

BAe 146 Magnetic Chip Detector



Majesty Airlines (MJA)
4,000 employees
Regional carrier
Operates 737 and BAe 146 aircraft

Personnel Involved

1. Frank: - Shift Manager
2. Dennis: - Shift Supervisor
- 42 years old, 22 years experience
3. Al: - Maintenance technician
- 32 years old, 10 years experience

Event Summary

The BAe 146 departed the Midland Airport at 1510 local time. Fifteen minutes later, while climbing at 5,000 feet, the crew saw that the oil quantity gauges for the numbers 2, 3, and 4 engines indicated empty, and that the reading for number 1 was less than one-fourth full. The crew began flying the airplane back to Midland. The low oil pressure warning light for the number 3 engine then illuminated. At 1527, the crew shut down the engine, declared an emergency, and requested and received immediate clearance to land at the nearest airport--Stennis Airport.

The low oil pressure lights for the number 2 and number 4 engines then began to illuminate intermittently. The crew conducted an instrument landing system approach to Stennis Airport with the thrust levers for the numbers 2 and 4 engines at flight idle, and the thrust lever for the number 1 engine at maximum thrust. When the crew was sure that the aircraft was in position for a safe landing, they shut down the number 2 engine. They shut down the number 4 engine during the landing roll and taxied clear of the runway using the number 1 engine.

The captain watched as the crew chief checked the engines. The cowls were covered with oil and oil spilled to the ground when the cowls were opened. All four magnetic chip detector plugs were removed and found to have no seals.

Post Event Investigation

Frank, the Shift Manager, came to work a few minutes early. He didn't like what he saw on the shift roster. The shift was supposed to have 12 people—himself, two supervisors, three senior mechanics, and six maintenance technicians. However, one supervisor was home sick and two of the senior mechanics had quit the week before and had not been replaced yet. So, Frank asked Dennis, one of the supervisors, to draw spectrometric oil analysis program (SOAP) samples and to change the magnetic chip detector plugs (MCDPs) in all four engines of one of the BAe 146s. Dennis was a former airframe technician who had received no engine maintenance training. Nevertheless, he was authorized by the company to perform some engine work.

Dennis searched for the MCDP change kits in the maintenance hangar but found none. MCDP change kits—which include oil plugs, plug seals, and SOAP sample bottles—normally were assembled by technicians who worked in the company's engine bay. Because of the personnel shortage, however, the engine bay night shift had been eliminated. The engine bay day shift assembled change kits upon request. But, because they had not been told by the second shift supervisor about the need for MCDP change kits on the night shift, they did not prepare any kits.

Dennis consulted with Frank and then went to the engine bay to assemble kits from items available there. He found MCDPs in the area of the engine bay that he believed contained the BAe 146 engine parts that were ready for use. The area, however, contained MCDPs that had been cleaned but had not been inspected or fitted with seals. Dennis assembled four change kits with MCDPs from this area. When Dennis returned to the hangar, none of technicians was available to obtain the SOAP samples and install the MCDPs, so he decided to do the work himself.

The norm at MJA was not to use the aircraft maintenance manual (AMM) for simple tasks. So, Dennis did not consult the AMM, which said that:

1. The SOAP samples must be obtained from the engine oil tanks within 15 minutes of engine shutdown,
2. The MCDPs must be installed with a new seal, and
3. The engines then must be operated to check for oil leaks and satisfactory engine operation.

Since Dennis did not read the AMM, he did not comply with these requirements. During the MEDA investigation, Dennis also admitted that he did not remember checking the plugs for seals prior to fitting them to the engines. Furthermore, he took the SOAP samples from the MCDP housings, not the engine oil tanks. However, during the MEDA investigation it was determined that not conducting ground runs was the normal practice at MJA.



After Dennis had finished the task, he saw that the job card required that the work be signed off by the person who performed the work and by the person who supervised the work. Since Frank had not supervised the work, Dennis assumed Frank would not sign off on the card. So Dennis asked Al to sign off as the mechanic who did the work, and then he (Dennis) could sign off as the person who supervised the work. This was not the first time Al had been asked to do this at MJA, so he signed the job card per Dennis' request. This was the last task that needed to be done on the BAe 146, so the aircraft was released for revenue service.

Dr. William Rankin of The Boeing Commercial Airplane Company provided this scenario.