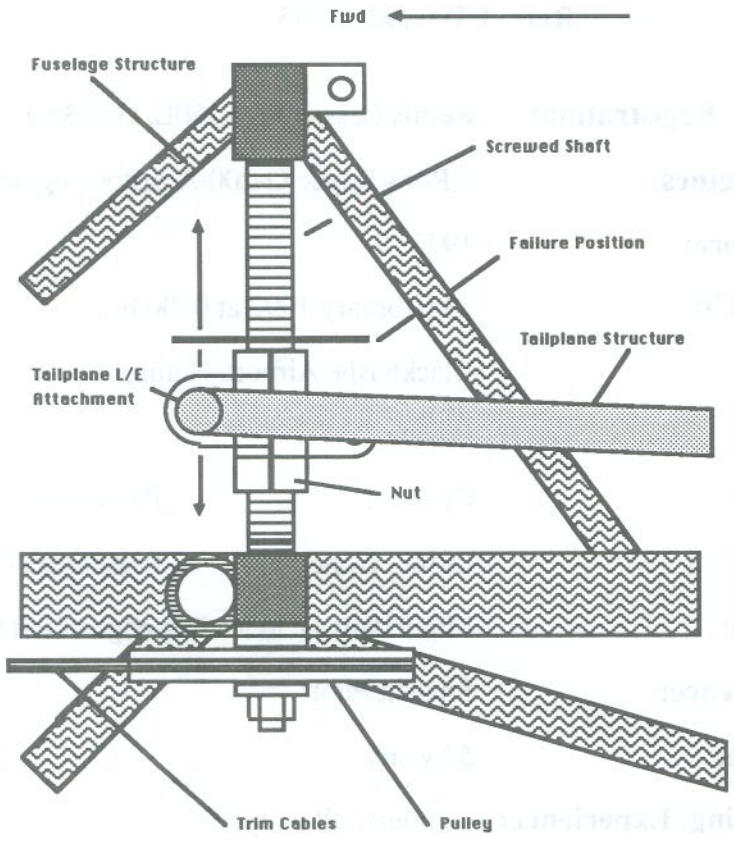
No: 4/92 **Ref: EW/G91/09/21** **Category: 1c**

Aircraft Type and Registration:	Piper PA-18-180 Super Cub, G-AVOO	
No & Type of Engines:	1 Lycoming O-320-A3A piston engine	
Year of Manufacture:	1967	
Date & Time (UTC):	8 September 1991 at 1100 hrs	
Location:	Dunstable Airfield, Bedfordshire	
Type of Flight:	Private (glider towing)	
Persons on Board:	Crew - 1	Passengers - None
Injuries:	Crew - None	Passengers - N/A
Nature of Damage:	Damage to tailplane trim system	
Commander's Licence:	Private Pilot's Licence with Night rating	
Commander's Age:	33 years	
Commander's Flying Experience:	1,150 hours (of which 130 were on type)	
Information Source:	Aircraft Accident Report Form submitted by the pilot	

As the aircraft accelerated in a descent from 2000 feet on the second aerotow of the day, the pilot operated the pitch trim handle to trim nose-down, only to find that he could not 'trim out' the stick forces. The remainder of the flight was conducted with a large measure of nose-up trim which resulted in a difficult, but uneventful, landing. Subsequent examination of the aircraft revealed that the pitch trim screwjack had broken into two sections but had been retained, as the screw is effectively held captive between its upper and lower bushes.

Pitch trim on this aircraft is effected by altering the incidence of the tailplane. This is accomplished by the tailplane pivoting about its trailing edge, with the leading edge attached at its centre to a nut which runs on a screw-shaft mounted vertically in the airframe. The shaft is rotated by cables from a handle in the cockpit, there being approximately 25 turns of the handle required for full travel. During aerotow operations this trim system is in almost constant use, compensating for large variations in pitching moments due to flap, power and speed changes. The aircraft is also subject to considerable vibration, particularly during the low speed, full power, climb segment of each flight.



Tailplane Trim Mechanism Installation - Schematic

The shaft had failed at its mid-point within a region which exhibited excessive wear on the screw thread. Evidence of fatigue cracking was present on the fracture surfaces, originating from the entire circumference of the thread root. Metallurgical examination of the screw material showed it to conform to the manufacturer's specification.

The shaft was fitted to the aircraft in March 1984 and had accumulated a total time of 2,448 hours. Data extracted from the records showed that, on average over the life of the screw, the aircraft had achieved 6.89 aerotows per hour, with a total number of flights of 16,866. The last recorded maintenance on the screw was in August 1991, 102 hours before the failure, when it was found to be 'loose'. It was re-shimmed, tested and found to be satisfactory. Comments were made by an experienced engineer on type to the effect that any excessive shimming used to eliminate side play on the tailplane front or rear attachments can result in high friction in the system and introduce side loads on the screw. He also stated that a check for increased friction should be accomplished after such shimming. There is no related guidance given in the Maintenance Manual on this subject.