

# AIB Bulletin

# 10/85

**No: 10/85**

**Ref: EW/C914**

**Aircraft type and registration:** Piper PA32RT Lance G-HUGH (light single engined fixed wing aircraft)

**Year of Manufacture:** 1978

**Date and time (GMT):** 25 April 1985 at about 1630 hrs

**Location:** Ottershaw, Nr Woking, Surrey

**Type of flight:** Private

**Persons on board:** Crew — 1                      Passengers — 3

**Injuries:** Crew — 1 (serious)              Passengers — 3 (2 fatal)

**Nature of damage:** Aircraft destroyed

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

**Commander's Age:** 39 years

**Commander's total flying experience:** 84 hours (of which 8 hours were on type)

**Information Source:** AIB Field Investigation.

## HISTORY OF THE FLIGHT

The accident occurred whilst the aircraft, with the pilot and three passengers on board, was

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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on a flight from Jersey Airport to Fairoaks aerodrome. On the previous day, 24 April 1985, the same aircraft with the same occupants had flown from Fairoaks to Jersey. On this flight the aircraft had departed Fairoaks with a total fuel load of 50 US gallons, divided equally at 25 US gallons per side in each wing tank. The outbound flight proceeded apparently without incident and the aircraft landed at Jersey Airport at 1052 hrs, after a flight lasting 57 minutes.

The following day, at about 1500 hrs, the pilot and his passengers arrived back at Jersey Airport in order to prepare for the return flight to Fairoaks. The pilot first went to Jersey Airport Air Traffic Control (ATC), where he filed a Visual Flight Rules (VFR) flight plan for the return flight to Fairoaks, and also obtained a weather forecast for the return route and destination and diversion aerodromes. Prior to leaving Jersey ATC, the pilot requested a re-fuelling vehicle to meet him at the aircraft. According to the re-fuelling vehicle operator, the pilot stated that the aircraft had 25 Imperial gallons (30 US gallons) of fuel on board and that he required a further 20 gallons (24 US gallons). The output of the re-fuelling vehicle was calibrated in metric units. Accordingly the pilot agreed that a total of 100 litres (26½ US gallons) should be uplifted, and said that he required 30 litres (7.95 US gallons) in the left wing tank and 70 litres (18.65 US gallons) in the right tank.

Jersey ATC cleared the aircraft to depart for a VFR flight to Fairoaks, and it took off at 1507 hrs. The weather was generally fine, with isolated light rain showers and the lowest reported cloud base 2700 feet. The aircraft cruised below cloud and the flight apparently proceeded without incident until, at about 1615 hrs, the aircraft was being positioned for an approach and landing on runway 06 at Fairoaks aerodrome. As it reached the downwind position the pilot informed the Fairoaks Flight Information Service radio operator that he was not getting the green lights which should indicate that the landing gear was locked down, and that he wished to fly past the radio tower for a visual check. The aircraft flew past the tower and the radio operator informed the pilot that the landing gear appeared to be down; at the same time he alerted the aerodrome fire and rescue crew. The pilot next reported that he wished to fly past the tower a second time and re-cycle the landing gear for a further visual check. This was done and the pilot was again informed that the landing gear appeared to be down. The aircraft was then observed to enter a shallow climb, which took it over woodland to the north-east of the aerodrome, when the pilot reported that his engine had failed, followed by the brief transmission "I'm going in". The aircraft crashed into the woods and, shortly after the initial impact, there was a fierce fire.

An eye-witness who was working close to the accident site had observed the aircraft on its first two circuits of the aerodrome and his attention was re-drawn to it when he heard the engine splutter and stop. Seeing that the aircraft was descending towards the trees, and realising that an accident was imminent, he ran towards the trees. He observed the aircraft strike the tops of the trees before falling almost vertically to the ground. He managed to assist one passenger from the wreckage before there was an explosion, followed immediately by a fierce fire. Returning to the wreckage he managed to release the pilot and drag him away from the fire. By this time the fire had become intense and he was unable to reach the remaining two occupants. The Fairoaks aerodrome fire crew arrived on the scene within 2 minutes of impact and extinguished the fire. The pilot had sustained severe burns and multiple injuries; the two remaining passengers died in the fire.

#### **WRECKAGE AND IMPACT INFORMATION**

Initial on site examination revealed that the aircraft first contacted the tops of the trees at a height of approximately 60 feet above ground level, whilst descending in a noseup/wings level attitude. It then struck a substantial tree trunk with sufficient force to detach both wings from the fuselage at their roots, the right wing falling to land inverted at the base of this tree, the left wing travelling forward and coming to rest on its leading edge adjacent to the fuselage some 24 metres from the first impact. The aircraft's configuration at this time was determined as structurally intact, landing gear down, flaps 25° and with the throttle closed. There was no indication from the damage to the propeller that the engine was developing power. There was copious evidence of a post accident fire throughout the accident site and wreckage, particularly around the right wing and in the forward cabin area. There was no evidence of fire in or immediately surrounding the left wing.

The aircraft wreckage was recovered to the AIB facility at Farnborough where a detailed investigation was carried out. Examination of the wreckage failed to reveal any pre-existing defect or failure in the engine, airframe, or flying control systems which might have contributed to the accident. Although it was established that the landing gear was in the down and locked position at ground impact, due to the severity of the post crash fire the reason for the apparent failure of the landing gear position indicator lights could not be established. The aircraft's documents indicated that it had been properly maintained in accordance with the approved Civil Aviation Authority maintenance schedule; and it possessed a valid Certificate of Airworthiness in the Passenger Transport Category.

### **THE AIRCRAFT'S FUEL SYSTEM**

The Piper PA 32RT—300T aircraft has a total fuel capacity of 98 US gallons, of which 94 US gallons are declared to be usable. The fuel is stored in two integral tanks, one in each wing, and is controlled by a selector which is located below a central instrument panel. The selector has three positions, one position corresponding to each wing tank plus an OFF position. There is no facility for supplying fuel from both tanks simultaneously. Instructions concerning the recommended procedures for operating the fuel system are contained in the aircraft Operating Handbook, a copy of which was carried in the aircraft. When using less than the standard 98 US gallons capacity of the tanks, fuel should be distributed equally between each side. In flight it is also recommended that, in order to keep the aircraft in best lateral trim, the fuel should be used alternatively from each tank. Should the engine stop due to one fuel tank being emptied, it can take as long as 10 seconds to re-start the engine after selecting the opposite tank. Fuel consumption in cruising flight depends very much upon the way that the engine and propeller power controls are set; it can vary from 14 to 24 US gallons per hour. Calculations regarding the accident flight suggest that the fuel consumption on that occasion would have averaged about 21 US gallons per hour.

When the aircraft landed at Jersey on the day before the accident, the total fuel remaining was calculated to have been about 30 US gallons. The fuel uplifted on the following day was  $26\frac{1}{2}$  US gallons, bringing the total contents before engine start to  $56\frac{1}{2}$  US gallons. If this quantity was evenly distributed this would have meant that each wing tank unit contained  $28\frac{1}{4}$  US gallons. The flight from Jersey until the engine stopped lasted for about 1 hour and 23 minutes. At an average fuel consumption of 21 US gallons per hour, the total fuel consumed in 1 hour and 23 minutes would have been approximately 29 US gallons.

**Aircraft type and registration:** Monnett Moni G-BKUO (Self-launching motor glider; home build)

**Year of Manufacture:** 1984

**Date and time (GMT):** 1 July 1985 at about 1830 hrs

**Location:** Tibenham aerodrome, Norfolk

**Type of flight:** Private

**Persons on board:** Crew — 1                      Passengers — None

**Injuries:** Crew — 1 (fatal)                      Passengers — N/A

**Nature of damage:** Aircraft destroyed

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

**Commander's Age:** 60 years

**Commander's Total Flying Experience:** In excess of 5000 hours (of which 6½ hours were on type)

**Information Source:** AIB Field Investigation.

The aircraft was on a local flight within the Tibenham aerodrome circuit area. Shortly after take-off eye-witnesses observed it enter a low level turn and carry out a fly past of the hangar and clubhouse at a height of approximately 50 feet above ground level. Returning to the central aerodrome area, it entered a climbing turn to the right before it was next observed in an approximately 45° nose down attitude, spinning towards the ground. The general consensus of eye-witness evidence is that the aircraft initially spun to the right, appeared to partially recover, before spinning in the opposite direction. Evidence from the wreckage showed that it struck the ground in a steep nose down attitude whilst spinning to the left. The aircraft was destroyed and the pilot sustained fatal injuries.

The Monnett Moni is a home build aircraft constructed from an all metal kit. Although small, the aircraft is of largely conventional design, with the exception of the tail unit and the cockpit flying controls. The tail unit is of the 'V' or 'butterfly' type incorporating two moveable control surfaces, rather than the more conventional separate fin and rudder, with horizontal stabiliser and paired elevator surfaces. Control in pitch and roll is achieved by means of a small 'side-stick' control lever mounted on the right side cockpit wall. Control in yaw is affected by conventional rudder pedals. The design of the flying controls is such that maximum effectiveness of the controls about the pitch axis and about the yaw axis cannot be achieved simultaneously. In particular, when related to spin recovery, full rudder authority can only be obtained with the pitch control in the central or neutral position. The only flight instruments fitted are an airspeed indicator and an altimeter; there is no instrument fitted that would warn a pilot that the aircraft is not in balanced flight.

Detailed examination of the aircraft wreckage revealed no evidence of any pre-crash defect or failure of the structure, flying control, or flight instruments. The airspeed indicator was removed for further testing, and found to be functioning accurately. The aircraft appeared to be

constructed to a high standard of workmanship, and at the time of the accident it possessed a valid Permit to Fly, issued by the United Kingdom Civil Aviation Authority. The Permit to Fly prohibited, in the flight limitation section, intentional spinning and aerobatic manoeuvres.

It was not possible to determine the reason for the aircraft's entry into the spin. However, whatever recovery action was taken by the pilot, there would have been insufficient height in which to regain control before the aircraft struck the ground.

No: 10/85

Ref: EW/G85/07/09

**Aircraft type and registration:** Piper PA 25 Pawnee G-BENL (light single engined fixed wing aircraft)

**Year of Manufacture:** 1976

**Date and time (GMT):** 10 July 1985 at 0830 hrs

**Location:** Sutton Bank, N Yorkshire

**Type of flight:** Gliding aerotow

**Persons on board:** Crew — 1                      Passengers — None

**Injuries:** Crew — Minor                      Passengers — None

**Nature of damage:** Aircraft destroyed

**Commander's Licence:** Private Pilot's Licence with IMC rating

**Commander's Age:** 24 years

**Commander's Total Flying Experience:** 164 hours (of which 31 were on type)

**Information Source:** Aircraft Accident Report Form submitted by the pilot.

The airfield, at which this aircraft was operated as a glider tug, is positioned on the edge of the Hambleton Hills in N Yorkshire with a sheer drop of several hundred feet around its South and West facing boundaries. On this occasion, the aircraft had just been refuelled with 4 star MOGAS, prior to its first flight of the day, following which the pilot taxied to the glider launch point. The air temperature was +15°C.

On arrival, the engine was left running at 1000 to 1100 rpm for approximately 4 to 5 minutes until the cylinder head temperature rose to 250°F. A satisfactory magneto drop check was then carried out at 1700 rpm. As the glider pilot was not yet ready to launch, the pilot shut down the engine for a period of 4 to 5 minutes before re-starting.

The start of the launch was normal with the pilot reporting that 2400 rpm was achieved by the engine once full power had been selected. He states that the aircraft became airborne at 65 mph three quarters of the way along the 500 yard grass runway but, at a height of approximately 25 feet the engine suffered a total loss of power and the aircraft sank back onto the ground. By this time it was too close to the boundary of the airfield to stop. The aircraft fell over the cliff edge, pitching nose down and dropping the left wing as it did so, and began to accelerate downwards. It hit the tops of some trees and collided with the side of the cliff, turning through approximately 180° before coming to rest.

After salvage of the wreckage, the aircraft's engine, fuel system, and electrical system were examined by the maintenance organisation normally employed by the gliding club, with no pre-accident defects being discovered.

The aircraft had been operated mostly on MOGAS fuel for the previous 2½ years and, despite no record of approval for use with this fuel being discovered from examination of the aircraft or

CAA records, is reported generally as having suffered no problems. However, the pilot reports that the day prior to this accident he was forced to abandon one take off due to insufficient power following a period of idling with a hot engine.

**COMMENT**

An information leaflet issued by the CAA as No 4 in the series 'General Aviation Safety Sense' and titled 'Use of MOGAS', gives details of the limitations and precautions to be adopted with aircraft engines approved to run on motor gasoline.

**Aircraft type and registration:** Piper PA 24—250 G-ARLL (light single engined fixed wing aircraft)

**Year of Manufacture:** 1961

**Date and time (GMT):** 20 July 1985 at 1450 hrs

**Location:** Hastings, Sussex

**Type of flight:** Private (pleasure)

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

**Injuries:** Crew — None                                  Passengers — Minor

**Nature of damage:** Substantial, aircraft immersed in sea water

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

**Commander's Age:** 46 years

**Commander's Total Flying Experience:** 162 hours (of which 8 hours were on type)

**Information Source:** AIB Field Investigation.

The aircraft had departed from Southend and had had an uneventful flight to Compton Abbas, where a stop of 20 to 30 minutes was made prior to taking off for the return flight to Southend via the south coast. Shortly after passing Seaford, whilst in level flight at 1500 feet, the pilot became aware that the engine was losing power. He applied carburettor heat, switched the electric boost pumps on and pumped the throttle, but the engine failed to respond. The aircraft was turned to an open area north of Hastings, but when it became apparent that this could not be reached the pilot had no option but to land in the sea. The aircraft landed on the surf line parallel to the shore with a 15-20 knot tail wind, and cartwheeled to the right before coming to rest in 4 to 5 feet of water. The cockpit filled with water almost immediately but the occupants were able to evacuate without difficulty although the passenger suffered a minor injury to his hand.

Bystanders assisted in pulling the aircraft up on to the beach. Later the aircraft was dismantled and taken to Lydd Airport where it was subjected to an AIB examination.

The carburettor float chamber was found to be full of sea water and contained no trace of fuel. It was reasoned that had fuel been present before the accident, it is unlikely that all of it would have been displaced by sea water entering via the spray nozzle in the venturi. No other engine defects were observed.

The aircraft was equipped with tip tanks, each of 15 gallons capacity, in addition to the normal main and auxiliary tanks in each wing. The fuel selector allows for one tank on each side of the aircraft to be selected. The pilot recalled that he selected the left tip tank some 20 minutes before the engine failure, having observed that the tip tank gauge was indicating just over half full. After the accident, with electrical power removed, the gauge was indicating below half full. All the fuel gauges, together with the fuel contents transmitters, were subsequently bench checked and the main and auxiliary tank gauges were found to be correctly calibrated.



However, the tip tank (which gives the contents of either tip tank depending on the position of a toggle switch) was found to indicate over only  $\frac{1}{4}$  to  $\frac{1}{2}$  scale for the full range of movement of transmitter float arm. The needle tended to remain close to the  $\frac{1}{2}$  scale indication with electrical power removed. The reason appeared to be due to "striction" in the gauge mechanism. The right main tank was found to be selected at the time of the accident, although its contents were not known. However, refuelling records produced by the pilot showed that total fuel contents at the time of the accident should have been sufficient for 2 to 3 hours flying.

**Aircraft type and registration:** Cessna P206D G-AWUA (light single engine fixed wing aircraft)

**Year of Manufacture:** 1966

**Date and time (GMT):** 28 July 1985 at 1700 hrs

**Location:** Forton Airfield, near Shrewsbury

**Type of flight:** Parachute dropping

**Persons on board:** Crew — 1                      Passengers — 5

**Injuries:** Crew — None                      Passengers — None

**Nature of damage:** Nose gear assembly, propeller blades, and fuselage fairings damaged

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

**Commander's Age:** 38 years

**Commander's Total Flying Experience:** 278 hours (of which 36 were on type)

**Information Source:** Aircraft Accident Report Form submitted by pilot, telephone report from engineer, and AIB examination of steering collar.

The aircraft took off from Forton Airfield with a pilot, a jumpmaster, and 4 student parachutists on board. The student parachutists were despatched normally, although the pilot noted that the in-flight pedal forces were lower than usual.

During the landing roll the pilot heard a grinding noise and thought that a tyre had gone flat. After a few seconds the nose went down and the aircraft came to a halt with the nosewheel detached.

Examination of the aircraft showed that the steering collar (fig 1) on the nose gear had failed. This collar transmits the pilot's steering commands to the upper arm (fig 1, to right) of the torque link scissors assembly; failure of the steering collar would allow the lower strut to descend and the nosewheel to castor.

Metalurgical examination of the two fractures indicated that the initial fracture had occurred at A, in the area of reduced cross-section, and that the final failure occurred at area B. The initial fracture shows some evidence of a small area of fatigue originating in an area of rough surface finish on an inside radius (point C).

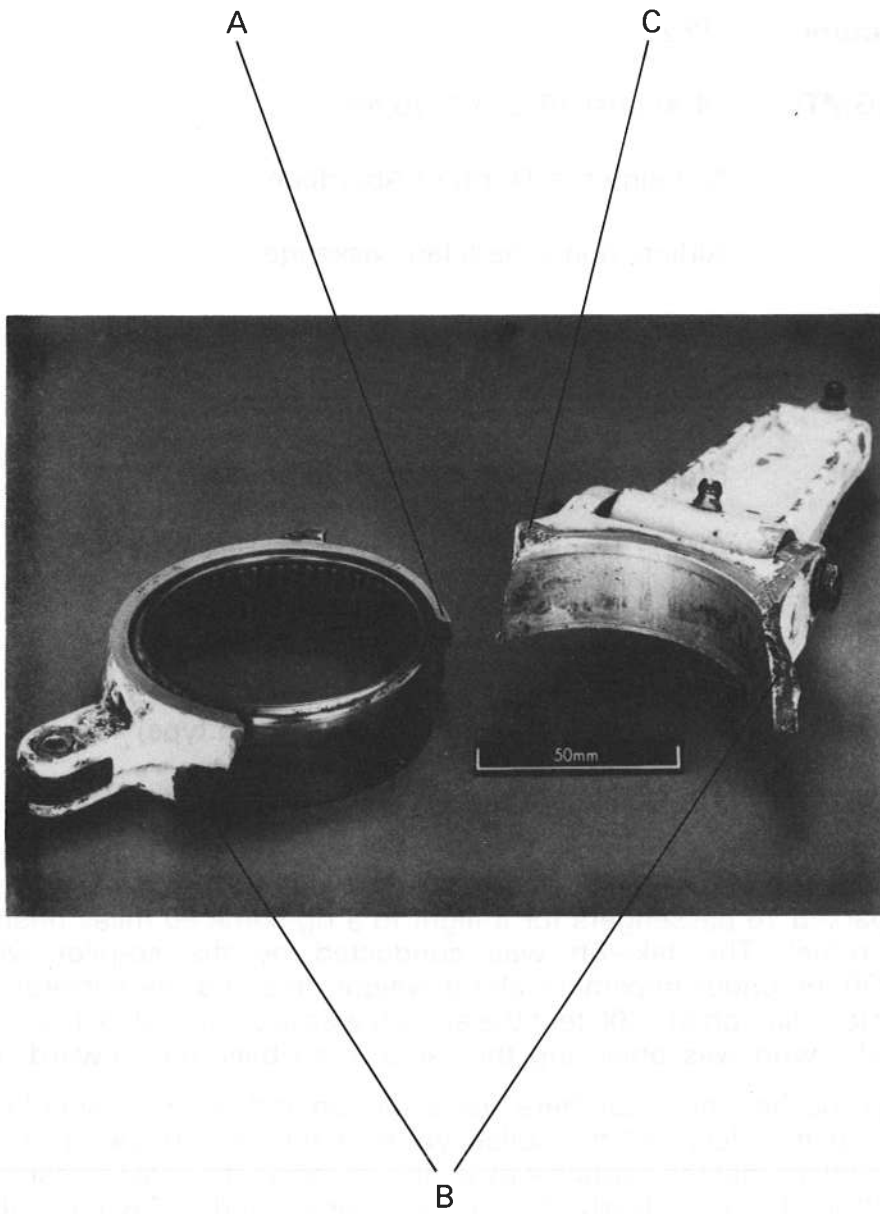


Fig 1

**Aircraft type and registration:** Bell 214ST G-BKFN (heavy helicopter public transport)

**Year of Manufacture:** 1982

**Date and time (GMT):** 14 August 1985 at 1115 hrs

**Location:** Nr Balmedie, North of Aberdeen

**Type of flight:** Airline, non-scheduled passenger

**Persons on board:** Crew — 2                      Passengers — 16

**Injuries:** Crew — None                      Passengers — None

**Nature of damage:** Broken main rotor blade drag brace

**Commander's Licence:** Airline Transport Pilot's Licence, Helicopters

**Commander's Age:** 40 years

**Commander's Total Flying Experience:** 7140 hours, (of which 1282 were on type)

**Information Source:** AIB Field Investigation.

The helicopter, which had just flown one uneventful out and return sector from Aberdeen airport, had embarked 16 passengers for a flight to a rig some 90 miles offshore following a rotors running refuel. The take-off was conducted by the co-pilot with the aircraft approximately 200 lbs under maximum all up weight, this and the subsequent climb being uneventful. After levelling off at 3000 feet the aircraft was accelerated to its cruise speed of 115 kt and the captain, who was operating the radio, read back the onward route clearance.

As the aircraft approached the coast there was a sudden and violent onset of severe vibration. The co-pilot immediately lowered the collective lever fully and began a rapid descent. The vibration was so violent that the captain was unable to locate the radio transmit switch and the instruments could not be read clearly. The co-pilot transmitted a May-day call and stated the intention of landing on the beach. Speech was difficult due to the continuing vibration, but the captain managed to get his hands on the controls and briefed the co-pilot he wanted to put down near a road to ensure easy access for emergency vehicles. He then took control and turned towards a field. The rate of descent was about 3000 feet per minute and the rotor rpm was well above normal. The crew decided to allow the rotor rpm to remain high as it was obvious that something was seriously wrong with the helicopter and they did not want to reduce the rate of descent. Throughout the emergency the pilots reported very heavy controls with considerable feed back and a loss of tail rotor effectiveness.

The captain was aware that he was attempting to land downwind but control of the helicopter was difficult and so he elected to carry out a constant attitude landing without flare. As the helicopter approached the ground both pilots pulled up on the collective which needed considerable force. The captain estimated that the touch down speed in the grass field was about 60 kt and, as the helicopter came to a halt, the vibration became more severe and the crew were seriously concerned that it might roll over.

Both sliding doors had been opened by the passengers before the aircraft came to a halt and, in spite of the violent rocking motion, four passengers left the helicopter and ran out under the rotor disc. The crew shouted to the other passengers to remain strapped in until the rotors had stopped and then to evacuate forwards. Meanwhile, the captain had shut down both engines and had applied the rotor brake at 70% rotor rpm (normal max 40%). The rotor came to rest without the helicopter rolling over and after switching off electrical power the crew and passengers evacuated the aircraft with injury.

Examination of the helicopter revealed an obvious failure of one of the main rotor blade (MRB) drag braces. The effect of this had been to allow the MRB to pivot in a lead/lag sense about the single rotor head attachment pin, resulting in an imbalance of forces about the rotor mast.

Both drag braces were removed from the helicopter and subjected to detailed metallurgical examination at the AIB facility at Farnborough and at the manufacturer's plant in the USA.

The drag braces on the helicopter are each comprised of two main components; a forged threaded barrel, and a clevis fitting attached to the barrel by two large stiffnuts. (Refer figure 1).

The brace had failed by fatigue across the barrel section at a position approximately  $1\frac{1}{2}$ " from the inboard end of the thread runout, the fracture surface being approximately  $\frac{1}{2}$ " within the inboard end of the inner stiffnut. The failure of the nut was also associated with fatigue, the nut apparently having been subjected to progressively increased loading as the fracture progressed across the barrel section. It was apparent that relatively high levels of corrosion were present on the thread surfaces adjacent to the fracture, as illustrated in figure 2. In order to examine the opposite drag brace from this helicopter, it was necessary to cut open the inboard nut to facilitate its removal, a process which revealed similar corrosion over most of the threaded sections covered by the nut, particularly around the position corresponding to the failure.

Detailed metallurgical examination is continuing to verify the likely connection between the corrosion and the fatigue failure, and to positively establish the cause of the corrosion in the first instance.

Both the barrel and stiffnuts are made from high tensile alloy steel, cadmium plated for corrosion protection. However, the stiffnuts are only effective as such due to deformation of the thread, accomplished during manufacture, by a degree of crimping of the end of the nut at three positions spaced  $120^\circ$  apart.

The possibility that damage was occasioned to the protective treatment of the threaded sections as the stiffnuts were screwed along the barrel, by these areas of relatively high contact pressure, is presently being investigated. Additionally the localised stress concentrations due to this feature of the stiffnut and operation of the helicopter in a mildly corrosive environment, ie over water, are being examined as possible contributory factors in the failure mechanism.

As a result of this failure and the subsequent discovery of corrosion/cracks on some other aircraft, the Civil Aviation Authority have placed additional restrictions on the life of this component and the design of the assembly is being reviewed.

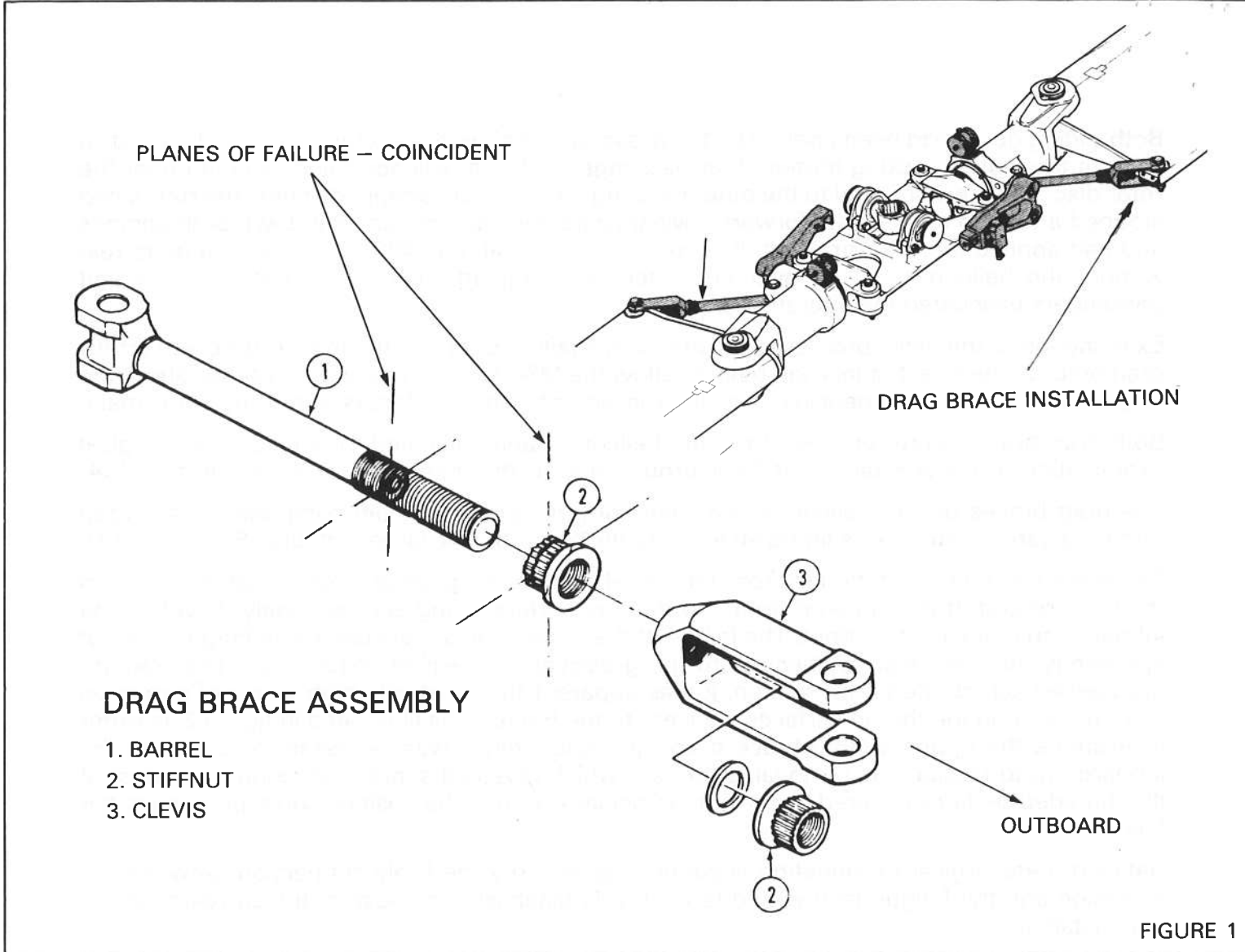


FIGURE 1

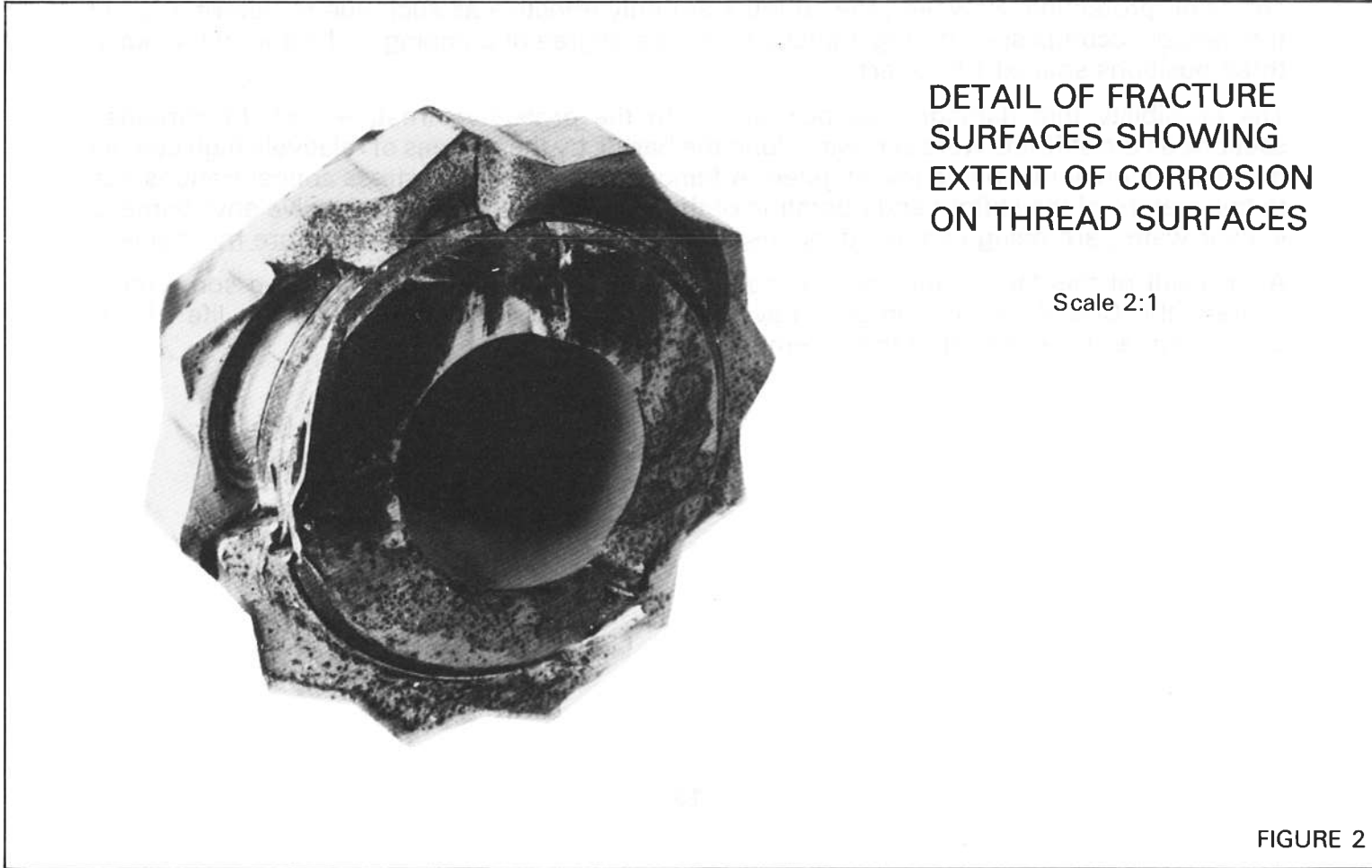


FIGURE 2

**Aircraft type and registration:** Miles M100 Student G-MIOO (light single engined fixed wing aircraft)

**Year of Manufacture:** 1957

**Date and time (GMT):** 24 August 1985 at 1443 hrs

**Location:** Duxford Airfield, Cambridge

**Type of flight:** Private (pleasure)

**Persons on board:** Crew — 1                      Passengers — None

**Injuries:** Crew — Minor                      Passengers — N/A

**Nature of damage:** Substantial damage to nose and cockpit section. Left hand wing cover stressed and left hand tail surfaces damaged. Right wing torn off.

**Commander's Licence:** Airline Transport Pilot's Licence

**Commander's Age:** 43 years

**Commander's Total Flying Experience:** 12,000 hours (of which about 20 hours were on type)

**Information Source:** Aircraft Accident Report form submitted by the pilot.

The aircraft was a prototype that had recently been refurbished. During the morning of 24 August 1985 the pilot had flown the aircraft in company with the test pilot who had been involved in its development flying. The test pilot had assessed the handling characteristics as being substantially the same as he had found them originally. At 1443 hours GMT the pilot, now solo, began his take-off on runway 24. He reports a normal spool up of the engine and acceleration of the aircraft. Shortly after becoming airborne he selected the landing gear up. At a height of less than 50 feet the engine failed and ran down. The pilot selected the landing gear down whilst maintaining the aircraft attitude and allowing the slight sink to develop.

The aircraft struck the grass area beyond the threshold of runway 06 in a slight nose down and right banked attitude. The right hand wing was torn off and the aircraft continued to ground loop. It stopped facing the direction from which it had come and between the extended lines of the concrete and grass runways.

There was a small post crash fire which was quickly extinguished by the airfield fire service who arrived at the scene within two minutes, having been alerted by the AFISO. It is believed that the engine continued to rotate for a short while after the impact.

The pilot was restrained by his shoulder harness but was rendered unconscious by a blow near his left eye caused by a cockpit accelerometer that had become detached from the instrument panel.

Initial examination of the engine and wreckage revealed that the engine had suffered a failure of the turbine disc. The turbine blades had been reduced by about one third of their length

having been subjected to excessive temperature. Furthermore, the engine intake ducting on top of the fuselage and behind the cockpit had collapsed. It was not possible to determine whether this had occurred prior to the impact or if it was caused during impact. In either instance it would have resulted in the engine being overfuelled thus causing high temperatures in the turbine area.



**No: 10/85**

**Ref: EW/G85/08/09**

**Aircraft type and registration:** Reims Cessna F172N G-BFLV (light single engined fixed wing aircraft)

**Year of Manufacture:** 1978

**Date and time (GMT):** 26 August 1985 at 1700 hrs

**Location:** Barton Aerodrome, Manchester

**Type of flight:** Training

**Persons on board:** Crew — 1                      Passengers — None

**Injuries:** Crew — None                      Passengers — N/A

**Nature of damage:** Damage to nosewheel, propeller, and left wingtip.

**Commander's Licence:** Student Pilot's Licence

**Commander's Age:** 17 years

**Commander's Total Flying Experience:** 36 hours (of which 7 were on type)

**Information Source:** Aircraft Accident Report form submitted by the pilot's Chief Flying Instructor.

The pilot flew an approach to runway 27 in a reported surface wind of 280°/8 kt. He was high over the threshold and touched down well up the runway. The aircraft bounced twice, overran the runway and came to rest on rough ground in a level attitude.

**No: 10/85**

**Ref: EW/G85/08/13**

**Aircraft type and registration:** DH 82A Tiger Moth G-BALX (light single engined bi-plane)

**Year of Manufacture:** 1939

**Date and time (GMT):** 30 August 1985 at 1750 hrs

**Location:** Private Airstrip near Battle, East Sussex

**Type of flight:** Private (pleasure)

**Persons on board:** Crew — 1                      Passengers — None

**Injuries:** Crew — None                      Passengers — N/A

**Nature of damage:** Damage to propeller, engine cowlings and both right mainplanes

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

**Commander's Age:** 42 years

**Commander's Total Flying Experience:** 110 hours (of which 35 were on type)

**Information Source:** Aircraft Accident Report form submitted by the pilot.

At the end of the landing run on a grass airstrip the aircraft nosed over. The pilot reports that he carried out a "wheeler" landing and believes that he applied excessive forward pressure on the control column during the landing run.

**Aircraft type and registration:** Piper PA28-140 Cherokee G-ATVO (light single engined fixed wing aircraft)

**Year of Manufacture:** 1966

**Date and time (GMT):** 3 September 1985 at 1030 hrs

**Location:** Cromer Airstrip, Norfolk

**Type of flight:** Private (pleasure)

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

**Injuries:** Crew — None Passengers — None

**Nature of damage:** Slight damage to left hand undercarriage and wing. Bent propeller, twisted nose wheel gear.

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

**Commander's Age:** 44 years

**Commander's Total Flying Experience:** 190 hours (of which 145 were on type)

**Information Source:** Aircraft Accident Report form submitted by the pilot.

The pilot had obtained permission to land at Cromer Airstrip prior to his departure from Stapleford. He was advised that the strip would be unmanned. From the windsock at the strip the pilot judged the wind to be 260° at 20 kt with some gusting. Visibility was reduced in rain showers. The grass strip at Cromer is 600 metres long and the pilot touched down on runway 18 some 150 metres in from the threshold. After touchdown the wind, which the pilot reports had now veered to 290°, caused the aircraft to weathercock. The landing direction was maintained by use of rudder, but a combination of the wet grass surface and downhill slope prevented the aircraft coming to a halt before the end of the runway which is crossed by a cart track. The aircraft nosed gently into the cart track, striking the left wing tip and undersurfaces, and the propeller, before coming to rest back on its wheels.

<b>Aircraft type and registration:</b>	North American Harvard Mk 2A G-BGOU (restored World War 2 single-engined training aircraft)	
<b>Year of Manufacture:</b>	1942	
<b>Date and time (GMT):</b>	7 September 1985 at approximately 1500 hrs	
<b>Location:</b>	Bourn airfield, near Cambridge	
<b>Type of flight:</b>	Private	
<b>Persons on board:</b>	Crew — 1	Passengers — Nil
<b>Injuries:</b>	Crew — 1 (fatal)	Passengers — None
<b>Nature of damage:</b>	Aircraft destroyed by impact and fire	
<b>Commander's Licence:</b>	Air Transport Pilot's Licence	
<b>Commander's Age:</b>	38 years	
<b>Commander's Total Flying Experience:</b>	5258 hours (of which 80 were on type)	
<b>Information Source:</b>	AIB Field Investigation.	

### **HISTORY OF THE FLIGHT**

On the morning of the day of the accident the pilot flew his aircraft from Debden, where it was normally based, to Finningley, where he flew a short, individual, aerobatic practice before landing. In the afternoon he took off with 3 other Harvards to perform a display, during which he flew in the number 4 position for that part of the display when all 4 aircraft formed a single formation. He spent 25 minutes on the ground at Finningley before taking off in the number 2 position to another Harvard based at Bourn, intending to route via Bourn to Debden. The pilot of the lead aircraft stated that as they approached Bourn the following RTF conversation took place between the 2 aircraft on the Bourn Radio frequency:

No 2: "ARE WE GOING TO GIVE THEM A DISPLAY?"

Leader: "DO YOU WANT TO?"

No 2: "YES"

There was no reason for the Bourn Radio station to be manned at that time and there were no replies from Bourn Radio to the information calls subsequently made by the Leader.

The Leader described the display given at Bourn as orientated along the 01/19 runway and consisting of a series of manoeuvres in the looping plane followed by a wingover manoeuvre intended to bring the aircraft back along runway 19 with increased separation. After the wingover he dived towards the centre of the airfield and then executed a climbing roll before turning right at about 1000 feet agl for a right-hand circuit to land on runway 25. These manoeuvres were part of the standard Harvard display sequence, and had been rehearsed and displayed several times before. The loops were normally flown in line astern with approximately two aircraft lengths separation, increasing during the wingover to give safe separation for the individual climbing roll, which was an optional end to the display and was not always carried out. The Leader neither saw, nor would have expected to see, the No 2 aircraft

during the display at Bourn.

Only one observer on the ground saw the whole of the display. He stated that it was conducted mainly between 500 and 1500 feet agl except for the shallow dive before the climbing roll, when both aircraft descended to between 300 and 400 feet before pulling up. He estimated the separation between the aircraft to have been some 3 to 4 aircraft lengths during the loops.

Three experienced observers saw the climbing rolls and their observations agreed in most details. The lead aircraft was seen to descend to about 300 feet then climb at an angle of about 25° before executing a roll to the left about his axis of flight, the engine cutting momentarily as it passed through the inverted position. The second aircraft followed a similar descent path at a separation estimated by 2 witnesses to be between 300 and 400 feet, although the third witness thought the separation was only 5 to 6 aircraft lengths (145 to 174 feet). It then commenced a roll to the left at about the same height at which the lead aircraft had rolled. However, by the time it reached the inverted position, it had changed heading to the left by about 30° to 45°, the nose was level or slightly below the horizon, and the rate of roll had slowed markedly. The nose continued to drop rapidly as the aircraft continued to roll very slowly left and the aircraft was then seen to pull through, as if executing the second half of a loop. The aircraft pulled through the vertical position and, as it reached about 250 feet agl, still steeply nose down, its pitch attitude increased sharply and half a second later is flicked to the right through at least 180° before crashing in a steep dive and catching fire. Its engine was not heard to cut during the roll, and the engine note was audible at moderate to high power throughout the pull through manoeuvre.

The aircraft had refuelled to full tanks before leaving Finningley and still had approximately 80 gallons of fuel on board at the time of the accident. The estimated centre of gravity (C of G) of the aircraft was 29.73 inches aft of the datum, well within the limits of 27.5 to 32.5 inches aft of the datum.

The C of G of the aircraft at the time of the accident was established because it is known that the Harvard can be difficult to handle in aerobatic manoeuvres if the C of G is close to the aft limit.

### **PILOT INFORMATION**

The aircraft was owned and flown by an experienced airline pilot, who was currently employed on scheduled operations. During the 5 days preceeding the accident he had flown 25 hours of airline service, including two long night flights. He had landed in the UK at 0700 hrs on the day before the accident. In the preceding 30 days, he had flown 75 hours in airline service and approximately 4 hours of Harvard flying, including two displays.

His log book records 80 hours of Harvard flying, mostly flown during the last 2 years and including periods of concentrated aerobatic and formation flying practice in June 1984 and April 1985. He was associated with other Harvard owners in a Harvard formation and aerobatic display team, which had performed regularly at air shows in recent years. There was no evidence that he suffered from any medical condition that could have contributed to the accident.

### **IMPACT PARAMETERS**

The aircraft crashed into a flat stubble-field immediately adjacent to the southern boundary of Bourn airfield; its initial point of impact was some 250 metres south-east of the threshold of runway 01 and it was travelling in a direction of 030°M. The aircraft's attitude at impact was assessed as 80° bank to the right with the fuselage axis approximately 45° nose down, and its speed as between 150 and 200 kt. There was evidence to show that the engine was running and producing a significant level of power, and that both the undercarriage and flaps were fully retracted. The extent and severity of the post-impact fire suggested that a large quantity of fuel was on board at the time.

### **WRECKAGE EXAMINATION**

The wreckage was removed to the AIB facility at Farnborough where a detailed examination took place. This revealed the aircraft to have been complete, and there was no evidence of pre-impact failures in its structure or flying control systems. All damage observed was consistent

with the impact and subsequent fire.

The aircraft's documents showed that it had been constructed in 1942 by North American Aviation Inc. since when it had seen service with the air forces of the United States, Britain, South Africa and Portugal, and had flown for a total of some 5500 hours. It possessed a Permit to Fly, issued by the CAA on 19 April 1985 and valid for 1 year, a condition of which was that a Fitness to Fly Certificate issued within the preceding 25 flying hours be in force at all times. At the time of the accident, the aircraft had flown for approximately 27 hours since the most recent Certificate was issued.

No: 10/85

Ref: EW/G85/09/04

**Aircraft type and registration:** Piper PA 28-161 G-BLEJ (light single engined fixed wing aircraft)

**Year of Manufacture:** 1978

**Date and time (GMT):** 8 September 1985 at 1237 hrs

**Location:** Eglinton Airfield, Co Londonderry

**Type of flight:** Training

**Persons on board:** Crew — 1    Passengers — None

**Injuries:** Crew — None    Passengers — N/A

**Nature of damage:** Nosewheel collapsed; substantial damage to main landing gear and both wings

**Commander's Licence:** Student Pilot

**Commander's Age:** 28 years

**Commander's Total Flying Experience:** 27.20 hours (of which 7.40 were on type)

**Information Source:** Aircraft Accident Report Form submitted by the pilot.

The pilot was engaged on practice circuits and landings. He had successfully completed 6 touch and go landings when after the seventh landing, just as the aircraft had almost reached take-off speed, the left wheel entered a substantial patch of standing water. The aircraft swung sharply to the left, left the runway, and passed through a barbed wire perimeter fence before coming to rest in an adjacent field. The weather at the time was fair with a light and variable wind but there had been continuous heavy rain on the previous day.

**No: 10/85**

**Ref: EW/G85/09/06**

**Aircraft type and registration:** Bolkow BO 209 Monsun G-AZOA (light single engined fixed wing aircraft)

**Year of Manufacture:** 1972

**Date and time (GMT):** 15 September 1985 at 1500 hrs

**Location:** Temple Bruer Airstrip, near Lincoln

**Type of flight:** Private (pleasure)

**Persons on board:** Crew — 2                      Passengers — None

**Injuries:** Crew — None                      Passengers — N/A

**Nature of damage:** Minor damage to undercarriage legs and wing attachments

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

**Commander's Age:** 44 years

**Commander's Total Flying Experience:** 67 hours (of which 1 was on type)

**Information Source:** Aircraft Accident Report Form submitted by the pilot.

The pilot flew a standard circuit for landing on runway 27 in a surface wind reported to be 280°/14 kt. He experienced moderate turbulence on finals and some loss of height. After initiating a go-around and before he had achieved a positive rate of climb, the main wheels struck a low ridge just short of the runway threshold. The pilot returned to Nottingham where, after a visual check of the undercarriage by ground observers, he landed the aircraft without further incident.



**No: 10/85**

**Ref: EW/G85/09/07**

**Aircraft type and registration:** Reims Cessna C150 G-BDEX (light single engined fixed wing aircraft)

**Year of Manufacture:** 1974

**Date and time (GMT):** 15 September 1985 at 1445 hrs

**Location:** Compton Abbas Aerodrome, Dorset

**Type of flight:** Training

**Persons on board:** Crew — 1                      Passengers — None

**Injuries:** Crew — None                      Passengers — N/A

**Nature of damage:** Damage to nose wheel leg, bulkhead, and engine bearers

**Commander's Licence:** Student Pilot's Licence

**Commander's Age:** 48 years

**Commander's Total Flying Experience:** 22.40 hours, all on type

**Information Source:** Aircraft Accident Report Form submitted by the pilot.

The student pilot completed four safe landings and take-offs to the satisfaction of his instructor before being sent solo. The instructor witnessed a good landing on the student's first solo circuit, but on the second the aircraft began to porpoise and eventually the nose leg collapsed, allowing the nose to strike the ground.

## **ACCIDENT REPORTS PUBLISHED**

The following Aircraft Accident Reports are now available from HMSO:—

### **AAR 1/85**

Report on the accident to Britten-Norman Islander BN2A-26 G-BDVW at Sanday Island Airfield, Orkney on 1 June 1984.

Price £3.20

### **AAR 2/85**

Report on the accident to Aerospatiale Puma 330J G-BJWS at Aberdeen Airport on 10 October 1982.

Price £5.40

### **AAR 3/85**

Report on the accident to SA 318B Alouette Astazou G-AWAP at Gat Sand, the Wash on 26 June 1983.

Price £3.50