL GABBEDY: And I believe your evidence was that those statements would be voluntary unless a Direction was issued from the Coroner.

DETECTIVE INSPECTOR NOVOSEL: Yes.

COL GABBEDY: And that what QPOL was looking for was simply an account; there was no requirement for any formal statement to be taken.

DETECTIVE INSPECTOR NOVOSEL: So I think initially that was part of the confusion. When we were saying we needed statements, statements can come in many forms and can include just a verbal account. I think that was part of the problem that we had. It had been misinterpreted that we were looking for typewritten statements. And, in fact, I know I later learned that we did obtain three verbal versions from three witnesses prior to them leaving Proserpine.

COL GABBEDY: When you say "it was misinterpreted", misinterpreted by whom?

DETECTIVE INSPECTOR NOVOSEL: I couldn't say, but that was part of Mr Gutteridge's – AC Gutteridge's clarification, and my clarification with PO Theissen, that we just needed a version. It didn't need to be a typewritten statement; that they could supply it however they wanted. We would submit that to the Coroner, and then he would make a determination about whether or not he wanted more questions. So he'll issue what he calls a "directive investigates", not a "directed statement".

He tells us the points that he wants covered, and we would go back to that person and obtain that information. So I was essentially trying to just obtain that initial version, whether it had been via a conversation, typewritten statement or however – whether it was even a written account that was

provided, a handwritten account provided by a witness. We were just looking to get an account.

COL GABBEDY: That makes sense. And that was made clear to PO Theissen, you say.

DETECTIVE INSPECTOR NOVOSEL: I thought it was clear. Yes, I thought that he understood what we meant. And certainly Mr Gutteridge reiterated that when he addressed the whole IC briefing. And possibly I revisited that with Lawrence O'Reilly, who took over from Theissen.

COL GABBEDY: And certainly what you were saying then, as I understand it – and tell me if I'm wrong – is that there wasn't a need for a formal statement. There wasn't a need, for example, to sit down with a Queensland Police Officer or an ADFIS member and give a statement; a statement from a member giving their account would be sufficient.

DETECTIVE INSPECTOR NOVOSEL: We would've been happy with that, and then it was up to the Coroner to make a determination about whether he wanted it in a more formal statement, or more information.

COL GABBEDY: Were you aware that – and I'll get the member's rank – I think it's Senior Constable Scells.

DETECTIVE INSPECTOR NOVOSEL: Luke Scells is the DS. Senior Constable Carland.

COL GABBEDY: So it was Luke Scells. So Detective Sergeant Scells, were you aware that he provided PO Theissen with a list of 13 questions that contained the information that he felt QPOL would require?

DETECTIVE INSPECTOR NOVOSEL: Yes. I gave my evidence earlier on that. Yes, I knew that there was an email with a list that Luke Scells had prepared and gave to Casey Theissen. Like I said, he is an experienced investigator and they're the things that he thought, probably from his experience, that the Coroner would be seeking information on.

COL GABBEDY: Were you aware that Army Headquarters reached out to PO Theissen for that information, and that PO Theissen refused to provide it to them?

DETECTIVE INSPECTOR NOVOSEL: I wasn't aware of that, no. I understand – from my memory, I think I also sent an email to Theissen with that same information, asking for follow-up to see where it was.

COL GABBEDY: Sorry, Detective Inspector. Last question for you – and I think you've already alluded to this. At paragraph 79 of your statement you refer to becoming aware that initial versions had been provided from three airmen on board the fourth MRH-90.

DETECTIVE INSPECTOR NOVOSEL: Yes.

COL GABBEDY: And that they'd been provided on 29 August 2023.

DETECTIVE INSPECTOR NOVOSEL: Yes.

COL GABBEDY: And those airmen were on the MRH-90 that had direct observation of the accident, were they?

DETECTIVE INSPECTOR NOVOSEL: My understanding, yes. Yes.

COL GABBEDY: Thank you very much. I have nothing further.

MS McMURDO: Thank you.

DETECTIVE INSPECTOR NOVOSEL: Thank you.

MS McMURDO: Any other applications to cross-examine? Thank you. Any re-examination?

COL STREIT: No, thank you.

MS McMURDO: No.

FLTLT ROSE: No, thank you, Ms McMurdo.

MS McMURDO: Thank you very much, Detective Inspector. You're free to go. We appreciate your assistance. Thank you.

DETECTIVE INSPECTOR NOVOSEL: Thank you, ma'am.

MS McMURDO: So we can end the video link now.

<**WITNESS WITHDREW**

MS McMURDO: Now, you're wanting a short adjournment at this point?

COL STREIT: There's been a slight change, Ms McMurdo. I can indicate to you that I've made a decision to call Dr Gavrilescu first, whilst the Detective Inspector was giving her evidence, because the issue I was seeking to resolve can't be dealt with. So it'll take a little bit of time.

MS McMURDO: Okay.

COL STREIT: So rather than lose time of the hearing - - -

MR McMURDO: I think that's very sensible.

COL STREIT: - - - if we start Dr Gavrilescu.

MR McMURDO: I'm sure Mr Phillips is very grateful.

COL STREIT: Yes, no doubt. And MAJ Luke Chapman is taking Dr Gavrilescu, and the witness this afternoon. The next witness after that will be LTCOL Reinhardt.

MS McMURDO: Yes.

MR MEEHAN: Might I announce my appearance. Simon Meehan, appearing for Thales Australia, with leave granted on the papers on 5 August, if it please.

MS McMURDO: Yes, thank you, Mr Meehan. I note that I did grant leave on 5 August for you to appear for Thales Australia. Thank you. Yes, MAJ Chapman?

MAJ CHAPMAN: Thank you, ma'am. I call Dr Maria Gavrilescu.

<DR MARIA GAVRILESCU, Sworn

<EXAMINATION-IN-CHIEF BY MAJ CHAPMAN

MS McMURDO: Dr Gavrilescu, help yourself to water.

DR GAVRILESCU: Thank you.

MS McMURDO: Thank you.

MR PHILLIPS: Ma'am, there's just one problem. There's a typographical error which I haven't had a chance to tell my friend about and it's on page 8 of the report, the second-last paragraph. It says "prims" and the word should be "prism".

MS McMURDO: You're ahead of me. Just a moment, please.

MR PHILLIPS: Yes.

MS McMURDO: So that was on page?

MR PHILLIPS: Page 8.

MS McMURDO: And the word should be?

MR PHILLIPS: "Prism".

MAJ CHAPMAN: First line, ma'am.

MS McMURDO: "Prism". All right. Well, I'm sure MAJ Chapman will have that corrected before he tenders the statement.

MAJ CHAPMAN: Can you please state your full name and your current position, please.

DR GAVRILESCU: My name is Maria Gavrilescu, and I'm currently the Discipline Lead for Aviation Vision Enhancement in the Human Factor Group, Human System Performance, Human and Decision System Division at DSTG in Melbourne.

MAJ CHAPMAN: Thank you. And can you confirm, please, that you received the following documents that I'll list out? First is a section 23 Notice requiring your appearance today to give evidence?

DR GAVRILESCU: Yes.

MAJ CHAPMAN: Second is an extract of the Inquiry Directions?

DR GAVRILESCU: Yes.

MAJ CHAPMAN: A copy of my appointment as an Assistant IGADF?

DR GAVRILESCU: Yes.

MAJ CHAPMAN: The Frequently Asked Questions Guide for Witnesses in IGADF Inquiries?

DR GAVRILESCU: Yes.

MAJ CHAPMAN: And, lastly, a Privacy Notice for witnesses giving evidence?

DR GAVRILESCU: Yes.

MAJ CHAPMAN: Thank you. And did you prepare and sign a – in this Inquiry, an expert report dated 29 July 2024?

DR GAVRILESCU: Yes, that's correct.

MAJ CHAPMAN: Can I just show you a document? Dr Gavrilescu, do you recognise that as the expert report that you prepared?

DR GAVRILESCU: Yes.

MAJ CHAPMAN: And it includes a number of annexures, and it's approximately 47 pages in length?

DR GAVRILESCU: Yes.

MAJ CHAPMAN: And is that your signature which appears on page 35?

DR GAVRILESCU: Yes.

MAJ CHAPMAN: Thank you. And noting my learned friend and your Senior Counsel's change, can I just take you to paragraph – rather, correction, page 8, and the penultimate paragraph – the second-last one?

DR GAVRILESCU: Yes.

MAJ CHAPMAN: And do you see, there, the first sentence, there's a reference to "simple glass", and a word?

DR GAVRILESCU: Yes. It should be "prism".

MAJ CHAPMAN: Thank you. Can you please also confirm that you were approached by the Inquiry to prepare your expert opinion in this matter?

DR GAVRILESCU: Yes, I can.

MAJ CHAPMAN: Thank you. And that you were provided with a letter of instruction, which was dated 9 July 2024, which set out the issues that you were to address in your report?

DR GAVRILESCU: Yes.

MAJ CHAPMAN: And that letter of instruction appears as Annexure C?

DR GAVRILESCU: Yes.

MAJ CHAPMAN: Thank you. Chair, can I tender the report of Dr Maria Gavrilescu?

MS McMURDO: Yes. That'll be Exhibit 40.

#EXHIBIT 40 - REPORT OF DR M GAVRILESCU

MAJ CHAPMAN: Dr Gavrilescu, throughout your evidence today, can I just please ask you to be mindful of your security obligations, and let me know of certain topics that I, or any other person, might ask you that might lead to discussions at the "Official: Sensitive" level, or high levels. Do you understand that?

DR GAVRILESCU: Yes.

MAJ CHAPMAN: If we do get to that territory, we may need to take the evidence in private hearing. You understand that?

DR GAVRILESCU: Yes.

MAJ CHAPMAN: Thank you. So to begin with, you are currently the Discipline Lead, Aviation Vision Enhancement, within the Human Factors Group and Human System Performance Division, of the Defence Science and Technology Group. Is that correct?

DR GAVRILESCU: Yes. The Human Performance System MSTC, Major Science and Technology. The division is Human and Decision Sciences.

MAJ CHAPMAN: Thank you. And you've been with DSTG – if I can use that as the acronym for Defence Science and Technology Group – for approximately 14 years.

DR GAVRILESCU: Yes.

MAJ CHAPMAN: And is DSTG generally described part of the Department of Defence? Is that right?

DR GAVRILESCU: Yes.

MAJ CHAPMAN: And it carries out the function of providing science and technology support to Defence and to Defence industry?

DR GAVRILESCU: Yes.

MAJ CHAPMAN: Thank you. And that includes operating a series of – or a number of laboratories and other testing facilities such as the one that you work in?

DR GAVRILESCU: Yes.

MAJ CHAPMAN: Thank you. Now, you describe yourself in your report as a "trained biophysicist"?

DR GAVRILESCU: Yes.

MAJ CHAPMAN: In terms of your formal qualifications, they include qualifications in physics and mathematics, as well as a wide range of subdisciplines, including quantum physics, electrodynamics, thermodynamics, nuclear physics, and molecular biophysics. And that's just to name a few. Is that right?

DR GAVRILESCU: Yes.

MAJ CHAPMAN: And you have a PhD. And can I just ask, what was the field of study – what was your research thesis there?

DR GAVRILESCU: Statistical analysis of functional magnetic resonance imaging data.

MAJ CHAPMAN: Thanks. And you describe your particular expertise as "theoretical optics, optical instruments, and the discipline of spectrometry". Correct?

DR GAVRILESCU: Yes.

MAJ CHAPMAN: And just in terms of that discipline of spectrometry, that is a specialist field, is it not, which examines, generally speaking, the interaction between light and matter? Is that a - - -

DR GAVRILESCU: It's measuring light sources and how they interact with, for example, night-vision devices.

MAJ CHAPMAN: Thank you. So you may have picked that up, in the present context it's how light – is it fair to say, how light behaves when it hits and is interpreted through a visor on a helmet, for example?

DR GAVRILESCU: A visor and image intensifier tubes.

MAJ CHAPMAN: And night-vision devices?

DR GAVRILESCU: Yes.

MAJ CHAPMAN: Thank you.

DR GAVRILESCU: Night-vision devices.

MAJ CHAPMAN: And it's with that specialisation that you have developed a practice, at DSTG, testing and advising Defence in relation to a wide range of optical devices?

DR GAVRILESCU: Yes, that's correct.

MAJ CHAPMAN: And with a particular focus on night-vision devices; is that right?

DR GAVRILESCU: Yes, that's correct.

MAJ CHAPMAN: Now, just returning to DSTG generally, you say that you have managed the capability for DSTG in this area since about 2019?

DR GAVRILESCU: Yes.

MAJ CHAPMAN: And at DSTG, you and your colleagues at the Aviation Vision Enhancement operate a research laboratory?

DR GAVRILESCU: Yes.

MAJ CHAPMAN: And it's at that laboratory that you take equipment such as devices that we'll be discussing, to test and conduct testing.

DR GAVRILESCU: Yes, that's correct.

MAJ CHAPMAN: In terms of the testing that you undertake in the laboratory, is this a testing of both new equipment and modifications to existing equipment?

DR GAVRILESCU: Yes, that's correct.

MAJ CHAPMAN: And the AVE lab – if I can refer to it like that – it's able to conduct static testing; is that right?

DR GAVRILESCU: (No audible reply).

MAJ CHAPMAN: And can you just describe what "static testing" is?

DR GAVRILESCU: So we're measuring the way that humans perform with night-vision devices in particular visual performance. Static tests of visual performance imply no time limit. While dispensing the studies, they can look at the images we present with unlimited time. That's the best performance they can get. It's not realistic because in real life pilots only have limited time to interpret visual cues, either in the cockpit or in the outside world.

MAJ CHAPMAN: And you can conduct the testing in this laboratory by simulating moonlight conditions.

DR GAVRILESCU: Yes, that's correct.

MAJ CHAPMAN: And you say in your report you can do that from millilux up to 200 millilux.

DR GAVRILESCU: Yes, that's correct.

MAJ CHAPMAN: And that is a range of illumination, is it, that can accurately reflect moonlight conditions?

DR GAVRILESCU: Yes, that's correct.

MAJ CHAPMAN: And a millilux – I made the reference without explaining it, but that is a measurement of illumination in a particular setting. Is that right?

DR GAVRILESCU: Yes, it's usually how we describe moonlight levels. I'd have to say that millilux is a measure of how human eyes are seeing moonlight, not a measure of how night-vision devices are seeing moonlight.

MAJ CHAPMAN: And while your laboratory has a focus on night-vision devices – or one of its focuses is night-vision devices, you say at page 2, in response to question 2, that you also run a research program which looks at performance of HMSDs. Is that right?

DR GAVRILESCU: Yes. Our current research is looking at helmet-mounted display. More precisely: technology, their design, their development in terms of helmet-mounted displays.

MAJ CHAPMAN: And I was going to get to the acronyms. And HMSD, you're aware I'm referring to helmet-mounted sight displays?

DR GAVRILESCU: Yes.

MAJ CHAPMAN: Now, hopefully the technology is with me, but there's an image that I would like to – and do you see that image there, Dr Gavrilescu? Do you identify that as being a helmet-mounted display device on a helmet? So this example being TopOwl?

DR GAVRILESCU: Yes, this is TopOwl.

MAJ CHAPMAN: In this instance, we're looking at TopOwl. Are you familiar with TopOwl as being manufactured and maintained by Thales?

DR GAVRILESCU: Yes.

MAJ CHAPMAN: And I'll return to discuss aspects of TopOwl in some detail, but – and this is part, is it, the TopOwl system, of a sophisticated helmet system that's worn by pilots on the MRH ships at the time of the accident?

DR GAVRILESCU: Yes, that's correct.

MAJ CHAPMAN: And it's a system which, to your knowledge, is still worn by pilots operating the ARH Tiger, another Attack Reconnaissance Helicopter which is in Service today?

DR GAVRILESCU: Yes, that's correct.

MAJ CHAPMAN: And just to identify, for the benefit of the Chair and the Air Vice-Marshal that the constituent parts of the TopOwl – is that being projected?

MS McMURDO: Yes, very well.

MAJ CHAPMAN: We have the helmet, which is possibly better produced on the other image. Sorry. At the bottom, there is a helmet, and then that might – and then on top, as a separate section, the HMSD is separate to the helmet.

DR GAVRILESCU: Yes.

MAJ CHAPMAN: And the HMSD sits on top of the helmet; is that right?

DR GAVRILESCU: Yes, it clips on the helmet and has three points of contact with the helmet.

MAJ CHAPMAN: Thank you. And you'll see there that there's a clear visor in this case, although they can be swapped out for different colours. Is that right?

DR GAVRILESCU: The clear visor is a fixed visor on TopOwl. It can be stacked with two other visors, sometimes. So they have a dark visor they use during the day sort of like sunglasses to cut some of the glare from the sun. They also can use a laser eye protection visor that can clip on top of this, too. So they can operate with this visor or three – or two other visor; three in total. But this visor is always present in TopOwl. It's part of the image – optical image train. It's what we call an image combiner, and is essential to create the intensified image that the pilots are seeing.

MAJ CHAPMAN: And do you see there in front of the pilot's eyes in this example the green symbology?

DR GAVRILESCU: Yes.

MAJ CHAPMAN: And is that what's referred to as the HUD display?

DR GAVRILESCU: Yes, the symbology is presented on this clear visor, and they can see it both during the day and during the night.

MAJ CHAPMAN: And that's the head-up display, is the acronym?

DR GAVRILESCU: Yes.

MAJ CHAPMAN: And in terms of the image intensifier tubes, are they on each side of the helmet there?

DR GAVRILESCU: Yes, they're those cylinder with the red tinge at the top. Those are the image intensifier tubes.

MAJ CHAPMAN: Yes, and those are aligned with the pilot's eyes at a horizontal level. Those are the ones you're talking about?

DR GAVRILESCU: Yes.

MAJ CHAPMAN: And it's those image intensifier tubes which enable a night-vision image to be generated; is that right?

DR GAVRILESCU: Yes, they amplify ambient light in night conditions to bring an intensified image of the world in front of the pilot's eyes.

MAJ CHAPMAN: And that night-vision image generated is then projected, is it, on to the visor?

DR GAVRILESCU: It's not exactly projected on the visor. So the image travels from the side – the back of the tubes through an optical path. The last element in this optical path is the visor itself. So the visor has two pinkish patches that are a bit hard to see in this image. But those pinkish patches, they're made of a special material, a dichroic material. They act like a mirror for the green radiation – the green part of the radiation. So the green is reflected to the eyes and they act like a lens for anything else.

So the actual intensified images are contained precisely in space in two green patches called exit pupils that are represented in one of the other images I provided to you. So the pilot's eyes have to be precisely placed within these exit pupils for them to see the intensified image of the world. And they do that by having a liner fitted precisely to their head. They have their head scanned, 3D scanned, and a liner made out of styrofoam is fitted in their helmet precisely, so their eyes are sitting inside those green patches.

MAJ CHAPMAN: And the intensified images you just described of the night-vision image, it would appear in the line of sight of the pilot in this example?

DR GAVRILESCU: Yes. It's a bit behind the visor in space. It's not sitting on the visor. It's a little bit behind.

MAJ CHAPMAN: I just want to discuss the topic of your laboratory's testing with respect to the TopOwl.

MS McMURDO: I might just say, these photographs are included in Exhibit 40.

MAJ CHAPMAN: Yes, thank you, Chair.

MS McMURDO: Just for the record.

MAJ CHAPMAN: Thank you.

First, you say at page 6 of your report that since 2010, you have been involved in developing and refining assessment methods relevant to ANVIS and TopOwl. Do you see that?

DR GAVRILESCU: Yes.

MAJ CHAPMAN: And just pausing there for a moment, you have referred throughout your report to TopOwl and then ANVIS NVGs. Is that an acronym for night-vision goggles, the NVGs?

DR GAVRILESCU: Night-vision goggles, yes, that's correct.

MAJ CHAPMAN: And both TopOwl and ANVIS are night-vision devices; is that right?

DR GAVRILESCU: Yes, that's correct.

MAJ CHAPMAN: They're just different products.

DR GAVRILESCU: Yes.

MAJ CHAPMAN: And do you know what the ANVIS acronym stands for?

DR GAVRILESCU: Aviation Night-Vision Imaging System.

MAJ CHAPMAN: And could you, if you can, just explain the principal differences between the two systems – that is, ANVIS and TopOwl – in terms of direct and indirect night-vision systems?

DR GAVRILESCU: Yes. So the night-vision goggles, or ANVIS, they're just a pair of binoculars. That is the simplest night-vision system that exists. So they have a lens in front – they have intensifier tubes, one for each side of the binoculars. In front of these intensifier tubes, there's a lens that focuses the light coming from the environment on to the tube, then that light is amplified. And there's another lens at the back of the tube that is focusing the image on the pilot's eyes. These four lenses are focused independently, so the focus is very good for the goggles. The system is very simple, and because it only has two lens, there's very little loss of light when the light passes through the system.

TopOwl is a more complex system because it has to send the image from the back of the tubes all the way – to bend the light all the way in front of the eyes. It has more optical elements. It has – I actually have not ever seen how the optic part looks like. It's sealed and we don't have any information from the manufacturers, but it's got prisms and lenses and mirrors, with the last element being the visor, as I mentioned. Because it's a more complex optical path with more elements, there's more light loss along this optical path. So for the same light that goes on the tubes, there's less light coming in front of the eyes through TopOwl compared to night-vision goggles. TopOwl has some advantages because it's more balanced.

So the goggles, they're fixed on a bracket in front of their eyes, so they hang in front of their eyes. It changes the centre of gravity compared to the centre of gravity of the head. It puts pressure on the neck. They're more painful to wear. They have a battery pack at the back as a counterweight.

TopOwl is more balanced. The actual material that covers the visor and the tubes is carbon fibre, so it's very light. It offers the advantage that it has an unoccluded vision of the world. So if there is enough light in the world – like full moon, for example – they can see, through the visor, the real world. That can help them with cues for different tasks. It's got a head tracker, so the symbology is actually taking into account – the magnetic head tracker takes into account the movements of the head.

It does exaggerate some of the depth cues because the tubes are about five times more apart than the human eyes, and it does require a process of adaptation to these cues. But based on the discussions we had with pilots wearing TopOwl, once they got past that initial period of adaptation, they seemed to prefer TopOwl because it offers them direct vision of the world. It's easier for them to read the cockpit instruments because they have nothing in front of their eyes.

MAJ CHAPMAN: So making an attempt to summarise some of that, the reference to "direct" and "indirect", the direct view is a reference to the goggles fitting over the eye - - -

DR GAVRILESCU: Yes.

MAJ CHAPMAN: - - - and one sees directly through it and is given the night-vision capability. Whereas in relation to TopOwl, there is no direct view. It is fed through a system - - -

DR GAVRILESCU: Yes.

MAJ CHAPMAN: - - - and what is being fed into the system is not in front of the eyes, it's off to the sides.

DR GAVRILESCU: It's off to the side, yes, that's correct.

MAJ CHAPMAN: And that's why it's referred to as indirect. Yes. So you say that your laboratory has been conducting testing of versions of TopOwl since about 2010. And that's around the time that you've been with DSTG?

DR GAVRILESCU: Even prior. There are some reports on TopOwl Config 0 prior to 2010, when I started at DSTG.

MAJ CHAPMAN: And your laboratory was conducting testing of some of the first iterations of TopOwl?

DR GAVRILESCU: That's correct.

MAJ CHAPMAN: And that was well prior to the introduction of TopOwl – or well prior to the introduction of the MRH into Service?

DR GAVRILESCU: Yes. Tiger started first with TopOwl.

MAJ CHAPMAN: Yes. So it was testing of TopOwl as it applies on the ARH Tiger before the MRH came in.

DR GAVRILESCU: Yes.

MAJ CHAPMAN: Could I just ask you to go to page 6 of your report. Do you see there, Dr Gavrilescu, under "b." three – a), b) and c)? The first being "Assessment of physical (optical) parameters for NVD"?

DR GAVRILESCU: Yes.

MAJ CHAPMAN: Now, what I want to ask you about that, you refer to these being "assessment methods" that you have undertaken – and just pausing there. Is the reference to "assessment methods" a reference to the types of testing that you've completed with TopOwl?

DR GAVRILESCU: TopOwl and ANVIS.

MAJ CHAPMAN: And ANVIS, yes. So we can take it that your lab has conducted testing in respect of TopOwl concerning at least each of these elements under - - -

DR GAVRILESCU: Yes.

MAJ CHAPMAN: So "Gain", "Halo", and so on, under each of those headings?

DR GAVRILESCU: Yes, that's correct.

MAJ CHAPMAN: And you note, I see, throughout your report the various methods of testing and that you conduct testing both in the lab, in the first instance. Correct?

DR GAVRILESCU: Yes, that's correct.

MAJ CHAPMAN: And then where possible, you might also conduct flight testing and human interface trials?

DR GAVRILESCU: We worked very closely with AATES – Army Aviation Test and Evaluation Section – to undertake ground trials. That's pilots sitting in the helicopter with all the cockpit lights on and wearing the night-vision devices, but not flying on the ground. Because, in that context, we can still measure some aspects of visual performance. And then they go and do some flight trials subsequent to the ground trials. I haven't been involved in the flight trials per se.

MAJ CHAPMAN: And you say in the summary section to question 3, which is on page 10, that you strongly recommend that in addition to laboratory testing, that both ground and flight trials be undertaken.

DR GAVRILESCU: Yes, that's correct.

MAJ CHAPMAN: And is that really to verify their laboratory testing, putting the item being tested under the strains and workloads of an operational sortie?

DR GAVRILESCU: Yes. I mean, all the laboratory trials are inherently limited. We cannot replicate the kind of workload and stress and tempo they experience in real missions. We also are limited in what we can reproduce in the lab. For example, we cannot reproduce the cockpit lights. We actually do not project symbology in TopOwl. So if we use TopOwl, it's without symbology.

But because in the lab we can control the light level very precisely, it's sort of like you keep the moon in one place when you run these experiments. We can run experiments with enough participants to give us statistically significant differences. So it's the first layer of evidence that a device – when you compare two devices, one of the devices is better than the other.

But we strongly recommend that our first layer of evidence is complemented with ground trials where you have all the cockpit lights on, they have the symbology. On the ground, we can run some limited visual performance testing. And we have implemented some of these methods in our work with AATES to use them on the ground trials. But what the ground trials are missing is the rest of the real world.

So then in flight trials, you have the full gamut of factors contributing to the mission, but obviously you cannot run any sort of objective visual performance testing. So AATES has been developing some, and has been using some, subjective testing. But the evidence is limited because the light level varies during this testing; the moon is moving, the clouds, whatnot.

So within these three layers of evidence, taken together, are better than using just one of these layers.

MAJ CHAPMAN: Because they create a complete environment.

DR GAVRILESCU: A complete environment.

MS McMURDO: Could I just ask you, you said you can't replicate the symbology in the laboratory. Is that because you're in the laboratory and you're not outside flying, so you won't get the - - -

DR GAVRILESCU: Yes. So basically the symbology is created from the aircraft itself. We do not have that capacity to create symbology in our laboratory. So we're using TopOwl just as a – with intensifier tubes to see images that we present to their eyes without any symbology.

MAJ CHAPMAN: Ma'am, I just see the time.

MS McMURDO: Yes. It is already lunchtime, so we'll adjourn until 1 o'clock.

HEARING ADJOURNED

HEARING RESUMED

MS McMURDO: Thanks, MAJ Chapman.

MAJ CHAPMAN: Thank you, ma'am.

Dr Gavrilescu, I just want to turn now to consider some examples of specific testing that your laboratory has conducted in respect of TopOwl, and the night-vision capability.

DR GAVRILESCU: Yes.

MAJ CHAPMAN: So you've referred in your report to investigations having been conducted by your laboratory, comparing levels of acuity between TopOwl and ANVIS around 2008 and 2009. Is that right?

DR GAVRILESCU: Yes.

MAJ CHAPMAN: And one of the outcomes of that testing was that the testing identified, as you record in your report, a loss of acuity in TopOwl, when compared with the ANVIS system. Right?

DR GAVRILESCU: Yes, that's correct.

MAJ CHAPMAN: Again, we need to appreciate there is fundamentally a difference in these systems. We have ANVIS is the direct view, so the goggles, and TopOwl is the indirect view with the heads-up display. Is that right?

DR GAVRILESCU: Yes.

MAJ CHAPMAN: Just in terms of the testing, you describe in your report at the bottom, I think of page 6, that visual performance with the ANVIS night-vision system was found to have significantly higher visual performance in lab conditions when compared to TopOwl.

DR GAVRILESCU: Yes, that's correct.

MAJ CHAPMAN: Could you just explain, for the benefit of the Chair and the Air Vice-Marshal, what is meant by the expression "loss of acuity" in the context of night-vision devices?

DR GAVRILESCU: Yes. So I have to specify that these tests were conducted before I joined DSTG, and it was a direct comparison between

ANVIS 9 and TopOwl Configuration 0 that was used at that time. They also had, for a very limited number of tests, prototype Configuration 3 TopOwl. But most of the tests were done on comparing Configuration 0 with ANVIS. So the test looked at visual acuity, which is the ability of humans to detect small details in the world around us. And also, in terms of contrast sensitivity, there is some complex visual function that relates to our ability to perceive differences in contrast – an object standing against a background.

So the tests comparing Configuration 0 with ANVIS 9 were done both in terms of static test, with no limitation on time, and also in terms of transitional acuity and contrast sensitivity, where the images were presented for very brief periods of time, 250 milliseconds. And all these tests are run at three different light levels: two millilux, which is corresponding to starlight; 10 millilux, which corresponds to crescent moon; and 30 millilux, which corresponds to new moon. In all these conditions, the visual performance of human participants with ANVIS 9 were better than with TopOwl Configuration 0. Significantly so.

MAJ CHAPMAN: Thank you. In terms of TopOwl, another point of distinction about it is, unlike ANVIS, TopOwl is a system which is given its night-vision capability through the intensifier tubes. There is some intensifier tubes with the goggles as well?

DR GAVRILESCU: Yes, the goggles have intensifier tubes.

MAJ CHAPMAN: So is it the - - -

DR GAVRILESCU: In fact, the tubes were the same, the intensifier tubes, in TopOwl and in ANVIS. It's just that TopOwl is a more complex system and there is loss of light with each optical element along the path, including the dichroic, the pink patches on the visor.

MAJ CHAPMAN: So is it the case that while the earlier versions of TopOwl – and this is Config 0 - - -

DR GAVRILESCU: Yes.

MAJ CHAPMAN: - - - the night vision recorded the poor results when compared with ANVIS? That improved significantly with the introduction of Config 3?

DR GAVRILESCU: Configuration 3 is significantly better than Configuration 0. I have not ever been involved in testing, comparing directly Configuration 3 with ANVIS. But in the report, that I mentioned

there was a static visual acuity test comparing directly Configuration 3 with ANVIS. In that static test, the conclusion was that the performance of Config 3 is similar to ANVIS. But that test had some limitations that I describe in the report, and I can go through right now.

So it was a test done by using paper charts. So we had letters printed on white paper. White paper reflects a lot more light than the black screen that we used in all the other tests. Also, in the case of TopOwl, there was enough light in the laboratory so the participants could see the letters directly through the visor, not just through the intensifier tubes. So it wasn't a one-by-one comparison, if you want.

In all the testing that we've done, we observed that the difference between these two devices, ANVIS and TopOwl, is larger at lower light levels. With white paper, you get more light. So the difference will become smaller, just because it's more light in the devices.

The other problem with this test is that it is diverging from the results we saw with the gain on these devices. So the gain is the ratio between the output light, how much light gets at the end of the tube, to the input light. We measure gain as a system measure, the output at the exit of the device, versus the input on the device. And similar tubes, with exactly the same gain, put into different devices have different system level gain.

So the physical measurements of gain that were reported in our companion report show that ANVIS 9 has far larger gain than both Config 1 – sorry, Config 0 and Config 3. So there was an increase in gain from Config 0 to Config 3. Larger gain is obviously better because you get more light in front of your eyes. But ANVIS 9 had significantly better gain than both of them.

In a subsequent study that we have done in 2019, when we compare Configuration 3 fitted with ITT tubes, with Configuration 3 fitted with L3 tubes – better intensifier tubes – there was a small increase in gain in Configuration 3 with L3 tubes compared to Configuration 3 with ITT tubes. And measuring static acuity using computer-based test on black screens, there was a significant difference in Configuration 3 with L3 tubes.

The difference in gain between ANVIS 9 and Config 3 is way bigger, so I expect that if we reproduce this test, the computer-based test, on black screen – currently in the lab we use a projector that has near infrared source, so you cannot see the images directly with your eyes, just through the intensifier tubes – I suspect that ANVIS 9 will be superior in terms of static visual acuity compared to TopOwl Configuration 3.

MAJ CHAPMAN: Thank you. So just as part of that evidence – your explanation, you gave evidence that TopOwl Configuration 3 ended up being comparable in performance to ANVIS 9. Right?

DR GAVRILESCU: Just in terms of static visual acuity.

MAJ CHAPMAN: Yes. And the next step in the development and iteration of these night-vision devices is that following the Configuration 3 upgrade, sometime later there was – and I think you mentioned this in your answer – a further upgrade of the intensifier tubes to the L3?

DR GAVRILESCU: Yes.

MAJ CHAPMAN: And the L3 is a intensifier tube produced by Harris Technologies; is that right?

DR GAVRILESCU: Yes.

MAJ CHAPMAN: Do you know when that was?

DR GAVRILESCU: 2019.

MAJ CHAPMAN: 2019.

DR GAVRILESCU: We have done the experiments in 2019 to provide evidence to DACM, and they subsequently proceeded to upgrade all the night-vision devices used by Army Aviation with L3 tubes.

MAJ CHAPMAN: So it's your understanding that the L3 tubes were those in Service on the MRH-90 Fleet at the time of the accident?

DR GAVRILESCU: Yes, that's correct.

MAJ CHAPMAN: Now, did your lab conduct any testing of the L3 tubes in the way that it tested the Configuration 3 tubes?

DR GAVRILESCU: You mean on TopOwl?

MAJ CHAPMAN: Yes.

DR GAVRILESCU: We directly compare TopOwl with L3 tubes with TopOwl with the old tubes provided by ITT.

MAJ CHAPMAN: So you did do a comparison, did you, between the Configuration 3 tubes and the L3 tubes?

DR GAVRILESCU: Yes.

MAJ CHAPMAN: I just want to now move to another topic, which is stereopsis.

DR GAVRILESCU: Yes.

MAJ CHAPMAN: I'm pronouncing that correctly?

DR GAVRILESCU: Yes.

MAJ CHAPMAN: The Inquiry has received evidence concerning stereopsis being an optical effect, which we can develop later. But can you just describe in perhaps lay terms your understanding of what stereopsis is?

DR GAVRILESCU: Stereopsis or stereovision relates to our ability to perceive the world as a 3D concept. And it's linked to the fact that when we look at something we converge our eyes. And the closer this object is to us, the more we converge. That means that there's slight differences between the left and the right image – the image of that object on the left and the right retina. The closer the object is, the bigger the difference. Our brain is geared to interpret the small differences as depth cues. The bigger the difference, the closer the object is to us.

Stereovision is measured by stereoacuity. Stereoacuity is the ability to perceive – the smallest difference that someone can perceive reliably, and it's measured in seconds of arc, which is 1 over 3600. So there's 60 minutes in an arc, 60 seconds in a minute. So that's how we measure the ability of individuals to perceive the 3D image of the world through stereoacuity. Stereoacuity is true stereovision. Stereovision is not the only type of visual – part of visual system that allows us to perceive the world in 3D. We have what we call monocular or one-eye cues that have eyes to perceive this 3D image of the world, and there are a few of them.

One of them is called surface textures, or textural gradients. We see more details when the objects are closer to us, and then we can interpret that if an object is less – if we see less details in an object that's far from us than an object where we see more object – more details in. Motion parallax. When we're in motion, things that are closer to us move faster. Size constancy. We know that an object has a certain size, a person or a car, so if this – we see something that is smaller in size than the typical size of a car, we know that car is further away from us. And also occlusion, for example. If something occludes our vision to an object, we know that that object is further away than the object that occludes our vision.

So someone can have a 3D representation of the world, being stereo blind, basically.

MAJ CHAPMAN: And I note that you describe it, I think it's page 9 of your report, that the effect of stereopsis is not a relevant consideration for daytime flight?

DR GAVRILESCU: No. In TopOwl, no.

MAJ CHAPMAN: In TopOwl. And that's because, isn't it, the pilot essentially uses their own vision and they don't have to – their vision of the outside world is not – it doesn't come to them through any other prism.

DR GAVRILESCU: Yes. So they see the world as they will see normally, just through the clear visor.

MAJ CHAPMAN: And it's the case that stereopsis – I withdraw that. So in your experience testing these devices, TopOwl and ANVIS, did you encounter stereopsis arising with the use of ANVIS?

DR GAVRILESCU: Well, ANVIS will have just the same type of stereopsis as you would with normal vision because pilots are able to adjust the tubes, to place them precisely in front of their eyes. So there is no difference in terms of depth cues in ANVIS versus normal vision.

MAJ CHAPMAN: Can you briefly explain to the Chair and the Air Vice-Marshal the reason why stereopsis is particularly pronounced in indirect systems?

DR GAVRILESCU: In TopOwl?

MAJ CHAPMAN: In TopOwl.

DR GAVRILESCU: So in TopOwl the intensified images are seen through the intensifier tubes that are on the side of the head. In Configuration 3 they're about five times more apart than the typical distance between the eyes, which is about 65 millimetres. So what's happening is that we get images in front of our eyes that come from the distance – have exaggerated depth differences because it's like our eyes are on the side of our head, and our brain interprets this as these objects feel much closer than they really are. This is called hyper-stereopsis, and this has interesting effects.

So, for example, pilots wearing TopOwl for the first time will have trouble appreciating the distance to an object. If they are asked to fly and stop

20 metres from an object, they usually stop away further away than 20 metres because they think they're closer than they really are.

Another effect is the so-called bowl effect when they land, because they see the land – the ground closer than them, they feel like they're in a bowl. The ground comes close to their chest. So these are exaggerated depth cues that our brain doesn't know how to interpret and distorts the perception of depth.

Pilots do adapt to this after they use TopOwl for a while. How long it takes depends on the individual. There is a reference in the open literature that I found published by the US Army Research Laboratory that cites five to 10 hours. I think there are people that will take probably less, probably more than – less than five, more than 10. It's an individual measure, how quickly they adapt to this. But once they adapt at ab initio when they first use TopOwl, then when they stop flying for a period they lose some of this adaptation but they regain it much faster.

Just discussing with pilots using TopOwl, in the first instance when they put TopOwl on for the first time they are a bit concerned about this distorted vision cues; the world looks very unnatural. But once they go past that initial point and they adapt, they find TopOwl natural. They've adapted to it and they can operate as normal.

MAJ CHAPMAN: So the fact that you've got information inputs coming from the side of the helmet and not directly in front of you requires, in summary, cognitive work. It requires effort on the part of the brain to interpret, at least initially, what you're seeing?

DR GAVRILESCU: Initially, yes. It's a learned behaviour. Once they learn that behaviour, they can operate normally.

MAJ CHAPMAN: You've mentioned that it creates a crater or bowl effect in the vision. Insofar as that's been described – well, you described it as rising up to the chest. Is that a description of the ground possibly in a hover state, when the aircraft's in a hover state?

DR GAVRILESCU: Yes. Hover or landing, yes.

MAJ CHAPMAN: Right.

DR GAVRILESCU: They also have problems initially with slope perception.

MAJ CHAPMAN: So in that position, hover or landing, as it's been described to you, there's a bowl effect, that the ground appears to be coming up towards the chest?

DR GAVRILESCU: Yes.

MAJ CHAPMAN: So the issue, as you understand it, that a pilot relying on a night-vision device such as TopOwl like this, that they might not be in a position to accurately judge where the ground is relative to the aircraft?

DR GAVRILESCU: In the initial stages, yes.

MAJ CHAPMAN: At least in the initial stages.

DR GAVRILESCU: I should say that if there is enough light in the environment so they can see the world through the visor, they can use the monocular cues that I just mentioned to sort of recalibrate. Because the monocular cues, the one-eye cues, are not affected by hyper-stereopsis. So if it's dark and they don't see anything beyond the intensified image, yes, they will have problems initially estimating how far from the ground they are. But once they pass the initial stage, then they can make that judgment because they learn that their estimation is wrong and they can correct for that.

MAJ CHAPMAN: So we've been talking about the stereopsis effect occurring in a hover state. Does your research suggest that it can happen in an in-flight state with respect to, for example, formation of aircraft and distance?

DR GAVRILESCU: I have not been directly involved in any research related to hyper-stereopsis. But I would say that a pilot that was already adapted to TopOwl, it doesn't matter the circumstance, they will be able to overcome hyper-stereopsis.

MAJ CHAPMAN: Though a pilot who perhaps either isn't a necessarily experienced or has low familiarity or recency with the system, it's possible that could be an issue?

DR GAVRILESCU: Yes. Yes, it could be if they had a period of break and this is the first mission they do after that period of break. They might be in a state where they need to recalibrate their vision to overcome this exaggerated cues.

MAJ CHAPMAN: While you wouldn't be able to describe it as the crater effect from the ground, it's possible, in your evidence, that there could be some other effect which misjudges distance between another aircraft?

DR GAVRILESCU: Distance between objects, yes, that would be possible.

MAJ CHAPMAN: Thank you.

MS McMURDO: You mentioned slope estimation.

DR GAVRILESCU: Yes.

MS McMURDO: Could you just explain what you mean by that a little bit, please?

DR GAVRILESCU: So when you estimate slope, you need to make an estimate about the horizontal distance and the vertical distance. The horizontal distance is distorted because of the hyper-stereopsis, so obviously the slope will be affected in a negative way. That's important when they have to land on a slope, for example, because it has a double hit, if you want: they get errors with slope estimates, and they get errors because they don't estimate the distance from the ground.

MS McMURDO: So what happens then is, once the pilot's got used to the hyper-stereopsis, their brain automatically gets their eyes to recalibrate?

DR GAVRILESCU: Yes.

MS McMURDO: And that will happen every time they put on their TopOwl gear and fly. But then you said when they have a break, they could lose that, but it will return much more quickly.

DR GAVRILESCU: Yes.

MS McMURDO: So can you give us any assistance with what sort of break would be necessary for them to lose it?

DR GAVRILESCU: I'm not sure about that. I haven't been involved - - -

MS McMURDO: Would that perhaps be idiosyncratic to the pilot, or - - -

DR GAVRILESCU: Yes, it could be an individual component. I mean, stereoacuity is an individual number, so it has a variability across people.

MS McMURDO: Right.

DR GAVRILESCU: So it (indistinct) to the same principle - - -

MS McMURDO: Yes, okay.

DR GAVRILESCU: - - - that there will be a difference from pilot to pilot.

MS McMURDO: And also how quickly it would return.

DR GAVRILESCU: Yes.

MS McMURDO: But would we be talking about requiring a number of flights or would it return pretty quickly after you put the helmet on and started flying again?

DR GAVRILESCU: I'm not privy of that information.

MS McMURDO: You're not sure, no.

DR GAVRILESCU: All I can say is that just anecdotal conversations with pilots on TopOwl with L3, they said to me that adaptation to hyper-stereopsis seems to be easier with TopOwl with L3. And my feeling – my thought with this is that they just get more light, so they have more of the monocular cues to help them recalibrate their system. But this is just discussions; we haven't done any measurements.

MS McMURDO: Thank you very much.

AVM HARLAND: You spoke about the difficulties interpreting slopes and approaches to things. Can you describe the difference between land terrain and overwater and how that would be presented on TopOwl?

DR GAVRILESCU: So when flying overwater, there are different issues than flying overground. Water is a featureless terrain. There is no landmarks. Like, it's harder to use monocular cues, for example, because you have no landmarks to anchor on. The other problem with flying overwater is that night-vision devices amplify light, not just invisible domain – the type of light we see with our eyes. They also amplify near infrared light that we don't see with our eyes.

TopOwl has these sort of reddish patches. They're what we call Class B filters. So these filters have been added to the intensifier tubes to allow the pilots to see the cockpit lights in front of them, and that pretty much prevents the tube to amplify the lights from the cockpit. Class B filters that are used in TopOwl actually cut most of the visible light, so they can see all

three colours in the cockpit: blue, green and red. So mostly they amplify near infrared light.

So the problem with water is water absorbs near infrared light. So the water (sic) coming from the moon is very poorly reflected off water and that's the part of the moonlight that the tubes amplify. So overwater the background they see is much, much darker than overland, for example, where you can have surfaces with higher reflectances; like defoliated trees, for example. Leaves reflect a lot of near infrared light. So the problems when flying overwater are more complex than flying overground.

AVM HARLAND: That's great, thank you.

MAJ CHAPMAN: Dr Gavrilescu, just based on your earlier evidence of the mental work that it's required to do overcome stereopsis, do you agree that there is a correlation between stereopsis and high rates of fatigue?

DR GAVRILESCU: I think initially, yes, when they adapted. I'm not sure that is true after the adaptation period. We have not done any measurements to confirm such a high level of fatigue.

MAJ CHAPMAN: So would you say that among the challenges that pilots face flying at night using these devices, be it ANVIS or TopOwl, that the use of these devices inherently adds to their workload, which adds to their fatigue?

DR GAVRILESCU: Yes, flying at night is harder than flying at day. Night-vision devices are not the same as your direct vision through your eyes. They have a limited field of view, so you lose all the verifier cues – not so much in TopOwl. If there is enough light in the environment – it also depends on how much light you have. It's much easier to fly in a full moon than it is in starlight.

If you have enough light in the environment, then through the clear visor they get their verifier cues. The image is a bit less natural because it's green and it's dimmer. So it's not just the device, the human vision in these dim environments is different than the human vision in bright daylight. It's actually a part of the human visual performance that there's very little research in the outside world because, apart from pilots doing very complex missions at night, there are very few other occupational categories where visual performance is important.

In this particular context, a little variation in light goes a long way because every photon counts in this domain. So we have all the light-sensitive cells now ready, now firing at once, but none of them functions at optimal level.

Our visual performance in this domain, this dim light domain, depends on the interaction between these types of cells in our retina and that in turn is modulated by both how much light there is – the light level – but also the colour of the lights that we see. So having through TopOwl, for example, just green, activates only the green-sensitive cells. But if you have other colours – like if you have enough light from the cockpit, you activate more cells, your visual performance is better.

MAJ CHAPMAN: And it's important to recognise, isn't it, that with these night-vision devices, that they don't work where there is zero light available because - - -

DR GAVRILESCU: No - - -

MAJ CHAPMAN: - - - it's an amplifying product?

DR GAVRILESCU: - - - you need something to amplify.

MAJ CHAPMAN: Yes. So even in low cue environments where you have very little light, that will necessarily translate, will it, to a poor NV image?

DR GAVRILESCU: Yes.

MAJ CHAPMAN: Compared with one where you have ample or sufficient light?

DR GAVRILESCU: Yes, that is correct. In a very poor light environment, the light is amplified but the image is very, very dim and is full of dynamic specks of light called scintillations. That's because the amplification is at the same level of quantum processes that just release photons from inside the tube randomly. So those photons that are randomly released to quantum processes inside the tubes are not real light; they're just specks of light that come and go. So the image has a very poor resolution and is very dim, so it's very hard for them to operate in such conditions. The more light you have in the environment, the better the performance is.

MAJ CHAPMAN: Thank you.

MS McMURDO: Could I ask you, is it important for pilots using night-vision devices, particularly TopOwl, to have a natural stereovision? So there are some people - - -

DR GAVRILESCU: Good stereovision.

MS McMURDO: - - - who don't have it. Yes, some people don't have it.

DR GAVRILESCU: We haven't done any type of studies like this, particularly for TopOwl. But I am working with a group of scientists based at Air Force Research Laboratory in Dayton, Ohio, and the Air Force Base there. They're from a group called Operational Based Visual Assessment. And we're working together to modernise the vision testing and the vision standards for aviation. So one of the areas that we've been doing a lot of work is in measuring stereovision, and whether stereovision is important.

So some of the work they've done was on the refuelling vision system on the KC-46. That's a hyper-stereoscopic system, similar to TopOwl. And in that particular instance they've run a lot of studies and they showed that having better stereoacuity or better stereovision gives them better performance with the task. Now, whether that translates to better performance in TopOwl, I cannot give you an answer, but it is possible.

MS McMURDO: Just from a layperson's perspective, that would make sense.

DR GAVRILESCU: Yes. I don't have the numbers to confirm that, but yes.

MS McMURDO: I understand, yes.

MAJ CHAPMAN: I would just like to move to some evidence now about the stresses and fatigue in the context of what you have described as misalignment in your report. You've responded to this issue at question 10, which is on page 10 of your report, and could you just describe to us what you referred to as "optical misalignment" and how that arises in the context of the night-vision devices?

DR GAVRILESCU: So any binocular device – binocular, a device that puts two independent images in front of our eyes – can be affected by misalignment. That includes a microscope, for example. Misalignment comes because the two sides are not perfectly parallel and they make our eyes do unnatural movements. We are usually – we are used to convergent-type movements on moving our eyes towards the nose because we focus on objects closer to us, but up to a point.

But there is nothing in the real world to force our eyes to go this way divergence, or vertically dipvergence. These devices can go in any combination, so that's what misalignment is. It can come from manufacturing errors, from just rough handling or accidents with the devices. Operating with a misaligned device creates – adds to fatigue. In particular, it creates all sorts of symptoms related to visual fatigue. And the

duration of the mission plays a role. So the longer you operate, the more this visual fatigue accumulates.

The easiest way to deal with misalignment is to take a break from the task. Someone that looks through the microscope, they take their eyes off, they have a break, they recover. Pilots on night-vision devices don't have that luxury, so they have to operate with these misaligned devices for the duration of the mission. The misalignment is not perceived until it is so bad that the image becomes double. So - - -

MAJ CHAPMAN: I was just going to come to that.

DR GAVRILESCU: Yes.

MAJ CHAPMAN: So just to summarise that initial concept, while our own eyes are aligned and that gives us the three-dimensional view of the world, the problem arises when you add on top physical prisms which may not themselves be aligned, such as binoculars which are not mechanically aligned.

DR GAVRILESCU: Yes.

MAJ CHAPMAN: And the consequences of this is that the misaligned device can then have a corresponding effect on our own impression of what we see.

DR GAVRILESCU: Yes. It's forcing our eyes to make unnatural movements, and that creates visual fatigue.

MAJ CHAPMAN: You say in the report that optical misalignment affects night-vision devices generally. So it's not something which is unique to TopOwl at all. It affects - - -

DR GAVRILESCU: No, any device that puts two independent images in front of your eyes.

MAJ CHAPMAN: Including ANVIS.

DR GAVRILESCU: Including ANVIS. Yes, that's true.

MAJ CHAPMAN: When you talk about misalignment, that's the physical misalignment, as you say, of the prisms within the devices?

DR GAVRILESCU: Something is misaligned in that device. In TopOwl, it would be hard to know what exactly is misaligned because it's such a complex optical path. Something is not where it's supposed to be.

MAJ CHAPMAN: I think you've said in your earlier answer that the misalignment can range from the very minor, which may not even be perceptible - - -

DR GAVRILESCU: Yes.

MAJ CHAPMAN: - - - to the more significant, and I think you referred also in your evidence to, at that extreme, it could end up being double vision.

DR GAVRILESCU: Double vision, yes. So we have a certain capacity to correct for this misalignment. But after we reach that capacity, we're no longer seeing one image, we see double.

MAJ CHAPMAN: This is not an issue, again, that arises during the day, in the daylight context, because pilots use their own eyes without the assistance of a device because their own vision of the world doesn't need to be translated through any device. That's right?

DR GAVRILESCU: Yes.

MAJ CHAPMAN: So in the same way that you have described that the use of the night-vision device creates some fatigue, it creates the fatigue because there's an additional layer of cognitive work that needs to take place?

DR GAVRILESCU: It's a physical stressor on our eyes that is forcing our eyes to keep this unnatural position for a period of time, and that leads to fatigue.

MAJ CHAPMAN: The workload created by the misalignment, in your opinion can that be quite significant in terms of fatigue?

DR GAVRILESCU: So we have done a laboratory study. We initially looked whether there is, in the literature, enough evidence to show that misalignment can impact task performance, for example. And we couldn't find any reasonable or credible evidence in that way. So we have done a study now in our laboratory where we simulated a helicopter flight – a helicopter tail-chase task, and we added some extra tasks in there.

We ran this with people from normal population, not pilots. And we have run this for an hour, and they were exposed to a simulation when there was no misalignment with this, and a simulation where their eyes were misaligned about half a degree this way and half a degree this way. So basically we made their eyes point at an angle. They were not aware of the condition, and none of them could tell us afterwards whether they performed the misaligned or the aligned conditions. Like, it wasn't perceived as such.

But we were able to measure task performance objectively in terms of the number of errors they made, and also in terms of the speed of their responses. And there was a significant increase in the number of errors and a significant decrease – a significant increase in the number of errors and a significant increase in the response times. So they took longer to respond and they made more mistakes, although they were not aware of this.

At the same time, we recorded some physiological parameters usually associated with fatigue, such as pupil diameter, heart rate, and heart rate variability, and also peripheral skin temperatures. And there was significant changes in all these parameters, indicative of fatigue. So in this, obviously limited simulation, because it was one hour and it wasn't the same sort of level of difficulty as a sortie, we proved that misalignment at a level that is not perceived does have a negative impact on task performance.

These kind of studies are very difficult to run. We are planning to run some more. But based on our study, we can't recommend a number how much misalignment is tolerable, how much misalignment will absolutely keep the pilot safe and performing at their best. It was just too limited, and not replicating the exact conditions.

We are working with our American partners to try to come up with some operationally relevant tolerance limits for misalignment. So this is work in progress. I don't have a number how much is tolerable, but we do know that the level we measured there was a significant decrement in task performance and significant fatigue effect.

MAJ CHAPMAN: So what you can say, even without the precise number, is that even in cases of this minor misalignment which might not be even perceptible, there is fatigue which is accruing to the pilot by having to make these adjustments?

DR GAVRILESCU: That's correct, yes.

MAJ CHAPMAN: And at page 11 of your report you conclude with the statement that:

Additional fatigue induced by misalignment might reach a level at which it could interfere with flight performance and safety.

And my question is, is that comment based around risk to flight safety based on a scientific probability, or do you have some real-world data and experience?

DR GAVRILESCU: No, we don't have any real-world data. This is the work that we're trying to undertake now with our American collaborators. I cannot comment on this.

MAJ CHAPMAN: I understand. I'll just take you to page 11 of your report.

DR GAVRILESCU: Yes.

MAJ CHAPMAN: And about halfway down the page you refer to testing that you conducted on ARH Tiger pilots at Robertson Barracks in 2011/2012. Do you see that?

DR GAVRILESCU: Yes. The questionnaires?

MAJ CHAPMAN: Yes.

DR GAVRILESCU: Yes.

MAJ CHAPMAN: And you were seeking by that testing, were you not, to gauge how misalignment impacts on task performance? Is that correct, generally speaking?

DR GAVRILESCU: Yes. So our original idea was that there are perceived symptoms of misalignment that we could potentially collect via questionnaires, so the typical visual fatigue symptoms: dry eyes, red eyes, eye strain, headache even. So we developed the questionnaire and we went to Darwin. We instructed the pilots to fill in that questionnaire. All the questions they had to rate from 1, "No symptoms", to 5, "Severe symptoms".

We stayed there a few nights and helped them through the questionnaires to make sure they understand how to fill it, and then we left the questionnaires there and asked them to fill one in before they went on night sorties and one when they came back. A few months later, we collected those questionnaires but all the ratings were "No symptoms".

MAJ CHAPMAN: And when you were observing them, when you were

handing out the questionnaires or in that process, were you at that time observing them returning from flights?

DR GAVRILESCU: Yes.

MAJ CHAPMAN: And what did you see about their physical characteristics there?

DR GAVRILESCU: They definitely had red eyes.

MAJ CHAPMAN: Right.

DR GAVRILESCU: But they still - - -

MAJ CHAPMAN: So – sorry.

DR GAVRILESCU: - - - ranked the symptoms as "No symptoms".

MAJ CHAPMAN: So you had a situation where, despite having observed obvious signs of visual fatigue, you were getting responses that there were no symptoms at all from their point of view?

DR GAVRILESCU: Yes. It could have been sort of what they were used to as being fatigue. Maybe for them that was just the normal type of fatigued experience and that's why they rated it as "No symptoms". And a normal person that is not trained and is not used to this level of fatigue would have rated as more, "Severe". But, yes, they rated "No symptoms".

MAJ CHAPMAN: And what was the approximate sample size of this group?

DR GAVRILESCU: Well, we left them on their own to complete the questionnaires. I can't remember how many pilots, individual pilots, completed. We gave them a PIN number because, based on our ethics protocol, we have to keep all the data anonymous. I can't remember how many of them responded, but I had a big bunch of questionnaires and, yes, they were all rated at 1.

MAJ CHAPMAN: And I think you say you followed up with some lab testing, and what were the conclusions of the testing in terms of the impact of misalignment on task performance?

DR GAVRILESCU: Yes. So the experiment I just described before - - -

MAJ CHAPMAN: That was the - - -

DR GAVRILESCU: We followed up because we thought, "Well, we can't get to the bottom of this, is misalignment a serious issue for night-vision devices or not just with questionnaire". So that's why we undertook that experiment. And in that experiment, we did prove that, yes, indeed, misalignment has an impact on task performance.

MAJ CHAPMAN: Based on your experience with Aviation units, do you have any view as to why these respondents, do you think, were responding with "No symptoms at all"?

DR GAVRILESCU: Yes, I do have an opinion. It's just a personal opinion based on what I observed. TopOwl maintenance is not done on base. They have to send – if something is wrong with TopOwl, seriously wrong, they have to send it back to the manufacturer in Sydney for maintenance. That takes them off and they can't maintain capability. So they're very reluctant to let go of TopOwl.

MAJ CHAPMAN: This is the pilots, is it?

DR GAVRILESCU: The pilots, yes. So they're reluctant to find fault with TopOwl. And having that they don't use – so the display module that fits on the helmet, they pick whichever one is available. They don't have a dedicated one they use all the time. They could hope that, you know, maybe the next one will be better. So they're reluctant to send TopOwl back to the manufacturer just because it gives them headaches.

MAJ CHAPMAN: So if - - -

MS McMURDO: So the helmets are individually fitted?

MAJ CHAPMAN: Yes.

DR GAVRILESCU: The helmets are, yes.

MS McMURDO: Uniquely fitted to each individual pilot.

DR GAVRILESCU: But the actual display module, the TopOwl, that clips on top of the helmet and gives them the night vision, that's separate from the helmet.

MS McMURDO: That's separate. I see.

DR GAVRILESCU: And any display module can be fitted to any helmet. So they pick whichever one is ready for them before they – at the night of

the mission.

MS McMURDO: I see.

DR GAVRILESCU: So they might have a bad experience with one, but they know that next time they will pick another one and maybe that one is better. Yes.

MAJ CHAPMAN: I just want to consider some of the testing that your laboratory has conducted with Aviation units on the alignment issue. So you refer in answer to question 11 on page 12 of your report to alignment testing that you conducted of a large sample of these devices.

DR GAVRILESCU: Yes.

MAJ CHAPMAN: And the sample size you referred to is 129 HMSD and 121 ANVIS goggles. Do you see that?

DR GAVRILESCU: That is a spelling mistake. It was 102 goggles, sorry.

MAJ CHAPMAN: Sorry, a hundred and?

DR GAVRILESCU: 102 goggles, and a 129 HMDs. I apologise for that.

MAJ CHAPMAN: 102 goggles, thank you. Thank you for that. And you refer to using your or the laboratory's custom-built alignment bench to conduct this testing.

DR GAVRILESCU: Yes.

MAJ CHAPMAN: Now, I take it that's a bench which is a method of measuring misalignment and alignment, and you can get precise measurements?

DR GAVRILESCU: Yes. So we custom built this bench using very precise scientific cameras and so it's a very objective test. We've done extensive testing and development on this bench, and it's giving us an accuracy of subarcminutes. So we physically moved targets on (indistinct) stages and applied the method and were able to reproduce those movements within 0.4 arcminutes. It gives us good reproducibility within one arcminute.

So we took this bench to three different bases in Darwin, at Robertson Barracks in Townsville, at the RAAF Base there, and in Oakey at the School of Aviation Medicine, and we measured all the TopOwls and all the ANVIS that we could gather.

MAJ CHAPMAN: Yes. And you record the results of that testing in your report to be first, that you found TopOwl had a significantly larger misalignment issue than ANVIS.

DR GAVRILESCU: Yes.

MAJ CHAPMAN: And a much larger proportion of the TopOwl HMSDs did not pass the go/no criteria?

DR GAVRILESCU: The go/no go criteria, yes.

MAJ CHAPMAN: Yes. And is that to say that of the large sample size that you tested there was a significantly larger number of HMSDs that were misaligned compared to the ANVIS?

DR GAVRILESCU: That is correct, yes.

MAJ CHAPMAN: And is the reference to "go/no go test" you referred to a quick test which is – is that a quick test procedure carried out by pilots to test for misalignment in a (indistinct) way?

DR GAVRILESCU: Yes. So that is a test that was developed by someone in Army Aviation. I'm not aware of who exactly is responsible for that test. That test was already (indistinct) in 2010, when I started at DSDG. It's a subjective test. They have a piece of paper with a circle of red LEDs. They have to put that at 50 metres from the TopOwl. So a pilot or support personnel is wearing TopOwl and is looking at this target at 50 metres. They can see the red circle through the visor, but they also see a green circle because that's the intensified image. And they look at each, at this pair of green and red, with each eye separately, and they have to make a judgment on the clock position for each eye. Where is the green circle in respect to the red circle for left eye and for right eye? And also in terms of diameter overlap, how much the diameters overlap.

They put them into an Excel spreadsheet and that spreadsheet comes with either a green field saying "go" or a red field saying "no go". And if they – we use the same numbers they used in the Excel spreadsheet as a go/no go criteria because this is what Army Aviation is using. I don't know of any scientific evidence to show that if they're in green, in "go", that means they have no impact on task performance, or safety, or anything like that.

MAJ CHAPMAN: So is it your understanding that the go/no go test is something which needs to be carried out as mandated prior to every flight with TopOwl?

DR GAVRILESCU: I think, from my knowledge, it was like that initially. So every pilot had to undertake this test before each mission at night. But then they relaxed the frequency of testing and I think at the moment they're not the pilots running this test but the tech support personnel. It's just because it's very difficult to find an area that is dark enough and 50 metres long. And when they go on field missions, it's impossible to run this test.

MAJ CHAPMAN: So if I understood you correctly, when this initially came in it was conducted by the pilots?

DR GAVRILESCU: Yes.

MAJ CHAPMAN: The ones who would obviously be operating and wearing the device - - -

DR GAVRILESCU: Yes.

MAJ CHAPMAN: - - - and who would be able to work out whether the alignment is correct, but that has since changed. Your understanding now is that it's operated – or these tests are conducted by, like, non-pilots or - - -

DR GAVRILESCU: The tech support personnel. Yes, the tech support personnel, like, prepares TopOwl for the night missions. During the day, they conduct this test. That's to my knowledge.

MAJ CHAPMAN: So your knowledge. It may be that these tests are still conducted frequently, but just not by the pilots?

DR GAVRILESCU: Yes. I'm not sure if they still conduct them before each mission.

MAJ CHAPMAN: Do you have any research to suggest whether the go/no go 50-metre test is accurate or sufficient for the purpose for which it's intended?

DR GAVRILESCU: I had a look at some of the data that was saved in the Excel spreadsheet. And for one particular TopOwl display module, there were various people undertaking this test over a period of a month. I looked at four or five display modules. There was some sort of consistency in terms of clock position, but wild variability in terms of diameter overlap. And it's actually very hard because the circles appear very small and it's very hard to judge with any degree of precision how much diameter overlap these circles have. And a little bit of variability, like going from 0.4 to 0.6, will lead to quite different results.

MAJ CHAPMAN: Just in terms of the review or the testing that you did with the 129 HMSDs and I think one hundred and - - -

DR GAVRILESCU: Two.

MAJ CHAPMAN: Two. I had one. So 102.

DR GAVRILESCU: Yes.

MAJ CHAPMAN: Is it correct that you found in that testing that all of the brand-new TopOwl HMSDs tested within the manufacturer's alignment limits?

DR GAVRILESCU: Yes. So Thales has manufacturing limits, and that's based purely on the process they have in place to manufacture these devices. All the new TopOwls that I ever tested were within those limits.

MAJ CHAPMAN: So all of the ones that you tested that were brand-new were within the limits?

DR GAVRILESCU: Yes.

MAJ CHAPMAN: Though many that you tested were not?

DR GAVRILESCU: Yes, they were not brand-new.

MAJ CHAPMAN: And were they the ones which had had some use; they were not brand-new?

DR GAVRILESCU: Yes.

MAJ CHAPMAN: Do you recall any data suggesting how much use a new TopOwl might have to be subjected to before it is at risk of misalignment? Is there anything of that nature?

DR GAVRILESCU: I don't have data of that nature. But another investigation that we've done was we tested whether there are environmental factors that could affect misalignment and we found that the temperature, environmental temperature, has a significant impact on TopOwl misalignment. It doesn't have an impact on the ANVIS misalignment.

So in a particular heat, so a higher temperature, it has a permanent – it creates a permanent misalignment in TopOwl and the shape and the size of

the effect are quite complex for Configuration 3. They're pretty much device-specific. But if you keep cycling them from cold to heat, they drift out of alignment. So just exposing them to heat will take them out of misalignment without any other accidents or mishaps.

MAJ CHAPMAN: I'm going to come to that evidence about the environment and temperatures. Before I do, can I just take you back to two points? So you make the comment in your report that Army Aviation currently operate under a go/no go criteria for optical misalignment which is less stringent than the manufacturer's limits.

DR GAVRILESCU: Yes, that's correct.

MAJ CHAPMAN: Do you have a view as to why Army Aviation might choose, apparently, not to comply with the manufacturer's standard?

DR GAVRILESCU: Well, I'm not sure what the reason was. But in realistic terms, manufacturing limits are not operationally relevant.

MAJ CHAPMAN: Sure.

DR GAVRILESCU: They're specific to the manufacturing process. So we want to make sure that, at delivery, the devices are delivered within the promised parameters. It doesn't mean that they have to be kept in that sort of stringent limits. As I said, the research regarding how much is tolerable in operational context to ensure top performance and safety are still underdoing, so I don't have a number for that. But the manufacturing limits are not realistic in terms of keeping them in operational context.

So in the 50-metre test, the current go/no go criteria was arrived on simply by adding how much sloppiness – or how much error is in this test because it's a subjective test to the manufacturing limits. So there is no scientific evidence based on how much is tolerable, how much is too much in terms of task performance. It's simply to deal with the fact that this test is imprecise and this is the sort of errors you make in the measurement. So that's the go/no go criteria for TopOwl.

MAJ CHAPMAN: You've just touched earlier, a few minutes ago, on the environmental temperatures can impact on alignment with TopOwl. And I think that's something you've addressed at page 13, towards the bottom, under the heading "Temperature Effects on Misalignment".

DR GAVRILESCU: Yes.

MAJ CHAPMAN: Did you see that with ANVIS or it just affecting TopOwl?

DR GAVRILESCU: No. We measured ANVIS misalignment in the same condition and there was no temperature effects.

MAJ CHAPMAN: And was that a conclusion, in terms of the environmental impact, that you reached from testing conducted up in Robertson Barracks, or - - -

DR GAVRILESCU: We tested this in our lab. We heated TopOwl in a special enclosure up to 33 degrees and we cool it down to 10 degrees. And then we cycle it, so we put it in hot environment and then cold and hot and cold, as they would experience day/night cycles. And in that testing, we observed that misalignment drifts with temperature, and once you heat it, it never comes back to - - -

MAJ CHAPMAN: And you refer to the temperature range, I think, in your report of 10 to 33 degrees. Did you also test the effects of humidity in that environment?

DR GAVRILESCU: No. The lab is quite well insulated from humidity.

MAJ CHAPMAN: How many units do you estimate were affected?

DR GAVRILESCU: We tested four Config 3s and one Config 1 with temperature.

MAJ CHAPMAN: Four Config - - -

AVM HARLAND: So just to be clear, it's actually the cycling between cold and hot that creates the condition, or is it if it was stored in hot conditions only and flown in hot conditions only, would it be okay?

DR GAVRILESCU: So the moment you heat it up the first time, the misalignment change and even if you let it cool down at room temperature for days, it never comes back to the original value. So it has a bit of resistance. When we put it in 10 degrees, it comes back from cold if you place it at room temperature for a while. But then what we've done was cycling through as they would from day to night, for example, and the misalignment keeps drifting. And eventually it will go out of the go/no go criteria because it keeps drifting over time.

MAJ CHAPMAN: I'm just trying to get clear on this. So if a TopOwl is exposed to hot conditions, that will create an initial misalignment?

DR GAVRILESCU: Yes.

MAJ CHAPMAN: Which won't be corrected if you cool it down?

DR GAVRILESCU: No.

MAJ CHAPMAN: So if the TopOwl remained in hot conditions – and what would you describe that as? Is that above a certain temperature?

DR GAVRILESCU: We only tested up to 33 degrees. I wasn't – I felt uncomfortable to heat it more. I know that, for example, in the Tiger cockpit that has a lot of glass, the temperature in the cockpit gets higher than 33. I suppose it could get higher on MRH as well, especially if the helicopter is on the ground in tropical Queensland, but I have never tested beyond 33 degrees.

MAJ CHAPMAN: So heating is a mechanism that creates the misalignment?

DR GAVRILESCU: Yes.

MAJ CHAPMAN: Thank you.

MS McMURDO: Can I just ask a few more questions along those lines, too?

DR GAVRILESCU: Yes.

MS McMURDO: So it was only heating that creates the misalignment, not going from hot to cold?

DR GAVRILESCU: Well, cycling from hot to cold accumulates the - - -

MS McMURDO: It can cause more misalignment?

DR GAVRILESCU: Yes. Accumulates the misalignment. So the misalignment increases with hot temperatures. It recovers somewhat, but not completely. But if you cycle it through hot and cold, it keeps accumulating and it drifts more and more.

MS McMURDO: I see. And flying in night and day conditions, inside the cockpit in particular, the cockpit is cold at night and it's hot in the day.

DR GAVRILESCU: Yes.

MS McMURDO: Particularly if it's sunny.

DR GAVRILESCU: So that's why we were trying to simulate this cycling from day to night.

MS McMURDO: And then taking the TopOwls and putting them in nice, air-conditioned temperatures at 20 degrees isn't going to correct what's already happened.

DR GAVRILESCU: Yes.

MS McMURDO: And what continues to happen.

DR GAVRILESCU: Yes. We have two TopOwls in the lab that we never took outside. They stay in constant environment. The misalignment doesn't change on those.

MS McMURDO: Once it's happened, it doesn't change.

DR GAVRILESCU: So it's constant, nothing drifts, because we don't cycling them. We don't expose them to any hot temperatures.

MS McMURDO: So unless they've gone in for maintenance to Thales and been realigned, they - - -

DR GAVRILESCU: Yes, they will drift.

MS McMURDO: - - - will stay that way whenever it happened.

DR GAVRILESCU: Yes.

AVM HARLAND: Just to follow on from that, I think earlier I heard you say that the pilot won't pick up misalignment until it becomes so severe that double vision occurs.

DR GAVRILESCU: Yes.

AVM HARLAND: But the misalignment does create fatigue effect – or cumulative fatigue effect.

DR GAVRILESCU: Yes, but they will not be aware of that. I mean, they might experience headaches and they might experience red eyes or tired eyes, but maybe they don't feel like reporting that because they expect these sort of conditions.

AVM HARLAND: Okay. Thank you.

MAJ CHAPMAN: Approximately halfway down the page on page 13, also in the context of the alignment issue – and we've just mentioned this, the practical issue of where these devices are maintained – and you've given some evidence that TopOwl maintenance is performed by the manufacturer, Thales in Sydney, whereas I think with the NV goggles, the ANVIS goggles, issues of alignment can be corrected onsite.

DR GAVRILESCU: Yes.

MAJ CHAPMAN: And is that making use of a device called the Hoffman 126 box?

DR GAVRILESCU: Yes, that's correct.

MAJ CHAPMAN: Who operates that? Is that the support crew?

DR GAVRILESCU: The support crew, yes, the maintainers.

MAJ CHAPMAN: Support crew, right. So this is the support crew to the pilots. So they might, for example, identify a moderate alignment issue, hand it to the support crew. The support crew then use the Hoffman box to fix that.

DR GAVRILESCU: Yes.

MAJ CHAPMAN: What's your understanding of how long that – is that a lengthy process?

DR GAVRILESCU: So the support crew is not necessarily aware they are realigning the goggles. They follow the protocol. So they do routine maintenance on the goggles, and part of that routine maintenance they are doing actually an alignment, and they are doing a very good job because they have a tolerance box embedded in that Hoffman 126, and they don't just put the device within that box, they put it in the middle of the box, like bang on zero.

I do know, just talking to pilots, that sometimes when they feel like the goggles give them headaches they can take them to the maintainers and tell them, "These goggles give me headaches. Can you fix them?" They don't necessarily associate these symptoms with misalignment. They're not aware of misalignment. But they can get the goggles fixed out of the normal routine cycle, so maintenance, if they require it.

MAJ CHAPMAN: So it's the case that there is ongoing maintenance which should avoid most of the misalignment issues, though where something has fallen through the cracks perhaps - - -

DR GAVRILESCU: Yes.

MAJ CHAPMAN: - - - there's an ability to take this to a technician who can fix it quickly.

DR GAVRILESCU: Yes.

MAJ CHAPMAN: But that's not the case with TopOwl which, as you say, needs to return to Sydney to be maintained.

DR GAVRILESCU: Yes.

MAJ CHAPMAN: So the reality of all this is that if you're operating from a unit in Queensland, you know, if your HMSD is in need of alignment, that's taking out one of the HMSDs and taking out some capability while that gets fixed.

DR GAVRILESCU: Yes.

MAJ CHAPMAN: Do you know how long approximately these units are back in Sydney to be fixed?

DR GAVRILESCU: I'm not sure. It used to be months. They improved, but I still think it would be a cycle of at least one month.

MAJ CHAPMAN: Noting that you're not aware precisely of it, these devices or these units can be sent in for an alignment issue also as part of general maintenance. That's correct?

DR GAVRILESCU: Yes. There are many other issues that they can declare a certain helmet-mounted display, a certain TopOwl unserviceable, and send it back for maintenance, not just misalignment. In fact, I think it has to be horribly misaligned for them to send it back for misalignment.

MS McMURDO: Can I ask too, the fact that the helmet is fitted to the individual's head, and then the TopOwl clips on on top with three clips, that system is designed so that there won't be misalignment - - -

DR GAVRILESCU: Yes.

MS McMURDO: - - - through the TopOwl thing moving a bit?

DR GAVRILESCU: Yes. So the outside of the helmet is the same. It's just the inside that is individualised. The hard shell – so the distance between the two clips on the side, and there's a set of – an area where TopOwl slides in in the middle, they're exactly in the same position, so there's no stress on the TopOwl itself, based on moving it from one helmet to another.

MS McMURDO: No, but what I'm also saying too is it's unlikely that there'll be a misalignment just through the angle of the TopOwl that's fitted on top because - - -

DR GAVRILESCU: Very unlikely, yes.

MS McMURDO: - - - it's fitted very firmly.

DR GAVRILESCU: It's fitted very firmly, yes.

MS McMURDO: Thank you.

MAJ CHAPMAN: And you've referred, Dr Gavrilescu, to a visit that you conducted in 2019 to Thales in Sydney.

DR GAVRILESCU: Yes.

MAJ CHAPMAN: And there you say you observed 55 HMSD units being maintained, and the comment was made that that was not unusual at that time.

DR GAVRILESCU: Yes, that's correct.

MAJ CHAPMAN: So, at any one time, that's a significant number of units, the capability, which are out of the cycle.

DR GAVRILESCU: Yes, that's correct.

MAJ CHAPMAN: At question 12, which is on – or, rather, in your response to question 12 on page 14 you were asked to consider the ability of pilots to identify the misalignment affecting their HMSD. And you've already given evidence that it can be slight, not observable, to, in the worst case, double vision. You've also made a comment in the context of this answer: that Army Aviation pilots and aircrew are more likely to raise issues related to visual fatigue when it can be rectified on base. That's a comment, I take it, going back to your evidence about ANVIS?

DR GAVRILESCU: Yes.

MAJ CHAPMAN: Is it the case that, in your experience, they're likely, the pilots, to raise these issues when it's not going to require their unit to be sent off, and then they might not have an ability to fly?

DR GAVRILESCU: It is actually a very quick process. If they go to the maintainer, it is a very quick process to realign it. So they have no problem flagging that a certain pair of goggles is problematic for them, gives them headache.

MAJ CHAPMAN: Because they know it can be fixed quickly?

DR GAVRILESCU: It can be fixed quickly, yes.

MAJ CHAPMAN: And, similarly, they're less likely, in your experience, to raise those issues when they think raising it might have an adverse effect on capability?

DR GAVRILESCU: Yes.

MAJ CHAPMAN: And is that a comment that you make, in your report, based on your experience interacting with the Aviation community, Army Aviation?

DR GAVRILESCU: Yes.

MAJ CHAPMAN: And so you consider, do you, that, at least on the issue of misalignment there is likely a higher reporting of issues impacting ANVIS than TopOwl? Would that be a fair comment?

DR GAVRILESCU: I'm not sure that the operators with ANVIS – could be aircrew, could be pilots – are aware that this is a misalignment issue. Whenever they have an issue with their goggles, including headaches, they can take them to the maintainers and it gets fixed in a few minutes. So they have no problem doing that. I'm not sure if they identify this as a specific misalignment issue.

MAJ CHAPMAN: And just moving on from that topic to stereovision – and you've given some evidence about this – but it's the case, isn't it, that not everyone in the community has stereovision?

DR GAVRILESCU: That's correct, yes.

MAJ CHAPMAN: And I'm not asking you to quantify this precisely – although, to your understanding, is it particularly rare that someone might not have stereovision?

DR GAVRILESCU: Not really. I'm almost stereoblind.

MAJ CHAPMAN: And can you just briefly outline the sorts of issues that a pilot might face who does not have stereovision?

DR GAVRILESCU: [redacted]

They did find this – well, similar results with other tasks, but not in all the tasks they investigated. I believe, in one of the references, they looked specifically at helicopter landing, and they couldn't find improvement with – they couldn't find that there is a definite improvement for people with better stereoacuity. So the general conclusion of these investigations was that, in certain circumstances, having better stereoacuity will make you a better operator.

In particular, they identified situations such as formation flying, or situations where you really need to have a very precise depth perception such as formation flying, or refuelling from a tank, or when you taxi on a tarmac and you try not to clip the aircraft or aircrafts around you. So, in those specific circumstances, they found evidence that it helps if you have better stereoacuity; the better your stereoacuity, the better you perform on these tasks. There is no general blanket evidence that having better stereoacuity will make you a better operator in all circumstances.

MAJ CHAPMAN: Understood. And you've given an opinion at page 16, so in response to question – 15 of your report that there's presently no stereovision standard which is used for the selection of ADF pilots?

DR GAVRILESCU: That's correct.

MAJ CHAPMAN: Correct. So at the moment, as far you're aware, is it the case that an individual can enter into ab initio flight training with the ADF even where they lack stereovision?

DR GAVRILESCU: Yes, that is possible.

MAJ CHAPMAN: And there's no controls, as far as you're aware, about that?

DR GAVRILESCU: No.

MAJ CHAPMAN: And you consider, do you, that consistently with the approach that's been taken by the US Air Force, that their should be a standard imposed to that effect? Is that right?

DR GAVRILESCU: Yes. So - - -

MAJ CHAPMAN: And could you just explain, sorry - - -

DR GAVRILESCU: Yes?

MAJ CHAPMAN: - - - why that is?

DR GAVRILESCU: So, yes, this is my personal/professional opinion, and by no means reflects the position of DSGT in any way, shape or form. So, in general, vision standards are quite old. They've been defined in 1940s, 1950s, when the aircrafts were much simpler, and the way that pilots operated was quite different. The actual test that I use to measure various characteristics of human vision are very old; most of them based on pen and paper. And we work with international collaborators under TTCP – collaborators from US in Dayton, but also Canada and UK, trying to look at modernising both the vision tests, but also the vision selection criteria.

The main reason is that the current displays are a lot more complex. And helmet-mounted displays, in particular, are becoming prevalent, and they rely on good binocular vision. So good cooperation between the eyes, and stereovision is part of that set of skills. So the evidence we've got from our partners in Dayton suggests that there are specific tasks related to Military Aviation where having good stereoacuity is a definite advantage. So that's another reason why I think it should be a standard.

US Department of Defense is imposing a standard of 40 arcseconds across all Military Aviators, but in particular for US Army and US Navy. So that's specific relevant for Rotary Wing operators. They enforce it very strictly, so someone that doesn't have 40 arcseconds is not allowed to undergo – to the training program. For the Air Force, they can provide waivers up to 120 arcseconds under certain circumstances, and for certain roles.

So I think at the very least, considering that we are operating modern aircrafts and the technology in helmet-mounted displays is evolving, the manufacturer's looking at adding cues in 3D, so stereoacuity will definitely

be an advantage. I think we should adopt a similar selection criteria as our American partners for the time being, and then revise that as more evidence becomes available.

MAJ CHAPMAN: And those are – you mentioned they're enforcing those standards. So they're presently in place?

DR GAVRILESCU: Yes.

MAJ CHAPMAN: And they have been for – do you know how long those standards have been in place for?

DR GAVRILESCU: I'm not sure how long they've been in place for, but they're very strongly enforced for Rotary Wings. There is no waiver on them.

DR GAVRILESCU: Are you aware of any consideration being given by the ADF, generally, to changing a standard in that way?

DR GAVRILESCU: No. We have been working with Institute of Aviation Medicine in this space. As I said, we're looking at a lot of other tests. For example, colour discrimination, and all sorts of other tests. Stereoacuity is one that they're concerned about, and they would like to have a standard for stereoacuity imposed.

MAJ CHAPMAN: So based on this, your understanding of the position in the US is that they enforce this standard in particular categories, and one of them, at least – there's refuelling, I think you mentioned?

DR GAVRILESCU: Yes.

MAJ CHAPMAN: But another is formation flying?

DR GAVRILESCU: They think that, in this situation, having good stereoacuity is an advantage.

MAJ CHAPMAN: Is that your understanding? Formation flying, fixed-wing, and rotary?

DR GAVRILESCU: They're mostly concerned with rotary wings, in terms of very strict standards for stereoacuity.

MAJ CHAPMAN: And your understanding of why they're concerned about this is that, in the broad, the sorts of technologies which are coming into play in these cockpits really demand stereovision to interpret

information clearly.

DR GAVRILESCU: Yes. Demand would – binocular vision and stereovision is part of it. So having good stereovision will be part of having good binocular vision. There are other parameters that are not relevant to this discussion that we're looking at, but stereovision is definitely one of them.

MAJ CHAPMAN: Yes.

AVM HARLAND: Are you aware if any of our Australian Air Force refuelling aircrew have to undergo stereovision testing?

DR GAVRILESCU: As far as I know, not.

AVM HARLAND: Okay, thank you.

MAJ CHAPMAN: And just a follow-on from the Air Vice-Marshal's question. And they're, as I understand it, operating very similar type, in terms of the tankers and refuellers, as we are?

DR GAVRILESCU: It's a hyper-stereoscopic system, yes.

MAJ CHAPMAN: I just want to move now to what I think is the final topic, to discuss your responses to question 16.

DR GAVRILESCU: Yes?

MAJ CHAPMAN: Now, this is where you were asked about the stress symptoms that pilots may experience when operating the HMSD in high workload situations and in degraded vision environments.

DR GAVRILESCU: Yes.

MAJ CHAPMAN: And you've given some evidence previously that degraded visual environments inherently add a level of workload and also stressors to the pilot's experience. Is that right?

DR GAVRILESCU: Yes.

MAJ CHAPMAN: Now, what I want to ask you is that from the point of view of a scientist specialising in the field of optics, you list on page 17 – commencing on 17, towards the bottom, a list of potential stressors to visual performance. And they're listed from (a) to (f) there. And I'm going to ask you to comment on each of these briefly.

But I might take you up on the last one first, which is the issue of currency. Now, you make the point that pilots lose at least some degree of their adaptation when they stop flying at night for long periods.

DR GAVRILESCU: Yes.

MAJ CHAPMAN: Could you just explain – and there's been some evidence earlier in your responses about this – but could you just explain to the Chair and the Air Vice-Marshal, what do you mean by adaptation in this context and how currency is significant, more generally?

DR GAVRILESCU: Yes, so as I mentioned before, ab initio, when they experience TopOwl for the first time, they take some time to compensate for this extreme and different than natural world depth cues. And I mentioned there is a reference published in the US Army Research Laboratory suggesting five to 10 hours, but it's variable. Some people are quicker; some people are not so quick.

Once they pass this initial adaptation to hyper-stereopsis, if they fly constantly they don't have to do anything, they're adapted and they're used to it, and they can compensate. They can make sense of the real world. It also helps if there is enough light in the environment for them to see these monocular cues for depth perception. That helps them to collaborate a bit quicker.

But if they take breaks – this is a learned behaviour. Some of this learned behaviour dissipates, and when they return to flying, especially during the first mission, there is a likelihood that they will not perform at their best because they're reacquiring that skill. I don't have evidence on how long it takes to reacquire that skill, but based on the conversation with pilots, they need much shorter time to reacquire that skill.

And also, as I mentioned before, they said that they find it much easier to adapt to hyper-stereopsis with TopOwl with a 3 (indistinct) with the previous version of TopOwl with the ITT tubes.

MAJ CHAPMAN: And returning to the top of that list you started at the bottom.

DR GAVRILESCU: Yes.

MAJ CHAPMAN: But to "light levels"?

DR GAVRILESCU: Yes.

MAJ CHAPMAN: You've given some evidence earlier this afternoon about how:

the darker the environment –

just as it says there –

the more degraded the visual performance.

And, indeed, you've given some evidence about how imagine intensifier tubes and night vision is only good to the extent there is some light available.

DR GAVRILESCU: Yes.

MAJ CHAPMAN: And that the quality of the NV image would deteriorate by reference to how low the light is.

DR GAVRILESCU: Yes, that's correct.

MAJ CHAPMAN: In relation to the next one, which is "Weather", you say the presence of weather creates a problem; flying over featureless terrain is a challenge - - -

DR GAVRILESCU: Yes.

MAJ CHAPMAN: - - - particularly for water. Why do you say that, in that scenario, it's a particular stressor?

DR GAVRILESCU: So flying overwater, as I mention, is one of the, I would say, harder things they have to do, especially in a dark environment. So, again, I have to emphasise here that is a double hit. So they operate with a device in front of their eyes. That device adds a blur to the vision of the world.

Human vision in that dim environment is not optimal. So the device creates a blur, human vision is not top performance like in daylight. They have to rely on cues in the environment to orient themselves. A featureless terrain doesn't have any cues; everywhere looks the same. So that could, potentially, be a stressor because they have nothing to orient themselves on.

In particular, water is problematic because water doesn't reflect near infrareds. And photo power that has Class B filters, the main amplification of the light is for near infrared light. So if you see the moonlight reflected

on water, that's just a visible part of the moon spectrum. But they don't get that amplified because of the Class B filters.

The part that gets amplified is absorbed by water. So they don't get almost anything back from the water; everything is dark. It looks the same everywhere. If they encounter rain, then the droplets of rain in the air absorb near infrared. The up and the down look the same. They have no horizon line. So I haven't done any measurements in this, but in these conditions it would be harder for them. It would be a stressor. It would be harder for them to undertake their mission and they could disorient.

MAJ CHAPMAN: So even in featureless physical terrain, that's a better reference point for night vision than water?

DR GAVRILESCU: Yes. For example, sand is featureless terrain, but sand reflects both visible and near infrared lights, so they will have more light coming to their eyes if they fly over sand. Snow is a featureless terrain. I know it's not necessarily relevant for us, but snow reflects almost all the light, and it doesn't absorb. So snow is water in a different form; it doesn't absorb near infrared radiation. But water in liquid form absorbs near infrared radiation, and it's very little that gets sent back to the eyes.

MAJ CHAPMAN: And the lack of information or data coming into the NV device to create the image might lead to disorientation or possibly or potentially a cause of loss of situational awareness?

DR GAVRILESCU: Yes.

MAJ CHAPMAN: And in terms of your comment concerning degraded off-axis visual performance, the Inquiry is dealing with some evidence concerning that issue in the symbology set in TopOwl. Can you just explain how the off-axis symbology represents a stressor in your view?

DR GAVRILESCU: It's not the off-axis symbology. So the intensifier tubes don't have the same performance across the 40 degree field of view. The best performance is in the middle of the field of view. So we recommended to pilots to move their head around so they look at the important cues in the environment through the best part of the tube. So instead of trying to catch up with the periphery of the field of view, you move your eyes and you look directly at that.

If the symbology is head-locked, so the symbology moves with your head, that could potentially create problems. I do not have evidence or data to support that. But if your head moves and the symbology moves with your head, you could create problems.

MAJ CHAPMAN: So there's a link established between a tendency on the part of a pilot to be wanting to look directly in the middle of the intensified image to achieve the best quality of image - - -

DR GAVRILESCU: Move their head, yes.

MAJ CHAPMAN: - - - and then to look around, to move their head off-axis, to achieve the best possible night-vision image for where they're looking off-axis?

DR GAVRILESCU: Yes.

MAJ CHAPMAN: I'll just ask a question. Dr Gavrilescu, is there anything finally that you'd like to add to your evidence today?

DR GAVRILESCU: Yes. I wish, with your permission, to express my most sincere condolences to the four families that lost loved ones and they're in my thoughts and I'm feeling very, very sorry for this terrible accident.

MAJ CHAPMAN: Thank you.

MS McMURDO: Thank you. I'm sure we all share your thoughts.

MAJ CHAPMAN: Indeed. Thank you, ma'am. That's the evidence.

MS McMURDO: Yes, thank you. Did you have anything? Any applications to cross-examine?

MR MEEHAN: Yes. Happy to - - -

MS McMURDO: Yes.

MR MEEHAN: If it please, I make application. It hasn't been foreshadowed, Chair, for the sole reason that Thales hasn't been provided with this witness's statement. There's no criticism embedded in that proposition. It's a very singular point that I want to engage upon. It might involve a few questions to get there but I don't anticipate it will take more than 10 minutes.

MS McMURDO: No. Well, I think you've got a legitimate interest, so I'm happy to give you leave to cross-examine. Thank you, Mr Meehan.

<CROSS-EXAMINATION BY MR MEEHAN

MR MEEHAN: Doctor, at the risk of over-simplifying the description of the TopOwl system, would you accept that it comprises of hardware on the one hand, and software as well?

DR GAVRILESCU: Yes.

MR MEEHAN: By way of example, the hardware includes the helmet that we see on the screen.

DR GAVRILESCU: Yes.

MR MEEHAN: As well as the display module.

DR GAVRILESCU: Yes.

MR MEEHAN: There's also a cockpit tracking module, would you agree?

DR GAVRILESCU: Yes.

MR MEEHAN: A connection module.

DR GAVRILESCU: Yes.

MR MEEHAN: A control panel.

DR GAVRILESCU: Yes.

MR MEEHAN: And an electronic unit.

DR GAVRILESCU: Yes.

MR MEEHAN: On the software side of the ledger, as it were, you've given some evidence about symbology today and the symbology is created, do you accept, by the software that's embedded in the TopOwl system?

DR GAVRILESCU: Yes, that's correct.

MR MEEHAN: And I think in your evidence you indicated that the symbology was created from the aircraft itself. Do you remember saying something to that effect?

DR GAVRILESCU: Yes.

MR MEEHAN: Is this right: that the software embedded in the TopOwl system draws upon avionics data from the aircraft itself.

DR GAVRILESCU: That's correct, yes.

MR MEEHAN: And that would ultimately, by reason of the software, lead to the projection of symbology on the visor. Is that a fair description?

DR GAVRILESCU: Yes, that's correct.

MR MEEHAN: The issue I wanted to more directly take you to is an answer you gave, namely that you accepted the TopOwl system was created and manufactured by Thales.

DR GAVRILESCU: Yes.

MR MEEHAN: Do you remember giving that answer, or something to that effect?

DR GAVRILESCU: Yes.

MR MEEHAN: When you gave that answer, did you mean to confer that the software embedded in the system was created and/or manufactured by Thales?

DR GAVRILESCU: No. I have really no experience with symbology. I've seen symbology just fleetingly when we have run some ground trials because the pilots had the symbology projected in the visors, but I have no experience with symbology. We cannot project the symbology in the lab because we don't have the helicopter.

MR MEEHAN: Yes.

DR GAVRILESCU: I have no experience. I don't know where the source of the symbology is. I have no experience with symbology.

MR MEEHAN: Just for abundant clarity, when you say you have no idea of the source of the symbology, you don't know – and this is not criticism – you don't know in point of fact which organisation created the software embedded in the TopOwl system. Is that correct?

DR GAVRILESCU: No, and I do apologise if I infer that I know where the software is coming from.

MR MEEHAN: There's no need for an apology; I just wanted to clarify that.

DR GAVRILESCU: Yes.

MR MEEHAN: That's the cross-examination.

MS McMURDO: Could I just ask, what is meant by "avionic data symbology"? "Symbology relies on avionic data from within the aircraft to create the symbology." I think that's what was said.

DR GAVRILESCU: I think it gets information from the systems on the aircraft itself.

MS McMURDO: I see. Right.

DR GAVRILESCU: It presents some of that information on the multifunctional displays within the helmet.

MS McMURDO: I see. Thank you.

DR GAVRILESCU: That's correct.

MR MEEHAN: May it please.

MS McMURDO: Yes. Thank you, Mr Meehan. Yes, LCDR Gracie? It's nice to see you back.

LCDR GRACIE: Thank you.

MS McMURDO: We've missed you.

LCDR GRACIE: I haven't been far.

<CROSS-EXAMINATION BY LCDR GRACIE

LCDR GRACIE: Dr Gavrilescu, my name is LCDR Malcolm Gracie. I represent CAPT Danniel Lyon, who was the pilot of the aircraft. Could I just ask if you could look at page 7, please, of your statement?

DR GAVRILESCU: Yes.

LCDR GRACIE: At about point 4 on the page, you make a reference to a loss of acuity in the TopOwl Configuration 0.

DR GAVRILESCU: Yes.

LCDR GRACIE: Then in the next paragraph you say:

> *Full details of these experiments –*

that's experiments by DSTG in 2009?

DR GAVRILESCU: Yes.

LCDR GRACIE:

> *Are provided –*

in the report to which you refer. You say:

> *In brief, TopOwl Configuration 0 showed significantly degraded visual performance when compared to ANVIS NVGs.*

DR GAVRILESCU: Yes, that's correct.

LCDR GRACIE: I just want to hold that for a moment and ask you, bearing in mind what you've just said there, if you go to page 31, please – and just help me out if I'm moving into other territory, or if this is more of the same.

DR GAVRILESCU: Yes.

LCDR GRACIE: At the top paragraph, on about the seventh line or so, you say:

> *More intensified light is lost along the complex TopOwl optical path than in the ANVIS. Therefore, the system level gain in TopOwl is significantly lower than the system level gain in ANVIS, fitted with the same intensifier tubes.*

DR GAVRILESCU: Yes, that's correct.

LCDR GRACIE: Was the same quantification of how much lower it was?

DR GAVRILESCU: Yes.

LCDR GRACIE: Was it up to 50 per cent?

DR GAVRILESCU: This is information that is classified beyond "Unclassified" level and I'm not able to share that with you. But, yes, we do quantify, and we do have this quantified.

LCDR GRACIE: It was a quantified - - -

DR GAVRILESCU: Yes.

LCDR GRACIE: - - - figure which represented the loss of acuity relative to TopOwl and the ANVIS?

DR GAVRILESCU: Yes, we do have the exact numbers. It's just not information that I can share in an unclassified environment.

LCDR GRACIE: Thank you. Just picking up on something that you just raised in relation to the software drawing on the avionics from the aircraft, can I just explore that a little bit? In this same paragraph, at the last sentence, you say:

> *Pilots on TopOwl experience exaggerated depth cues and they have to adapt to this distorted image of the world.*

Can I just touch on that? My very basic understanding is that helmet-mounted displays or head-up displays as we have in the case of the HMSD, can be based on two sources of information. One is the real world and one is the aircraft world – or aircraft frame, for want of a better point of view.

DR GAVRILESCU: Yes, that's correct.

LCDR GRACIE: My understanding is that one method permits the HUD, in this case, to provide attitude information based on the real world. So that would be, what, external parameters?

DR GAVRILESCU: (No audible reply).

LCDR GRACIE: You're nodding?

DR GAVRILESCU: Yes, that's correct.

LCDR GRACIE: And the other is that – as I'm about to ask you – whether or not the avionics in the aircraft represent this, whether or not it is what's known as a body access concept?

DR GAVRILESCU: As I mentioned before, I don't have any knowledge about the symbology, so the hyper-stereopsis distortion of the depth cues, and specifically referring to the intensified image of the real world, is not related to the symbology, and that's what I've been talking about. I don't know how the symbology – how the exact symbols were selected that are presented in the visor from the cockpit, and I don't know how they relate to the real world.

LCDR GRACIE: So we don't know – or you don't know what the two methods of attitude are presented through that symbology?

DR GAVRILESCU: Yes, I don't know how that information – sorry.

LCDR GRACIE: And I don't mean that as a criticism, don't worry.

DR GAVRILESCU: I just don't have expertise in this.

LCDR GRACIE: I don't know either. There was only one other matter that I was going to ask you about and that was this: aside from the difference in the – sorry, I withdraw that. Let me start again. One of the tasks that you did at DSTG was to assess, as I understand it, Configuration 3 of the ITTs - - -

DR GAVRILESCU: Yes.

LCDR GRACIE: - - - compared to the – was it a Category 3?

DR GAVRILESCU: The optics are the same; the tubes are different. So we compare the same display module, if you want, with ITT tubes against the same – exactly the same optics with L3 tubes.

LCDR GRACIE: And in terms of that comparison, the L3 upgrade was significantly better?

DR GAVRILESCU: Yes, on all the tests that we have run. And the gain is better as well.

LCDR GRACIE: And that's then a separate consideration to how it performed relative to an ANVIS NVG?

DR GAVRILESCU: We have not compared TopOwl with L3, with the goggles with L3. So all the goggles across the Army Aviation have been upgraded with L3 tubes. They're using white phosphor tubes. TopOwl is using grey – sorry, green phosphor tubes. We have not directly compared TopOwl with L3, with ANVIS with L3.

LCDR GRACIE: So since the 2009 assessment which said that there was a significantly lower level gain in TopOwl relative to ANVIS, you haven't done anything since then?

DR GAVRILESCU: We did measure the gain. We didn't compare visual performance. So ANVIS with L3 versus ANVIS with ITT tubes is better in terms of gain. The same in the TopOwl with L3 versus TopOwl with ITT tubes. The relative difference between TopOwl with L3 and ANVIS with L3 is the same as between TopOwl with ITT and ANVIS with ITT. So the relative difference between the devices, like-to-like, in terms of tubes, is exactly the same. I cannot tell you the number, but - - -

LCDR GRACIE: No, that's okay. No, that's all right.

DR GAVRILESCU: Yes, we have measured this quantitatively.

LCDR GRACIE: But nothing has changed from the 2009 assessment that it's a significantly lower acuity in the TopOwl relative to the ANVIS?

DR GAVRILESCU: We have not compared L3 TopOwl with ANVIS with L3, but having that the gain is the same difference, I would venture to say that if we do compare the visual acuity with ANVIS with L3 will be better than TopOwl with L3. But I don't have the number; we have not done that comparison.

LCDR GRACIE: Understood. No, thank you for that. Thank you, ma'am.

MS McMURDO: Any other applications to cross-examine? No? Any re-examination? No.

All right then. I think we'll have a short break, a 15-minute break, before we start the next witness. Is that sufficient?

<WITNESS WITHDREW

HEARING ADJOURNED

HEARING RESUMED

MS McMURDO: Yes, MAJ Chapman.

MAJ CHAPMAN: Thank you, ma'am. I call LTCOL Brendan Reinhardt.

<LTCOL BRENDAN JOHN REINHARDT, Affirmed

<EXAMINATION-IN-CHIEF BY MAJ CHAPMAN

MS McMURDO: Yes, MAJ Chapman.

MAJ CHAPMAN: Thank you, ma'am. Could you please state your full name, and your current position?

LTCOL REINHARDT: Brendan John Reinhardt. I'm a Reservist. I fill the T&E Mentor position at AAvnTC.

MAJ CHAPMAN: Can you also confirm, LTCOL Reinhardt, that you've received the following documents prior to today, and I'll just list them: first is a section 23 Notice requiring your appearance today to give evidence?

LTCOL REINHARDT: Yes.

MAJ CHAPMAN: Second is an extract of the Inquiry Directions?

LTCOL REINHARDT: Yes.

MAJ CHAPMAN: Third is a copy of my appointment as an Assistant IGADF?

LTCOL REINHARDT: Yes.

MAJ CHAPMAN: Fourth is the Frequently Asked Questions Guide for Witnesses of the IGADF?

LTCOL REINHARDT: Yes.

MAJ CHAPMAN: And the last is the Privacy Notice for witnesses giving evidence?

LTCOL REINHARDT: Yes, and I signed it.

MAJ CHAPMAN: Thank you. And have you prepared, for the purposes of this Inquiry, a statement?

LTCOL REINHARDT: Yes, I have.

MAJ CHAPMAN: Can I hand you a copy of that statement? Do you recognise that as a statement dated 30 July 2024, with nine annexures?

LTCOL REINHARDT: Yes.

MAJ CHAPMAN: And the statement itself is 20 pages in length?

LTCOL REINHARDT: Yes.

MAJ CHAPMAN: And that is your signature which appears on page 20 of the statement?

LTCOL REINHARDT: Yes.

MAJ CHAPMAN: And do you wish to make any amendments to this document?

LTCOL REINHARDT: No.

MAJ CHAPMAN: And can you just confirm that you were approached by the Inquiry to prepare the statement?

LTCOL REINHARDT: Yes.

MAJ CHAPMAN: Thank you. Ma'am, can I tender the statement of LTCOL Brendan Reinhardt?

MS McMURDO: Exhibit 41.

#EXHIBIT 41 - STATEMENT OF LTCOL B REINHARDT DATED 30/07/24

MAJ CHAPMAN: LTCOL Reinhardt, throughout your evidence today, can I just please ask you to be mindful, as we've asked all witnesses to be mindful, of your security obligations?

LTCOL REINHARDT: Understood.

MAJ CHAPMAN: And let me know if there are any topics that – or anyone else asking questions might ask you about – that tend to lead you into discussions about matters at a "Official: Sensitive" level or higher.

LTCOL REINHARDT: Yes.

MAJ CHAPMAN: And if they do, if we do get there, we may need to take some evidence in a private hearing. Do you understand that?

LTCOL REINHARDT: Yes.

MAJ CHAPMAN: Okay. Can I just begin with some questions about your background? You refer in your statement to joining the ADF in January 1989.

LTCOL REINHARDT: Yes.

MAJ CHAPMAN: And at that stage, you joined the Royal Australian Air Force.

LTCOL REINHARDT: Correct.

MAJ CHAPMAN: And at that time, you were studying towards a Bachelor of Aerospace Engineering at ADFA, being the Australian Defence Force Academy?

LTCOL REINHARDT: Yes, I was. And I graduated – well, that degree was conferred by the Royal Melbourne Institute of Technology.

MAJ CHAPMAN: And that's in 1992?

LTCOL REINHARDT: Yes.

MAJ CHAPMAN: And since then you've completed a number of other tertiary qualifications at a Master's level?

LTCOL REINHARDT: Yes.

MAJ CHAPMAN: And as you say in your statement at paragraph 4, you are presently undertaking a Research Master's in Aerospace Engineering.

LTCOL REINHARDT: Correct.

MAJ CHAPMAN: Just in terms of your flying career, following your time at ADFA, you attended Ab Initio Flight Training at RAAF Pearce. Is that correct?

LTCOL REINHARDT: Correct.

MAJ CHAPMAN: And you graduated from that course in 1994?

LTCOL REINHARDT: Yes.

MAJ CHAPMAN: And you subsequently had a number of postings with the RAAF flying the Caribou.

LTCOL REINHARDT: Correct.

MAJ CHAPMAN: And that's a fixed-wing transport aircraft.

LTCOL REINHARDT: Correct.

MAJ CHAPMAN: And you've deployed around this time, and it's around just after 1994, to East Timor on two occasions.

LTCOL REINHARDT: Yes.

MAJ CHAPMAN: And you note in paragraph 7 that you have also been employed for a time with CASG, which is the Capability and Sustainment Group, Defence.

LTCOL REINHARDT: So I was employed with the Defence Acquisition Organisation, which was a predecessor to CASG.

MAJ CHAPMAN: And that was in the capacity as an operational adviser, giving advice concerning a number of updates to various procurement projects.

LTCOL REINHARDT: Correct.

MAJ CHAPMAN: Was that a uniformed role, or a civilian?

LTCOL REINHARDT: That was a uniformed role.

MAJ CHAPMAN: And next, in 2003, you transferred from the RAAF to the Army, and you undertook helicopter conversion training. Is that correct?

LTCOL REINHARDT: Correct.

MAJ CHAPMAN: So your flying career up until that point, the point at which you transferred to Army, was fixed-wing only.

LTCOL REINHARDT: Correct.

MAJ CHAPMAN: And you say – and I'm now reading from paragraph 10 of your statement – that when you were first posted, you were first posted in Army to 1st Aviation Regiment. Is that right?

LTCOL REINHARDT: Yes, I was.

MAJ CHAPMAN: And you were a line pilot on a Kiowa.

LTCOL REINHARDT: Correct.

MAJ CHAPMAN: And can you just give the Inquiry Chair and the Air Vice-Marshal some sense of what's involved as a line pilot with other - - -

LTCOL REINHARDT: So the 1st Aviation was a Reconnaissance Regiment. I was within a flying Troop, flying Kiowas in the reconnaissance role. The Kiowa is a small, light observation helicopter crewed by two pilots. And, yes, I started off just as a line pilot, but then fulfilled other duties as I gained more experience.

MAJ CHAPMAN: You also say in the same paragraph that you had, as you've just mentioned, a number of other positions at 1st Aviation Regiment, including as Troop Commander.

LTCOL REINHARDT: Yes.

MAJ CHAPMAN: Aviation Safety Officer.

LTCOL REINHARDT: Yes.

MAJ CHAPMAN: Operations Officer.

LTCOL REINHARDT: Yes.

MAJ CHAPMAN: And Acting Officer Commanding.

LTCOL REINHARDT: Correct.

MAJ CHAPMAN: When you say that you held those positions, did you hold them while you were flying as a line pilot, or were they substantive positions on their own while you were not flying?

LTCOL REINHARDT: So the Troop Commander, the OPSO and the Acting OC, they were designated positions which required me to fly as well. The Aviation Safety Officer would have been a position I filled as a line pilot, so it was another duty that I would've held while doing the line flying.

MAJ CHAPMAN: In July 2008 you were selected for, and attended, test pilot qualification training in the United States.

LTCOL REINHARDT: Yes.

MAJ CHAPMAN: At the National Test Pilot School.

LTCOL REINHARDT: Yes.

MAJ CHAPMAN: Can you give the Chair and the Air Vice-Marshal a sense of what's involved in that course, and the selection group?

LTCOL REINHARDT: So the course, we don't run it in Australia. There's several test pilot schools that are run around the world. The idea is to take a pilot who has experience in their role, who understands what the job requirements are and the unique challenges of it, and then train them to fly multiple aircraft; to look at certification, performance-handling qualities, a whole bunch of systems, so that when you complete the course you can come back and help bridge between the operational world and the engineering world for a – you know, you could be involved in designing a new aircraft, certifying a new aircraft, modifications to an aircraft, providing specialist advice to people who command those aircraft. You could be involved in safety investigations, providing technical information. There's a wide range of things that you can be employed in.

MAJ CHAPMAN: You returned the following year. So this is July 2009. At that point, effectively, you say you commenced your test pilot career in Australia.

LTCOL REINHARDT: Correct.

MAJ CHAPMAN: By this stage, you were flying Kiowas and you were also flying the ARH Tiger.

LTCOL REINHARDT: So I flew predominantly Kiowa, plus some civilian aircraft that the Army had leased. I had a limited conversion to Tiger in that period. I did not complete a full conversion to Tiger until I left ARDU.

MAJ CHAPMAN: Though you hadn't been exposed at that stage to the MRH-90.

LTCOL REINHARDT: No.

MAJ CHAPMAN: Can I just confirm that although you've since moved to the Reserves – and when did you transfer to the Reserves?

LTCOL REINHARDT: March 2013. No, '23.

MAJ CHAPMAN: March 2023.

LTCOL REINHARDT: Yes.

MAJ CHAPMAN: That you're still flying the ARH Tiger in a capacity today?

LTCOL REINHARDT: Yes.

MAJ CHAPMAN: Do you fly the Tiger with the TopOwl helmet system?

LTCOL REINHARDT: Yes.

MAJ CHAPMAN: Then, in January 2019 – and I'm taking this from paragraph 16 of your statement – you posted into the Army Aviation Test and Evaluation Section.

LTCOL REINHARDT: Yes.

MAJ CHAPMAN: And you posted in as a Major, and as a test pilot.

LTCOL REINHARDT: Correct.

MAJ CHAPMAN: And you will obviously understand – I'll use abbreviation AATES, and you understand that to mean that organisation?

LTCOL REINHARDT: I do.

MAJ CHAPMAN: You were there a relatively short time, for a period of, I think, only about three months before you were promoted to your current

rank of Lieutenant Colonel, and you took over – or you assumed – you were in charge of AATES from that point.

LTCOL REINHARDT: Correct.

MAJ CHAPMAN: And you were in charge as the SO1 at AATES.

LTCOL REINHARDT: Correct.

MAJ CHAPMAN: You took over from LTCOL Langley; is that right?

LTCOL REINHARDT: Correct.

MAJ CHAPMAN: Before I come to AATES specifically, I might just ask you some questions, developing what you've said about test pilots generally. So you refer, at paragraph 25, to a key aspect of a qualified test pilot must be role experience. Can you just develop that, develop what you mean by "role experience"?

LTCOL REINHARDT: So that is getting to proficiency in how, I guess, Army Aviation want to employ you. Aircraft and systems have interesting characteristics. If you don't – that characteristic may not be relevant to a role, so if you don't understand the role, you can't make a prediction on what the characteristic might mean in the role. I could give a specific example, if you wished.

MAJ CHAPMAN: Certainly.

LTCOL REINHARDT: So it may appeal to sir, but so an interesting example might be close air support. So you may wish to modify a helicopter to fire rockets to mark for close air support. You know, with role experience in the FAC role, you should appreciate that you don't have to get that rocket on target, you just need to put down a mark that can be referenced then for the fast jet coming in. So, you know, a characteristic of a helicopter, it may not be very accurate to fire the rocket, but the role doesn't require the accuracy. So then you would make a recommendation, a sensible recommendation, because of your role experience.

MAJ CHAPMAN: Would it be a fair statement to say that part of your role as a test pilot can be to operate an aircraft type up to the edge of its performance envelope?

LTCOL REINHARDT: Yes, or past it.

MAJ CHAPMAN: Or past it. So in that way, test pilots, perhaps among other pilots – line pilots, instructors, and so forth – have a pretty unique appreciation of the operating limits of what they're testing.

LTCOL REINHARDT: Yes, we certainly cover a lot of that on course, but it's not just the physical act of doing it. We have to understand the engineering process to get there, how the job is done safely, and also designing a safe and repeatable experiment that can gather data, that has a logical way it was gathered, and a repeatable way it can be gathered so that the evidence can stand the test of time.

MAJ CHAPMAN: And some context: testing the performance of the aircraft can, as you've just noted, go beyond capability and what other pilots might be authorised to do.

LTCOL REINHARDT: That may be a requirement, but it's very heavily regulated and insured for safety and test integrity.

MAJ CHAPMAN: I just want to ask you now some questions about AATES itself, and your tenure there. At paragraph 12 of your statement you say that AATES was raised – or it was established in about 2016.

LTCOL REINHARDT: Yes.

MAJ CHAPMAN: Do I understand that it was established as Army's specific Flight Test Organisation, or FTO?

LTCOL REINHARDT: Yes.

MAJ CHAPMAN: And that when you refer to FTO, that has a particular status, does it, under the DASRs?

LTCOL REINHARDT: It may. So, you know, it's a Flight Test Organisation that under DASR would be approved to conduct certain elements of flight tests, specifically probably Category 1 and 2 flight tests.

MAJ CHAPMAN: Could you just describe – when I referred to the DASRs, you understood I was referring to the Defence Aviation Safety Regulations?

LTCOL REINHARDT: Yes.

MAJ CHAPMAN: Could you just describe, please, what, to your mind, the primary role of AATES is insofar as where it sits in the Aviation Safety Framework?

LTCOL REINHARDT: It is to provide advice on risk, I would say holistically, to the Aviation system.

MAJ CHAPMAN: Is it the case – and I'm now referring to paragraph 31 of your statement – that AATES, as the Army's Flight Test Organisation, takes instructions from, among others, DACM, with respect to testing a platform, or an item to be tested, or a modification?

LTCOL REINHARDT: So DACM would drive the prioritisation. In my time they tasked – they provided the tasking directed to me. Now, with the standing up of Aviation Command, the formal tasking, I believe, is done through G3 Avn Command, but again DACM would prioritise that tasking.

MAJ CHAPMAN: During your time at AATES, was that under the former system where the tasking - - -

LTCOL REINHARDT: It was both, and in the transition DACM would task me.

MAJ CHAPMAN: Then AATES, as the FTO, receives the tasking and conducts the testing.

LTCOL REINHARDT: Yes.

MAJ CHAPMAN: And prior to the testing, it obviously prepares the parameters for the testing so they can achieve the intent of what's needing to be tested.

LTCOL REINHARDT: Yes. And we would articulate that in a Flight Test Plan which would demonstrate our system knowledge, how we are going to conduct – or what the objectives of the test are, how the test is going to be conducted, how we're going to deal with the data, and also there would be a large element of flight safety for pure conduct of the test, but there would also be a level of test integrity applied to that. And depending on the level of test, it would be assured by DASA.

MAJ CHAPMAN: Is it in this context that you would apply, with this testing, a plan for a Military Permit to Fly or some other authorisation?

LTCOL REINHARDT: A military permit may be required, and that is a level of assurance provided by DASA on the activity we're going to conduct.

MAJ CHAPMAN: So, as a general rule, you conduct the testing and then, following the testing, AATES would prepare a report which deals with the issues tested and makes findings with respect to the results of the testing?

LTCOL REINHARDT: Correct.

MAJ CHAPMAN: The reports produced by AATES, in addition to making findings as to the specifics of the testing, would also include, do they not, recommendations as to what to do next?

LTCOL REINHARDT: Yes.

MAJ CHAPMAN: Those recommendations would be sent up the chain of command to the relevant authority and maybe the MAO; is that the case?

LTCOL REINHARDT: Correct.

MAJ CHAPMAN: Depending on the type of modification.

LTCOL REINHARDT: Correct.

MAJ CHAPMAN: And that can change.

LTCOL REINHARDT: Correct.

MAJ CHAPMAN: Just in terms of the recommendations, not specific findings, what recommendations across the spectrum can AATES make?

LTCOL REINHARDT: So we have a series of findings that are standardised amongst the other Flight Test Organisations as well. Is that where you're going?

MAJ CHAPMAN: What are those references – standardised - - -

LTCOL REINHARDT: So we have standard terms: "Unacceptable", "Unsatisfactory", "Undesirable", "Satisfactory" and "Enhancing". And they then link to a level of recommendation. They are outlined at the start of our reports, and there are things like "must", "could", "should".

MAJ CHAPMAN: So these are, at one end of the spectrum, "Unacceptable"; the other end of the spectrum, it would be "Enhancing"?

LTCOL REINHARDT: Correct.

MAJ CHAPMAN: Just in relation to – and I'm at paragraph 33 of your statement. Is it the case that if there's an "Unacceptable" recommendation that is made by AATES, that in effect this is advisory only to the ultimate approving authority?

LTCOL REINHARDT: That would be a – so our airworthiness system allows the Command to take a reasoned decision, and so they could choose, based on the context, to not comply with an AATES recommendation.

MAJ CHAPMAN: So in other words, a recommendation, even if it were "Unacceptable", does not in fact bind the chain of command in terms of introducing an item to Service?

LTCOL REINHARDT: No. AATES is not a gatekeeper.

MAJ CHAPMAN: So just extending that example, the Military Air Operator, if they are the ultimate approving authority, retains the discretion whether or not to introduce a platform or a modification?

LTCOL REINHARDT: Correct. But within that, there is the WHS Act and there is the seven-step SFARP Risk Management process. So depending on the level of the recommendation, I would expect that the decision-makers would outline their decision through the seven-step process.

MAJ CHAPMAN: Just following on from that answer, your expectation – or your understanding is that a decision-maker, with respect to an "Unacceptable" finding, would need to make their own assessment and take their own risk assessment with respect to whether or not to introduce that item to Service?

LTCOL REINHARDT: As I said earlier, we provide information to inform Command of risk. I am not aware of all the context that Command have to consider. So they may seek other information or they may be prepared, depending on their context that I don't know, to accept the risk as I've outlined it.

MAJ CHAPMAN: Can I just turn to ask you some questions about TopOwl? There was an image which was – we'll just ask the AV people to put the image up, if they can?

MS McMURDO: The image that was part of Exhibit 40, Dr Gavrilescu's statement.

MAJ CHAPMAN: Thank you, ma'am.

So do you see on the screen there, LTCOL Reinhardt, a picture of an individual wearing HMSD TopOwl system?

LTCOL REINHARDT: Yes, I do.

MAJ CHAPMAN: This is drawing on paragraph 39 of your statement, but the TopOwl, just so you can identify it and we're clear, it comprises these two elements. The first is the physical shell helmet, which it's between the ears and the lower part of the model there. And that is a helmet which is laser-fitted, is it?

LTCOL REINHARDT: There's a liner that's laser cut. Or there is a liner that's – your helmet is laser – or measured and then the liner is cut to that measurement.

MAJ CHAPMAN: That's to inform, I think you say in the statement, both comfort but also to ensure that the eye alignment is correct with the HUD?

LTCOL REINHARDT: Yes.

MAJ CHAPMAN: The second element of the TopOwl system is the HMSD. And HMSD is the helmet-mounted sight display?

LTCOL REINHARDT: Yes.

MAJ CHAPMAN: That's the part on the top, which we can see in green and black shade, which can be fitted on top of the shell helmet. Is that right?

LTCOL REINHARDT: Yes.

MAJ CHAPMAN: Those depicted in the photograph with the round circles on either side of the head there, they're the image intensifier tubes. Is that right?

LTCOL REINHARDT: Near the ears? Yes, they are.

MAJ CHAPMAN: What is the function, generally speaking, of the image intensifier tubes? Could you just explain that?

LTCOL REINHARDT: So image intensifier tubes intensify available light, and some near infrared light, to present a visual image that's used in night flying. So there is varying amounts of light in the night flying environment, whether that's due to starlight or moonlight or cultural lighting. And those tubes are very sensitive to that, and they amplify that very small amount of

light we can't see with our normal eye, to create a picture that is presented to the pilot right in front of his eyes. And you can see part of that on that picture with the green glow on the dichromatic patches.

MAJ CHAPMAN: So where on that picture, just to be clear, would you say the dichromatic pictures are? I see there it's on the symbology, but where in that picture is the - - -

LTCOL REINHARDT: So the dichromatic patch is in those circle areas, the green circle areas right in front of your eyes.

MAJ CHAPMAN: I have a laser pointer, I'm told, which works well there.

LTCOL REINHARDT: Yes. About there. And on the other side as well. Yes, you can see part of the green image. So they'd see a little bit of near infrared but they don't see a lot of infrared.

MAJ CHAPMAN: Their primary function is to give the HMSD and the TopOwl a night-vision capability?

LTCOL REINHARDT: Correct.

MAJ CHAPMAN: And that night-vision capability, it will not work necessarily if there's zero light? It needs light to amplify?

LTCOL REINHARDT: In theory, yes. So if there is no light or no near infrared, you will not see anything. And the night environment, there are dark nights and there are nights with a lot of illumination.

MAJ CHAPMAN: So in terms of night-vision capability, this TopOwl system is referred to as an indirect system, as opposed to a direct system; is that right?

LTCOL REINHARDT: Correct.

MAJ CHAPMAN: Can you just describe in your own words what the principal differences are between the direct and the indirect systems, as you understand it?

LTCOL REINHARDT: So direct view, you are looking – your eye is right behind the little TV screen that generates the image. So that would be an ANVIS-type system where the tubes would be right in front of your eyes.

MAJ CHAPMAN: That's the goggles?

LTCOL REINHARDT: The goggles, yes. In this system, it's an indirect system, so where the tubes are, you can see, you can't put your eye right behind it. So there's a series of mirrors, and transparencies, and reflectors, and lenses, that take the image and move it all the way around, through the helmet, to put it in front of your eye.

MAJ CHAPMAN: So to summarise that, the HMSD enables the – well, that's in the night-vision context, but it also enables the pilot to have critical flight information symbology projected onto their visor which is right in front of their eyes?

LTCOL REINHARDT: Correct.

MAJ CHAPMAN: And being right in front of their eyes, it's compelling information, would you agree with that?

LTCOL REINHARDT: Yes, I would.

MAJ CHAPMAN: And at paragraph 42, I believe, you describe in detail what is meant by symbology. So to summarise that, that's a reference, is it, to symbols that are projected onto the visor?

LTCOL REINHARDT: Yes.

MAJ CHAPMAN: And each of those symbols, I take it, has a particular meaning?

LTCOL REINHARDT: Yes.

MAJ CHAPMAN: And they provide a visual representation, taken together, of the state of condition of the aircraft or where it is placed?

LTCOL REINHARDT: Yes.

MAJ CHAPMAN: And these include symbology referring to – attitude is one example?

LTCOL REINHARDT: Yes.

MAJ CHAPMAN: Pitch?

LTCOL REINHARDT: Pitch and roll, which make up attitude, yes.

MAJ CHAPMAN: And an angle of bank?

LTCOL REINHARDT: Yes. Which make up attitude.

MAJ CHAPMAN: And there's also an ability, is there not, on the HMSD, to project a FLIR image?

LTCOL REINHARDT: In the MRH, there is.

MAJ CHAPMAN: And that can be projected onto the visor?

LTCOL REINHARDT: Correct. In the same place that you would project the NVD image. But you cannot have both at once; it is one or the other.

MAJ CHAPMAN: Is it on one side or the other, or can that be changed on the visor?

LTCOL REINHARDT: So the symbology can be selected either left or right, depending on your master eye. But you cannot make a selection for IIT or FLIR.

MAJ CHAPMAN: And where we were referring to FLIR, that's a reference to Forward-Looking Infrared Image (sic)?

LTCOL REINHARDT: Correct. And that looks at a different spectrum to the IIT. There might be some overlap, but it's predominantly different.

MAJ CHAPMAN: And just in terms of what's projected onto the visor, it's information which is also information available on the primary flight display? Do you understand what I mean by that?

LTCOL REINHARDT: It is. So there's a lot of information there. There's the attitude information that we described. There's heading information. There's how much power your aircraft engines are producing. There's how fast you're going. There's a lot of useful information there. And, from my experience flying Tiger, it's almost completely eyes out flying. I rarely need to look inside to check anything; it's all presented to me. And, you know, the benefit of TopOwl is I can fly completely eyes out with this system.

MAJ CHAPMAN: And the reference to flying eyes out, it enhances situational awareness?

LTCOL REINHARDT: Yes, and reduces workload because I don't have to be looking inside to check other things.

MAJ CHAPMAN: But certainly parts of the information that's projected

onto the visor is information which is also, if you needed it, in the cockpit?

LTCOL REINHARDT: Correct. You know, all this information is in the MFDs as well.

MAJ CHAPMAN: And the MFDs is a reference to the Multi-functional Flight Displays; is that right?

LTCOL REINHARDT: Yes.

MAJ CHAPMAN: And are those MFDs customisable and they're changeable, by the pilot, to some degree?

LTCOL REINHARDT: So I haven't got a lot of time on MRH-90. You can select where you put different information. There are different pages you can bring up. But, you know, the primary flight display and a few things like that are pretty standardised.

MAJ CHAPMAN: So is it the case that, on the MRH, with the HMSD, you had a situation where the pilots have a duel ability to interpret and be given flight data from both the multifunctional displays in front of them and also from the TopOwl, from what's projected onto the visor?

LTCOL REINHARDT: Yes.

MAJ CHAPMAN: And that information you'd expect to be the same; is that right?

LTCOL REINHARDT: Well, the information should be – so if you are – if the primary flight display is telling me I'm doing 60 knots, then the HMSD symbology should also be telling me I'm doing 60 knots. I cannot have a mismatch in what it's telling me.

MAJ CHAPMAN: You cannot have a mismatch between what's appearing on the primary flight – multifunctional fight displays and the TopOwl?

LTCOL REINHARDT: No. Well, that would create confusion.

MAJ CHAPMAN: I think you've given some evidence about this already, but can you just explain the benefits or the advantage that's offered by a HUD over flying by reference to the multifunction displays?

LTCOL REINHARDT: Well, I can keep looking out. And so, you know, a helicopter operates in the low-level environment. The low-level environment is very complex. There's trees and powerlines and all sorts of

things around. If I'm looking inside, I can't be looking outside at those obstacles. So it allows me to keep my eyes out. And if it's constructed and built properly, it significantly reduces my workload because I don't have to scan inside.

And if the information is presented where I need it, I don't have to go – I don't have to devote as much mental power to try and work out what the aircraft does. So that frees up my capacity then to concentrate on the mission. So this is why we build aircraft that are simple to fly, because we don't employ pilots to aircraft, we employ pilots to do the mission. So the simpler the aircraft is to fly, the more mental capacity I have to concentrate on the mission.

MAJ CHAPMAN: And you talk, at around paragraph 49 of your statement, that TopOwl was only made available to the pilots and not available to the aircrew. Is that your understanding?

LTCOL REINHARDT: Correct.

MAJ CHAPMAN: And - - -

LTCOL REINHARDT: Well, the aircrewman. We should probably – yes, correct.

MAJ CHAPMAN: Aircrewman – correction. And that the aircrewman were issued with another style of helmet which you referred to, at paragraph 49, as the HGU-56P type?

LTCOL REINHARDT: Yes.

MAJ CHAPMAN: And was that a helmet which had a night-vision capability?

LTCOL REINHARDT: It does. You can add a night-vision capability to it.

MAJ CHAPMAN: In the form of the NVGs?

LTCOL REINHARDT: Yes. And the Australian Army uses an ANVIS system on that style of helmet.

MAJ CHAPMAN: And what does ANVIS refer to?

LTCOL REINHARDT: It's Aviators Night Vision Imaging System. It's an American, direct view system.

MAJ CHAPMAN: And this is a direct view – this is the goggle system?

LTCOL REINHARDT: Correct.

MAJ CHAPMAN: And you can have image intensifier tubes included with those?

LTCOL REINHARDT: Well, you have to.

MAJ CHAPMAN: You have to for the purposes of - - -

LTCOL REINHARDT: Yes.

MAJ CHAPMAN: Yes?

LTCOL REINHARDT: But you can also add HUDs to them. And Chinook flies with a HUD on their ANVIS system because their pilots use this system in the front, and they have a HUD for it.

MAJ CHAPMAN: As opposed to using TopOwl?

LTCOL REINHARDT: Correct.

MAJ CHAPMAN: Or an indirect system?

LTCOL REINHARDT: Well, they don't have the TopOwl system fitted to Chinook.

MAJ CHAPMAN: Are you aware of any other indirect system in Service in the Australian Army at the moment in terms of NVDs?

LTCOL REINHARDT: No.

MAJ CHAPMAN: And the system you've just referred to, ANVIS, was widely used by Army Aviation prior to the introduction of TopOwl?

LTCOL REINHARDT: Correct.

MAJ CHAPMAN: Now, I just want to ask you some questions about testing of TopOwl modifications. So you say that, in your statement at paragraph 50, as SO1 AATES, you conducted, and your team of test pilots and engineers conducted, activities with respect to three modifications to the MRH?

LTCOL REINHARDT: Well, yes, three elements of the MRH; two of which were modifications, and one which, I say in my statement, was a change in the configuration role and environment.

MAJ CHAPMAN: And just turning to those that are described in your statement at 50(a), "TopOwl version 5.10 Symbology Upgrade". That's one of them?

LTCOL REINHARDT: Correct.

MAJ CHAPMAN: Second was the IIT intensifier tube upgrade?

LTCOL REINHARDT: Correct. And I would like to add that this testing was required because of an earlier AATES report before I took over, where some limitations were applied to an operational profile that the aircraft flew.

MAJ CHAPMAN: Yes. And, lastly, the last report dealt with not so much a modification but a change in the use of pilotage FLIR; is that right?

LTCOL REINHARDT: Correct.

MAJ CHAPMAN: And I think there's been reference to change in the CRE. What does that refer to?

LTCOL REINHARDT: The Configuration, the Role, and the Environment. Do you want me to do more than that?

MAJ CHAPMAN: Yes, you could explain it a bit.

LTCOL REINHARDT: Within the Statement of Operating Use of Intent there – so IU – is a document that is a capstone or a high-level document that describes how we're going to use the aircraft. It's used for engineering data, but it's also used to inform operational stuff. So, you know, we may say that we want to fly an aircraft at night, we want to say the aircraft is to operate at low level, and that would inform what systems we need to do that.

In my opinion, pilotage FLIR would be called out in the SOIU; however, it wasn't. So I considered that this was a change in how the aircraft was being – the change in the aircraft CRE that needed to be articulated.

MAJ CHAPMAN: Thank you. And I'm just turning up a document. And while I do, the first – possibly not in time – but the first of those that you refer to is the AATES testing with respect to the symbology upgrade 5.10. And do you have a copy of your statement there?

LTCOL REINHARDT: Well, yes.

MAJ CHAPMAN: Can I take you then to – I'll just pause there for a moment. Sorry, COL Reinhardt, just a moment. Can I take you to Annex E?

LTCOL REINHARDT: Sorry, can I confirm we're talking about the MRH-90 Taipan HMSD Version 5.1, Operational Evaluation Report?

MAJ CHAPMAN: No, we're talking about the next one. So we're talking about the operation evaluation minute which immediately follows the report you're referring to.

MS McMURDO: Perhaps if you could show – because it is very difficult to find your way around these annexures.

MAJ CHAPMAN: Certainly.

MS McMURDO: They're not actually – they don't have letters on them, at least in my copy.

MAJ CHAPMAN: Yes.

LTCOL REINHARDT: So this is the AATES response to Aviation Branch, HMSD Version 5.1, OPEVAL?

MAJ CHAPMAN: That might help. If you just pass back the exhibit briefly, we can apply some tabs which might make it a little easier. It won't take long.

MS McMURDO: That will help. Okay, thank you.

MAJ CHAPMAN: Thank you for that time, ma'am.

MS McMURDO: Could you show AVM Harland the series. What number is it that you're referring to?

MAJ CHAPMAN: It's Annex E. And if I could just – it has an Army Headquarters, Forces Command logo up the top.

MS McMURDO: Yes, we've got it. Yes. Thank you.

MAJ CHAPMAN: Just let me know when you've turned that up, COL Reinhardt.

LTCOL REINHARDT: I have Annex E.

MAJ CHAPMAN: Thank you. And that is a minute, is it not, from Headquarters, Forces Command, Aviation Branch, Standards Section?

LTCOL REINHARDT: It's signed by Avn Branch Op Airworthiness.

MAJ CHAPMAN: And that's the same document, and it's dated 29 February 2020?

LTCOL REINHARDT: Correct. So Avn Branch, Op Airworthiness, Standards Section.

MAJ CHAPMAN: Yes. And this was part of Forces Command, before the separate Aviation Command was raised.

LTCOL REINHARDT: Correct.

MAJ CHAPMAN: Thank you. Can you just go to the first page of that document?

LTCOL REINHARDT: Yes.

MAJ CHAPMAN: And this is a document you've seen? It's annexed to your statement?

LTCOL REINHARDT: Yes.

MAJ CHAPMAN: You're familiar with it?

LTCOL REINHARDT: Yes.

MAJ CHAPMAN: Do you see there in paragraph 1 that there is a summary – or this is a reference to a report where AATES had been requested to conduct human machine interface assessments with respect to HMSD Version 5 software upgrade? Do you see that?

LTCOL REINHARDT: I can see that sentence.

MAJ CHAPMAN: And you conducted that testing; is that right?

LTCOL REINHARDT: Correct.

MAJ CHAPMAN: And the outcome of the testing was reduced to writing, was it not?

LTCOL REINHARDT: Correct.

MAJ CHAPMAN: And that test report, including all your findings and recommendations, is Annex D, is that right, just to identify it?

LTCOL REINHARDT: It is Annex D.

MAJ CHAPMAN: And, significantly, COL Reinhardt, you say – well, the report, this document – and you were not the author of this document – it says this, that:

> *Your testing –*

that is, AAETS' testing –

> *concluded that there was an unacceptable ambiguity in attitude presentation during off-axis lateral viewing which could lead to controlled flight into terrain.*

LTCOL REINHARDT: Correct.

MAJ CHAPMAN: Just to unpack that a little. That is consistent with your findings?

LTCOL REINHARDT: Yes.

MAJ CHAPMAN: It is an accurate summary of what was found in the report?

LTCOL REINHARDT: That specific sentence, yes.

MAJ CHAPMAN: And can you just explain "controlled flight into terrain", what that is a reference to?

LTCOL REINHARDT: So the people controlling the aircraft or the people piloting the aircraft believe they have control of it but are unaware, for whatever reason, of where the earth is or where the aircraft is going fully, and the aircraft flies into the ground or water. So there is not a problem or a malfunction with the aircraft. The aircraft is perfectly serviceable and able to fly, but the aircraft was under the control of the crew but impacted the ground.

MAJ CHAPMAN: Yes. And the reference to "controlled" is a reference "under the control of a crew", nevertheless it results in a catastrophic outcome of the aircraft flying either into terrain, or it also encompasses water. Is that correct?

LTCOL REINHARDT: So my intent on using CFIT – or, you know, if an aircraft hit water, I would apply the same term.

MAJ CHAPMAN: So this is a summary of AATES' conclusion in its report with respect to the software upgrade, and it reflects the fact that AATES made – and correct me if I'm wrong – a recommendation that – or found, rather, that there was unacceptable ambiguity in the presentation of information on the HMSD which, if not corrected, you foresaw could lead to a risk of CFIT. Is that right?

LTCOL REINHARDT: Correct. Do we need to define the term "unacceptable"?

MAJ CHAPMAN: Well, "unacceptable" is a reference back to a standardised term. I think you referred to it's used in AATES' reports; is that right?

LTCOL REINHARDT: Correct.

MAJ CHAPMAN: And is your understanding of "unacceptable" in that context?

LTCOL REINHARDT: Well, it prevents a weapons system performing operational tasks; I was not using it in that context, or "liable to cause accidents and restrictions needed to prevent the occurrence are considered intolerable". The recommendation terminology to be used would be "something must be done". The recommendation level is "essential".

MAJ CHAPMAN: And, LTCOL Reinhardt, do you find that also in this document, if you go to pages – A1, Annex A. So you've went previously to where this was signed on 29 February. Do you see there Annex A, and it starts with, "Advice for readers", "Conclusions", and "Recommendations"?

LTCOL REINHARDT: Yes. And you can see where "unacceptable" is defined.

MAJ CHAPMAN: So we referred to this earlier, in terms of in the context of AATES' recommendations, you have on the positive side, "enhancing characteristic".

LTCOL REINHARDT: Yes.

MAJ CHAPMAN: And that's a reference to AATES has made a determination that this particular modification or change is an improve – or it's an enhancing characteristic and, as it says, should be incorporated in future designs.

LTCOL REINHARDT: Well, you have correctly described one of the terminologies. This is not the terminology I applied to this case.

MAJ CHAPMAN: I understand that. The left and right of arc in terms of recommendations - - -

LTCOL REINHARDT: Correct.

MAJ CHAPMAN: So in the positive side, we have "enhancing".

LTCOL REINHARDT: Correct.

MAJ CHAPMAN: And then at the very other end of the spectrum – so we're now talking about the most consequential recommendation that AATES can make is that AATES determines the particular item under test is "Unacceptable".

LTCOL REINHARDT: Correct.

MAJ CHAPMAN: And you concluded, based on flight testing in this case, that the symbology upgrade that was being proposed was unacceptable.

LTCOL REINHARDT: Correct.

MAJ CHAPMAN: In that it would lead, in your estimation and your judgment, to CFIT - - -

LTCOL REINHARDT: Correct.

MAJ CHAPMAN: - - - controlled flight into terrain, in certain conditions. Can you go now go to page 10 of this minute, which is the operational evaluation? And do you see there, at paragraph 16 - - -

LTCOL REINHARDT: Yes, I have it.

MAJ CHAPMAN: You've got paragraph 16?

LTCOL REINHARDT: Yes.

MAJ CHAPMAN: So it refers there to the OPEVAL Version 5.1 that was conducted over a series of testing. So just to put this in context, this is a report of the Standards Branch; correct?

LTCOL REINHARDT: So it's been signed with an – colloquially, yes, Standards Branch conducted this activity.

MAJ CHAPMAN: And this was an activity which came in response to AATES' testing, in respect of which you concluded that there was an unacceptable risk with respect to the upgrade of the symbology. Correct?

LTCOL REINHARDT: Yes, correct.

MAJ CHAPMAN: So this op evaluation was a series, as it says there, of sorties to retest, was it, or to conduct additional testing with respect to the Version 5.10 symbology?

LTCOL REINHARDT: So additional testing, and a wider group of people. So the MAO, I would say, would have been gathering more information to – in the "become reasonably informed" step of the seven-step process of Risk Management which is required by the WHS Act. Of note, the flight testing that my organisation conducted was only conducted by day. This testing conducted night sorties as well. However, I consider, with the background of flying experience I have, and my training as a test pilot, that I can make an accurate assessment of this unacceptability by day flight only.

MAJ CHAPMAN: Was your testing intended – this is the AATES testing - - -

LTCOL REINHARDT: Correct.

MAJ CHAPMAN: - - - intended to be run by day and by night?

LTCOL REINHARDT: It was. It was meant to.

MAJ CHAPMAN: And why was it terminated as a test serial by day only, and you didn't proceed to night testing?

LTCOL REINHARDT: So this testing required a Military Permit to Fly, and DASA provides assurance to my activity. As part of that assurance process, I must demonstrate that I have sufficient systems knowledge to understand what I'm doing, and when we found this characteristic of ambiguity, it became obvious to me that the system had not been explained

to me correctly, and we did not know how it was performing or why it was performing in the way it does. So I believe this invalidated my DASA assurance to continue with the flight test, and I needed to go back and find out more information, because I was no longer reasonably informed in the seven-step Risk Management process.

Also, there was timelines that needed to be met. By me going on and dabbling in trying to work out what's going on, I was wasting time. This needed to go back to CASG, and needed to be explained by CASG as to what was going on. So I stopped, and wrote this, my report, to get that process going.

MAJ CHAPMAN: So not only did you consider that if you were to confer to conduct it, it would be outside of your authorisation, is it fair to say that it was also, to your mind, too risky to continue to test in those circumstances?

LTCOL REINHARDT: Well, risk is all a balance, right? So in my context, there was no requirement to accept risk to work out what was going on here. This characteristic could have been an integration issue. The issue was best identified and then sent back to CASG so they could work out what was going on, because the system as described to us at AATES at that time was not described correctly. We had no concept of what this ambiguity was. It was not described to us. We did not know why it was behaving - - -

MAJ CHAPMAN: Thank you. Ma'am, I see the time. It might be convenient.

MS McMURDO: Yes, we are committed to finishing at 4 o'clock, I'm afraid. So I hope this hasn't disrupted your schedule too much, but we'll need you again tomorrow morning at 10 o'clock. All right then, we'll adjourn until 10 o'clock tomorrow morning.

<WITNESS WITHDREW

PUBLIC INQUIRY ADJOURNED UNTIL
THURSDAY, 8 AUGUST 2024 AT 1000