Defence Aviation Safety Investigation

On the night of 28 July 2023, an Australian Army MRH-90 Taipan helicopter impacted waters in the vicinity of the Whitsunday Islands, Queensland. The MRH-90 helicopter, from the 6th Aviation Regiment, was the third in a formation of four MRH-90s that were conducting an air mobile mission during Exercise Talisman Sabre 23.

In response to the accident, the Director of the Defence Flight Safety Bureau (DFSB) formed an Aviation Safety Investigation Team to conduct an independent aviation safety investigation to:

- Determine the key accident sequence of events and cause of the accident
- Identify systemic and organisational factors that directly or indirectly contributed to the accident
- Make recommendations for safety system improvement in order to prevent re-occurrence of a similar event.

The Director of the DFSB has the authority to undertake an aviation safety investigation independent of the Defence chain of command and those responsible for regulating Defence aviation.

This aviation safety investigation was one of the most complex conducted by Defence in recent history. The duration of the investigation was commensurate with the nature and circumstances of the event and the scope and depth of evidence and analysis. Independent subject matter expert reports and peer reviews were sought to verify and validate analysis and findings, and to protect against bias.

The Director of the DFSB provided an Aviation Safety Investigation Report to the Defence Aviation Authority, Chief of Army, Commander of Army Aviation Command and the Director General of the Defence Aviation Safety Authority on 28 March 2025.

The report provides safety actions and recommendations. The report does not seek to apportion blame or determine liability and does not recommend disciplinary or administrative action against organisations or individuals. This approach is consistent with the Australian Transport Safety Bureau's approach to aviation safety investigations and the International Civil Aviation Organization.

The report is classified 'OFFICIAL: Sensitive' in accordance with requirements specified by the Australian Government Protective Security Principles Framework and will not be released to the public. The Director of the DFSB will provide an 'OFFICIAL' report for public release upon completion of essential debriefings and the learning phase with Defence Aviation rotary-wing units, applicable Defence organisations and affected personnel. The release of the 'OFFICIAL' report will occur in May.

Findings

Consistent with Australian Transport Safety Bureau investigation report terminology, the DFSB Aviation Safety Investigation Report uses 'verbal probability expressions' as a basis to make findings, which represent the investigators' understanding of the level of likelihood (such as *virtually/almost certain, extremely likely, very likely, likely*). Investigators are required to use professional interpretation, assessment and judgement of the level of likelihood in the absence of direct evidence of causal or contributing factors.

Primary cause

- The investigation concluded that the primary cause of the accident was an unrecognised loss of spatial orientation, commonly referred to as spatial disorientation.
    - Unrecognised spatial disorientation occurs when a pilot misperceives the orientation, or position, of their aircraft with reference to the surrounding environment. This leads the pilot to take actions that are relative to their misperceived orientation and without awareness that the aircraft is in an abnormal state.
    - Due to the low operating altitude of the formation and the aircraft's high rate of descent, the investigation concluded that the pilots did not have sufficient time after experiencing the unrecognised spatial disorientation event to rebuild an accurate mental model of the aircraft's orientation, and apply 'unusual attitude' recovery techniques prior to impact.

Contributory findings

- Varying visibility and contrast in overcast and showery environmental conditions, and intermittent periods where the horizon was *more than likely* not discernible are considered to have contributed to degradation of the pilots' spatial orientation, in particular whilst the pilots were task-focused to maintain formation position using night vision devices as the primary visual reference.
- Cabin doors were authorised to be in the closed configuration for the mission in order to alleviate the aircrewmen's exposure to rain and low temperatures until a pre-determined approach point to the landing zone. However, this restricted the aircrewmen's visibility and ability to contribute effectively to the pilots' situation awareness within the formation and of proximity to terrain.
- The investigation found systemic organisational influences that *likely* reduced the effectiveness of risk controls across the Defence Aviation Safety Program's multi-layered framework of independent safety assurance. This includes policy and regulation, organisational approvals, education and training, and oversight for aeromedical factors, aviation fatigue management, human performance limitations and spatial disorientation.
- The investigation noted that Army Aviation faced significant challenges to mitigate operational safety and airworthiness risks arising from the complexity of maintaining and

operating the MRH-90, especially during a period of force modernisation and platform transitions.

- The investigation found that demands on key personnel responsible for aviation safety often exceeded workforce capacity, which *likely* degraded the effectiveness of Army Aviation's safety, quality and risk management systems.

Non-contributory findings

- The technical investigation of the Voice and Flight Data Recorder and aircraft wreckage concluded that the aircraft's propulsion systems, transmissions and gearboxes, flight control systems and associated major systems were operating normally, and that there were no structural failures of the aircraft prior to impact.

- The operational investigation concluded that it was *almost certain* that the helmet mounted sight and display, and associated night vision imagery and flight symbology displayed to the pilots, was functioning correctly.

- The investigation also concluded that it was *almost certain* that the helmet mounted sight and display 'pitch scale attitude' was not contributory to the crew's loss of spatial orientation as it is not part of the pilots' instrument scan whilst flying formation.

- All formation crews were current and qualified to conduct the low level, formation, flight over water using night vision devices.

- The mission was appropriately authorised by a current and qualified flight authorisation officer.

- Forecast weather and environmental conditions were within authorised and appropriate limits set by the commanding officer of the 6th Aviation Regiment.

Investigation

Process and priority

The aviation safety investigation followed a structured process to determine the key sequence of events and primary cause of the accident through:

- Forensic analysis of the Voice and Flight Data Recorder and aircraft wreckage

- Interviews with individuals directly involved in the accident as well as relevant specialists and experts not directly involved in the accident.

- Review of operational documentation and risk management artefacts for the mission.

The investigation's initial priority was to determine whether a failure of a major aircraft system or aircraft structural integrity might have been causal or contributed to the accident. The

investigation then analysed contributory factors spanning individual and crew actions, local conditions, risk controls and organisational influences in order to make recommendations for safety improvement and prevent re-occurrence of a similar event.

In accordance with international convention and requirements for original equipment manufacturers to provide airworthiness advice to global operators of NH90 variants, NHIndustries in association with Airbus Australia Pacific, assisted the Aviation Safety Investigation Team to inspect and analyse wreckage and major aircraft systems. The original equipment manufacturer also provided specialist reports of the forensic analysis of technical data obtained from the Flight Data Recorders. By convention, the original equipment manufacturer is restricted from reviewing cockpit voice recorder audio files.

The Defence Science and Technology Group conducted independent forensic analysis of aircraft wreckage and voice and flight data downloaded from the Voice and Flight Data Recorder. The Defence Science and Technology Group also created simulated models of the formation's flight profiles and the aircraft's manoeuvring within the formation throughout the key accident sequence of events.

The Australian Transport Safety Bureau provided specialist technicians to assist with underwater retrieval of the Voice and Flight Data Recorder, and subsequently assisted with the preparation to download data from the Voice and Flight Data Recorder's Crash Survivable Memory Unit. The Australian Transport Safety Bureau also provided subject matter expert assistance for the retrieval and preservation of aircraft wreckage, which was exposed to long periods of saltwater immersion.

A subject matter expert on civil and military spatial disorientation events and aviation accident investigations provided an independent report on the likely effects of spatial disorientation experienced by the pilots.

An Army Aviation MRH-90 test pilot was seconded to the Aviation Safety Investigation Team to facilitate flight simulator recreations of the key accident sequence of events, and to provide detailed advice regarding aircraft systems, avionics, flight control systems, handling characteristics and standard operating procedures.

The Institute of Aviation Medicine and Army Aviation's Senior Aviation Medical Officer investigated aspects related to aviation medicine, aeromedical factors (such as spatial orientation and fatigue management) and human performance limitations.

Defence Aviation's Aeronautical Life Support Logistics Management Unit provided an independent report on aircraft life support equipment and cockpit and cabin restraint systems.

The New Zealand Defence Force provided advice related to NH90 standard operating procedures and techniques for equivalent MRH-90 missions conducted by the Australian Defence Force.

Support Services

- The **Defence Member and Family Helpline** is the first point of call for Defence members and families seeking support, information or connection with their community. They can be reached 24 hours a day, seven days a week on **1800 624 608**.

- **Open Arms** veterans and families counselling provides free and confidential counselling and support for current and former serving ADF members and their families. They can be reached 24 hours a day, seven days a week on **1800 011 046** or visit https://www.openarms.gov.au/ for more information.