Gemini Flash IIA, G-MVEP

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Aircraft Type and Registration:	Gemini Flash IIA, G-MVEP
No & Type of Engines:	1 Rotax 503 piston engine
Year of Manufacture:	1988
Date & Time (UTC):	27 October 1997 at 1059 hrs
Location:	Roydon Hamlet, Essex
Type of Flight:	Private (Training)
Persons on Board:	Crew - 1 - Passengers - None
Injuries:	Crew - 1 fatal - Passengers - N/A
Nature of Damage:	Aircraft destroyed
Commander's Licence:	Student pilot
Commander's Age:	43 years
Commander's Flying Experience:	31 hours (all of which were on type)
	Last 90 days - 18 hours
	Last 28 days - 11 hours
Information Source:	AAIB Field Investigation

History of flight

The pilot was on a qualifying solo cross-country flight for theaward of a Private Pilot's Licence. The planned route was fromHunsdon Airfield, near Harlow, Essex to Headcorn Airfield in Kent,where the aircraft would be refuelled for the return flight toHunsdon. There was low cloud in the area and the pilot was briefedto return to Hunsdon if this became a problem; the planned altitudewas 1,500 feet initially and then 2,000 feet.

The pilot had programmed his route into his Global PositioningSystem (GPS) equipment. Data stored in the GPS was used to determine,in part, the history of the flight. At 1032 hrs, the aircrafttook off from Hunsdon Airfield and flew a complete left hand circuitbefore tracking south down the western side of Harlow. At 1042hrs the aircraft turned left and tracked east, over Junction 7of the M11 towards the village of Moreton. At 1051 hrs, shortlybefore it reached Moreton, it made

a 180° turn to the leftand tracked along the southern edge of Harlow. It then turnedto track north and, shortly afterwards, the GPS stopped loggingdata. The last relevant position logged was at 1058 hrs afterthe aircraft had started a left turn in a position about 260 metresnortheast of the accident site. The final part of the track wasconfirmed by comparing it with recorded data from Heathrow radar;the time of the final return was also 1058 hrs.

Witnesses were consistent in their observations. They reportedhearing a sharp 'crack' and seeing the left wing move up almostto the vertical. Shortly afterwards the right wing did the sameand, the aircraft spiralled to the ground with the wings foldedtogether and the trike assembly describing a circle beneath them. The aircraft was in the vicinity of the final GPS/radar contactwhen the observations were made and one witness called the emergencyservices while it was still falling; the call was recorded at1058 hrs. The AAIB was unaware of anyone who saw the aircraftin normal flight.

The pilot survived the impact but died shortly afterwards fromhis injuries. Post mortem examination revealed no pre-existingmedical condition which would have contributed to the accident.

Pilot's flying experience

The pilot started a course of microlight flying training in March1997. Initial training was in a Mainair Blade aircraft. Hisfirst flight in the Gemini Flash IIA, G-MVEP, was on 26 August1997. He made good progress through the course and went soloon 20 September 1997 after 19 hours. His last flight before theaccident was on 26 October 1997, after which he had flown a totalof 19 hours dual and 1140 hours solo.

Meteorology

An aftercast was obtained from the Meteorological Office at Bracknell. There was a weak cold front lying from Kings Lynn to Folkestone;it was moving slowly westwards.

Surface wind 100°/10 kt

2,000 feet wind 130°/15 kt

Visibility 9 km

Cloud FEW base 600 feet

SCT base 1,000 feet

BKN base 4,500 feet

Temp/Dew point +10C/+8C

QNH 1027 mb

Global positioning system

The GPS equipment carried in the aircraft worked throughout theaccident flight. It uses satellite navigation to establish itsposition which it then displays on a small screen. The equipmenthas a logging facility which saves position, time and date intonon-volatile memory, on a periodic basis when direction or speedchange significantly. The equipment was found to operate satisfactorilyafter the accident.

The data logged during the accident flight was downloaded ontoa computer. As the downloaded data was based on a datum otherthan that used for Ordnance Survey maps, a correction factor wasapplied to each latitude/longitude point logged and the resultsplotted onto a 1 to 25,000 map. The plotted points correlatedwell with the known positions of the take off and the accident. It was not possible to determine the height of the aircraft duringany part of the flight as GPS altitude, although displayed onthe screen, is not logged in the non-volatile memory.

From 1058 hrs, the GPS stopped logging data for a period of twentyfour minutes. It is considered that this was because the GPSwas unable to receive sufficient satellite signals to calculateits position.

It was probably carried in the document pocket on the right sideof the aircraft and consequently the accuracy of the recordeddata may have been degraded because of satellite obscuration bythe pilot or the metal framework of the aircraft. This degradationmay have been more noticeable when tracking west as five of theeight satellites in view would have been behind the aircraft.

Further geographical positions consistent with that of the accidentsite were recorded in the equipment; two points at 1122 hrs, twopoints at 1229 hrs and a period of uninterrupted operation from1406 hrs to 1443 hrs. It is likely that, as the aircraft wreckagewas moved during the post accident recovery, the GPS may haveperiodically received adequate satellite signals before it waseventually turned off when the AAIB arrived on the scene.

Accident Site

The microlight was found laying on its left hand side with thewing folded in two. The only significant ground mark had beenmade by the muffler and did not show any signs of aircraft rotation. The guarded magneto switch was found in the 'off' position. The aircraft was carrying 50 kg of ballast in an appropriate container.

The propeller had disintegrated and the majority of it was retrievedfrom a 400 metre long trail, however only 45% of the leading edgeswas recovered. The fabric nose cone was found 275 metres fromthe accident site along the line of the propeller debris. Novibration damage was apparent on the engine mounts, muffler, airfilter or engine casing.

Subsequent examination at the AAIB facility at Farnborough revealedheavy indentations on the lower left hand side of the keel, andwood dust embedded in the left vertical face of the keel fabricin the area over the indentations. The indentations were verysimilar to keel damage on another wing which was known to havehad a propeller strike on the keel.

The following structural damage had occurred before the microlighthit the ground:

The outer 1.33 m of both leading edge tubes had broken in a downwardsdirection.

The right hand leading edge tube had detached from the nose plate.

The control bar had failed at the inner end of the right handgrip by being forced through the front strut; the front struthad a corresponding slight bend.

The wires on the upper wing did not show any curling typicallyassociated with excessive tension, and the king post was undamagedby compression. The structural damage was consistent with negative'g' and the trike 'dropping into the wing'. The aircraft hada renewal of its certificate of validity on 30 July 1997and had flown for a total of 152 hours, and the log book did notcontain any record of significant maintenance actions.

The ASI and the altimeter were checked andfound to be satisfactory. Detailed examination of the microlightrevealed the failure of a muffler spring and an upper side wireferrule. Whilst these failures had occurred after the loss ofcontrol and subsequent structural failure, the details are givenbelow in the interests of flight safety.

Muffler Spring Failure

The hook end on one of the three muffler springshad failed and, although the area on the accident site aroundthe muffler impact mark had been examined closely, the failedend was not recovered. The fracture surfaces were therefore examinedto determine whether the failure had been caused by fatigue, andhence the hook could have struck the propeller, or whether thefailure had been in overload.

The fracture surface had started from a pre-existinggroove in the spring material, and the failure had then propagatedto the circumference of the spring. The groove was in a positionthat could only have been reached by the locking wire used toretain the spring body to the muffler in the event of the springfailing. However, the locking wire fitted showed no similar wearpattern. It was therefore concluded that the wire had been renewed,and that a previous locking wire had worn the groove. The springhad subsequently failed. There was no evidence to support thetheory that the spring had failed before the propeller disintegration,however the vibration after the disintegration, or the groundimpact could both have produced forces sufficient to overloadand break the weakened spring.

The illustrations are shown overleaf.

Insufficient evidence of this accident hasbeen accumulated to determine the cause with any degree of confidence. The AAIB therefore intend to rebuild the sail, using as manyof the original parts as possible, with the initial objectiveof determining the pitch moment and stall characteristics of thisspecific wing. The results of these tests will be published whenthey are available.