Jetstream 4100, G-MAJA

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Aircraft Type and Registration:	Jetstream 4100, G-MAJA
No & Type of Engines:	2 TPE 331-14R-802H turboprop engines
Year of Manufacture:	1994
Date & Time (UTC):	18 January 1998 at 1429 hrs
Location:	Near Jersey, Channel Islands
Type of Flight:	Public Transport
Persons on Board:	Crew - 3 - Passengers - 12
Injuries:	Crew - None - Passengers - None
Nature of Damage:	Structural damage to fin and right aileron, small punctures in skin of pressure hull near nose. Fire-detection system and propeller de-icing system rendered inoperative
Commander's Licence:	Airline Transport Pilot's Licence
Commander's Age:	55 years
Commander's Flying Experience:	12,540 hours (of which 3,900 were on type) Last 90 days - 130 hours Last 28 days - 50 hours
Information Source:	Aircraft Accident Report Form submitted by the pilot, reports on nature of damage by aircraft operator, examination of damaged aileron at manufacturers' component handling warehouse

Circumstances

The aircraft was descending towards Jersey after a flight from Cardiff. The pilot reported that the outside air temperature was +2°C, the aircraft was clear of cloud and flying in moderate rain. The weather radar was on the 10 mile range and set 10 degrees up; the lightning detectors were on. There were a number of CBs in the area, as well as along the route from Cardiff. All had been avoided. There were no returns on the weather radar at the time of the event.

As the aircraft reached FL 60 there was a bright flash and a very loud bang. The right engine generator went off line and the left engine overheat warning came on. The generator was reset and

the checklist for the engine overheat warning actioned. The airspeed was reduced to 140 kt as a precaution in case of structural damage. The cabin crew were briefed and the Captain addressed the passengers. Thereafter, an uneventful approach to Jersey took place, during which the Captain considered that aileron control was not as effective as normal, although he believed that the strong wind and low-level turbulence may have contributed to this impression.

On leaving the aircraft, the extent of the damage was noted by the crew.

Radar and communications data

Examination of radar recordings and a transcript of the ATC tape recordings showed changes in the rate of descent, ground-speed and heading occurring about a point in time 30 seconds before the radio call was made reporting the strike. Within the accuracy of such an analysis, these changes associated with the strike identified the height of the aircraft at the time as just under 6,000 feet and the location of the event to be close to the north eastern corner of the island of Sark.

Recorded meteorological data

The Meteorological Office archived database of automatically recorded lightning discharges was examined, a period of 3 minutes being studied. That time was equally distributed before and after the time of the strike as deduced from analysis of the radar and communications data. The nearest recorded discharges during this period were at positions a minimum of 70 nautical miles from the aircraft location, even allowing for the estimated errors within the detection system.

A diagrammatic map presentation of lightning discharge data, covering the area of earth's surface from latitude 30 deg N to 70 deg N and between longitudes 40 W and 40 E was also received from the Meteorological Office (this area had Greenwich approximately at its centre). This presentation covered a time period of 46 minutes, finishing 30 minutes before the strike on G-MAJA. (Such diagrams are produced in real time and are not normally retained by the Meteorological Office). Other than discharges in the Mediterranean area this showed only a large concentration of discharges centred in the region of the Channel Islands/Cherbourg Peninsula with two further isolated discharges shown off the Brittany coast.

Aircraft equipment

G-MAJA, in common with other J41 aircraft, is equipped with a lightning detection/mapping system which presents detected lightning discharge data relative to aircraft position on the weather radar screen, together with the normal atmospheric moisture detected by the radar. Crews operating with this type of equipment reported that it provided valuable information to assist the planning of flight paths to remain clear of serious atmospheric turbulence. The presentation of both the conventional weather information and the detected discharges on the same screen provides a better picture of the shape and extent of any electrical storm than would the weather radar information alone.

The effectiveness of the system in providing information to prevent actual strikes on the airframe is not known. All such systems are historical rather than predictive; it is known that significant numbers of lightning strikes are triggered by the passage of an aircraft when no lightning has been present at that location in the immediately preceding period. By their nature, conventional mapping systems cannot provide guidance to avoid such isolated strikes.

General

The Meteorological Office lightning discharge recording system does not guarantee to record all discharges; it is presumed that the magnitude of the power, or action integral, of any discharge is the major factor governing successful detection. The fact that this strike was not detected but that lightning activity existed in that area during the previous hour and ten minutes, suggests that residual lightning potential remained after an active storm had ceased and that the passage of the aircraft was required to initiate a low power discharge.

It has been noted by offshore helicopter operators that a number of winter lightning strikes occurring over the open sea in recent years have happened, as in this case, when the relevant aircraft has been operating at outside air temperatures close to 0°C.