AAIB Bulletin No: 7/94 **Ref: EW/G94/05/01** **Category: 1.3**

Aircraft Type and Registration:	Cessna 195, G-BBYE
No & Type of Engines:	1 Jacobs Aircraft & Engines R-755-S piston engine
Year of Manufacture:	1950
Date & Time (UTC):	1 May 1994 at 1555 hrs
Location:	HMS Daedalus, Lee-on-Solent, Hampshire
Type of Flight:	Private
Persons on Board:	Crew - 2 Passengers - 2
Injuries:	Crew - None Passengers - None
Nature of Damage:	Landing gear left main leg broken, propeller damaged, engine shock-loaded, fuselage left underside crushed and left wing deformed outboard of mid-span
Commander's Licence:	Private Pilot's Licence
Commander's Age:	38 years
Commander's Flying Experience:	121 hours (of which 16 were on type) Last 90 days - 8 hours Last 28 days - 3 hours
Information Source:	Aircraft Accident Report Form submitted by the pilot and metallurgical examination of failed component

In a frank account of the landing the pilot described how he overcompensated for a leftward drift following an initial bounce and the aircraft 'ground looped' to the right. The runway in use was 10 and the wind was from 120 or 130 at 15 kt, producing a slight crosswind from the right. As the aircraft slewed to the right the left main leg collapsed.

On the Cessna 195 the landing gear is of the undamped steel leaf type. The inboard end of the leg is bent to form a horizontal tongue which locates in the fuselage structure; it is retained by a bolt at its inboard end within the fuselage and supported in a slotted housing in the fuselage skin. The leg had failed in downward bending from a pre-existing fatigue crack at the top front corner of the spring leaf at the outboard edge of the supported area in the slotted housing (see photographs). The fatigue crack ran aft 15 mm in the chord-wise direction and 5 mm down the leading edge of the leaf. Very rapid progression of the fatigue had taken place just before the final separation. This was probably a result of high cyclic loads during the ground loop rather than an indication of the crack reaching its critical

length where it would fail under normal loading. The crack had probably, therefore, been exploited by the loads sustained during the ground loop but it had existed for a long time and had been driven by stresses just in excess of the endurance limit. The fatigue crack had multiple origins and local corrosion and fretting, caused by contact top and bottom with the support housing, had been factors in the fatigue initiation. However, the top surface had not been shot-peened, as had the underside, and it did not, therefore have the additional fatigue resistance provided by that process. The underside's surface hardness was 350HV(10) (Vickers hardness test) whereas that of the top was 250HV(10), the core hardness. The metallurgist pointed out that in an undamped spring landing gear the rebound stresses can be almost as high as the initial impact stresses. If the top surface had been shot-peened its fatigue endurance limit might well have been raised above the marginally high stress levels that it had been sustaining, giving it an unlimited fatigue life. The tensile strength of the steel from which the leg had been made was approximately 115,000 lb/in^2, equivalent to S96.

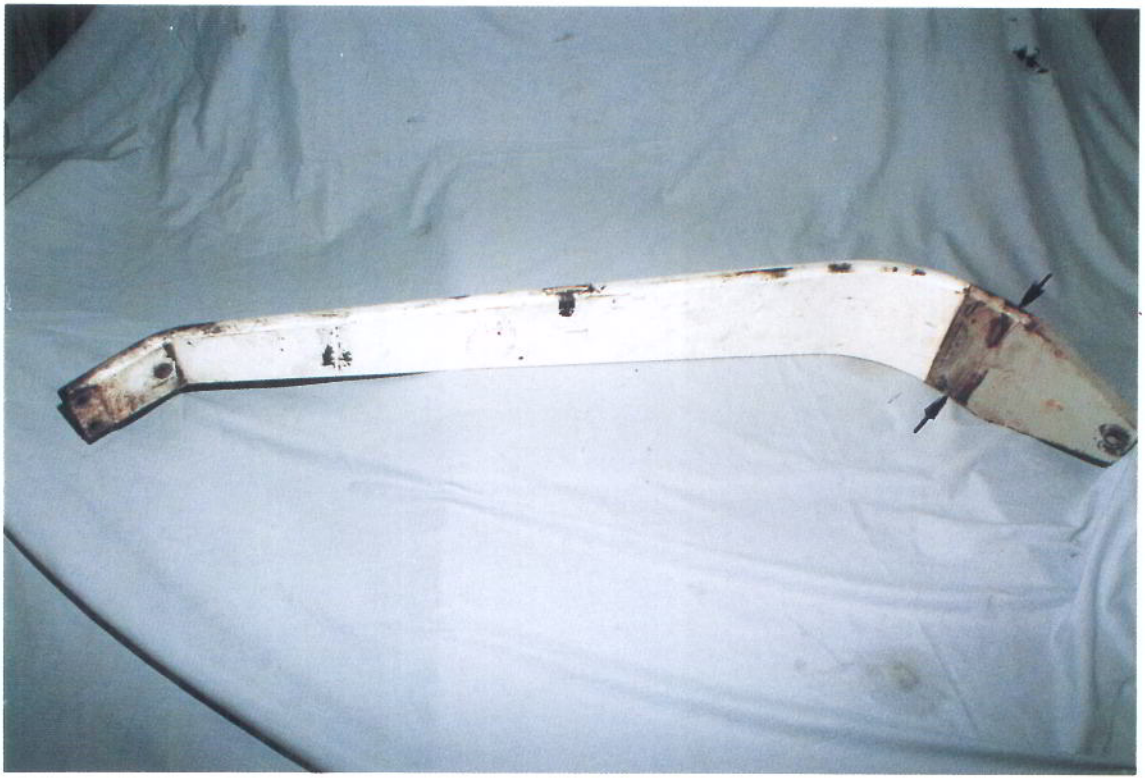

Fig 1: Left mainleg with position of fracture indicated by arrow

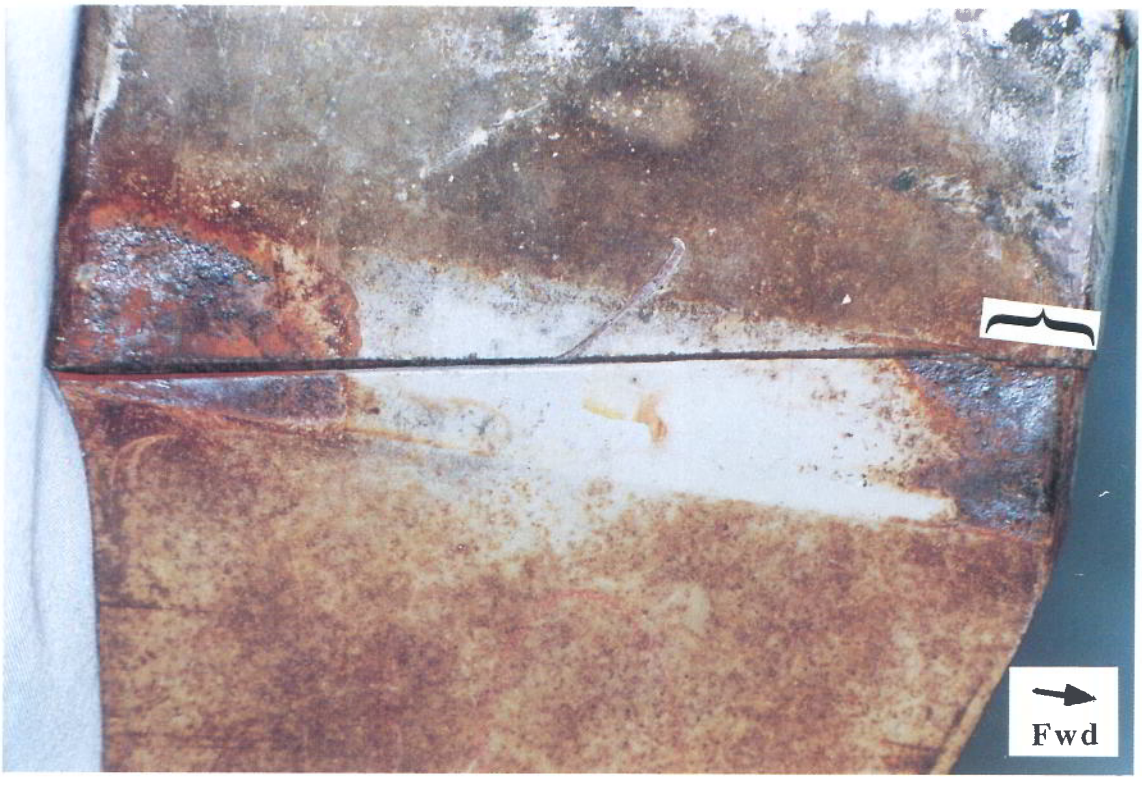

Fig 2: Top surface of mainleg failure area with extent of fatigue fracture indicated and showing corrosion and fretting in contact areas within support housing

Photographs:- H Tyrer