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Air Accidents Investigation Branch

THE DEPARTMENT OF TRANSPORT

AAIB Bulletin 12/90

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No: 12/90 **Ref: EW/G90/07/37** **Category: 1a**

Aircraft Type and Registration:	McDonnell Douglas DC-9-32, G-PKBM
No & Type of Engines:	2 Pratt & Whitney JT8D-15 turbofan engines
Year of Manufacture:	1974
Date and Time (UTC):	9 July 1990 at approximately 1505 hrs
Location:	Over Stockton-on-Tees, Cleveland
Type of Flight:	Public Transport
Persons on Board:	Crew - 2 Passengers - (Not reported)
Injuries:	Crew - None Passengers - None
Nature of Damage:	Left outer landing gear door detached; minor damage to left main flap
Commander's Licence:	Airline Transport Pilot's Licence
Commander's Age:	40 years
Commander's Total Flying Experience:	4,509 hours (of which 1,669 were on type)
Information Source:	Aircraft Accident Report Form submitted by the pilot

Circumstances

The aircraft was climbing through FL130 en route from London Heathrow to Teesside when, in the area of Brookmans Park, a slight vibration was noticed as the aircraft accelerated through 260 kt. No abnormal indications were observed on the flight deck other than vibration through the rudder pedals. The speed was increased to 280 kt, with no increase in the vibration level. A lower flight level than that planned was sought and obtained. After levelling-off at FL260 the speed was reduced to 250 kt. A moderate level of vibration was momentarily experienced during this deceleration. A direct route to Teesside was obtained and the vibration subsequently diminished during the remainder of the flight. The crew had discussed the possibility of a landing gear problem and decided to lower the gear a little earlier than normal. Light to moderate turbulence was experienced below 2500ft due to the gusty conditions. ATC were requested to visually inspect the aircraft during final approach and they reported that everything appeared normal. After an uneventful landing, it was found that the left outer landing gear door was missing. Later, the door was found in Stockton-on-Tees where it had struck three houses and damaged a motor car.

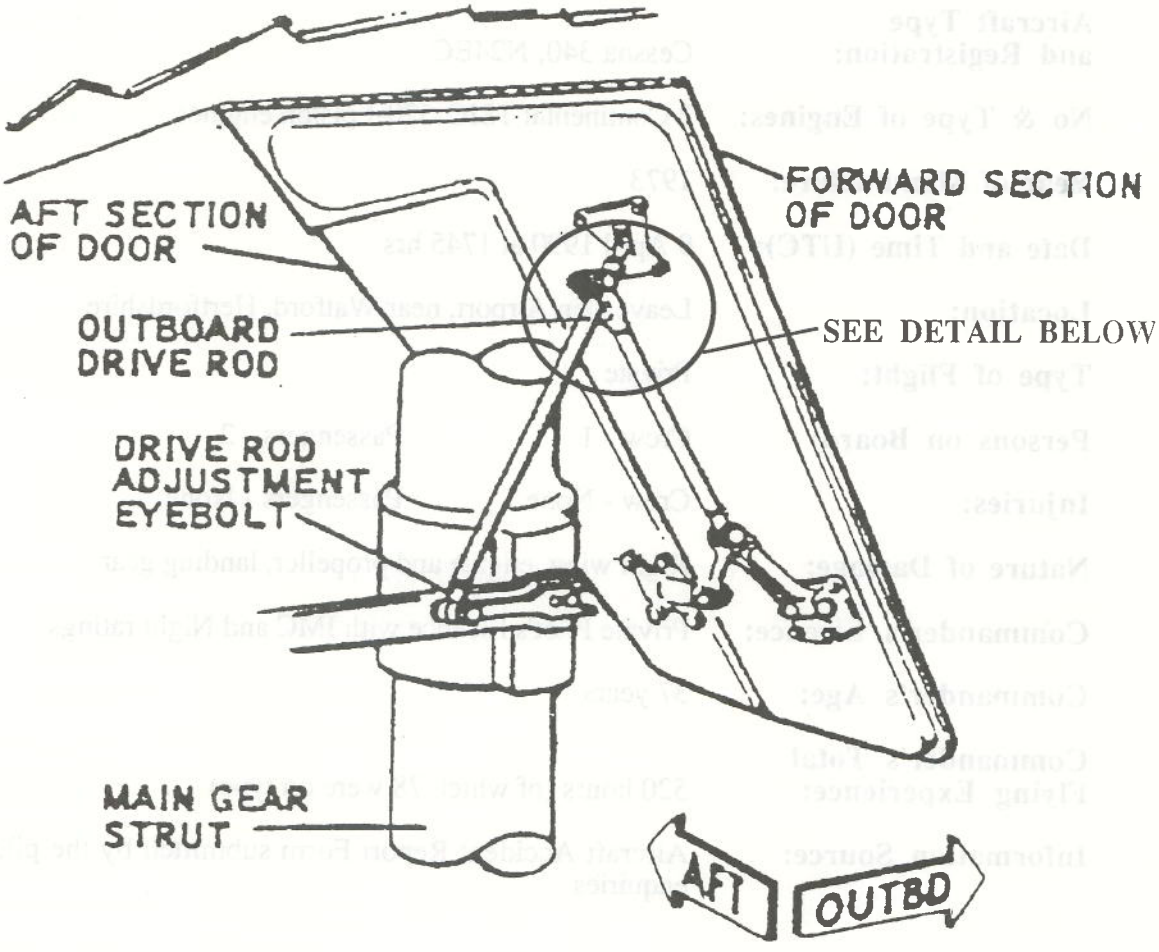
Examination of the aircraft

Inspection revealed that the main landing gear outboard door drive rod had become detached from the eye end fitting, but the latter had remained attached to the door assembly (see Figure). The securing nut and bolt that attached the end fitting to the rod was not found. Thus either the bolt had failed or the nut had come undone, allowing the bolt to fall out. The door had then failed its hinge atttachment and separated from the aircraft striking the left main flap as it fell away, causing a dent and puncturing the skin.

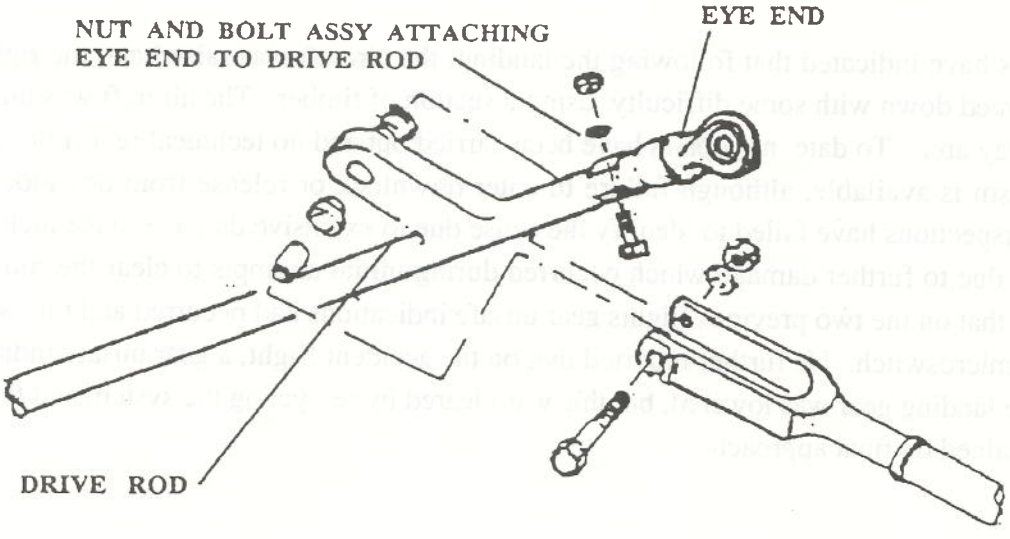
A more detailed examination revealed little evidence of lubrication on either the left or right landing gear linkages. However, there was no indication that lack of lubrication or linkage seizure had caused the problem. Furthermore, it was observed that there was no elongation of the mating holes on the drive rod or eye-end fitting, suggesting that no excessive load had been applied to the drive rod.

A fleet inspection of main landing gear door linkages revealed that differing types of bolt secured the eye-end fitting to the drive rod and that the orientation of the bolt also varied between aircraft. The correct orientation was 'head-down' in order to reduce the possibility of interference with the door fitting. It was then found that the Illustrated Parts Catalogue and the Overhaul Manual called up different bolt types. The advice of the aircraft manufacturer was therefore sought. Their response was that the correct configuration was an NAS 1404-12 pan-headed bolt installed head-down, although different bolts, albeit of the same strength, had been used on earlier installations. However, the same retaining nut, an NAS 679A4 locknut, was used regardless of the type of bolt. This was also the only joint on the door assembly which did not employ a castellated nut and split pin.

The aircraft manufacturer further stated that there had been 18 cases of the subject door becoming detached in flight, with the horizontal stabilizer having suffered severe damage in one instance. However only one, or possibly two, cases were ascribed to loose or mis-rigged linkages. The manufacturer plans to issue an Alert Service Bulletin (No. A32-244) calling for an inspection for cracks, corrosion and general security of these linkages. The FAA is considering mandatory action on this subject in the near future.



GEAR EXTENDED



DC9 MAIN LANDING GEAR DOOR ASSY DETAIL

No: 12/90 **Ref: EW/G90/04/19** **Category: 1b**

Aircraft Type and Registration:	Cessna 340, N24EC	
No & Type of Engines:	2 Continental TSIO-520-J piston engines	
Year of Manufacture:	1973	
Date and Time (UTC):	9 April 1990 at 1745 hrs	
Location:	Leavesden Airport, near Watford, Hertfordshire	
Type of Flight:	Private	
Persons on Board:	Crew - 1	Passengers - 2
Injuries:	Crew - None	Passengers - None
Nature of Damage:	Right wing, engine and propeller, landing gear	
Commander's Licence:	Private Pilot's Licence with IMC and Night ratings	
Commander's Age:	37 years	
Commander's Total Flying Experience:	520 hours (of which 78 were on type)	
Information Source:	Aircraft Accident Report Form submitted by the pilot and telephone enquiries	

The pilot reported that a normal landing was carried out. During brake application, the right main landing gear collapsed causing the right propeller to strike the runway, so stopping the engine. The aircraft came to rest on the grass at the right side of the runway. The left engine was shut down, fuel and electrical equipment were turned off and the aircraft was evacuated.

Enquiries have indicated that following the landing, the aircraft was raised and the right landing gear was jammed down with some difficulty, using a section of timber. The aircraft was then cleared from the runway area. To date no repairs have been carried out and no technical report on the landing gear mechanism is available, although failure to enter downlock or release from downlock is suspected. Visual inspections have failed to identify the cause due to extensive damage to the locking mechanism and also due to further damage which occurred during initial attempts to clear the runway. The pilot reported that on the two previous flights gear unsafe indications had occurred and this was attributed to a faulty microswitch. He further reported that on the accident flight, a gear unsafe indication occurred when the landing gear was lowered, but this was cleared by re-cycling the system and three green lights were obtained on final approach.

No: 12/90 **Ref: EW/G90/07/05** **Category: 1b**

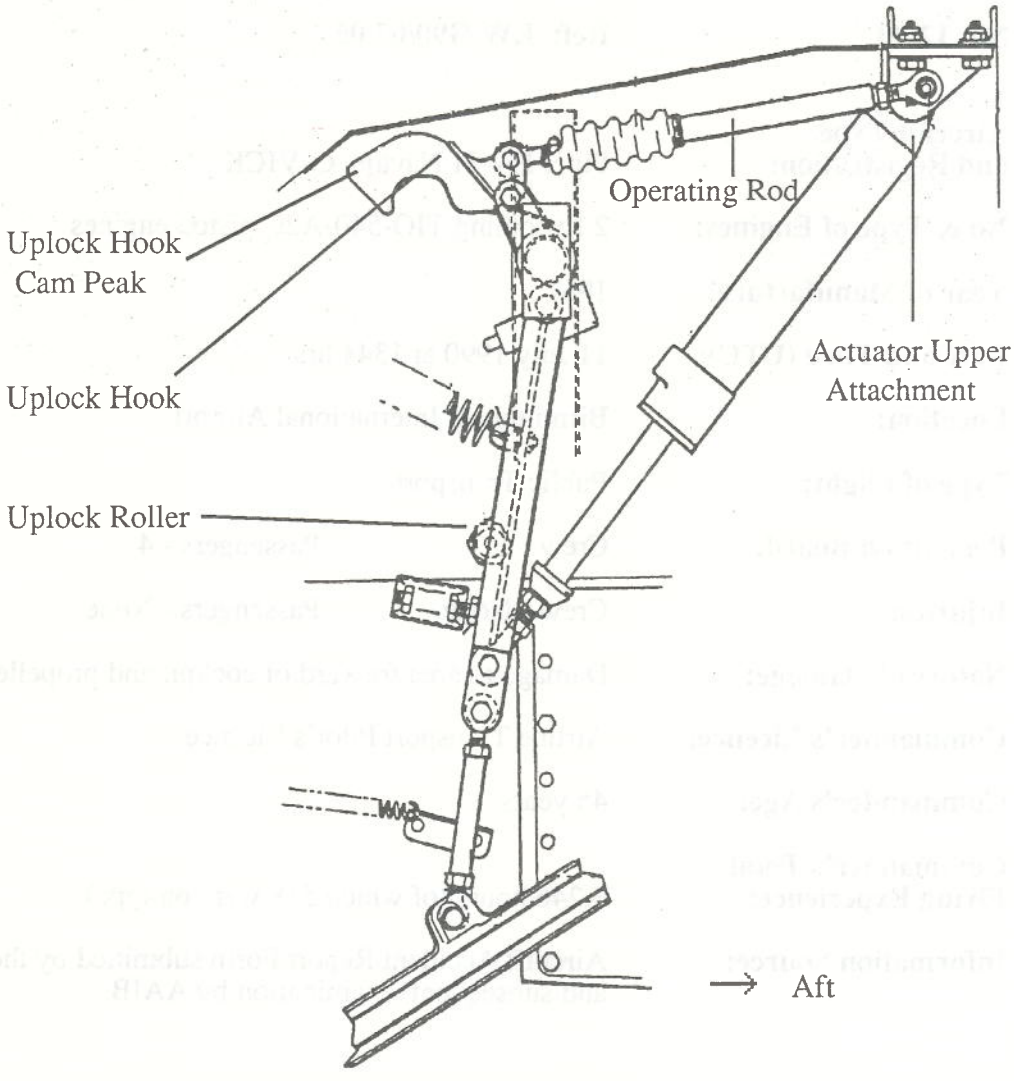
Aircraft Type and Registration:	Piper PA-31 Navajo, G-VICK
No & Type of Engines:	2 Lycoming TIO-540-A2C piston engines
Year of Manufacture:	1967
Date and Time (UTC):	11 July 1990 at 1344 hrs
Location:	Birmingham International Airport
Type of Flight:	Public Transport
Persons on Board:	Crew - 1 Passengers - 4
Injuries:	Crew - None Passengers - None
Nature of Damage:	Damage to area forward of cockpit and propeller tips
Commander's Licence:	Airline Transport Pilot's Licence
Commander's Age:	45 years
Commander's Total Flying Experience:	3,246 hours (of which 518 were on type)
Information Source:	Aircraft Accident Report Form submitted by the pilot and subsequent examination by AAIB

On the outward flight to Edinburgh the landing gear unsafe light remained on, but retraction noises and handling implied that the gear was stowed. The gear extended without trouble at Edinburgh, where the aircraft was jacked and the mechanism lubricated.

On the next flight the gear was retracted normally and the flight was uneventful until the gear was selected down on approach at Birmingham when the nose gear green light failed to illuminate and the gear unsafe light stayed on. A fly past was carried out and ATC advised that the nose wheel was still retracted. After some 25 minutes effort to lower the nose wheel the pilot made an unpowered landing with both two-bladed propellers feathered, and allowed the nose to fall onto the runway. Damage to the nose structure was caused primarily by vertical forces rather than by the effect of sliding along the runway.

The uplock hook is spring-loaded in the locked direction. On extension of the gear, the actuator upper attachment moves aft in a slot, thereby opening the hook by means of an operating rod. On gear retraction the uplock roller contacts a cam portion of the hook and rotates the hook nose up allowing the roller to enter the hook. This rotation of the hook is permitted by a telescopic action of the operating rod.

Examination showed that the welded lugs forming the support for the uplock hook pivot bolt were both distorted in a manner consistent with overload forces applied by uplock rod tension with rotation of the uplock hook restricted.



Nose Landing Gear Operation

The uplock operating rod was bent in two places, probably by overload forces applied during nose up rotation of the uplock hook beyond the point at which the uplock operating rod telescopic action bottomed out (under compression). There was also considerable play in the uplock hook pivot, with some elements found to be oval - again consistent with overload. Marking was found on the upper face of the uplock hook consistent with contact from the uplock roller nut.

After the damaged components had been replaced and the system rigged, the overall length of the operating rod was approximately 4 mm less than that of the original rod: this was equivalent to approximately 10° of uplock hook rotation in the closed direction, and 20 mm movement of the peak of the uplock hook cam.

The bending of the operating rod and the ovality of the hook pivot could have been caused by forces produced when the spring portion of the operating rod bottomed out because of its excessive length. Slop developing in the uplock hook pivot could eventually cause the roller to contact the uplock cam hook above the peak during retraction, allowing the roller nut to ride on the top face of the uplock hook, thereby preventing a subsequent nose gear extension.

A search of the SDAU database did not reveal any similar incidents.

No: 12/90 **Ref: EW/G90/08/25** **Category: 1c**

Aircraft Type and Registration:	Cessna 150F, G-ATHG	
No & Type of Engines:	1 Continental O-200-A piston engine	
Year of Manufacture:	1965	
Date and Time (UTC):	27 August 1990 at 1050 hrs	
Location:	Brough Airfield, Humberside	
Type of flight:	Private	
Persons on Board:	Crew - 1	Passengers - None
Injuries:	Crew - None	Passengers - N/A
Nature of Damage:	Damage to nose leg and propeller	
Commander's Licence:	Student Pilot	
Commander's Age:	29 years	
Commander's Total Flying Experience:	24 hours (all on type)	
Information Source:	Aircraft Accident Report Form submitted by the pilot	

The aircraft started its take-off roll on a grass strip and crossed a tarmac runway. The nose was felt to rise slightly and the nose wheel assembly detached from the aircraft, the nose then lowered and the nose leg dug into the grass, bringing the aircraft to rest.

The nose leg was found to be folded back under the aircraft and the damage was consistent with the nose wheel striking the edge of the tarmac runway.

No: 12/90 **Ref: EW/G90/10/07** **Category: 1c**

Aircraft Type and Registration:	Cessna 152, G-BMJC
No & Type of Engines:	1 Lycoming O-235-L2C piston engine
Year of Manufacture:	1981
Date and Time (UTC):	12 October 1990 at 1500 hrs
Location:	Cambridge Airport, Cambridgeshire
Type of flight:	Private
Persons on Board:	Crew - 1 Passengers - None
Injuries:	Crew - None Passengers - N/A
Nature of Damage:	Nose wheel leg bent, rudder bars and attachments damaged
Commander's Licence:	Private Pilot's Licence
Commander's Age:	50 years
Commander's Total Flying Experience:	52 hours (all on type)
Information Source:	Aircraft Accident Report Form submitted by the pilot

The aircraft touched down on the grass runway, bounced and re-landed heavily on the nose landing gear, which bent backwards. As the rudder bars had become disconnected from the nose wheel, the pilot was unable to taxi the aircraft clear of the runway. He completed the shut down drills and pulled the aircraft clear.

No: 12/90 **Ref: EW/G90/06/18** **Category: 1c**

Aircraft Type and Registration:	Cessna 152, G-BOHB
No & Type of Engines:	1 Lycoming O-235-L2C piston engine
Year of Manufacture:	1977
Date and Time (UTC):	12 June 1990 at 1017 hrs
Location:	Tattenhoe, near Bletchley, Buckinghamshire
Type of flight:	Private (training)
Persons on Board:	Crew - 2 Passengers - None
Injuries:	Crew - None Passengers - N/A
Nature of Damage:	Left wing heavily damaged, further damage to cowl, aft fuselage and tail. Nose leg collapsed
Commander's Licence:	Commercial Pilot's Licence with Instrument and Instructor ratings
Commander's Age:	32 years
Commander's Total Flying Experience:	1,416 hours (of which 200 were on type)
Information Source:	Aircraft Accident Report Form submitted by the pilot and metallurgical investigation by Materials and Structures Department, RAE Farnborough

The aircraft was being used on a dual instruction detail when "slight but unusual" engine vibration was felt. The instructor decided to cut the flight short and set course for Cranfield, informing Cranfield ATC of the situation. Over the next four or five minutes the vibration increased until there was a loud bang at which the instructor closed the throttle and completed the engine shutdown drill.

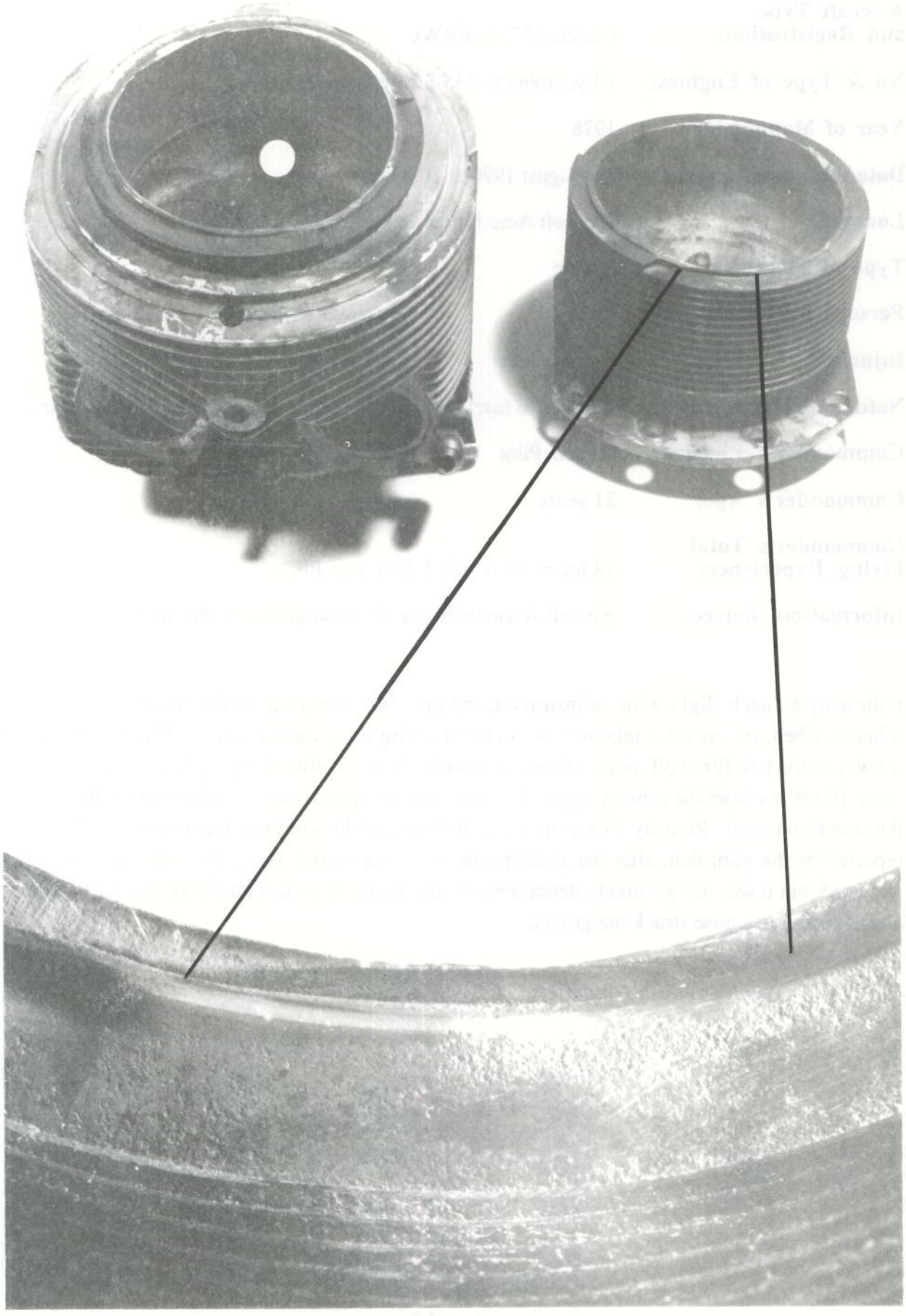
A forced landing was carried out from an altitude of 1500 feet, into wind (5 kt), and the aircraft touched down about half-way into a field which had a pronounced downslope. The aircraft ran to the far corner of the field where it collided with fences, hedges and trees. Although the airframe received substantial damage in these collisions the aircraft remainded upright, the cockpit structure remained intact and the crew emerged uninjured.

It was found that the engine's left hand rear cylinder had detached through a circumferential fracture in its skirt which had developed between two of the cooling fins. The failure was initially examined by a CAA Surveyor who consulted a metallurgist about the nature of the failure but it was subsequently despatched to AAIB for metallurgical examination at RAE Farnborough. Co-incidentally the CAA

became aware of a similar failure in another Lycoming O-235 engine (a series N2A from a Slingsby T67) and that cylinder was also received at Farnborough for examination.

The two cylinders had failed in fatigue and the failures were almost identical in location, initiation and development (cylinder from G-BOHB is shown in the photographs). The cylinder external surfaces had been protected by paint but this had largely disappeared from the barrel surface between the fins and the unprotected surfaces were corroded. Initiation had been from a single origin in an area of the external surface which was corroded and pitted. Staining from hot combustion gases was evident over about one third of the circumference of the fracture (this effect was less marked but slightly more extensive in the case of the other cylinder). This showed how far the crack had progressed before the final rapid rupture. There was no suggestion from the metallurgical examination of any material defect or deficiency.

G-BOHB FAILED ENGINE CYLINDER



AREA OF FATIGUE ORIGIN

No: 12/90 **Ref: EW/G90/08/14** **Category: 1c**

Aircraft Type and Registration:	Cessna 152, G-BRWC	
No & Type of Engines:	1 Lycoming O-235-L2C piston engine	
Year of Manufacture:	1978	
Date and Time (UTC):	29 August 1990 at 1050 hrs	
Location:	Sandtoft Aerodrome, Belton, South Yorkshire	
Type of Flight:	Private	
Persons on Board:	Crew - 1	Passengers - None
Injuries:	Crew - None	Passengers - N/A
Nature of Damage:	Damage to fuselage, propeller, wing tips and nose landing gear	
Commander's Licence:	Student Pilot	
Commander's Age:	21 years	
Commander's Total Flying Experience:	18 hours (of which 2.5 were as PIC)	
Information Source:	Aircraft Accident Report Form submitted by the pilot	

Following a check flight with an instructor, the pilot had continued to fly circuits solo for some 30 minutes when, on his third take-off, he reported losing directional control. The aircraft ran off the runway to the left, lifted off, but continued turning to the left before dropping heavily into a potato field some 10 metres from the runway edge. The pilot was uninjured and was able to make his escape from the aircraft unaided. Runway 23 was in use at the time and the wind was reported as 200°/12 kt. It was reported by the pilot that, after the accident, the left steering rod to the nose landing gear was found fractured, but it was not positively determined by maintenance personnel if this had occurred before or after the aircraft's nose struck the ground.

No: 12/90 **Ref: EW/G90/08/27** **Category: 1c**

Aircraft Type and Registration:	CFM Metal-Fax Streak Shadow S-A, G-STRK
No & Type of Engines:	1 Rotax 582 piston engine
Year of Manufacture:	1990
Date and Time (UTC):	14 August 1990 at 1520 hrs
Location:	Jurby Airfield, Isle of Man
Type of Flight:	Private
Persons on Board:	Crew - 1 Passengers - 1
Injuries:	Crew - None Passengers - None
Nature of Damage:	Left main landing gear collapsed and nose gear buckled - propeller destroyed - left side flap bent and small cuts in wing fabric
Commander's Licence:	Private Pilot's Licence
Commander's Age:	44 years
Commander's Total Flying Experience:	131 hours (of which 1 was on type)
Information Source:	Aircraft Accident Report Form submitted by the pilot

The pilot reports that, as the weather was CAVOK and the surface wind was 240°/10-12 knots with gusts to 14 knots, she decided to carry out some circuit practice. Runway 26 at Jurby aerodrome has a displaced threshold due to a public road which crosses the approach, and one of the pilot's concerns was to maintain a safe height whilst crossing the road.

On the first approach the pilot crossed the road at 300 feet, reduced power and commenced what she anticipated being a fairly long final approach for landing. As the aircraft was about 10 feet above the runway there was what she described as a 'sudden and very vicious gust' from which she had no time to recover. A heavy landing on the left main landing gear resulted. The aircraft then slid to a halt sustaining substantial damage. Both occupants, who had been wearing full restraint harnesses which held throughout, were able to release themselves from the wreckage without injury.

In a frank and detailed Aircraft Accident Report, the pilot considers that the cause of the accident was the presence of wind shear which was exacerbated by her own inexperience on type.

No: 12/90 **Ref: EW/G90/09/14** **Category: 1c**

Aircraft Type and Registration:	Gulfstream AA-5A, G-OMOG
No & Type of Engines:	1 Lycoming O-320-E2G piston engine
Year of Manufacture:	1978
Date and Time (UTC):	25 September 1990 at 1100 hrs
Location:	Compton Abbas Airfield, Wiltshire
Type of Flight:	Private
Persons on Board:	Crew - 1 Passengers - None
Injuries:	Crew - None Passengers - N/A
Nature of Damage:	Broken torque tube and damaged propeller
Commander's Licence:	Student pilot
Commander's Age:	40 years
Commander's Total Flying Experience:	55 hours (of which 19 were on type)
Information Source:	Aircraft Accident Report Form submitted by the pilot and additional telephone calls

The student pilot was on the first leg of his qualifying cross country. The speed at touch-down on the grass runway was rather high and the pilot reports that he kept the nose-wheel clear of the runway during the initial landing run. The aircraft then encountered an undulation in the runway and became airborne. The subsequent landing was nose wheel first which caused the nose landing gear to partially collapse allowing the propeller to contact the ground. The pilot was able to complete the landing run and shut down the aircraft clear of the runway.

No: 12/90 **Ref: EW/G90/08/29** **Category: 1c**

Aircraft Type and Registration:	Jodel D120A, G-BHNK
No & Type of Engines:	1 Rolls-Royce Continental C90-14F piston engine
Year of Manufacture:	1963
Date and Time (UTC):	11 August 1990 at 1435 hrs
Location:	Stapleford Tawney Airfield, Essex
Type of Flight:	Private
Persons on Board:	Crew - 1 Passengers - 1
Injuries:	Crew - serious Passengers - serious
Nature of Damage:	Engine and wings detached; cockpit disrupted
Commander's Licence:	Private Pilot's Licence with IMC rating
Commander's Age:	38 years
Commander's Total Flying Experience:	265 hours (of which 127 were on type)
Information Source:	Aircraft Accident Report Form submitted by the pilot

The pilot and his passenger took off from runway 22 with 60 kg of MOGAS on board to practice circuit flying. On initial climb out at about 300 ft agl and opposite some trees which were upwind of the climb out path, turbulence was encountered from which the aircraft quickly recovered. The next three circuits were uneventful. On the fifth circuit the aircraft was climbing at 75 kt and approximately 200 ft agl when the right wing dropped unexpectedly. The pilot attempted recovery by lowering the nose and turning away from the trees but the aircraft continued to behave as if stalled. At about 10-20 ft above the ground the pilot pulled the nose up in an attempt to land on the mainwheels but the left wing dropped and struck the ground whereupon the aircraft cartwheeled onto its nose. The engine, which had continued to run at full power until impact, detached from the fuselage and the aircraft came to rest vertically embedded into the ground. The pilot and his passenger, who were still in their full harnesses, ended up face down into the soil and required assistance to escape from the wreckage.

Both occupants suffered serious injuries. At the time of the accident the surface air temperature was 30° C; the wind was 290°/08kt and the weather was CAVOK. The Met Office at Bracknell have no record of any windshear or turbulence warnings for London FIR airfields valid at the time of the accident.

No: 12/90 **Ref: EW/G90/09/18** **Category: 1c**

Aircraft Type and Registration:	Maule MX-7-180, G-MORL
No & Type of Engines:	1 Lycoming O-360-C1F piston engine
Year of Manufacture:	1990
Date and Time (UTC):	29 September 1990 at 1510 hrs
Location:	Newcastle International Airport, Newcastle-upon-Tyne
Type of Flight:	Private
Persons on Board:	Crew - 1 Passengers - 1
Injuries:	Crew - None Passengers - None
Nature of Damage:	Substantial damage to left wing-tip, aileron and main landing gear
Commander's Licence:	Private Pilot's Licence with Night rating
Commander's Age:	43 years
Commander's Total Flying Experience:	138 hours (of which 3 were on type)
Information Source:	Aircraft Accident Report Form submitted by the pilot

The pilot reports that he intended to carry out a local flight from Newcasle Airport. When he received take-off clearance on runway 25 from ATC he was requested to 'expedite'. In complying with this request he lined the aircraft up to the left of the runway centre line and opened the throttle more quickly than usual. A swing to the left developed and the left main landing gear struck and destroyed a runway light. This tipped the aircraft further to the left resulting in the left wing-tip contacting the ground. After the aircraft was brought to a stop, the engine was shut down and both occupants disembarked without injury. The weather at the time was fine with a surface wind of 220°/5 knots.

No: 12/90 **Ref: EW/G90/10/04** **Category: 1c**

Aircraft Type and Registration:	Piper PA-28-140, G-AVWM
No & Type of Engines:	1 Lycoming O-320-E2A piston engine
Year of Manufacture:	1967
Date and Time (UTC):	14 October 1990 at 1202 hrs
Location:	Andrewsfield Airfield, Essex
Type of Flight:	Private
Persons on Board:	Crew - 1 Passengers - 1
Injuries:	Crew - None Passengers - None
Nature of Damage:	Nose landing gear leg bent; engine bearer broken; right underwing skin rippled behind main gear leg
Commander's Licence:	Private Pilot's Licence with Night rating
Commander's Age:	37 years
Commander's Total Flying Experience:	96 hours (of which 92 were on type)
Information Source:	Aircraft Accident Report Form submitted by the pilot and consequent AAIB enquiries

The surface wind was 210°/8 kt and the approach was to grass runway 27R. The pilot reported that, as the aircraft crossed the threshold, he retarded the throttle to what appeared to be the closed position. He noted that the friction nut was tight and that the engine speed had not reduced below 1100 rpm. The aircraft had started to climb when the power suddenly reduced to idle, which caused it to sink rapidly onto the runway and land heavily in an almost three-point attitude. The engine was shut down and the aircraft came to rest to the right of the runway. The occupants, who were wearing diagonal upper torso restraint, escaped without injury.

The maintenance organisation which carried out the post accident examination and subsequent repair of the aircraft was unable to identify any pre-existing fault with the engine or its associated controls.

No: 12/90 **Ref: EW/C1169** **Category: 1c**

Aircraft Type and Registration:	Piper PA-28-140 Cherokee, G-AYIH
No & Type of Engines:	1 Lycoming O-320-E2A piston engine
Year of Manufacture:	1970
Date and Time (UTC):	7 July 1990 at 1230 hrs
Location:	Cranfield Village, Bedfordshire
Type of flight:	Private
Persons on Board:	Crew - 1 Passengers - 2
Injuries:	Crew - 1 (Fatal) Passengers - 2 (Fatal)
Nature of Damage:	Forward fuselage and landing gear severely damaged, centre and rear fuselage and wings moderately damaged
Commander's Licence:	Private Pilot's Licence (Group A) with IMC and Night ratings
Commander's Age:	41 years
Commander's Total Flying Experience:	366 hours (of which 319 were on type)
Information Source:	AAIB Field Investigation

History of the flight

The accident occurred on the Saturday of the annual Popular Flying Association (PFA) rally at Cranfield. On the previous day the pilot completed fitting a drag reduction kit to G-AYIH, his own aircraft (see below). That evening he flew solo for 25 minutes before returning to his home base of Elstree where the aircraft fuel tanks were filled to full capacity with 100LL AVGAS.

On Saturday morning the pilot was asked by an acquaintance if he would fly him to Biggin Hill where the acquaintance was to collect another aeroplane. The pilot agreed and together they took off at 1047 hrs. En-route the flight progressed normally and they landed at Biggin Hill at 1111 hrs where the passenger disembarked. The pilot took-off again, alone, at 1127 hrs en-route for Blackbushe, where he intended to collect two friends and take them to Cranfield. Although the pilot was not a member of the PFA, he was aware of the requirement to land at Cranfield by 1230 hrs - an air display was due to start at 1300 hrs (1400 hrs local).

At about 1150 hrs the pilot called Blackbushe and requested joining instructions. After some initial difficulty in discriminating between Blackbushe and Farnborough (135°(M) / 3.7 nm from Blackbushe), he landed normally at Blackbushe at 1155 hrs. The pilot was instructed to taxi along the southern taxiway passing to the north of the refuelling pumps and to park on the main apron. He did not do so but remained on the southern taxiway, embarked his passengers with the engine running and then executed a wide left turn through 180° to face west back down the taxiway. He then requested departure. He was given instructions to taxi to the holding point for runway 26 and subsequently took-off normally at 1202 hrs. At the time of take-off the aircraft's weight was close to the maximum authorised weight and the centre of gravity was within limits.

A map recovered from the wreckage showed a direct track drawn between Blackbushe and Cranfield which passed through the north west corner of the Luton special rules zone. At 1213 hrs the pilot contacted Luton Approach; he gave his position as passing High Wycombe and requested VFR clearance through the corner of the zone at 2000 feet whilst transponding on code 4321. Clearance was given and at 1225:39 hrs the pilot reported "FIVE DME TO RUN TO CRANFIELD". He was warned of at least 15 contacts in the Cranfield overhead by the Luton Approach controller and instructed to contact Cranfield by radio which he did at 1227:05 hrs, stating his altitude as 2000 feet.

At Cranfield the wind was 260°/15 kt gusting to 25 kt and the visibility was 8 to 10 km. The surface temperature was 19°C and the cloud had lifted into broken strato-cumulus base 1800 feet tops 3000 feet with more scattered strato-cumulus between 5000 and 6000 feet. For the duration of the PFA rally, normal Air Traffic Control at Cranfield had been replaced by an AFIS. The pilot was informed "INDIA HOTEL LANDING RUNWAY TWO SIX LEFT HAND QFE ONE ZERO ZERO ONE". The pilot repeated this information and stated that he had the airfield in sight. The AFISO then replied "ROGER, KEEP A SHARP LOOKOUT FOR TRAFFIC". At 1228:23 hrs the pilot reported downwind and this was the last recorded radio transmission from the aircraft. There were between 10 and 20 aircraft in the circuit at the time and G-AYIH was seen by witnesses and on radar to join the circuit at the beginning of the downwind leg about one mile south of runway 26. The primary radar return from the aircraft faded as it turned left on to base leg at 1229:16 hrs. Eye witnesses reported that at this time there were between 6 and 12 aircraft established on final and long final approach. The pilot of G-AYIH turned on to base leg with the apparent intention of joining this stream at or about the number 4 to land position. The pilot of a Fuji aircraft at about 500 feet agl on finals, who believed he was number 4 to land, saw a Cherokee type aircraft approaching him on a collision course from his 10 o'clock; to him the aircraft appeared to be level or slightly high and under power, and his passenger saw the Cherokee's landing light flash. As the Fuji pilot was about to take avoiding action, the Cherokee turned right to pass behind the Fuji. This turn was observed by several witnesses who saw the Cherokee turn to face towards the remaining traffic on finals and then, almost immediately, reverse direction into a left turn through about 180° using approximately 60° angle of bank. On completion of this turn the Cherokee was north of the extended centreline and tracking towards the airfield at a height estimated to be between 100 and

300 feet. Several people saw the aircraft recover from the turn to an essentially wings-level attitude with small erratic oscillations in bank angle. Two witnesses thought they saw the aircraft's nose rise slightly before they and many other witnesses saw the nose and left wing drop almost simultaneously. Eye witnesses close to the crash site saw the aircraft spiral to the left in a 40° to 45° descent with between 60° and 90° of left bank and noticeable sideslip. Some witnesses heard an engine begin coughing and spluttering and some heard an engine increase from low power to a higher power setting before they and other witnesses heard an impact a few seconds later.

The aircraft crashed at approximately 1230 hrs with no injury to anyone on the ground. All three occupants suffered multiple injuries and were certified dead at the crash site by a medical practitioner. A postmortem examination of the occupants revealed nothing which contributed to the accident. The pilot's class three medical certificate was endorsed with the requirements to wear spectacles to correct distant vision and to carry spare spectacles. No positive evidence of corrective lenses was recovered from the wreckage but one pair of spectacle frames was recovered which could have contained corrective lenses.

Examination of Wreckage

Examination of the wreckage and the accident site showed that the landing gear of the aircraft had struck the upper parts of two 7-8 foot high greenhouses situated near the rear wall of a house in Cranfield Village. There followed a secondary impact of the left wing with a chain link fence, before the fuselage nose suffered major impact with the corner of a brick-built single storey conservatory, near to ground level. At initial impact the aircraft was heading approximately 185°M on a flight path descending at around 15° to the horizontal, whilst essentially level in pitch and rolled around 10° left. Forward speed was estimated at 40-50 kt.

The left wing impact caused the aircraft to yaw sharply left and it came to rest erect on a heading of 150°M around 3.5 metres beyond the initial impact point, with the nose embedded 1.3 metres into the demolished lower corner of the building. The forward fuselage suffered longitudinal crushing damage back to the area of the rudder pedals. The remainder of the fuselage sustained deformation in some areas, but was not grossly damaged and the empennage was virtually unmarked. There was no structural incursion into the cabin space except to some degree in the instrument panel and rudder pedal areas. Both wings remained attached to the fuselage. The left wing sustained localised leading edge damage and this caused significant rupture of the left wing fuel tank and major fuel release. The right wing did not suffer gross damage, but the right fuel tank water drain valve protruding from the undersurface of the wing was forced and held open by impact damage, resulting in release of most of the gasoline in the tank. There was no fire.

It was not possible to establish the history of the aircraft and its maintenance status as the Aircraft and Engine Log Books could not be located. The aircraft had valid Certificates of

Airworthiness (Private Category), Registration and Approval of Aircraft Radio Installation. The pilot at the time of the accident was the registered owner.

Detailed inspection of the aircraft included examination of the structure, the seats and seat belts, the flying control system, the instrumentation and the fuel system, and strip examination of the engine. No evidence of pre-impact defect or malfunction of the structure or engine was found, and analysis of samples of fuel and engine oil from the aircraft by the Ministry of Defence Directorate General of Defence Quality Assurance, Woolwich, showed that both were consistent with approved specification requirements. Markings indicated that the propeller was rotating at the time that the aircraft struck the greenhouses. The evidence indicated that the powerplant was not delivering high power at impact but this could not be quantified, given the nature of the impacts. A placard on the instrument panel cautioned "Do not open the throttle rapidly (idle to full throttle in 2 seconds minimum)".

The evidence indicated that all parts of the flying control system had been connected at the time of the accident, and no evidence of a control restriction or jam were found, although such a possibility could not be totally dismissed, given the degree of disruption in some areas. The evidence indicated that wing flaps were in the retracted position at the time of impact.

It was found that the stall warning detector microswitch was intermittent in operation. Strip examination revealed that this was the result of slight corrosion on the contacts, and the evidence suggested that this may well have been present at the time of the accident. The switch was designed to be operated by a small vane located in the leading edge of the left wing when the airflow around the wing approached the aerodynamic stalled condition and thereby caused the vane to pivot upwards. Switch operation completed an electrical circuit that illuminated a small red warning light on the instrument panel, however, the system on this aircraft model did not include an audio warning, as commonly fitted to many similar aircraft.

It was also found that the aircraft was fitted with an aerodynamic drag reduction kit. It comprised, for each wing, a 2½ inch wide curved aluminium strip fastened chordwise to the upper and lower wing surfaces to cover the inboard and outboard attachments for the wing fuel tank; shaped fairings covering the three flap hinges beneath the wing lower surface; a 2 inch wide thin aluminium sheet pop-riveted to the wing undersurface and covering the gap between the flap and the wing undersurface; and a similar 4 inch wide sheet covering the gap between the aileron and the wing undersurface. The flaps on this aircraft model are of the single slotted type and the ailerons of the frise type. The kit was reportedly supplied by Laminar Flow Systems Inc., St Thomas, Virgin Islands and fitted by the aircraft owner during the week preceding the accident. It was approved for installation on United States registered aircraft of this type under a Federal Aviation Administration (FAA) Supplemental Type Certificate (STC). Application has reportedly not been made for CAA approval for the kit for G-AYIH or for any other UK registered aircraft. A Certificate of Release to Service issued by the holder of an Aircraft Maintenance Engineer's Licence is required (Air Navigation Order, Article 11) before flying

after making a modification such as the drag reduction kit. Reportedly, the owner's intention was to fit additional drag reduction fairings, to the landing gear, when the aircraft was on jacks at an approved maintenance organisation for its Annual Inspection, due shortly after the accident. After this, a CAA Surveyor was to be asked to inspect the modifications to determine whether the CAA would categorise them as Minor or a Major Modifications and to establish the details of the flight testing required. The effect of the drag reduction kit modifications on the aircraft's pre-and post-stall behaviour could not be documented precisely but it is unlikely that their effect on the stall speed and characteristics would have been significant.

The two forward seats distorted, but remained attached to the floor rails, and the rear seats were undamaged. Forward seat belts each comprised a two-piece lap strap, fastened by a buckle, and an inertial reel diagonal shoulder strap. The shoulder strap terminated in a steel attachment fitting with a keyhole slot which could be clipped to a shouldered spigot (or post) forming part of the buckle (Fig 1). Lap straps and the diagonal strap inertial reel were anchored directly to the aircraft structure. Both sets of belts remained intact and attached to the aircraft and there was no sign of distress or marking of the straps, buckles or anchorages indicative of either belt having been highly loaded. Checks indicated that both forward belts functioned correctly except that, for each set, the diagonal strap (Pacific Scientific Co. Part No. (PN) 0107116-9) tended to readily disengage from the lap strap buckle (American Safety Equipment Corp. Model 9600-22, PN 500567) unless under constant tension. With this method of diagonal strap attachment, the shouldered portion of the spigot is commonly fitted with an elastomeric bush which assists in retention of the diagonal strap fitting onto the spigot. Such bushes tend to wear out and detach after a period of use. No bush was present on either front seat buckle of G-AYIH. Information is awaited on whether the model of buckle fitted was required to be fitted with such a bush, and on whether the model of diagonal strap fitted was approved by CAA for use with the model of lap strap fitted.

CAA General Aviation Safety Information Leaflet (GASIL) 10/90 (Engineers' Supplement, page f) describes a method of renewing such buckle bushes, proposed by a member of the USA Cessna Pilots' Association, using soft clear plastic automotive fuel hose. No information has been found to suggest that there is a CAA approved repair scheme but further details are awaited from the CAA.

Autopsy evidence of the injuries to the front seat occupants, together with the lack of markings on them from diagonal shoulder strap restraint, suggested that the upper torso restraint of both front seat occupants had not been effective.

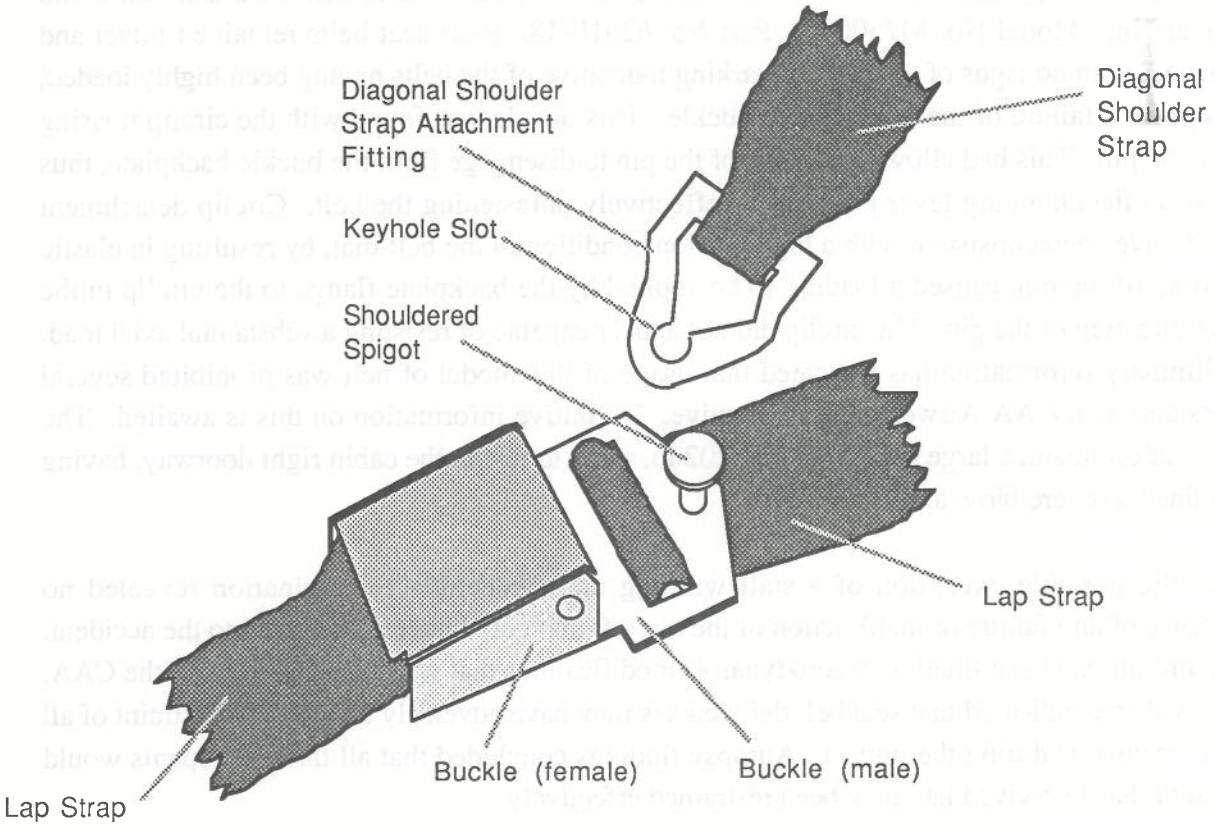
Rear seat belts each consisted of a two-piece webbing lap strap anchored to the aircraft structure. One of the straps passed through a metal buckle fastened to the end of the other strap, and could be clamped in the buckle by rotation of a clamping lever forming part of the buckle. The pivot for the clamping lever consisted of a 0.25 inch diameter pin located at either end in a hole in the flanges of the buckle backplate. Axial restraint of the pin in the back plate flanges was by means of a shoulder formed on one end of the pin and by a small circlip located in a shallow

circumferential groove formed near the other end. The belt assemblies were Cumming and Sanders Inc. Model No. M7500-S2, Part No. 62910-18. Rear seat belts remained intact and attached, with no signs of distress or marking indicative of the belts having been highly loaded, except for a failure of the left seat belt buckle. This buckle was found with the circlip missing from the pin. This had allowed one end of the pin to disengage from the buckle backplate, thus allowing the clamping lever to displace, effectively unfastening the belt. Circlip detachment could have been consistent with a high tension condition in the belt that, by resulting in elastic bending of the pin, caused a loading to be applied by the backplate flange to the circlip in the axial direction of the pin. The circlip did not appear capable of resisting a substantial axial load. Preliminary information has indicated that usage of this model of belt was prohibited several years ago by a CAA Airworthiness Directive. Definitive information on this is awaited. The rear seat occupant, a large man weighing 202 lb, came to rest in the cabin right doorway, having sustained a severe blow to the chin.

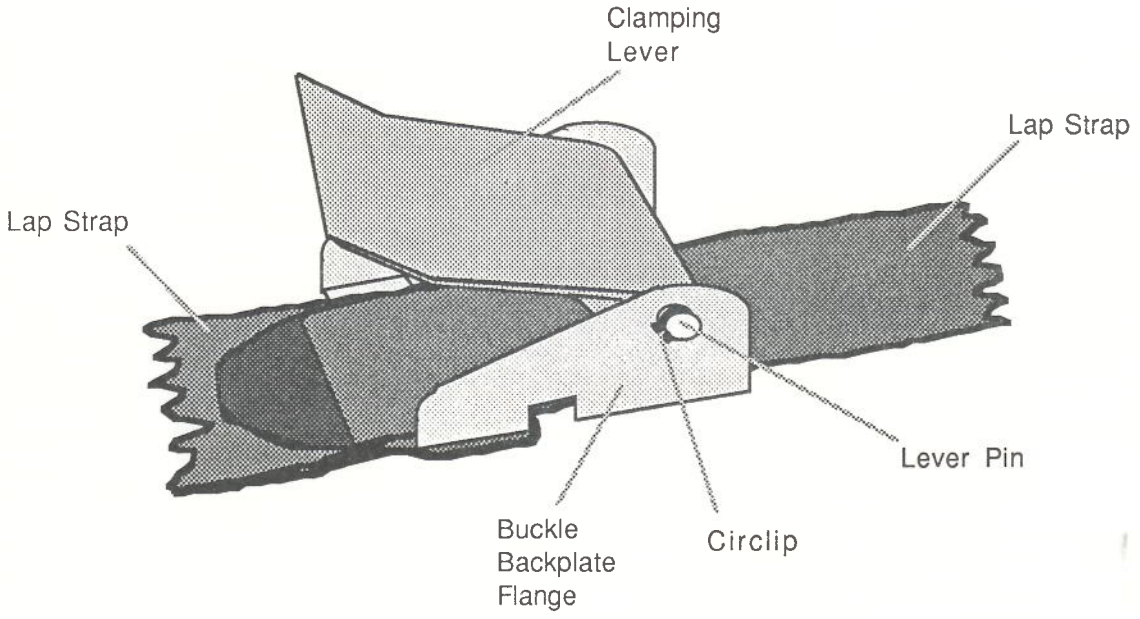
With the possible exception of a stall warning unserviceability, examination revealed no evidence of any failure or malfunction of the aircraft that could have contributed to the accident. The aircraft had been fitted with aerodynamic modifications that were not approved by the CAA. The evidence indicated that seat belt deficiencies may have adversely effected the restraint of all three occupants during the impact. Autopsy findings concluded that all three occupants would probably have survived had they been restrained effectively.

A number of recommendations are under consideration, but further information is awaited from the CAA before they are finalised.

SEAT BELT SCHEMATICS



FRONT SEAT BELT



REAR SEAT BELT

FIG 1

No: 12/90 **Ref: EW/G90/09/10** **Category: 1c**

Aircraft Type and Registration:	Piper PA-28-160, G-ARVW	
No & Type of Engines:	1 Lycoming O-320-B2B piston engine	
Year of Manufacture:	1962	
Date and Time (UTC):	26 September 1990 at 1010 hrs	
Location:	Bodmin Airfield, Cornwall	
Type of Flight:	Private	
Persons on Board:	Crew - 1	Passengers - 2
Injuries:	Crew - None	Passengers - None
Nature of Damage:	Substantial damage to the whole aircraft	
Commander's Licence:	Private Pilot's Licence	
Commander's Age:	43 years	
Commander's Total Flying Experience:	73 hours (of which 32 were on type)	
Information Source:	Aircraft Accident Report Form submitted by the pilot	

When the pilot started the aircraft engine, there was a small 'clang' noise and investigation revealed that the aircraft's tow bar, which had inadvertently been left attached to the nose wheel, had fallen off one of the wheel lugs. In the pilot's opinion, this partial disconnection accounted for the clang. Nevertheless, the towing arm, which he then stowed in the aircraft, displayed a half-diameter crease which matched minor abrasions of the propeller tips.

Runway 03, used for the take-off, has a grass surface and is 480 metres long with a 1:20 up gradient for the first half and a down gradient of similar magnitude for the second. The wind was variable at less than 5 kt, the temperature was 16°C and there was a slight dew remaining on the grass. The aircraft weight was estimated by the pilot as 2162 lb, some 38 lb below the MTWA.

During take-off, although the nosewheel lifted at the expected time, the aircraft would not accelerate above 58 kt and, at a point about 140 metres from the end of the runway, the take-off was discontinued and the brakes were applied. The pilot states that the braking action was very poor and that this, assisted by the downslope, caused the aircraft to overrun the end of the runway and pass through some brambles, a wire fence and over a 10 foot drop beyond the overrun area before coming to rest.

All the safety restraint harnesses withstood the impact forces, there was no fire and, when the pilot had shut down the aircraft systems, the occupants vacated the aircraft through the forward door.

No: 12/90 **Ref: EW/G90/10/11** **Category: 1c**

Aircraft Type and Registration:	Piper PA-28-161, G-BRBA
No & Type of Engines:	1 Lycoming O-320-D3G piston engine
Year of Manufacture:	1979
Date and Time (UTC):	23 October 1990 at 1735 hrs
Location:	Goodwood (Chichester) Airfield, Sussex
Type of Flight:	Private
Persons on Board:	Crew - 1 Passengers - None
Injuries:	Crew - None Passengers - N/A
Nature of Damage:	Minor damage to propeller
Commander's Licence:	Student Pilot
Commander's Age:	29 years
Commander's Total Flying Experience:	116 hours (all on type)
Information Source:	Aircraft Accident Report Form submitted by the pilot

The pilot was briefed for a solo night exercise as part of a course leading to the issue of a Commercial Pilot's Licence. The taxi path to the in-use grass runway was along an out-of-use grass runway marked by glim lamps and reflective markers. On approaching the holding point, the pilot turned his aircraft to the right to position for his power check. As he did so, he realised that he was moving away from the lighted area and continued the turn to regain the runway. The nose of the aircraft dipped and the pilot heard a scraping noise as the aircraft stopped. The pilot increased power but the aircraft failed to move. The aircraft had taxied onto a field of newly sprouted crop adjacent to the manoeuvring area which, by the light of the taxi light, was indistinguishable from the prepared surface of the airfield. The nose wheel had sunk into the soft ground and allowed the propeller to penetrate several inches below the surface.

No: 12/90 **Ref: EW/G90/08/26** **Category: 1c**

Aircraft Type and Registration:	Piper PA-28-181, G-BRME
No & Type of Engines:	1 Lycoming O-360-A4M piston engine
Year of Manufacture:	1977
Date and Time (UTC):	27 August 1990 at 1950 hrs
Location:	Near Portaferry, Northern Ireland
Type of Flight:	Private
Persons on Board:	Crew - 1 Passengers - None
Injuries:	Crew - None Passengers - N/A
Nature of Damage:	Minor damage to both mainplanes
Commander's Licence:	Commercial Pilot's Licence and Airline Transport Pilot's Licence (H)
Commander's Age:	32 years
Commander's Total Flying Experience:	250 hours fixed wing (of which 30 were on type) and 1,865 hours rotary wing
Information Source:	Aircraft Accident Report Form submitted by the pilot

The aircraft departed Liverpool at 1845 hrs on the last sector of a flight to Belfast, Aldergrove Airport. The Airfield Approach Checklist was completed shortly before the descent and the pilot noted that there were 15 US gall in the right wing tank and 10 US gall in the left; the fuel selector was to the right tank.

Descent, from a cruising altitude of 2000 feet, was initiated as the coast was crossed north of Portaferry. The pilot reported that he believed that the carburetor heat control had been selected to HOT throughout the descent. As the aircraft passed 1000 feet it was selected to COLD and power was applied to arrest the rate of descent. The rpm increased slightly but the engine failed to respond to further throttle movement and subsequently stopped. The magneto switch was confirmed on BOTH, the fuel pump was selected on, the mixture lever was set fully forward and the fuel selector was changed to the left tank. Again the engine failed to respond, even when the carburetor heat control was subsequently selected to HOT.

By 700 feet a field had been selected for the forced landing and a brief distress message had been transmitted. The detail of the selected landing area was not discernible at this time and it was not until the later stage that the pilot became aware of a small hill in his approach path. The necessary detour around this caused the pilot to omit the pre-crash vital actions.

A landing was made, with no flap selected, on an up slope, into an estimated 10 kt head wind. The aircraft sustained minor damage as it went through a wire strand type boundary fence in the touchdown area, but the landing was otherwise uneventful. After he had completed the relevant vital actions, the pilot, who was wearing diagonal type upper torso restraint, escaped without injury.

Before the aircraft was moved from the site, a successful engine run was carried out by the maintenance organisation.

Information obtained from the Meteorological Office at Bracknell indicated that, over the period of the accident, the following height/temperature profile existed;

Height	Temp	Dew Point
2000 feet	13°C	10°C
1000 feet	15°C	12°C
Surface	17°C	16°C

These conditions would have been conducive to the formation of serious carburetor icing.

No: 12/90 **Ref: EW/G90/09/11** **Category: 1c**

Aircraft Type and Registration:	Piper PA-34-220T, G-BLYK
No & Type of Engines:	2 Teledyne Continental piston engines, TSIO-360-KB2 (left) LTSIO-360-KB2 (right)
Year of Manufacture:	1984
Date and Time (UTC):	26 September 1990 at 1245 hrs
Location:	Southampton Airport, Eastleigh, Hampshire
Type of Flight:	Training
Persons on Board:	Crew - 2 Passengers - None
Injuries:	Crew - None Passengers - N/A
Nature of Damage:	Damage to underside of fuselage, left flap, propellers and nose landing gear doors
Commander's Licence:	Commercial Pilot's Licence with IMC and Instructor ratings
Commander's Age:	42 years
Commander's Total Flying Experience:	1,473 hours (of which 452 were on type)
Information Source:	Aircraft Accident Report Form submitted by the pilot and enquiries with ATC authorities, an engineering organisation and the Airport Authorities

The aircraft was being used in a training detail and the accident occurred whilst landing after conducting some upper air work in the area to the east of the Isle of Wight. The instructor stated that after being cleared for a straight-in approach to runway 02 they carried out their pre-landing checks and commenced a descent from 1500 feet. Whilst descending at 140 kt, the instructor suggested to the student that he should lower 1st stage flap, which the student then selected. At 130 kt the student moved the landing gear selector lever out of its detent to "down". The instructor saw the gear-in-transit lights and announced "3 greens" when the three green (landing gear down-and-locked) lights illuminated. At 500 feet, "3 greens" were confirmed. There was no call that contained any reference to the condition of the landing gear on the recording of the ATC frequency. The student rounded out at 80 kt, closed the throttles and held the aircraft off the runway. The main landing gears appeared to touch very lightly but the aircraft then settled onto the runway on its underside. The instructor stated that no landing gear warning horn was heard, but he thought that the stall warning horn had possibly sounded as the aircraft touched down.

When the aircraft was lifted from the runway, the 3 landing gears were observed to be in their retracted and locked positions. The aircraft's landing gear was extended and locked using the normal aircraft systems.

Examination of the aircraft revealed that the first contact with the runway had been with the landing gear fully retracted and full flap deployed. To date, no detailed examination of the landing gear extension and retraction system has been undertaken.

It was noted that a very similar accident occurred to this aircraft at the same airfield on 13 June 1989 (AAIB Bulletin 10/89).

No: 12/90	**Ref: EW/G90/09/05**	**Category: 1c**
Aircraft Type and Registration:	Piper PA-34-220T, G-DARA	
No & Type of Engines:	2 Continental TSIO-360-KB1 piston engines	
Year of Manufacture:	1983	
Date and Time (UTC):	18 September 1990 at 1200 hrs	
Location:	Oxford (Kidlington) Airport	
Type of Flight:	Private	
Persons on Board:	Crew - 1	Passengers - 1
Injuries:	Crew - None	Passengers - None
Nature of Damage:	Severe	
Commander's Licence:	Private Pilot's Licence with IMC rating	
Commander's Age:	52 years	
Commander's Total Flying Experience:	302 hours (of which 140 were on type)	
Information Source:	Aircraft Accident Report Form submitted by the pilot and AAIB examination of the aircraft.	

The aircraft was flown from Sturgate Airfield to Oxford Airport where an approach was flown to Runway 27. This is a grass runway with a landing distance available of 884 metres, paralleled on its northern side by another grass runway, Relief Runway 27. Runway 27 was provided with a PAPI and with edge lighting which was illuminated at the time of the accident. The reported wind was approximately 10-20 kt from 240°M, the cloud base was 2000 feet agl and visibility was good.

The pilot reported that after a normal final approach with full flap, throttles fully retarded and propeller levers at fine pitch, the aircraft suddenly veered sharply right, when at about 15 feet over the runway threshold. Pressure on the left rudder pedal did not correct the deviation and the aircraft landed on its right mainwheel on the right edge of the runway while heading 40-50° right of the runway direction. The aircraft bounced from the right mainwheel to the left mainwheel and then onto the nosewheel. From the ATC tower, the aircraft had been seen to apparently pitch up when around 6 feet agl and then to drop to the ground.

Examination of the aircraft showed that both wings had distorted, with skins wrinkled and rivets sheared; the right wing nacelle had nodded several degrees nose down; the tip of each of the three

propeller blades on both engines had been bent backwards; and the nose landing gear support structure had been damaged. Inspection during aircraft disassembly by the repairers found that rudder cable tension was slightly low, consistent with the effects of the nose landing gear support structure damage. No evidence was found of a pre-accident defect that could have affected control of the aircraft.

Approximately 8-9 flying hours before the accident the aircraft had suffered damage to the nose landing gear and propeller tips when the pilot landed at Biarritz Airport, France. After rectification, the aircraft had been flown back to the UK and had subsequently made seven flights, mainly for test purposes. Apart from an auto-pilot problem, possibly related to an electrical defect, there were no reports of aircraft handling difficulties during these flights.

No: 12/90 **Ref: EW/G90/08/24** **Category: 1c**

Aircraft Type and Registration:	Piper PA-38-112, G-BGZJ
No & Type of Engines:	1 Lycoming O-235-L2C piston engine
Year of Manufacture:	1979
Date and Time (UTC):	5 August 1990 at 1026 hrs
Location:	Cambridge Airport, Cambridgeshire
Type of Flight:	Private
Persons on Board:	Crew - 1 Passengers - None
Injuries:	Crew - None Passengers - N/A
Nature of Damage:	Damage to right mainplane
Commander's Licence:	Student Pilot
Commander's Age:	38 years
Commander's Total Flying Experience:	75 hours (of which 40 were on type)
Information Source:	Aircraft Accident Report Form submitted by the pilot

The holding point for runway 31 was marked by a day-glo marker. A chequered runway control vehicle was located on the downwind side of this marker. The aircraft was stopped on the grass beside the runway control vehicle. When the pilot was advised to be ready for immediate departure he attempted to pass between the marker and the vehicle and, whilst he observed other aircraft on the approach, the left wingtip of his aircraft hit the vehicle. The aircraft swung to the left and hit the vehicle again before stopping.

No: 12/90 **Ref: EW/G90/10/10** **Category: 1c**

Aircraft Type and Registration:	Piper PA-46-310P, G-BPZF
No & Type of Engines:	1 Continental TSIO-520-BE1 piston engine
Year of Manufacture:	1984
Date and Time (UTC):	20 October 1990 at 1426 hrs
Location:	Fairoaks Airport, Surrey
Type of Flight:	Private
Persons on Board:	Crew - 1 Passengers - 1
Injuries:	Crew - None Passengers - None
Nature of Damage:	Propeller tips and lower engine cowlings
Commander's Licence:	Private Pilot's Licence
Commander's Age:	44 years
Commander's Total Flying Experience:	1,310 hours (of which 10 were on type)
Information Source:	Aircraft Accident Report Form submitted by the pilot

Following a flight that originated from Blackbushe the pilot reports that he intended to carry out a practice short field landing on runway 06 at Fairoaks aerodrome. The declared landing distance available on that runway is 728 metres. Cockpit checks were completed and, to the best of his recollection, the pilot selected the landing gear lever fully down. The approach and landing were considered to be normal and moderately heavy braking was used to assess the stopping distance. The aircraft was then 'cleaned up' and taxied off the runway.

Shortly after entering the taxi-way, and whilst at a speed described as walking pace, the hydraulic pump warning light illuminated and the nose landing gear retracted. The propeller contacted the hard surface, and the engine was immediately shut down as the aircraft came to a halt. After the incident the pilot reports noticing that the landing gear selector was resting about ¼ inch above its lower stop, although there is no doubt that the landing gear was fully down during the landing. Further investigation is being carried out.

No: 12/90 **Ref: EW/G90/10/01** **Category: 1c**

Aircraft Type and Registration:	(1) Porterfield CP50, G-AFZL (2) Piper PA-28-140, G-AVLF
No & Type of Engines:	(1) 1 Continental A50-5 piston engine (2) 1 Lycoming O-320-E2A piston engine
Year of Manufacture:	(1) 1939 (2) 1967
Date and Time (UTC):	4 October 1990 at 1445 hrs
Location:	White Waltham Airfield, Berkshire
Type of Flight:	Private
Persons on Board:	Crew - None Passengers - None
Injuries:	Crew - N/A Passengers - N/A
Nature of Damage:	(1) Propeller destroyed, engine cowlings and engine bearer damaged and right wing-tip bent (2) Windscreen broken and engine cowlings damaged
Commander's Licence:	Private Pilot's Licence
Commander's Age:	59 years
Commander's Total Flying Experience:	174 hours (of which 49 were on type)
Information Source:	Aircraft Accident Report Form submitted by the pilot

The pilot of G-AFZL reports that, after a local flight from White Waltham, he taxied to the fuel pumps to refuel. When this was completed he requested the refueller to swing the propeller to re-start the engine. The refueller had little experience in swinging propellers and the pilot decided to do it himself. It took six or seven attemps to start the engine, and it was necessary to put the ignition switches off twice and reset the propeller before trying again. When the engine did start it seemed to take up the normal idle power, however as the pilot walked from the front of the aircraft towards the right wing he reports that the engine power appeared suddenly to increase. He tried to get to the entry door to operate the throttle and in doing so grabbed the right wing strut. This caused the aircraft to turn to the right when it over-rode the wheel chocks and started to move forward. The pilot tried to pull harder on the wing strut but unfortunately he stumbled and fell. The aircraft continued moving forward until it collided with the parked PA 28. Both aircraft were unoccupied.

No: 12/90 **Ref: EW/G90/10/06** **Category: 1c**

Aircraft Type and Registration:	Reims Cessna FA152, G-MPBH
No & Type of Engines:	1 Lycoming O-235-L2C piston engine
Year of Manufacture:	1981
Date and Time (UTC):	13 October 1990 at 1505 hrs
Location:	Compton Abbas Airfield, Wiltshire
Type of Flight:	Private
Persons on Board:	Crew - 2 Passengers - None
Injuries:	Crew - None Passengers - N/A
Nature of Damage:	Nose landing gear collapsed - propeller bent and engine shock loaded
Commander's Licence:	Private Pilot's Licence
Commander's Age:	58 years
Commander's Total Flying Experience:	134 hours (all on type)
Information Source:	Aircraft Accident Report Form submitted by the pilot

The aircraft was on a flight from Biggin Hill to Compton Abbas. The handling pilot reports that after an uneventful cross-country flight he joined the circuit at Compton Abbas on the base leg for runway 08. He was advised to land one quarter of the way down the runway due to turbulence. The Landing Distance Available on this runway is 803 metres. Bearing in mind the warning of turbulence, the pilot decided to keep the base leg "tight" and turned onto the final approach at about 450 feet above the airfield level. As the aircraft reached the aiming point, at an airspeed of 45 to 50 knots, the pilot reduced the power to idle. Initial contact was firm and the aircraft bounced. On the second contact the nose landing gear collapsed and the aircraft slid to a halt. Both pilots were wearing full restraint harnesses which held and, having made the switches safe, they vacated the aircraft without injury. The weather at the time was fine with a surface wind of 150°/10 knots.

No: 12/90 **Ref: EW/G90/07/17** **Category: 1c**

Aircraft Type and Registration:	Reims Cessna F150M, G-BEXS
No & Type of Engines:	1 Rolls-Royce Continental O-200-A piston engine
Year of Manufacture:	1977
Date and Time (UTC):	25 July 1990 at 1410 hrs
Location:	Hollywell Wood Estate, Panshanger, Hertfordshire
Type of Flight:	Private
Persons on Board:	Crew - 1 Passengers - None
Injuries:	Crew - 1 (minor) Passengers - N/A
Nature of Damage:	Aircraft destroyed
Commander's Licence:	Private Pilot's Licence
Commander's Age:	40 years
Commander's Total Flying Experience:	77 hours (all on type)
Information Source:	Aircraft Accident Report Form submitted by the pilot, inquiries with numerous aviation organisations and limited engineering investigation by AAIB

After an uneventful take-off the pilot climbed the aircraft to a cruising altitude of 2000 feet. As the aircraft approached the southern edge of Hertford, the pilot felt vibration from the engine. He attempted to cure this vibration by use of carburettor heat and accelerating and decelerating the engine, but to no avail. The pilot noticed that during these attempts to cure the vibration, the aircraft was losing height. He therefore selected a suitable field, turned downwind and then checked the fuel, engine primer, magnetos, carburettor heat and mixture but the engine continued to vibrate and produced very little power. The pilot then shut down the engine and transmitted a Mayday call to Luton ATC. As the aircraft neared the ground the pilot noticed a movement in the field and decided to go for the next field, which looked reasonable. However, there was a ditch and fence surrounding this field. As the aircraft approached the ditch and fence, the pilot raised the nose of the aircraft to clear them. The pilot stated that the aircraft then "landed awkwardly" and was extensively damaged.

An initial engineering investigation was carried out by the operator's engineering organisation which found a partial failure of the propeller boss on the engine crankshaft. However detailed examination by the Materials Department of the Royal Aerospace Establishment showed that this failure had been caused by the ground impact of the aircraft. Further examination of the engine by AAIB at

Farnborough found that three out of the four exhaust valves, which were reasonably free within their working range, could only be removed from their cylinders by use of a hammer and drift. When the fourth exhaust valve, which was freely removed from its cylinder, was fitted in turn to the other three cylinders it could not be fitted without using excessive force. When the three exhaust valves that had to be forced from their cylinders were fitted in turn to the fourth cylinder, they were easily inserted and removed. The cylinder from which the exhaust valve was removed freely was a replacement whereas the other three cylinders were originally fitted when the engine was overhauled some 700 hours before the accident.

Continental Aircraft Engine Service Bulletin, No. M77-3, dated January 1977, entitled "Use of alternative aviation grade fuels in engines originally certified on 80/87, 91/96 and 100/130 grade fuels" warns about exhaust valve sticking:

"Exhaust valve sticking can result from lead salt (sulfated ash) accumulation in the lubricating oil. It is recommended that regular 50 hour oil changes be implemented to reduce such accumulation. A few stuck exhaust valves have been reported where examination of the cylinder assembly revealed an exhaust leak between the exhaust elbow flange and the exhaust port face. This condition created localized cylinder head overheating and subsequent exhaust valve and guide distress. The exhaust system should be inspected every 100 hours and leaks corrected prior to continued engine operational service".

No other fault was found within the engine, its systems or the airframe. A weather aftercast was obtained which indicated that there was a possibility of moderate carburettor icing at cruise power and serious carburettor icing at descent power.

No: 12/90 **Ref: EW/G90/09/17** **Category: 1c**

Aircraft Type and Registration:	Reims Cessna F172H, G-BFJV
No & Type of Engines:	1 Continental O-300-D piston engine
Year of Manufacture:	1968
Date and Time (UTC):	28 September 1990 at 1155 hrs
Location:	Sleap Aerodrome, Myddle, Shropshire
Type of flight:	Private
Persons on Board:	Crew - 1 Passengers - None
Injuries:	Crew - None Passengers - N/A
Nature of Damage:	Damage to both mainplanes, nose leg, propeller, engine cowling and firewall
Commander's Licence:	Private Pilot's Licence
Commander's Age:	Not known
Commander's Total Flying Experience:	195 hours (of which 48 were on type)
Information Source:	Aircraft Accident Report Form submitted by the pilot

Of the original three runways at Sleap Aerodrome only two remain in use and these are of reduced length. There are lengths of the original paved runways before each runway start and beyond each runway end. These areas are marked with diagonal crosses to signify that they are unfit for aircraft movement (refer to Rules of the Air, Rule 43). The perimeter taxiway is not licenced for use by aircraft and cannot be reached without passing a diagonal cross. The only approved taxiway is a short stub between the intersection of the runways and the parking area outside the clubhouse.

The aircraft touched down on runway 23, close to the intersection with runway 19, some 500 metres before the runway stop line. Because he was aware that another aircraft was landing behind him, the pilot taxied beyond the runway end, over the white cross and on for some 450 metres until he reached the end of the paved surface. He encountered no warning notice to indicate that the perimeter taxiway was not fit for aircraft use and, accordingly, turned left to taxi anti-clockwise to the clubhouse.

Soon after passing the original threshold of runway 01 he saw on his right side a concrete and brick vehicle inspection ramp. He moved to the left of the taxiway and the left wing struck two sections of angle iron that he had not seen against the background landscape. The aircraft swung rapidly to the left, the right wingtip struck the ground and the aircraft tipped on to its nose before settling back to a level attitude.

With his accident report the pilot sent to the AAIB a copy of the landing chart he used, which was a copy of the Jeppeson landing chart for Sleap dated 28 Jan 87. This chart showed the full length of all three original runways in solid black. Closer inspection showed that the chart was a modified version of an earlier chart. The white outlines of the out of use runway and the extensive sterile areas at the ends of the usable runways had been neatly shaded with black ink, which obscured the diagonal crosses shown on the chart and showed the runways starting and ending at the perimeter taxiway. The correct runway lengths of 802 metres and 745 metres were, however, shown and arrows indicated the beginnings and ends of the runways with their elevations. The current Jeppeson landing chart for Sleap, dated 30 Aug 89, correctly depicts the licenced runways. The pilot later stated that he interpreted white crosses on runways to indicate that the marked sections were not available for take-off and landing.

After further investigation it was recommended to the CAA that aerodrome information in the UK AIP should include warnings wherever taxiways are unfit for aircraft movement.

No: 12/90 **Ref: EW/G90/08/28** **Category: 1c**

Aircraft Type and Registration:	Replica Sopwith Triplane, G-PENY
No & Type of Engines:	1 Lycoming O-320-B1B piston engine
Year of Manufacture:	1988
Date and Time (UTC):	12 August 1990 at 1515 hrs
Location:	Northampton (Sywell) Aerodrome, Northamptonshire
Type of flight:	Private
Persons on Board:	Crew - 1 Passengers - None
Injuries:	Crew - minor Passengers - N/A
Nature of Damage:	Substantial to major airframe components
Commander's Licence:	Private Pilot's Licence
Commander's Age:	41 years
Commander's Total Flying Experience:	282 hours (of which 8 were on type)
Information Source:	Aircraft Accident Report Form submitted by the pilot

The pilot was conducting a series of touch and go landings in light wind conditions. On his first approach, an undemanded roll to the left was noted on crossing the threshold, but this did not prevent a satisfactory landing. On his second approach, the pilot decided to add 5 kt to his previous threshold speed and fly a flatter approach to improve control response. When 100 metres from the threshold, the left wing again dropped and a high sink rate developed. The pilot applied full power and the aircraft landed heavily before becoming airborne again. During this landing the swing axles reached their mechanical stops and bent slightly. The pilot reports that the subsequent landing was gentle but the damage sustained on the first landing allowed the spreader bar between the wheels to dig into the grass runway causing the aircraft to nose over onto its back. One shoulder strap of the pilot's full harness failed when the aircraft inverted but he was able to evacuate the open cockpit with only minor injuries.

No: 12/90 **Ref: EW/G90/08/12** **Category: 1c**

Aircraft Type and Registration:	Rockwell Commander 112A, G-BDAK
No & Type of Engines:	1 Lycoming IO-360-C1D6 piston engine
Year of Manufacture:	1975
Date and Time (UTC):	27 August 1990 at 1448 hrs
Location:	Shoreham Airport, Sussex
Type of Flight:	Private
Persons on Board:	Crew - 1 Passengers - 1
Injuries:	Crew - None Passengers - None
Nature of Damage:	Propeller ground contact, major damage to the right wing
Commander's Licence:	Private Pilot's Licence
Commander's Age:	41 years
Commander's Total Flying Experience:	148 hours (of which 102 were on type)
Information Source:	Aircraft Accident Report Form submitted by the pilot and engineering report.

The pilot carried out a standard circuit joining procedure from the dead side for runway 25. The wind reported was 240°/14kt. Downwind he lowered the landing gear and confirmed three greens. On base leg he lowered 20° of flap and on finals he set full flaps and again checked three greens. At no time did he hear a warning bell and a normal touchdown was made. After a ground roll of about 300 metres first the noseleg collapsed and then the right mainleg. The aircraft slid for about 40 metres before coming to a halt. The pilot and his passenger evacuated the aircraft through the normal exits without difficulty, the pilot having gone through the shut-down procedure.

An investigation was carried out for the insurers by a local engineering company. The aircraft was supported on jacks and the engine cowlings removed. There was no obvious damage or failure in the landing gear, supporting structure or hydraulic system. Though some hydraulic fluid had been lost during salvage its quantity had evidently been adequate at the time of the accident.

When the system had been topped up and bled it appeared to operate normally with correct indications.

The landing gear is held or locked in the "down" position by three separate systems; spring assisted over-centred drag links, locking pins within the jacks and hydraulic pressure from the electrically driven

pump which is activated whenever a green indication is not obtained for any of the three legs. The nose landing gear has two microswitches; one on the locking pin in the jack and one on the drag brace. Both microswitches must be made to obtain a green indication. With "down" selected the hydraulic pump is de-activated only when "three greens" indicate.

Examination of the nose landing gear showed that the locking pin was worn and ineffective, the locking pin microswitch was not being operated at all because of bad adjustment and the drag brace switch was so far out of adjustment that the landing gear was able to retract over 45 degrees before the switch operated and energised the pump.

These deficiencies robbed the nose landing gear of two of its downlock safeguards and left only the over-centred drag-brace. An hypothesis was formed that the over-centre lock had been broken under the vibratory loads experienced during the landing run. (The runway was grass covered but was reported by the pilot as being smooth). With the drag brace "broken" the worn locking pin within the jack would be incapable of preventing retraction of the nose landing gear and, because of the faulty adjustment of both microswitches the leg would retract to 45 degrees before the pump would be switched on. At that point it would be too late to prevent the leg retracting further. During the nose landing gear's collapse its jack would develop a back-pressure in the hydraulic system which would tend to unlock either main landing gear and would do so if the pressure generated were high enough. This effect was demonstrated during the investigation. It was considered that after the initial breaking of the downlock the nose landing gear's rearward collapse would have been an accelerating one and would have become sufficiently rapid to cause this effect so explaining the collapse of the right main landing gear.

No: 12/90 **Ref: EW/G90/09/16** **Category: 1c**

Aircraft Type and Registration:	Scheibe SF25B, G-BRRC
No & Type of Engines:	1 Stark-Stamo MS 1500/2 piston engine
Year of Manufacture:	1970
Date and Time (UTC):	25 September 1990 at 1450 hrs
Location:	Marchington Airfield, Staffordshire
Type of flight:	Private
Persons on Board:	Crew - 2 Passengers - None
Injuries:	Crew - None Passengers -N/A
Nature of Damage:	Aircraft extensively damaged
Commander's Licence:	Private Pilot's Licence
Commander's Age:	53 years
Commander's Total Flying Experience:	552 hours (of which 7 were on type)
Information Source:	Aircraft Accident Report Form submitted by the pilot

The flight from Netherthorpe to Marchington was conducted with the handling pilot in the left seat and the aircraft owner, who was considerably more experienced on type, in the right seat. The pilot had been flying with his right hand and crossing over his left hand during the final approach in order to operate the spoilers. However, during the flight, the owner suggested that, when landing the aircraft from the left seat, it would be better to hold the control column with the left hand and keep the right hand on the centrally mounted spoiler lever. Considering the owner's greater experience, the pilot decided to ignore the slightly 'unnatural' feeling and to practice this technique for a few circuits and landings at Marchington.

Two landings were accomplished successfully but, 10 seconds before touchdown on the third, some turbulence was encountered which the pilot judged to require a reduction of the amount of spoiler deployed.

The pilot states that from this point the situation rapidly deteriorated as he instinctively reverted to his original (left hand on the spoiler lever) handling method. Instead of moving the spoiler lever forward, he moved the control column forward, lowering the aircraft nose, which he then attempted to correct by pulling back the spoiler lever, further increasing the rate of descent. The aircraft pitched down sharply towards the undershoot and struck the ground hard, in a steep nose-down attitude. It then bounced and slewed violently through 180°, still in a severe nose-down attitude, striking the ground again and falling back onto the tail.

The full safety harnesses of both occupants withstood the impact and there was no fire.

No: 12/90 **Ref: EW/G90/09/02** **Category: 1c**

Aircraft Type and Registration:	Scintex CP 1310-C3 Super Emeraude, G-ASMV
No & Type of Engines:	1 Continental O-200-A piston engine
Year of Manufacture:	1963
Date and Time (UTC):	9 September 1990 at 1215 hrs
Location:	Heath Farm, near Cromer, Norfolk
Type of flight:	Private
Persons on Board:	Crew - 1 Passengers - 1
Injuries:	Crew - None Passengers - None
Nature of Damage:	Engine upper cowling detached, windscreen broken, engine-driven fuel pump and pipes damaged
Commander's Licence:	Private Pilot's Licence
Commander's Age:	49 years
Commander's Total Flying Experience:	255 hours (of which 250 were on type)
Information Source:	Aircraft Accident Report Form submitted by the pilot

The aircraft was on a pleasure flight from Seething, south-east of Norwich, to Leicester via the Norfolk coast. Whilst approximately overhead Cromer in steady level flight the pilot felt vibration and started to throttle-back. As he did so there was a bang and the the top engine cowl detached, striking and breaking the windscreen before it slid away over the wing.

The pilot switched off the ignition and fuel and checked the flying controls, which were apparently normal. Selecting a suitable field for a forced landing, he attempted to restart the engine but was unsuccessful and performed a dead-stick landing into the field. The landing was well executed and no further damage to the aircraft occurred.

Subsequent examination revealed that the propeller spinner backplate had developed cracks which allowed the spinner assembly to move back until it contacted the cowl and engine. The spinner had then broken up and disrupted the fuel pump and fuel supply pipes whilst forcing up the leading edge of the engine cowling and breaking the retaining clips. The backplate was apparently some 26 years old.

The pilot states that he was surprised at the relative lack of draught in the cockpit despite the fact that the majority of the windscreen had been lost due to impact from the cowling and notes that the aircraft handled normally throughout the forced landing.

No: 12/90 **Ref: EW/G90/07/41** **Category: 1c**

Aircraft Type and Registration:	Slingsby T61A, G-AYYK
No & Type of Engines:	1 Stark-Stamo MS 1500/1 piston engine
Year of Manufacture:	1971
Date and Time (UTC):	31 July 1990 at 1430 hrs
Location:	Perranporth Airport, Cornwall
Type of Flight:	Private (training)
Persons on Board:	Crew - 2 Passengers - None
Injuries:	Crew - None Passengers - N/A
Nature of Damage:	Damage to the propeller, main landing gear and wheel housing
Commander's Licence:	Private Pilot's Licence with Gliding Instructor ratings
Commander's Age:	63 years
Commander's Total Flying Experience:	1,240 hours (of which 140 were on type)
Information Source:	Aircraft Accident Report Form submitted by the pilot and subsequent AAIB enquiries

As the aircraft back-tracked runway 23, after landing, a scraping noise was heard which appeared to come from the main landing gear. The pilot was about to bring the aircraft to a halt, when it stopped abruptly of its own accord and tipped forward onto the nose.

Post accident examination by the crew revealed that the two halves of the wheel hub had separated. The expansion of the hub and tyre had caused it to jam in the wheel housing. The hub separation was later found to have resulted from the failure or incorrect fitting of the retaining circlip.

No: 12/90 **Ref: EW/G90/09/13** **Category: 1c**

Aircraft Type and Registration:	Socata Morane Saulnier Rallye 150ST, G-BDCA
No & Type of Engines:	1 Lycoming O-360-A4A piston engine
Year of Manufacture:	1955
Date and Time (UTC):	19 September 1990 at 0955 hrs
Location:	Hele Payne Farm, Bradninch, Devon
Type of Flight:	Private
Persons on Board:	Crew - 1 Passengers - 2
Injuries:	Crew - None Passengers - None
Nature of Damage:	Substantial to major airframe components
Commander's Licence:	Commercial Pilot's Licence with Instructor rating
Commander's Age:	64 years
Commander's Total Flying Experience:	15,945 hours (of which over 7,000 were on type)
Information Source:	Aircraft Accident Report Form submitted by the pilot and additional telephone inquiries

The pilot of G-BDCA had arranged to fly a passenger from a farm strip for the purpose of making a video recording of the farm. This flight could only take place on 19 September 1990. On the evening of 18 September the pilot went to the field and selected a take-off path that would avoid obstruction and built-up areas. The selected path was on a heading of 105° and gave a take-off run available of about 640 metres with a steadily increasing down slope. The pilot drove his car over the first 320 metres of established grass and then viewed the rest of the take-off path but did not drive or walk over it. This portion of the take-off path consisted of newly sown grass which had just started to show. The pilot assessed that his chosen path was suitable for the intended flight. A meteorological forecast obtained by the pilot on 18 September indicated that a cold front would pass through the area overnight and that the weather would be clear for the planned flight.

When the pilot arrived at the strip on the morning of 19 September, the ground was wet from overnight rain and, following the passage of the front, the wind had gone round to the North West with a mean speed of about 15 kt. The pilot estimated that this would give him a downwind component of about 7 kt. When the passengers arrived there were three rather than the one that the pilot had planned on. He said that he was unable to take three but agreed to take two. With two passengers the aircraft was well below the authorised maximum take-off weight.

Having completed his pre-flight preparation including a power check, the pilot started his take-off run. The first part of the run was over substantially level grass and although the pilot noted slower than normal acceleration he was not unduly concerned. The pilot raised the nosewheel just clear of the ground and the aircraft reached the newly seeded portion of the field having travelled about 500 metres. At this point, the pilot felt that he was on soft ground and decided to get airborne as quickly as possible. However the aircraft was now entering an area that had been badly affected by the overnight rain and the aircraft failed to leave the ground. The pilot states that the maximum airspeed achieved was 40-45 kt. When the pilot realised that the aircraft was not going to get airborne be maintained a high nose attitude to minimise the effect of impact with a fence and hedge at the boundary of the field. The aircraft went through the hedge and fence in a high nose attitude and came to rest on a road. Although the aircraft was severely damaged, the occupants were able to evacuate the cabin uninjured. A small fire had started in the aircraft engine but this was extinguished by the pilot with the aid of motorists on the road.

No: 12/90 **Ref: EW/G90/07/33** **Category: 1c**

Aircraft Type and Registration:	Socata TB20, G-BLYD
No & Type of Engines:	1 Lycoming IO-540-C4D5D piston engine
Year of Manufacture:	1985
Date and Time (UTC):	27 July 1990 at 1125 hrs
Location:	Biggin Hill Airport, Kent
Type of Flight:	Private
Persons on Board:	Crew - 2 Passengers - None
Injuries:	Crew - None Passengers - N/A
Nature of Damage:	Damage to nose landing gear, cowling and propeller
Commander's Licence:	Commercial Pilot's Licence with IMC and Instructor ratings
Commander's Age:	32 years
Commander's Total Flying Experience:	3,795 hours (of which 200 were on type)
Information Source:	Aircraft Accident Report Form submitted by the pilot and discussion with maintenance organisation

A normal take-off was made from runway 11. At 200 feet, the landing gear was retracted but the pilot noticed that the gear unlocked light remained illuminated. The landing gear was recycled to "down", following which only the two main landing gears indicated down-and-locked. The nose landing gear light did not illuminate and the associated gear unlocked light remained on. The emergency landing gear lowering system was used but these indications remained.

A flypast of the tower was requested. The tower confirmed that the noseleg appeared to be hanging at about 45 degrees and the nose wheel was twisted to the right. Attempts were made to lock the nose landing gear by the application of "g" and yaw, without success. The pilot informed Biggin ATC that he intended to land.

After a brief delay while the emergency services were called, a normal approach was made to runway 21. The approach was made with 10 degrees of flap and just prior to the flare the mixture was set to lean and the fuel turned off. A normal landing was made and the nose wheel held off as long as possible. As the speed decayed, the propeller stopped and the second pilot was able to use the starter to level the propeller blades, after which he switched off the magnetos. The nose then contacted the runway and the aircraft rolled about another 100 yards before coming to rest. The crew vacated the aircraft without injury as the emergency services arrived.

Damage to the aircraft was limited to the front lower cowling, air intake, exhaust, heat exchanger and one propeller tip. Further examination showed that the lugs which attached the actuating mechanism to the noseleg had both separated at the welds, thus preventing retraction or extension.

The failed parts were returned to the manufacturer for investigation, who reported that the failure was not a common occurrence and referred the maintenance organisation to the inspections contained in the Maintenance Manual and to the requirements of Service Bulletin No. 45, "landing gear actuator stays". The maintenance organisation noted that no sign of long standing corrosion was seen on the fracture surfaces and stated that later aircraft have strengthened lugs. Enquiries failed to uncover any recent heavy landings.

No: 12/90 **Ref: EW/G90/10/02** **Category: 1c**

Aircraft Type and Registration:	Taylor Monoplane, G-BDAD
No & Type of Engines:	1 Volkswagen 1500 (Peacock) piston engine
Year of Manufacture:	1976
Date and Time (UTC):	1 October 1990 at 1630 hrs
Location:	Blackpool Airport, Lancashire
Type of Flight:	Private
Persons on Board:	Crew - 1 Passengers - None
Injuries:	Crew - None Passengers - N/A
Nature of Damage:	Substantial damage to right wing, landing gear and engine cowling
Commander's Licence:	Private Pilot's Licence with IMC and Night ratings
Commander's Age:	25 years
Commander's Total Flying Experience:	107 hours (none on type)
Information Source:	Aircraft Accident Report Form submitted by the pilot

The pilot reports that he was preparing to make his first flight in the aircraft. After familiarising himself with the cockpit lay out and having started the engine, he requested Blackpool Airport ATC for clearance to carry out a taxiing exercise. This was granted. Having completed the exercise he taxied the aircraft to the holding point of runway 25 where, after completing the run up checks, he requested and was given take-off clearance.

He reports that full power was applied and checked, the control column was positioned slightly forward from the fully aft position, and the take-off run was commenced. The aircraft was kept straight without difficulty and the control column was moved slightly further forward. At a speed of about 40 knots the nose of the aircraft started to rise but the tail wheel remained on the ground. The nose continued to rise until the right wing dropped suddenly and the aircraft pitched forward allowing the propeller to contact the ground. The aircraft continued in a right hand slide before coming to rest in a nose down attitude on a disused runway. The pilot had been wearing a full 4 point harness which held throughout and he was able to release himself and vacate the aircraft without injury.

The weather at the time was fine with a surface wind of 190°/10 knots.

No: 12/90 **Ref: EW/G90/10/03** **Category: 2c**

Aircraft Type and Registration:	Bell 47G-2, G-ASYW
No & Type of Engines:	1 Lycoming VO-435-A1D piston engine
Year of Manufacture:	1958
Date and Time (UTC):	8 October 1990 at 0954 hrs
Location:	Redhill Aerodrome, Surrey
Type of Flight:	Private (training)
Persons on Board:	Crew - 1 Passengers - None
Injuries:	Crew - None Passengers - N/A
Nature of Damage:	Skids and mounting struts distorted, lower cockpit area punctured
Commander's Licence:	Student Helicopter Pilot with Private Pilot's Licence (A)
Commander's Age:	40 years
Commander's Total Flying Experience:	17 hours rotary wing (all on type); 562 hours fixed wing
Information Source:	Aircraft Accident Report Form submitted by the supervising instructor

Following a 35 minute dual flight comprising hover, take-off and landing exercises, the instructor briefed the student on the different cockpit reference attitudes which would result from his absence, and left the aircraft. He had already loaded the ballast which would be necessary to comply with the minimum cockpit loading during the planned solo flight.

The student's first attempt at lift-off developed a slight yaw, which she immediately corrected, as she had been trained, by replacing the helicopter on the ground. The second attempt began normally but a large deviation in pitch attitude developed, which the student attempted to correct by sharply raising the collective pitch lever. Large pitch oscillations developed and continued until the student lowered the lever and the helicopter landed heavily, whilst moving forward and to the right, severely distorting the landing skids.

There was no fire and, when the rotor stopped, the student vacated the aircraft.

No: 12/90 **Ref: EW/C1177** **Category: 2c**

Aircraft Type and Registration:	Schweizer 300C (Hughes 269), G-BRNR
No & Type of Engines:	1 Lycoming HIO-360-D1A piston engine
Year of Manufacture:	1989
Date and Time (UTC):	28 September 1990 at 1858 hrs
Location:	Oxford (Kidlington) Aerodrome
Type of flight:	Commercial (Training)
Persons on Board:	Crew - 1 Passengers - 1
Injuries:	Crew - 1 (minor) Passengers - None
Nature of Damage:	Fire damage to cockpit, tail rotor detached, tail rotor gearbox fractured
Commander's Licence:	Airline Transport Pilot's Licence (H) with Instructor rating
Commander's Age:	52 years
Commander's Total Flying Experience:	Approximately 19,000 hours rotary wing (of which approximately 6,000 were on type) and 1,000 hours fixed wing
Information Source:	AAIB Field Investigation.

The purpose of the flight was to demonstrate to the passenger the effectiveness of the parachute pyrotechnic flares required to be carried on single-engined helicopters during night flying for ground illumination in the event of a forced landing. The passenger, a qualified balloonist, was the holder of a Private Pilot's Licence (Helicopters) that included a Type Rating for the Schweizer 300C but no Night Rating.

In common with other types of single-engined helicopter, the aircraft was fitted with a permanent installation capable of accepting two flares. The installation was attached to a member beneath and external to the cabin, and the flares could be individually fired by cockpit switch operation in the event of a night forced-landing. It was intended to fire two flares over the airfield from a position where they would remain within the airfield boundary, with the Airfield Fire Service standing by to deal with any problems that could be caused should a flare descend to the ground still burning.

The aircraft, fitted with dual controls, took-off after dark and the commander successively fired the two flares, without difficulty. The passenger then requested the commander, who was in the right seat, to fire a hand-held pyrotechnic parachute flare, for comparison. The flare comprised a cylinder from which a rocket-propelled projectile could be fired, deploying into a high luminosity flare suspended

under a small parachute. Removal of a plastic cap on each end of the cylinder exposed the bore of the firing tube at one end and the firing mechanism at the other. The firing mechanism consisted of a trigger that could be pivoted to the firing position after a safety pin had been removed. An arrow printed on the cylinder indicated the direction of deployment of the projectile from the cylinder.

With the helicopter at around 1000 feet above the airfield, the commander removed the end caps and safety pin, opened the cabin right door and operated the trigger, but inadvertently with the cylinder reversed. The projectile rocketed around the cabin and came to rest on the floor in the forward right corner of the cabin, with the flare generating intense light, a large plume of flame and considerable smoke. Following abortive attempts to jettison the flare out of the doorway, the commander wedged the right door open against the external airflow with his foot and the passenger opened the left door and held it open with his elbow. The commander, subjected to burns from the flare and with a plume of flame snaking up in front of him and out of the right doorway towards the main fuel tank, suffered an almost complete loss of visual references as a result of the intense light and smoke, and because of soot deposits on the transparencies. He established that the passenger, located in a somewhat better environment and shielded by the central instrument console, could still see outside, and passed control to him.

The passenger attempted a run-on landing on the airfield, but did not manage to level the helicopter and it touched down in a nose-high attitude. The tail sting was bent upwards by the ground contact and the tail rotor contacted the ground, causing the blades to detach and the tail rotor gearbox casing to fracture. The aircraft came to rest, on its skids, an estimated 1 minute after the firing of the flare, and the occupants were able to evacuate rapidly. Almost coincident with touchdown the flare extinguished itself. The Fire Service was almost immediately in attendance and extinguished a few small flames remaining in the vicinity of the flare.

The pilot suffered generally surface burns to his hands and legs; the passenger was uninjured. The forward right transparency, the cabin floor panel, the instrument console and the right seat were fire damaged.

No: 12/90 **Ref: EW/C1180** **Category: 3**

Aircraft Type and Registration:	Mainair Sports Gemini Flash IIA, G-MWEI
No & Type of Engines:	1 Rotax 503 piston engine
Year of Manufacture:	1989
Date and Time (UTC):	1 November 1990 at 1645 hrs
Location:	½ nm northeast of Cleobury Mortimer, Shropshire
Type of Flight:	Private
Persons on Board:	Crew - 1 Passengers - None
Injuries:	Crew - Fatal Passengers - N/A
Nature of Damage:	Trike destroyed and wing severely damaged
Commander's Licence:	Private Pilot's Licence
Commander's Age:	54 Years
Commander's Total Flying Experience:	57 hours (all on type)
Information Source:	AAIB Field Investigation

The microlight had first been registered by the manufacturer in February 1990 and had been flown by the new owner on 7 March 1990 at the start of an approved training course. He completed this on 16 June 1990, having by then achieved 48 hours flying time. On 11 July 1990 he flew the aircraft to his own landing strip at Cleobury Mortimer where he made five landings and take-offs, although his aircraft was based at another farm strip. The owner's strip, which was orientated north/south, was not suitable for use on the day of the accident and consequently the pilot had prepared another strip, which was orientated 075°/255°, in an adjacent field.

When operated at Maximum Authorised Take-off Weight and from a level and firm surface, the declared take-off distance required by this aircraft, from the start of roll to achieving a 15 metres (49 feet) "screen" height, is 181 metres. The declared landing distance, from a similar height to the end of the landing roll is 230 metres. The new strip, to be used for the first time on the accident flight, was soft uneven ground, 90 metres long with a 7° upslope in the direction 075°. Further up the slope, an earth moving vehicle was parked immediately behind a fence 21 metres beyond the end of the strip and, 48 metres beyond that, on higher ground, a coppice of 50 feet high trees was situated. The total height of the trees above the touchdown point on the strip was about 100 feet.

On the day of the accident the wind was 290°/7 kt and was blowing up the slope. Take-off, down the slope, was successfully achieved and the aircraft departed the immediate area for about 10 minutes before returning to carry out a high-level pass, flying downwind, over the new strip. It was then seen to fly a left hand circuit and to descend, on what appeared to be a final approach to land downwind and uphill on the strip. Witness accounts vary as to whether the aircraft flew very low or touched the ground, but, about half way up the slope and a little to the right of the landing strip, the application of full engine power was heard and the aircraft was seen to begin a very steep climb towards the trees. The aircraft brushed through the canopy of an oak tree within the coppice and fell to the ground just beyond the tree line.

The aircraft struck the ground hard, on its right side in a slightly nose down attitude with very little forward speed and with the engine under power. The trike keel frame was broken in the impact, the fibreglass fairing pod was severly damaged and the wing leading edge tubes and keel damaged.

Examination of the wreckage on site revealed no evidence of pre-impact defect or malfunction of the aircraft. All rigging pins and safety connections on both the trike and the wing were installed correctly and the king post over-centre toggle was correctly positioned. The wing tip washout settings were 'normal' with the adjustment pins engaged securely. All rigging cables were intact and secure, and the luff lines were rigged to a 'normal' setting. The velcro trailing edge pocket seals were closed normally.

Appropriate safety recommendations have been made to the CAA.

ADDENDUM

AAIB Bulletin 8/90, page 18.

ACCIDENT TO DE HAVILLAND DH82A TIGER MOTH G-AODT
AT OLD BUCKENHAM, NORFOLK ON 17 JUNE 1990

Since the publication of this bulletin the aircraft owner has provided the following information.

The grass area where the aircraft attempted to land, declared by the pilot to have a landing distance available of 375 metres in a landing direction 05, has been measured and found to be 256 metres in length. The owner has also advised the AAIB that, adjacent to this grass area is a hard runway offering a landing distance of 732 metres in the landing direction 07, which he himself uses in all but strong crosswind conditions.

ADDENDUM

AAIB Bulletin 9/90, page 30. This amended report is reprinted in full.

Aircraft Type and Registration:	Piper PA-24, G-ARUO	
No & Type of Engines:	1 Lycoming O-360-A1A piston engine	
Year of Manufacture:	1961	
Date and Time (UTC):	25 July 1990 at 1200 hrs	
Location:	Truro Airfield, Cornwall	
Type of flight:	Private	
Persons on Board:	Crew - 1	Passengers - None
Injuries:	Crew - None	Passengers - N/A
Nature of Damage:	Substantial to landing gear, propeller, engine mountings and wings	
Commander's Licence:	Private Pilot's Licence	
Commander's Age:	43 years	
Commander's Total Flying Experience:	263 hours (of which 40 were on type)	
Information Source:	Aircraft Accident Report Form submitted by the pilot and subsequent telephone inquiries by AAIB	

The pilot was undertaking a transit flight from White Waltham to Truro. He had obtained a meteorological forecast which indicated that landing conditions at Truro would be suitable. Truro airfield has a 500m runway 32/14 with an overall slope of 1.8% Up on 32. This runway has an additional 100m starter extension with an up-slope of 5.8%. This extension is declared for take-off and over-run only. At about 0830 hrs on the morning of the accident, the pilot attempted to obtain prior permission for his intended landing but could not contact the owner of the airstrip. He therefore left a message on the airfield owner's telephone answering machine stating his intention of landing at Truro. On arrival at Truro, the pilot attempted to make radio contact but the radio was not manned. He therefore completed an overhead join and observed the windsock which gave a tailwind component on Runway 32 of about 10 kt. At the time of the accident the wind recorded at Cambourne was 110°/17 kt gusting to 28 kt, and the observation at St Mawgan was 120°/13 kt.

The pilot states that he had operated from Truro before and was aware of the up-slope on Runway 32. Having elected to land on 32, the pilot states that he made a normal approach but after landing realised that he would not be able to stop his aircraft before the airfield boundary fence. Despite heavy braking, the aircraft went through the frangible boundary fence and entered a stubble field. The aircraft sustained only minor damage from its contact with the fence and the pilot decided to regain the airfield by taxiing through the gap in the fence which he had just made. During this manoeuvre the aircraft's nosewheel entered a shallow ditch adjacent to the fence. This ditch had a sloping side towards the stubble field but a vertical side some 3-5 inches high on the airfield side. Contact with the vertical side of the ditch caused the nose landing gear to collapse followed by the main landing gear.

LIST OF RECENT AIRCRAFT ACCIDENT REPORTS ISSUED BY AIR ACCIDENTS INVESTIGATION BRANCH

3/89	Sikorsky S61N helicopter G-BDII near Handa Island off the north-west coast of Scotland on 17 October 1988	June 1989
4/89	Boeing 747 N605PE at Gatwick Airport on 1 February 1988	August 1989
5/89	Boeing 747-136 G-AWNM on approach to Runway 27L at London (Heathrow) Airport on 11 September 1988	December 1989
6/89	Concorde 102 G-BOAF over the Tasman Sea, about 140 nm east of Sydney, Australia on 12 April 1989	December 1989
1/90	Sikorsky S61N G-BDES in the North Sea, 90 nm north-east of Aberdeen on 10 November 1988	May 1990
2/90	Boeing 747 N739PA at Lockerbie, Dumfriesshire, Scotland on 21 December 1988	September 1990
3/90	Sikorsky S61N G-BEID 29 nm north-east of Sumburgh Shetland Isles on 13 July 1988	September 1990
4/90	Boeing 737 G-OBME near Kegworth, Leicestershire on 8 January 1989	October 1990

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ABBREVIATIONS COMMONLY USED IN AAIB BULLETINS

ADELT	automatically deployable emergency locator transmitter
ADF	automatic direction finding equipment
AFIS(O)	Aerodrome Flight Information Service (Officer)
AFS	Aerodrome Fire Service
agl	above ground level
AIC	Aeronautical Information Circular
amsl	above mean sea level
ASI	airspeed indicator
ATC(C)	Air Traffic Control (Centre)
CAA	Civil Aviation Authority
CG	centre of gravity
°C,F,M,T	celsius, fahrenheit, magnetic, true
DME	distance measuring equipment
ETA	estimated time of arrival
ETD	estimated time of departure
FL	flight level
fpm	feet per minute
g	normal acceleration
gall imp/US	gallons, imperial or United States
hrs	hours
IAS	indicated airspeed
IFR	Instrument Flight Rules
ILS	Instrument landing system
IMC	Instrument Meteorological Conditions
IR	Instrument Rating
IRE	Instrument Rating examiner
kg	kilogram(s)
km	kilometre(s)
kt	knot(s)
lb	pound(s)
mb	millibar(s)
mm	millimetre(s)
MDA	Minimum Descent Altitude
MTWA	Maximum Total Weight Authorised
NDB	non-directional radio beacon
nm	nautical mile(s)
NOTAM	Notice to Airman
OCL	Obstacle Clearance Limit
PAPI	Precision Approach Path Indicator
PAR	precision approach radar
PIC	pilot in command
psi	pounds per square inch
rpm	revolutions per minute
RTF	radiotelephony
RVR	runway visual range
SSR	secondary surveillance radar
TAS	true airspeed
UTC	Universal Time Coordinated
VASI	Visual Approach Slope Indicator
VFR	Visual Flight Rules
VHF	very high frequency
VMC	Visual Meteorological Conditions
Vne	never exceed airspeed
VOR	VHF omni range