PRELIMINARY SERIOUS INCIDENT REPORT

Accident and Incident Investigations Division

Serious Incident
- Preliminary Report -
AIID Ref No: CA18/3/2/1460

Figure 1: The file picture of the ZS-ZWY aircraft. (Source**:** https://www.jetphotos.com/registration/ZS-ZWY)

Description

On Sunday, 27 October 2024, a Boeing 737-800 aircraft with registration ZS-ZWY was on a scheduled commercial flight SFR313 from Cape Town International Airport (FACT) in the Western Cape province to Lanseria International Airport (FALA) in Gauteng province. After landing at FALA during taxi, the right-side bearing stopped operating and the crew increased thrust to maintain taxi speed. The aircraft was brought to a stop in the parking bay. After a walk-around inspection at the parking bay, the aircraft maintenance engineer (AME) found that there was smoke which originated in the right main wheel assembly. Moreover, the right main wheel assembly showed signs of metal deposit. No person was injured during this serious incident.

Occurrence Details

Reference Number	**:** CA18/3/2/1460
Occurrence Category	**:** Category 1
Type of Operation	**:** Air Transport Operation, Passenger (Part 121)
Name of Operator	**:** Safair
Aircraft Registration	**:** ZS-ZWY
Aircraft Make and Model	**:** Boeing 737-800
Nationality	**:** South African
Place	**:** Lanseria International Airport, Gauteng Province
Date and Time	**:** 27 October 2024 at 1058Z
Injuries	**:** None
Damage	**:** Minor

Purpose of the Investigation

In terms of Regulation 12.03.1 of the Civil Aviation Regulations (CAR) 2011, this report was compiled in the interest of the promotion of aviation safety and the reduction of the risk of aviation accidents or incidents and not to apportion blame or liability.

All times given in this report are Co-ordinated Universal Time (UTC) and will be denoted by (Z). South African Standard Time is UTC plus 2 hours.

Investigation Process

The Accident and Incident Investigations Division (AIID) of the South African Civil Aviation Authority (SACAA) was notified of the occurrence involving a Boeing 737-800 which occurred at Lanseria International Airport (FALA) in Gauteng province on 27 October 2024 at 1058Z. The occurrence was reported to the AIID on 4 November 2024 and it was classified as a serious incident according to the CAR 2011 Part 12 and the Internation Civil Aviation Organisation (ICAO) STD Annex 13 definitions.

The AIID has appointed an investigator-in-charge to conduct a full investigation. The investigator did not dispatch to the accident site. Notifications were sent to the State of Registry, Operator, Design and Manufacturer in accordance with the CAR 2011 Part 12 and the ICAO Annex 13 Chapter 4. The IIC is awaiting responses from the states to indicate if they will be appointing a representative and/or advisor. The AIID will lead the investigation and issue the final report of this serious incident in accordance with the CAR 2011 Part 12 and the ICAO Annex 13.

The information contained in this preliminary report is derived from the information gathered during the on-going investigation into the occurrence. Later, an interim statement or the final report may contain altered information if new evidence is found during the on-going investigation that requires changes to the information depicted in this report.

The AIID reports are made available to the public at:
https://www.caa.co.za/industry-information/accidents-and-incidents/

Notes:

1. *Whenever the following words are mentioned in this report, they shall mean the following:*
   Serious Incident — this investigated serious incident
   Aircraft — the Boeing 737-800 involved in this serious incident
   Investigation — the investigation into the circumstances of this serious incident
   Pilot — the pilot involved in this serious incident
   Report — this serious incident report

2. *Photos and figures used in this report were taken from different sources and may have been adjusted from the original for the sole purpose of improving clarity of the report. Modifications to images used in this report were limited to cropping, magnification, file compression; or enhancement of colour, brightness, contrast; or addition of text boxes, arrows, or lines.*

Disclaimer

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Abbreviation	Description
°	Degrees
°C	Degrees Celsius
AGL	Above Ground Level
AIID	Accident and Incident Investigations Division
AME	Aircraft Maintenance Engineer
AMO	Aircraft Maintenance Organisation
AOC	Air Operating Certificate
ATC	Air Traffic Control
ATPL	Airline Transport Pilot Licence
C of A	Certificate of Airworthiness
C of R	Certificate of Registration
CRS	Certificate of Release to Service
CVR	Cockpit Voice Recorder
FACT	Cape Town International Airport (ICAO designation)
FALA	Lanseria International Airport (ICAO designation)
FCTM	Flight Crew Training Manual
FDR	Flight Data Recorder
FDM	Flight Data Monitoring
FO	First Officer
ft	Feet
GPS	Global Positioning System
hPa	Hectopascal
IATA	International Air Transport Association
kg	Kilogram/s
kt	Knots
m	Metres
METAR	Meteorological Aerodrome Report
MTOW	Maximum Take-off Weight
PF	Pilot Flying
PIC	Pilot-in-command
PSI	Pounds per square inch
QAR	Quick Access Recorder
QNH	Altitude Above Mean Sea Level
SACAA	South African Civil Aviation Authority
SAWS	South African Weather Service
TBO	Time Between Overhaul
Vref	Landing Reference Speed or the threshold crossing speed
UTC	Co-ordinated Universal Time (GMT)
Z	Zulu (Term for Universal Co-ordinated Time - Zero Hours Greenwich)

1. FACTUAL INFORMATION

1.1. History of Flight

1.1.1 On Sunday morning, 27 October 2024, a Boeing 737-800 aircraft with registration ZS-ZWY was on a scheduled domestic flight SFR313 from Cape Town International Airport (FACT) in the Western Cape province to Lanseria International Airport (FACT) in Gauteng province. Six crew members and 184 passengers were on-board the aircraft. The flight was conducted under the provisions of Part 121 of the Civil Aviation Regulations (CAR) 2011 as amended.

1.1.2 The pilot-in-command (PIC) was the pilot monitoring (PM) and the first officer (FO) was the pilot flying (PF). The crew reported that the aircraft took off from FACT with no defects recorded in the aircraft's Technical Logbook (TL) 36.

1.1.3. Upon reaching FALA, the crew performed a normal landing on Runway 07. During taxi, the aircraft required a higher-than-usual low-pressure turbine and compressor spool (N1) thrust setting to maintain movement until the aircraft reached the parking bay. The aircraft needed additional thrust to overcome resistance which indicated a possible issue that was affecting taxi performance. Typically, the aircraft could taxi at low speed with minimal engine thrust.

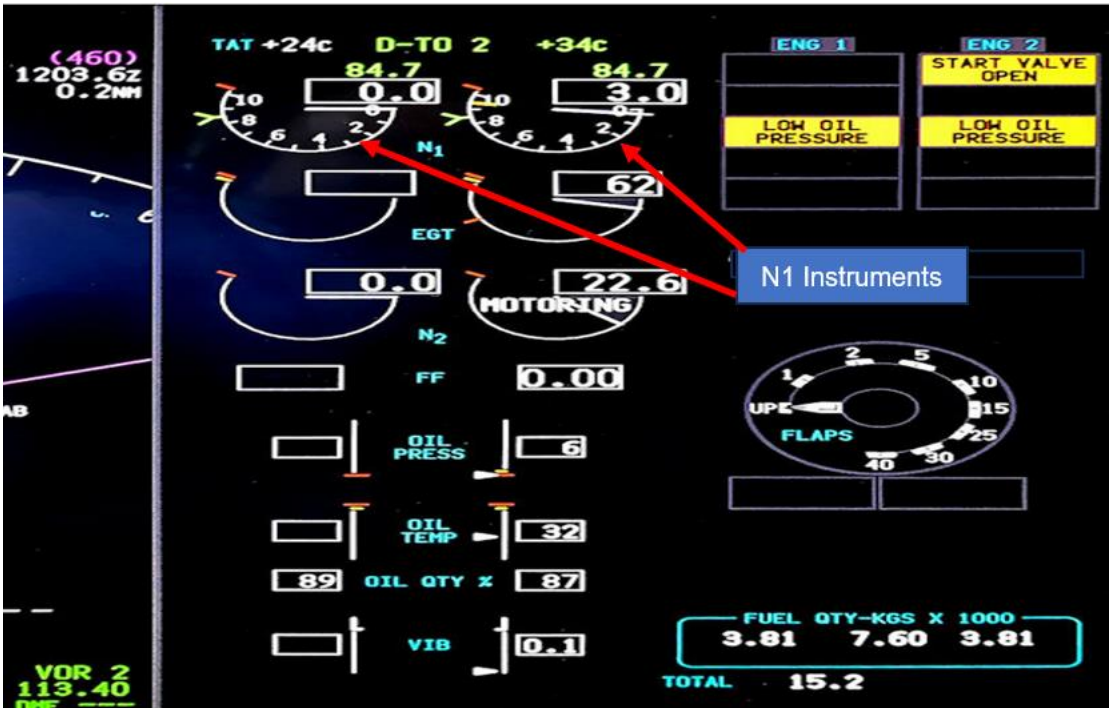


Figure 2: Boeing 737 sample cockpit instruments. (Source: http://www.b737.org.uk/powerplant.htm#engin)

1.1.4. The aircraft maintenance engineer (AME) stated that he conducted a transit check (walk-around) after the aircraft was parked and noticed smoke emanating from the Number 4 main wheel assembly, as well as that the wheel was at an angle (which was an anomaly). The main wheel assembly was then removed and the inner hub was found broken. The AME also removed the brake assembly and noticed that it was hot with a temperature of approximately 240°C. He also observed some melted metal on the brake assembly. After removing the

brake assembly, he found that the bearing had stopped operating and was stuck in the axle. The bearing was removed, and the axle was inspected for any damage such as signs of overheating, scratch marks, broken pieces, loosened sleeves or cracks. Nothing abnormal was found. Thereafter, the new bearing, brake and wheel assembly were installed, and the aircraft was released to service on the same day.

1.1.5. Only the Number 4 main wheel assembly and the bearing were damaged; no person was injured.

1.1.6. The serious incident occurred during the day whilst the aircraft was taxiing at FALA at Global Positioning System (GPS) co-ordinates determined to be 25°56’22.89" South, 027°55’32.07” East.

1.2. Injuries to Persons

Injuries	Pilot	Crew	Pass.	Total On-board	Other
Fatal	-	-	-	-	-
Serious	-	-	-	-	-
Minor	-	-	-	-	-
None	2	4	184	190	-
Total	**2**	**4**	**184**	**190**	**-**

Note: Other means people on the ground.

1.3. Damage to Aircraft

1.3.1 The Number 4 main wheel assembly’s inboard hub and the bearing were damaged.

Figure 3: The red circle indicates the location of the damage.

1.4. Other Damage

1.4.1 None.

1.5. Personnel Information

Pilot-in-command (PIC)

Nationality	South African	Gender	Male	Age	34
Licence Type	Airline Transport Pilot Licence (ATPL)				
Licence Valid	Yes	Type Endorsed	Yes		
Ratings	Instrument, Flight Instructor Grade 3				
Medical Expiry Date	31 January 2025				
Restrictions	VDL (valid only with correction for defective distant vision)				
Previous Incidents	None				

Note: Previous incidents refer to past serious incidents the pilot was involved in, when relevant to this serious incident.

Flying Experience:

Total Hours	6534
Total Past 24 Hours	4.06
Total Past 7 Days	11.17
Total Past 90 Days	144.58
Total on Type Past 90 Days	144.58
Total on Type	3400

1.5.1. The PIC was initially issued an Airline Transport Pilot Licence (ATPL) on 19 August 2016 under the provisions of Part 61 of the CAR 2011. The licence was revalidated on 17 March 2024 with an expiry date of 31 May 2025.

1.5.2. The PIC was issued a Class 1 medical certificate on 17 January 2024 with an expiry date of 31 January 2025.

1.5.3. The PIC conducted the Crew Resource Management (CRM) course on 20 April 2024 and a certificate was issued with an expiry date of 30 April 2025.

First Officer (Pilot Flying)

Nationality	South African	Gender	Male	Age	36
Licence Type	Airline Transport Pilot Licence (ATPL)				
Licence Valid	Yes	Type Endorsed	Yes		
Ratings	Instrument, Flight Instructor Grade 3				
Medical Expiry Date	31 January 2025				
Restrictions	VDL (valid only with correction for defective distant vision)				
Previous Incidents	None				

Flying Experience:

Total Hours	6204.6
Total Past 24 Hours	4.1
Total Past 7 Days	10.7
Total Past 90 Days	109.1
Total on Type Past 90 Days	109.1
Total on Type	1585.7

1.5.4. The FO was initially issued an ATPL on 24 June 2016 under the provisions of Part 61 of the CAR 2011. The licence was revalidated on 7 January 2024 with an expiry date of 28 February 2025.

1.5.5. The FO was issued a Class 1 medical certificate on 22 January 2024 with an expiry date of 31 January 2025.

1.5.6. The FO conducted the Crew Resource Management course on 2 January 2024 and a certificate was issued with an expiry date of 31 January 2025.

1.5.7. The AME was initially issued an Aircraft Maintenance Engineer Licence on 24 March 2023. His licence was renewed on 1 May 2024 with an expiry date of 30 April 2026.

1.6. Aircraft Information (Source: Boeing 737 Manual)

1.6.1. *The Boeing 737-800 is a low-wing, narrow-body, single-aisle jet transport aircraft powered by two high bypass CFM56-7B26 turbofan engines mounted on pylons beneath the wings. The aircraft is designed to operate with two pilots and six cabin crew on-board. The aircraft is designed to carry a maximum of 189 passengers.*

Airframe:

Manufacturer/Model	Boeing 737-800	
Serial Number	40247	
Year of Manufacture	2011	
Total Airframe Hours (At Time of Serious Incident)	4 3104.37	
Last Inspection (Date & Hours)	20 September 2024	42817.40
Hours Since Last MPI	286.97	
CRS Issue Date	20 September 2024	
C of A (Issue Date & Expiry Date)	16 August 2019	31 August 2025
C of R (Issue Date) (Present Owner)	15 September 2022	
Type of Fuel Used	Jet A1	
Operating Category	Commercial (Part 121)	
Previous Incidents	None	

Note: Previous incidents refer to past serious incidents the pilot was involved in, when relevant to this serious incident.

Engine:1

Manufacturer/Model	CFM International 56-7B26
Serial Number	960161
Hours Since New	48 054
Hours Since Overhaul	Not reached

Engine:2

Manufacturer/Model	CFM International 56-7B26
Serial Number	960195
Hours Since New	39182
Hours Since Overhaul	Not reached

1.6.2. According to available information, the wheel assembly and the bearing formed part of the 1000 units that were bought by the operator on 23 March 2023 from the United States (US) supplier as unserviceable; they were taken to the local approved manufacturer for overhaul. The parts had no past recorded data. The wheel assembly had been used eight times as replacement on different aircraft and overhauled three times. The overhaul interval is 24 months or 1.800 landings, whichever occurs first (see an extract from Honeywell Standard Practices Manual attached as Appendix B).

1.6.3. The bearing is classified as an on-condition item which means that it is not tracked as a life-limited or hard-time component. Therefore, the bearing is replaced based on its condition. Post-serious incident, the bearing was shipped to the local manufacturer for further inspection and analysis.

1.7. Meteorological Information

1.7.1. The weather information below was obtained from the Meteorological Aerodrome Report (METAR) that was issued by the South African Weather Service (SAWS) for FALA on 27 October 2024 at 1058Z.

Wind Direction	320°	Wind Speed	24,34Gkts	Visibility	9 999m
Temperature	26°C	Cloud Cover	Nil	Cloud Base	Nil
Dew Point	12°C	QNH	1009hPa		

1.8. Aids to Navigation

1.8.1. The aircraft was equipped with standard navigational equipment as approved by the Regulator (SACAA). There were no records indicating that the navigational equipment was unserviceable prior to the flight.

1.9. Communication

1.9.1. The aircraft was equipped with a standard communication system as approved by the Regulator. There were no recorded defects with the communication system prior to the flight.

1.10. Aerodrome Information

1.10.1. The aircraft took off from FACT to FALA; it landed on Runway 07 at FALA.

Aerodrome Name	Lanseria Internation Airport (FALA)
Aerodrome Location	Lanseria, Gauteng Province
Aerodrome Status	Licensed
Aerodrome GPS coordinates	” 25°56’22.89"South, 027°55’32.07” East
Aerodrome Elevation	4,517 ft
Runway Headings	73º
Dimensions of Runway Used	07/25 3 047x45m
Heading of Runway Used	07

Surface of Runway Used	Asphalt
Approach Facilities	Tower and Approach control service: 24 hours. Ground movement control service: [05h45 – 19h00] daily. Instrument approaches include VOR/DME, NDB and RNAV. Tower Frequency: 124.00MHz.
Radio Frequency	Tower 124.00 MHz Apron 122.85 MHz Ground 121.65 MHz

1.10.2. The FALA layout chart is attached as Appendix A.

1.11. Flight Recorders

1.11.1. The aircraft was equipped with a flight data recorder (FDR) and a cockpit voice recorder (CVR) as required by regulation. The FDR and CVR were not retrieved from the aircraft after the serious incident as the serious incident was reported to the Regulator seven days after the occurrence; also, the aircraft had already been returned to service. However, the Quick Access Recorder (QAR) was retrieved from the aircraft, data was downloaded, and the following was observed:

At touch down

Landing Reference Speed or the threshold crossing speed (Vref): 143kts

Speed at touchdown: 149.1kts

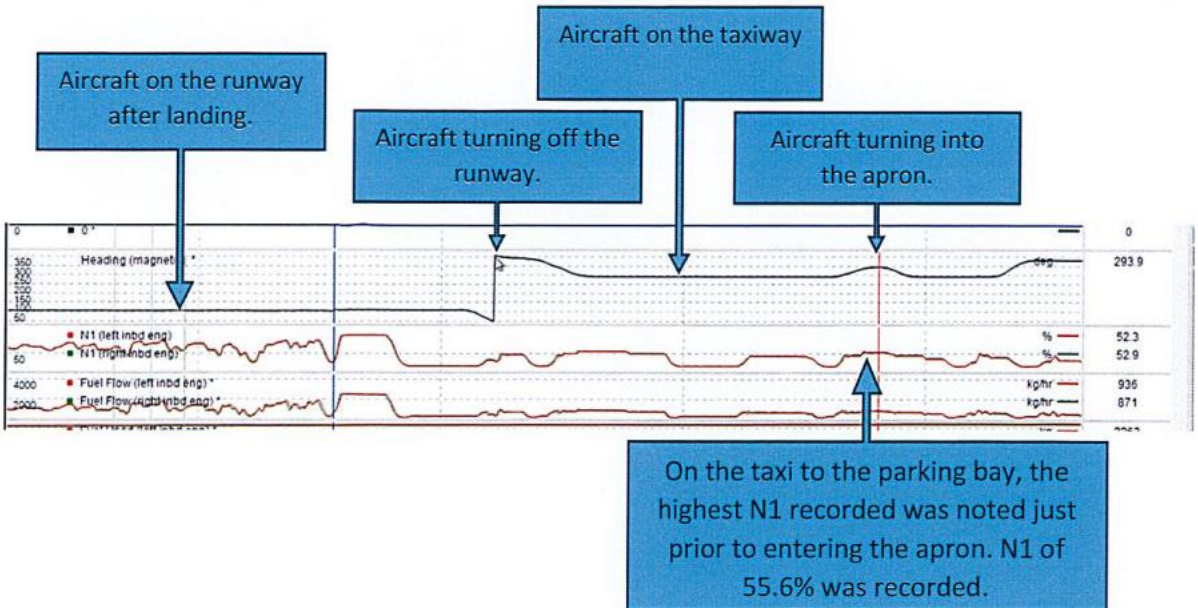
Wind: Headwind components8.1kts

Crosswind wind component 21kts

Crosswind technique applied: Touchdown in Crab (reference Boeing FCTM 6.47 Crosswind Guidelines). Based on the technique, the Number 1 main wheel touched down first.

Vertical force of gravity (G's) at touchdown: 1.24G (FDM Lvl1=1.68G Lvl2=2.25G and IATA = 1.7G)

Taxi N1- 36% to 56% - normal for undulated taxiway and turns to apron (see Graph 1).



Graph 1: The downloaded QAR data.

1.12 Wreckage and Impact Information

1.12.1 The AME noticed smoke emanating from the main wheel assembly during the transit check. Thereafter, the main wheel assembly was removed and the following observations were made: the inner hub had broken off from the wheel rim with metal deposits observed in the affected area; the brake unit showed a slight damage; and the wheel bearing exhibited signs of overheating, it had also stopped operating.

1.12.2 The Number 4 tyre exhibited signs of deflation.

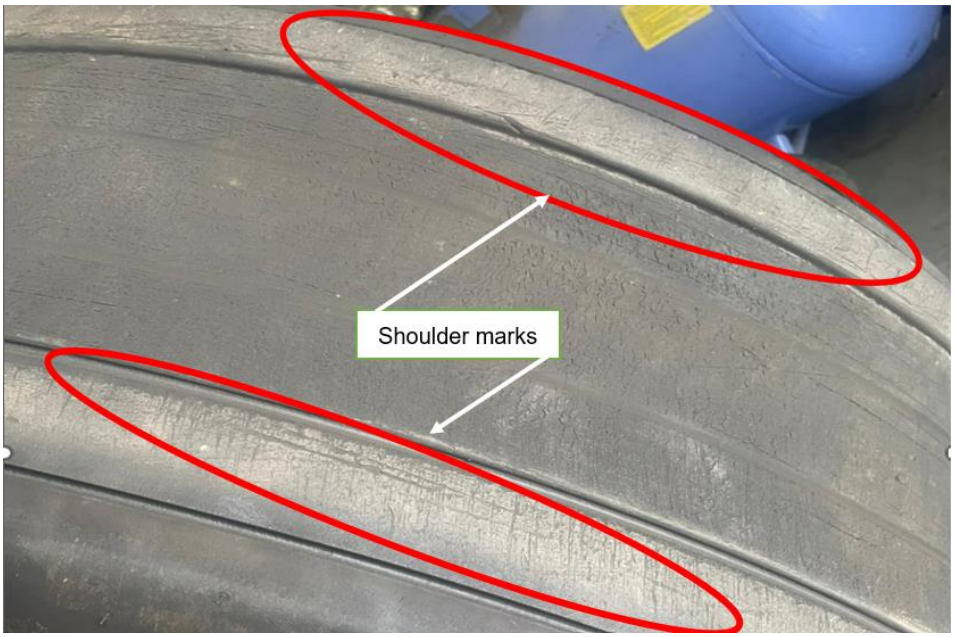


Figure 4: The shoulder marks on the Number 4 main tyre shoulder.

1.12.3 The Number 4 inboard hub exhibited multiple fractures and had a yellowish discolouration.

Figure 5: The fractured Number 4 hub.

1.12.4 The broken hub pieces had cracks as well as a yellowish discolouration.

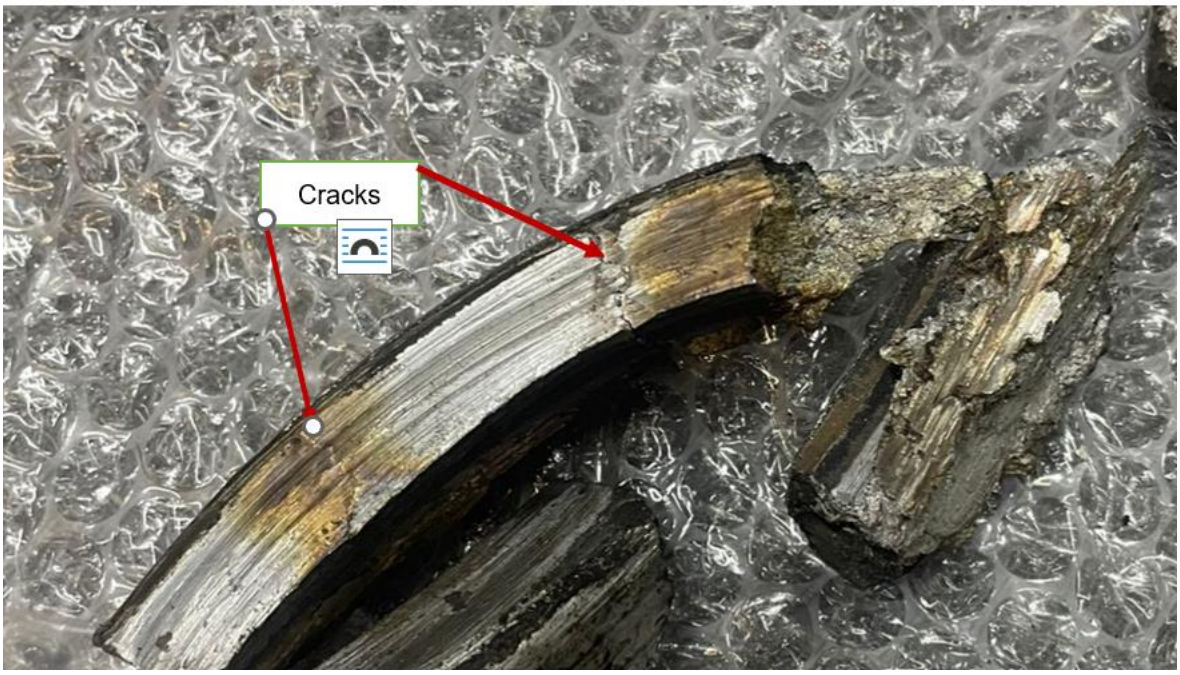


Figure 6: The fractured pieces of the hub.

1.12.5 The Number 4 inner bearing exhibited signs of overheating which included discolouration and surface damage.

Figure 7: The number 4 inner bearing.

1.12.6 The Number 4 brake assembly showed signs of damage.

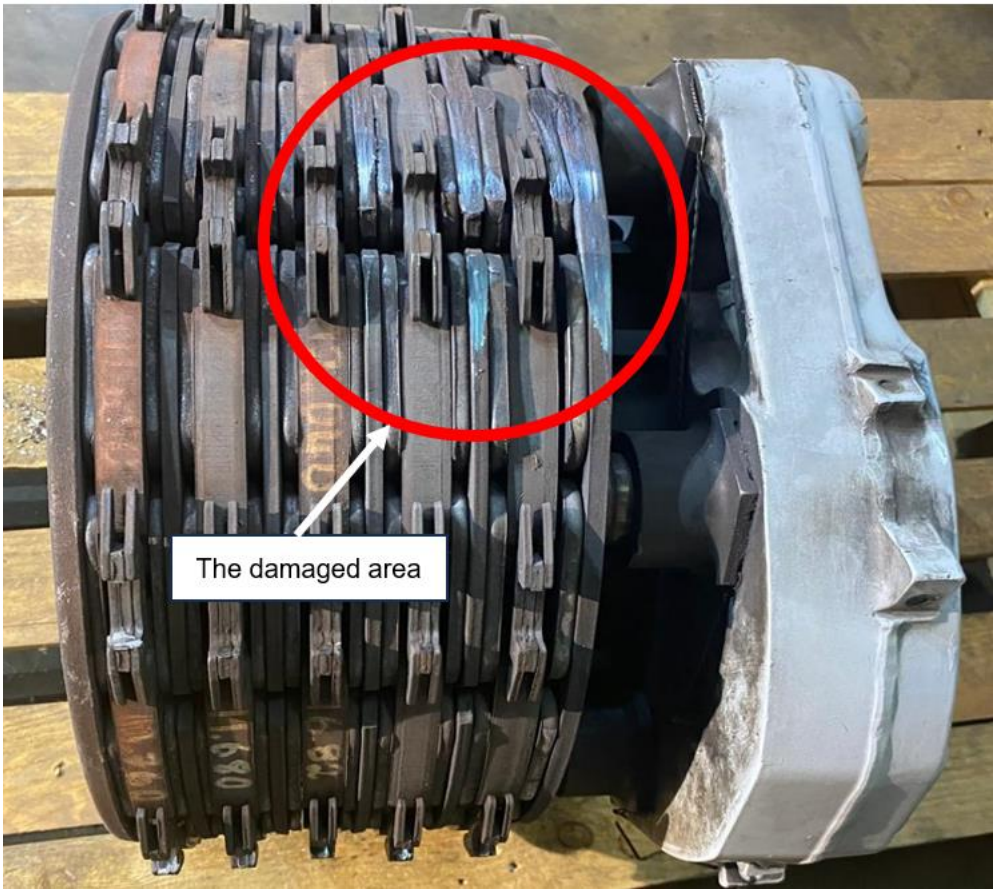


Figure 8: The Number 4 brake unit assembly.

1.13 Medical and Pathological Information

1.13.1 None.

1.14 Fire

1.14.1 There was no evidence of a pre-or post-impact fire.

1.15 Survival Aspects

1.15.1 The accident was considered survivable as there was no damage to the cockpit and cabin areas that would have caused serious injuries to both occupants.

1.16 Tests and Research

1.16.1 To be discussed in the final report.

1.17 Organisational and Management Information

1.17.1 This was a scheduled passenger commercial flight that was operated under the provisions of Part 121 of the CAR 2011 as amended.

1.17.2 The operator was issued a Class I Air Service Licence Number S941D by the Air Service Licensing Council on 26 March 2014 for Category A1 aircraft. The operator was also issued a Class II Air Service Licence Number N942D on 17 August 2011 for Category A1 aircraft as well as Class III Air Service Licence Number G943D on 17 August 2011 for Category A1 aircraft.

1.17.3 The operator had a valid Air Operating Certificate (AOC) that was issued by the Regulator on 4 June 2024 with an expiry date of 30 April 2025.

1.17.4 The aircraft was maintained by the SACAA-approved aircraft maintenance organisation (AMO). The AMO was issued an AMO Certificate on 9 October 2024 with an expiry date of 31 October 2025.

1.17.5 The operator used the services of a local service provider to maintain the wheels of the aircraft. The service provider was issued an AMO Certificate on 28 November 2023 with an expiry date of 30 November 2024.

1.18 Additional Information

1.18.1 Landing Gear, Wheels and Brakes (Source: Boeing 737 Manual)

Main wheels

The main wheels, designed to allow easy replacement, are fitted to fixed stub axles and held in place by a single wheel nut and washer. The wheel nut is secured by locking bolts.

The wheels are of a split hub design with the hubs containing the inboard and outboard tapered roller bearings (see Figure 12). The outer bearing component is known as the cup and the inner bearing component as the cone. The cup-bearing raceway is an interference fit within the hub, and the cone is a sliding fit on the stub axle. The rollers run on tracks in the cone and cup. The track on the cone is defined by a rib around its edges; there are no ribs on the cup. The inboard and outboard bearing assemblies are fitted with external grease seals which are held in place by spring steel retaining rings located in grooves in the wheel hub.

The bearings are provided as part of the wheel assembly. When fitted to the axle, a nut and washer are used to apply pressure to the bearings, which is known as the preload. The preload ensures the bearing cups and cones are correctly seated, and the rollers correctly aligned. This is achieved by applying a torque to the nut using a suitable torque wrench. Once the bearing assembly has been preloaded, the nut is loosened slightly, whilst maintaining a tight contact between the cup, cone and rollers, then retightened to this service torque, which is usually about 20-25% of the preload torque. Both these procedures are done whilst slowly rotating the wheel clockwise to ensure that the large roller ends are seated against the cone rib.

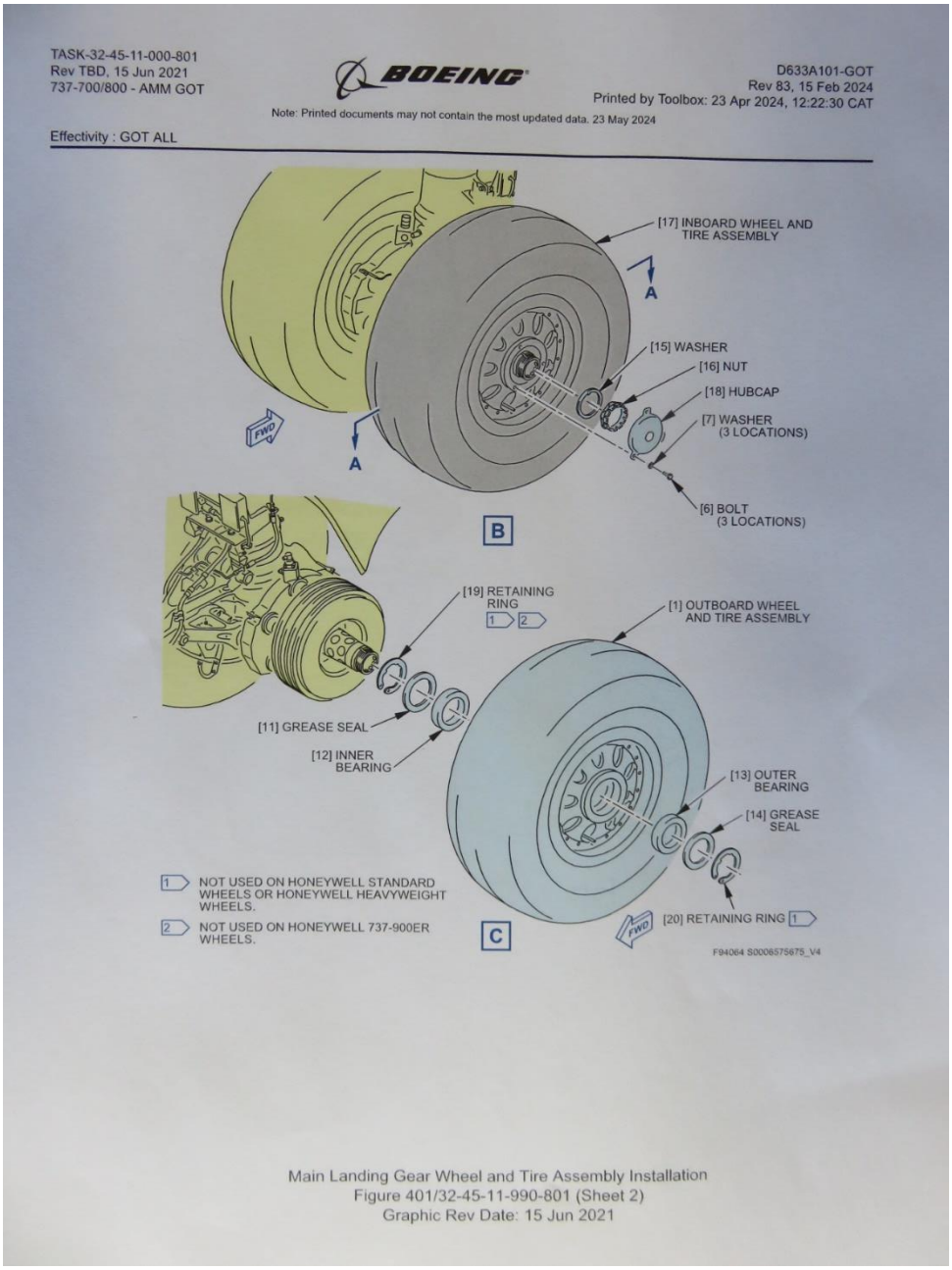


Figure 9: Landing gear mainwheel general arrangement. (Source: Boeing 737 Manual)

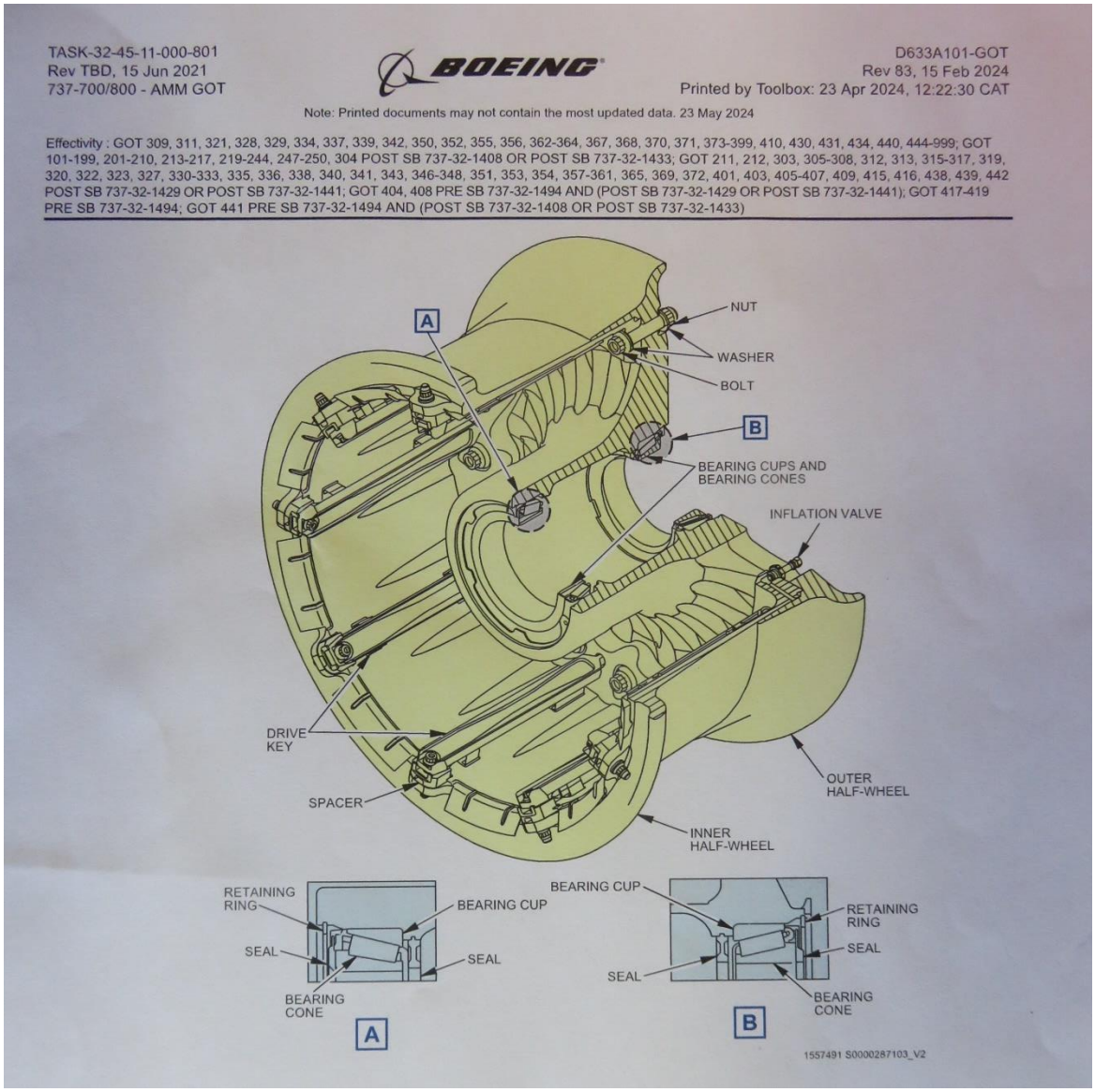


Figure 10: The inner [A] and outer [B] bearing arrangement. (Source: Boeing 737 Manual)

1.19 Useful or Effective Investigation Techniques

1.19.1 None.

2 FINDINGS

2.1 General

From the available evidence, the following preliminary findings were made with respect to this serious incident. These shall not be read as apportioning blame or liability to any organisation or individual.

To serve the objective of this investigation, the following sections are included in the conclusions heading:

- **Findings —** are statements of all significant conditions, events, or circumstances in this serious incident. The findings are significant steps in this serious incident sequence, but they are not always causal or indicate deficiencies.

2.2 Findings

Pilots

2.2.1 The PIC was initially issued an ATPL on 19 August 2016 under the provisions of Part 61 of the CAR 2011. The licence was revalidated on 17 March 2024 with an expiry date of 31 May 2025.

2.2.2 The PIC was issued a Class 1 medical certificate on 17 January 2024 with an expiry date of 31 January 2025.

2.2.3 The PIC conducted his CRM course on 20 April 2024 with an expiry date of 30 April 2025. The PIC was properly qualified and medically fit to conduct the flight.

2.2.4 The FO was initially issued an ATPL on 24 June 2016 under the provisions of Part 61 of the CAR 2011. The licence was revalidated on 7 January 2024 with an expiry date of 28 February 2025.

2.2.5 The FO was issued a Class 1 medical certificate on 22 January 2024 with an expiry date of 31 January 2025.

2.2.6 The FO conducted his CRM course on 2 January 2024 with an expiry date of 31 January 2025. The FO was properly qualified and medically fit to conduct the flight.

2.2.7 The AME was properly licensed.

Aircraft

2.2.8 The aircraft was issued a Certificate of Registration (C of R) on 15 September 2022.

2.2.9 The last maintenance inspection that was conducted on the aircraft before the serious incident flight was certified on 20 September 2024 at 42817.40 airframe hours. The aircraft accrued 286.97 airframe hours since the said inspection.

2.2.10 The aircraft was issued a Certificate of Airworthiness (C of A) on 16 August 2019. The latest C of A had an expiry date of 31 August 2025.

2.2.11 The aircraft landed at a speed of 149.1 kts; during touchdown, the G force was 1.24G which was within the limits, and the touchdown in crab was used as per the Boeing FCTM. Based on the crab technique, the Number 1 main wheel touched down first. The compressor spool (N1) was increased from 36% (normal) to 56% as the aircraft experienced a drag during taxi.

2.2.13 The Number 4 main wheel assembly was damaged. The bearing was also damaged and had stopped operating; both the bearing's inner hub and the brake unit assembly were damaged as the main wheel assembly experienced difficulty during taxi.

Aerodrome

2.2.14 FALA is a licensed airport with one runway. It can accommodate larger aircraft such as the Boeing 737-800. The aircraft landed on Runway 07.

Environment

2.2.15 The crosswind speed at the time was 22 kts with gusts reaching 32 kts. The aircraft is certified to withstand a maximum crosswind component of 34.5 kts which meant that the recorded wind conditions were within the aircraft's operational limits.

3 ON-GOING INVESTIGATION

3.1 The AIID investigation is on-going and the investigator will look into other aspects of this occurrence which may or may not have safety implications.

4 SAFETY RECOMMENDATIONS

4.1 General

The safety recommendations listed in this report are proposed according to paragraph 6.8 of Annex 13 to the Convention on International Civil Aviation and are based on the conclusions listed in heading 3 of this report. The AIID expects that all safety issues identified by the investigation are addressed by the receiving States and organisations.

4.2 Safety Recommendation/s

4.2.1 None.

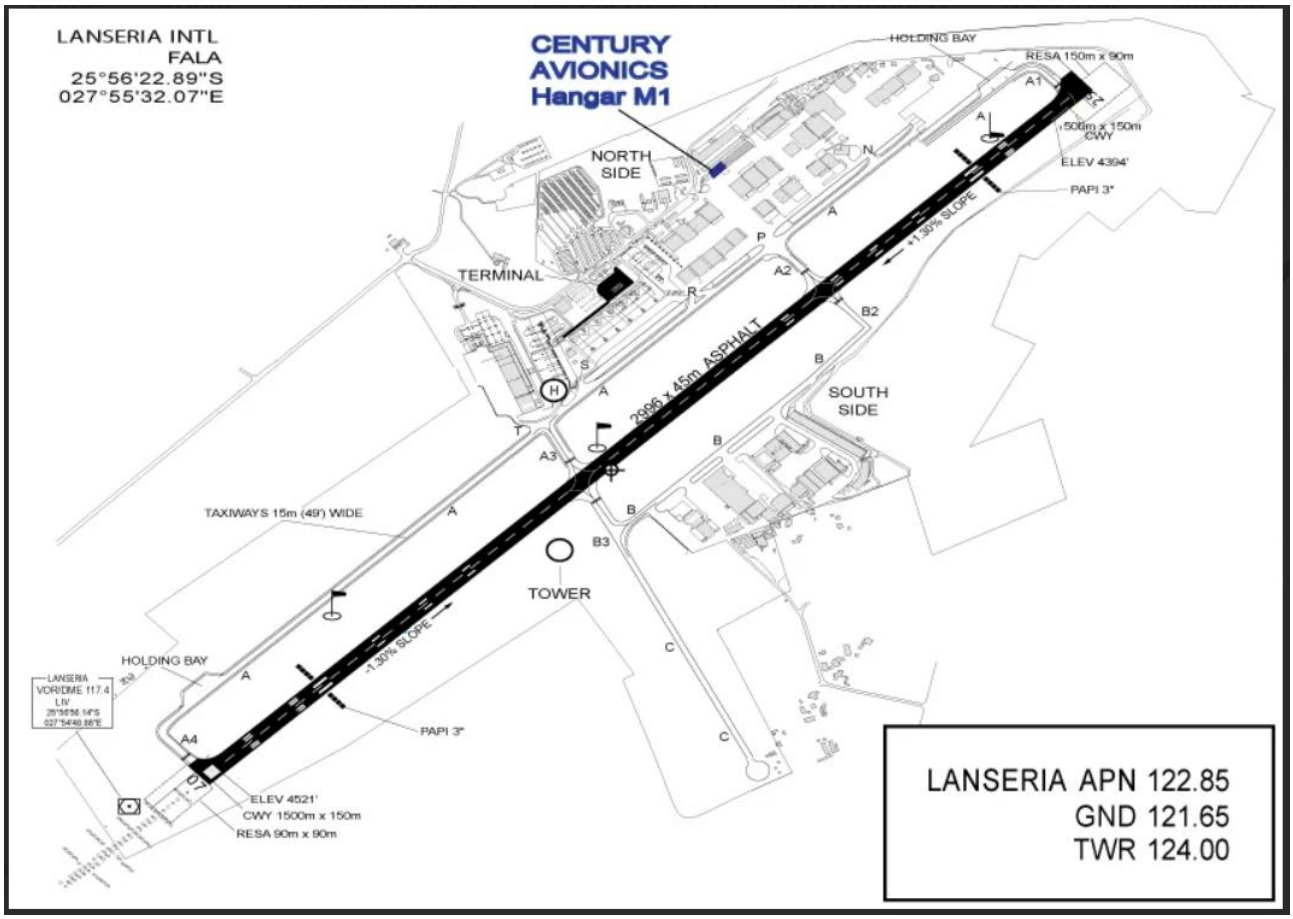
5 APPENDICES

5.1. Appendix A: FALA Aerodrome Chart
5.2. Appendix B: Honeywell Standard Practices Manual

This report is issued by:

Accident and Incident Investigations Division
South African Civil Aviation Authority
Republic of South Africa

Appendix A: FALA Aerodrome Chart



Honeywell Standard Practices Manual: Appendix B

Topic	Definition and/or Instructions
Tire Change Inspection Interval	• Minor disassembly, cleaning, and inspection of wheel components performed at all tire removals. - If verifiable inspection history is not available, all wheel assemblies and wheel halves must be overhauled immediately to ensure compliance with the service limits of the applicable Component Maintenance Manual (CMM).
Overhaul Inspection Interval	Major disassembly, cleaning, and inspection of wheel components. • Wheel assemblies must be overhauled every 24 months or 1,800 landings, whichever occurs first. At operator option, overhaul timing may be managed based on accumulated tire changes that are equivalent to the 1,800 landing criteria (for example, if the average fleet landings per tire is 230, 1,800/230 or 7 tire changes are permitted between overhauls). • A wheel assembly that reaches the end of its 24 month overhaul cycle or accumulates 1,800 landings while installed on the aircraft does not require immediate removal. In this case, to accommodate tire wear, the assembly may remain in service for up to an additional four months. • A wheel assembly that reaches the end of its 24 month overhaul cycle without being installed on an aircraft may be disassembled and inspected per the tire change inspection criteria. Successful completion of the minor inspection restarts the overhaul inspection interval. Any evidence of corrosion requires an overhaul to be performed. - As a wheel accumulates more landings, it may become necessary to shorten the timeframe between overhaul inspections or increase the frequency of Non-Destructive Testing (NDT) inspections. These decisions may be made by operators based on their documented service history.