

ACCIDENT

Aircraft Type and Registration:	Piper PA-23-250 Aztec, G-BGTG	
No & Type of Engines:	2 Lycoming IO-540-C4B5 piston engines	
Year of Manufacture:	1979	
Date & Time (UTC):	19 July 2007 at 1615 hrs	
Location:	Guernsey Airport	
Type of Flight:	Private	
Persons on Board:	Crew - 1	Passengers - 1
Injuries:	Crew - None	Passengers - None
Nature of Damage:	Scratch on the lower side of the right wing tip and aileron, damage to the right landing gear door, damage to footstep	
Commander's Licence:	Private Pilot's Licence	
Commander's Age:	58 years	
Commander's Flying Experience:	1,171 hours (of which 12 were on type) Last 90 days - 16 hours Last 28 days - 5 hours	
Information Source:	Aircraft Accident Report Form submitted by the pilot, plus AAIB examination of a failed door actuating cylinder	

Synopsis

Failure of the right gear hydraulic actuator when the landing gear was selected down led to the loss of the hydraulic fluid in the system. The emergency lowering system was used, which deployed the left and nose landing gears, but the right gear remained retracted. A successful emergency landing was subsequently carried out.

Examination of the actuator revealed the presence of pre-existing stress corrosion and critical cracking, in the actuator body. It was concluded that the failure was associated with the maritime environment in which the aircraft had operated, possibly exacerbated by very thin anodic coating.

History of the flight

During an ILS approach to Guernsey Airport in VMC, with 1/4 flap selected, the landing gear was selected to DOWN but failed to extend. The gear selector was re-cycled to no effect and, after a fly-past of the tower who confirmed that the gear was still retracted, the pilot departed the circuit area and carried out the emergency checklist. This included use of the manually operated pump in an effort to extend the gear, but this had no discernible effect. After consulting with the aircraft's maintenance base by radio, the emergency CO₂ blow-down system was operated. This resulted in the nose and left main gears extending but the right main

gear did not. A further fly-past of the tower provided visual confirmation that it was still retracted.

After briefing the passenger, a landing was executed on the left main wheel, with the right wing being held off as long as possible. The engines were stopped using the magneto switches and, as the right wing settled into contact with the runway, the left wheel brake was applied and the aircraft brought to rest on the runway. After making the aircraft safe, both occupants evacuated without incident via the main door.

Aircraft examination

Examination of the aircraft after the accident revealed that the barrel of the right main landing gear door actuator had failed in such a manner as to allow the end-cap of the cylinder to detach. This caused a total loss of hydraulic fluid and consequent failure of the retraction actuating system. The AAIB examined the failed actuator and it was apparent that the end-cap had separated because of a 'breakout' of material around holes in the barrel of the cylinder. These holes provided location for a pair of roll pins that passed tangentially through the barrel and the cylinder end plug, on opposing sides of the cylinder housing, fixing the former to the latter (Figure 1).

In addition to the fractures associated with the breakout a series of longitudinal cracks of varying length and width were also apparent at other locations around

each of the roll-pin holes in the barrel. This occurred both at the end which had failed and also around similar roll-pin holes in the opposite end of the barrel, which had not failed (Figure 2). It was evident that the breakout which had allowed the end plug to detach, resulted from exploitation of these pre-existing cracks, which gave the appearance of having been caused by stress-corrosion or a related mechanism.

The failed unit was subjected to detailed metallurgical examination, which included scanning electron microscopy. It was established that the cracks were indeed intergranular, probably caused by corrosion, which was widely apparent. Corrosion products had fully penetrated the grain boundaries, consistent with exposure to a marine environment. Cracks appeared to have been initiated by intergranular fissures in the surface of the barrel during manufacture, prior to the component being anodised, resulting in penetration of these fissures by anodic products (oxides). Additionally, the anodic coating of the barrel was unusually thin, being no more than 3 microns. This appeared to be not thick enough to prevent exploitation of these fissures subsequently by corrosion in service. The final overload fractures were ductile, suggesting that the material itself was not particularly embrittled, but Energy Dispersive X-Ray (EDX) analysis suggested the material was a copper/aluminium alloy, a type that generally offers poor resistance to corrosion.

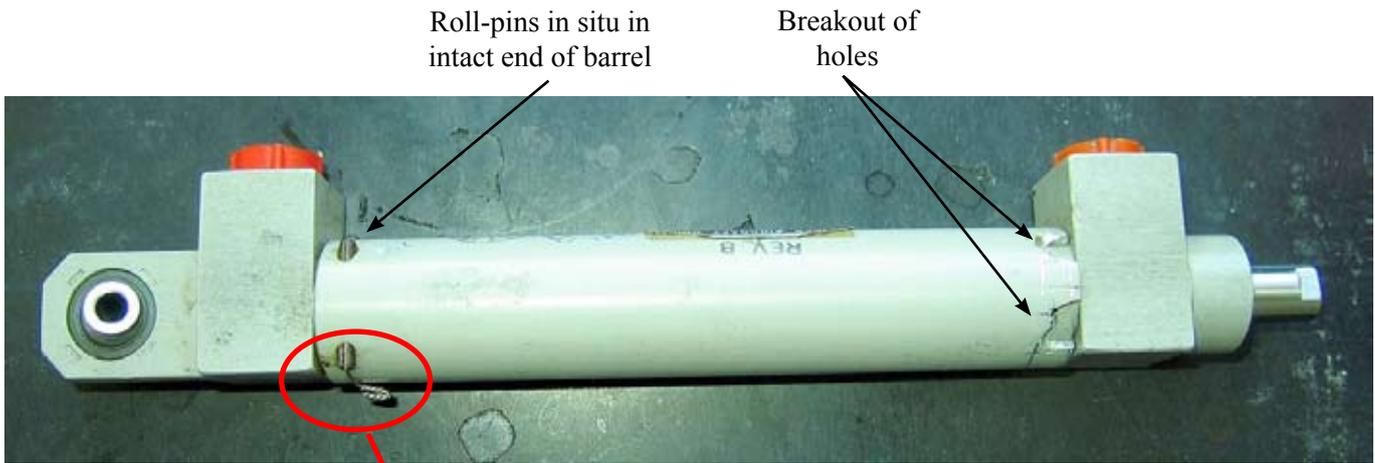


Figure 1 (above)

Failed actuator, showing broken-out roll-pin holes (end plug re-inserted in barrel)

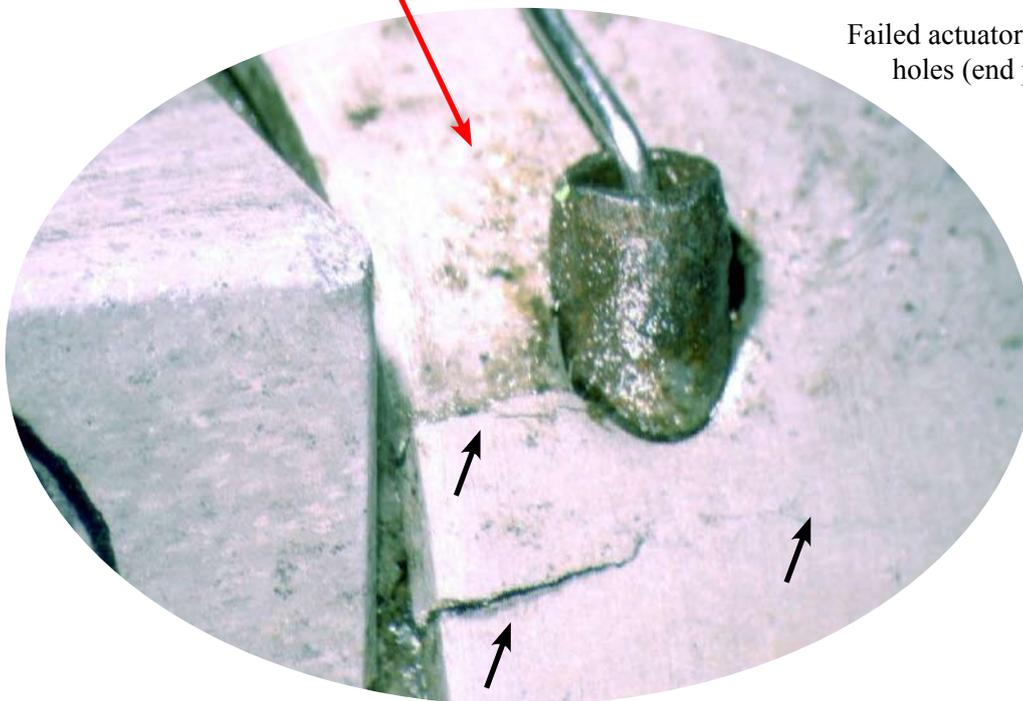


Figure 2

Typical cracks at hole in *intact* end of barrel