

No: 8/90

Ref: EW/C1160

Category: 1a

Aircraft Type and Registration: Boeing 747-243B, G-VGIN

No & Type of Engines: 4 Pratt & Whitney JT9D-7A turbofan engines

Year of Manufacture: 1971

Date and Time (UTC): 17 May 1990 at 0352 hrs

Location: Narita Airport, Tokyo, Japan

Type of Flight: Public Transport

Persons on Board: Crew - 21 Passengers - 103

Injuries: Crew - None Passengers - None

Nature of Damage: Damage to hydraulics, electrical wiring and doors in left hand body landing gear bay

Commander's Licence: Airline Transport Pilot's Licence

Commander's Age: 57 years

Commander's Total Flying Experience: 14,820 hours (of which 8,802 were on type)

Information Source: AAIB Field Investigation

The aircraft was scheduled for a passenger flight from Narita Airport to Gatwick Airport with a departure time of 0330 hrs. The crew recorded the following information from the departure ATIS, "Oscar", timed at 0230 hrs;

Runway	16
Surface wind	Variable/3 kt
Visibility	30 km
Cloud	1 okta base 4000 feet
Temperature	20° C
Dew Point	7° C
QNH	1019 mb

An aftercast provided by the Meteorological Office at Bracknell indicated that, enroute, the aircraft would have initially encountered a northerly jetstream, changing to south-westerly at 120° east and to westerly for the final portion of the flight. There were active cold fronts positioned at approximately 120° east, 60° east and in the area of the Baltic Sea.

The TAF for Gatwick Airport covering the period from 0600 to 2400 on 17 May was issued at 2216 hrs on the 16 May and contained the following information;

Surface Wind	Variable/5 kt
Visibility	3000 metres
Cloud	3 oktas cumulus base 3000 feet

The visibility was forecast to increase to greater than 10 km, after 0900 hrs.

The aircraft carried a full fuel load of 154,786 kg and its planned take-off weight was 333,585 kg. Take-off speeds V1 and VR were calculated to be 151 and 172 kt respectively. Having been given a Narita Reversal 3 departure, the take-off run was commenced at about 0352 hrs. At or about V1 the crew became aware of a slight "rumble" and, shortly after lift-off, as the gear was selected up, there was a "bang", the No 1 Hydraulic System low pressure warning light illuminated and the system contents decreased rapidly. Normal gear retraction was achieved, however, the inboard trailing edge flap remained at 10°. The ALTERNATE TRAILING EDGE FLAP OPERATION drill was carried out to complete the flap retraction schedule. ATC informed the crew that a quantity of tyre rubber had been found on the runway, which confirmed their assessment that a tyre had either burst or shed its tread. The fact that it was the No 1 hydraulic system which had failed and that the bang heard shortly after lift-off seemed to come from behind the flight deck, led them to surmise that the problem tyre was on either the left or right body gear.

The Commander initially expressed his intention to climb to 6000 feet in order to jettison fuel and return to the airfield. ATC was informed and the crew and passengers were briefed accordingly. ATC clearance was given to jettison fuel on the 149° radial from the Choshi VOR between 10 and 25 nm, a procedure which, it was estimated, would have taken about an hour. Once the relevant after take-off drills had been completed and the aircraft was enroute to the jettison area the crew assessed the condition of the remaining aircraft systems and discussed the various options available to them. After due consideration, the Commander decided that it was safe to continue the flight to Gatwick.

About an hour after take-off, while carrying out a routine check, the Flight Engineer noted that the L BODY TILT light on his gear annunciator panel illuminated when pressed. This indicated that the gear was not in the full tilt position. As no other system was affected, no further action was required.

The aircraft carried a "heavy" flight deck crew which consisted of the Commander, 2 First Officers and 2 Flight Engineers. The Flight Engineers did alternate 3 hour periods on the flight deck and the spare First Officer relieved the Commander and First Officer as required. The First Officer for the final part of the flight was the one who had been in the righthand seat for take-off.

At 1538 hrs the aircraft had reached position DANDI and called London on frequency 134.25 MHz. The nature of the unserviceability was explained and London was asked to relay the information to Gatwick ATC with the request that the aircraft be given radar vectors to final approach and that fire

cover be arranged for the landing. Shortly before top of descent, at FL390, the warning horn sounded intermittently, the cabin altitude began to climb at about 700 fpm, the GRD SAF RELAY ON caution illuminated, the air conditioning packs went into ground mode and the landing gear annunciator showed both L and R BODY TILT. The aural warning circuit breaker was pulled to silence the horn. Manual mode was selected on the cabin pressurisation controller and control of the cabin was regained. The ground safety circuit breaker was pulled and, although the initial attempt was unsuccessful, a subsequent attempt re-established automatic control of the pressurisation. Attempts to re-establish automatic control of the air conditioning system failed and it remained under manual control for the remainder of the flight. At 1559 hrs the aircraft left FL390 with a fuel state of about 14,400 kg. The flight planned fuel state at top of descent was 14,233 kg.

The DESCENT APPROACH (one or two hydraulic system(s) inoperative) drill was completed, by FL160, down to 'Alternate T/E Flaps..EXTEND ON SCHEDULE'. Later, when an attempt was made to lower the flap using the alternate system, only the outboard trailing edge flaps moved. These were set to 1° and switched off. The inboard switch was left at DOWN and the appropriate circuit breakers were tripped/reset to no avail. As only sections 2 and 4 of the leading edge flap had extended, the decision was made to carry out the ALTERNATE LEADING EDGE FLAP OPERATION drill before going to the SPLIT TRAILING EDGE FLAPS drill. Just as the crew were about to start the drill the inboard trailing edge flap started to move. On reaching 1° it was switched off. The remainder of the leading edge flap was lowered and subsequent operation of all flap was successfully accomplished as per the schedule.

Gatwick ATC, in preparation for the arrival, had delayed all departures and brought the airfield to Full Emergency status. Inbound traffic was directed into the hold or to alternate airfields and departures were held. At 1627 hrs the crew informed Gatwick Approach, on frequency 125.87MHz, that they were now ready to commence the approach, and the aircraft was cleared to 4000 feet on a heading of 280°. At about 4000 feet, the ALTERNATE LANDING GEAR EXTENSION drill was carried out and the nose and right body landing gear extended. Several unsuccessful attempts were made to lower the left body gear. The normal system was used to lower the wing landing gear. ATC was informed of the situation and subsequent drills were carried out from the PARTIAL MAIN GEAR LANDING checklist.

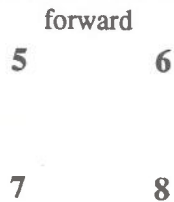
At 1635 hrs, the crew informed ATC that the left body gear was in an "unconfirmed position". The controller responded "You don't want to do a low flypast" to which the crew replied "We'll turn onto finals and see how it is from there." At 1638 hrs further clearance was given to 2000 feet when the following exchange between ATC and the aircraft occurred;

ATC	"The Gatwick Duty Manager would like you to do a flypast sir it's up to you"
Aircraft	"We'll accept that be advised that after the flypast we'd like a fairly early return because we are rather low on fuel"

Prior to this acceptance, the crew had calculated that the fuel state was about 8,000 kg, 2,000 kg of which would be used for the flypast and subsequent circuit. It was noted that the weather was fine, it was daylight and all other movements had been held until G-VGIN had landed.

At 1641 hrs the aircraft left 2000 feet, established on the localiser at 6.5 nm to runway 08R. The go-around was initiated at 1643 hrs. ATC reported that "...outer bogies are fine on both port and starboard - on centre the port side is not down - the starboard looks normal". At 1646 hrs the aircraft was cleared to 2000 feet and was positioned for a visual approach. At 1651 hrs the aircraft was told to continue visually and transferred to the tower frequency , 124.22 MHz. Clearance to land on 08R was given at 1652 hrs when the aircraft was 4 nm on final approach. The surface wind was reported as 130°/5 kt and G-VGIN landed at 1654 hrs. In the latter stage of the landing roll there was noticeable nosewheel vibration and the Commander, having brought the aircraft to a halt, elected not to taxi off the runway. The APU was started and, following an inspection by ground engineers, the aircraft was towed to the stand where the passengers disembarked in the normal manner. The fuel load on landing was estimated by the crew to be about 6,000 kg. This was confirmed by the post shutdown fuel state which was recorded in the Technical Log as 5,800 kg.

The Boeing 747 is equipped with four main landing gear legs, comprising left and right wing gears and left and right body gears; each landing gear has four wheels. The left body gear wheels are numbered from 5-8 in the following order:



The left body landing gear bay was heavily contaminated with Skydrol hydraulic fluid and the No 7 wheel was resting on the bay door. See photo 1. The tread had detached from the No 6 tyre and two small pieces were found in the landing gear bay at Gatwick, the majority of the tread was recovered from near the point of rotation on the runway at Narita.

Damage to the aircraft within the left hand body landing gear bay included:

- Rupture of the hydraulic pipe from No 1 training edge flap
- Inboard trailing edge flap motor electrical loom and conduit
- Left hand body gear door slide ramp missing

During a normal extension of the body gear the bay doors are held out of the path of the wheels by hydraulic pressure. With the loss of the No 1 hydraulic system the gear is lowered under gravity and the wheels are designed to contact the door ramp, photo 2, and move the doors aside; in this case the door ramp was missing and the doors had arrested the fall of the gear.

Tyre pressures and oleo extensions were within limits. The tyres from the right hand nosewheel and the left body gear were taken to the tyre manufacturer, together with the tread debris recovered from the No 6 tyre. The tread on the No 6 tyre was reassembled and the damage was found to start from a point adjacent to foreign object damage (FOD). FOD was also discovered on the tyres from the right hand

nosewheel and No 7 wheel. Tyres can be retreaded until they are rejected on condition, the No 6 tyre was on its fifth retread, which is quite normal. The interface between the detached tread and the tyre carcass showed no evidence of delamination or defect prior to the tread separation. The edges of the FOD to the Nos 6 and 7 tyres did not exhibit the wear normally to be expected from a landing. The FOD was therefore consistent with having occurred on the last take-off.

The Boeing 747 is equipped with four main landing gear legs, comprising left and right wing gears and left and right body gears; each landing gear has four wheels. The left body gear wheels are numbered 1 to 4 in the following order:



The left body landing gear leg was heavily contaminated with hydraulic fluid and the No 7 tyre tread had detached from the No 6 tyre and two small pieces were found in the landing gear bay at Gatwick, the majority of the tread was recovered from near the point of rotation on the runway at Heathrow.

Damage to the aircraft within the left hand body landing gear bay included:

- Rupture of the hydraulic pipe from No 1 trailing edge flap
- Impaired trailing edge flap motor electrical loom and conduit
- Left hand body gear door slide ramp missing

During a normal extension of the body gear the bay doors are held out of the path of the wheels by hydraulic pressure. With the loss of the No 1 hydraulic system the gear is lowered under gravity and the doors are designed to contact the door ramp/photo 2, and move the doors aside; in this case the door ramp was missing and the doors had entered the fall of the gear.

Tyre pressure and also extensions were within limits. The tyres from the right hand nosewheel and the left body gear were taken to the tyre manufacturer, together with the tread debris recovered from the No 6 tyre. The tread on the No 6 tyre was reassembled and the damage was found to start from a point adjacent to the object damage (FOD). FOD was also discovered on the tyres from the right hand



PHOTO 1 NO 7 WHEEL RESTING IN LEFT BODY GEAR DOORS - (Viewed facing rearwards)



PHOTO 2 DOOR SLIDE RAMP FITTED TO RIGHT HAND BODY GEAR DOOR