FINAL REPORT

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In accordance with the provisions of SI 205 of 1997, the Chief Inspector of Accidents, on 9 May 2004 appointed John Hughes as the Investigator-in-Charge to carry out a Field Investigation into this occurrence and prepare a Synoptic Report.

Aircraft Type and Registration:	Cessna 210J, EI-AWH
No. and Type of Engines:	1 x Continental IO0520-J
Aircraft Serial Number:	210-59067
Year of Manufacture:	1969
Date and Time (UTC):	9 May 2004 @ 18.29 hrs
Location:	Cork Airport (EICK)
Type of Flight:	Private
Persons on Board:	Crew - 1 Passengers - 2
Injuries:	Crew - Nil Passengers - Nil
Nature of Damage:	Port undercarriage damaged
Commander's Licence:	Irish PPL
Commander's Details:	Male, aged 47 years
Commander's Flying Experience:	1,225 hours (of which 205 were on type)
Information Source:	Station Manager, Cork Airport.

1 FACTUAL INFORMATION

1.1 History of the Flight

After a local flight the aircraft returned to Rathcoole, Co.Cork, for a landing on Runway (RWY) 09. At the time the pilot's brother was using a tractor/mower in cutting the grass at the airfield. On left down-wind the pilot carried out the landing checks, selected undercarriage (U/C) down and joined finals at about 2 miles.

As his brother had not noticed his approach, the pilot decided to opt for a "Go Around". During the "go around" he selected gear up. He noticed, however, that the mechanism failed to bring the left landing gear up satisfactorily. Neither of the two landing gear position indicator lights illuminated and the U/C gear handle was vibrating and not in the neutral position. He climbed to 1,200 feet and attempted to rectify the situation by selecting gear down and gear up alternatively about three times, but was unsuccessful on each attempt. He operated the emergency hand pump, which did not achieve the result of locking the U/C down.

The pilot said that the right wheel and nose wheel appeared to be down and in position, but the left main gear was stuck at the mid-travel position, just out of his sight. He then sought, and received, permission to fly to Cork Airport where the wind was favourable to the main runway and where emergency services were available. He flew past the control tower at Cork Airport approximately three times for a visual check on the situation and received the controllers confirmation that the left main landing leg was "partially up and partially down". With full flaps and the fuel cut off selected, he successfully landed on the grass area east a beam RWY 35. The pilot and his passengers exited the aircraft in the normal way. There were no injuries reported and there was no fire.

1.2 Damage to the Aircraft

The aircraft was removed to the hangar area and jacked up. On inspection it was found that the port undercarriage saddle assembly P/N 1241423-1 had cracked and had broken up, which left the port leg dangling in flight. An inspection of the starboard saddle revealed, that there was a crack in the same area of the saddle, although the saddle had not fractured. **(See Appendix A)**

1.3 Aircraft Information

The retractable tricycle landing gear is extended and retracted by hydraulic actuators, powered by an engine driven hydraulic pump. Two position-indicator lights show that the gear is either up or down and locked. The gear-down indicator light is "green" whilst the gear-up indicator light is "amber". The gear position handle has two neutral positions (slightly above centre for gear up, and slightly below centre for gear-down) which give a mechanical indication of the gear position. From either position, the handle must be pulled out to clear a detent before it can be repositioned. Operation of the gear doors will not begin until the handle has been repositioned.

To reposition the gear, the handle is pulled out and moved to the desired position and then released. Pressure is created in the system by the engine driven hydraulic pump and the gear is actuated to the selected position. A detent in the gear handle system holds the handle in the operating position until the cycle is completed and then the handle automatically returns to neutral and the pressure in the system is relieved.

1.4 Inspection of Saddles

Both saddles were removed from the aircraft and the Investigation had a local non- destructive metallurgical examination carried out on these components.

This examination concluded that:

* Failure of the LH saddle occurred through fatigue cracking.
* There was no material or manufacturing defect associated with the fracture.
* The RH saddle was cracked at a location corresponding to the area of initiation of the failure in the LH saddle.
* Bruising/oxidation suggested that cracking was present for a considerable time prior to the final failure.

1.5 Component History

The manufacturers issued, a Service Letter SE 70-29 in 1970, which announced the incorporation of higher strength main landing gear saddles in 1968 Model 210 series aircraft. As a result of field experience with all saddles this SE 70-29 was revised and in December 1975 the manufacturers issued another Service Letter, SE 75-26 to cover the main landing gear saddle inspection and replacement. For the 1969 Model Cessna 210 it stated:

"The main landing gear saddles should have a dye penetrant or magnaflux inspection accomplished upon accumulation of 1200 hours and at each annual inspection thereafter. Improved saddles (P/N 1241423-1 and –2) may be identified by the shot peened surface and smooth edge radius. Shipments of these saddles after December 1969 were of the improved design."

The FAA database records detail about eight other cases relating to the unserviceability of these saddles. In most cases the cracks were detected during annual inspection while following the inspection criteria set out in FAA AD76-14-07R2. This AD amended and re-issued in 1985 also requires a dye penetrant inspection of the saddle on every annual inspection.

1.6 Airworthiness Directive

AD76-14-07R2 re-issued in 1985 states:

"On 210 J airplanes, within the next 100 hours time in service after the effective date of this AD, for airplanes with over 1200 hours time in service and at each annual inspection thereafter, inspect the main landing gear saddles for cracks using dye penetrant procedures in accordance with instructions outlined. On those airplanes on which main landing gear saddles have been replaced, base the compliance time on new saddles time in service rather than the airplane time in service".

The AD also makes reference to replacing saddles *"with improved saddles of the same part number".* The improved saddle is identified by having a shot peened surface, smoothed out radii and has the parting line 0.1 inch step of the forging removed**. (See Appendix B)**

Para G of the AD states*: "Installation of main landing gear saddles Part No.1294151-1 and 1294151-2 in lieu of part numbers 1241423-1 and 1241423-2 constitutes an equivalent means of compliance for this AD".* [This new type had been introduced by the aircraft manufacturer in the early eighties. It was given a new part number because it was manufactured by a separate company.]

1.7 Manufacturers Examination

The saddles were forwarded to the aircraft manufacturer for non-destructive testing. The 6 page laboratory report on these included a statement that *"the earlier design of saddle had an approximately 0.1 inch step along the forging parting line that also runs through the area of the radius" at the point of concern".* However the saddle which had fractured at this radius did not have this 0.1 inch step as a significant surface feature and the area of the crack at the radius was fairly smooth. The RH saddle did have a forging step and was found to have a 0.6 inch crack originating in the region of the step. The manufacturer could not confirm whether the saddles were installed at aircraft build or if they had been installed on the aircraft since then.

1.8 Service History

The log book for this aircraft was presented to the Investigation by the owner. In 1984 a licenced engineer verified under the SBs and ADs section, that AD76-14-07R2 Compliance had been fulfilled in 1980. It also states that the Next Compliance due was 2,200 hours and that the period of compliance was 1,000 hours. This would indicate that the saddles had been changed in 1980 at 1,200 hours aircraft time. However this could not be confirmed as the owner was not in possession of the aircraft's previous log book. A search for the log book proved fruitless.

The aircraft was involved in a gear-up accident at 1,442 hours flying time in July 1987. The RH elevator, horizontal stabilizer and RH flap were replaced. Records at that time indicate that all AD's and SB's were updated and certified as correct. The landing gear saddles were "inspected" but the next compliance time was stated as 2,442 hours, (which was arrived at by adding 1,000 to the then aircraft hours of 1,442 hours).

During an annual inspection in July 1990, the logbook states, that the next compliance due was at 2,442 hours. At the August 1991 Annual Inspection, the records show that AD76-14-07 R2 was not applicable "at this time" and the next compliance due was at 2,442 hours.

During the annual inspection in March 2002 the dye penetrant inspection of the saddles was carried out. The annual inspection in April 2004 records, that the dye penetrant inspection was due, but the work sheets for the 2004 annual inspection do not actually record the dye penetrant inspection as having been carried out.

2. ANALYSIS

The LH saddle which fractured had a smooth radius at the fracture area. The RH saddle had a forged 0.1 inch step line and obviously came from a different batch. It was not possible to determine if these saddles were installed at aircraft assembly or whether one or both were installed at a later date. The fact that there were improved saddles in circulation, at different times and with the same part number as the earlier design, compounds the problem.

If these components had been replaced in 1980 when the aircraft had reached approximately 1,200 hours flying time, then dye penetrant inspection would not have been required until 2,400 hours (1200 + 1200) flying time. As it was, the aircraft hours at saddle failure was 2,164 hours.

If, on the other hand, the saddle had not been replaced, a dye penetrant inspection was due every annual inspection since 1,200 hours aircraft time. Four different contractors had conducted annual inspections on this aircraft. The log book indicates that the saddles were inspected only three times between 1984 and 2004.

Clearly there was ambiguity about the compliance of this particular AD. In some cases "compliance" was interpreted as 1,000 hours and by others "compliance" was interpreted as 100 hours when a dye penetrant examination should have been carried out.

The Investigation was unable to determine whether the original saddles had been replaced due to the fact that the log book had not always been properly completed by contractors, the contractors changed frequently and the new improved saddles had the same part number as the original inferior ones.

3. CONCLUSIONS

(a) Findings.

The port undercarriage failed to extend due to a fracture of the associated undercarriage saddle.

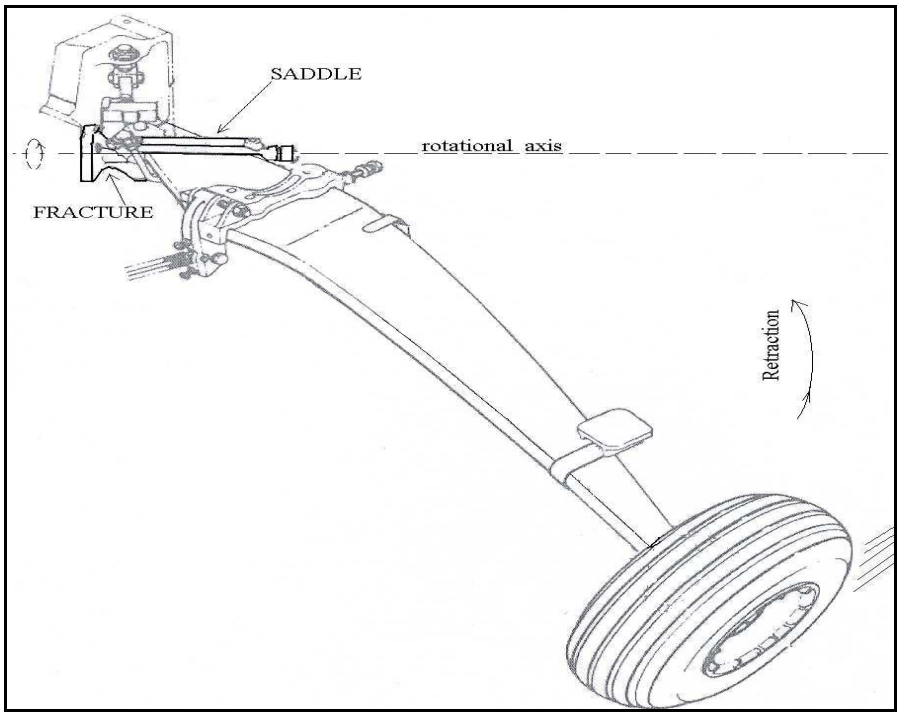
(b) Causes.

The port main landing gear saddle was found fractured due to fatigue failure.

4. SAFETY RECOMMENDATIONS

1. The manufacturer should ensure that aircraft components, which have been modified or improved, be identified by a dash number added to the original part number. **(SR 18 of 2005)**

APPENDIX A

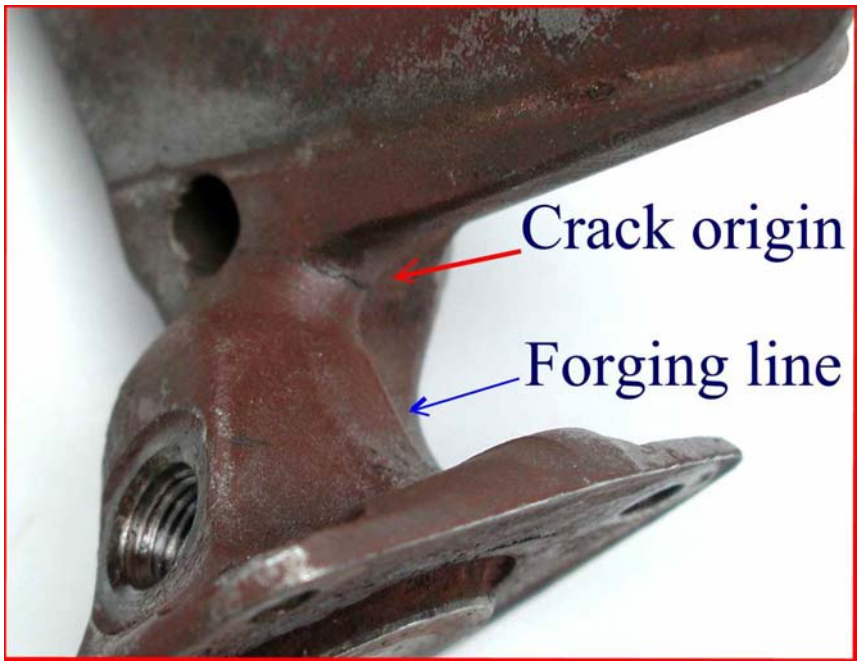


Sketch showing location of saddle in the LH undercarriage.

APPENDIX A

The 7.5 inch long fractured LH Saddle Assembly P/N 1241423-1 (Forging P/N 1241423-497) and cracked RH Saddle Assembly P/N 1241423-2 (Forging P/N 1241423-498).

APPENDIX B



Above: Photo of cracked RH saddle showing the original forging line.