
Tire failure and systems damage on takeoff, Airbus A320-212, G-JDFW, 10 July 1996

Micro-summary: This Airbus A320 experienced significant damage following the shredding of a tire on takeoff.

Event Date: 1996-07-10 at 0117

Investigative Body: Aircraft Accident Investigation Board (AAIB), United Kingdom

Investigative Body's Web Site: <http://www.aaib.dft.gov/uk/>

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Airbus A320-212, G-JDFW, 10 July 1996

AAIB Bulletin No: 11/96 Ref: EW/A96/7/1 Category: 1.1

Aircraft Type and Registration:	Airbus A320-212, G-JDFW
No & Type of Engines:	2 CFM56-5A3 turbofan engines
Year of Manufacture:	1992
Date & Time (UTC):	10 July 1996 at 0117 hrs
Location:	Alicante Airport, Spain
Type of Flight:	Public Transport
Persons on Board:	Crew - 7 - Passengers - 130
Injuries:	Crew - Nil - Passengers - Nil
Nature of Damage:	Damage to No 1 engine, landing gear and hydraulic pipes
Commander's Licence:	Airline Transport Pilot's Licence
Commander's Age:	36 years
Commander's Flying Experience:	6,325 hours (of which 272 hours were on type) Last 90 days - 232 hours Last 28 days - 74 hours
Information Source:	AAIB Field Investigation

Investigation procedures

Following the initial accident notification, the AAIB contacted the Spanish authorities to offer assistance during the investigation. The Spanish Comision de Investigacion de Accidentes had assessed that the event had been initiated by a tyre problem on take off and, because the crew and aircraft would shortly be returning to UK, requested that the AAIB conduct the investigation. This was agreed, with the understanding that the Spanish authorities would provide the necessary ATC and Airport Services information.

History of flight

Following an uneventful flight from Manchester to Alicante, the crew of G-JDFW prepared the aircraft for the return journey. There were no problems noted during the external checks which were carried out by the first officer; the commander had completed a satisfactory external check prior to the earlier departure from Manchester. After a normal start and short taxi to Runway 10, the crew

were cleared for take off. With the commander as handling pilot, power was applied for a reduced power take off and the aircraft started rolling. Engine parameters were checked satisfactorily and, in accordance with normal procedures, the first officer called "100 kt" for an airspeed check. Shortly afterwards, at an estimated 120 kt, both crew members became aware of a vibration which was increasing as ground speed increased. There were no other obvious abnormalities and the commander decided to continue the take off; V1 had been calculated as 140 kt. The vibration ceased as G-JDFW became airborne and the first officer called that they had a positive rate of climb. This was the cue for the handling pilot to call for gear retraction but the commander noted that the left gear was indicating 'red' and decided not to change the aircraft configuration. The first officer advised ATC that G-JDFW had a problem and would be returning to Alicante; he also informed them that they had a suspected tyre burst and asked for a runway inspection. Subsequently, in the climb towards the holding pattern at FL 80, the crew interrogated the Electronic Centralised Aircraft Monitoring (ECAM) display and noted three failures; there was a loss of the Yellow hydraulic system, the flaps were locked and there was an unsafe gear indication. The appropriate drills were reviewed and the commander briefed the senior cabin attendant (SCA) and made a PA to the passengers, advising them that the aircraft would be returning to Alicante.

By now, the crew had considered the situation and been informed by ATC that tyre debris had been found on the runway. The commander concluded that the tyre burst had subsequently caused secondary damage to the yellow hydraulic system and to the flaps; checking the ECAM indicated that the gear was down and locked and therefore the unsafe gear light was a false indication. During these procedures, the SCA came to the flight deck to inform the commander that there was vibration being felt in the passenger cabin, at the rear and between the wings. There was no vibration felt in the flight deck but interrogation of the engine parameters revealed that the No 1 engine vibration gauge was now indicating 9.9 units. The commander retarded No 1 throttle to idle and the indication on the vibration gauge decreased to a normal reading of 0.4 units. He then gently advanced No 1 throttle open but was aware of increasing vibration and an associated reading of 3.0 units and so retarded the throttle to idle; with the throttle at idle, there was no abnormal indication or any physical vibration and the throttle was left in this position for the rest of the flight. With this additional problem, the crew declared a 'Pan' and also requested a lower altitude for the hold. This request was granted and G-JDFW descended to 6,000 feet on the QNH of 1024 mb.

Once established at the lower level, the crew again considered their situation. All the appropriate checks had been completed and the commander was confident that their current predicament had been caused by a burst tyre. The weather was good and the only outstanding problem was the vibration indications on No 1 engine when the power was increased; all other engine parameters were normal. Therefore, the commander decided to remain in the hold to reduce landing weight prior to his final approach. Once this decision had been taken, the first officer advised ATC that they would be holding for approximately 1 hour before making an approach to land and would require fire cover after landing. The commander briefed the SCA of his intentions and she then informed the rest of the cabin crew. The passengers were then advised of the situation and briefed for an emergency landing.

Once the fuel had reduced sufficiently, the commander carried out an approach to Runway 28; the wind was light and variable. The initial touchdown was gentle and on the right gear; the spoilers had not been armed and the thrust reversers were not selected. As the left gear touched the runway, braking was gently applied to the right gear. After touchdown, the crew were aware of vibration and the commander then applied braking to both gears; the commander became aware that the nose wheel steering was inoperative and used differential braking to clear the runway at the fast turn-off. As GJDFW came to a halt with the engines secured and the parking brake applied, the aircraft was

quickly surrounded by the Rescue and Fire Fighting Service (RFFS). There was no visible signs of fire but, within the cockpit, the brake temperatures indicated 800°C on the left gear and 400° rising to 600°C on the right gear; the RFFS applied foam to the left gear. With communications now established between the crew and the English speaking aircraft despatcher on the end of the interphone, it was decided to keep the passengers on board until the aircraft could be moved further from the runway. A tug was quickly attached and the aircraft was moved, with the fire crew still in attendance. Once well clear of the runway, the passengers were disembarked normally through the front left door.

After the crew had disembarked, the commander noted that the left inner tyre had been extensively ripped and that the left outer was deflated but still intact. He had also noted that the vibration was much heavier during the movement with the tug compared to when the aircraft was under its own power.

Information from Spanish authorities

The METAR for 0100 hrs on 10 July indicated a surface wind of 020°/06 kt with no cloud, excellent visibility and a ground temperature of 21°C.

It was confirmed that the airfield surfaces are checked each day at 0600 hrs and 1800 hrs. The inspection on the evening prior to the accident was satisfactory.

A full ATC radio transcript was provided. This confirmed the sequence of events as reported by the crew and indicated clear and comprehensive liaison between them and the ATC controller.

Flight Recorders

The Flight Data Recorder, a Loral Fairchild Model F800 was removed from the aircraft and replayed satisfactorily by AAIB. The recording included the period from take off to the engine throttle being retarded at 8000 ft. As the aircraft was still accelerating on the ground with an airspeed of 125.7 kt IAS, the vibration recorded on No 1 Engine increased from a value of 1.1 units to a value of 12.7 units, and remained at that level. The vibration level is recorded once every four seconds, so the increase could have taken place up to four seconds earlier. Twenty seconds later, the 'Yellow Hydraulic' system initiated a warning; at that time, the aircraft was just airborne at a speed of 169 kt IAS. There was also a temperature rise on No 1 Engine concurrent with the vibration; the EGT value was about 60° higher than on Engine No 2. The aircraft continued to climb for approximately 6 minutes and levelled at 8,000 ft. Engine No 1 was throttled back 18½ minutes after take off; the vibration level then reduced. The warnings were also reflected in the output from the ECAM recorded by the central maintenance computer.

The Cockpit Voice Recorder was not replayed as the recording of the event would have been overwritten

Engineering Inspection

The agreement for the AAIB to investigate the accident was finalised on 11 July 1996. By then, the runway had been cleared of debris and an examination would not have been productive. The

engineering content of this bulletin has therefore been obtained from reports from the operator's repair team and an examination of the tyre by the AAIB and the manufacturer.

An initial damage survey found the following significant damage:

Nos 1 and 2 main wheel tyres on the left main gear had deflated and, although the hubs were intact, large pieces of No 2 tyre were missing; No 1 tyre was intact.

Hydraulic pipes in the 'Green' and 'Yellow' systems were perforated.

Tyre debris was found in No. 1 engine, which had suffered severe damage to 17 fan blades; four fan outlet guide vanes (non-rotating) had been released.

The aircraft was repaired for an uneventful ferry flight back to the UK on 16 July.

Examination of the No. 2 main wheel tyre showed the presence of damage typical of tyre disintegration at high rotational speed following damage after impact with a foreign object. There were no signs of manufacturing defects or of damage from under inflation or excessive wear. The engine damage had been caused by ingestion of pieces of the No 2 tyre carcass.