MINISTRY OF DEFENCE

Military Aircraft Accident Summary of a Royal Air Force Board of Inquiry

Aircraft:	Jaguar T2A XX143
Date of accident:	18 September 1996
Place of accident:	RAF Lossiemouth
Casualties:	1, major

Synopsis

1. Jaguar T2A XX143 was the No2 in a formation take-off from RAF Lossiemouth when, as the aircraft left the ground, the left-hand engine surged. Suspecting an engine problem, the pilot instinctively selected maximum reheat in order to maintain the climb. He then checked his engine instruments and, after selecting a lower climb attitude, throttled back the right-hand engine. The aircraft continued to lose height the pilot ejected shortly before it crashed into the sea, about a mile from the end of the runway. The Board of Inquiry concluded that the accident was caused by the incorrect diagnosis of the engine problem and the consequent throttling back of the serviceable engine.

Background

2. The Jaguar Operational Conversion Unit at RAF Lossiemouth is responsible for the training of all Jaguar pilots for employment on front-line squadrons. The syllabus covers conversion to type, instrument flying, weapons and air combat training, and close formation manoeuvring, using both the two-seat Jaguar T2A and the single-seat Jaguar GR1A. Close formation training is carried out early in the syllabus, once the pilot has mastered the basic

handling charactistics of the Jaguar. It consists of dual instructional sorties, followed by solo consolidation sorties. It is not uncommon for the Jaguar T2A to be flown solo for some syllabus sorties depending on aircraft availability.

Circumstances

3. The pilot of XX143 was briefed and authorised to fly his first solo formation sortie on the morning of 18 September 1996. Pre-flight checks were carried out conscientiously and in an un-hurried fashion, and with nothing unusual noted during engine start, the aircraft was taxied and lined up alongside the lead aeroplane for a formation take-off. At the start of the take-off roll, reheat was selected on both engines, and apart from XX143 dropping back slightly on the leader, the take-off appeared normal. At, or about, the point where the aircraft became airborne the pilot heard an unusual noise emanating from the rear of the aircraft. (This noise, along with an unusual flame from the rear of the aircraft was also noted by a number of eye-witnesses; both occurrences are symptomatic of an engine surge.) The pilot, suspecting that one of the aircraft's engines had malfunctioned, correctly selected maximum reheat on both engines and raised the undercarriage in an attempt to climb away. On checking his engine instruments, the pilot diagnosed that the right-hand engine had surged and jettisoned the two external fuel tanks to reduce drag and weight, and selected a lower climb attitude. The pilot then throttled back the right-hand engine, but, unable to stop the aircraft's rate of descent, he ejected shortly before the aircraft impacted the sea.

Rescue operation

4. The ejection sequence was normal, although the pilot was aware of a pain in his back which caused him some difficulty in inflating his dinghy and boarding it. A RAF Sea King Search and Rescue helicopter, already airborne on a local training sortie, quickly

located and rescued the pilot and flew him to the local hospital for preliminary checks. It then transferred him to a major infirmary where his spinal compression injuries were assessed as major.

Aircraft damage

5. The aircraft was destroyed as it impacted the sea, although parts of the airframe, along with the two engines, were salvaged for inspection by the Board of Inquiry.

Investigation

6. Although the Jaguar is not fitted with an Accident Data Recorder, the Inquiry was able to drawn on evidence from the aircraft wreckage, numerous eye-witnesses, and the pilot himself. Examination of the wreckage showed that the left-hand engine had suffered major damage from an engine surge and the Inquiry considered that the overall loss of thrust caused by the throttling back of the right-hand engine when, in fact, it was the left-hand engine which was in surge, reduced the overall thrust to such a point that the loss of the aircraft was inevitable.

7. With this in mind, the Inquiry concentrated on determining the circumstances leading up to the surge and the incorrect diagnosis of which engine was affected. The left-hand engine was strip examined by Rolls-Royce plc, who, on dismantling the main fuel control unit, found a damaged pressure seal. Detailed examination of the seal found that it had been formed using less material than specified and revealed evidence of contamination during the moulding process; Rolls-Royce concluded that both these factors would have increased the probability of a seal failure. Modelling by Rolls-Royce of the effects of the seal's failure suggested that it could allow gross over-fuelling of the engine, thus causing it to surge. In considering why the pilot had incorrectly diagnosed

which of the engines had surged, the Inquiry accepted pyschological evidence that the pilot had had only a very short time in which to react promptly, correctly and accurately, and that the incorrect diagnosis was probably a combination of stress, the sense of urgency and inexperience. Ultimately however the Inquiry concluded that, as the aircraft would probably have been recoverable had the problem been diagnosed correctly, it was the shutting down of the wrong engine which caused the accident.

Safety recommendations

7. The Inquiry recommended that Rolls-Royce be tasked to investigate the integrity of the pressure seals in the engine fuel control unit to safeguard their quality. In addition, it recommended that greater emphasis be placed on this type of emergency during simulator training, and guidance be issued to all Jaguar pilots on dealing with engine failures at the critical moment during take-off.