Rallye Club 880B, G-AYKF

AAIB Bulletin No: 2/97 Ref: EW/G96/8/9 Category: 1.3

Aircraft Type and Registration:	Rallye Club 880B, G-AYKF
No & Type of Engines:	1 Rolls Royce O-200-A piston engine
Year of Manufacture:	1970
Date & Time (UTC):	26 August 1996 at 0600 hrs
Location:	Near Barton Airfield, Manchester
Type of Flight:	Private
Persons on Board:	Crew - 1 - Passengers - 1
Injuries:	Crew - Fatal - Passengers - Fatal
Nature of Damage:	Aircraft destroyed
Commander's Licence:	Private Pilot's Licence
Commander's Age:	27 years
Commander's Flying Experience:	107 hours (of which 53 hours were on type)
	Last 90 days - 45 hours
	Last 28 days - 8 hours
Information Source:	AAIB Field Investigation

History of the Flight

The accident occurred shortly after the aircraft took off fromBarton for a return flight to its base at Panshanger.

On the day before the accident the pilot, who was a co-owner ofthe aircraft, arrived with the passenger at Panshanger Airfieldat approximately midday to fly to Manchester for a photo-journalismassignment. During their brief visit to the local flying clubthe CFI, who had been giving advise to the pilot on the aircraft'soperation, asked the pilot if a climb performance check had beencarried out recently on the aircraft since maintenance actionhad been completed on one of the cylinder valve guides. The CFIstated that the pilot's response was somewhat vague so he advisedhim to carry out a climb performance check during that afternoon'sflight. The CFI also stated that during their visit to the clubthe pilot did not make use the club's facilities to obtain anyweather information for his flight to Manchester Barton. Theaircraft, departed Panshanger and arrived without incident atManchester Barton Airfield at 1547 hrs.

The activities of the pilot and passenger after landing at Bartonare not known, however, at approximately 1910 hrs the pilot taxyedthe aircraft to the fuel pumps where it was refuelled with 65.3litres of Avgas to full tanks. The pilot and passengerwere next seen at 2050 hrs when they arrived at the airfield hotelto book a room for the night. They were registered on arrivalby the hotel chef. He did not see them again that evening anddid not see them leave the hotel the following morning but hebelieved that they departed the hotel at approximately 0530 hrsto walk the 500 metres to the aircraft. He reported that theweather at the time he arrived for work, some minutes earlier,was of heavy rain with moderately strong winds.

The airfield ATC (published operating hours from 0900 hrs to Sunset) was not manned at the time the pilot and passenger arrived atthe aircraft and prepared for departure. Two members of the PoliceFlying Unit, a helicopter pilot and his observer, who were onduty in their operations room positioned on the south-westernairfield boundary, observed the aircraft as it departed from Runway20 (grass surface 530 x 33 metres). These witnesses confirmedthat at the time of take off there was a 10 to 15 kt windwith no low cloud and no rain. The aircraft appeared 'to climbat a very shallow angle with an excessive nose-up attitude'. After a few more seconds into the flight it then entered a steepvertical spiral descent to the left and was lost from sight ata height of approximately 200 feet agl.

The police pilot and observer immediately manned their helicopterand flew the short distance to the area to find that the aircrafthad crashed. The observer left the helicopter to attend to thepilot and passenger but they had both received fatal injuries. The Fire Brigade and Ambulance Service, who had been alertedby the police crew, were on the scene at 0612 hrs and 0613 hrsrespectively.

Airfield environment

The airfield, which is 73 feet amsl, is situated by Barton Moss5 nm west of Manchester and lies within the Manchester ControlZone. There are high tension power cables one mile to the westof the field and 35 feet high street lamps on a road one milesouth-east of the aerodrome. The Manchester Ship Canal lies approximately1,000 metres on the extended centreline from Runway 20. Alongsidethe canal is a further set of high tension power lines with obstructions3,000 metres beyond, marked on the 1:500,000 aeronautical chartfor the area, rising to a height of 351 feet agl and 400 feetagl.

Meteorology

An aftercast obtained from the Meteorological Office Bracknellgave the synoptic weather situation as a depression of some 1006mb centred near Blackpool with a trough of low pressure extendingsouthwards across the area. The weather was of scattered outbreaksof rain or showers, visibility 10 to 15 km, broken cloudaround 2,000 feet with a higher broken cloud base at 8,000 feetand a surface wind of 180°/05 kt veering to 200°/20kt with a temperature of +13°C. The Manchester Airport weatherobservation at 0550 hrs on 26 August 1996 was surface wind 160°/07kt, visibility greater than 10 km, few clouds at 800 feet,broken cloud at 2,300 feet, temperature +12°C and a sea levelpressure of 1008 mb.

Pathology

Post mortem examination of the pilot revealed that there was nopre-existing medical condition that could have affected his flyingperformance.

Pilot flying experience

The pilot started his Private Pilot's Licence (PPL) training inNovember 1994 flying a Piper PA38 from Turweston Airfield, Northamptonshire. In April 1995 the pilot gained his PPL. From June 1995 the pilotflew from Elstree Airfield in Piper PA38 and Cessna 172 aircraft. After the purchase of 'GAKYF' the pilot conducted all hisflights from Panshanger and had his most recent Certificate ofExperience (C of E) signed in May 1996.

Engineering aspects

The crash site

The aircraft had crashed on a flat area of reclaimed land, some30 metres from a tall (10 metre) hedge which was aligned approximatelyeast/west. The area around the aircraft had been trampled anddid not show distinctive ground marks associated with the impact.

The aircraft

Both wing leading edges showed some impact damage, with the leftwing marginally more damaged than the right. The attitude ofthe wing and front fuselage indicated that the aircraft had crashedwith wings approximately level, but with a pitch angle of approximately35º nose down. The nose wheel had collapsed and the aircraftfuselage had broken behind the rear cabin bulkhead. When theaircraft was lifted it was noticed that there were no tyre tracksbehind the wheels. The impact speed was estimated to be between40 to 60 kt.

Flying controls

No pre-existing defects were found in the primary flying controls,but the left hand flap had come off and was resting under thetail of the aircraft. Extensive corrosion was evident aroundthe left inboard flap track (see *Corrosion* below), howeverthe flap track was still in place and witness marks showed thatthe left flap had been attached at impact. The leading edge slatsare normally extended by a spring force overcoming the stagnationair pressure at low speed. By the nature of their design theywould have been extended by inertial forces (if not already extendeddue to low speed) when the nose of the aircraft hit the ground:it was therefore not possible to determine their position beforeimpact.

The elevator trim is operated by a rack and pinion which drivesthe inner portion of a substantial Bowden cable system. The rackwas found to be fully out, *ie* in the full nose up position. Although the Bowden cable was heavily deformed, the impact wouldhave been unlikely to produce the compressive loading of the innercable necessary to position the rack as found.

Engine and fuel

The engine was buried in the ground with one propeller blade exposed,subsequent examination of the fixed pitch propeller blade showedthat it had been rotating under power at impact. The fuel cockwas selected to the left hand tank, which had been ruptured onimpact and had lost its contents; the right tank had approximately1.5 gallons removed from it after the accident, and still containedabout 1 gallon. An engine strip showed that the engine hadbeen mechanically sound before impact. The fuel pump containedsome fuel with no indication of water contamination, and the carburettorfloat and pressure checks gave satisfactory results for an in-serviceengine.

There had been some degradation of the ignition system:

Two of the plugs were unserviceable when tested under 90 psi pressure- No 1 top and No 4 bottom. Both magnetos had worn cams whichwould have given timing errors. One magneto could not be runbecause of damage. The intact magneto was run and gave a satisfactoryspark at high speed, the timing error caused a complete loss ofspark at low speed but this was masked by a spark produced bythe impulse mechanism.

Thus one plug was unserviceable in two cylinders, and the otherplug was fed by a magneto with degraded performance.

Corrosion

The corrosion around the wing flap area was extensive and wouldhave been obvious upon inspection. This area is specificallymentioned in Service Bulletin 133/2 which is called up by CAAAirworthiness Directive (AD) 02-02-84 at intervals not exceeding100 hours or 6 months.

The aircraft logbook showed the last annual inspection, includingall mandatory airworthiness directives, had been carried out on24 November 1995. No further applications of Service Bulletin133/2 were recorded up to the accident, a period of 79 hours/267days. Of the 14 applications of the Service Bulletin recordedin the log book, only 4 met the time interval requirement of theAD.

Possibility of mis-set elevator trim

The only witnesses to see the aircraft on the day of the accidentsaw it during its take off and initial climb. There were no witnessespresent to observe the pre-flight activities of the pilot as hewas preparing the aircraft for departure. Engineering evidencesuggests that at the time of take off the elevator trim was setto the fully nose-up position. Pilots of this type of aircraft,who have experienced flight with the trim inadvertently set tothis position, state that control column forces required to overcomethis nose up pitch are extremely high. It is therefore possiblethat at some time between the landing on the previous day andtake off the trim was moved and inadvertently set in the fullnose up trim position. After take off the pilot would have beenaware of the control column forces but possibly not aware as tothe actual cause. Furthermore it is possible that the pilot didnot apply enough nose down control to allow the aircraft to acceleratebeyond this high drag situation. In a possible attempt to climbabove the approaching high tension power lines and obstructionsthe aircraft stalled and, under engine torque reaction, yawedand entered a spin to the left. There was insufficient heightavailable for the pilot to effect a recovery.