Defence
Safety Authority

This Interim Report contains facts which have been determined up to the time of issue. It is published to inform the military chain of command, aviation industry and the public of the general circumstances of this accident and should be regarded as tentative and subject to alteration or correction if additional evidence becomes available.

20220623-ZM152_SI_Interim_Report

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INTERIM REPORT FROM THE SERVICE INQUIRY (SI) INVESTIGATING THE ACCIDENT INVOLVING F-35B ZM152 ON HMS QUEEN ELIZABETH ON 17 NOV 21

All times Local (UTC + 2 hrs)

Headline

1. While the investigation into the F-35B accident of 17 Nov 21 is ongoing, the SI Panel is now confident that the cause was not related to an aircraft technical issue but was most likely caused by human, organisational and procedural factors.

Introduction

2. On 17 Nov 21 HMS QUEEN ELIZABETH (QNLZ) was operating in the eastern Mediterranean six months into her maiden Carrier Strike Group deployment, Operation FORTIS. United States Marine Corps F-35B aircraft had commenced flying operations at 06:30 and two UK F-35Bs, from 617 Squadron (Sqn), were programmed to launch at 11:45. The lead aircraft, ZM152 taxied to the runway for launch at 11:37. The aircraft converted to short take-off mode and at the direction of the Captain of the Flight Deck the pilot conducted engine run up checks, confirmed all engine indications were normal, selected take-off power, 97% Engine Thrust Request (ETR), and released the brakes.

3. The pilot reported that the initial acceleration felt normal, but then decreased. On checking the engine displays they discovered that the power was low, at 74% ETR. The pilot then selected maximum (100% ETR) but the engine continued to deliver lower than expected power. Due to the resulting low speed of ZM152, the pilot attempted to abort the take-off but was unable to stop the aircraft before the end of the ramp and ejected. The ejection was successful, the parachute deployed, and the pilot landed on the flight deck suffering only minor injuries. The aircraft impacted the sea and was seen to be afloat passing down the port side of the Ship before it subsequently sank.

Background

4. ZM152 last flew on the 13 Nov 21 and required no maintenance activity before the preparation for its flight on 17 Nov 21. During the day prior to the accident, QNLZ transited

through the Suez Canal on her homeward passage. As a security measure for that passage all F-35Bs on the flight deck had Red Gear fitted. Red Gear, which included engine intake blanks, was designed to protect from ingress of foreign objects. That night, 617 Sqn engineering personnel serviced ZM152 to prepare it for flight the following day.

5. ZM152's servicing was tasked to two engineers who started shift at 19:30. The first engineer conducted their aspects of the servicing shortly after 21:30 and was completed no later than 23:00. After a mid-shift meal, the second engineer started their work at 00:30. During the intervening period there was thunderstorm activity around the Ship. When the second engineer arrived at the aircraft to conduct their part of the servicing, and on all subsequent inspections of the aircraft prior to flight, the intake blanks were not seen. During their individual tasks, the engineers removed some elements of the Red Gear, but no entry was required in the aircraft technical log upon fitment or removal. A local accounting procedure was in place, but this was not used for the mass fitting and removal of Red Gear during the Suez transit. No muster was conducted prior to flying to ensure all the Red Gear had been removed.

6. Prior to sinking, the left-hand intake blank was observed to float clear of ZM152's wreckage and was subsequently impounded. A salvage operation was mounted, and the aircraft was located and successfully recovered to the UK.

Cause

7. Following analysis of the Flight Data Recorder by the manufacturer, and having completed an independent Airworthiness Review, the Panel has identified no technical issue with the aircraft. It is the Panel's opinion that it is almost certain that a single engine intake blank remained inside the engine intake at the time of launch, causing a restriction in airflow to the engine such that it was unable to generate enough power for take-off.

Conclusion

8. Based on the evidence obtained, the Panel is confident that the primary causal factor of the event was the left-hand intake blank remaining in the aircraft prior to launch reducing the engine power. This was most likely due to a combination of human, organisational and procedural factors. Nevertheless, the inquiry continues to pursue a standard of evidence that will allow other lines of inquiry to be addressed across a range of possible causes. The Panel is focussing on potential mechanisms of movement of the intake blank and comparisons of UK servicing procedures with other F-35 operating nations.

9. In accordance with its terms of reference, the Service Inquiry continues to examine other factors, including equipment design, workforce resource, fatigue management, quality assurance and post-occurrence management of the event, to identify any relevant lessons that may prevent reoccurrence and enhance Air Safety.

Director General Defence Safety Authority