Cessna 310L, G-AZUY

AAIB Bulletin No: 1/99 Ref: EW/G98/07/03 Category: 1.2

Aircraft Type and Registration:	Cessna 310L, G-AZUY
No & Type of Engines:	2 Continental IO-470-V piston engines
Year of Manufacture:	1966
Date & Time (UTC):	3 July 1998 at 2145 hrs
Location:	Liverpool Airport
Type of Flight:	Private
Persons on Board:	Crew - 1 - Passengers - 2
Injuries:	Crew - None - Passengers - None
Nature of Damage:	Wheels-up landing, aircraft considered beyond economic repair
Commander's Licence:	Private Pilot's Licence
Commander's Age:	38 years
Commander's Flying Experience:	762 hours (of which 335 were on type)
	Last 90 days - 103 hours
	Last 28 days - 58 hours
Information Source	Aircraft Accident Report Form submitted by the pilot and additional information from Insurers

The aircraft was completing the last of six flights that day on a leg from Barton (Manchester) to its base in Liverpool. On final approach to Liverpool, whilst carrying-out pre-landing and final approach checks, the pilot reports that he was distracted by a passenger who was concerned about the proximity of some trees. He looked out and confirmed that he was on the correct glidepath according to the VASIS and continued the checks and the approach.

The pilot's normal practice when landing on Runway 27 at Liverpool was to select 5° flap for a normal approach but to 'fly' the aircraft at a height of about 10 to 20 feet along the runway until touching-down at the mid-point. This would involve relatively high power and a nose-high attitude. It was during this latter phase that he glanced-down at the landing gear indicators and saw that he had no green light for the nose gear but remembers no configuration warning horn. He immediately elected to go around, applying power and selecting the landing gear up but felt what appeared to be the right mainwheel touch in a lower-than-normal aircraft attitude, followed by the right propeller striking the ground. He immediately reselected landing gear down, leaned-off the mixture controls, switched-off the magnetoes and landed the aircraft. The aircraft slid along the runway on its belly before coming to a halt, whence the pilot supervised the evacuation of his passengers in the normal way. The airport fire service attended promptly, but there was no fire and they arranged for the aircraft to be lifted onto a trailer which was towed to a maintenance facility.

Description of the landing gear actuating system

On this aircraft type, extension and retraction of the landing gears is achieved by a single electric motor which, through a gearbox, moves a series of linkages to extend or retract all three gears simultaneously. Thus, if one of the three encounters resistance during extension/retraction and no failures in the mechanism occur, the other two will be prevented from completing the commanded cycle. The nose gear doors are mechanically linked to motion of the leg so that they start to close as the nose gear enters the bay.

A manual extension handle is mounted between the front seats and, when deployed, can be used to hand-crank the landing gear up or down by declutching the motor and allowing the mechanism to be moved manually.

Indication lights comprised the normal three green lights to indicate all landing gears fully down and locked. A single red light illuminates when any actual gear position does not agree with the selected position. It will therefore illuminate whilst the gears are in-transit during a normal extension/retraction cycle but should extinguish when the cycle is complete. A warning horn will sound if the throttles are reduced below about 12"Hg manifold pressure with the landing gear 'up' or if the red light is illuminated as a reminder to the pilot or as a warning that one or more gears is unsafe.

Examination of the aircraft

The aircraft was initially examined by the maintenance organisation and a surveyor from the owner's insurance company. The latter advises that, upon lifting the aircraft, the main gears

drooped down from what had been a fully retracted condition on the runway whilst the nose gear did not move. Concerned at the prospect of further damage, it was decided to manually retract the main gears by winding the emergency handle. This was done without difficulty and the aircraft was positioned on jacks. The main gears were then manually wound-down but strong resistance was encountered which prevented full movement into downlock. The nose gear was then accessed by cutting away the doors and it, too, started to partially extend. Disconnecting the nose gear actuating linkage from the main gear enabled the main gears to be wound both electrically and manually into downlock whilst the nose gear was free to drop under its own weight and could be pushed into downlock. Damage to the main gear doors suggested that they had folded into the up position whilst the aircraft was in contact with the runway. This was not the case with the nose gear, which had no signs of damage to the edges of the doors as might be expected had the leg retracted with the wheel on the ground. It was found that the 'adjusting bellcrank' and 'fork bolt' (see diagram) in the nose gear actuating linkage had fractured, preventing transmission of landing gear motor movement to the nose gear itself but presumably causing a jamming condition which prevented the main gears from completing their extension cycle.

The failed components were despatched to AAIB, but examination found no evidence of pre-existing damage or cracking: the parts appeared to have failed in a single fast fracture.

It was also discovered that the 'Gear Unsafe/In-transit' light filament was unserviceable and that this was known to the pilot.

Discussion

As far as the main landing gears are concerned, the sequence of events could be explained by the pilot's very late decision to abort the landing and rapid selection of landing gear up. As the gear moved away from the downlocked condition, the aircraft possibly continued to sink onto the now-unsafe gear. In such cases this would normally cause fractures of the actuating mechanism, which were not found, but it is possible that, with a low sink-rate, the rate of retraction may have roughly matched the rate of descent such that damaging loads were not fed-back into the actuating system.

This did not appear to be the case with the nose landing gear which reportedly seemed to have remained in the fully retracted condition throughout. It was the lack of the green indication light which led to the decision to go-around and the pilot implies that it was distraction by a passenger during the landing checks which prevented him noticing this earlier. It was also found that the landing gear configuration warning horn, which should sound as the throttles are retarded below about 12"Hg manifold pressure with the gear up or in an unsafe condition, only sounded with the throttles fully closed.

The pilot also reported that the previous take offs and landings at Barton and Haydock had been noticeably 'bouncy' due to the uneven nature of these grass airstrips. This is presumably mentioned as a possible factor affecting the integrity of the nose landing gear. The type of failure found after the accident is typical of that found when landing loads are applied to a noseleg which is not fully down-and-locked and hence the actuating linkage attempts to react this loading. However, if the fork bolt and bellcrank had fractured during the take off at Barton, then the nose gear would have been unable to retract and the red gear unsafe light should have illuminated throughout the flight to Liverpool, unless the failures occurred after the nose gear went into the uplock position. The unserviceable filament would have prevented this warning.