AAIB Bulletin No: 3/2005 **Ref: EW/C2004/02/01** **Category: 1.3**

Aircraft Type and Registration:	Piper PA-25-235 Pawnee, G-BDWL
No & Type of Engines:	1 Lycoming O-540-B2C5 piston engine
Year of Manufacture:	1965
Date & Time (UTC):	1 February 2004 at 1354 hrs
Location:	Crowland Airfield, Lincolnshire
Type of Flight:	Private
Persons on Board:	Crew - 1 Passengers - None
Injuries:	Crew - 1 (Fatal) Passengers - N/A
Nature of Damage:	Aircraft destroyed
Commander's Licence:	Private Pilot's Licence
Commander's Age:	81 years
Commander's Flying Experience:	2,160 hours (of which 685 were on type) Last 90 days - 5 hours Last 28 days - 4 hours
Information Source:	AAIB Field Investigation

Synopsis

The Pawnee carried out a normal takeoff towing a glider. At approximately 500 feet it inexplicably turned to the right and entered a descent. The glider released from the tow and was able to land normally back on the airfield. The aircraft however, continued its descent striking the ground banked 35º to the right in a 45º nose down attitude. It is probable that the pilot became medically incapacitated in flight before being fatally injured in the impact. One medical related safety recommendation has been made.

History of the Flight

The pilot and his wife, both qualified glider pilots, flew together earlier in the day, successfully completing a twenty-minute glider flight from an aero-tow release height of 3,000 feet. An hour after landing the pilot relieved the 'duty pilot' on the tug aircraft, G-BDWL, to carry out the final aero-tow of the day. Although the weather at the time was satisfactory there were signs that deteriorating conditions were approaching from the west. The surface wind was estimated to be

210°/15-18 kt with moderate turbulence; the visibility was good; there were a few clouds at 3,000 feet and the temperature was 11°C.

As he strapped himself into the Pawnee, the pilot was described as being 'his normal self, chatting and joking' with the 'duty pilot' who was checking that the aircraft canopy was clean. Meanwhile, a student and gliding instructor were strapping themselves into the glider. The two aircraft were then connected by the tow rope in preparation for takeoff.

It was normal practice for the gliding club to use radios, which were fitted in both the towing aircraft and the glider, to enable communication between the ground crew and the tug pilot. This particularly applied while the slack was being taken up on the towing cable and to confirm that all was ready for the two aircraft to takeoff. This flight was no exception, and the glider pilots heard the tug pilot respond correctly to the radio calls made by the ground crew.

The takeoff from Runway 21 proceeded normally and the aircraft and glider combination climbed ahead, at approximately 60 kt on the runway heading, until they reached a height of about 500 feet. The Pawnee then started a gentle turn to the right. The glider followed as the Pawnee's angle of bank gradually increased and its rate of climb reduced. There was no change in the Pawnee's engine power and no apparent pilot induced deflection of the Pawnee's control surfaces that could have given rise to the manoeuvre. The tug and glider combination then began to descend and accelerate. When the angle of bank reached approximately 20° the glider instructor realised that something was wrong. He took control of the glider and called "release" while pulling on the yellow release toggle. The student also pulled his release toggle and the glider separated from the tug at an estimated height of between 300 to 400 feet agl and at a speed of about 70 kt. The glider continued the turn into a right hand circuit and landed safely back on Runway 21. Meanwhile, the Pawnee was seen to continue to turn to the right, with a gradually increasing angle of bank, and to descend at an ever steepening angle, still without any apparent control inputs being made by the pilot. The aircraft struck the ground pitched nose down by 45° and banked 35º to the right. Witnesses on the ground remarked that the engine sounded as if it had remained at take-off power throughout.

Members of the gliding club rendered assistance to the pilot of the Pawnee, which, despite being severely damaged, had not caught fire. On arrival at the aircraft however, it was evident that he had not survived the accident.

Pilot Information

Flying experience

The pilot had been flying Single Engine Piston (SEP) aeroplanes and gliders for 50 years He was issued his Private Pilot's Licence in 1953 and had accrued a total of 2,160 hours in SEP aeroplanes and 2,400 hours in gliders, in which he was also qualified to instruct. He flew on a regular basis and had carried out three aero-tows as the pilot of the tug aircraft the day before the accident. There was no evidence that the accident was the result of any handling problems.

Medical examinations

The pilot had a current Joint Aviation Authorities (JAA) Class 2 medical certificate. This certificate had to be renewed annually because he was over the age of 50. An annual electrocardiogram (ECG) examination also formed part of the medical certificate requirements. (Note: Class 2 medical certificates held by pilots below the age of 50 are valid for 2 years as is the requirement for an ECG examination.)

During his routine flight crew medical examination conducted in 2001 his ECG had been queried and he had been subjected to a cardiological review in September of that year. This review included an exercise ECG and the UK Civil Aviation Authority (CAA) considered that the results were compatible with a JAA Class 2 medical certificate. In 2002 the pilot's ECG again caused him to be referred to a cardiologist. After a review in July 2002 and a 24-hour ECG later in the year, which showed no abnormalities, the pilot was declared fit to fly but with a requirement for an annual cardiology review. As a consequence, the pilot saw a cardiologist again in November 2003 and, once more, he was assessed as being fit to hold a JAA Class 2 medical certificate, with no further cardiology review required over and above the normal requirements. However, the pilot's blood pressure was noted to be high and he commenced a course of treatment in the same month, with further medication being prescribed in January 2004. Although the pilot had been advised that he should inform the CAA of any additional medication prescribed, he appears not to have done so.

Pathology

The report of the post mortem examination stated:

> *In summary, this man died due to the effects of injuries sustained during the crash and it is likely that the crash was caused by medical incapacitation due to haemorrhage into an atheromatous plaque of a coronary artery. Appropriate medical screening had been performed and he had been reviewed by a cardiologist; given that his coronary artery*

atheroma was not severe and that haemorrhage of this sort into a plaque is a random and unpredictable event, it is unlikely that any other more intensive medical screening would have prevented this occurrence. His age clearly represents a risk factor not only for cardiac events but other potentially incapacitating medical conditions, and the Civil Aviation Authority may wish, once more, to review the medical requirements for pilots in this age group.

The report considered it likely that the haemorrhage would have triggered a spasm of the coronary artery, leading to a cardiac arrhythmia, or irregular heartbeat, and loss of consciousness. It also stated that there was no reason to assume that the blood pressure medication, which the pilot had recently been prescribed, contributed to the accident.

Glider towing operations

Although the aircraft and the glider were both fitted with a radio, it was also possible for the pilots to use a system of pre-arranged signals between the glider and tug aircraft to cater for abnormal situations if there was a radio failure. In the event of a tug problem the pilot would rock the wings, signalling the glider to release at once. If the tug pilot saw a problem with the glider, such as its airbrakes being open, he would move the rudder from side to side. In an emergency it was also possible for the tug pilot to release the tow cable from its attachment at the rear of the tug aircraft using a release handle in the cockpit. Neither of the visual signals nor activation of the tow cable release by the tug pilot were observed on the accident flight.

It was the usual practice at this club for an aircraft/glider combination, after becoming airborne, to climb straight ahead at 60 kt to 2,000 feet agl before releasing.

The previous tug pilot estimated that the aircraft contained between nine and ten gallons of fuel when he handed it over for its final flight. He stated that the aircraft had operated normally on its previous flight, which was also an aero-tow, and that he was planning to operate the next aero-tow himself when the accident pilot asked if he might take over the towing duties.

Accident site details

The aircraft crashed into cultivated ground adjacent to the left hand edge of Runway 27. The initial impact mark had been made by the right wing tip; immediately beyond this were marks made by the main landing gears and nose of the aircraft. The disposition of the marks indicated that the aircraft had struck the ground on a track of around 300° magnetic, banked approximately 35° to the right and in a steep nose-down attitude, probably in excess of 45°. The aircraft had then performed a cartwheel manoeuvre along a track of approximately 330° onto the grassed surface of the runway,

with the main wreckage coming to rest erect and with the nose pointing back along the impact path approximately 25 metres from the initial impact point. The aft fuselage had suffered an inertial failure during the impact such that it was lying parallel to the right wing.

The glider tow rope had detached from the aircraft and was found lying on the ground a few metres back along track from the initial impact point. It was found that the release mechanism on the aircraft had operated, most probably due to movement of the release lever in the cockpit during the initial impact. The glass-fibre fuel tank had burst open at impact but this had not resulted in a fire. The absence of a refuelling log meant that the contents at the time of the accident could not be quantified.

Examination of the wreckage

The cable operated flying control system was examined and it was established that there had been no pre-impact failure or disconnect. It was also established that the flaps were in the retracted position at impact.

The engine had been torn off its mountings during the impact but had remained attached to the airframe by various control and instrumentation cables. The two-bladed metal propeller did not display the usual evidence of power applied at impact, ie chord-wise scoring and damaged leading edges. However the witness evidence was consistent in that the engine was heard to be operating at high power throughout. It is probable that the absence of significant propeller blade damage was the result of the steep impact attitude causing the propeller to be brought to an immediate halt. Also, the heavy, clay-based soil contained few obstructions, such as stones, that could have damaged the blades.

During the course of the examination some corrosion was found in the right elevator. The elevators on this type of aircraft are constructed from a steel frame with a fabric covering. The forward structural member consists of a ⅞ inch diameter torque tube which is attached to the rear of the horizontal stabiliser. A curved trailing edge tube, of approximately ⅜ inch diameter is welded to the inboard end of the torque tube, close to the fin.

The trailing edge tube was found to have corroded through almost its entire thickness close to its welded joint with the torque tube. The outboard section of the tube however, was in good condition. Whilst it was not clear if the tube had failed prior to impact, it is considered that even if it had, this would have resulted in some loss of span-wise torsional rigidity, perhaps leading to a degree of warping. Thus, there may have been a reduced down-force on the right elevator when aft stick (up elevator) was applied. It is considered that this did not have any bearing on the cause of the accident. The corrosion may have had its origins in the aircraft's crop-spraying days, but is not visible under

the fabric covering. The equivalent component on the left elevator displayed no corrosion. The Civil Aviation Authority's (CAA) attention has been drawn to this matter.

Survivability

Despite the severity of the impact, the tubular space-frame construction of the fuselage had prevented a collapse of the cockpit area. The seat had broken from its mountings although the harness had remained intact. The shoulder straps were attached via a steel cable to a lockable reel located in the aft fuselage. The reel was mounted on a plate that had been welded to one of the structural tubes. The reel could be locked by means of a lever in the cockpit connected to the lock mechanism on the reel itself. This was found in the unlocked position, and while it is possible that it could have been moved post accident, the reel had broken away from its mount due to severe distortion of the strut on to which it had been welded. The distortion was associated with the structural disruption that had occurred in the cartwheel manoeuvre; thus the reel did not break away as a result of any loads applied via the shoulder harness cable.

In view of the steep attitude and the likely speed at impact, it is considered that the accident was non-survivable.

Additional information

A very similar accident, reported in AAIB Bulletin 9/2004, occurred on 29 February 2004. That investigation concluded that the pilot of a Pawnee (G-ASKV), aged 71 years with a JAA Class 2 medical certificate, probably died in flight as a result of heart failure. It was considered that an abnormality in the pilot's heart had developed in the five month period since his previous medical examination. He, likewise, gave no indication that he felt unwell and had already completed several aero-tows immediately before the accident flight.

Analysis

The aero-tow flight proceeded normally until, at approximately 500 feet agl, the tug aircraft inexplicably rolled to the right and descended. Realising that something was wrong, the glider released from the tow to carry out a normal landing on the airfield. After release the tug aircraft continued to roll and descend into the ground. The pilot appeared to have no influence on the aircraft's progress once the unexpected deviation from the normal flight path occurred.

The engineering examination, although discovering some corrosion in the right elevator, did not reveal any technical fault that could have caused the accident.

The pilot was experienced in glider towing operations, familiar with the aircraft and held a current JAA Class 2 medical certificate. Although he appeared to be fit and well, the post mortem report stated that it was likely that the accident occurred as a result of him becoming medically incapacitated in flight. He had received a number of cardiological reviews in the previous three years and had been assessed as fit to hold a JAA Class 2 medical certificate on each occasion. It was considered unlikely that any more intensive medical screening would have prevented his incapacitation as the underlying cause was regarded as a random and unpredictable event.

The post mortem report stated that *'the pilot's age clearly represents a risk factor not only for cardiac events but other potentially incapacitating medical conditions, and the Civil Aviation Authority may wish, once more, to review the medical requirements for pilots in this age group.*

The accident on 29 February 2004, in which a 71-year-old pilot, operating another glider towing Pawnee, probably died of heart failure in flight, appears to add weight to the argument for such a review.

The aviation medical authorities require an increased level of medical scrutiny for flight crew over the age of 50 years because of the statistical increase in health risks attributable to increasing age. The periodicity of medical and ECG examinations for pilots significantly over the age of 50 however, remains unchanged. At one time there was a requirement for pilots over the age of 65 to have an aviation medical examination every six months. This requirement however, was changed to 12 months by the JAR. ICAO Annex 1 paragraph 1.2.5.2 details a 'Standard' of 24 months periodicity for private pilots. ICAO Annex 1 also details a (non-mandatory) 'Recommendation' (paragraph 1.2.5.2.2) that this should be reduced to 12 months in those over 40 years. The JAR is therefore in accord with the ICAO 'Recommendation', but is more stringent than that demanded by the relevant 'Standard'.

Notwithstanding the comments above, this accident, and the one on the 29 February 2004, involved elderly pilots suffering from a rapidly deteriorating medical condition whilst airborne. The onset of one condition appears to be 'random and unpredictable' whilst the other appears to have developed between medical examinations.

Safety Recommendation 2004-101

It is therefore recommended that the Joint Airworthiness Authority (Licensing Sectorial Team) consider supporting a study of the continuing medical fitness of elderly pilots in order to ascertain whether a review of the medical requirements and periodicity for a Joint Airworthiness Authorities (JAA) Class II medical is required or, regardless of medical examination requirements, whether there should be an upper age limit placed on persons wishing to operate aircraft certificated for single pilot operations.