

Boeing 747-136, G-AWNE

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Aircraft Type and Registration:	Boeing 747-136, G-AWNE
No & Type of Engines:	4 Pratt & Whitney JT9D-7 turbofan engines
Year of Manufacture:	1970
Date & Time (UTC):	4 September 1997 at 1315 hrs
Location:	Maintenance area, Heathrow Airport, London
Type of Flight:	On maintenance
Persons on Board:	Crew - N/A - Passengers - N/A
Injuries:	Crew - N/A - Passengers - N/A
Nature of Damage:	The Nos 2 and 3 engine pods, the nose landing gear, gear bay, steering system, gear doors and door actuating mechanism were damaged; a small area of lower fuselage was also damaged
Commander's Licence:	N/A
Commander's Age:	N/A
Information Source:	AAIB Field Investigation

The aircraft was undergoing a 'Service One' maintenance check during which an Acceptable Deferred Defect (ADD) was actioned. Rectification of this particular ADD involved the removal of the Landing Gear Control Handle Module to replace a switch within the module. After this module was refitted, a function test was required. The Landing Gear Control Handle Module contains the landing gear indicator lights, the lever lock relay and solenoid, the lever detent switches and the landing gear lever. In order to test the module, all of the landing gear downlock pins must be fitted and hydraulic pressure must be available. The landing gear lever has to be pulled out and selected to another position which, when the aircraft is on the ground, requires placing the lever in the landing gear UP position. When the aircraft is on the ground, the landing gear lever is prevented from inadvertent movement to the UP position by a lever lock. The lever lock is electrically engaged, but can be manually overridden by a deliberate action to push it to one side.

Towards the end of the 'Service One' maintenance check the outstanding items were the engine ground runs, leak checks and the function test of the Landing Gear Control Handle Module. It was decided to complete all of these items when the aircraft was in the engine run compound outside the maintenance hangar.

The engineers who were assigned to carry out the engine run had conducted a number of activities during the day, including cowling the engines and engine trim balancing. With the exception of the licensed aircraft engineer (LAE), the team had spent the 2 to 3 hours that preceded the incident waiting in the crew room. During this time, the LAE had been involved in other activities including reading the relevant technical manuals in preparation for the function tests to be carried out. At approximately 13.30 hrs local time, the team were requested to move the aircraft to the engine run compound. In preparation for the aircraft pushback, they took up positions at various points in the hangar. This activity was neither directed nor co-ordinated. It is common practice for Tractor (tug) Drivers to use a modified nose landing gear downlock pin instead of the aircraft's downlock pin. This modified downlock pin, which was provided by the aircraft operator as part of the tractor's ground equipment, had a long metal pole welded to a downlock pin. Use of the modified downlock pin enabled the Tractor Driver to fit and remove it from the nose landing gear without using steps or climbing up the nose leg. Upon completion of towing or pushing the aircraft, the Tractor Driver would remove the modified downlock pin and stow it with the other ground equipment on the tractor. Prior to pushback of the aircraft the Tractor Driver asked an engineer, who was seconded to the team, if he could remove the aircraft's nose landing gear downlock pin and replace it with the modified pin. The engineer, thinking that only an engine run was going to take place, agreed and the Tractor Driver exchanged the pins, placing the aircraft's downlock pin onboard the aircraft. During pushback, towing, and whilst conducting the maintenance tasks in the engine run compound, a Headset Operator on the ground is the focal point for all personnel involved and should be in continuous communication with the Brake Person, who would be located on the aircraft's flight deck with the engineer conducting the maintenance tasks. He/she must also have visual or audio communication with the Tractor Driver and with other personnel in key positions around the aircraft. Just prior to the start of pushback, another licensed aircraft engineer, who was working on the aircraft but was not directly involved in the engine run task, requested one of the engineers on the team to assume the role of Headset Operator. Although the engineer was not appropriately trained and reportedly felt uncomfortable with the task, he complied.

At no time prior to the pushback were the members of the team formally briefed by the LAE on the activities that were planned in the engine run compound. All staff later interviewed were of the opinion that only an engine run was to take place, except for the LAE and the Avionics Technician.

The following timings and sequence of events were taken from individual's recollections and the Cockpit Voice Recording. The timings are in minutes and seconds from the end of the recording when electrical power was removed, which was within 30 seconds following the incident.

As the aircraft's tail moved clear of the maintenance hangar, the pushback was halted and the Auxiliary Power Unit was started. At this time, about 15 minutes prior to the incident, the LAE declared on the aircraft's intercom that he was going to run the Nos 1 and 4 hydraulic systems to retract the landing gear doors, which had been extended for maintenance reasons. Prior to switching on the hydraulic systems, the LAE asked the Headset Operator to reset the main and nose landing gear doors and to check that the nose landing gear pin was fitted, which he did. The LAE then checked with the Headset Operator that the areas around the landing gear doors were clear, engaged the Nos 1 and 4 hydraulic systems and retracted the doors. This was followed at 12:38 with the engagement of all four hydraulic systems and retraction of the wing flaps. The pushback/tow was continued into the engine run compound. At 6:30 the aircraft arrived in the engine run compound and the brakes were set to ON. At 5:54 the LAE asked the Headset Operator to verify that all the landing gear downlock pins had been inserted. After removing his headset, the Headset Operator proceeded aft and checked the main landing gear downlock pins. At 4:47 the Headset

Operator confirmed to the LAE that the downlock pins were in position. Recollections of the events suggested that the tractor was still in position next to the nose landing gear leg at this time. The LAE then asked the Headset Operator to let him know when the engine foreign object damage (FOD) guards were in place and everyone was clear of the engines. At about this time the Tractor Driver, who was not aware that a landing gear function test was to be conducted, disconnected the towbar from the aircraft and removed both the steering pin and modified nose landing gear downlock pin. This action by the Tractor Driver went unnoticed by the Headset Operator and the rest of the team. At 3:23, in response to a question from the Headset Operator, the LAE said that he was going to put the undercarriage selector lever into the UP position, and since all the doors would open he didn't want "anybody wandering around". The team members put in place all the engine FOD guards and chocked the main landing gear wheels, but not the nose wheels, and the Tractor Driver had moved the tractor clear from the aircraft. At 0:53 the Headset Operator reported to the LAE that the engine FOD guards were in place. At 0:25 the LAE placed the flight deck landing gear lever into the UP position, whereupon the nose landing gear retracted and the nose of the aircraft descended onto the hardstanding. Fortunately no injuries occurred to the personnel.

Following this incident, the operator conducted a thorough investigation into the circumstances and compiled thirteen recommendations. Included amongst these recommendations were requirements to establish a common working practice and procedure within the airline for the fitting and removal of landing gear downlock pins and to develop a management process to ensure cross-departmental review and communication of major ground incidents which would include all subsidiaries and franchises of the airline.

In June 1996 a similar incident had occurred at the operator's engineering base at Cardiff (AAIB Bulletin 12/96). Following this earlier incident the staff at Cardiff made and actioned a number of recommendations to prevent a similar occurrence. These recommendations were not reviewed or actioned at the operator's main base at Heathrow.

In February 1998 a similar incident occurred at the operator's Gatwick base.