Republic of the Philippines
CIVIL AVIATION AUTHORITY OF THE PHILIPPINES

AIRCRAFT ACCIDENT INVESTIGATION AND INQUIRY BOARD

FINAL REPORT

HZ-AK22
BOEING B777-368ER

OPERATOR: SAUDI ARABIAN AIRLINE

TYPE OF OPERATION: COMMERCIAL AIR TRANSPORT

DATE OF OCCURRENCE: JUNE 20, 2022

PLACE OF OCCURRENCE: NINOY AQUINO INTERNATIONAL AIRPORT, PHILIPPINES

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(B777-368ER HZ-AK22 Final Report)

FOREWORD

This report was produced by the Aircraft Accident Investigation and Inquiry Board (AAIIB), Civil Aviation Authority of the Philippines, MIA Road, Pasay City, Philippines.

The report is based upon the investigation carried out by the AAIIB in accordance with Annex 13 to the Convention on International Civil Aviation, Republic Act 9497 Section 42, and Philippine Civil Aviation Regulation Part 13.

Readers are advised that the AAIIB investigates for the sole purpose of enhancing aviation safety. Consequently, AAIIB reports are confined to matters of safety significance and may be misleading if used for any other purpose. It should be noted that the information in AAIIB reports and recommendations is provided to promote aviation safety, and in no case is it intended to imply blame or liability.

Furthermore, no part of the AAIIB report or reports relating to any accident or investigation shall be admitted as evidence or used in any suit or action for damages arising out of any matter mentioned in such report or reports.

FINAL REPORT

TITLE: Incident involving a Boeing B777-368ER type of aircraft with Registry Number HZ-AK22 that experience taxiway excursion at Ninoy Aquino International Airport, Manila, Philippines on June 20, 2022/1348H (0548 UTC).

Notification of Occurrence to National Authority

The incident was reported to the AAIIB-CAAP by the CAAP Operations Center at 1400H (local time) on June 20, 2022.

Identification of the Investigation Authority

The Aircraft Accident Investigation and Inquiry Board (AAIIB), the mandated accident investigation organization within the Civil Aviation Authority of the Philippines (CAAP), as the State of Occurrence, conducted the investigation.

Organization of the Investigation

In accordance with the provisions of the Philippine Civil Aviation Regulation (PCAR) Part 13, an Investigator-In-Charge was appointed.

Authority Releasing the Report

The Final Investigation Report was released by the Aircraft Accident Investigation and Inquiry Board (AAIIB) and published on the CAAP website on **15 October 2025.**

Synopsis:

On June 20, 2022, Saudia Airlines flight SV862, a Boeing B777-368ER operating from Riyadh to Manila, landed uneventfully on Runway 24 at Ninoy Aquino International Airport at approximately 1348H local time. While taxiing off the runway via Taxiway E5 and turning onto Taxiway C at low speed, the aircraft's right main landing gear veered off the paved surface and entered the adjacent grass area. The crew stopped the aircraft and notified Air Traffic Control. The aircraft became immobilized with the right main gear embedded in soft ground. The incident was attributed to the flight crew's misjudgment of the main gear position during the tight turn.

LIST OF ACRONYMS AND ABBREVIATIONS

AAIIB	:	Aircraft Accident Investigation and Inquiry Board
AACO	:	Arab Air Carriers Organization
ATC	:	Air Traffic Control
ATIS	:	Automatic Terminal Information Service
ATPL	:	Air Transport Pilot License
CAAP	:	Civil Aviation Authority of the Philippines
CPL	:	Commercial Pilot License
CRM	:	Crew Resource Management
CVR	:	Cockpit Voice Recorder
DFDR	:	Digital Flight Data Recorder
FCTM	:	Flight Crew Training Manual
FO	:	First Officer (FO)
GACA	:	General Authority of Civil Aviation
GMCS	:	Ground Maneuver Camera System
HIL	:	Hold Item List
ICAO	:	Civil Aviation Organization
IFR	:	Instrument Flight Rules
KSA	:	Kingdom of Saudi Arabia
LDA	:	Landing Distance Available
MIAA	:	Manila International Airport Authority
MEL	:	Minimum Equipment List
NAIA	:	Ninoy Aquino International Airport
NDB	:	Non-Directional Beacon
OERK	:	King Khalid International Airport
PCAR	:	Philippine Civil Aviation Regulations
PCN	:	Pavement Classification Number
RFFS	:	Rescue and Firefighting Services
TODA	:	Take-Off Distance Available
TORA	:	Take-Off Run Available
UTC	:	Coordinated Universal Time
VMC	:	Visual Meteorological Conditions

1. FACTUAL INFORMATION

Aircraft Registration No.	:	HZ-AK22
Aircraft Manufacturer/Model:		Boeing B777-368ER
Operator	:	Saudi Arabian Airlines
Address of Operator	:	P.O. Box 167, Jeddah 21231, Saudi Arabia
Place of Occurrence	:	Ninoy Aquino International Airport, Manila, Philippines
Date/Time of Occurrence	:	June 20, 2022/1348H (0548 UTC)
Type of Operation	:	Scheduled Commercial
Phase of Flight	:	Taxi
Type of Occurrence	:	Taxiway Excursion

1.1 History of the Flight

On June 20, 2022, Saudia Airlines flight SV862, a scheduled international passenger service from King Khalid International Airport (OERK), Riyadh, Saudi Arabia, to Ninoy Aquino International Airport (RPLL), Manila, Philippines, was operated using a Boeing B777-368ER aircraft.

The approach and landing were uneventful. The aircraft landed on Runway 24 at approximately 1348H local time. During the landing roll, Manila Tower instructed the flight crew to vacate the runway via Taxiway E5, proceed via Taxiway C, and hold short of intersection G8W.

While executing a right-hand turn from E5 onto Taxiway C at low taxi speed, the aircraft's right main landing gear deviated from the paved surface and entered the adjacent grass area. The crew promptly stopped the aircraft and informed Air Traffic Control of the excursion. The aircraft remained immobilized with its right main gear embedded in soft ground (Figure 1).

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In response, Manila International Airport Authority (MIAA) Rescue and Firefighting Services (RFFS), along with Saudia's maintenance and ground personnel, were dispatched to the site. A controlled disembarkation of passengers was conducted using a mobile airstair positioned at the aircraft's forward left door.

Recovery operations commenced shortly thereafter. At approximately 1730H, the aircraft was extracted from the grassy area and towed to a remote parking stand for technical evaluation and inspection. No injuries were reported, and there was no visible damage sustained by the aircraft during the event.

Figure 1 – The aircraft's last position.

1.2 Injuries to Person (s)

Injuries	Crew	Passengers	Others	TOTAL
Fatal	0	0	0	0
Serious	0	0	0	0
Minor	0	0	0	0
None	3/17	399	0	

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1.3 Damage to Aircraft

The aircraft sustained minor damage.

1.4 Other Damages

There was no reported other damage because of this incident.

1.5 Personnel Information

1.5.1 Pilot-In-Command (PIC)

Gender	:	Male
Date of Birth	:	October 26, 1965
Nationality	:	Saudi
License	:	ATPL AT-2232; for the validity, refer to GACAR Part 61.65 (b)
Type rating	:	Airplane Multi-Engine Land – A320, DC-9, B777
Medical Certificate	:	Class 1, valid until August 14, 2022
Date of last medical	:	August 15, 2021
Total flying time	:	17,452 + 0 Hours as of 31 May 2022
Total flying time on type	:	7,181 + 0 Hours as of May 31, 2022

Training/Check	Date	Remarks
a. Annual Check	03 Jun 2022	- Passed/Annual Line Check completed satisfactorily
b. License Proficiency Check and Requalification (3 observed take-off/landing)	24 Mar 2022	- Passed
c. LOFT Training	22 Mar 2022	- LOFT Recurrent completed - No remarks if the trainee had passed or failed the training
d. Operator Proficiency Check and Requalification (3 observed take-off/landing)	19 Sep 2021	- Passed

1.5.1 First Officer (FO)

Gender	:	Male
Date of Birth	:	June 04, 1994
Nationality	:	Saudi

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License	:	Commercial Pilot CP-25968; for the validity, refer to GACAR Part 61.65 (b)
Type rating	:	Airplane Single and Multi-Engine Land – Instrument Airplane A320, B777
Medical Certificate	:	Class 1, valid until July 12, 2022
Date of last medical	:	July 13, 2021
Total flying time	:	1,691 + 0 Hours as of May 31, 2022
Total flying time on type	:	82 + 0 Hours as of May 31, 2022

Training/Check	Date	Remarks
a. Final Check	05 May 2022	- Passed/Final Check completed satisfactorily - Aircraft variant differences completed satisfactory as standard
b. LOFT Training	25 Feb 2022	- Passed/LOFT Qualification completed
c. FFS LOFT	25 Feb 2022	- Satisfactory/Qualification LOFT training completed satisfactory
d. Airman Proficiency and Type Rating Check – Additional Type Rating other than ATP	23 Feb 2022	- Approved
e. FFS Company Check	20 Feb 2022	- Passed/Trainee is ready for GACA rating

1.6 Aircraft Information

The Boeing B777, commonly referred to as the Triple Seven, is an American long-range wide-body airliner developed and manufactured by Boeing Commercial Airplanes. Developed in consultation with eight major airlines, the program was launched in October 1990. The prototype was rolled out in April 1994, and first flew in June of that year. The 777 entered service in June 1995. The longer-range 777-300ER, with a MTOW of 700,000–775,000 lb. (318–352 t), entered service in 2004. It can accommodate a ten–abreast seating layout and has a typical 3-class capacity of 301 to 368 passengers, with a range of 5,240 to 8,555 nautical miles (9,700 to 15,840 km). It is the first Boeing aircraft with fly-by-wire controls.

1.6.1 Aircraft Data

Registration Mark	:	HZ-AK22
Manufacturer	:	Boeing
Country of Manufacturer	:	United States of America
Type/Model	:	B777-368ER

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Operator	:	Saudi Arabian Airline
Serial No.	:	41059
Year of Manufacture	:	2013
Certificate of Airworthiness	:	Valid until November 09, 2024
Certificate of Registration	:	Refer to GACAR 47.41 (a) – Duration and Return of Certificate
Category	:	Transport
Gross Weight	:	351,533 kgs.
Number of Flight Crew	:	2
Number of Passengers	:	413
Airframe total time	:	26,959 + 01 Hours

1.6.2 Engine Data

Manufacturer	:	General Electric
Type	:	Dual Rotor, Axial Flow, High Bypass Turbofan
Model	:	GE90-115B1
Engine Serial No.	:	901-133 (ENG 1), 907-854 (ENG 2)
Engine TSO	:	14,001 + 43 hours (ENG 1), 13,755 + 36 hours (ENG 2)
Engine Total Time	:	13,417 + 20 hours (ENG 1) 13,171 + 13 hours (ENG 2)

1.6.3 Aircraft Status

The operator provided copies of the aircraft's Minimum Equipment List (MEL) and Hold Item List (HIL) for review. Examination of these documents confirmed that there were no active deferred items or discrepancies that could have contributed to the incident. Notably, no issues were identified with the aircraft's steering system or the Ground Maneuver Camera System (GMCS).

Furthermore, post-incident crew interviews and flight documentation indicated that the aircraft was operating normally throughout the flight and during taxi. No flight control or handling anomalies were reported, and all onboard systems were functioning within prescribed parameters.

1.7 Meteorological Information

At the time of the occurrence, the weather at Ninoy Aquino International Airport (RPLL) was reported as follows:

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Time (UTC)	Wind Condition	Sky Condition	Visibility	Temp.	Dewpoint	QNH
1300	310° true, variable between 290° and 350°, at 7 knots	Few cumulonimbus clouds at 2,300 feet, few clouds at 2,500 feet, scattered clouds at 10,000 feet	9 km	31°C	25°C	1006hPa

The reported conditions were within Visual Meteorological Conditions (VMC), with no indication of adverse weather phenomena such as precipitation, low visibility, or wind shear that could have contributed to the excursion. The taxiway surfaces were dry, and lighting conditions were sufficient for visual ground operations.

1.8 Aids to Navigation

The flight was conducted under Instrument Flight Rules (IFR) in compliance with standard international procedures. Ninoy Aquino International Airport (RPLL) is equipped with the following operational radio navigation and landing aids:

- **DVOR/DME:** Co-located on the aerodrome, providing azimuth and distance guidance for en-route and terminal area navigation.
- **ILS Category I (Runway 06/24):** Instrument Landing System providing lateral and vertical guidance for precision approaches to Runway 06 and Runway 24.
- **NDB (Non-Directional Beacon):** Available for certain approach procedures and terminal navigation.
- **ATIS (Automatic Terminal Information Service):** Provides continuous broadcast of essential aerodrome and meteorological information.

The aircraft's arrival, approach, and landing were uneventful and conducted under VMC conditions. The excursion occurred during post-landing taxi under visual conditions and not during instrument procedures.

1.9 Communications

There were no anomalies noted in the communication between the flight crew and ATC. The change in taxi clearance was acknowledged and read back by the crew. There were no indications of communication delay or misunderstanding contributing to the incident.

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1.10 Aerodrome Information

Ninoy Aquino International Airport/NAIA (IATA: MNL, ICAO: RPLL), is the main international airport serving Metro Manila in the Philippines and the main gateway for travelers to the Philippines.

NAIA is managed by the Manila International Airport Authority (MIAA), an agency of the Department of Transportation (DOTr).

1.10.1 Aerodrome Geographical and Administrative Data

ARP coordinates and site at AD	143036 N, 1210049 E
Elevation	75 ft
Geoid undulation at AD ELEV PSN	141 ft
MAG VAR/Annual Change	3ºW (2021) / 6.0' increasing
AD Operator, address	Manila International Airport Authority MIAA Administration Building MIA Road, Pasay City, Metro Manila
Types of traffic permitted (IFR/VFR)	IFR - VFR

1.10.2 Operational Hours

AD Operator	H24
ATS Reporting Office (ARO)	H24
MET Briefing Office	H24
ATS	H24
Remarks	H24

1.10.3 Rescue and Fire Fighting Services

AD category for fire fighting	CAT IX
Rescue equipment	Ten (10) fire trucks [Two (2) Rosenbauer (12500 liters each), two (2) Rosenbauer (12000 liters each), three (3) E-One (12000 liters each), one (1) Spartan (5678 liters), two (2) Iveco Magirus (6000 liters each)] and four (4) Ambulances.

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1.10.4 Aprons and Taxiways

Apron surface and strength	Terminal 1 Surface: CONC. Strength: PCN 91 R/D/W/T. Terminal 2 Surface: CONC. Strength: PCN 92 R/D/W/T. Terminal 3 Surface: CONC. Strength: PCN 92 R/D/W/T. Terminal 4 Surface: CONC. Strength: PCN 91 F/D/W/U. RPA T1 Surface: CONC. Strength: PCN 91 R/C/W/U. RPA T2 Surface: CONC. Strength: PCN 92 R/C/W/U. RPA T2B Surface: CONC. Strength: PCN 91 R/C/W/U. RPA T3 Surface: CONC. Strength: PCN 92 R/D/W/T. RPA T4 Surface: ASPH. Strength: PCN 91 F/C/W/U. Balagbag Surface: CONC. Strength: PCN 92 R/C/W/U. Cargo Terminal Surface: CONC. Strength: PCN 92 R/D/W/T.
Taxiway width, surface and strength	TWY C Width: 23 M. Surface: CONC. Strength: PCN 114 F/D/W/U. TWY D Width: 23 M. Surface: CONC + ASPH. Strength: PCN 91 F/D/W/U. TWY E1 Width: 36 M.

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	Surface: ASPH. Strength: PCN 93 F/C/W/U. TWY E2 Width: 35 M. Surface: ASPH. Strength: PCN 92 F/C/W/U. TWY E4 Width: 35 M. Surface: ASPH. Strength: PCN 95 F/C/W/U. TWY E5 Width: 25 M. Surface: ASPH. Strength: PCN 91 F/C/W/U. TWY F1 Width: 41 M. Surface: ASPH. Strength: PCN 91 F/C/W/U. TWY F1B Width: 18 M. Surface: ASPH. Strength: PCN 90 F/C/W/U. TWY F2 Width: 41 M. Surface: ASPH. Strength: PCN 91 F/C/W/U. TWY F3 Width: 22 M. Surface: ASPH. Strength: PCN 92 F/C/W/U. TWY F4 Width: 40 M. Surface: ASPH. Strength: PCN 90 F/C/W/U. TWY F5 Width: 45 M. Surface: ASPH. Strength: PCN 91 F/C/W/U. TWY G1 Width: 36 M. Surface: ASPH. Strength: PCN 90 F/C/W/U. TWY G2 Width: 52 M. Surface: CONC.

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	Strength: PCN 90 R/C/W/U. TWY G3 Width: 47 M. Surface: ASPH. Strength: PCN 90 F/C/W/U. TWY G4 Width: 48 M. Surface: ASPH. Strength: PCN 91 F/C/W/U. TWY G5 Width: 45 M. Surface: ASPH. Strength: PCN 90 F/C/W/U. TWY G6 Width: 41 M. Surface: CONC + ASPH. Strength: PCN 95 F/C/W/U. TWY G8E Width: 66 M. Surface: ASPH. Strength: PCN 95 R/C/W/U. TWY G8W Width: 38 M. Surface: ASPH. Strength: PCN 95 R/C/W/U. TWY G9 Width: 48 M. Surface: CONC + ASPH. Strength: PCN 90 F/C/W/U. TWY G10 Width: 21 M. Surface: ASPH. Strength: PCN 92 F/C/W/U. TWY G11 Width: 49 M. Surface: ASPH. Strength: PCN 95 F/C/W/U. TWY G12 Width: 51 M. Surface: ASPH. Strength: PCN 90 F/C/W/U. TWY G13 Width: 51 M. Surface: ASPH. Strength: PCN 90 F/C/W/U.

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	TWY G14 Width: 51 M. Surface: ASPH. Strength: PCN 90 F/C/W/U. TWY G15 Width: 59 M. Surface: ASPH. Strength: PCN 90 F/C/W/U. TWY GA1 Width: 12 M. Surface: ASPH. Strength: PCN 91 F/C/W/U. TWY GA2 Width: 13 M. Surface: ASPH. Strength: PCN 90 F/C/W/U. TWY GA3 Width: 13 M. Surface: ASPH. Strength: PCN 90 F/C/W/U. TWY GA4 Width: 13 M. Surface: ASPH. Strength: PCN 92 F/C/W/U. TWY GA5 Width: 10 M. Surface: ASPH. Strength: PCN 90 F/C/W/U. TWY GA6 Width: 22 M. Surface: ASPH. Strength: PCN 90 F/C/W/U. TWY H1 Width: 49 M. Surface: CONC. Strength: PCN 114 F/D/W/U. TWY H2 Width: 25 M. Surface: CONC. Strength: PCN 114 F/D/W/U. TWY H3 Width: 41 M. Surface: CONC + ASPH. Strength: PCN 91 F/D/W/U. TWY H4

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	Width: 14 M. Surface: CONC + ASPH. Strength: PCN 91 F/D/W/U. TWY H5 Width: 22 M. Surface: CONC + ASPH. Strength: PCN 91 F/D/W/U. TWY J Width: 23 M. Surface: ASPH. Strength: PCN 92 F/C/W/U. TWY K Width: 54 M. Surface: CONC. Strength: PCN 95 R/C/W/U. TWY L Width: 36 M. Surface: CONC. Strength: PCN 91 R/D/W/U. TWY M1 Width: 45 M. Surface: CONC. Strength: PCN 110 R/C/W/U. TWY M2 Width: 48 M. Surface: ASPH. Strength: PCN 93 F/C/W/U. TWY M3 Width: 46 M. Surface: ASPH. Strength: PCN 90 F/C/W/U. TWY N Width: 21 M. Surface: CONC. Strength: PCN 92 R/D/W/U. TWY P Width: 36 M. Surface: ASPH. Strength: PCN 90 F/C/W/U. North TWY Width: 16 M. Surface: CONC. Strength: PCN 94 R/C/W/U. Rapid Exit TWY R1 Width: 30 M.

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	Surface: CONC. Strength: PCN 110 R/C/W/U. Rapid Exit TWY R2 Width: 25 M. Surface: ASPH. Strength: PCN 90 F/C/W/U. Rapid Exit TWY R3 Width: 25 M. Surface: ASPH. Strength: PCN 90 F/C/W/U. Rapid Exit TWY R4 Width: 25 M. Surface: ASPH. Strength: PCN 90 F/C/W/U. Rapid Exit TWY R5 Width: 40 M. Surface: CONC. Strength: PCN 115 R/C/W/U. Rapid Exit TWY R6 Width: 30 M. Surface: CONC. Strength: PCN 115 R/C/

1.10.5 Runway Physical Characteristics

RWY	TRUE BRG	Dimensions of RWY	Strength (PCN) and surface of RWY and SWY	THR coordinates RWY end coordinates THR geoid undulation	THR elevation and highest elevation of TDZ of precision APP RWY
06	060.30º	3,514m X 60m	PCN 114 F/D/W/U CONC+ASPH	142954.83N 1210005.11E	14 ft
24	240.30º	3,514m X 60m	PCN 114 F/D/W/U CONC+ASPH	143049.78N 1210144.02E	74 ft
13	134.80º	2,249m X 45m	PCN 104 R/A/W/T CONC+ASPH	143121.65N 1210018.16E	15 ft
31	314.80º	2,249m X 45m	PCN 104 R/A/WT CONC+ASPH	143033.38N 1210108.07E	41 ft

1.10.6 Declared Distances

RWY	TORA	TODA	ASDA	LDA
06	3,514 m	3,664 m	3,514 m	3,409 m

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24	3,409 m	3,629 m	3,514 m	3,409 m
13	2,249 m	2,309 m	2,249 m	2,105 m
31	2,105 m	2,249 m	2,105 m	NU

1.11 Flight Recorders

The aircraft is equipped with the following required flight recorders:

1.11.1 CVR

The four (4) CVR recording channels showed good quality and covered the entire operation from OERK to RPLL.

Manufacturer : Honeywell International Inc.
Model : HFR5-V
Part No. : 980-6032-001
Serial No. : 02384

1.11.2 DFDR

The recorded FDR parameters were intact and allowed an accurate reconstruction of the incident dynamics. The data were analyzed and validated with the assistance of Saudi AIB using the appropriate interpretation tools.

Manufacturer : Honeywell International Inc.
Model : HFR5-D
Part No. : 980-4750-009
Serial No. : FDR01280

1.12 Wreckage and Impact Information

The aircraft came to a stop within the vicinity of Taxiway C, near the exit from Taxiway E5, at geographic coordinates 14°30'04.40" N, 120°00'13.43" E. The right main landing gear exited the paved taxiway surface and settled on a grassy, unreinforced area adjacent to the intersection. The soft ground conditions contributed to limited wheel mobility, preventing further taxi movement.

A post-event technical inspection conducted by the operator's maintenance personnel revealed four (4) fractured support clamps associated with the junction boxes mounted on the right main landing gear. Additionally, two (2) main landing gear tires exhibited localized sidewall cuts, consistent with lateral side-load contact and deformation during the excursion.

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No damage was reported to the aircraft's structural airframe, wings, or engines. There were no ground infrastructure damages, fluid leaks, or fire hazards identified at the site.

The aircraft was later recovered and towed from the soft ground area to a remote stand for further inspection and operational clearance assessment.

Figure 2 – The right main landing gear exited the paved taxiway surface.

1.13 Medical and Pathological Information

The involved flight crew holds a current Class 1 Medical Certificates issued by the General Authority of Civil Aviation (GACA) of the Kingdom of Saudi Arabia (KSA).

1.14 Fire

No reports were received regarding any post-incident fires.

1.15 Survival Aspects

The incident occurred during ground taxi operations at low speed, following a normal and stabilized landing rollout on Runway 24. The aircraft was under full positive

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control when the right main landing gear exited the paved surface and came to rest on adjacent grassy terrain. The event did not involve sudden deceleration forces, collision hazards, or compromise to the structural integrity of the aircraft.

Throughout the incident, the aircraft remained upright, stable, and fully intact. All essential onboard systems, including electrical, hydraulic, and communication systems, remained operational. There were no immediate threats to occupant safety, nor was there any evidence of smoke, fire, fuel leakage, or hazardous material release.

Upon recognizing that further taxiing was not possible due to immobilization on soft ground, the flight crew promptly notified Air Traffic Control (ATC) and coordinated assistance. Emergency services from the Manila International Airport Authority (MIAA) Rescue and Firefighting Services (RFFS), together with Saudia maintenance and ground handling personnel, responded accordingly.

A controlled passenger disembarkation was executed directly from the taxiway using a mobile airstair. The process was conducted efficiently and without incident. There were no injuries, no signs of distress among passengers and crew, and no requirement for emergency evacuation procedures.

1.16 Test and Research

No tests were conducted on the aircraft, as there were no reported technical issues prior to or following the incident.

1.17 Organizational and Management Information

Saudia (Saudi Arabian Airlines), the national flag carrier of the Kingdom of Saudi Arabia, is a state-owned enterprise headquartered in Jeddah. The airline operates under the regulatory oversight of the General Authority of Civil Aviation (GACA) of Saudi Arabia. Its primary hub is King Abdulaziz International Airport (OEJN) in Jeddah, with secondary hubs located at King Khalid International Airport (OERK) in Riyadh and King Fahd International Airport (OEDF) in Dammam.

Saudia maintains a diverse fleet of wide-body and narrow-body aircraft and operates scheduled domestic and international services to over 100 destinations across the Middle East, Africa, Asia, Europe, and North America. On 29 May 2012, it became the first carrier in the Persian Gulf region to join a major global alliance by entering the SkyTeam network. It is also a founding member of the Arab Air Carriers Organization (AACO).

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As part of its safety management and flight operations program, Saudia adheres to Boeing Flight Crew Training Manual (FCTM) procedures and International Civil Aviation Organization (ICAO) standards. The airline has established standard operating procedures (SOPs) for ground operations involving wide-body aircraft, including guidance on taxi techniques, clearance verification, and CRM protocols.

2. ANALYSIS

2.1 Flight Operations

2.1.1 Post-Landing and ATC Instructions

After touchdown, the flight crew was initially instructed to vacate the runway via Taxiway R5, then proceed to Taxiway R6 and C for G8E. However, shortly afterward, ATC issued revised instructions to expedite runway vacation via Taxiway E5, followed by a right turn on Taxiway C, and to hold short at G8W due to other traffic on final approach.

The revised clearance was acknowledged, and the aircraft taxied accordingly. During the turn from Taxiway E5 to C, the aircraft's right main landing gear departed the paved surface, becoming stuck in the adjacent grassy area.

2.1.2 Taxi Procedure

General and specific taxi procedures are available for reference through the published Boeing B777 Flight Crew Training Manual (FCTM). Likewise, such procedure can also be found under Saudia's Flight Operations Manual (FCOM).

On the review of the FCTM, the following significant requirements have been noted:

a. Prior to Taxi:
"An airport diagram should be readily available to each crew member during taxi."

b. Prior to Landing:
"Plan/brief the expected taxiway exit and route to parking."

c. Use of the Ground Maneuver Camera System (GMCS):

"The GMCS is designed to aid the flight crew in determining the location of the nose and main gear wheels prior to or during turns while taxiing and its use

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should be limited to this function." "The Ground Maneuver Taxi display may be used sparingly to determine the proximity of the nosewheels and main gear to the taxi surface edge and when the main gear have cleared the inside corner of a turn."

d. "Normal taxi speed is approximately 20 knots, adjusted for conditions.

e. "When approaching a turn, speed should be slowed to an appropriate speed for conditions. On a dry surface, for turn angles greater than those typically required for high-speed runway turn offs, use approximately 10 knots."

f. Turns of 90 degrees or more
"Initiate the turn as the intersecting taxiway centerline (or intended exit point) approaches the aft edge of the number 2 window. Initially use approximately full nosewheel steering tiller displacement. Adjust the tiller input as the airplane turns to keep the nosewheel outside of the taxiway centerline, near the outside radius of the turn. Nearing turn completion, when the main gear are clear of the inside radius, gradually release the tiller input as the airplane lines up with the intersecting taxiway centerline or intended taxi path.

While the FCTM emphasizes the importance of pre-taxi and pre-landing planning including briefing the anticipated taxi route and having airport diagrams accessible there was no indication from the Cockpit Voice Recorder or crew statements that a detailed taxi briefing was conducted after receiving the revised instruction to vacate via Taxiway E5. The short notice of the route change, given during the landing roll, may have reduced the crew's ability to re-brief and mentally prepare for the acute turn at the E5 and C intersection. This procedural gap likely impacted situational awareness and turn anticipation.

Further, the aircraft's turn onto Taxiway C from E5 required close adherence to FCTM guidance for 90° or tighter turns. This includes slowing to approximately 10 knots, initiating the turn as the intersection centerline reaches the aft edge of the no. 2 window, and using full tiller input followed by gradual release. Available data, including the FDR trace and CVR timing, indicate that the turn was initiated at an appropriately reduced speed; however, the lack of clear CRM callouts or gear clearance monitoring suggests incomplete application of these taxi techniques. The failure to deliberately oversteer to accommodate the inboard tracking of the main gear likely contributed to the excursion.

Although the Ground Maneuver Camera System (GMCS) was functional on the aircraft, there is no evidence that it was utilized during the turn. FCTM guidance states that the GMCS should be used sparingly to monitor gear proximity to pavement edges, particularly in constrained turns. Its absence in flight deck discussions or callouts indicates a missed opportunity to supplement external scanning with visual confirmation of main gear position.

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2.1.3 Crew Statement and CVR Insights

In the post-incident statement, the flight crew confirmed that during the right turn onto Taxiway C, they "did not notice that the right main gear was moving towards the grass." The aircraft was at low taxi speed and came to a stop once the crew recognized the deviation. The crew notified ATC and awaited towing support. Passengers were deplaned via mobile airstairs while the aircraft was immobilized.

The CVR data supports the sequence of events and provides insight into cockpit dynamics:

2.1.4 Airport Layout and Taxiway Consideration

At RPLL, Runway 24 is served by multiple exit taxiways, including R6, E5, and C5. Taxiway E5 intersects with Taxiway C at an angle that may pose maneuvering challenges for wide-body aircraft such as the B777-300ER, particularly when turning from a relatively narrow high-speed exit. This geometry requires precise nosewheel steering and adequate clearance for main gear tracking.

In this case, the aircraft was instructed to exit Runway 24 via Taxiway E5, turn right onto Taxiway C, and hold short of G8W toward Terminal 1 (Figure 3).

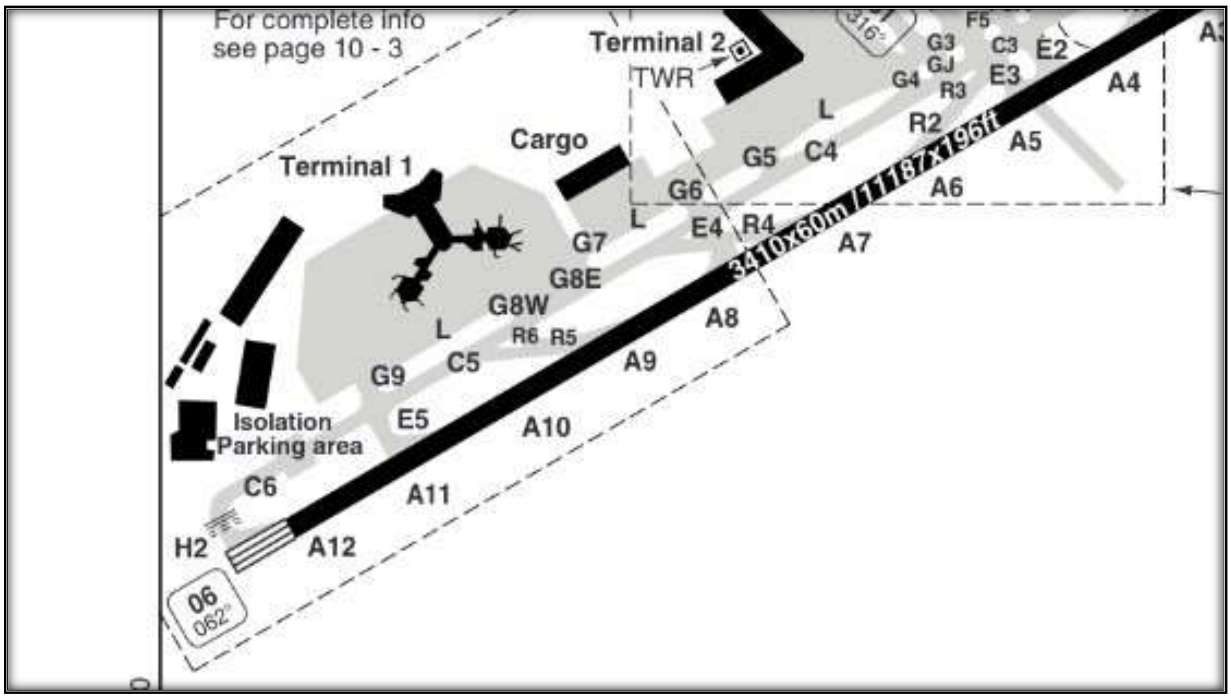

Figure 3 – Runway layout showing exits R5 and E5 intersecting taxiway C.

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The E5–C turn forms a relatively sharp angle for large aircraft like the B777-300ER. The paved surface at this junction appears limited, and any slight deviation from the centerline or a wider than expected turning radius could result in the main gear veering off the pavement onto the adjacent grass.

According to the CAAP published Manual of Standards (MOS) for Aerodromes, taxiway fillets must be provided at junctions and intersections of taxiways with runways, aprons, and other taxiways. These fillets are intended to ensure that the minimum wheel clearances specified in MOS 6.7.2.1 are maintained when aircraft maneuver through such intersections (Figure 4).

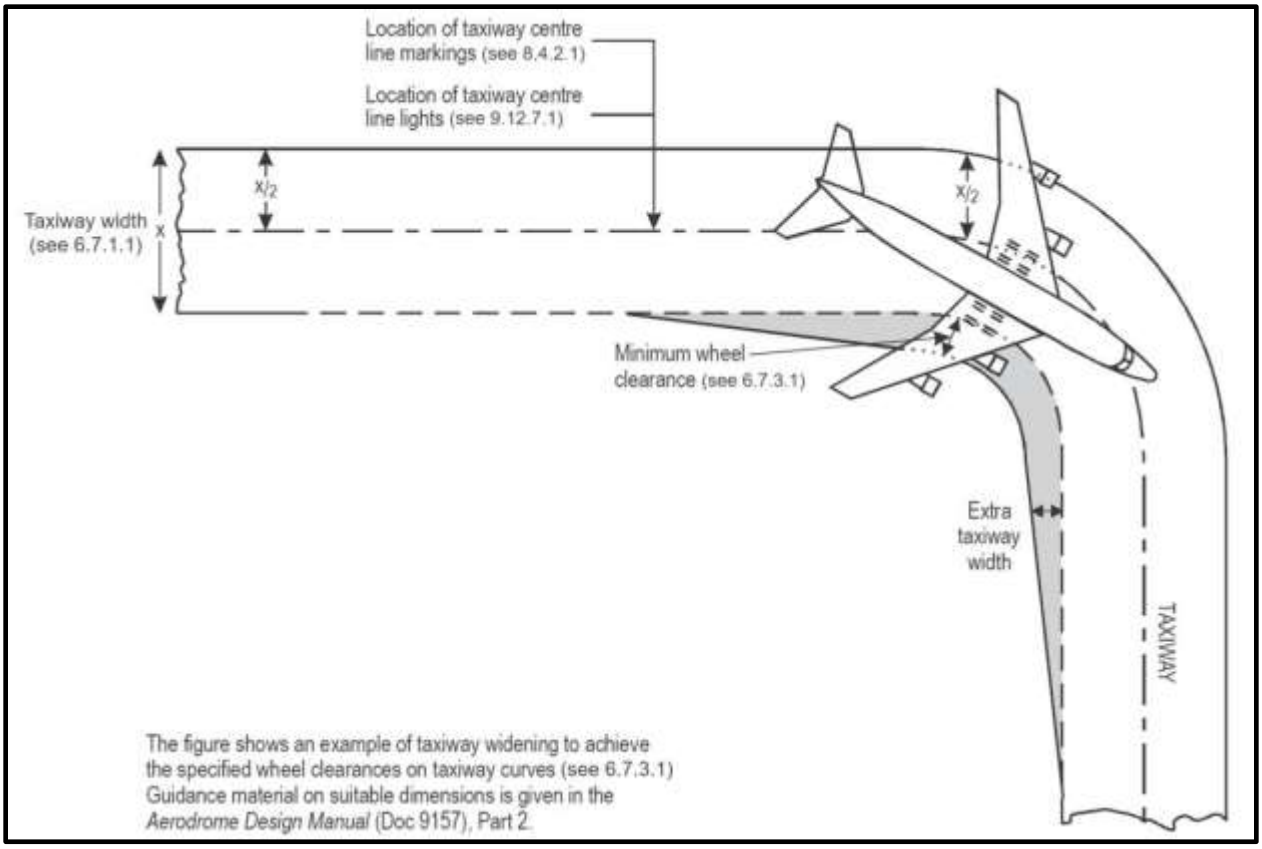

Figure 4 – Example of Taxiway widening.

Specifically, MOS 6.7.2.1 requires that when the cockpit of the intended aircraft remains over the taxiway centerline, the clearance distance between the outer main wheel and the edge of the taxiway shall not be less than the value indicated in Table 6.7-2 (Figure 5).

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	OMGWS			
	Up to but not including 4.5 m	**4.5 m up to but not including 6 m**	**6 m up to but not including 9 m**	**9 m up to but not including 15 m**
Clearance	1.50 m	2.25 m	3 m[a,b] or 4 m[c]	4 m

Figure 5 – MOS Table 6.7-2.

For a B777-368ER, with an Outer Main Gear Wheel Span (OMGWS) of 12.9 meters, a minimum clearance of 4 meters must be maintained between the outer main wheel and the taxiway edge during curved taxi operations. In this incident, considering the aircraft's dimensions, the available clearance may have been marginal, particularly if the aircraft's centerline alignment or turning radius was slightly off. At the time, the required fillet at the E5–C junction had not yet been constructed. Furthermore, the crew did not report any concerns regarding inadequate lighting or signage, although CVR data indicates that the First Officer had limited visual reference to the right side during the maneuver.

The crew complied with ATC instructions and initiated the right turn onto Taxiway C at a controlled taxi speed. However, spatial misjudgment during the turn caused the right main landing gear to exit the paved surface.

The Boeing 777's wide-body configuration and large turning radius require deliberate oversteer, particularly in tight taxiway junctions. While the E5–C intersection is technically accessible for such aircraft, flight crew training manuals and aircraft geometry suggest that it poses operational challenges if alignment is not precise.

This assessment is supported by a simulation of a B777-300ER taxiing from Runway 24 via Taxiway E5 (25 meters wide) and onto Taxiway C (23 meters wide). The simulation showed that, even when the cockpit was kept on the taxiway centerline, the right main landing gear veered off the pavement during the E5–C turn (Figure 6).

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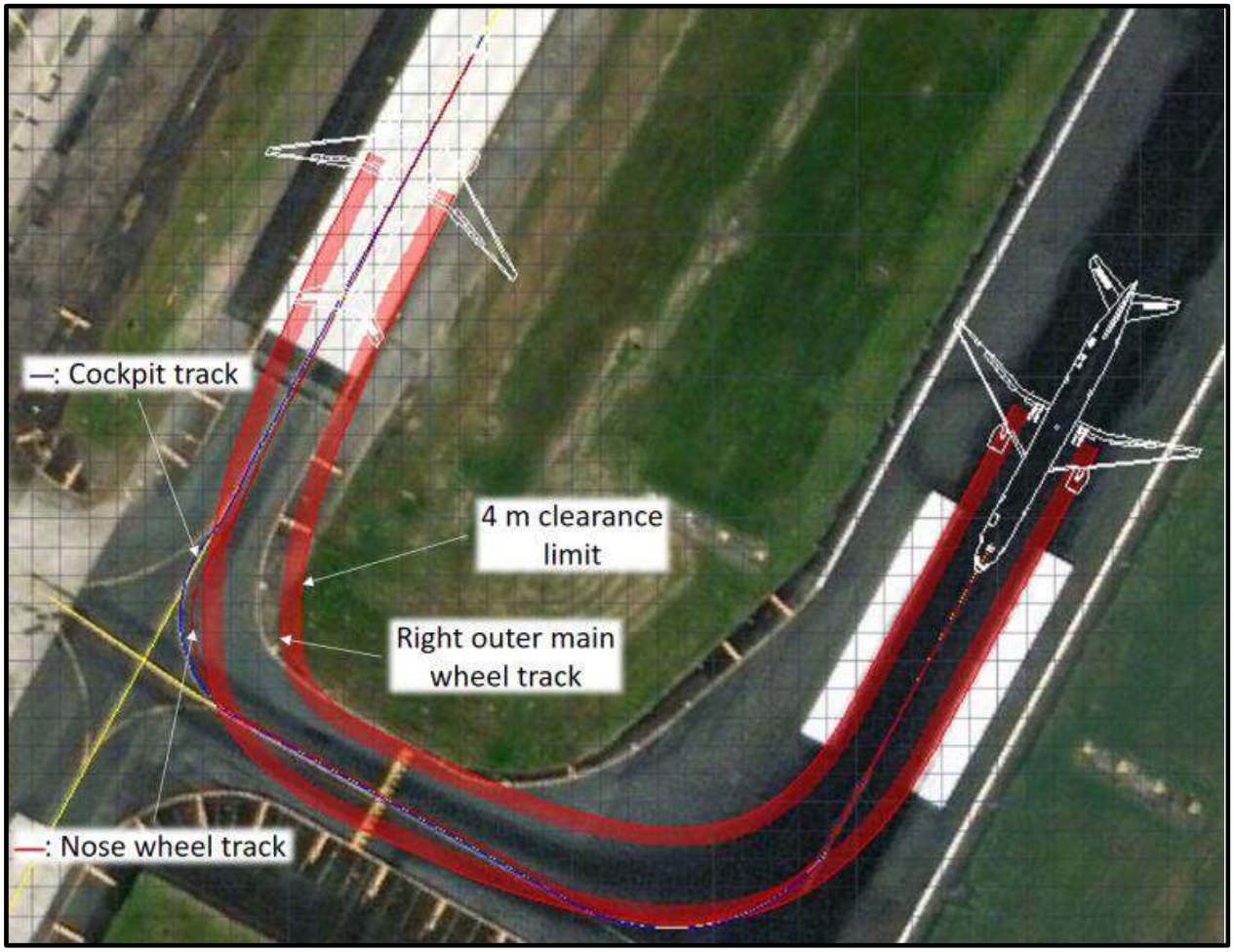

Figure 6 – B777-300ER taxi simulation from RWY 24 to TWY C via TWY E5.

Additionally, the last-minute change in taxi instruction from R5 to E5 may have reduced the crew's opportunity for mental rehearsal and situational planning. In the immediate post-landing phase, where workload is already high, the rapid transition to a revised taxi route increases the risk of spatial errors, particularly in geometrically constrained taxiway environments.

Following the incident, and as part of the Taxiway C upgrading project, the airport authority constructed the required taxiway fillets at the E5–C intersection. This work, completed in 2023, ensured compliance with ICAO Annex 14 and the Manual of Standards for Aerodromes design requirements (Figure 7).

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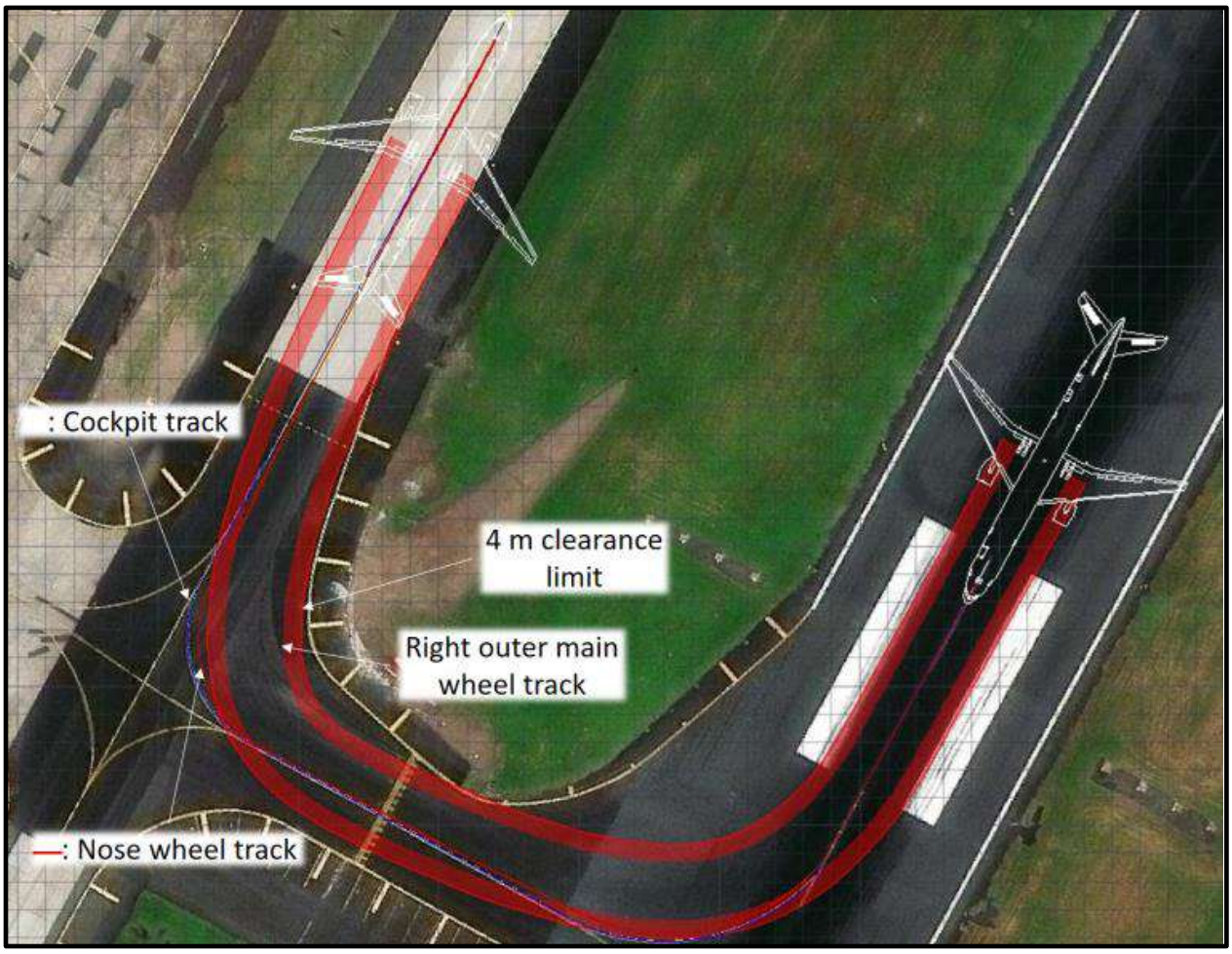

Figure 7 – B777-300ER taxi simulation from RWY 24 to TWY C via TWY E5, with the fillets incorporated at the taxiway junctions.

2.2 Human Factors

CVR analysis revealed the absence of verbal coordination or confirmation between crew members regarding gear or wingtip clearance during the turn. The lack of these standard callouts reflects a gap in active Crew Resource Management (CRM) and mutual monitoring during a high-vulnerability phase.

The flight crew's restricted visual reference of the main gear from the cockpit, coupled with the potential over-reliance on intuitive judgment instead of procedural callouts, likely contributed to spatial misjudgment. While the GMCS was available, there was no evidence that it was utilized, nor were there callouts referencing its display. As per Boeing guidance, the GMCS should be used with caution and must not be considered a substitute for active external monitoring.

Pilot seating adjustments and eye position may also have affected spatial perception, especially when assessing clearance during low-speed turns. Without a deliberate

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strategy for gear position awareness (e.g., oversteer calculations or spotter input), perceptual inaccuracies may arise.

2.3 Organizational Factor

The operator maintains adherence to the training and operational guidance prescribed by the aircraft manufacturer, Boeing, particularly for the Boeing 777 series. Flight crew qualifications, recurrent training schedules, and standard operating procedures (SOPs) were found to be generally in line with industry norms. However, the incident suggests that certain areas within the operator's training framework may benefit from further refinement. Specifically, there is a need to enhance scenario-based training modules that simulate the maneuvering of Boeing 777 aircraft in constrained or geometrically complex taxiway environments, such as those present at Ninoy Aquino International Airport.

Additionally, there should be greater emphasis on the use of Crew Resource Management (CRM) techniques, particularly coordinated verbal callouts related to gear and wingtip clearance during tight ground maneuvers. This would support active mutual monitoring and reduce the risk of spatial misjudgment. Furthermore, standardized post-landing planning protocols should be reinforced, especially in situations where taxi clearances are amended after touchdown, limiting time for re-briefing and route visualization. Addressing these organizational factors would contribute significantly to the operator's ground safety posture and help mitigate the risk of future taxiway excursions.

As part of reinforcing operational safety, there is a need to strengthen pilot training on main gear tracking and wide-body taxi techniques. Given the inherent geometry of large aircraft such as the Boeing 777, the main landing gear can track significantly inside the nose gear path during turns, making precise maneuvering essential, particularly on narrow or complex taxiways.

The operator's current training programs could benefit from expanded emphasis on these aircraft-specific handling characteristics. Integrating dedicated modules within recurrent training to address wide-body taxi operations, including challenges posed by acute-angle turns and geometrically constrained taxiways would help enhance situational preparedness.

Additionally, leveraging full-flight simulators to replicate a variety of taxi scenarios under different speeds, steering inputs, and environmental conditions would provide crews with practical exposure to real-time gear behavior. Such enhancements would support improved spatial judgment and risk awareness during ground operations, particularly in high-traffic or unfamiliar aerodromes.

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To further mitigate the risk of ground excursions, recurrent training should incorporate scenario-based exercises that simulate tight taxiway configurations. These scenarios should challenge flight crews to develop stronger spatial judgment by anticipating main gear and wingtip paths using available cockpit references, ground markings, and geometric cues.

Particular attention should be given to operations under low visibility or nighttime conditions, where depth perception and visual alignment are more difficult. Training should also reinforce best practices for conducting taxi briefings, especially following landing or when ATC issues last-minute changes to taxi routes. A two-pilot active monitoring concept should be emphasized, encouraging clear role delineation: one pilot managing taxi inputs while the other continuously monitors external clearance.

Where installed, the use of Ground Maneuver Camera Systems (GMCS) should be promoted as a supplementary aid to visual scanning and verbal coordination, not a substitute for it. This approach aims to embed deliberate, coordinated taxi practices in routine operations.

3. CONCLUSIONS

3.1 Findings

3.1.1 The aircraft was registered under a valid Certificate of Registration at the time of the occurrence.

3.1.2 The aircraft held a current and valid Certificate of Airworthiness.

3.1.3 The Pilot-in-Command held a valid Air Transport Pilot License (ATPL) and a current Class 1 Medical Certificate.

3.1.4 The aircraft technical logbook recorded no outstanding discrepancies within the seven (7) days preceding the incident.

3.1.5 The flight landed uneventfully on Runway 24 at Ninoy Aquino International Airport (RPLL) and vacated via Taxiway E5 as per air traffic control (ATC) instructions.

3.1.6 ATC subsequently instructed the crew to turn right onto Taxiway C and hold short of Taxiway G8W.

3.1.7 During the execution of the turn from E5 to C, the aircraft's right main landing gear departed the paved surface and entered a grassy, soft ground area adjacent to the taxiway.

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3.1.8 At the time of the incident, the absence of taxiway fillets at the E5–C intersection created maneuvering limitations for large aircraft such as the Boeing 777-300ER and contributed to the right main landing gear exiting the paved surface.

3.1.9 There were no injuries to passengers or crew, and the aircraft remained under control throughout the incident.

3.1.10 Cockpit Voice Recorder (CVR) data revealed that there was situational uncertainty during the turn, with limited verbal coordination between crew members.

3.1.11 Crew coordination was insufficient, and there was an absence of positive visual confirmation or callouts regarding main gear clearance during the taxi maneuver.

3.2 Probable Cause

3.2.1 Primary Cause Factors

a. The flight crew's misjudgment of the aircraft's main gear position during a tight taxiway turn, resulting in the right main gear departing the paved surface.

3.2.2 Contributory Cause Factor

a. Inadequate situational awareness of main gear tracking and taxi clearance margins during the turn.

b. Limited verbal coordination and mutual cross-checking between flight crew members during ground maneuvering.

c. Reduced planning time due to the last-minute revision of taxi instructions, which constrained the crew's ability to conduct a comprehensive post-landing taxi briefing.

d. Absence of taxiway fillets at the E5–C intersection contributed to maneuvering limitations for large aircraft such as the Boeing 777-300ER.

4. SAFETY RECOMMENDATIONS

4.1 Following the completion of the safety investigation, the Aircraft Accident Investigation and Inquiry Board proposes the following safety recommendations to **Saudi Arabian Airlines**:

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a. Safety Recommendation no. 22C10-AK22-SR1:
Reinforce training on main gear tracking and wide-body taxi techniques.

Reinforce training on main landing gear tracking principles and wide-body aircraft taxi techniques, with particular emphasis on the geometry of gear paths during tight turns. This includes integration of structured modules within recurrent training programs addressing turn anticipation, oversteer techniques, and spatial judgment in constrained taxiway environments.

b. Safety Recommendation no. 22C10-AK22-SR2:
Encourage the use of GMCS where available but ensure pilots maintain external visual checks.

Promote the effective use of the Ground Maneuver Camera System (GMCS), where installed, as a supplemental situational awareness tool. However, it must be emphasized that reliance on GMCS should not replace external visual scanning and coordinated crew monitoring. Crews should be trained to use the system judiciously to confirm gear position without losing external situational awareness.

c. Safety Recommendation no. 22C10-AK22-SR3:
Establish SOPs for verbal confirmation of wing/gear clearance during tight turns.

Standard operating procedures (SOPs) should be reviewed and updated to incorporate explicit requirements for verbal callouts and mutual confirmation of wingtip and main gear clearance during tight or complex taxi maneuvers. This includes delineation of roles between pilot flying and pilot monitoring to ensure active cross-checking and safe ground navigation.

5. SAFETY ACTION

5.1 Following the occurrence, Saudia Flight Operations Management initiated the following remedial measures and corrective actions for the involved flight deck crew:

a. Two (2) hours of CRM training, focusing on TEM and situational awareness.
b. Four (4) sectors of line training.
c. Two (2) sectors line check.

Reference: Saudia Flight Safety Department email dated August 21, 2022.

5.2 As part of the NAIA/RPLL Taxiway C upgrading project, the Manila International Airport Authority (MIAA) completed the construction of the required taxiway fillets at the E5–C intersection, which was completed in CY 2023.

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