AIRCRAFT ACCIDENT INVESTIGATION REPORT

AIRCRAFT DAMAGE DURING TAKE-OFF

ATLAS AIR INC.

BOEING 747-400F, N404KZ (USA REGISTRY)

NARITA INTERNATIONAL AIRPORT

ABOUT 21:39 JST, AUGUST 12, 2024

July 11, 2025
Adopted by the Japan Transport Safety Board
Chairperson RINOUE Kenichi
Member TAKANO Shigeru
Member MARUI Yuichi
Member SODA Hisako
Member TSUDA Hiroka
Member MATSUI Yuko

1. PROCESS AND PROGRESS OF THE AIRCRAFT ACCIDENT INVESTIGATION

1.1 Summary of the Accident	On Monday, August 12, 2024, shortly after a Boeing 747-400F, N404KZ, operated by the Atlas Air Inc., took off from Narita International Airport, an instrument indicated an abnormality in the hydraulic and cabin pressurization systems at about 21:39 Japan Standard Time (JST: UTC + 9hrs, unless otherwise stated all times are indicated in JST on a 24-hour clock). Consequently, the aircraft returned to the airport and landed. The post-flight inspection revealed damage to the airframe structure and others. There was a total of seven people on board the aircraft, consisting of the captain, the co-pilot and five passengers. No one suffered injury.
1.2 Outline of the Accident Investigation	On August 13, 2024, the Japan Transport Safety Board (JTSB) designated an investigator-in-charge and an investigator to investigate this accident. JTSB designated another investigator on August 28, 2024. An accredited representative of the United States of America, as the State of Design, Manufacture, Registry and Operator of the aircraft involved in the accident participated in the investigation. Comments were invited from parties relevant to the cause of the accident and the relevant State.

2. FACTUAL INFORMATION

2.1 History of the Flight

According to the statements of the flight crew members (the captain and the co-pilot), as well as the flight data records and air traffic control (ATC) communication records, the history of the flight history is summarized as below.

On Monday 12 August 2024 at around 21:10, a Boeing 747-400F, N404KZ, operated by Atlas Air Inc., began taxiing from an apron spot at Narita International Airport on a scheduled Flight 7106 of the company to Los Angeles International Airport.

In the aircraft's cockpit, the captain sat in the left seat as PF*1, and the co-pilot sat in the right seat as PM*1.

The flight crew members felt a vibration during taxiing around W6 to W5 on Taxiway A as though they were getting over something. However, as they could not hear anything, they continued to taxi.

As there were no further abnormalities during the taxiing, the aircraft took off from Runway 16R (hereinafter referred to as "the Runway") at about 21:39.

During take-off rolling, the aircraft did not exhibit any vibrations or instrument abnormalities.

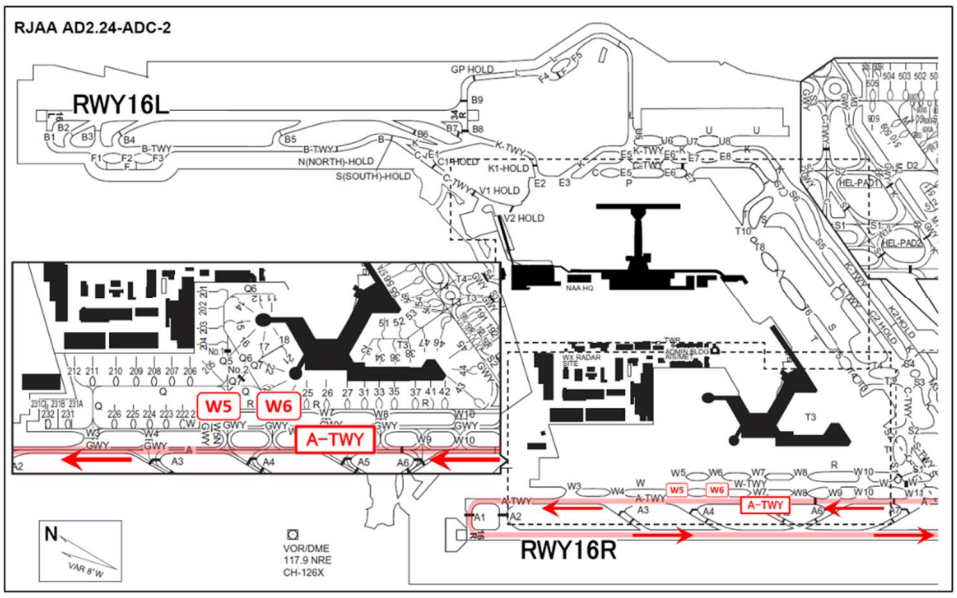

Figure 1: Narita International Airport Plan View and Taxiing Route

Immediately after take-off, the aircraft's EICAS (Engine Indicating and Crew Alerting System) displayed the "HYD QTY LOW 4" (Advisory) message, indicating that the No. 4 hydraulic system, which is also the main hydraulic system for the brakes, had a low hydraulic quantity.

The flight crew members confirmed the rapid decrease in hydraulic oil from the No.4 hydraulic system with the EICAS. While continuing to climb,

*1 "PF (Pilot Flying)" and "PM (Pilot Monitoring)" is a term for identifying a pilot from role sharing in an Aircraft controlled by two people, PF mainly manipulates the Aircraft and PM Mainly performs monitoring of flight condition of the Aircraft, and makes cross check of operation of PF and operations other than maneuvering.

	they performed the non-normal checklist in response to the failure in the No.4 hydraulic system. However, as no other abnormalities were found at this time, and returning to Narita International Airport would require the aircraft to consume fuel in order to reduce its weight below the allowable gross landing weight, the captain continued flying to Los Angeles International Airport. The flight crew members also believed that a hydraulic oil leak likely occurred through the hydraulic system during the take-off roll and requested that Narita International Airport Traffic Control Tower check the surface of Runway 16R. While the aircraft was climbing, at an altitude of about 12,000 ft, the EICAS displayed the "CABIN ALTITUDE" (Warning) message at 21:52, indicating the high cabin pressure altitude. The flight crew members therefore checked the cabin pressure altitude and found that it was indicating 10,300 ft. The aircraft stopped climbing at about FL150, made an emergency call to air traffic control and performed the non-normal checklist in response to the cabin depressurization. In accordance with this checklist, the aircraft descended to 10,000 ft, after which it was decided to return to Narita International Airport. In order to reduce its total weight in time for landing, the aircraft began jettisoning fuel over the sea at about 00:06 on August 13, 2024. During the jettisoning, the EICAS displayed the "HYD QTY LOW 1"(Advisory) message, indicating that the No. 1 hydraulic system, which also serves as the backup hydraulic system for the brakes, had a low hydraulic quantity. This was followed by a "HYD PRESS SYS 1" (Caution) message, indicating that the hydraulic pressure in the No. 1 hydraulic system was low. The flight crew therefore performed the non-normal checklist in response to the loss of the No. 1 and No. 4 hydraulic systems. Once it was confirmed that the aircraft's total weight was below the allowable gross landing weight, the flight crew members started preparing for landing. In accordance with the non-normal checklist for the loss of the No. 1 and No. 4 hydraulic systems, they performed an emergency gear extension instead of the normal gear extension. At 00:49, the aircraft began its descent towards Narita International Airport. After landing on the Runway at 01:12, the aircraft came to a stop just past the halfway point. Due to the loss of multiple hydraulic systems, the flight crew were unable to use the steering function and automatic brakes, therefore, they reduced the speed using the manual brakes during landing. The Runway was closed for about seven hours while the aircraft was moved to the apron.

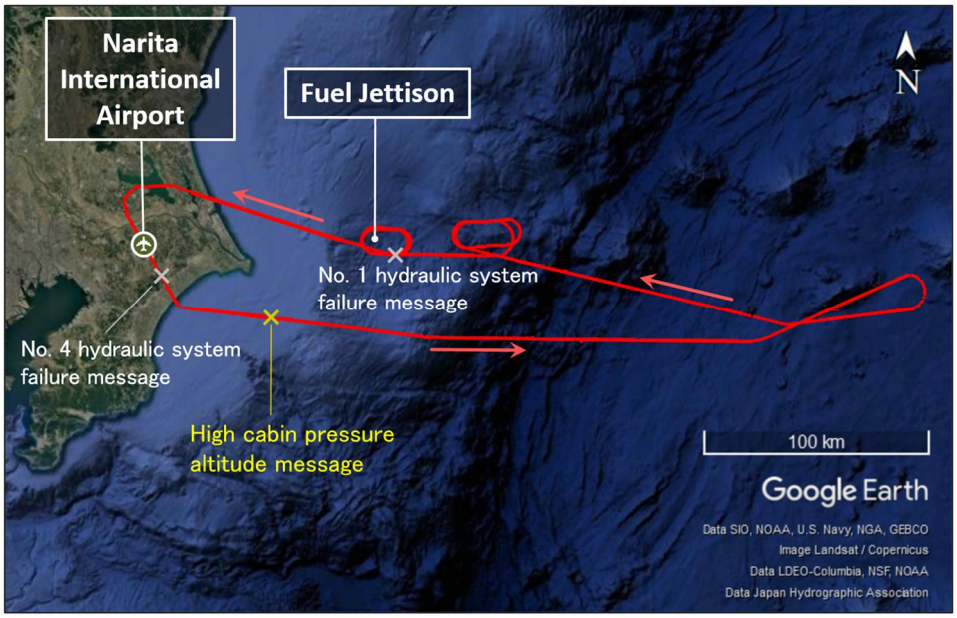

Figure 2: Estimated Flight Route and Location of Each Event

A post-flight inspection revealed damage to the left body gear (hereinafter referred to as "the Landing Gear") No. 7 and No. 8 wheel assemblies, the arched pressure deck for the ceiling in the Landing Gear wheel well, the airframe structure and others.

Neither the flight crew nor any passengers suffered injuries.

This accident occurred at about 21:39, on August 12, 2024, at Narita International Airport (35° 44' 25" N, 140° 23' 34" E)。

2.2 Injuries to Persons	None
2.3 Damage to the Aircraft	Extent of damage: Substantial ・Arched pressure deck for the ceiling in the landing gear wheel well was punctured by about 25 cm (about 10 in) from front to back and by about 38 cm (about 15 in) from left to right (this is applicable to major repairs: see Figure 3). ・The Landing Gear's No. 7 and No. 8 wheel assemblies were damaged. ・The hydraulic system components of the Landing Gear's shock strut were broken and buckled. ・The Landing Gear's door was partially missing. ・There were about 80 cracks and dents of various sizes were found on the outer skins of the left lower fuselage, and the left horizontal stabilizer.

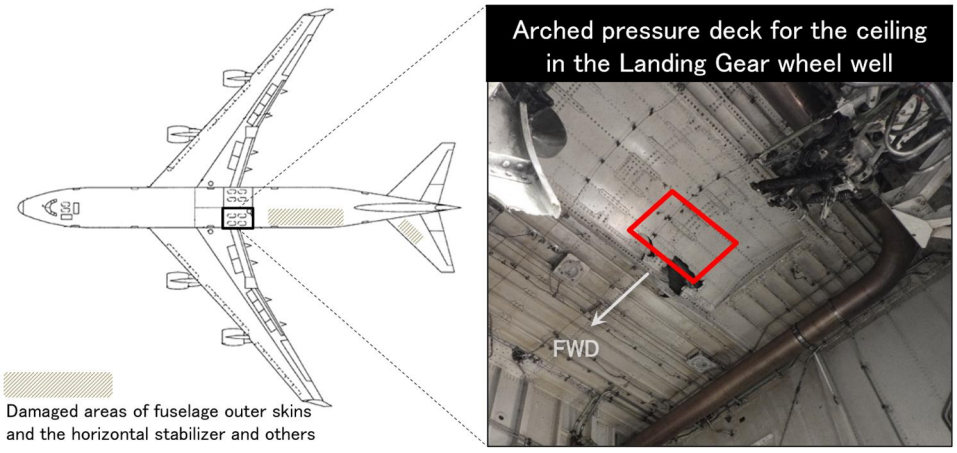

Figure 3: Damage Applicable to Major Repairs

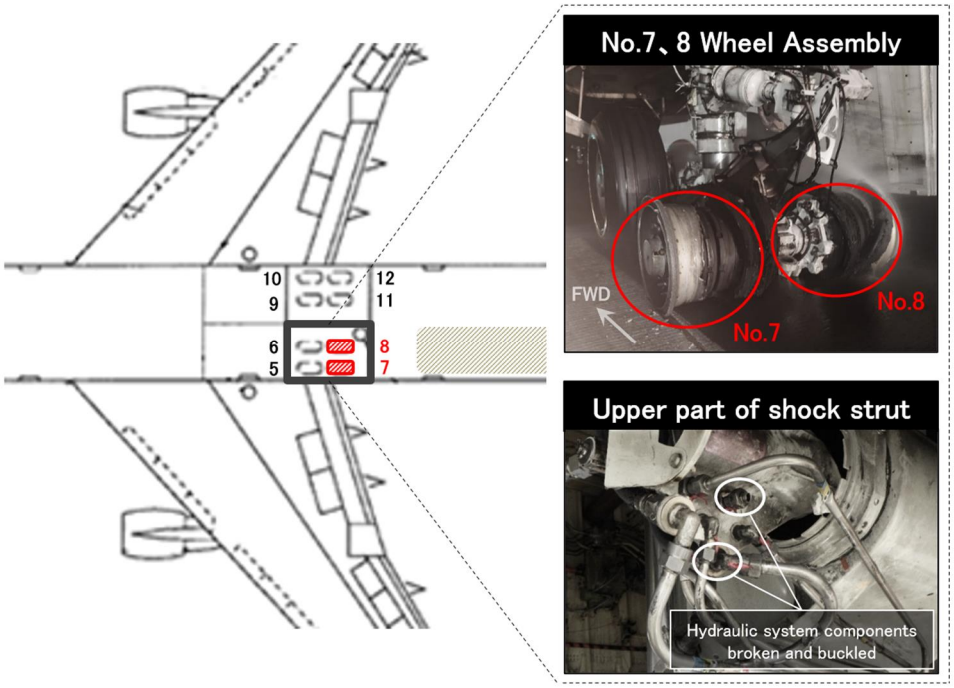

Figure 4 Damage other than to that Applicable to Major Repairs (Overall Condition)

2.4 Personnel Information

(1) Captain: Age 47

Airline transport pilot certificate (Aeroplane) May 28, 2015

Ratings and limitations:

Type rating for Boeing 747 -4*2 May 28, 2015

Class 1 aviation medical certificate Validity: January 31, 2025

Total flight time 9,140 hours 00 minute

Total flight time on the type of aircraft 1,181 hours 14 minutes

(2) Co-pilot: Age 55

Airline transport pilot certificate (Aeroplane) May 23, 2024

Ratings and limitations:

Type rating for Boeing 747 -4 April 18, 2024

*2 In the Competence Certification of the Federal Aviation Administration (FAA), the Boeing 747-400 aircraft is referred to as the B-747-4.

	Class 1 aviation medical certificate Validity: November 30, 2024 Total flight time 3,830 hours 00 minute Total flight time on the type of aircraft 161 hours 14 minutes
2.5 Aircraft Information	(1) Aircraft Type: Boeing 747-400F Serial number: 34283 Date of manufacture: March 5, 2007 Airworthiness Certificate: Date of issue: August 31, 2017 Validity (As long as the Company maintenance policy applies) Total flight time 64,170 hours 56 minutes (2) At the time of accident, the weight and the balance of the aircraft was within the allowable range.
2.6 Meteorological Information	Weather observations provided for Narita International Airport around the time of the accident were as follows: 21:40 Wind direction South-southeast, Wind velocity 3 m/s, Visibility 10 km, Weather Fine Temperature 27°C, Dew point 26°C, Sea level press 1,005 hPa
2.7 Additional Information	(1) Conditions of the Runway and Taxiway Damage to the Runway and taxiway lamp units was confirmed, and traces of linear and curved scoops were observed on the Runway surface. Part of the Landing Gear door and tire pieces were found on Taxiway A, and many aircraft parts (debris), including tire pieces and brake components were found on the Runway.

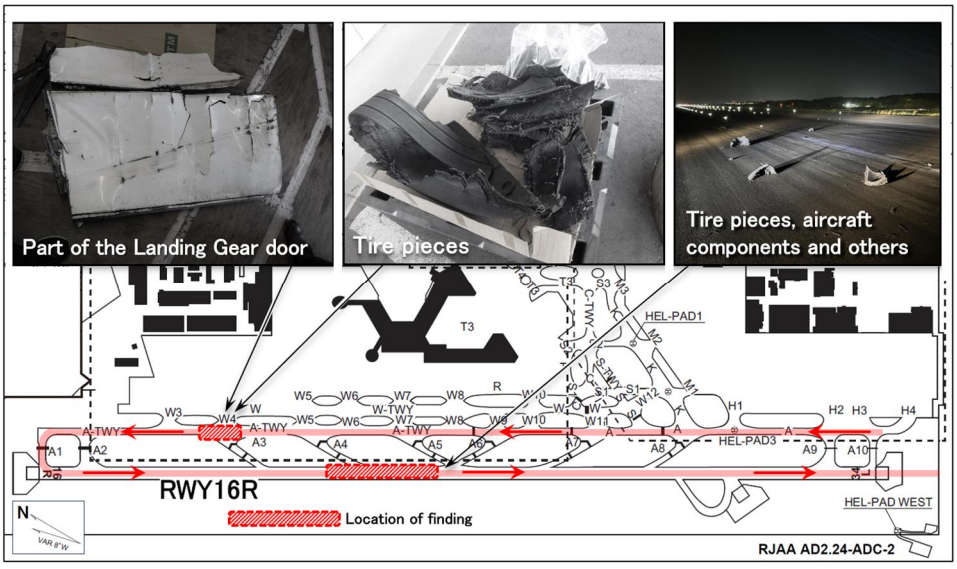

Figure 5: Types of Aircraft Components Found and Location of Finding

(2) Inspection Records for the Aircraft

According to the statements of the flight crew members and the mechanic of the aircraft, as well as the maintenance records, no anomalies were found in the Landing Gear during the daily periodical inspection, including the internal pressure measurement for each tire, conducted by the mechanic and the external aircraft check, conducted by the flight crew

members, before the aircraft's previous flight from Incheon International Airport to Narita International Airport.

According to the aircraft's flight crew members and mechanic, no anomalies were found with the Landing Gear during either the mechanic's external aircraft check after the aircraft's arrival at Narita International Airport or the flight crew members' external aircraft check prior to the relevant flight's departure from Narita International Airport.

(3) Information on the Landing Gear's No.7 and No. 8 wheel assemblies

The Landing Gear's No.7 and No. 8 wheel assemblies had been inspected and maintained in accordance with the company's maintenance manual.

As a result of the inspection of the aircraft's damaged components by its design and manufacturing company, debris from the aircraft wheels was found inside of the arched pressure deck for the ceiling in the Landing Gear wheel well.

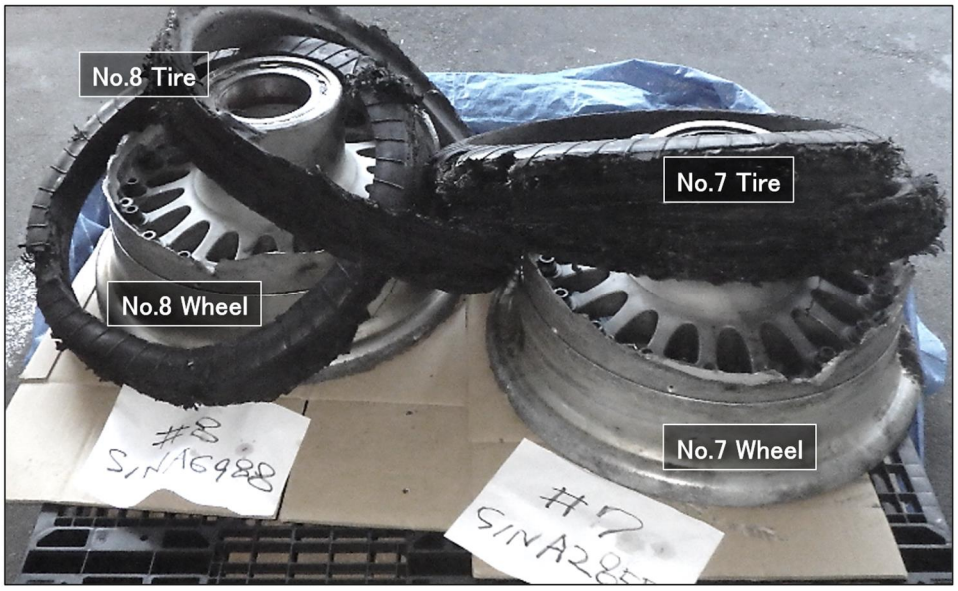

Figure 6: Damage to No.7 and No. 8 Wheel Assemblies

No. 7 and No. 8 (hereinafter referred to as the No.7 Tire and the No. 8 Tire, respectively) were damaged, with their detached components scattered across the runway and others.

According to the results of the investigation into the damaged the No.7 Tire and No. 8 Tire, which were sent to the equipment manufacturing company for analysis, manufacturing failures were not found in the retrieved components. It was also reported that the adhesion of the replacement surface during remolding (retreading: replacing the tread ply of the tire with a new one) was sufficient. In addition, the No.7 Tire showed signs of overall damage, including numerous exfoliations of the tread ply and nylon dissolution. However, such damage to the joint surface and others, as observed on the No.7 Tire, was not confirmed for the No. 8 Tire.

The No. 7 Tire had been remolded twice and was installed on the aircraft on June 21, 2024. Up to the time of this accident, it had undergone 89 cycles. And the No. 8 Tire had been remolded once and installed on the aircraft on August 9, 2024. Up to the time of this accident, it had undergone two cycles.

Figure 7: Damage to No.7 and No. 8 Tires

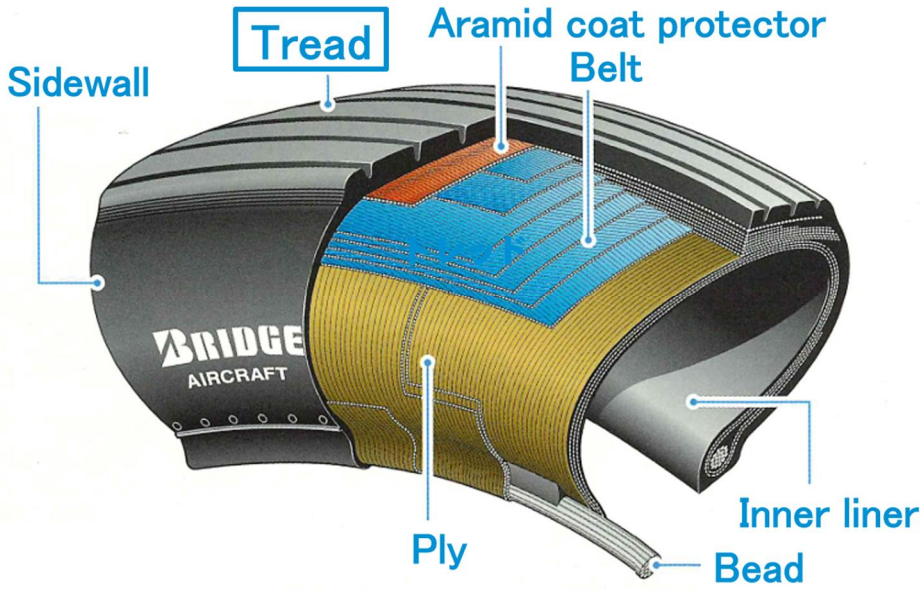

Figure 8: Structure of Radial Tire for Aircraft*3

(4) Video Recording

The video provided by the person who was filming the aircraft at the time of the accident showed that, while the aircraft was taxiing around W6 to W5 on Taxiway A, a piece of material that appeared to be part of its tire

*3 This excerpt is from " Dynamic Illustration: Perfect Encyclopedia of Airplane Mechanisms " (Natsumesha Co. Ltd, 2015, p.88), edited by Shinji Suzuki and featuring additional content.

was rotating in sync with the No. 7 wheel. The video also captured banging sounds and what sounded like explosions several times.

Besides, the video recorded thin, spray-like white smoke rising from the vicinity of the landing gear while the aircraft was executing a take-off roll, accompanied by what appeared to be a banging sound.

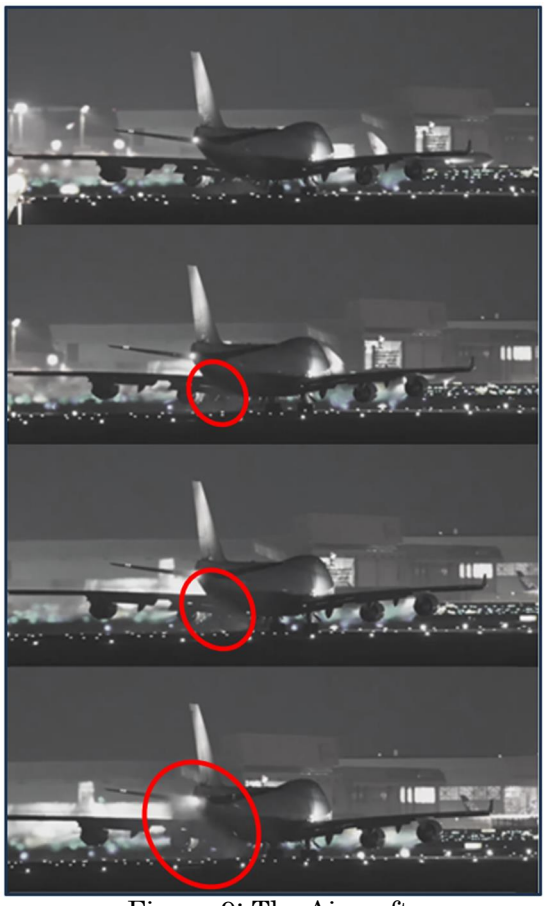

Figure 9: The Aircraft during its Take-off Roll

(5) The flight data recorder did not indicate any vibrations, impacts or other abnormalities relating to the cause of the accident. The cockpit voice recorder did not retain any voice recordings relating to the accident, as these had been overwritten by subsequent audio after landing.

(6) For Boeing 747 family aircraft, there is an option to equip aircraft with a Tire Pressure Indication System (TPIS), which displays messages on the EICAS in the cockpit when abnormal tire pressure occurs. However, the aircraft was not equipped with TPIS.

3.ANALYSIS

(1) Damage to No.7 and No.8 Tires

Regarding the No. 7 tire, the JTSB concludes that from the video records, some material that appeared to be part of the tire was rotating in sync with the No. 7 wheel, and there was also a "banging" sound, or something like an explosive sound, therefore the No. 7 Tire most likely burst while the aircraft was taxiing around W6 to W5 on Taxiway A.

Besides, the No.7 Tire was damaged overall, including numerous exfoliations of the tread ply and nylon dissolution. The contact patch was therefore flattened due to the insufficient tire pressure, and the load on the area between the tread ply of the tire and its sidewalls caused cracks in the tread ply, which most likely progressed to cause the damage.

On the other hand, almost no tread ply wear was observed on the No. 8 Tire. However, it is possible that the damage to the No. 7 Tire caused the No. 8 Tire to carry a greater load and bend, in addition, fragments of the No.7 Tire and debris left in the wheels would have damaged the No.8 Tire.

(2) Arched Pressure Deck for the Ceiling in the Landing Gear Wheel Well

The JTSB concluded that, as debris from the aircraft wheels was found inside of the damaged arched pressure deck for the ceiling in the Landing Gear wheel well, when the Landing Gear was retracted during take-off, this debris most likely fractured and hit the arched pressure deck for the ceiling in the Landing Gear wheel well.

It is highly probable that, in this accident, as the aircraft continued to taxi with the No.7 Tire damaged, debris from the No.7 Tire damaged the Landing Gear brakes and its hydraulic system tubes, in addition, the components of the aircraft wheels were more likely to break and scatter from the damaged wheels, damaging the arched pressure deck for the ceiling in the Landing Gear wheel well. This resulted in the EICAS message indicating the high cabin pressure altitude.

(3) Damage to the Hydraulic System

The JTSB concluded that based on the video records and the found location of the aircraft components (see Figure 5), it is highly probable that while the aircraft was taxiing around W6 to W5 on Taxiway A, the No.7 Tire was damaged, and the aircraft continued to taxi with the tire's exfoliated tread ply rotating in sync with the wheel, resulting in damage to the No.1 and No.4 brake hydraulic systems of the Landing Gear's shock strut.

The video recordings confirmed that while thin, spray-like white smoke (see Figure 9) was rising while the aircraft was executing a take-off roll, it is therefore most likely that the brake hydraulic system tubes were damaged at this time, resulting in subsequent hydraulic system failures.

(4) The JTSB concluded that, had the TPIS been installed, the flight crew members would likely have been able to detect the abnormal tire pressure during taxiing.

4. PROBABLE CAUSES

The JTSB concludes that the probable cause of the accident was that it is highly probable that the No.7 and No.8 Tires were damaged while the aircraft was taxiing, then the aircraft continued the take-off roll with the Landing Gear wheels exposed, causing the debris from the fractured Landing Gear wheels to hit the arched pressure deck for the ceiling in the Landing Gear wheel well, resulting in damage.

Regarding the damage to the No.8 Tire, it is possible that the pressure in the No.7 Tire was reduced, accordingly which caused the No. 8 Tire to carry a greater load and bend, in addition, the fragments of the No.7 Tire and debris left in the wheels damaged the No.8 Tire.

As for the cause of damage to the No.7 Tire, it is likely that the pressure in the No.7 Tire was reduced, however, the cause of this reduction could not be identified.

5. SAFETY ACTIONS

5.1 Safety Actions Required	It is desirable to appropriately identify trends in reducing tire pressure, leading to replacing the tire or searching for the cause of the failure. To this end, equipping aircraft with TPIS is effective, as it enables flight crew members to recognize abnormal tire pressure as soon as it occurs.
5.2 Safety Actions Taken after the Accident	After the accident, the company added the following changes to the tire pressure check items in the maintenance work instructions for daily periodic inspections.

	a. As a general rule, the tire pressure checks should be conducted on cold tires in a stabilized temperature environment (i.e. after more than two hours have passed since the aeroplane was blocked in.) b. The work card should directly list the allowable tire pressure limits for hot and cold tire conditions, respectively. c. They deleted the item, stating that replacing the wheel assembly could be postponed, if replacing its tires or brakes would cause delays to flight operations. d. They specified clearly in the work card that when the tread ply (radial) is exfoliated or carcass ply (bias) is exposed at any location, these tires are not serviceable and must be replaced. e. They revised the maintenance document to be entered the daily check results for the electronic recordkeeping (maintenance management) system to make the tire pressure inspections results are traceable. f. They added the item to the work card to check wheels for missing tire bolts or nuts during tire and wheel checks. g. They made a requirement to record the tool traceability number and calibration date of the used tire pressure gauge for the daily check. h. They prohibited the use of remolded tires on Wheel Positions No.7, 8, 11 and 12 (see Figure 4).