

Aircraft type and registration: Southdown Puma Sprint (Microlight Aircraft) G-MNDN

Year of Manufacture: 1985

Date and time (GMT): 17 August 1985 at 1555 hrs

Location: Chaddesdon, Derby

Type of flight: Private

Persons on board: Crew — 1 Passengers — 1

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

Nature of damage: Aircraft destroyed

Commander's Licence: Private Pilot's Licence Group D

Commander's Age: 38 years

Commander's Total Flying Experience: 53 hours (of which approximately 14 hours were on type)

Information Source: AIB Field Investigation.

The aircraft was constructed in June 1985 and since assembly and testing by the manufacturer's agent it had flown approximately 14 hours. Most of this flying was by the pilot involved in the accident, who was a qualified microlight pilot and a friend of the owner. The Puma Sprint is a 35 feet span sailing with a trike unit suspended beneath carrying two seats in tandem, the powerplant, and a tricycle undercarriage. It is powered by a 50 hp two-stroke engine driving a wooden two-bladed pusher propeller. The trike unit is attached to the hang point on the wing keel by a pylon and a front strut which, together with the trike keel, form a triangular structure. A cable installed inside the pylon can provide an alternative load path between the hang point and the trike keel if the pylon fails.

On the day of the accident, the pilot and the owner had flown the aircraft to Ashbourne where they refuelled it full capacity and thence, via Hucknall, to the departure field at Chaddesdon, a flight of some 2 hours. The operating field had grass 10—15 cms high and a very shallow ditch with raised edges, running at right angles to the direction of take-off and about 120 metres from the southern boundary. There was a very light wind from the northwest and so take-offs and landings were made in this direction, which was slightly uphill.

At about 1530 hrs, it was agreed that the pilot should take a relative of the owner for a short, one circuit, experience flight. During the take-off run, the pilot decided that the engine was not developing full power and so abandoned the attempt. During the accident investigation inspection of the field indicated that the aircraft's wheels had made fairly heavy contact with the lip of the ditch, probably during the aborted take-off run but it was not possible to ascertain whether contact had been sufficiently heavy to have damaged the aircraft. Following adjustment to the throttle cable, made in order to ensure maximum opening of the carburettor slide with full throttle selection, the engine was re-started and the aircraft took off. It followed a normal left hand circuit pattern and climbed to a height between 200 and 400 feet above the ground which

sloped up from the operating field. The aircraft then turned onto a westerly heading and after about 30 seconds the trike unit separated from the wing and fell almost vertically to the ground. Both occupants were killed.

The aircraft crashed into a stubble field 1.4 kilometres west-north-west of the take-off field, while on a heading of 280°M. A number of propeller blade fragments and one of the pilot's gloves were found forming a 150 m long trail leading to the trike unit. The evidence indicated that the trike unit contacted the ground with little forward speed on a heading of 290°M, about 10° nose-up and banked to the left. Damage was consistent with a high vertical descent rate. The wing contacted the ground 60 m beyond the trike unit in a steeply nose down attitude on a heading of 150°M. It was clear that the trike unit had separated from the wing in the air following failure of the front strut, pylon, and pylon cable.

Detailed examination indicated that the control bar attached to the wing had forcibly struck the forward strut and triggered a forward buckling failure of that strut. As the strut buckled, the top portion of the pylon had bent forwards until, having acquired a 16° permanent bend, the pylon failed in overload at the top attachment for the seat/engine bracket. The evidence suggested that these failures had occurred while the trike was subjected to a download from the wing. The forward strut then parted at the buckle point under positive loading and the trike unit rotated nose down relative to the wing until the upper portion of pylon contacted the fuel tank. Leverage of the pylon against the tank caused the pylon cable to break. During this over-rotation of the trike unit relative to the wing the propeller blades struck the aft end of the wing keel and fragmented. The engine was rotating at this point but not under high power. The wing was damaged in a number of areas. All damage was consistent with either the effects of high aerodynamic downloading resulting from the wing reaching high negative angles of incidence to the airflow, or to the effects of ground impact after separation from the trike. However, it was not possible to ascertain conclusively that the wing was free of damage prior to the accident.

The evidence was consistent with a whipstall and subsequent pull-out manoeuvre having caused the trike to separate from the wing, and analysis of witness evidence tended to support this. In this manoeuvre, the nose of the aircraft falls uncontrollably from a high nose-up attitude down to, or through, the vertical in a forward pitching motion. On passing through the vertical in the ensuing dive, severe negative "g" forces, both dynamic and aerodynamic are applied to the wing. As it is neither designed nor stressed to cope with these forces, it consequently distorts and provides a violent nose-up pitching moment. The forces so generated can be sufficient to disintegrate the aircraft.

Considerable investigation has been made into the possible reasons for the entry into a whipstall. The two components required are speed in excess of the trimmed (cruise) speed and a strong pitch-up manoeuvre, but there was no evidence to suggest a reason for the pilot to fly at a high speed or perform a pitch-up as an intentional manoeuvre. However it is an established fact that if the control bar is released whilst the aircraft is flying faster than the trimmed speed, the bar will move forward with a force dependant upon the degree of excess speed.