

**SERIOUS INCIDENT**

<b>Aircraft Type and Registration:</b>	ERJ 190-200 LR Embraer 195, G-FBEE	
<b>No &amp; Type of Engines:</b>	2 General Electric CF34-10E7 turbofan engines	
<b>Year of Manufacture:</b>	2007	
<b>Date &amp; Time (UTC):</b>	23 February 2010 at 1915 hrs	
<b>Location:</b>	Jersey Airport, Channel Islands	
<b>Type of Flight:</b>	Commercial Air Transport (Non-Revenue)	
<b>Persons on Board:</b>	Crew - 2	Passengers - None
<b>Injuries:</b>	Crew - None	Passengers - N/A
<b>Nature of Damage:</b>	No 2 engine cowling detached and leading edge slat on right wing damaged	
<b>Commander's Licence:</b>	Airline Transport Pilot's Licence	
<b>Commander's Age:</b>	54 years	
<b>Commander's Flying Experience:</b>	9,000 hours (of which 700 were on type) Last 90 days - 57 hours Last 28 days - 15 hours	
<b>Information Source:</b>	AAIB Field Investigation	

**Synopsis**

A post-flight inspection, by the crew, after a ferry flight from Jersey to Birmingham International Airport, revealed that both fan cowl doors on the No 2 engine were missing. The doors were later recovered from the runway at Jersey. Engineering rectification on the No 2 hydraulic system had been carried out prior to departure and latches on the fan cowl doors had not been fastened securely.

**History of the flight**

The aircraft had landed at Jersey with a complete loss of fluid from the No 2 hydraulic system, due to an in-flight leak from a pipe in the right engine pylon. Following rectification work, the commander and co-pilot were

tasked with ferrying the aircraft to Birmingham International Airport; this was to be a non-revenue flight so no passengers were being carried.

It was dark and there were no engineering personnel present when the crew arrived at the aircraft to prepare for their flight. They telephoned maintenance control and were told that all work had been completed and the aircraft was "ready to go". The commander carried out the walk-round checks and found nothing amiss.

The engine cowl latches are underneath the engine (Figure 1) and were not explicitly included in the walk-round checklist. Having checked the technical log and noting that the rectification work and a daily

check had been accomplished, the crew departed Jersey without apparent incident. The flight to Birmingham was uneventful, although the commander felt that the aircraft was “a little noisy”. The co-pilot was not concerned as he felt that the engine vibration was not unusual and was reading within limits, so the flight continued through to a normal landing.

After landing, another aircraft radioed the crew of G-FBEE advising them to check their right engine when they parked on stand. The commander did so and discovered that most of both engine fan cowl doors were missing. He advised Birmingham airfield operations to check their runway and forwarded a similar request to Jersey. As a result, the missing fragments of the fan cowl doors were located in the middle of Runway 27/09 at Jersey Airport.

### Examination of the aircraft

The fan cowls of the Embraer 195 aircraft comprise two ‘clamshell’ doors of composite material, hinged at their top edge. When closed and fastened, three over-centre clamps on the outboard cowl engage with hooks on the inboard cowl and, when locked, the clamps are flush with the surface. When unlocked, the clamp levers protrude and their edges are painted ‘dayglo’ red to make them more conspicuous (Figure 1).

Upon inspection, it was found that the fan cowls of the right engine had torn away from their hinges, leaving only a small portion of the upper structure still attached. Examination of the debris recovered from the runway showed that it comprised a substantial piece of each cowl door and numerous smaller pieces. The lack of any damage to the clamps and hooks indicated that they had not been engaged and that this was the most likely



**Figure 1**

reason for the detachment of the cowls. Damage to the airframe was limited to scuffing and denting of the leading edge slats and two punctures of the slat skin.

### Pre-incident maintenance activity

The aircraft had arrived in Jersey on the evening of 22 February 2010. Since the loss of hydraulic fluid meant that the No 2 Engine Driven Pump (EDP) had run without fluid, there was a requirement to check it and the hydraulic filters. There was also a requirement to carry out an inspection of the landing gear, which had been deployed by free-fall. Additional inspection work was also required because the aircraft had landed at higher than normal speed due to the inability to select the appropriate landing flap setting. The EDP check entailed opening the engine cowlings, but the filter check required access behind the wing/fuselage fairing aft of the wing trailing edge. However, these two inspections were detailed as a single ‘EDP/Filter check’ task in the maintenance manual.

Work was initiated by Technician ‘A’ on the late shift on 22 February 2010. He completed the EDP inspection

but, having closed the engine cowlings, he was interrupted by a telephone call before he could latch them shut. When he finished the call he stated that “his mind was on the remaining structural inspections to be completed elsewhere on the aircraft” and “he forgot to lock the cowlings” before handing over to Technician ‘B’ on a different shift at 0530 hrs on 23 February 2010. The verbal handover was to the effect that Technician ‘A’ had completed the EDP inspection but had not checked the filters.

Technician ‘B’ concentrated on completing the pipe repair before handing over to Technician ‘C’ at 1330 hrs, with another verbal instruction to complete the filter checks as well as performing the landing gear inspection. Technician ‘B’ recalled seeing the unlatched cowlings, but assumed that further access in this area was required for the filter check. As stated previously, the filters are situated behind the wing/fuselage fairing aft of the trailing edge.

The filter check was completed by Technician ‘C’ who, having worked closely with Technician ‘A’ for many years, was content to certify both the previous EDP work and his own. He did not realise that throughout this period the engine cowl latches remained unfastened.

### Discussion

The in-flight loss of one or both engine cowlings from a modern turbofan can cause additional damage and could jeopardise the safety of the aircraft or even people on the ground. In the case of G-FBEE, the consequential damage was relatively minor, albeit costly. AAIB Bulletin 7/2000 reported an incident to an Airbus A320 aircraft, registered G-VCED, in which both unlatched fan cowl doors on the left engine detached on rotation, causing damage to the flaps, slats, fuselage and fin as well as the engine and the destruction of the cowlings themselves. The particular

arrangement of the IAE V2500 engines on the A320 was similar to G-FBEE inasmuch as the fan cowls hang under gravity in an apparently closed position without an obvious gap with the adjacent structure. IAE had produced a modification to incorporate a spring-loaded plunger which would prevent the doors closing fully unless the plunger was manually pushed clear. The reason for this and other measures to improve conspicuity of open latches themselves was that, “several instances have been reported of Fan Cowl Doors not being latched prior to flight”.

The primary factor in the events which led to G-FBEE taking off with the right engine cowlings unlatched was the distraction of Technician ‘A’ by a telephone call before he had completed the task. However, there were three further opportunities to address the situation which were also missed:

- Technician ‘B’ had seen the unlatched cowls but had assumed that further access to the area was required and that Technician ‘C’ would attend to this task as part of the filter check.
- Technician ‘C’ completed the filter check and assumed that Technician ‘A’ had latched the cowls upon completion of the EDP check, being content to sign for work he had not accomplished himself.
- The commander conducted a walk-round inspection but did not notice the unfastened cowl; it should be noted that although the walk-round checklist does state to ‘*check access panels are secured*’; this did not explicitly include the security of the engine cowls.

### Safety actions taken to prevent recurrence

The operator has taken several actions as a result of the findings from this incident:

- An immediate message was sent to all engineers to ensure that, whenever Embraer 195 engine cowlings are opened, an entry in the technical log is raised which must be signed-for upon completion to certify that they are secure.
- All three technicians involved in the incident were given procedural training to reinforce the necessity to raise continuation sheets in the technical log or to use task cards to ensure that certification is carried out correctly.
- The Jersey station Engineering manager was reminded of the need for formal handovers and utilising technical log continuation sheets to break down long or complex tasks.
- The event was incorporated into the company's continuation training programme as an example of distraction and promoting awareness of using task breakdown sheets.
- A poster campaign was launched to highlight the issue of distraction and to remind technicians to check that all panels and doors are closed before despatch.
- A Notice to Aircrews was issued instructing them to include a check for security of the engine cowl fasteners during their pre-flight walk-round checks.