

# Boeing 747-121

**AAIB Bulletin No: 12/1996**

**Ref: EW/C96/6/5 Category: 1.1**

<b>Aircraft Type and Registration:</b>	Boeing 747-121,
<b>No &amp; Type of Engines:</b>	4 Pratt and Whitney JT9D-7A turbofan engines
<b>Year of Manufacture:</b>	1970
<b>Date &amp; Time (UTC):</b>	15 June 1996 at 1744 hours
<b>Location:</b>	Cardiff-Wales Airport
<b>Type of Flight:</b>	Not applicable
<b>Persons on Board:</b>	Flight Crew -3
<b>Passengers - Nil</b>	
	Maintenance Crew - 2
<b>Injuries:</b>	Crew - Nil
<b>Others - Nil</b>	
<b>Nature of Damage:</b>	Damage to body gears and to underside of rear fuselage, also damage to nose gear towbar attachments
<b>Commander's Licence:</b>	Not relevant, see text
<b>Commander's Age:</b>	Not relevant, see text
<b>Commander's Flying Experience:</b>	Not relevant
<b>Information Source:</b>	AAIB Field investigation

The accident occurred as the aircraft was being prepared for handover to the operator following major maintenance. The Flight Data Recorder (FDR) was not running at the time of the incident, but the Cockpit Voice Recorder (CVR) contained a complete record of the event. Security cameras outside the hangar had also recorded the pushback and the incident. Statements were taken from the staff involved. These were in generally good agreement and together with the recorded information described the following sequence of events leading up to the incident.

The aircraft had been on a 'C' check and the Estimated Time to Service (ETS) had been delayed from the previous day, due to the workload on the aircraft. It was rescheduled for 1800 hrs local time

(L) on the 15th. The task continued to run late, however the day shift fully expected to deliver the aircraft for service as scheduled, just before the end of their shift at 1800 hrs L, and so no 'handover' had been prepared. During this period the aircraft was under the control of the day shift aircraft controller. At about 1730 hrs L the night shift began to arrive and having arrived early, began to assist the day shift.

Prior to the arrival of the night shift, there had been some discussion concerning the landing gear pins. The pins, which had been removed prior to the pushback from the hangar, were re-fitted as required for some work card items which were still outstanding. The work card items outstanding were, in particular, a function check of the landing gear module and nose gear alternate extension checks. In addition, the tug driver was unwilling to push back unless the nose gear pins were in place. At about 1810 hrs L the aircraft was pushed back from the hangar to the apron outside. As the aircraft was being pushed back, an engineer on the night shift team saw the pins in place and queried with two of the day shift controllers whether the pins were the property of the operator or the maintenance organisation. He was advised that they did not belong to the operator, and understood the reply to mean that they could be removed after the aircraft was parked. It is not clear how this understanding arose, however the night shift were generally unaware of the outstanding work card items.

To expedite matters, the loading of freight began and the three members of the operator's flight crew boarded the aircraft in readiness for it to be handed over to them. Although the flight crew were on board, the Certificate of Release to Service (CRS) had not been signed and the flight crew were not in command of the aircraft. They were, however, on board with the intention of flight as it was understood that, once the CRS was signed the engineers would leave the aircraft and the flight crew would take command. The day shift team leader was seated in the left hand seat and was in contact with an engineer on the ground by headset. A number of other engineering personnel were around the aircraft, including several night shift personnel. Prior to carrying out the landing gear functions, the team leader asked the engineer on the headset to confirm that all the landing gear pins were in place. The engineer on the headset visually checked that all the landing gear pins were in place and advised the team leader on the flight deck accordingly.

During this time two engineers on the night shift were proceeding with the removal of the pins from the main and body landing gears. They then attempted to remove the nose gear pins, but could not reach them unaided. The removed main gear pins were deposited on the ground by the nose gear while an engineer went to obtain a tool to reach the nose gear pins. Even though some discussion with the engineer on the headset occurred concerning the landing gear doors, there was no effective communication between the two groups concerning the landing gear pins.

The team leader, on the flight deck, then selected the landing gear to UP. At this point a 'shudder' was felt and some discussion ensued as to the cause, which was initially attributed to the freight being loaded. However the team leader was not satisfied with this explanation and he then selected the landing gear lever to DOWN. Further inspection showed that both body gears were out of downlock and that there were no pins in the wing or body gears. The pins were then seen lying by the nose wheel. From the associated statements it was clear that the engineer on the headset was surprised (and "horrified") to see that the pins had been removed, and the engineers who had removed the pins were equally surprised that landing gear functions were being performed. The aircraft was shut down and the situation assessed; several attempts were made to put the body gears into downlock. The wing gear pins were re-fitted, however the body gear pins could not be fitted with the gears out of lock.

At about 1840 hrs L it was decided to tow the aircraft back into the hangar where the body gears could be more easily moved. A tow bar and tow vehicle were connected, the other engineer onboard took the flight engineer's position, and the brakes were released. Upon brake release the aircraft slowly tipped up onto its tail causing the tow bar attachments to break and the body gears to partly collapse, this in turn causing considerable damage to the body gear hydraulic actuators. Some damage to the lower skins and frames of the rear fuselage occurred. The personnel on the flight deck and in the cabin, who were uninjured, vacated the aircraft from the rear.

At the time of the incident the fuel on board was about 39,000kg, distributed in accordance with the Fluid Replenishment Manual. This placed the CG very slightly behind the wing gear datum. The AAIB had requested that the circuit breakers for the CVR and FDR be pulled, but as these were at the front of the aircraft it was thought inadvisable and the recorders were therefore removed from the aircraft. After the AAIB had inspected the aircraft, it was recovered by transferring fuel and eventually settled gently back onto its nose gear.

Following the accident, the maintenance organisation has introduced several measures, the most important of which are that the single person responsible for the aircraft is now clearly identified by the wearing of a red tabard; that the procedures relating to the control of ground lock pins have been improved and re-written; and that the access of customer representatives in such circumstances has been restricted; procedures relating to the formal return of an aircraft to the customer have been clarified and re-written.