**AAIB Bulletin No: 6/95** **Ref: EW/A95/3/3** **Category: 1.1**

**INCIDENT**

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| **Aircraft Type and Registration:** | Boeing 737-4Y0, G-OBMM | |
| **No & Type of Engines:** | 2 CFM56-3C-1 turbofan engines | |
| **Year of Manufacture:** | 1991 | |
| **Date & Time (UTC):** | 4 March 1995 at 0030 hrs | |
| **Location:** | Tenerife | |
| **Type of Flight:** | Scheduled Passenger | |
| **Persons on Board:** | Crew - 6 | Passengers - 175 |
| **Injuries:** | Crew - None | Passengers - None |
| **Nature of Damage:** | None | |
| **Commander's Licence:** | Airline Transport Pilot's Licence | |
| **Commander's Age:** | 36 years | |
| **Commander's Flying Experience:** | 5,400 hours (of which 1,800 were on type)<br>Last 90 days - 75 hours<br>Last 28 days - 29 hours | |
| **Information Source:** | AAIB enquiries and visits | |

The aircraft had recently had both engines changed as a precautionary measure following loss of oil contents from both engines during the climb. That incident is the subject of a separate AAIB Formal Investigation. One of the two replacement engines, Serial No 724661, was obtained from another operator and was fitted at the No 2 position. The engine had then operated normally for 48 hours and 27 flight cycles.

On 4 March 1995 the aircraft was engaged on a flight from Tenerife to Belfast. During the climb out of Tenerife the crew observed the No 2 engine oil quantity indication drop at a rate of 1% per minute. A turn back was initiated, and during the descent the No 2 low oil pressure (LOP) warning light flashed momentarily. The No 2 engine was therefore retarded to idle for the approach. During the landing roll the LOP light came on continuously and the engine was shut down.

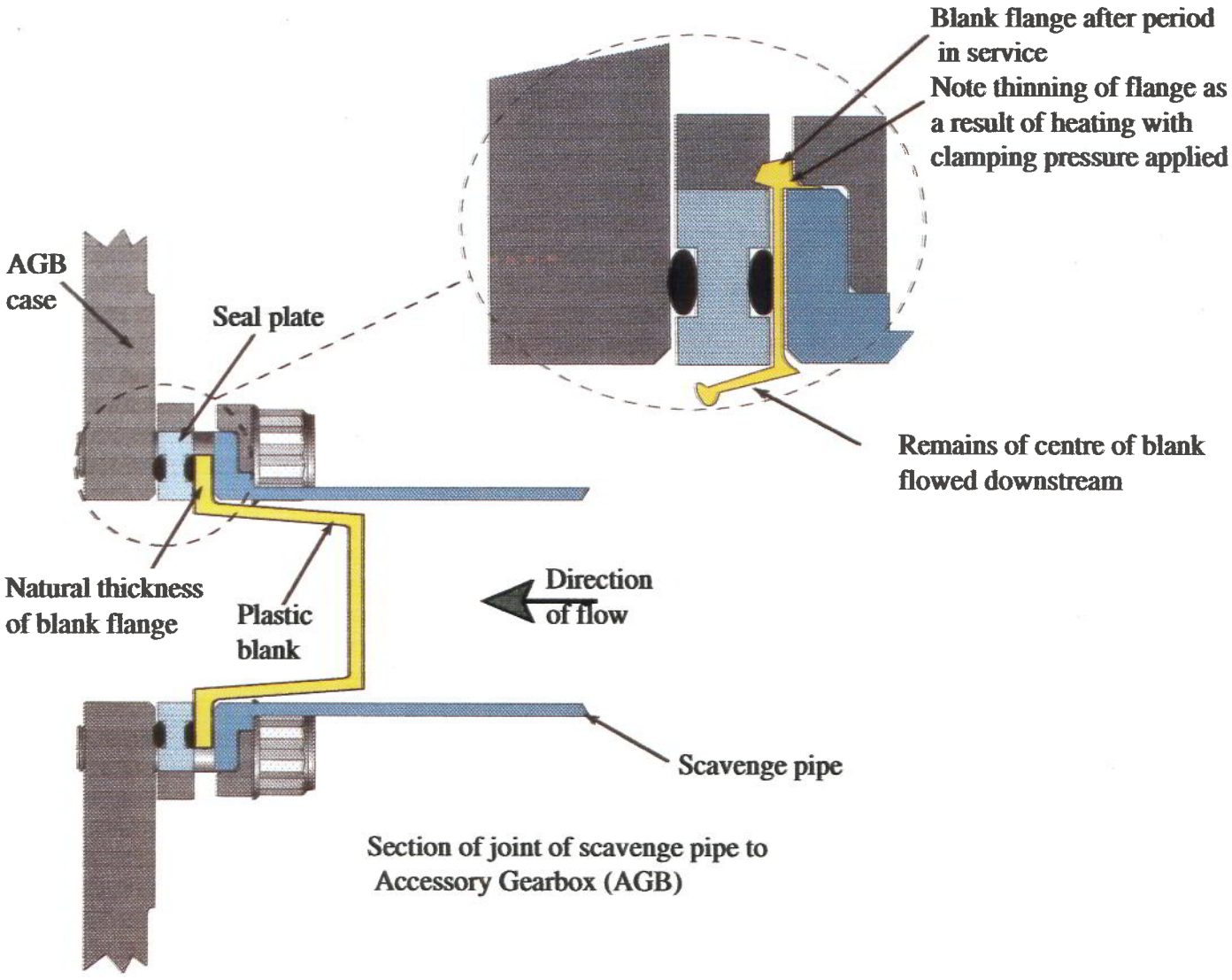
Examination of the engine at Tenerife found that the oil contents of the No 2 engine had been lost due to a leak from the transfer gearbox (TGB) scavenge pipe, at its interface with the accessory gearbox (AGB). When the interface joint was dismantled it was found that the associated seal plate was

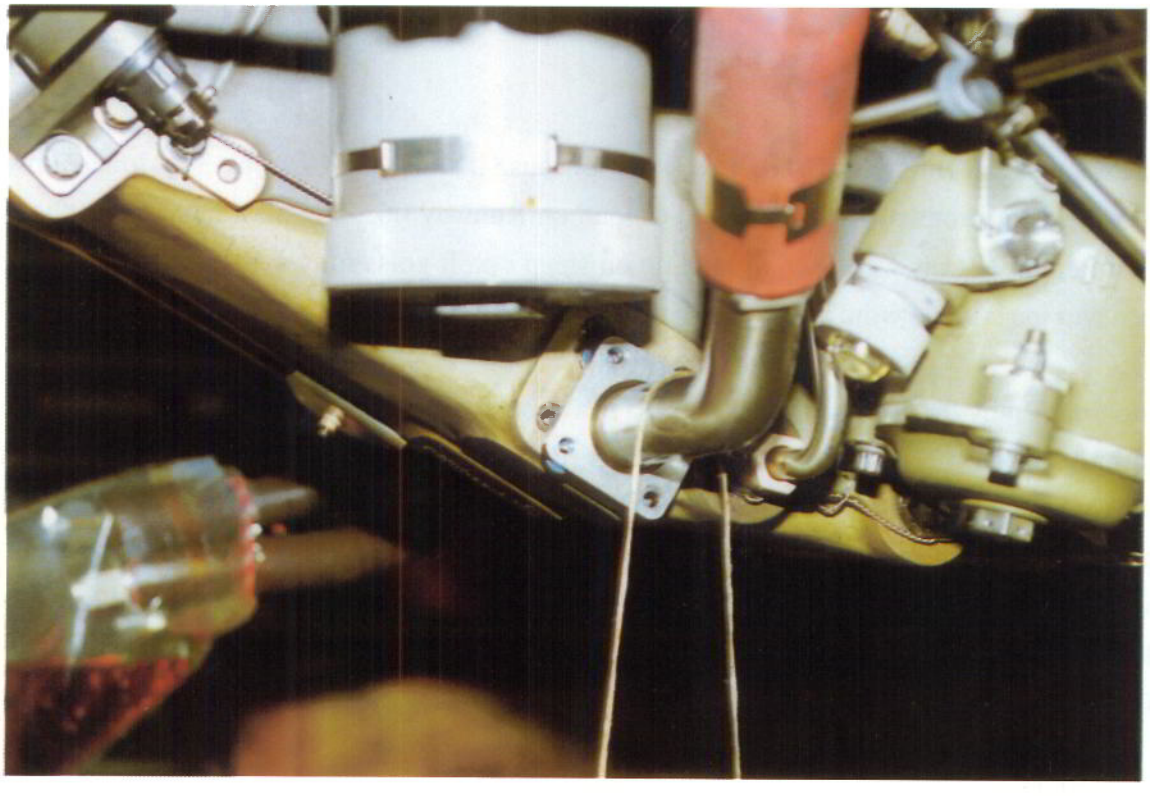
covered in a ring of melted yellow plastic on one side. The AGB, TGB and No 3 bearing magnetic chip detectors were examined and the AGB chip detector chamber was found to contain a single large piece of overheated and deformed yellow plastic. This, together with the plastic on the seal plate, was later shown to be a complete blanking plug of the type normally used to blank off the scavenge pipe prior to assembly. No other debris or evidence of engine deterioration was apparent. The engine manufacturer was consulted and advised the operator that, as the LOP indication had been illuminated for less than 30 seconds, the engine could remain in service. The scavenge pipe was refitted with a new seal plate and the oil system was replenished. The engine was ground run with no leaks evident, and the aircraft was then returned to service.

The records for the engine showed that it had been removed from another aircraft on 31 July 1994 because of insufficient exhaust gas temperature (EGT) margin and minor EGT exceedences, and sent for overhaul. At that time the engine had accumulated 11,885 hours and 6,314 cycles. The overhaul had included refurbishment of the AGB and the associated dismantling had included separation of the scavenge pipe from the AGB. Following this overhaul the engine had been run in a test cell. The test run was satisfactory, with a recorded oil pressure of about 50 psi. The engine was then placed in store where it remained until it was required for G-OBMM.

Following this incident the overhaul agency determined that the yellow plastic debris found was the remains of the type of blanking plug normally used the blank off the scavenge pipe during overhaul. Tests showed that this type of plug lost all mechanical strength at around 80 - 90°C, whereas the oil normally operates at some 100 - 110°C. During initial running, before the oil temperature increased, the plug would have obstructed oil flow from the TGB to the AGB, however this would have caused the oil to 'back-up' in the pipe until the level in the TGB was such that oil could flow into the transfer drive shaft duct. This duct runs between the TGB and the top of the AGB and therefore oil would flow back into the AGB via the duct until the plug softened sufficiently to rupture under the head of oil. This sequence accounted for the apparently normal oil system operation in the test cell and in the subsequent flights. The oil leak was then caused by progressive deterioration and breakup of the flange of the blanking plug and the seal plate 'O' ring.

There were several possible ways considered in which the plug could have been left in, or be placed within the pipe. Examination of the softened plastic showed that it was contoured to match the pipe flange and securing plate, rather than the completely flat flange of the AGB. This indicated that the flange had been on the pipe side, which appeared consistent with failure to remove the plug from the pipe before assembly. Another type of plastic plug, usually coloured red, is used to blank the AGB and this is rather larger and blocks the bolt holes. This had been removed. The accompanying diagram shows the general arrangement of the pipe, seal assembly and the position at which the blank had been located. The associated photograph shows the appearance of the parts during assembly; note that the yellow blank, which is in place within the scavenge pipe, is not clearly visible.



View on end of assembly with yellow plastic blank in scavenge pipe