ABN 85 120 213 381
Level 4, 190 Queen Street, Melbourne 3000 Telephone: 03 8628.5561 Fax: 03 9642.5185
Offices in: Melbourne, Brisbane, Darwin, Canberra, Perth, Sydney, Adelaide

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 MAJ L CHAPMAN and FLTLT A ROSE, Counsel Assisting

LCDR M GRACIE, representing CAPT D Lyon
SQNLDR I CASHA, representing LT M Nugent
LCDR M TYSON, representing CPL A Naggs
SQNLDR C THOMPSON, representing WO2 J P Laycock
COL N GABBEDY, representing MAJGEN Jobson
COL S THOMPSON, representing BRIG D Thompson
LTCOL D HEALEY, representing BRIG J Fenwick
SQNLDR T SCHMITT, representing COL D Lynch
SQNLDR M NICOLSON, representing D10
CMDR B JONES SC, with LCDR M HAY, representing D19
MAJ M BARNES, representing D146 and LTCOL A Norton
LEUT R CLUTTERBUCK, representing D147
MR G O'MAHONEY, with MR N HUMPHREY, representing Airbus
MS K MUSGROVE, representing the Commonwealth

0930, THURSDAY, 27 MARCH 2025

DAY 42

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**	14/04/25	(Transcription)

EXHIBIT LIST

Date: 27/03/2025

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

WITNESS LIST

Date: 27/03/2025

Name Of Witness **Page No.**

MS McMURDO: Yes, FLTLT Rose.

FLTLT ROSE: Good morning, Ms McMurdo, AVM Harland. To start proceedings today, I tender the audio of the cockpit voice recorder from Bushman 83. It's two hours and 35 minutes in length and it captures audio from the pilot's microphone, the co-pilot's microphone, the aerial microphone and the ICS combined. It's been security reviewed and redacted so that it can be classified at the "Official: Sensitive" level, and it's on this USB.

MS McMURDO: That will be Exhibit 170.

#EXHIBIT 170 - COCKPIT AUDIO FROM BUSHMAN 83

FLTLT ROSE: I also tender the transcript of the cockpit voice recorder from Bushman 83 that's been prepared by the Information Sciences Division of the Defence Science Technology Group for the Inquiry in response to a section 23 Notice. It contains the same redactions that have been applied to the audio, so that is also classified as "Official: Sensitive". Now, the transcript was prepared in four tranches, but I'll tender it as a bundle.

MS McMURDO: Exhibit 171.

#EXHIBIT 171 - TRANSCRIPT OF COCKPIT AUDIO FROM BUSHMAN 83

FLTLT ROSE: The transcript is an aide-mémoire to assist those listening to the audio of the cockpit voice recording. But if there is a discrepancy between the audio and the transcript, then the audio is the evidence. And we'll not be playing the entirety of the cockpit voice recorder at any point, but there will be excerpts of that being played in a private hearing later today. If Counsel representing wish to put certain parts of the transcript to any witness, it would have to be done in a private hearing.

MS McMURDO: Thank you.

FLTLT ROSE: I now call Mr Mike Grant.

<MR MICHAEL ROBERT GRANT, Sworn

<EXAMINATION-IN-CHIEF BY FLTLT ROSE

MS McMURDO: Mr Grant, if you need a break at any time, just let me know.

MR GRANT: Certainly.

MS McMURDO: Thank you.

MR GRANT: Thanks.

FLTLT ROSE: Can you please state your full name.

MR GRANT: Michael Robert Grant.

FLTLT ROSE: Do you mind just moving your chair slightly closer to the microphone? That will assist us. What's your current occupation?

MR GRANT: Senior Researcher at Defence Science Technology Group.

FLTLT ROSE: Can you confirm you received the following documents prior to today: a section 23 Notice requiring your appearance?

MR GRANT: I did.

FLTLT ROSE: An extract of the Inquiry's Directions?

MR GRANT: I did.

FLTLT ROSE: A copy of my appointment as an Assistant IGADF?

MR GRANT: I did.

FLTLT ROSE: Frequently Asked Questions Guide for Witnesses?

MR GRANT: Yes.

FLTLT ROSE: A Privacy Notice?

MR GRANT: Yes.

FLTLT ROSE: Did you prepare a statement for the Inquiry?

MR GRANT: Yes, I did.

FLTLT ROSE: I hand you a document. Is this your statement dated 17 February 2025?

MR GRANT: Yes, it is.

FLTLT ROSE: Is it 16 pages?

MR GRANT: Yes.

FLTLT ROSE: Do you wish to make any amendments to the statement?

MR GRANT: No.

FLTLT ROSE: I tender the statement.

MS McMURDO: Exhibit 172.

#EXHIBIT 172 - STATEMENT OF MR GRANT

FLTLT ROSE: Did the Defence Science Technology Group also receive a section 23 Notice in October 2024 requesting that the Platforms Division prepare an expert report for the Inquiry?

MR GRANT: Yes.

FLTLT ROSE: And did you prepare a report in response to that Notice?

MR GRANT: Yes, I did.

FLTLT ROSE: Now, if I hand you two documents, the document on top, is that the Letter of Instruction dated 18 October 2024? It's the annex to the Letter of Instruction.

MR GRANT: Sorry, I don't understand.

FLTLT ROSE: Is the document in front of you the information that you were asked to assess in your report?

MR GRANT: Yes, it was.

FLTLT ROSE: And then your report, the second document in front of you, is it 26 pages?

MR GRANT: That is the report, yes.

FLTLT ROSE: If you go to page 23.

MR GRANT: Yes.

FLTLT ROSE: You see the report's dated 28 November 2024?

MR GRANT: Yes, it is.

FLTLT ROSE: If you turn to page 15? Now, if you see in the second-last line on that page, you wish to make an amendment where it says "the 28th of October 2023"? You wish to change that, "the 28th of July 2023"?

MR GRANT: That is correct.

FLTLT ROSE: Do you have a pen with you? If not, we can provide one.

MR GRANT: I'm sorry.

FLTLT ROSE: Could you please cross out "October", write "July", and then put an initial next to it? Can you turn to page 19? In the second paragraph, the first line to the right, it says again the date, 28 October 2023?

MR GRANT: Yes.

FLTLT ROSE: Do you see that?

MR GRANT: Yes, I do see that.

FLTLT ROSE: Do you wish to change that to 28 July 2023?

MR GRANT: Yes, I do.

FLTLT ROSE: Can you please cross out "October", write "July", and then initial?

MS McMURDO: Sorry, is that page 19?

FLTLT ROSE: Yes. In the first line of the second paragraph.

MS McMURDO: Thank you.

FLTLT ROSE: Do you wish to make any further amendments to the report?

MR GRANT: No.

FLTLT ROSE: I tender the report and the Letter of Instruction together as one bundle.

MS McMURDO: The report and Letter of Instruction, 172 – 173, sorry.

#EXHIBIT 173 - MINUTE AND REPORT

FLTLT ROSE: And is the report 174?

MS McMURDO: Sorry? I thought you said we'd tender them as one document.

FLTLT ROSE: Yes, sorry.

MS McMURDO: The Minute and the report are 173.

FLTLT ROSE: Thank you.

If you could just put that report to the side now. It's classified "Official: Sensitive", so I won't be asking you any questions about that in a public hearing. Just keep your statement with you. Can I ask you to be mindful of your security obligations, so that if I or if anyone asks you a question in this public forum that you think is at the "Official: Sensitive" level or above, to let us know, and we won't explore that until we move to a private session.

MR GRANT: Understood.

FLTLT ROSE: I'll start with your background and qualifications. If you open up your statement at page 2? So if you put the Letter of Instruction and the report perhaps on another part of the table, so it's out of the way for now.

MR GRANT: Yes.

FLTLT ROSE: You are the Senior Researcher and Platform System at the Defence Science Technology Group in Melbourne?

MR GRANT: Yes.

FLTLT ROSE: And you've been in that role since 2016?

MR GRANT: Yes.

FLTLT ROSE: And you've worked at the Defence Science Technology Group since 2005, but in other roles?

MR GRANT: Correct.

FLTLT ROSE: And that includes as the Defence Scientist and Fixed-Wing Aircraft Performance?

MR GRANT: Correct.

FLTLT ROSE: Your specialisation is in aircraft performance and aerodynamics and flight dynamics, modelling and simulation or aircraft and flight path reconstruction?

MR GRANT: Correct.

FLTLT ROSE: You provide advice to Defence at the acquisition stage for air vehicles?

MR GRANT: Yes.

FLTLT ROSE: You provide advice on the impact to an aircraft's performance, aerodynamics and flight behaviours if Defence is considering modifications to an aircraft's external geometry?

MR GRANT: That's true, yes.

FLTLT ROSE: And you provide models of aircraft for a range of simulation activities and software?

MR GRANT: Yes.

FLTLT ROSE: And most relevant to this Inquiry, you analyse the flight data recordings and provide graphical replays or animations for accident and incident investigations?

MR GRANT: Yes.

FLTLT ROSE: If you go to page 3 of your statement, you set out that in 2023 and 2024 you were acting as Discipline Lead in another subgroup within the Platform Division of Defence Science Technology Group?

MR GRANT: Yes.

FLTLT ROSE: So you moved from the Flight Mechanics discipline to the Simulation and Program discipline, so that you could take up this high-level position?

MR GRANT: Correct.

FLTLT ROSE: And you're now back in the Flight Mechanics discipline now?

MR GRANT: Yes.

FLTLT ROSE: And in 2023, when the Defence Flight Safety Bureau contacted the Defence Science and Technology Group requesting forensic support for its investigation into the Bushman 83 accident, you and your staff focused on that task above all others because aircraft accident investigations are the highest priority for the Defence Science Technology Group?

MR GRANT: Yes, they are.

FLTLT ROSE: If you go to page 4? In terms of your qualifications, you have a Bachelor of Aerospace Engineering with Honours from RMIT.

MR GRANT: Yes.

FLTLT ROSE: And a Graduate Certificate in Safety and Accident Investigation from Cranfield University in the UK.

MR GRANT: Yes.

FLTLT ROSE: And you also have a pilot's licence.

MR GRANT: Previously, yes.

FLTLT ROSE: Previously. And that was in fixed-wing, I take it?

MR GRANT: Yes.

FLTLT ROSE: You've completed an Engine Failure Analysis Course in Melbourne.

MR GRANT: Yes.

FLTLT ROSE: And you've supported approximately 10 ADF incidents and accidents investigations that required flight path reconstruction and analysis since 2012.

MR GRANT: Yes.

FLTLT ROSE: You also assisted the AFP in their investigation into the Malaysian Airlines MH17 accident with flight path reconstructions.

MR GRANT: Yes.

FLTLT ROSE: Now, two of those investigations required you to conduct on-site investigations and wreckage analysis.

MR GRANT: Yes.

FLTLT ROSE: Did that include the investigation of the wreckage of Bushman 83?

MR GRANT: Yes.

FLTLT ROSE: And you've been a member of the Defence Science Technology Group's High Readiness Flyaway Team which supports ADF accidents and incidents for 10 years?

MR GRANT: Yes.

FLTLT ROSE: I want to turn now to the flight path recreations for Bushman 83. Page 5 of your statement. The Defence Science Technology Group was first formally asked to assist the Defence Flight Safety Bureau investigation into the crash of Bushman 83 on 24 August 2023?

MR GRANT: Yes.

FLTLT ROSE: As the lines of enquiry matured and the Defence Flight Safety Bureau reviewed the preliminary flight path reconstructions that you prepared, the DFSB would request further information and animations from you.

MR GRANT: Yes, correct.

FLTLT ROSE: So it was an iterative process with refinements being made to the products that you were producing over time.

MR GRANT: That's correct.

FLTLT ROSE: Now, the first requests that the DFSB made to the Defence Science Technology Group was for a forensic examination of Bushman 83's flight data, and a flight path reconstruction of the four aircraft formation that were flying in the sortie on 28 July '23.

MR GRANT: Yes.

FLTLT ROSE: And you were specifically looking for evidence of any technical problems with the aircraft or its flight path.

MR GRANT: Yes, something anomalous.

FLTLT ROSE: Sorry, what was the answer?

MR GRANT: Something anomalous, something out of the ordinary.

FLTLT ROSE: Now, I won't be asking you any questions about the contents of your findings in a public hearing, but we will discuss that later in a private session.

MR GRANT: Sure.

FLTLT ROSE: In terms of the timing, if you go to page 7?

MR GRANT: Yes.

FLTLT ROSE: You state that the Defence Science Technology Group provided a preliminary video to the DFSB on 6 September '23?

MR GRANT: Yes.

FLTLT ROSE: Was that an animation of the flight path?

MR GRANT: Yes, it was an anime, a video of the flight path reconstruction.

FLTLT ROSE: Now, back to page 6. The DFSB then asked you to produce additional videos or animations of the flight path reconstruction from various different vantage points, some of which were single-view animations, some of which were multi-view animations. Is that correct?

MR GRANT: Yes.

FLTLT ROSE: And then some animations were silent, and others had audio from the cockpit voice recorder overlayed.

MR GRANT: That's correct, yes.

FLTLT ROSE: And those animations included a field of regard views, some – both the front, left and right sides of the cockpit of Bushman 83?

MR GRANT: Yes.

FLTLT ROSE: What does "field of regard" mean?

MR GRANT: Field of regard is, I guess, the viewable space outside the cockpit window. It's not necessarily what can be seen all the time, but it is what is possible to be seen from a particular vantage point in the cockpit.

FLTLT ROSE: Relying on things like the geometry of the window?

MR GRANT: Yes. Window frames, position of, I guess, the eyes in the cockpit. You'll see different elements outside the windshield.

FLTLT ROSE: Did the requests from the DFSB come to the Defence Science Technology Group from the Director of DFSB or from the Investigator in Charge of the on-site investigation?

MR GRANT: The initial request was from one of the Deputy Investigators. We had - - -

FLTLT ROSE: Would that be CMDR Cooper?

MR GRANT: The formal tasking was from WGCDR Fryer and – but regular correspondence of emails and phones calls with both, yes, CMDR Dom Cooper and MAJ Sarah Rosier.

FLTLT ROSE: At page 12 – if you just flip through your statement – this is just going back to the field of regard issue. You referred to two sets of PNG files that you provided to the DFSB regarding your field of regard analysis?

MR GRANT: Yes, over two dates – yes, sorry, two sets over two different dates.

FLTLT ROSE: Is it the case that pilots used the structure in the cockpit to line up the aircraft in front of them?

MR GRANT: I'm not sure how they fly, but that is something I have heard.

FLTLT ROSE: And that's one of the reasons why it's important that you get the geometry in the cockpit right when you're creating your reconstructions, because you need to try as best you can to show what the pilots could have seen if they were looking out of the window of their cockpit at a certain point in time?

MR GRANT: Yes.

FLTLT ROSE: But you don't know where the pilots were looking at any given time?

MR GRANT: That's correct. And the eye positions, there's two provided for both left and right-hand side cockpits because there's a range of design eye points for the aircraft.

FLTLT ROSE: So where did you get the geometry of inside the MRH-90 cockpit from?

MR GRANT: So the inside we had two sources, one was a scan provided by Defence Science Technology Group, and there was an online geometry provided to us.

FLTLT ROSE: So was it the case that someone, not you, earlier on, perhaps years ago, when the MRH-90 was still in service – someone from the DSTG had taken a laser scan of the inside of the entirety of the MRH-90?

MR GRANT: Yes, that's my understanding. Yes, sometime many years ago – yes, more than 10 years ago.

FLTLT ROSE: And it was just fortuitous that you could use that,

incorporate into your reconstructions?

MR GRANT: Yes.

FLTLT ROSE: The Inquiry has heard some evidence about the cowling in the MRH-90 cockpit. Do you know what I mean by "cowling"?

MR GRANT: Covering the engine?

FLTLT ROSE: So when they're sitting in the cockpit, sort of the frame of the window at the front that's above instruments, before the window commences.

MR GRANT: Okay, yes.

FLTLT ROSE: We've heard some evidence that sometimes that blocked the pilot's view, depending on how tall they were in their seat. Have you - - -

MR GRANT: I haven't heard that, no.

FLTLT ROSE: But I take it, because you've had the laser scan that you were using of an MRH-90, you're confident that the height of the cowling is the height that it would have been in MRH-90 Bushman 83?

MR GRANT: Yes. So that particular analysis, all those images of the aircraft, if they could be seen from the cockpit of Bushman 83, used the laser scanned cockpit geometry as a reference.

FLTLT ROSE: Now, if you go to page 6 of your statement. You were also asked to produce storyboards in PowerPoint using maps of the flight path with the key events marked on those maps with timings and extracts from the audio of the cockpit voice recorder from Bushman 83?

MR GRANT: Yes.

FLTLT ROSE: And the DFSB also asked you to produce some reports, including a review of Airbus Asia Pacific's report on the flight data from Bushman 83?

MR GRANT: Yes.

FLTLT ROSE: I won't be asking you any questions about the contents of your reports in a public hearing, but we may discuss that later today.

You produced another report estimating the separation distances between the aircraft and the formation during the sortie?

MR GRANT: Yes, we did.

FLTLT ROSE: Again, I won't be asking you about the details of that report in this forum.

MR GRANT: Yes.

FLTLT ROSE: You provided information to the DFSB about the Flight Control System settings for the four aircraft in the formation?

MR GRANT: Yes, we did.

FLTLT ROSE: Did that include the decision heights that were set?

MR GRANT: Correct.

FLTLT ROSE: On each side of the cockpit?

MR GRANT: Yes, correct.

FLTLT ROSE: For all four aircraft?

MR GRANT: For all four aircraft, yes.

FLTLT ROSE: And you provided the Defence Flight Safety Bureau with a disc that had the Defence Science Technology Group's Graphical Replay System or GRS software and the accident reconstruction?

MR GRANT: Yes.

FLTLT ROSE: What is the Graphical Replay System software?

MR GRANT: It's a bespoke DSTG tool created some time ago by a previous colleague at DSTG. It is a way of replaying the flight data of an aircraft post-flight. So it provides the animation. It's the animation engine, I guess, is the best way to describe it.

FLTLT ROSE: So I take it that DSTG have the intellectual property for that software?

MR GRANT: Yes.

FLTLT ROSE: At page 8 of your statement you set out that you allowed the DFSB to manipulate and control the flight path reconstruction and obtain pertinent viewpoints of the formation at their discretion?

MR GRANT: Yes, that's the utility of the tool. Not only does it replay the aircraft in flight and replicate the changes in the attitude, the speed, the altitude of the aircraft in the animation, it also allows you to literally put yourself anywhere within that animation to view aircraft from different angles. For example, like a position on the ground and you can corroborate an eyewitness testimony from the ground using GRS. You could put the eyepoint into the cockpit of an aircraft, any aircraft in the formation, or you could just place an eyepoint off to the side, as like a wingman view.

FLTLT ROSE: Or even outside the aircrafts all together, sitting in space at a certain point?

MR GRANT: Yes, could be fixed, could be translating.

FLTLT ROSE: Translating? As in moving?

MR GRANT: A translating viewpoint, yes.

FLTLT ROSE: And it's your understanding that there was someone at the DFSB who knew how to use this software effectively?

MR GRANT: Yes.

FLTLT ROSE: The Defence Science Technology Group were also invited to review the Defence Flight Safety Bureau's draft Air Safety Investigation Report in December 2024?

MR GRANT: Yes.

FLTLT ROSE: Now, I won't be asking you any questions about the contents of that draft report at any stage today. In terms of the timing though, if you go back to page 7?

MR GRANT: Yes.

FLTLT ROSE: You set out that the final data that the Defence Science Technology Group provided to the DFSB was in December 2024?

MR GRANT: Yes.

FLTLT ROSE: And then you list each of the items you produce to the DFSB on pages 7 to 9 of your statement?

MR GRANT: Yes.

FLTLT ROSE: If you go back to page 6. The flight data you needed to perform each of these tasks was obtained from each of Bushman 81, 82, 83 and 84's Crash Survivable Memory Unit or CSMUs?

MR GRANT: That's correct.

FLTLT ROSE: Are these known as a black box?

MR GRANT: Yes, in common language, "the black box", yes.

FLTLT ROSE: Is it your understanding that the Crash Survival Memory Units from Bushman 83 was recovered from the crash site?

MR GRANT: Yes, it was recovered, yes.

FLTLT ROSE: And that the DFSB were able to obtain flight data from it?

MR GRANT: Yes, they were.

FLTLT ROSE: So the DFSB provided the flight data to you in two formats?

MR GRANT: Correct.

FLTLT ROSE: The first was a binary flight data format?

MR GRANT: Yes.

FLTLT ROSE: Now, that contains the full list of channels recorded by the Crash Survivable Memory Unit, but it's not readable by humans?

MR GRANT: That's correct.

FLTLT ROSE: And then there was a comma-separated value, or CSV, format?

MR GRANT: Yes.

FLTLT ROSE: Now, that is human readable, but it only captures a small subset of data channels on the Crash Survivable Memory Unit?

MR GRANT: Yes, that's correct.

FLTLT ROSE: And then the DFSB also provided you with the cockpit voice recorder data files for Bushman 83 and 84?

MR GRANT: Yes.

FLTLT ROSE: They didn't provide you with those from 81 and 82?

MR GRANT: No, they didn't.

FLTLT ROSE: Do you know why?

MR GRANT: I could probably answer that in the private session, I think.

FLTLT ROSE: I'll come back to that. If you go to page 7. Now, the DFSB also provided you with their parameter listing for the MRH-90 flight data recorder and the Crash Survivable Memory Unit which you used to update your Hawkview software to read the binary flight data format?

MR GRANT: Yes, that's correct.

FLTLT ROSE: What is a parameter listing, as a general proposition?

MR GRANT: The parameter listing, because the binary flight data is provided as a stream of ones and zeros the parameter listing provides essentially a map, for want of a better word, of where to find a particular parameter or channel. So the parameter listing is sometimes called an interface control document, and it will literally say every parameter or channel that is collected by the Flight Data Recording Unit – it will say where that word is – what we call a word is, located in the data stream. It tells you the – if there's any conversion factor. Like, sometimes numbers are multiplied by a factor once produced. It also tells you what the units are for that particular channel. And there's also a thing called a "mask" which is a way of – it's probably a software thing I won't go into, but it's an integral part of reading the flight data and converting it from binary to an engineering unit, or a Boolean channel, or an integer.

FLTLT ROSE: And does that information come from Airbus Germany?

MR GRANT: Yes.

FLTLT ROSE: And this helped you to read those channels that weren't included in the CSV format, such as the aircraft's subsystem status modes and settings?

MR GRANT: Yes, absolutely. Yes, you could not do it without the interface control document or the parameter listing.

FLTLT ROSE: If you go to page 9 now of your statement? In terms of how you undertook these taskings, you state that you used the Hawkview software to plot the binary flight data to produce the flight path?

MR GRANT: Not quite correct. We used the binary flight data for reading the channels that weren't collected by the CSV or weren't on the CSV file format. The CSV file was what we used to create the reconstructions for the four aircraft.

FLTLT ROSE: Is it the case that Hawkview converts the binary flight data into a FPR file, which it becomes – makes it human readable?

MR GRANT: It can, yes. So the two systems we can use, we can use Hawkview to read a binary file and create the FPR, but with the CSV format and with the number of channels that are collected, in this particular case we could use a typical mathematical software – I think Python was used in this case – to simply get the particular channels required for the flight path reconstruction because we don't need all the channels, we only need a small subset, things like airspeed, things like altitude, rotations. And we, using Python, could manipulate the CSV data to get – with a little bit of processing, to provide a FPR file, which I should say is the file that GRS needs to create the animation.

FLTLT ROSE: The sorts of the information that you wanted was position information, vehicle translation and rotation information at a rate of several times a second?

MR GRANT: Correct.

FLTLT ROSE: And then you put that FPR file into your GRS software, which replays the flight path trajectory?

MR GRANT: Yes. And we can add other important factors: landmarks, imagery from the ground – otherwise it would just be a black space that the animation's flying over. So it's good to have – it could be a Google Maps shot of the area, the surrounding area which makes it really

useful to understand where the aircraft was in time and space relative to landmarks.

FLTLT ROSE: And you mentioned before the sorts of information you were interested in to reconstruct that. So on that FPR file, things – airspeed, I think you mentioned before?

MR GRANT: Yes, correct.

FLTLT ROSE: Engine power?

MR GRANT: Yes.

FLTLT ROSE: Flight control positions?

MR GRANT: Yes.

FLTLT ROSE: And that means either the control surface deflections or the positions of the pilot's flight controls in the cockpit?

MR GRANT: Yes, that's right.

FLTLT ROSE: What are "control surface deflections"?

MR GRANT: So in the case of a helicopter, they're not – in a fixed-wing, they would be the rudder, the aileron, the elevator. For a helicopter, the actuators are around the main rotor, so the control surface's rods, pushrods, essentially.

FLTLT ROSE: And when you say "the position of the pilot's flight controls in the cockpit", do you mean things like the cyclic and the collective?

MR GRANT: Yes.

FLTLT ROSE: Anything else?

MR GRANT: So the cyclic forward and back, the collective, the engine power and pedals.

FLTLT ROSE: Pedals. So if you go to page 10 of your statement, you mentioned before that you used another piece of software called Python, which is a mathematical software?

MR GRANT: Yes.

FLTLT ROSE: And you also used something called MATLAB?

MR GRANT: Yes.

FLTLT ROSE: Is that a mathematical software?

MR GRANT: Yes, both mathematical software.

FLTLT ROSE: And then you actually updated your own Hawkview software over a number of weeks so that it was able to read some of this binary data?

MR GRANT: Yes, that's correct. So given, I guess, an imperative to get a preliminary recreation or reconstruction out, we used the CSV files and used Python to create the flight path to be read by GRS, the processing time to get a full, I guess a module is what we'd call it, in Hawkview, which is specific to a particular aircraft's flight data recorder. That takes some time. It's, you know, minimum four or five weeks, and then you've got to do some validation that you are actually reading the data correctly.

So in the interests of sort of expediency, we used the CSV format. It had all the channels we needed, so - - -

FLTLT ROSE: So you were confident that even though it had less channels than, say, the binary data, it was enough for you to do your reconstructions?

MR GRANT: Yes, absolutely. We don't need all – we really only need a small subset of channels to create a reconstruction. Yes.

FLTLT ROSE: And in terms of how you created the flight paths, you used the GRS to combine the flight path and to render the aircraft's surface geometry or skin?

MR GRANT: Yes.

FLTLT ROSE: Which enabled you to play the flight paths in real time?

MR GRANT: Yes. So there's two separate pieces. There's the flight Path, which is around, I think, a centre of mass or a reference location of an aircraft – usually in the centre of the aircraft – and the rendering is placed on that location. So they're quite divorced from each other. So we could put any skin we wanted there. But we had an MRH-90 skin, so that's the one we used.

FLTLT ROSE: So that's the laser cut that the DS - - -

MR GRANT: No, it was the one that we got from online some time ago.

FLTLT ROSE: A public source?

MR GRANT: Yes, it's a public source.

FLTLT ROSE: And that was dimensions of the MRH-90: how tall it was; wide it was; long it was?

MR GRANT: Yes. We ran a comparison of the CAD geometry we had and overlayed that onto the online version, so we were reasonably comfortable of its accuracy.

FLTLT ROSE: It matched up with the information you already had?

MR GRANT: Yes.

FLTLT ROSE: You can use this software to slow down or speed up the animations or take snapshots at particular points of interest?

MR GRANT: Yes, that's right.

FLTLT ROSE: And the software also allows you to change the viewing locations, as you said. So it could be from wherever you are: right-hand/left-hand cockpit, in the back where the aircrewman sit?

MR GRANT: Yes, that's right.

FLTLT ROSE: Or outside?

MR GRANT: Or outside, yes.

FLTLT ROSE: You state that the user can also elect a fixed earth or translating earth point. Now you said "translating", said "moving" before. But "fixed to the earth", what does that mean?

MR GRANT: Yes, fixed to the earth. So just like the view you would get if you were standing still at that location, watching an aircraft fly by. So sometimes there's an interest in corroborating an eyewitness testimony of what they've seen a plane do, and that's where GRS can sort of either, you know, prove or disprove that that was what occurred.

FLTLT ROSE: And if it's not fixed earth, so you're not watching them fly by, you're actually flying with it, even if you're outside the aircraft, it's almost as if you're, well, moving at the same pace?

MR GRANT: Yes, you're flying with it.

FLTLT ROSE: You can also present certain data from the flights such as the engine level positions or the engine power torque, air speed and altitude?

MR GRANT: Yes.

FLTLT ROSE: That's like a graphical depiction overlaid on top of the animation?

MR GRANT: Yes, we use a – it's a generic HUD that we just design that presents the information, similarly to how you would see it on an aircraft. It doesn't relate to any particular aircraft. It's just the one we use to neatly display speed and altitude in remotely the same location you might see it on any HUD.

FLTLT ROSE: So it's not depicting what the pilots would have seen through their TopOwl symbology?

MR GRANT: Yes, correct.

FLTLT ROSE: You don't have any program, software, that could replicate what the pilots would have seen on their 5.1 version of TopOwl?

MR GRANT: No, we don't.

FLTLT ROSE: It doesn't exist? It hasn't been created?

MR GRANT: I'm saying DST, as far as I know, doesn't possess that.

MS McMURDO: And you're not aware of one?

MR GRANT: I assume the simulators for the aircraft would, but I'm not aware, no.

MS McMURDO: Thank you.

FLTLT ROSE: When you said before that you can also overlay objects or landmarks that you obtained from Google Maps; is that correct?

MR GRANT: Yes, that's correct.

FLTLT ROSE: But you can also put in things like mountains, buildings, islands?

MR GRANT: Yes.

FLTLT ROSE: And they're - - -

MR GRANT: Objects, yes.

FLTLT ROSE: So they may not come from Google Maps, they could come from other sources?

MR GRANT: Other sources, yes. However, using Google Maps we, can see that things like islands match up in location to a Google Map.

FLTLT ROSE: So, in essence, the Defence Science Technology Group used these various pieces of software to provide the DFSB with a variety of still imagery and video animations from the reconstruction?

MR GRANT: Yes.

FLTLT ROSE: You also stitched together various viewpoints so that in one animation you may, in fact, have four different animations playing at the same time?

MR GRANT: Yes. Four views at the same time, yes.

FLTLT ROSE: Overlayed with audio from the cockpit voice recorder from either Bushman 83 or 84?

MR GRANT: Yes.

FLTLT ROSE: If you go to page 11 of your statement, you provide evidence of who in the DSTG performed these various tasks, but we don't need to name those persons today.

MR GRANT: Okay.

FLTLT ROSE: But obviously it was a team effort.

MR GRANT: Yes.

FLTLT ROSE: And it wasn't just you that produced all of these animations and products?

MR GRANT: That's right.

FLTLT ROSE: Now, you then list each item that you produced for DFSB on pages 11 to 13 and the formats that they were produced in?

MR GRANT: Yes.

FLTLT ROSE: If you go to page 13? This is where you set out the assumptions that you made when – or the DSTG, in general, made when recreating the flight paths. Is that correct?

MR GRANT: Yes.

FLTLT ROSE: Now, that included the assumption that each individual aircraft had a very accurate estimation of time as provided by the Core Management Computer as updated by the Global Positioning System onboard?

MR GRANT: Yes, that's right.

FLTLT ROSE: Does that mean that you could also assume that time, as detailed in a crash survival memory unit flight data between the aircraft and the formation, was more or less synchronised?

MR GRANT: Yes, we made an assumption of synchronised for the flight paths.

FLTLT ROSE: At page 14 you then state that you did notice the occasional and temporary discrepancy in the times by about one second between the two different sources of time in the binary data for all four aircraft?

MR GRANT: Yes.

FLTLT ROSE: And you've presumed that this was due to differences in how these channels logged their data with one channel capturing the data a small fraction of a second after the other channel captured its data?

MR GRANT: Yes.

FLTLT ROSE: So you've estimated that one aircraft's flight data time could be out of synchronisation with another aircraft in the formation by up to one second?

MR GRANT: That was the assumption, yes.

FLTLT ROSE: And you've estimated that the separation distances between the aircraft could also be out of synchronisation by up to one second?

MR GRANT: Yes.

FLTLT ROSE: And the synchronisation of any cockpit voice recording overlaid on an animation is also likely to be out of synchronisation with the flight data by up to one second, for reasons that you set out on page 14?

MR GRANT: Yes.

FLTLT ROSE: So on page 14, you also discuss some limitations in the software that you used?

MR GRANT: Yes.

FLTLT ROSE: And you state that, "Not all of the channels in the CSB format flight data collect data at the same rate"?

MR GRANT: Yes, that's right.

FLTLT ROSE: So the DSTG used linear data interpolation, or filling out, between known time steps to provide data that was not required for some channels to produce the necessary channels at the same rate?

MR GRANT: That is correct.

FLTLT ROSE: Are those limitations and assumptions that you made similar to what you do in your previous accident investigation recreations?

MR GRANT: There are a range of methods. I guess the concern is we don't want to be changing the original data of the flight that is recorded. So sometimes we'll accept slightly less pretty animation – jittery – in order to ensure that we are actually replicating and replaying just the information that has been recorded. You could use some very nice tools to smooth out the data, but you might be changing original data and that's kind of not what we want to do.

FLTLT ROSE: If you have smoothed out the data, you would have put that in the file name of any animation you created? It would say "smoothed"?

MR GRANT: I know my colleague tried a couple of attempts to smooth the data out to get a slightly better animation, yes.

FLTLT ROSE: So other than those occasional moments when you did try to smooth it out, the data you used in your reconstructions is the flight data as acquired from the crash survival memory unit?

MR GRANT: Yes.

MS McMURDO: And where it was smoothed out, that's noted?

MR GRANT: Noted - - -

MS McMURDO: Can we identify where that was done?

MR GRANT: We could. I'd have to look back at the file and see what might have been done.

MS McMURDO: I see. Thank you.

FLTLT ROSE: At page 15 of your statement, this is where you refer to issues with the fidelity of the flight path reconstructions.

MR GRANT: Yes.

FLTLT ROSE: The fidelity comes from the flight data and the aircraft geometry that you used.

MR GRANT: Yes.

FLTLT ROSE: And there were limitations of the two sources of geometry that the DSTG had for the cockpit?

MR GRANT: Yes.

FLTLT ROSE: So your team used something called the FOR analysis by Dr Rob Porter rather than relying solely on animation?

MR GRANT: Yes, absolutely. I would say that the replay is a – it can be a bit more qualitative when you're talking about a multi-ship formation.

Flight data recorders only record data for a single aircraft. They can't tell you where another aircraft is in relation to another. So the reconstruction would highlight an event, like a loss of separation event, yes. But I would be relying on a mathematical tool such as MATLAB or Python to get an accurate estimation of the separation distance between aircraft, yes – or separation from something else. Yes.

FLTLT ROSE: So what is the FOR analysis? Does that stand for something?

MR GRANT: Field of regard.

FLTLT ROSE: Field of regard. So different types of analysis were required to compute the separation distances and the line of sight from one aircraft to another?

MR GRANT: Yes. But still using the flight data, the channels recorded such as latitude and longitude.

FLTLT ROSE: Such as what, sorry? I didn't - - -

MR GRANT: Sorry, latitude and longitude.

FLTLT ROSE: Thank you. There are also certain things that can't be inferred from the animations and the storyboards, such as exactly where the pilots or aircrewman's head is located in their field of regard.

MR GRANT: Yes, that's right.

FLTLT ROSE: And, of course, where their eyes were pointing at any particular given time.

MR GRANT: Yes.

FLTLT ROSE: But you've already referred to using the design eye points for the field of regard analysis.

MR GRANT: Yes.

FLTLT ROSE: What do you mean by "design eye points"?

MR GRANT: So when an aircraft is designed, there's some assumed locations for where the eyes of a pilot in the cockpit will be. And there is a range between, I guess, the tallest man and the smallest woman, in

common language, really, that could occupy that cockpit. So their eyes will be in a slightly different location.

So the design eye point is also used to certify other things about the aircraft, like, what they can see and – so it's a reference from the OEM.

FLTLT ROSE: Is the design eye point then, is there one for the average male and one for the average female, in terms of height?

MR GRANT: No, it's the opposite. It's the highest male and the – the tallest male and the shortest female; the fifth percentile female and 95th percentile male.

FLTLT ROSE: So you can put the design eye point at either one of those?

MR GRANT: Yes.

FLTLT ROSE: But nothing in between?

MR GRANT: Correct.

MS McMURDO: Or do you average it?

MR GRANT: We could average it, I suppose. That's not how we chose to do it.

MS McMURDO: Yes. No.

MR GRANT: No, we just took those two design eye points and did an analysis based on those two eye points for both left and right of the cockpit.

FLTLT ROSE: You also note that the night-vision devices, they reduced the aircrew's field of view. And this is not represented in the field of view shown in the reconstructions?

MR GRANT: Yes, that's correct. I think there's one video where we tried to show the reduced field of view of the pilot. We did try. But again, without knowing really ever exactly where a pilot is looking, I'm not sure if that's an analysis that is helpful or not.

FLTLT ROSE: Is there a difference between "field of regard" and "field of view"?

MR GRANT: Yes. So field of regard is what you could see outside the cockpit. Field of view, I guess, is like your eye, your sensor on your eye. That's like when you're keeping your eye still, there's only so much you can see. So that's, I guess – it's sometimes used for, like, a sensor, not just eyes. But, you know, the field of view is what the sensor can capture.

FLTLT ROSE: So would the field of view then incorporate weather elements?

MR GRANT: No. No, the field of view would just be what you can see in terms of degrees.

FLTLT ROSE: So depending on how good the individual's eyesight is with the night-vision device overlayed what you could possibly see?

MR GRANT: Yes. We have not included any weather information in our animations. We don't know, yes. Obscurance is not taken into consideration either. Yes, the animation is - - -

FLTLT ROSE: Is that because the DFSB didn't ask you to include any weather elements?

MR GRANT: No, we just generally don't do it as a rule. Yes, like, some of the animations that look just like broad daylight, well, we know it wasn't broad daylight, it was dark. But we used, I guess, a rendering that is daylight so that, for illustrative purposes, for debrief purposes, you could see exactly everything that is in that space that we've put there.

Obviously, if there was obscurance, inclement weather, certain things might not be seen in the actual flying.

FLTLT ROSE: And on some animations you have attempted to put a night vision – or not night vision, but it's just run at night.

MR GRANT: A night rendering - - -

FLTLT ROSE: Night rendering?

MR GRANT: Yes.

MS McMURDO: And certainly it doesn't take into account any spatial disorientation that might have been experienced by the pilots, obviously?

MR GRANT: Yes, that's right.

FLTLT ROSE: Those are the question that I had in the public hearing.

MS McMURDO: Thank you.

So thank you for your evidence. It's amazing what clever people can do with technology. Obviously, as you've very fairly identified, there are a number of assumptions you've had to make and there are a number of factors that you can't be sure of, so what you have developed is very much an approximation of some - - -

MR GRANT: Yes. I'd say there's elements of approximation, yes.

MS McMURDO: Elements of approximation. Are you able, in any way, to give a mathematical probability of margin of error – is that possible here – as to how accurate you think this was probably what happened, or are you able to put it as high as that – likely?

MR GRANT: It is a truthful rendering of what occurred.

MS McMURDO: Yes. Of the work you've done, yes.

MR GRANT: Of the four aircraft. There are – I guess, the synchronisation is one of the issues about – certainly, things like separation. Exactly how one aircraft was separated from another is very much dependent on synchronisation and the assumption around that. And also, I think with the CVR there were some assumptions about its synchronisation with the flight path.

So, yes, there is an element of – there's a little bit of rubberiness, I suppose, with the animation. However, we'd say it's a fairly truthful – it is the flight data being shown. Ultimately, that is the flight data being shown, yes. So it is reading what was recorded by the CSMUs of the four aircraft.

MS McMURDO: Thank you. Now, are there applications to cross-examine in this public forum on what's been said so far? No applications. All right, so we'll now have to go into Private Session. Correct?

FLTLT ROSE: That's right.

MS McMURDO: Yes, so we'll need to adjourn and get that organised. And we'll proceed in the same manner in which we proceeded earlier in the week for the private session, with people identified as to who

can be in the room. All other people who are not part of the direction from me to be in the room will have to leave the room for the private session. The live streaming will be stopped. Recording, of course, will continue but the live streaming will be stopped, and then we'll have a roll call when we resume to make sure that only those who should be in the private hearing are in the private hearing.

All right then, we'll adjourn until we can do that.

<WITNESS WITHDREW

HEARING ADJOURNED

(Continued in Private Hearing Session)

HEARING RESUMED

MS McMURDO: We'll adjourn in a moment. Tomorrow, what time are we starting?

FLTLT ROSE: We only have one witness listed for tomorrow, so 10 am start should be sufficient.

MS McMURDO: 10 am, all right. Yes. And if I could remind everybody present – and, of course, particularly families and those who are personally affected by the evidence we've just heard – but everyone present that it has been a very difficult day. It has been a very emotional day, seeing this material, and we all know that assistance is available, and I'd urge you all to take advantage of it if it's needed.

Thank you. We'll adjourn now until 10 o'clock tomorrow.

PUBLIC INQUIRY ADJOURNED UNTIL
FRIDAY, 28 MARCH 2025 AT 1000