Fokker F28 Mark 0100, G-UKFK

AAIB Bulletin No: 9/98 Ref: EW/G97/10/24 Category: 1.1

Aircraft Type and Registration:	Fokker F28 Mark 0100, G-UKFK
No & Type of Engines:	2 Rolls Royce Tay 620-15 turbofan engines
Year of Manufacture:	1988
Date & Time (UTC):	13 October 1997 at 0705 hrs
Location:	Amsterdam, Schipol Airport, The Netherlands
Type of Flight:	Public Transport
Persons on Board:	Crew - 5 - Passengers - 100
Injuries:	Crew - Nil - Passengers - Nil
Nature of Damage:	Various rivets on left-hand side of nose damaged, outer static discharger missing from right-hand stabiliser, additional small part of right-hand stabiliser missing, pitot head had small residual metal pieces welded to it, a number of dents were present in fuselage top. Two electrical switches in elevator system ceased to function.
Commander's Licence:	Airline Transport Pilot's Licence
Commander's Age:	42 years
Commander's Flying Experience:	10,500 hours (of which 2,600 were on type) Last 90 days - 160 hours Last 28 days - 50 hours
Information Source:	Aircraft Accident Report Form submitted by the pilot and subsequent inquiries by AAIB

The Captain reported that the aircraft reached FL60 on departure from Schiphol, with the autopilot off. Whilst in IMC, it encountered precipitation in the form of small hail stones; the weather radar was in use and showed no hard core closer than 5 nm. The aircraft then received a lightning strike. The cabin crew observed what they described as fire-balls in the cabin, originating at the front and appearing to exit in the region of the overwing emergency doors. The Captain observed the *master caution* lights operating and warnings of EL 1 and EL 2 appearing on the MFDU, indicating that hydraulic pressure had fallen in both right and left systems of the elevator hydraulic control unit.

The crew check list calls for the appropriate illuminated push button on the overhead hydraulic panel to be operated (a 'fault' caption normally illuminates in the appropriate push button when hydraulic pressure falls in the relevant actuator causing the Flight Warning System to be signalled). Operation of the button places the appropriate hydraulic elevator boost system in bypass mode. Should fault warnings appear on both elevator buttons, the check list calls for both to be operated, hence placing both systems in bypass. This action removes all hydraulic boost from the elevator control, causing it to revert to manual operation. Under such conditions the elevator gearing alters.

The checklist actions were carried out and the crew elected to return to Schiphol (in manual elevator mode) where an uneventful landing was carried out. It is understood that flying with manual elevator is a procedure periodically practised in the simulator. The commander commented that the aircraft 'felt a bit peculiar' operating in this mode.

Subsequent examination of the aircraft indicated that the lightning had routed through the aircraft between the nose area and the elevators. Damage included functional failure of both elevator boost system Sequence Valve Proximity Switches, (sometimes known as the bypass switches). These are sited on the left and right manifold assemblies of the elevator hydraulic boost controller, itself positioned in the area of the junction between the fin and tailplane. The switches are normally each operated by movement of the associated sequence valve in the left or right hand manifold assembly respectively when loss of hydraulic pressure within the relevant manifold allows spring forces to move the valves fully to the shut-off position. The manufacturers state that under such conditions, the switches provide signal to the Flight Warning Computer, the Flight Control Computer (for autopilot functions) and the Maintenance and test panel (for maintenance purposes only).

It is presumed from the information available that the fault conditions found in each proximity switch caused the Flight Warning Computer to receive signals in the same way as would have occurred had pressure been lost in both elevator boost systems, although no movement of either sequence valve had apparently taken place and hydraulic pressure remained available to both boost units. Thus both EL 1 and EL 2 failure indications would have illuminated in the overhead panel. Actioning by the crew of the check-list items for EL 1 and EL 2 failure would then have signalled the pilot valves to the closed position causing both boost systems to cease providing hydraulic assistance. Thereafter, the elevator system would have operated in a purely manual mode. Thus correct crew response to a false warning resulted in a serviceable boost system being switched off.

Analysis of available records from ground based lightning recording equipment did not reveal major lightning discharges at the relevant time or place.