SERIOUS INCIDENT

Aircraft Type and Registration:	Boeing 737-8AS, EI-ENF
No & Type of Engines:	2 CFM 56-7B26 turbofan engines
Year of Manufacture:	2010 (Serial no: 35034)
Date & Time (UTC):	17 March 2022 at 0045 hrs
Location:	Manchester Airport
Type of Flight:	Commercial Air Transport (Passenger)
Persons on Board:	Crew - 6 Passengers - 167
Injuries:	Crew - None Passengers - None
Nature of Damage:	Fractured left main gear wheel hub
Commander's Licence:	Airline Transport Pilot's Licence
Commander's Age:	35 years
Commander's Flying Experience:	9,041 hours (of which 8,834 were on type) Last 90 days - 167 hours Last 28 days - 60 hours
Information Source:	Aircraft Accident Report Form submitted by the pilot and subsequent enquiries with the operator and wheel manufacturer

Synopsis

Whilst taxiing to the gate after landing, the outboard wheel on the left main gear failed because of a fatigue crack in the wheel hub. The wheel failure caused a hydraulic leak from the brake piston and the heat generated by the misaligned wheel, caused the hydraulic fluid to combust resulting in a fire.

The fatigue crack originated from a corrosion pit in the wheel hub. Following this occurrence, the wheel manufacturer developed an ultrasonic inspection technique to identify cracks in this location on the hub and the operator has incorporated the new inspection into their maintenance programme.

History of the flight

The aircraft made a normal approach and landed on Runway 23R at Manchester Airport, following which the crew were cleared to taxi to a stand at Terminal 3. Once on the taxiway, the crew found that to maintain the normal taxi speed a thrust of 40% N_1, which is higher than normal, was required. The crew considered that it was likely to be a flat tyre so continued to taxi to the terminal. With the increased thrust there was no noticeable difficulty in maintaining the aircraft in a straight line.

As the aircraft approached the stand the crew heard a radio transmission requesting the fire service attend an aircraft with "BRAKES ON FIRE" on stand. Realising that the call was

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about EI-ENF, the crew immediately completed the parking procedure and shut down the engines. A '*Standby*' call was made to the cabin crew and the situation was monitored. The fire service arrived and extinguished the fire, which had broken out around the left main landing gear wheels. As the fire was quickly extinguished, the flight crew considered that an emergency evacuation was unnecessary and, therefore, the passengers disembarked normally.

Recorded information

An assessment of the data on the quick access recorder identified that the approach and landing were normal, brake application was as expected and the manoeuvring speed around the taxiway corners was below 10 kt.

CCTV images showed that the fire started as the aircraft turned left from the apron towards the gate (Figure 1).

Figure 1

Still from CCTV showing a fire around the left main gear as the aircraft turned onto the stand (reproduced with permission)

Aircraft information

The Boeing 737-8AS is a single aisle commercial airline with a tricycle landing gear. Each main landing gear has two wheel assemblies attached to the landing gear axel. The wheels are made up of an inner and outer wheel half. Conical roller bearings located in the wheel half hubs carry the load from the wheel to the axel. Tie bolts hold the two halves together (Figure 2). The wheel brake pack is positioned within the inner wheel half.

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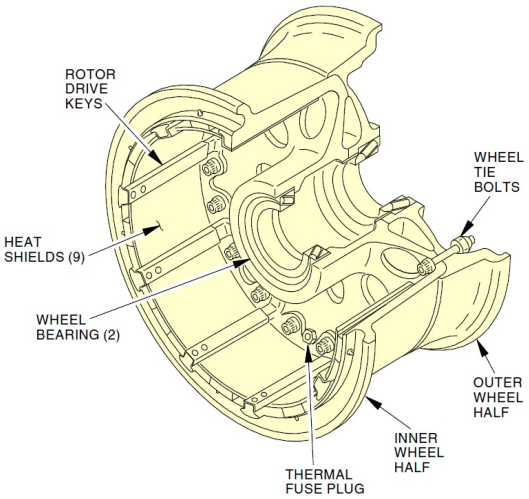

Figure 2

Boeing 737-800 wheel assembly (reproduced with permission)

Aircraft examination

After the event, the aircraft was examined by the operator's engineering personnel who discovered that the left main wheel inner hub had fractured. The resulting misalignment of the wheel had damaged the brake piston, causing a hydraulic fluid leak. They assessed that the heat generated by the misaligned wheel, whilst the aircraft taxied to the stand, was sufficient to ignite the hydraulic fluid.

The wheel and brake manufacturer subsequently identified that the inboard wheel hub had fractured radially in four locations; they also identified a circumferential crack around the hub (Figure 3).

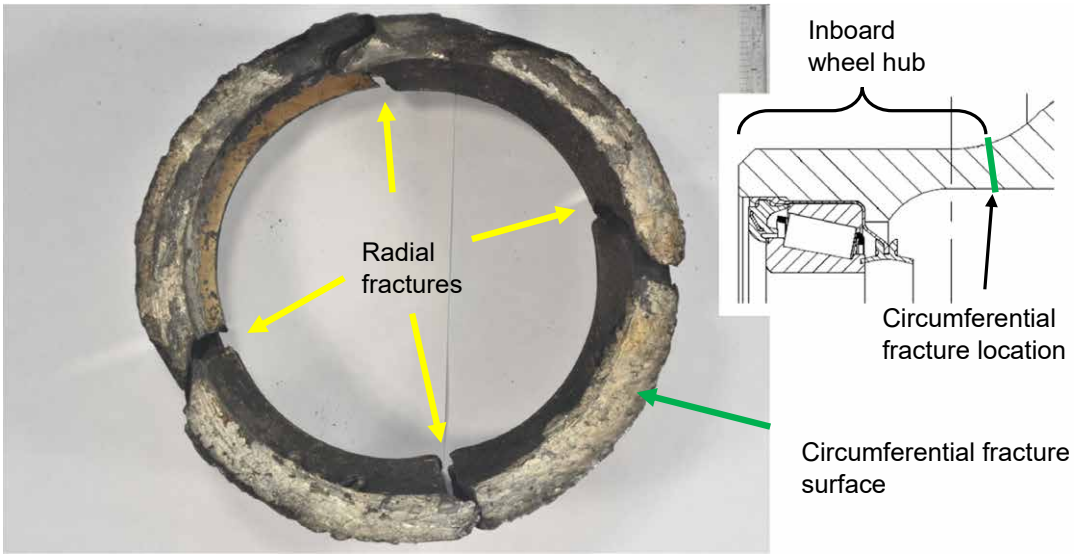

Figure 3

Inboard wheel half fragments showing the location of the circumferential and four radial fractures (reproduced with permission)

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Three of the four radial fractures and the circumferential fracture were all consistent with overload. A fatigue crack was identified on one of the fracture surfaces, which originated at a corrosion pit located on the lead-in chamfer of the inner wheel half bearing bore (Figure 4). A number of other fatigue cracks, all originating from corrosion pits, were also found in the bore.

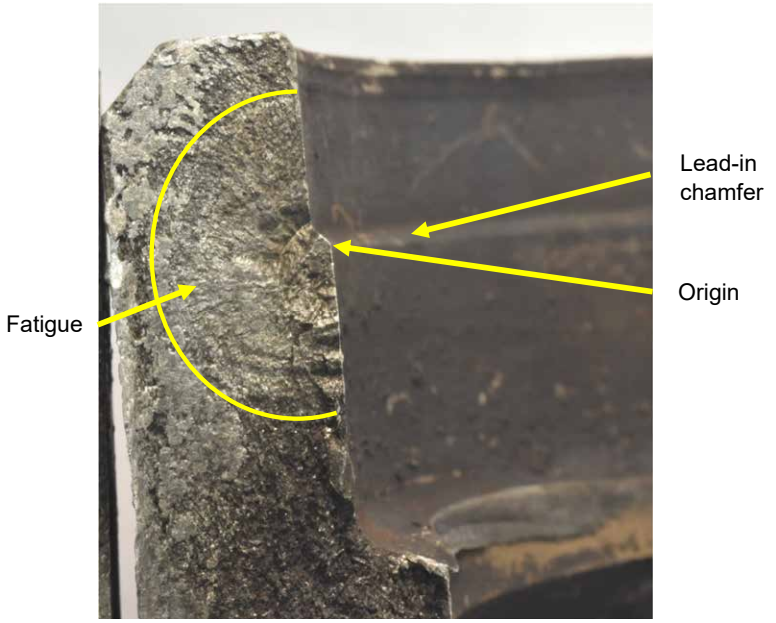

Figure 4

Radial fracture surface with area of fatigue highlighted (reproduced with permission)

Previous occurrence of similar hub failure

Following this occurrence, the operator experienced a similar event whilst operating in Spain, which is being investigated by the Spanish Comisión de Investigación de Accidentes e Incidentes de Aviación Civil (CIAIAC).

Safety actions

As a result of the wheel hub failures, the following Safety Action has been taken by the wheel manufacturer and the operator:

> The wheel manufacturer has developed an ultrasonic inspection to assess the condition of the internal bore of the wheel hub to identify the presence of cracks originating at the lead in chamfer of the bearing bore.
>
> The operator has introduced this optional ultrasonic inspection on their fleet of Boeing 737-8AS aircraft.

The wheel manufacturer stated that they would amend the component maintenance manual to introduce an ultrasonic inspection of the inner wheel half hub lead in chamfers.

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