Jetstream 4100, G-MAJA

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INCIDENT

Aircraft Type and Registration:	Jetstream 4100, G-MAJA	
No & Type of Engines:	2 Garrett Airesearch TPE 331-14GR/HR-807H turboprop engines	
Year of Manufacture:	1994	
Date & Time (UTC):	20 April 2001 at 0825 hrs	
Location:	12 nm south-east New Galloway NDB (NGY)	
Type of Flight:	Public Transport (Passenger)	
Persons on Board:	Crew - 3	Passengers - 13
Injuries:	Crew - None	Passengers - None
Nature of Damage:	None	
Commanders Licence:	Airline Transport Pilots Licence	
Commander's Age:	52 years	
Commander's Flying Experience:	8,000 hours (of which 1,200 were on type)	
	Last 90 days - 50 hours	
	Last 28 days - 17 hours	
Information Source:	Aircraft Accident Report Form submitted by the pilot	

Whilst climbing out of Glasgow airport en-route for Cardiff, at about FL240 the Central Annunciator Panel displayed a 'Toilet Smoke' caption. The Cabin Attendant was consulted and confirmed that no-one was smoking in the toilet but there appeared to be a 'blue haze' in the cabin which was not observed on the flight deck. A 'Mayday' was declared and the aircraft turned back to Glasgow, with the crew performing the Emergency Check List drill. During the descent, the caption disappeared and the Mayday was downgraded to a 'PAN' call. The aircraft landed without further incident.

Description of the Environmental Control System (ECS)

The Jetstream 41 Aircraft has a conventional ECS system employing engine bleed air, which is cooled by two Air Cycle Machines (ACM). Air from the left engine and ACM is delivered to the cabin whilst the right ACM output is preferentially routed to the flight deck. There is no conditioned air re-circulation system.

The ECS system generally employs dry bearings throughout to eliminate the possibility of oil contamination of the conditioned air from the system itself. A particle separator is fitted in the hot gas stream before entering the ECS and a water separator is in the conditioned air flow immediately after it leaves the ACM. The latter has a fabric screen and the ACM has a heat exchanger which requires periodic cleaning.

Investigation

G-MAJA had had a reported incident the previous day similar to the subject incident, but without any Toilet Smoke captions displayed in the cockpit. In response to this, the airline examined the lwft ACM which was found 'slightly stiff' to turn. However, it was freed and the aircraft returned to service. After the incident report the following day, the ACM itself was replaced.

A further report on 1st May of smoke in the cabin during landing and taxy led to the right ACM being replaced, but with no hard evidence on the nature of the contaminant. Then, on 27th July, a further incident of 'hot' smell (but no visible smoke) and a toilet smoke warning was experienced on the aircraft during the climb. Whilst the checklist was being actioned, the warning caption disappeared and the smell dissipated. No 'Mayday' or 'PAN' call was made and the aircraft landed normally without further incident.

This time, distinct traces of oily contamination of the ACM and heat exchanger was found and the left engine and ACM heat exchanger was changed. It is understood that no further similar incidents have occurred.

Discussion

Following the 1st May incident the aircraft manufacturer launched a review of this problem together with the ECS supplier. This concluded that the ECS system was unlikely to have been the source of the smoke but was unable to suggest any possible alternative explanation. Engines on the Jetstream 41 fleet had previously experienced a problem with over-replenishment of oil but, not only had this reportedly not manifested itself as smoke in the cabin, the engines installed on G-MAJA were to a later standard intended to prevent over-replenishment.

The airline had experienced several reports over a number of years of unusual smells/visible haze in the cabin and, in the absence of any definite cause, had taken the steps of regularly cleaning the ACM heat exchanger and the water separator screen. The latter is a fairly easy task, but the former requires despatch to workshops with the resulting implications for spares provisioning.

The left engine has been despatched to the manufacturer's overhaul facility for strip examination, as it appears the reason for the oil contamination must lie within the engine. Until the results of this inspection are known, the precise origin of the oil leak remains unclear, as are the reasons why it

appears to be intermittent. Any significant findings will be promulgated in a future edition of the AAIB Bulletin.