

# AIB Bulletin

# 12/84

No: 12/84

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**Aircraft type and registration:** Socata Rallye 110ST G-BGKB (light single engined fixed wing aircraft)

**Year of Manufacture:** 1979

**Date and time (GMT):** 9 June 1984 at 0935 hrs

**Location:** Maundown, Somerset

**Type of flight:** Private

**Persons on board:** Crew — 1                  Passengers — 2

**Injuries:** Crew — 1 (fatal)          Passengers — 2 (fatal)

**Nature of damage:** Aircraft destroyed

**Commander's Licence:** Private Pilot's Licence

**Commander's Age:** 28 years

**Commander's total flying experience:** 59 hours (of which 54 were on type)

**Information Source:** AIB Field Investigation

## History of the flight

The purpose of the flight was to take one of the passengers for a birthday treat around the local area. The aircraft took off in good weather from Dunkeswell, and an eyewitness saw it make a normal departure.

The aircraft was next sighted flying low near the town of Wellington, 8 miles north of Dunkeswell. It was estimated to be flying at a height of about 500 feet straight and level, and it disappeared to the north without manoeuvring or changing height.

Several eyewitnesses then saw the Rallye near the villages of Wiveliscombe and Langley Marsh (13 miles north of Dunkeswell) where it flew a figure of eight pattern at a height of about 1200 ft. It rolled out straight and level on an easterly heading and flew on for about 15 seconds. Eyewitnesses then described seeing the wings fold up and sweep back as the aircraft dived vertically into the ground. All the occupants were killed. There was no fire.

This Bulletin contains facts relating to the accidents which have been determined up to the time of issue. This information is published to inform the public and the aviation industry of the general circumstances of the accidents at the preliminary/stage and must necessarily be regarded as tentative and subject to alteration or correction if additional evidence becomes available.

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#### Aircraft information

The aircraft had full tanks on take-off and was slightly overweight. At the time of the accident, some 40 minutes after take-off, sufficient fuel would have been consumed for the aircraft to be close to the maximum all up weight of 1698 lbs for "Normal Category" operation. At this weight the load design factor given in the flight manual is +3.8g, and aerobatics and spins are prohibited. An accelerometer was mounted in the cockpit.

#### Examination of the wreckage

On-site examination of the wreckage showed that the aircraft had dived into the ground at an angle of approximately 80°. The degree of destruction indicated a high speed, and the damage to the propeller showed that the engine was producing power at impact. There was excessive wing dihedral angle, which was probably a pre-impact feature as the nature of the impact would not have allowed significant movement of the wings.

The wreckage was transported to the AIB's facility at Farnborough where a detailed engineering investigation was carried out.

It was found that there had been a structural failure of the wing spar consistent with the wing being overloaded in an upwards direction. Each wing spar consists of an upper and lower L-shaped boom attached to a vertically orientated sheet metal shear web. The spars are spliced together in the centre of the aircraft, effectively forming a single spar running from wing tip to wing tip. When the spar reacts lift forces, the lower boom is placed in tension and the upper boom in compression. Examination revealed that the spar failure had taken the form of a compressive failure of the upper boom, which had tended to be deformed into a S-shape in the area of failure. This area was centred a few inches to the right of the central splice, and had resulted in a fragment of some 6 inches in length being released from the upper boom. It is probable that this fragment was released at impact when the local distortion was sufficient to cause a bending failure of the boom material. It was not possible to determine the extent of pre-impact distortion, although any which did occur would have been accompanied by an upwards and perhaps rearwards deflection of the wings.

Consultations with the aircraft manufacturer revealed that static tests had been conducted on an airframe prior to certification, and that wing spar failure had occurred in the same area of the upper boom as that displayed on G-BGKB, albeit on the left side of the central splice. In this case the failure load was equivalent to 7.2g based on the maximum all-up weight of the aircraft, ie well in excess of the Flight Manual Limitation of 3.8g. The cockpit accelerometer was found to indicate 6.3g but it is not known whether this resulted during the impact or prior to it.

A metallurgical examination of the wing spar material revealed no significant departure from the material specification. In addition to being spliced together in the centre of the aircraft, the wings are attached to the fuselage by leading edge attachment points. The left wing attachment had survived intact; the right wing attachment was still attached to a piece of fuselage structure. The degree of distortion in this area indicated that failure had occurred as a result of impact forces. Two diagonally orientated drag rods, which react the aerodynamic drag forces on the wings, form a further link between the wings and fuselage. Examination revealed that these had failed as a result of severe overload forces such as those experienced during the ground impact.

The tail surfaces were found lying on top of the main wreckage, and it was evident from the forwards distortion of the tailplane attachments that they had been subjected to an inertial failure when the fuselage struck the ground. Examination of the flying controls revealed that all had remained connected with the exception of the aileron actuating rods and one rudder cable. The degree of distortion indicated that these were impact failures. It was established that the flaps were retracted and the leading edge slats were in. No evidence was found of any mechanical failure of malfunction that could have precipitated the overload failure of the wing spar.

#### Discussion

This type of failure is consistent with the sudden wing fold described by eyewitnesses. Although most of the aircraft's flight path could not be established, the manoeuvres which were reported to have preceded the sudden dive and wing failure appear unlikely to generate aerodynamic loads sufficient to cause the failure of an undamaged wing. As no evidence was found of any preceding failure or malfunction in the aircraft, or of a medical factor, it was not possible to determine how the overload failure of the wing spar was sustained.