## BULLETIN ADDENDUM

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| **AAIB File:** | **EW/G93/06/28** |
| **Aircraft Type and Registration:** | **Cessna R182 Skylane RG, G-BPUM** |
| **Date & Time (UTC):** | **30 June 1993 at 1810 hrs** |
| **Location:** | **Farnborough Airport, Hampshire** |
| **Type of Investigation:** | **Aircraft Accident Report Form submitted by the pilot, engineering examination by an aircraft engineer, AAIB and enquiries with the aircraft manufacturer** |

**SYNOPSIS (AAIB Bulletin 10/93 refers)**

Subsequent to attempted lowering of the landing gear using the normal system and hand operated hydraulic pump, the aircraft was landed on its main gear on Runway 11 at Farnborough with its nose gear doors still closed.

During the aircraft's recovery from the runway an attempt was made to lower the nose landing gear by accessing the nosewheel and applying hand pressure to the top of the nosewheel tyre, but to no avail. An engineer operated the manual landing gear system, but after a couple of strokes of the hydraulic pump handle it became 'solid' as if the hydraulic system had reached a high pressure, but the nose landing gear did not move. Eventually the nose landing gear was extended by the removal of one of the hydraulic pipes from the nose landing gear actuator and releasing hydraulic fluid under pressure.

With the aircraft on jacks in a maintenance hangar, and the remains of the nose landing gear doors removed, the landing gear system was powered up and numerous retraction and extension tests were carried out, with no fault found. During some of the extension tests the nose landing gear was purposely held by hand in the retracted position and it was found that it was possible, with considerable effort, to maintain it in the retracted position.

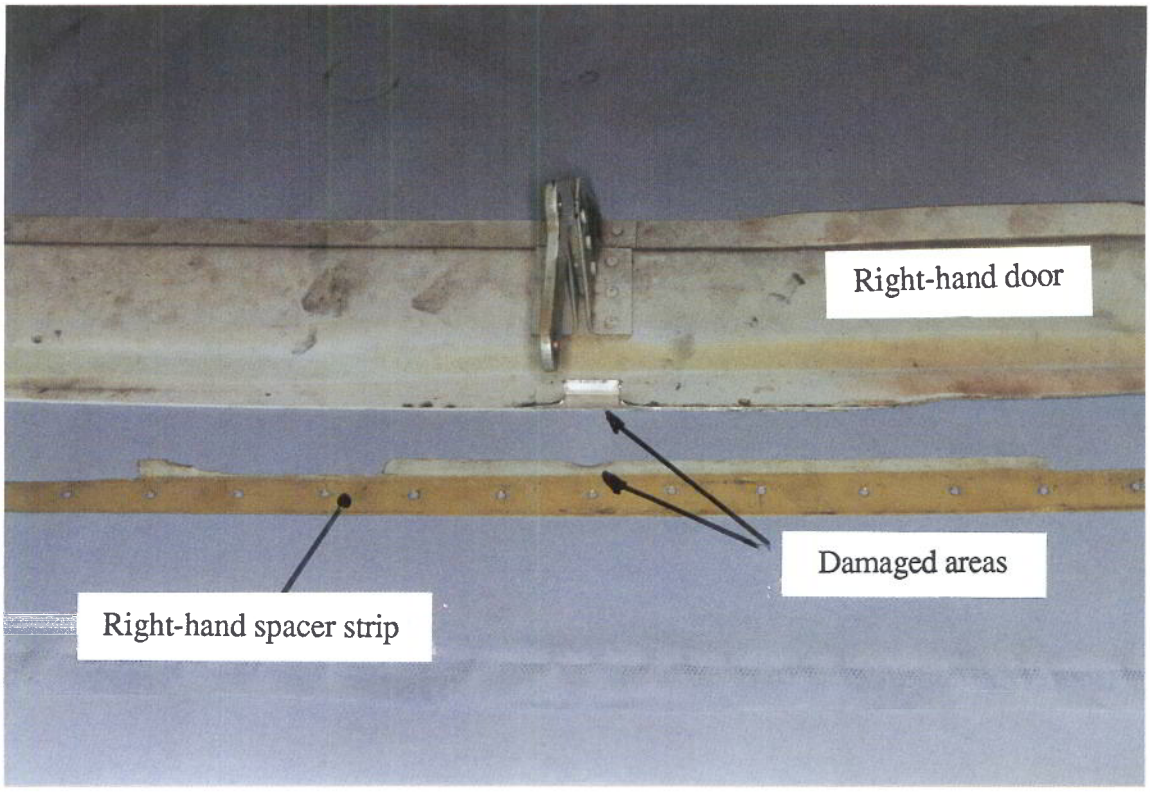
Examination of the nose landing gear doors showed evidence that when they were in the closed position there had been minor interference between the doors. On one of the door edges that abutted the fuselage skin in the area of the middle door hinge a section, approximately 0.75 inches x 0.5 inches, of the outer aluminium skin had been peeled back (photograph nos 1 and 2). It was not possible to attribute this damage to the landing. It was noticed that on the inside of both nose landing gear doors there were black rubber marks indicating that doors had been in contact with the tyre whilst in the closed positions.

With the nose landing gear hydraulic actuator removed, attempts were made to hold the nose landing gear wheel away from the fore/aft aligned position whilst retracting the nose landing gear, to see if it was possible to retract it in a 'cocked' position. It was found that the nose landing gear self-centring system functioned correctly.

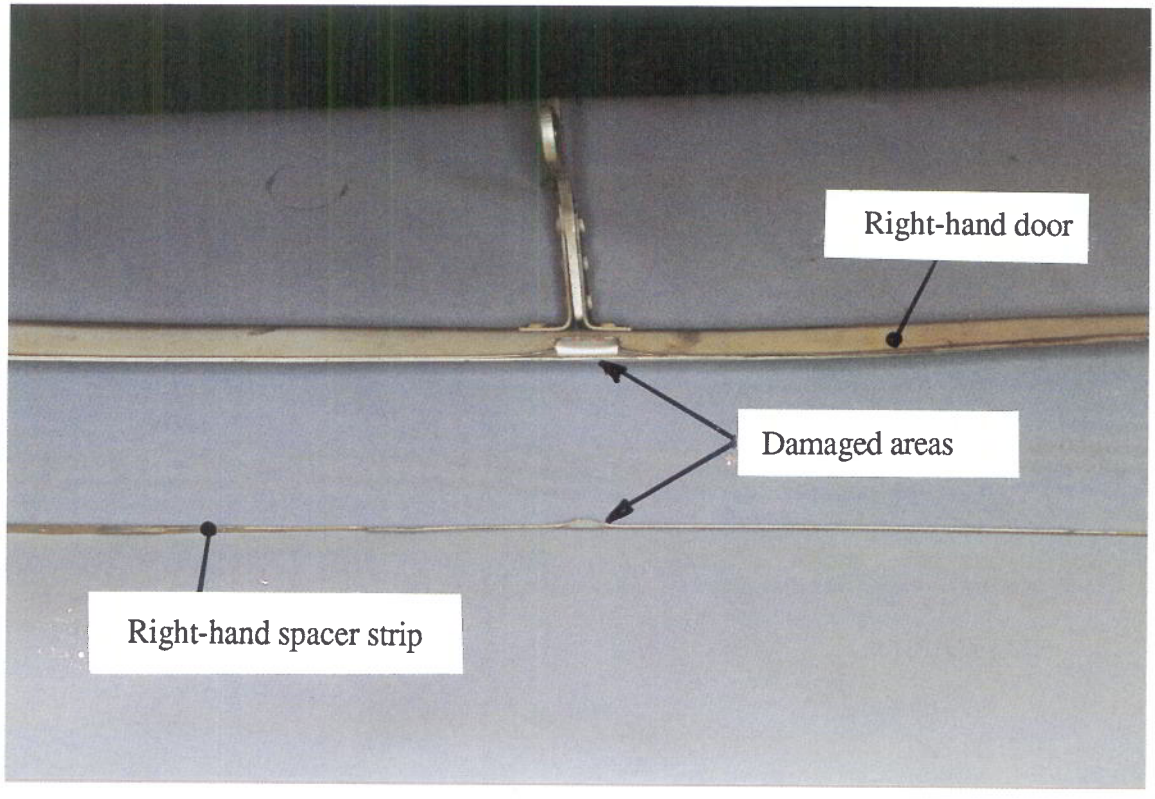
When the nose landing gear hydraulic actuator was stripped and examined it was found that a circumferential groove had been formed on the piston rod (photograph no 3) which went around approximately one third of the circumference. This groove corresponded to the position of the piston rod within the actuator's output bearing housing when the nose landing gear was retracted. Examination of the actuator bore revealed a circumferential groove in the inner cylinder wall that had been made by the metal edge of the piston. This groove was approximately the same length as that on the piston rod, but was orientated 180° around the circumference from it. The position of this groove also corresponded to the position within the actuator of the piston when the nose landing gear was retracted. The orientation of these two grooves relative to each other within the actuator indicated that, over a period of time, the nose landing gear actuator had been subject to some resistance during the initial part of the landing gear extension cycle.

The aircraft had been involved in two previous accidents. The first accident on the 10 July 1989 involved failure of a main landing gear (AAIB Bulletin 10/89), and the second on the 17 April 1991 involved a nose landing gear collapse after landing (AAIB Bulletin 6/91). A detailed metallurgical examination of the failed nose landing gear following the accident on 17 April 1991 showed that it had failed in overload in a rearwards direction and that there was no evidence of previous damage. Following that accident the aircraft had extensive repairs to the nose landing gear bay and lower forward fuselage area. During this repair the maintenance organisation had difficulty in ensuring that the nose landing gear doors operated freely without locking in the closed position. The aircraft had flown approximately 50 hours without incident since this repair had been completed.

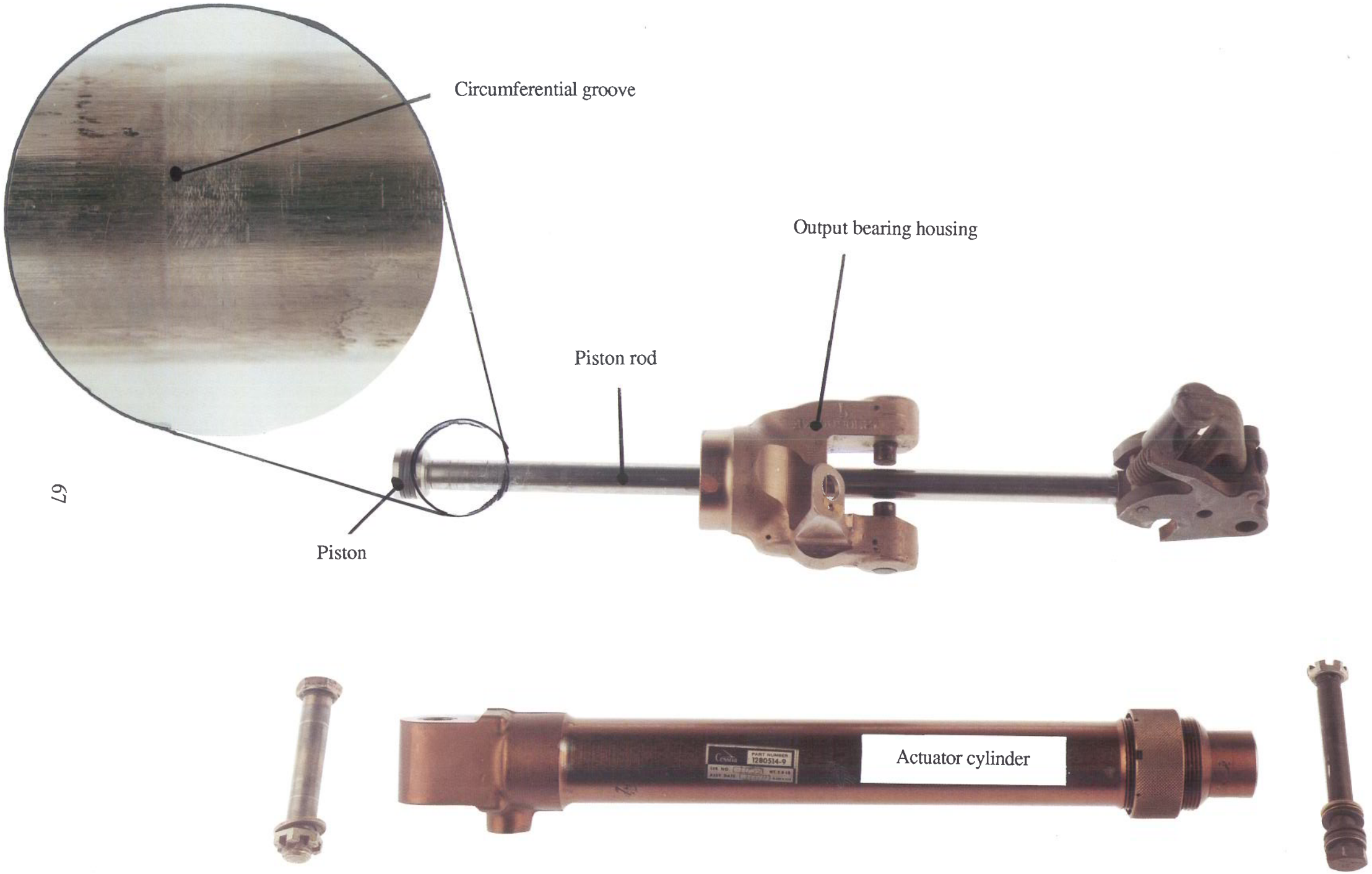
During the repair of the aircraft following this latest accident it was found that a spacer strip (photograph nos 1 and 2) had been inserted between the lower fuselage skin and the aircraft structure on both sides of the nose landing gear bay. This spacer strip was not a Cessna part and is not specified in the Aircraft Parts Manual. The repair organisation also encountered considerable difficulty in achieving free operation of the landing gear doors and on a number of occasions managed to lock the doors in the closed position. The associated foul was caused by interference between the hinge edge of the door and the edge of the fuselage skin (figure no 1). This jamming of the doors was sufficient to hold the nose landing gear in the 'UP' position after it had been selected 'DOWN'.




**Photograph No 1 Damaged edges of the right-hand nose landing gear door and spacer strip**




**Photograph No 2 Damaged edges of the right-hand nose landing gear door and spacer strip**




**Photograph No 3 Nose landing gear hydraulic actuator**

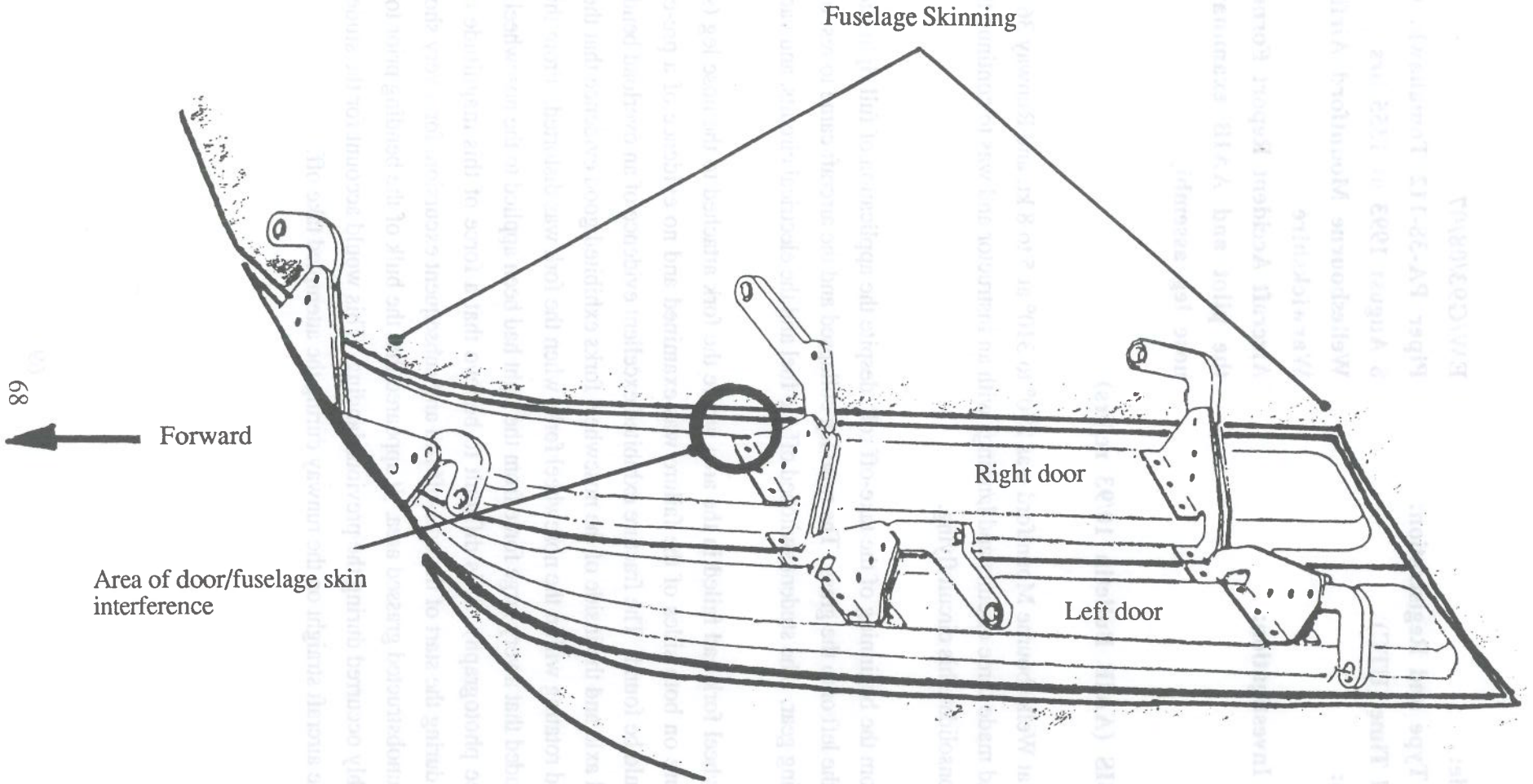



**Figure No 1 Nose landing gear doors in the closed position**