



Air Accident Investigation Sector

Serious Incident

- Final Report -

AAIS Case N^o: AIFN/0002/2024

Runway Incursion

Operators:	Aircraft 1 - NetJets, Transportes Aereos S.A Aircraft 2 - Saudi Arabian Airlines
Make and Model:	Aircraft 1 - Bombardier BD-700-1A11 Global 5000 Aircraft 2 - Airbus A330-343
Nationality and Registration:	Aircraft 1 - Portugal, CS-GLY Aircraft 2 - Saudi Arabia, HZ-AQ14
Place of Occurrence:	Dubai International Airport (OMDB)
State of Occurrence:	United Arab Emirates
Date of Occurrence:	29 January 2024



This Investigation was conducted by the Air Accident Investigation Sector of the United Arab Emirates pursuant to Civil Aviation Law No. 20 of 1991, in compliance with Air Accident and Incident Investigation Regulation, and in conformance with the requirements of Annex 13 to the Convention on International Civil Aviation.

This Investigation was conducted independently and without prejudice. The sole objective of the investigation is to prevent future aircraft accidents and incidents. It is not the purpose of this activity to apportion blame or liability.

The Air Accident Investigation Sector issued this Final Report in accordance with the national and international standards and practices. Consultation with applicable stakeholders, and consideration of their comments, took place prior to the publication of this Report.

The Final Report is publicly available at:

<http://www.gcaa.gov.ae/en/epublication/pages/investigationReport.aspx>

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Occurrence Brief

AAIS Case N°:	AIFN/0002/2024
Operators:	Aircraft 1 – NetJets, Transportes Aereos S.A Aircraft 2 – Saudi Arabian Airlines
Aircraft make and model:	Aircraft 1 – Bombardier BD-700-1A11 Global 5000 Aircraft 2 – Airbus A330-343
Registration mark:	Aircraft 1 – CS-GLY Aircraft 2 – HZ-AQ14
Manufacturer serial number:	Aircraft 1 – 9498 Aircraft 2 – 1731
Number and type of engines:	Aircraft 1 – Two, Rolls Royce BR700-710A220 turbofan engines Aircraft 2 – Two, Rolls Royce Trent 700 high-bypass turbofan engines
Date and time (UTC):	29 January 2024, at 1652 UTC
Place:	Dubai International Airport, the United Arab Emirates
Category:	Aircraft 1 – Commercial Business Jet Aircraft 2 – Commercial Air Transport (Passenger and Cargo)
Persons on-board:	Aircraft 1 – 3 persons Aircraft 2 – 303 persons
Injuries:	Nil

Investigation Process

The occurrence was notified by Dubai Air Navigation Services to the Air Accident Investigation Sector (AAIS) by phone call to the Duty Investigator Hotline Number +971 50 641 4667.

The AAIS opened an investigation in line with the State's obligations in accordance with Annex 13 as the United Arab Emirates being the State of Occurrence.

The occurrence was classified as a 'serious incident' after the initial investigation phase.

The AAIS notified the Gabinete de Prevenção e Investigação de Acidentes com Aeronaves e de Acidentes Ferroviários (GPIAAF) of Portugal, being the State of Registry and the Operator of the Global 5000 aircraft, the Transportation Safety Board of Canada, being the State of Manufacture and Design of the Global 5000 aircraft, the Accident Investigation Bureau of Saudi Arabia, being the State of Registry and the Operator of the A330 aircraft, and the Bureau d'Enquêtes et d'Analyses (BEA) of French, being the State of Manufacture and Design of the A330 aircraft.

The scope of the investigation into this serious incident is limited to the events leading up to the occurrence; no in-depth analysis of non-contributing factors or non-safety-related issues was undertaken.

Notes:



- ¹ Whenever the following words are mentioned in this Final Report with the first letter capitalized, they shall mean the following:

 - (Aircraft) – Bombardier BD-700 Global 5000 aircraft, registration marks, CS-GLY, operating flight number NJE316K, which crossed the runway
 - (Airport) – Dubai International Airport (ICAO code: OMDB)
 - (Commander) – The commander of the aircraft
 - (Copilot) – The copilot of the aircraft
 - (Incident) – This investigated serious incident
 - (Investigation) – The investigation into the circumstances of this serious incident
 - (Operator) – NetJets, Transportes Aereos S.A
 - (Report) – this serious incident investigation Final Report.
- ² Unless otherwise mentioned, all times in this Report are 24-hour clock in Coordinated Universal Time (UTC), United Arab Emirates local time minus 4).
- ³ Photos and figures used in this Report are taken from different sources and are adjusted from the original for the sole purpose to improve the clarity of the Report. Modifications to images used in this Report are limited to cropping, magnification, file compression, or enhancement of color, brightness, contrast, or insertion of text boxes, arrows, or lines.



Abbreviations

AAIS	The Air Accident Investigation Sector of the United Arab Emirates
ACAS	Airborne collision avoidance system
AFLCMS	Airfield lighting control and monitoring system
AIRN	Air north
AMC	Acceptable means of compliance
AOC	Air operator certificate
ATC	Air traffic control
ATCL	Air traffic controller license
ATCO	Air traffic controller officer
ATS	Air traffic services
ATSOM	<i>Air traffic services operating manual</i>
ATPL	Air transport pilot license
CAR	<i>Civil Aviation Regulations</i> of the United Arab Emirates
CAT	Category
CAT	Commercial air transport
CVR	Cockpit voice recorder
DANS/dans	Dubai air navigation services
DMATS	<i>DANS manual of air traffic services</i>
EASA	European Union Aviation Safety Agency
EGKB	London Biggin Hill Airport
ELP	English language proficiency
FDR	Flight data recorder
ft	Feet
GCAA	The General Civil Aviation Authority of the United Arab Emirates
GMC	Ground movement controller
GMR	Ground movement radar
hPa	Hectopascal
IAS	Indicated airspeed
ICAO	International Civil Aviation Organization
ILS	Instrument landing system
IR	Instrument rating
ITHP	Intermediate holding position
KIAS	Knots indicated airspeed
km	Kilometers
L	Left



LDA	Landing distance available
METAR	Meteorological aerodrome report
MEP	Multi engine piston
MHz	Megahertz
No.	Number
OAT	Outside air temperature
OM	<i>Operations manual</i>
OMDB	Dubai International Airport
OPC	Operator proficiency check
OPS	Operations
PBN	Performance based navigation
PF	Pilot flying
PM	Pilot monitoring
R	Right
REF	Reference
RIMCAS	Runway incursion monitoring and collision avoidance system
RWY	Runway
SEP	Single engine piston
SOP	Standard operating procedures
TCDS	Type certificate data sheet
TI	<i>Temporary instruction</i>
TNA	Training needs analysis
TODA	Take-off distance available
UAE	The United Arab Emirates
UTC	Coordinated Universal Time
WXR	Weather radar
ZFW	Zero fuel weight



Synopsis

On 29 January 2024, a NetJets, Transportes Aereos S.A. Bombardier BD-700-1A11 Global 5000 aircraft, registration marks CS-GLY, was scheduled for ferry flight NJE316K, from London Biggin Hill Airport, the United Kingdom, to Dubai International Airport in the United Arab Emirates, with three persons on board comprising two flight and one cabin crewmembers.

After the landing on runway 30L at Dubai International Airport, the Aircraft vacated the runway. The Aircraft needed to taxi via specific taxiways and crossed runway 30R to reach its designated parking stand. Before crossing, the flight crew received a conditional clearance to cross Runway 30R. However, during the Aircraft's crossing the runway, a runway incursion occurred as another aircraft took off from Runway 30R. The minimum distance between the two aircraft was about 1,330 meters when the departing aircraft lifted off while the crossing aircraft was at the edge of the runway.

The Air Accident Investigation Sector (AAIS) determined that the causes of the runway incursion Serious Incident were the Tower controller's use of a non-standard phraseology in the conditional clearance issued to the Aircraft for crossing the runway, which led to the flight crew incorrectly identifying an aircraft taxiing ahead as the conditional aircraft. Additionally, the flight crew did not seek clarification from the Tower controller despite being uncertain about the taxiway lights being off beyond the stop bars and the guidance lights for crossing the runway.

The AAIS identified contributing factors to the Incident, including the Aircraft was not yet on Tower frequency when the controller issued the take-off clearance to another aircraft for runway 30R, resulting in the flight crew being unaware of the departure of the other aircraft. Additionally, the improper handling of the stop bars at Mike 2 led to their activation nearly simultaneously with the NJE316K crossing, preventing the flight crew from noticing the stop bars activation as they passed.

The AAIS issued four safety recommendations addressed to the air navigation service provider to: emphasize to air traffic controllers the importance of using correct standard phraseology that enhances pilots' situational awareness; ensure adherence to the revised standard operating procedures for selecting holding point stop bars; study the potential for improving the current system functionality to allow automatic activation of stop bars based on updated standard operating procedures; and incorporate familiarization training for air traffic controllers with actual night-time conditions on the airfield. Additionally, one safety recommendation was addressed to the Operator to assess the effectiveness of the safety measures taken following the Incident, ensuring that the safety efforts are both efficient and effective.



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1. Factual Information

1.1 History of Flight

On 29 January 2024, a Bombardier BD-700-1A11 Global 5000 Aircraft, registration marks CS-GLY, was scheduled to operate ferry flight NJE316K from London Biggin Hill Airport (EGKB¹), the United Kingdom, to Dubai International Airport (OMDB²), the United Arab Emirates. There were three persons on board comprising two flight and one cabin crewmembers.

The Commander was the pilot monitoring (PM), and the Copilot was the pilot flying (PF).

At 1648, NJE316K landed on runway 30L, vacated the runway via taxiway Kilo 9, and continued taxiing through taxiway Kilo. The Commander took controls while the Aircraft was taxiing out.

At 1650:39, while NJE316K was taxiing on taxiway Kilo, the Ground controller directed NJE316K flight crew to continue on taxiway Kilo, transition to taxiway Lima 3, and hold at ITHP Lima 3 Alpha.

There were two aircraft, with callsigns FDB338 and DHX263, in front of NJE316K that were required to cross runway 30R from the holding point Mike 2. The Tower controller provided clearance first to FDB338 to continue to taxiway Mike 2 and cross runway 30R while it was taxiing on taxiway Lima 3 before reaching intermediate taxi-holding position (ITHP) Lima 3 Alpha. After this clearance, the Tower controller provided instructions to DHX263 to expedite the taxi, follow traffic in front (FDB338), proceed to taxiway Mike 2, and cross runway 30R. At that time, DHX263 was taxiing on taxiway Lima 3 and had just passed ITHP Lima 3 Bravo, while FDB338 was crossing taxiway Mike.

The Tower controller instructed DHX263 to proceed to taxiway November and hold at November Echo after crossing the runway. At that time, FDB338 had already passed the holding point and continued across the runway. While FDB338 was taxiing on taxiway November 2, the Tower controller instructed the flight crew to contact Ground control. At that moment, DHX263 was in the process of crossing the holding point on Mike 2.

The stop bar was deactivated when the Tower controller provided clearance to FDB338 and DHX263 to cross runway 30R.

At 1652:44, NJE316K commenced turning to the right to continue taxiing through taxiway Lima 3 (figure 1).



Figure 1. Ground movement radar (GMR) screenshot at 1652:44

¹ EGKB is the ICAO four letter airport code for London Biggin Hill Airport, the United Kingdom

² OMDB is the ICAO four letter airport code for Dubai International Airport, the United Arab Emirates

At 1652:52, DHX263 was taxiing on taxiway Mike 2 in front of NJE316K and approaching the holding point, with the countdown timer indicating 3 seconds remaining, as displayed on the airfield lighting control and monitoring system (AFLCMS) (figure 2). While NJE316K was turning right from taxiway Kilo to taxiway Lima 3.

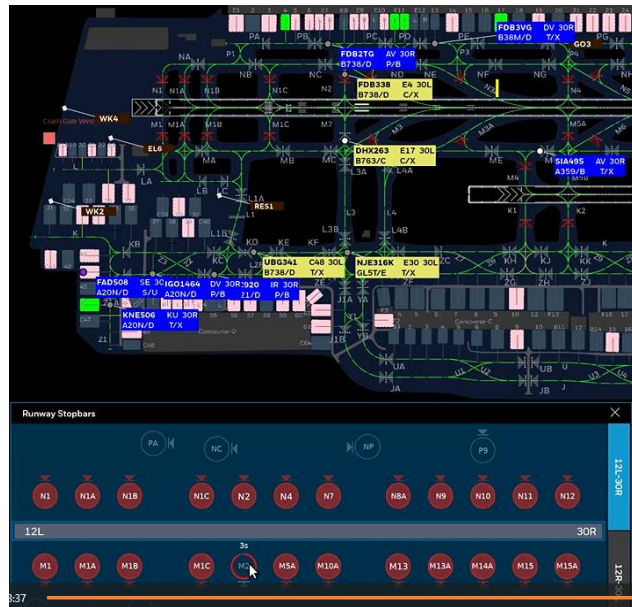


Figure 2. AFLCMS screenshot at 1652:52, indicating the controller interactions with the stop bar

At 1652:54, the stop bar on Mike 2 reactivated (turned ON) after a 60-second interval was due, while DHX263 just crossed the stop bar (figure 3). The NJE316K was taxiing on taxiway Lima 3 after completing the turn and the Commander noticed the stop bar activation for a few seconds.

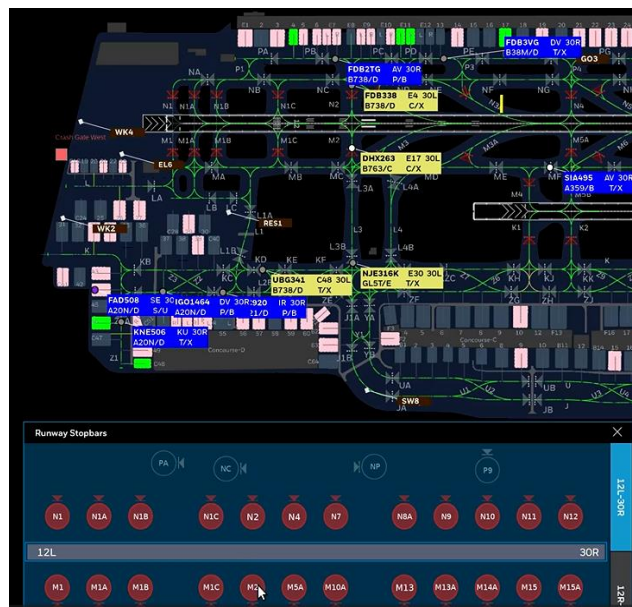


Figure 3. AFLCMS screenshot at 1652:54, stop bar on Mike 2 reactivated

At 1652:57, the controller deactivated the stop bar on Mike 2, which reset the 60-second timer (figure 4).

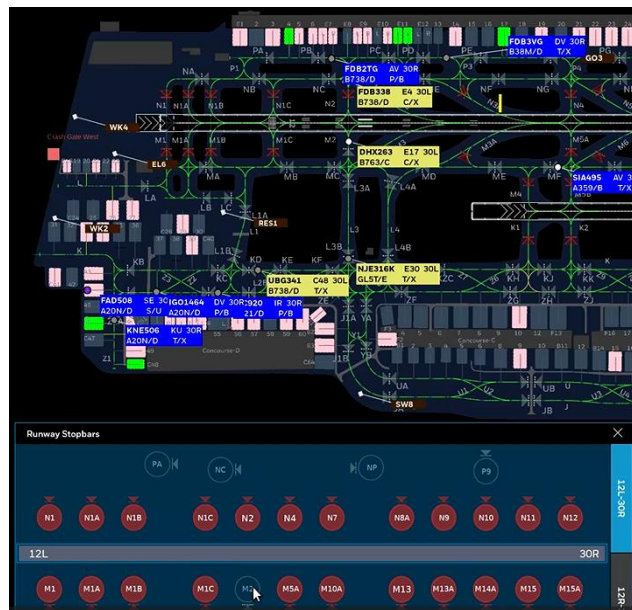


Figure 4. AFLCMS screenshot at 1652:57, stop bar on Mike 2 deselected

At 1653:11, Ground controller instructed NJE316K to contact the Tower control, which was then read back correctly by the flight crew that ended at 1653:19.

At 1653:19, a Saudi Arabian Airlines Airbus A330-343 aircraft, operating flight number SVA561, was lining up on the threshold of runway 30R, and the Tower controller cleared it for takeoff. At this time, NJE316K was taxiing on taxiway Lima 3 (perpendicular to runway 30R), at about 370 meters from the runway centerline intersection (figure 5).



Figure 5. GMR screenshot at 1653:19

At 1653:23, the flight crew of SVA561 read back correctly the clearance given, and about three seconds later, the crew advanced engine thrust levers for takeoff.

At 1653:28, the NJE316K flight crew contacted the Tower control for the first time after changing the frequency from Ground control to Tower control and reported holding at Lima 3 Alpha (figure 6).



Figure 6. GMR screenshot at 1653:28

At 1653:31, the Tower Control provided conditional clearance to NJE316K for taxiing to holding point Mike 2 and crossing runway 30R behind the rolling A330 aircraft (see Appendix 1). This conditional clearance issuance ended at 1653:39. The flight crew read back the clearance correctly.

At 1653:51, NJE316K crossed the middle of the taxiway Mike and continued taxiing through taxiway Mike 2 (figure 7).



Figure 7. GMR screenshot at 1653:51

At 1653:58, the stop bar lights illuminated (figure 8.b. and 8.c.), before NJE316K crossing the holding point of taxiway Mike 2. Figure 8.a. shows the AFLCMS screenshot one second before the stop bar became active.



Figure 8.a. AFLCMS screenshot at 1653:57



Figure 8.b. AFLCMS screenshot at 1653:58



Figure 8.c. GMR screenshot at 1653:58

At 1654:00, NJE316K reached holding point Mike 2 crossing the stop bars, while SVA561 was rolling on runway 30R (figure 9).

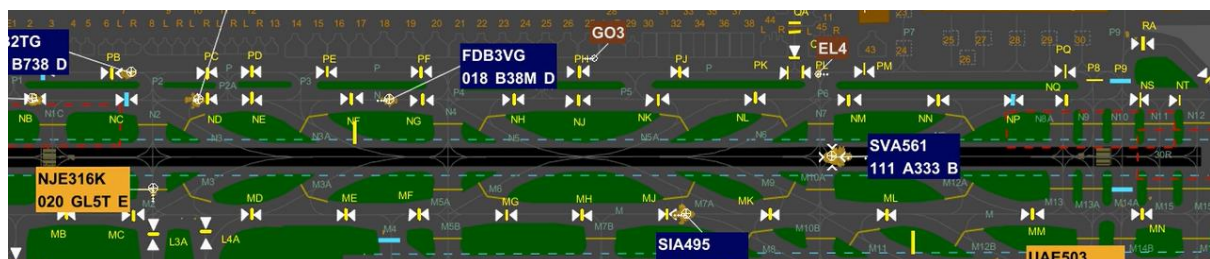


Figure 9. GMR screenshot at 1654:00

At 1654:01, the runway incursion monitoring and collision avoidance system (RIMCAS) Stage 2 alert appeared since there was a conflict between SVA561 and NJE316K with a visual and audible alarm on the Controller's display (figure 10).



Figure 10. GMR screenshot at 1654:01

At 1654:03, the Tower controller instructed SVA561 to stop immediately, while the indicated airspeed was about 132 knots while accelerating (figure 11). There was no reply received from SVA561.



Figure 11. GMR screenshot at 1654:03

At 1654:08, while NJE316K was crossing the runway, the Tower controller instructed NJE316K flight crew to expedite the crossing. SVA561 rotated at 149 knots indicated airspeed (figure 12). Subsequently, an unidentified calling “Expediting” was heard by the Tower.



Figure 12. GMR screenshot at 1654:08

At 1654:13, SVA561 lifted off at 161 knots indicated airspeed. NJE316K was taxiing along the edge of the runway, vacating the runway after crossing it (figure 13).



Figure 13. GMR screenshot at 1654:13

At 1654:18, the flight crew of SVA561 asked the Tower control whether there was traffic crossing the runway, and the controller confirmed.

At 1655:16, while NJE316K was taxiing on the taxiway November, Tower control (a replaced controller) instructed the flight crew to hold their position. The flight crew then stopped the Aircraft.

At 1655:40, the Tower controller inquired if the flight crew of NJE316K were aware they had crossed the runway without clearance. As per the Commander's statement, the crew responded that they observed the stop bar lights were off and believed they were cleared to cross behind an A330 aircraft taxiing in front of them. The Tower controller informed NJE316K flight crew that they would check the matter and instructed them to contact Ground control.

1.2 Injuries to Persons

There was no injury to any person.

1.3 Damage to Aircraft

There was no damage to any aircraft.

1.4 Other Damage

There was no damage to property or the environment.

1.5 Personnel Information

1.5.1 NJE316K Flight Crew

The qualifications and experience of the Commander and Copilot of NJE316K at the time of the Incident were as shown in table 1.

Table 1. Flight crewmembers' data		
	Commander	Copilot
Age	54	31
Type of license	ATPL(A) ³	CPL(A)
Valid to	27 February 2024	27 August 2024
Rating	MEP ⁴ , SEP ⁵ IR ⁶ , PBN ⁷ , BD-700	IR, BD-700
Total flying time (hours)	5,585.4	912.2
Total Command on all types (hours)	3,781.7	0
Total on this type (hours)	3,903	94.3
Total Command on this type (hours)	2,651.8	0
Total on type the last 28 days	31	22.7
Total on type the last 14 days	7.6	7.6
Total last 7 days (hours)	7.6	7.6
Total on type last 7 days (hours)	7.6	7.6
Total last 24 hours (hours)	7.6	7.6
Last Operator proficiency check (OPC)	18 January 2024	15 August 2023
Last annual line check	29 August 2023	3 October 2019
Medical class	Class 1	Class 1
Valid to	27 February 2024	27 August 2024
Medical limitation	VNL ⁸ , SIC ⁹	VDL ¹⁰

³ ATPL-A: Air transport pilot license - Aeroplanes

⁴ MEP: Multi engine piston

⁵ SEP: Single engine piston

⁶ IR: Instrument Rating

⁷ Performance based navigation (PBN) specifies that aircraft required navigation performance (RNP) and area navigation (RNAV) systems performance requirements be defined in terms of accuracy, integrity, availability, continuity, and functionality required for the proposed operations in the context of a particular airspace, when supported by the appropriate navigation infrastructure.

⁸ VNL is a medical limitation code of correction for defective near vision, which means that the licence holder should have readily available spectacles that correct for defective near vision as examined and approved by the aero-medical centre or aero-medical examiners.

⁹ SIC is specific medical examination(s) limitation that requires the aero-medical centre (AeMC), or aero-medical examiner (AME) to contact the medical assessor of the licensing authority before embarking upon a revalidation or renewal aero-medical assessment. The limitation is likely to concern a medical history or additional examination(s) which the AeMC or AME should be aware of prior to undertaking the assessment.

¹⁰ VDL is a medical limitation code of correction for defective distant vision, which means that the licence holder should have readily available spectacles that correct for defective distant vision as examined and approved by the aero-medical centre or aero-medical examiners.



English language proficiency (ELP)	Level 6	Level 6
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According to the flight crew records provided to the Investigation, both flight crewmembers were qualified for the flight.

1.5.2 Air Traffic Controller

The involved Air North Dubai Tower controller held an air traffic controller license (ATCL) issued by the General Civil Aviation Authority of the United Arab Emirates (GCAA), and valid until 30 September 2024. The controller Class III medical certificate was valid until 18 August 2024.

Based on the controller roster and statement, the controller was well-rested and fit for duty on the day of the Incident. The controller took over the position of the Tower control about five minutes before the Incident.

1.6 Aircraft Information

1.6.1 Aircraft data of flight NJE316K

The Aircraft was a Bombardier BD-700-1A11 (Global 5000) which was manufactured in 2012, and delivered to the Operator on 20 November 2019. It was certificated, equipped, and maintained in accordance with the requirements of the European Union Aviation Safety Agency (EASA). The Aircraft flight technical logs provided to the Investigation showed no technical defects prior to the Incident. No technical anomaly was reported by the crew before or during the flight.

1.6.2 Aircraft data of flight SVA561

The aircraft, with registration marks HZ-AQ14, was an A330-343 manufactured in September 2016, and delivered to the Operator on 28 September 2016. It was certificated, equipped, and maintained in accordance with the requirements of the Kingdom of Saudi Arabia General Authority of Civil Aviation. No technical anomaly was reported by the crew before or during the flight.

1.7 Meteorological Information

Table 2 shows the METAR¹¹ for OMDB on 29 January 2024, during the period from 1600 to 1630.

Table 2. METAR, 29 January 2024, 1600 to 1630 UTC	
METAR OMDB 291600Z 26006KT CAVOK 23/10 Q1017 NOSIG	
METAR OMDB 291630Z 26008KT CAVOK 23/11 Q1018 NOSIG	

Table 3 describes the above-mentioned METAR.

Table 3. Description of the METAR		
1600 UTC		1630 UTC
Wind	Direction 260 degrees / speed 6 knots	Direction 260 degrees / speed 8 knots
Visibility	10 km or more	10 km or more

¹¹ Meteorological aerodrome report (METAR) is a format for reporting weather information



Clouds	No clouds	No clouds
OAT	23°C	23 °C
Dew point	10 °C	11 °C
Pressure (Altimeter)	1017 hPa	1018 hPa
Condition	No significant change within the next 2 hours	No significant change within the next 2 hours

The Incident occurred at night in visual meteorological conditions (VMC). The weather condition was not a factor in the Incident.

1.8 Aids to Navigation

There were no reported defects related to ground-based navigation aids or their serviceability. The ground-based navigation aids were functioning normally on OMDB.

1.9 Communications

All communications between the flight crew and OMDB air traffic control (ATC) were generally clear and normal and were recorded by the ground-based voice recording equipment. The recording of these communications was made available to the Investigation.

After landing until 1653:18, NJE316K was in communication with Dubai Ground Control (Primary GMC-1) on a frequency of 118.350 megahertz (Mhz). Following that, it was in contact with Dubai Tower Control (Primary Air North) on a frequency of 118.750 Mhz from 1653:28 to 1656:33.

1.10 Aerodrome Information

Dubai International Airport, ICAO code OMDB, coordinates 25°15'10"N 55°21'52"E, is located 4.6 kilometers east of Dubai city. The airport elevation is 62 feet.

The Airport is equipped with two asphalt runways: 30R/12L and 30L/12R. Runway 30L has a landing distance available (LDA) of 4,315 meters, and runway 30R has a take-off distance available (TODA) of 4,360 meters. From the centerlines, runways 30R/12L and 30L/12R are 385 m apart.

Both runways 30L and 30R are equipped with ILS ICAO CAT IIIB precision approach lighting systems.

The taxiing guidance system at OMDB consists of stop bars and selectable segments of green taxiway centerline lights. The system guides arriving and departing aircraft between the runways and parking positions by the use of airfield lighting. Flight crews are guided by green taxiway centerline lights in front of the aircraft to provide dedicated, safe, and efficient ground movement. The system at OMDB is designed to provide pilots with visual guidance while taxiing, but not limited to periods of low visibility. It is controlled by the Tower controllers using a taxiway lighting control panel.

All taxiing guidance lights on taxiways leading to the runways terminate at the runway holding positions where, by default, red stop bar lights remain ON unless deselected/deactivated by the Tower controller. When deselected, these stop bar lights will re-activate automatically back to red after 60 seconds.

When the red stop bars illuminate, green taxiway lights beyond the stop bars, including those at the lead-on to line up and the guidance lights to cross the runway, will be off. Once the stop bars are deactivated, the green taxiway lights beyond the stop bars, including those for line-up and runway crossing will automatically turn on.

The runway holding positions (CAT I and CAT II / III) are supplemented with elevated

The ITHPs for general service taxiway crossings are provided with stop bar lighting, namely the ITHP stop bar lightings, (figure 14 and Appendix 2).

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1.16 Tests and Research

No tests or research were required to be conducted for the Investigation.

1.17 Organizational and Management Information

1.17.1 Air navigation service provider

Dubai Air Navigation Services (dans) is certified by the GCAA. It is responsible for providing aerodrome control services within the Dubai control zone.

OMDB is a controlled aerodrome at which air traffic control service is provided to aerodrome air traffic.

1.17.1.1 Procedures of conditional clearance

The *dans manual of air traffic services (DMATS)*, part 3, section 5.2.14.1, describes the conditional clearance for aircraft procedures and the corresponding management of the stop bars. It states:

“5.2.14 Conditional Clearance

5.2.14.1 Aircraft

...

- d. Conditional phrases such as “behind landing aircraft” or “after departing aircraft”, shall only be used when the aircraft can be seen by the ATCO [air traffic controller officer] and pilot. When the conditional clearance involves a departing aircraft and an arriving aircraft, it is important that the departing aircraft correctly identifies the arriving aircraft on which the conditional clearance is based.

...

- g. A conditional clearance does not authorize crossing of an illuminated stop bar; stop bars will be deselected once the subject traffic has passed.”

1.17.2 Operator

The NJE316K Operator was granted an air operator certificate (AOC) issued by the Portuguese Civil Aviation Authority to perform commercial air transport (CAT) operations.

1.17.2.1 Taxiing procedure

According to the Operator’s *operations manual - part A (OM-A)*, the taxiing procedure related to the stop bar was as follows:

“8.3.24 Descent Procedure

Taxiing is a high workload phase of flight that requires the full attention of the flight crew. It shall be treated as a safety-critical activity and sterile cockpit procedures shall be applied.

The following procedures apply for taxiing:

...

- m. The aeroplane shall stop and hold at all lighted stop bars and will only proceed further when an explicit clearance to enter or cross a runway has been issued by ATC and the stop bar lights have been switched off. If a clearance to cross or enter the runway has been issued by ATC and the stop lights remain on, flight crew shall question ATC to ensure that the crossing is authorised;

...”



1.17.2.2 Avoidance of collision procedure

According to the Operator's OM-A, the avoidance of collision procedure related to right-of-way for surface movement of aircraft was as follows:

"3.2 Avoidance of Collision

3.2.2 Right-of Way

Nothing in these rules shall relieve the pilot-in-command of an aircraft from the responsibility of taking such action, including collision avoidance manoeuvres based on resolution advisories provided by ACAS equipment, as will best avert collision.

Regardless of the type of flight or the class of airspace in which the aircraft is operating, vigilance for the purpose of detecting potential collisions shall be exercised on board an aircraft. This equally applies while operating on the movement area of an aerodrome.

...

d. Surface movement of aircraft, persons and vehicles.

...

2. At a controlled aerodrome an aircraft taxiing on the manoeuvring area shall stop and hold at all runway-holding positions unless an explicit clearance to enter or cross the runway has been issued by the aerodrome control tower.

3. An aircraft taxiing on the manoeuvring area shall stop and hold at all lighted stop bars and may proceed further in accordance with (2) when the lights are switched off.

..."

1.18 Additional Information

1.18.1 Tower controller interview

In the interview, the involved Tower controller stated that on the day of the Incident, the controller had an afternoon shift starting from 13:00 until 22:00 local time. The controller woke up around 10:00, having about 7 to 8 sleeping hours. The Incident day was the fourth day of the controller's six-day working cycle which had two morning shifts, then two afternoon shifts, and two night shifts as last. This means that the Incident occurred on the second day of the controller's afternoon shifts.

During the first hour of the controller's duty on the day, the controller served as Ground controller. The controller was then plugged in as the Departure (Tower) controller for runway 30R. In this Incident, the controller's first transmission was when providing a lineup clearance to SVA561 (at 1650:53). The controller then provided crossing north runway clearance to two other aircraft (with the callsigns FDB338 and DHX263, respectively). Afterward, the Tower controller granted SVA561 a take-off clearance, followed by issuing conditional clearance to NJE316K to cross the runway.

The controller stated that the airfield lighting worked properly including the stop bar lights on holding point Mike 2. The stop bar lights could be manually turned off whenever required, which changed the red (activation) to off. Once deselected (turned off), the stop bar is programmed to automatically re-activate (turn ON) after a 60-second interval, causing the stop bar lights back to red.

The Tower controller had managed the crossing of two aircraft on runway 30R before handling the NJE316K crossing. The controller deactivated the stop bar on Mike 2 before the first aircraft (FDB338) reached the holding point. The controller was aware of the second one (DHX263) as it approached the holding point, with the stop bar lights remaining off until they automatically turned red just as DHX263 crossed the holding point. After a few seconds, the controller deactivated the stop bar. As explained, the controller typically switches the stop bar



off if there is no traffic behind it. The controller would either let the 60-second run out or reactivate it, if necessary before the timer ends. This is a common operational practice for managing multiple aircraft crossing a runway simultaneously, as stated by the controller.

The controller had four screens in front for managing the Tower control tasks. One of these screens displayed the airfield map, which included the entire lighting system, including the stop bar control panel. The controller could control each individual stop bar by selecting the setting from this screen, which also included the approach monitoring display. Another screen of the four was the ground movement radar (GMR) display.

The controller explained the logic behind the aerodrome lighting: when all the red stop bars are illuminated, the green taxiway lights beyond the stop bar, including those leading onto the runway line-up, are off. In this situation, the green guidance taxi lights for crossing the runway are also off. When the stop bar is turned off, the green taxiway lights leading onto the runway beyond the stop bar, including those leading onto the runway line-up, and the green guidance taxi lights for crossing the runway will turn on.

The Tower controller stated that the NJE316K flight crew made the first contact with the controller while the Aircraft was taxiing on Lima 3 before reaching ITHP Lima 3 Alpha. The controller responded by providing a conditional clearance to taxi to holding point Mike 2, behind the rolling A330 aircraft (SVA561), and to cross runway 30R after it passed.

The conditional clearance allowed NJE316K to taxi to the edge of the Mike 2 holding point, where it was to wait for SVA561 aircraft to roll for takeoff before crossing. The Tower controller noted using the term “rolling” instead of “departing” to emphasize that SVA561 was in the take-off roll and nearly crossing in front of NJE316K. The controller believed that using “rolling” would enhance the NJE316K flight crew's situational awareness regarding another aircraft activity on the runway. In the controller's view, “rolling” indicated that the aircraft was either accelerating for takeoff or decelerating after landing. However, the controller acknowledged that the standard phraseology should use “departing” instead of “rolling”.

Regarding the takeoff of an aircraft on the runway and another aircraft on a holding point that would cross the runway, the Tower controller stated that the procedure involves issuing a conditional clearance and physically deactivating the stop bar for the aircraft on the holding point to cross the stop bar once traffic on the runway has passed.

The controller did not manually reactivate the stop bar on Mike 2 after providing the conditional clearance to NJE316K, as believed there was no threat after deactivating it and considering the 60-second interval. However, the controller was uncertain about the controller's rationale for this decision.

Based on the controller's watch on screen, the controller stated that the activation of the stop bar came back before NJE316K crossed the stop bar.

The controller issued a ‘runway (crossing) clearance’ instruction to NJE316K, using the term ‘behind’ both in the middle and at the end of the instruction. The controller was uncertain why the NJE316K flight crew might have misunderstood the clearance.

In terms of visibility, the Tower controller could see the threshold of runway 30R through the window from a specific angle.

1.18.2 NJE316K flight crew interviews

1.18.2.1 Commander

The Commander had a normal 7 to 8 hours of night sleep before the flight. He arrived at the EGKB about one hour before the flight NJE316K. The takeoff was at about 0930 local time, the same as UTC.



The flight to Dubai was a ferry flight and during this time the Copilot, who was close to finishing his training, underwent a line check conducted by the Commander. This was not the Commander's first flight to OMD. After landing, the Commander took over controls during the taxi-out.

As the Aircraft was taxiing around the corner at taxiway Lima 3 after turning right from taxiway Kilo, the Commander could see the red stop bar for a few seconds on Mike 2. The Commander noticed a wide-body aircraft in front of the Aircraft that was taxiing on the same route.

The Aircraft continued taxiing on taxiway Lima 3, and before reaching ITHP Lima 3 Alpha, the flight crew switched communication from Ground to Tower control. After their initial contact with the Tower, the controller issued a clearance to cross the runway, stating "... behind the rolling A330, crossing runway 30R, behind", as per the Commander's statement. The crew noted this clearance from the Tower.

The Commander stated that the airfield's bright lights made it difficult for him to identify the type of aircraft ahead. He thought the conditional aircraft in front of him was the A330, based on the clearance provided by the Tower. However, he was actually confused with the taxiing Boeing B767 (flight DHX263), as he realized thereafter. He stated that he found the phrase "...behind rolling..." to be ambiguous and nonstandard and it would have been clearer if the term "...behind departing..." had been used. Additionally, he was unaware that an aircraft (A330, flight SVA561) was on the runway and had not heard that an aircraft was cleared for takeoff from runway 30R.

According to the Commander, after the aircraft in front (B767) crossed the runway, the stop bar on Mike 2 was still (green) until the N316K Aircraft reached it. He did not see the stop bar activate (turn red). Given this and his understanding of the conditional clearance given to taxi behind the aircraft in front and to cross the runway, he did not stop the Aircraft and continued taxiing, and past the stop bar.

After passing the stop bar, the Commander noticed some changes in the lights ahead but he was uncertain which ones had changed. However, he recalled that there were still green lights ahead and around the corner. Before reaching the runway, the taxiway green lights were illuminated ahead. He stated that when the Aircraft just entered the runway, the taxiway lights turned off until the Aircraft vacated the runway. While crossing the runway, he received a call from the Tower urging him to expedite the crossing and then heard another aircraft (A330) say, "I think there's an aircraft on the runway." During the crossing, he was unaware and he did not see an aircraft taking off to his right. He also realized that the aircraft in front of him was not A330, as he noticed the DHL logo on it.

After crossing the runway, and while taxiing on the taxiway November 2, the taxiway lights were illuminating, continuing toward taxiway November. A different controller, the controller supervisor, instructed N316K to hold position when taxiing on taxiway November. The controller then informed the flight crew that they infringed on runway crossing. The Commander responded by pointing out that there was no red stop bars and the flight crew saw green lights in front of them. They were following a taxiing aircraft in front of them after receiving clearance to cross the runway. He also noted that they did not see the A330 aircraft.

1.18.2.2 Copilot

The Copilot stated that he had a typical 7-hour night's sleep before the flight on January 29, 2024, from EGKB to OMD. The last flight he carried out was on 4 January 2024. He arrived at the airport at about 0800, and the takeoff of N316K was at about 0930. This flight was a line check and marked his first flight to OMD as a copilot.

The crew executed a standard vectored approach onto the ILS for runway 30 left. The Copilot handled the landing as the pilot flying, and the Tower controller instructed the



crew to vacate the runway to the left. The Commander took over controls at a lower speed before vacating the runway. The Aircraft vacated the runway via taxiway Kilo 9, continued along taxiway Kilo, and then turned right onto taxiway Lima 3. While taxiing on Lima 3, the crew were instructed to contact Tower.

The Copilot recalled that during the first Tower transmission, they received a conditional clearance to cross the runway, stating "...behind the rolling Airbus A330 cross runway 30 right behind," which he then read back. The Copilot noted that the terms "departing" or "depart" were not used in this transmission; instead, the phrase "rolling", which is non-standard, was used. Since the crew saw an aircraft rolling in front of them and had been cleared to cross behind it, they assumed that the taxiing aircraft was the A330, prompting them to follow it and cross the runway.

The Copilot stated that he did not recall seeing the stop bar activated at any point while taxiing on taxiways Lima 3 and Mike 2. He remembered following the green taxiway lights.

Before crossing the runway, he was unaware of any aircraft on it because the Tower did not provide any information after they switched from Ground to Tower frequency. Additionally, according to the Copilot, the airfield was filled with bright lights, and their lower seat positions in the smaller jet made the nearby lights more dazzling, which partially obscured their view of objects further away.

When crossing the runway, the Copilot heard the Tower controller instruct another aircraft to stop, leading him to believe that the take-off clearance for that aircraft had been canceled. The Tower controller then directed NJE316K flight crew to expedite the runway crossing, which the Copilot read back. By the time the Tower controller instructed to expedite the crossing, the Aircraft was crossing nearly at the edge of the runway.

As the Aircraft was taxiing out on taxiway November, another Tower controller, who was the supervisor of the original controller, instructed them to hold position. The Copilot believed that this new controller had taken over the Tower station. The controller then inquired if the crew were aware of the situation that had just occurred. The Commander took over the communication from the Copilot and elaborated the event to the Tower.

1.18.3 SVA561 flight crew interviews

The statements obtained from the interviews with both flight crewmembers of SVA561 were nearly identical. SVA561 received clearance for takeoff when it lined up on runway 30R. The commander was the PM and the copilot acted as the PF.

After SVA561 received take-off clearance and began its roll, the commander did not see any traffic ahead nor hear any clearance issued by the Tower to other aircraft. The bright lights surrounding the runway made it difficult for both crewmembers to identify any traffic planning to cross. Furthermore, the commander did not notice the Tower's transmission instructing SVA561 to stop immediately.

The copilot of SVA561 stated that during rotation, he saw a light moving onto the runway some distance ahead, referring to the lights of NJE316K Aircraft. The commander also stated that he observed traffic crossing the runway after SVA561 lifted off. The SVA561 commander then asked the Tower for confirmation about any traffic on the runway, and the controller confirmed its presence.

1.18.4 Acceptable means of compliance (AMC) for conditional clearances

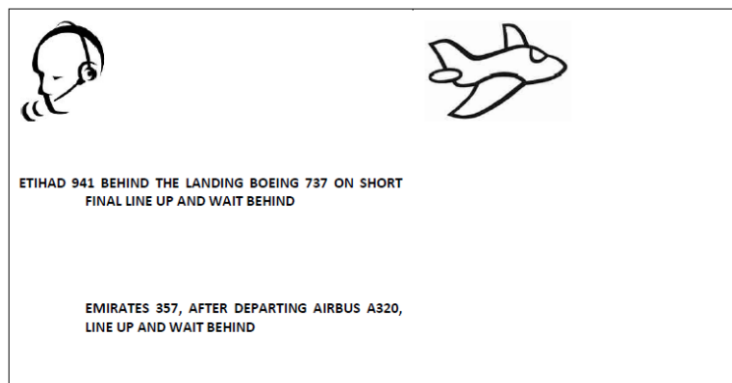
The *acceptable means of compliance (AMC) 69 – UAE Radiotelephony Standards*, issued by the GCAA, provides guidance on radiotelephony standards used in the United Arab Emirates for conditional clearance, as follows:

"2.12 Conditional Clearances

2.12.1 Conditional phrases, such as “BEHIND LANDING AIRCRAFT”, or “AFTER DEPARTING AIRCRAFT” shall not be used for movements affecting the active runway(s), except when the aircraft or vehicles concerned are seen by the controller and the pilot. The aircraft or vehicle causing the condition in the clearance shall be the first aircraft/vehicle to pass in front of the other aircraft concerned. Conditional clearances shall not be given to vehicles

2.12.2 In all cases a conditional clearance will be given in the following order and consist of:

- i. identification; (callsign)
- ii. the condition;
- iii. the clearance;
- iv. brief reiteration of the condition;



NOTE 1: These require the aircraft receiving the conditional clearance to identify the aircraft or vehicle causing the conditional clearance. Reference to the aircraft causing the condition may be insufficient and it may be necessary to be more specific, such as adding a description of the colour or the company name to ensure correct identification.

NOTE 2: Caution is required to avoid confusion when more than one similar aircraft or company are present.”

1.18.5 ICAO Document 4444 for conditional clearances

ICAO Doc 4444, *Procedures for Air Navigation Services – Air Traffic Management*, sub-section 12.2.7, provides guidance on radiotelephony standards for conditional clearances, as follows:

“12.2.7 Conditional phrases, such as “behind landing aircraft” or “after departing aircraft”, shall not be used for movements affecting the active runway(s), except when the aircraft or vehicles concerned are seen by the appropriate controller and pilot. The aircraft or vehicle causing the condition in the clearance issued shall be the first aircraft/vehicle to pass in front of the other aircraft concerned. In all cases a conditional clearance shall be given in the following order and consist of:

- a) identification;
- b) the condition;
- c) the clearance; and
- d) brief reiteration of the condition,

for example:

“SAS 941, BEHIND DC9 ON SHORT FINAL, LINE UP BEHIND”.

Note.— This implies the need for the aircraft receiving the conditional clearance to identify the aircraft or vehicle causing the conditional clearance.



1.19 Useful or Effective Investigation Techniques

This Investigation was conducted in accordance with the *Air Accident and Incident Investigation Regulation* of the United Arab Emirates, and the AAIS-approved policies and procedures, and in conformity with the Standards and Recommended Practices of *Annex 13 to the Chicago Convention*.

2. Analysis

2.1 General

The investigation collected data from multiple sources to determine the causes and contributing factors of the Incident.

This analysis examines the aerodrome's environmental conditions, relevant procedures and operations, flight crew performance, and air traffic control.

This part of the Report discusses how these aspects contributed to the Incident. Additionally, the analysis addresses safety issues that, while not directly contributed to the Incident, are important for overall safety concerns.

2.2 Managing the Stop Bar on the Route of Two Aircraft Ahead of NJE316K

After landing and vacating the runway, as NJE316K was taxiing on taxiway Kilo, the Tower controller deactivated the stop bar on Mike 2 to manage two other aircraft crossing the north runway. One of the two aircraft was FDB338, which was taxiing on taxiway Lima 3 before crossing intermediate taxi-holding position (ITHP) Lima 3 Alpha, and the other was DHX263, taxiing behind FDB338 on taxiway Lima 3 while crossing ITHP Lima 3 Bravo. Both aircraft were ahead of NJE316K and were instructed to cross runway 30R, as their taxi routes necessitated crossing the runway.

After the 60-second interval of the deactivation, the stop bar was automatically switched back to activation mode. At that moment, DHX263 had just crossed the stop bar and continued taxiing to cross the runway, while FDB338 was on November 2 after crossing the runway. In this situation, only the Commander of NJE316K observed the stop bar's activation.

Three seconds later, the stop bar was manually deactivated, initiating a new 60-second timer cycle. Meanwhile, DHX263 was still taxiing on Mike 2, approaching the edge of the runway, while guidance taxi lights were illuminating green toward the runway.

At that time, NJE316K was taxiing on taxiway Lima 3 while crossing ITHP Lima 3 Bravo. The controller deactivated the stop bar to ensure it was not active before DHX263 crossed runway 30R. The taxiing guidance lights for crossing on the runway would be switched off when the stop bar is activated. As stated by the Tower controller, the two actions in the airfield lighting control and monitoring system (AFLCMS) by deselecting the stop bar the first time before FDB338 passed the stop bar and the second time after DHX263 had passed, are common practices needed to manage multiple aircraft crossing simultaneously. After the stop bar was deactivated, DHX263 crossed the runway with the guidance taxi lights illuminating green for crossing.

2.3 Lack of Departing Traffic Awareness

While taxiing and approaching ITHP Lima 3 Alpha, the NJE316K flight crew contacted the Tower control about 10 seconds after correctly following the Ground controller's instruction to switch to the Tower frequency. During that time, the Tower controller issued a take-off clearance to SVA561 while it was lined up at the threshold of runway 30R. The SVA561 flight crew promptly read back the clearance correctly.

About three seconds after the SVA561 flight crew read back the clearance, the NJE316K flight crew contacted the Tower control. Both NJE316K flight crewmembers stated that they were unaware of the SVA561's departure from the same runway because they did not hear the take-off clearance issued to SVA561. This indicates that the NJE316K flight crew had not yet switched their communication to the Tower frequency when the controller cleared SVA561 for takeoff and received the readback from SVA562. As a result, the NJE316K flight

crew had a degraded situational awareness of the traffic on the airfield. Such situations are typical at airfields where multiple frequencies are in operation.

When the conditional clearance was issued to NJE316K, SVA561 commenced its take-off roll just slightly in front of threshold runway 30R, about 3,110 meters away from NJE316K's position. The situation occurred at night under visual meteorological conditions (VMC), with bright lights surrounding the aerodrome. Although the NJE316K flight crew could see some objects at the threshold of runway 30R, the surrounding bright lights likely made it difficult for them to distinguish the SVA561 aircraft lining up and just starting the takeoff roll on runway 30R from the surrounding background lights.

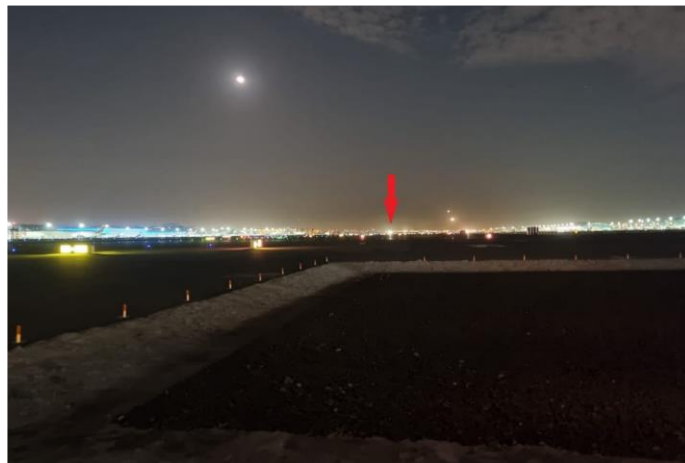


Figure 15. Picture captured from ITHP Lima 3 Alpha (NJE316K position) shows a red arrow pointing to an aircraft lining up for departure on runway 30R
[source: dans]

The Investigation believes that as NJE316K continued taxiing on taxiways Lima 3 and Mike 2, crossing the stop bar on Mike 2 and approaching the runway edge, the NJE316K flight crew assumed the runway was clear of traffic. Their assumption was based on the unnoticed take-off clearance issued to SVA561, their reliance on the conditional clearance for crossing the runway issued to them, and the conditional traffic being the aircraft that was taxiing ahead of them. Hence, the NJE316K flight crew might not have looked to their right side to verify no traffic on the runway. Should they have done it, they might have noticed a movement of lights, which could have triggered their awareness of an activity's presence on the runway.

Due to the CVR of the aircraft being overwritten and the Commander being in control of the Aircraft during the Incident, the investigation could not determine whether the Copilot's line check contributed to the incident.

2.4 Conditional Clearance

After the NJE316K flight crew contacted the Tower controller, the controller provided a conditional clearance for crossing the runway stating, "... taxi holding point mike two, behind the rolling three thirty [A330] cross runway three zero right [30R] behind [the A330]." This flight crew read back the conditional clearance identical to the controller's instruction.

As stated by the Tower controller, the controller was expecting that using the term "rolling" would have enhanced the NJE316K flight crew's situational awareness of an aircraft



taking off on the runway (expectation bias¹²). The “three thirty” sub-term in the instruction statement referred to the SVA561 A330 in the take-off roll.

In the controller’s mindset, NJE316K should have remained at the Mike 2 holding point until the crew saw the SVA561 pass in front of them. By using the non-standard phrase “rolling” instead of “departing”, the controller diminished the first defense barrier to prevent the runway incursion, while the stop bar should have served as the second barrier, provided it was activated in a timely manner. The Tower controller acknowledged that the correct standard phrase should have been “departing”, as outlined in the air navigation service provider’s *manual of air traffic services (DMATS)*, and the guidance information contained in the *acceptable means of compliance (AMC) 69 – UAE Radiotelephony Standards*.

The Tower controller could see SVA561 (A330 aircraft) lining up at the threshold of runway 30R and expected the NJE316K flight crew to identify the A330 as the conditional aircraft. However, using the term “rolling”, made the NJE316K flight crew assume that the aircraft in front of them was the A330. No confirmation was made by either the controller or NJE316K flight crew to ensure that the A330 aircraft was correctly identified as the intended conditional aircraft by both parties.

2.5 Managing the Stop Bar for NJE316K and Flight Crew Interpretation

The controller did not manually turn on (activate) the stop bar on Mike 2 after providing the conditional clearance to NJE316K because the controller expected that there was no threat after deactivating the stop bar. The controller was also aware that the 60-second interval would have elapsed before NJE316K reached the stop bar, which would naturally prevent the crew from proceeding with the crossing.

After DHX263 crossed and vacated the runway, the stop bar remained off with a remaining timer of 48 seconds. At this time, NJE316K was taxiing on taxiway Lima 3, about 11 seconds after crossing ITHP Lima 3 Bravo.

About seven seconds later, the Tower controller cleared SVA561 for takeoff, and a few seconds later, the NJE316K flight crew reported that they were holding at ITHP Lima 3 Alpha. The Tower controller then issued the conditional clearance to cross runway 30R. At the end of this clearance statement, about 20 seconds remained before the automatic reactivation of the stop bar. In this situation, the Tower controller should have manually activated the stop bar since NJE316K was next to cross runway 30R, and it would take more than 21 seconds to reach the stop bar given the distance and taxi speed. When the conditional clearance was issued, NJE316K’s taxi speed was 10 knots. The NJE316K flight crew subsequently accelerated their speed upon noticing the off-condition of the stop bars on Mike 2 and interpreted the given clearance as authorization to cross the runway. Increasing taxi speed upon receiving clearance to cross a runway is standard procedure for operators, as evidenced by both of the preceding aircraft (FDB338 and DHX263) following the same practice.

Right after the NJE316K flight crew correctly read back the conditional clearance, the Tower controller instructed the DHX263 flight crew to contact Ground control. At that time, NJE316K was crossing taxiway Mike and was heading towards taxiway Mike 2. Nine seconds later, the RIMCAS alert triggered, about one second after NJE316K passed the holding point at Mike 2. The Tower controller, managing the movements of four aircraft simultaneously, likely overlooked the NJE316K’s movement, assuming the 60-second interval for automatic stop bar reactivation would initiate before NJE316K reached the stop bar.

On the other hand, the flight crew of NJE316K stated that they did not notice the stop bar activation while crossing it. They interpreted the conditional clearance as a directive to

¹² Expectation bias: A psychological concept associated with perception and decision making that can allow a mistaken assessment to persist.” (Bhattacharjee 2001). [Source: Skybrary]



follow the “rolling” aircraft ahead of them, DHX263, which was taxiing after crossing the runway. This indicated that the Tower controller’s use of nonstandard phraseology made the NJE316K flight crew to believe that DHX263 was the A330 aircraft, resulting in reduced situational awareness of traffic movement on the runway.

If the Tower controller had used the term “departing” instead of “rolling”, the NJE316K flight crew might have recognized the A330 as the aircraft taking off and would have halted their crossing, as also stated by both flight crew. The bright lights around the aerodrome distracted the flight crew, making it difficult for them to identify that the A330 mentioned in the conditional clearance was not the aircraft taxiing ahead of them. The unnoticed stop bar activation reinforced their confirmation that they could proceed.

According to the Commander’s statement, after passing the holding point Mike 2, he observed ahead that the guidance lights for crossing the runway were switched off. The green taxiway lights leading onto the runway beyond the stop bar were off since the stop bars were activated, as per the design. Therefore, the Investigation believes that the Commander observed ahead both, the taxiway lights leading onto the runway beyond the stop bar and the guidance lights for crossing the runway, were off.

However, he did not seek confirmation from the controller, even though it would have been appropriate in that situation. Instead, the flight crew proceeded to cross the runway. The Investigation believes that the Commander was influenced by confirmation bias¹³, believing they had already received clearance to cross the runway and assuming there were no issues. If the Commander had asked for confirmation of these off-lights after the holding point and before crossing the runway, the Tower controller might have alerted them about the departing aircraft on the runway, potentially preventing the runway incursion.

According to DMATS procedures for issuing conditional clearance, an aircraft is not permitted to cross activated stop bars, and stop bars will be turned off once the relevant traffic on the runway has passed. When the controller ended issuing the conditional clearance to NJE316K, the stop bar lights were off and would have taken 20 seconds remaining before automatically reactivating. At the same time, SVA561 had just started its take-off roll and had not yet crossed in front of NJE316K. If the controller activated the stop bar after issuing the conditional clearance, the Commander, as stated, would have stopped the Aircraft before reaching the activated stop bar, potentially preventing the runway incursion.

The Incident occurred during the Tower controller last working hour of a normal 9-hour duty on that day, after a one-hour break. However, based on the available voice data and analysis of the conversation and tone of the Tower controller's recorded voice prior to recognizing the runway incursion, there was no evidence that the controller was experiencing any difficulties or signs of fatigue. Furthermore, the controller was well-rested and fit for duty that day.

2.6 Crossing the Active Stop Bar and Runway Incursion

According to ATC recordings, the stop bar automatically reactivated as the 60-second countdown expired (figures 8.a, 8.b, and 8.c). NJE316K Aircraft was about one second away from the Mike 2 holding point, though it is likely that the actual time may have been less than one second due to system update delays and radar refresh rates. Furthermore, considering the cockpit position and 20 knots taxi speed, it is probable that the front of the Aircraft had already passed the stop bar, which was now behind the crew resulting in the crew’s peripheral view being inadequate to recognize the stop bar reactivation.

¹³ Confirmation Bias: Expectation bias can intertwine with confirmation bias, leading pilots to focus on information that confirms their expectations while ignoring contradictory evidence.



When NJE316K crossed the holding point on Mike 2, SVA561 was on take-off roll with an indicated airspeed of 117 knots. The distance between those two aircraft was 2,260 meters.

The runway incursion monitoring and collision avoidance system (RIMCAS) activated about one second after NJE316K crossed the holding point on Mike 2, with a distance of about 2,205 meters between the two aircraft. The Tower controller quickly recognized the runway incursion and immediately instructed the SVA561 flight crew to stop the takeoff. At that moment, SVA561's indicated airspeed was 132 knots. Despite the urgent instruction, the SVA561 flight crew did not respond, and both crewmembers later stated that they could not recall hearing the controller's instructions.

The Investigation believes that the SVA561 crew were focused on the critical phase of flight and the high speed the aircraft had attained. At the time of the Tower's instruction to stop, the Aircraft was at about 132 knots indicated air speed, just five seconds away from starting the rotation at about 145 knots.

Since there was no response from the SVA561 crew, the controller immediately instructed the NJE316K crew to expedite its runway crossing. At this time, SVA561 started its rotation with an indicated airspeed of 149 knots, and NJE316K was already on the runway.

About one second later, NJE316K crossed the runway centerline while SVA561 was still in its rotation, with a separation of 1,630 meters between the two aircraft. SVA561 lifted off when both aircraft were on the runway, about 1,330 meters apart, just as NJE316K vacated the runway. Simultaneously, an audible transmission was heard on the Tower frequency saying "expediting", but no specific call sign was mentioned. This transmission actually came from NJE316K.

After the SVA561 lifted off, about 100 feet above ground level, the SVA561 flight crew inquired with the Tower if there was any traffic crossing the runway, and the controller confirmed that there was.

After the Incident, the Tower duty supervisor assumed the role of the Tower controller. The supervisor later inquired with the NJE316K flight crew if they were aware that they had crossed active runway 30R without clearance. The crew replied that the stop bar light was green when they reached the holding point and had already received clearance to cross the runway behind the aircraft taxiing ahead of them. They also expressed confusion due to the absence of the red stop bar light, leading them to believe they were cleared to proceed crossing the runway. This further indicates to the Investigation that the flight crew did not notice the activation of the stop bar before or during their crossing.

3. Conclusions

3.1 General

From the evidence available, the following findings, causes, and contributing factors were made with respect to this Incident. These shall not be read as apportioning blame or liability to any particular organization 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 Incident. The findings are significant steps in this Serious Incident sequence but they are not always causal or indicate deficiencies.
- **Causes.** Are actions, omissions, events, conditions, or a combination thereof, which led to this Incident.
- **Contributing factors.** Are actions, omissions, events, conditions, or a combination thereof, which, if eliminated, avoided, or absent, would have reduced the probability of the Serious Incident occurring, or mitigated the severity of the consequences of the Serious Incident. The identification of contributing factors does not imply the assignment of fault or the determination of administrative, civil, or criminal liability.

3.2 Findings

3.2.1 Findings relevant to the Aircraft

- (a) The NJE316K Aircraft was certificated, equipped, and maintained in accordance with the requirements of the European Union I Aviation Safety Agency.
- (b) No defects or technical anomalies were reported for the Aircraft systems and equipment before or during the flight, or after landing.

3.2.2 Findings relevant to the flight crewmembers of NJE316K

- (a) Both NJE316K flight crewmembers possessed the necessary licenses and ratings issued in accordance with the requirements of the Civil Aviation Authority of the Netherlands, and they were fit for the flight.
- (b) The Commander was the pilot monitoring (PM), and the Copilot was the pilot flying (PF). After landing, the Commander took over controls at a lower speed before vacating the runway. When the Incident occurred, the Commander was in control of the Aircraft.
- (c) Both flight crewmembers were unable to accurately identify the type of aircraft taxiing ahead of them due to the bright lights around the aerodrome impairing their visibility.
- (d) The crew believed that the aircraft in front of them was the A330 referenced in the conditional runway crossing clearance, when in fact that aircraft was to their right, taking off from runway 30R.

3.2.3 Findings relevant to Air Traffic Control

- (a) The Tower controller possessed the necessary licenses and ratings to assume the role of the Tower controller, in accordance with the requirements of the *Civil Aviation Regulations* of the United Arab Emirates.



- (b) The Tower controller was well-rested and fit for duty on the day of the Incident.

3.2.4 Findings relevant to operations

- (a) NJE316K was not yet on the Tower frequency when the Tower controller cleared SVA561 for takeoff from runway 30R, resulting in the NJE316K flight crew being unaware of SVA561 departure.
- (b) The Tower controller used a non-standard phraseology, using the term “behind the rolling” instead of “behind the departing” when issuing the conditional clearance to NJE316K for crossing the runway.
- (c) The Tower controller did not activate the stop bar at taxiway Mike 2 after issuing the conditional clearance to NJE316K, as there was no requirement to do so.
- (d) The use of the term “rolling” in the conditional clearance led both NJE316K flight crewmembers to believe that the aircraft ahead was the A330 as the conditional aircraft, and the bright light conditions further distracted them, making it difficult to accurately identify the aircraft type taxiing in front.
- (e) The minimum ground separation between SVA561 and NJE316K, while both were on the runway, was about 1,330 meters.
- (f) Following the Incident, a new controller quickly took over the Tower control position, as per the standard procedures.

3.3 Causes

The Air Accident Investigation Sector determines that the causes of the runway incursion Serious Incident were:

- (a) The Tower controller’s use of a non-standard phraseology in the conditional clearance issued to NJE316K flight crew for crossing the runway, led to the NJE316K flight crew incorrectly identifying the A330 taxiing ahead as the conditional aircraft.
- (b) The NJE316K flight crew did not seek clarification from the Tower controller despite being uncertain about the taxiway lights being off beyond the stop bars and the guidance lights for crossing the runway.

3.4 Contributing Factors

The Air Accident Investigation Sector identifies the following contributing factors to the Serious Incident:

- (a) NJE316K was not yet on the Tower frequency when the Tower controller issued take-off clearance to SVA561 for runway 30R, resulting in the NJE316K flight crew being unaware of SVA561 departure.
- (b) The improper handling of the stop bars at Mike 2 led to their activation nearly simultaneously with the NJE316K crossing, preventing the flight crew from noticing the stop bars activation as they passed.

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 Part 3 of this Report; the Air Accident Investigation Sector expects that all safety issues identified by the Investigation are addressed by the concerned organizations.

4.2 Safety Actions Taken

4.2.1 Dubai Air Navigation Services

Dubai Air Navigation Services (dans) undertook the following corrective safety measures following the Incident and in response to its internal safety investigation into the Incident:

- (a) Issuing a *temporary instruction (TI) ATC-DXT-TI-008-2024 – Conditional Crossing Clearance Temporarily Suspended-Departure Runway*. After that, this *TI* was replaced by *supplementary instruction ATC-DXT-SI-016-2024 – DMATS Part 3 Update - Conditional Crossing Clearances on the Departure Runway*.

The updated procedures included rewording the existing procedures to remove ambiguity, clarifying procedures concerning “traffic in sight,” and selecting holding point stop bars. The procedures were reworded as follows:

“- The order and content of a conditional clearance shall be:

- Identification
- Condition
- Clearance
- Reiteration of the condition

For example:

“Emirates 462 behind the landing (Pakistan) A320 on short final, line up and wait behind.”

“Emirates 462 behind the departing (Pakistan) A320, cross runway 12R behind”

- An ATCO shall obtain a report of “traffic in sight” if there is any doubt as to whether the aircraft issued the conditional clearance has the ‘subject aircraft’ in sight. (For example, when the ‘subject aircraft’ is only just commencing its take-off roll.)
- When issuing a conditional clearance, ATCOs shall consider the distance between the aircraft issued the clearance and the ‘subject aircraft’, visibility and if daytime/nighttime conditions.
- ATCOs shall ensure that any previously deselected stop bar is re-illuminated in front of the aircraft issued the conditional clearance. ATCOs shall not wait until the stop bar has ‘timed out’.
- ATCOs shall only deselect the stop bar once the ‘subject traffic’ stated in the conditional clearance has passed.”

- (b) Consider implementing software updates to automatically activate the stop bar lights whenever an aircraft or vehicle crosses the stop bar. However, this consideration is still ongoing and not yet decided.
- (c) In collaboration with training and standards and guided by the Aerodrome and Air Navigation (ANA) in the General Civil Aviation Authority (GCAA), the

involved controller completed remedial training before returning to active duty. Before the training, a comprehensive training needs analysis (TNA) had been conducted and addressed by the appropriate departments.

4.2.2 NetJets

Following the Incident, NetJets undertook a safety action by issuing a Safety Notice titled “Safety Focus – Runway Incursions” to all NetJets pilots in February 2024, which reinforced the importance of seeking clarity from ATC whenever doubts persist or when non-standard phraseology is used.

4.3 Safety Recommendations

4.3.1 Dubai Air Navigation Services

SR19/2024

The Tower controller used a non-standard phraseology when issuing a conditional clearance for crossing the runway, which was inconsistent with the established procedures, impacting the flight crew's situational awareness of traffic movement on the runway.

Even though dans took the necessary safety actions, the Air Accident Investigation Sector recommends that dans reinforce among its air traffic controllers to apply correct standard phraseology incorporating aspects that raise awareness of how specific phraseology may affect pilot situational awareness.

SR20/2024

The Tower controller did not activate the relevant stop bar after issuing NJE316K conditional clearance to cross the runway, as the procedures were not established. Moreover, the Tower controller commonly practiced and handled multiple closely spaced aircraft crossing simultaneously within a single 60-second stop bar deactivation interval, a practice not outlined in standard procedures.

Even though dans revised the procedures including the selection of holding point stop bars, the Air Accident Investigation Sector recommends that dans reinforce among its air traffic controllers to follow the revised standard procedures.

SR21/2024

As the consideration taken by Dubai Tower operations to implement the available new software update, the Air Accident Investigation Sector recommends that dans study the potential for enhancing the current system's functionality to allow stop bars to automatically activate as required based on its revised standard operating procedures.

SR22/2024

The Incident occurred at night in visual meteorological conditions (VMC) with intense bright lights surrounding the aerodrome impairing the flight crew's visibility. To ensure air traffic controllers are well-acquainted with the actual night-time conditions on the airfield, including hotspot areas, it is recommended that dans integrate this familiarization into their training programs.



4.3.2 NetJets, Transportes Aereos S.A

SR23/2024

Before entering the runway for crossing, the Commander noticed that the taxiway lights beyond the stop bars and the crossing runway guidance lights were turned off until the Aircraft vacated the runway. However, the NJE316K flight crew did not seek confirmation from the Tower control. Had they sought confirmation, the probability of runway incursion would have been reduced.

Although NetJets took the necessary safety actions by issuing a Safety Notice, the Air Accident Investigation Sector recommends that NetJets assess the effectiveness of the measures to ensure that the safety efforts are both efficient and effective.



Appendix 1. Transcript of Air Traffic Control Recordings

Time	Comm/Freq	Agency	Transcript
16:52:20	118.750	AIRN (Air North – Dubai Tower Control)	Diamond Two Six Three after crossing runway right November hold November Echo
16:52:25	118.750	DHX263	... crossing right November hold November Echo Diamond Two Six Three
16:52:46	118.750	AIRN	flydubai Three Three Eight contact Ground One Two One decimal Six Five bye bye
16:52:49	118.750	FDB338	Contact One Two One decimal Six Five, flydubai Three Three Eight
16:53:11	118.350	GMC1 (Ground Movement Controller 1 – Dubai Ground Control)	Fraction Three One Six Kilo contact tower One One Eight Seven Five
16:53:16	118.350	NJE316K	... Seven Five Fraction eh Three One Six Kilo
16:53:19	118.750	AIRN	... Five Six One Wind Two Five Zero Four knots runway Three Zero Right clear for takeoff
16:53:23	118.750	SVA561	Clear for takeoff runway Three Zero Right Saudia Five Six One
16:53:28	118.750	NJE316K	Fraction Three One Six Kilo holding Lima Three Alpha
16:53:31	118.750	AIRN	Fraction Three One Six Kilo Dubai Ground sorry Tower, hello, taxi holding point Mike Two, behind the rolling Three Thirty cross runway Three Zero Right behind
16:53:42	118.750	NJE316K	Taxi Mike Two behind the rolling Three Thirty cross runway Three Zero right behind, Fraction Three One Six Kilo
16:53:45	118.750	AIRN	Diamond Two Six Three contact Ground One Two One decimal Six Five bye bye
16:53:48	118.750	DHX263	... decimal Six ... Diamond Two Six Three bye
16:54:03	118.750	AIRN	Saudi Five Six One stop immediately I say again stop immediately acknowledge
16:54:08	118.750	AIRN	Fraction Three One Six Kilo expedite cross, expedite cross
16:54:14	118.750	Unidentified	Expediting
16:54:18	118.750	SVA561	Tower, the ehhh Five Six One confirm there was traffic crossing the runway?
16:54:22	118.750	AIRN	Affirm, there was traffic infringing the runway
16:55:16	118.750	AIRN	... Three One Six Kilo hold your position
16:55:19	118.750	NJE316K	Hold position Three One Six Kilo
16:55:40	118.750	AIRN	Fraction Three One Six Kilo you were aware you crossed the runway without a clearance
16:55:44	118.750	NJE316K	eh Fraction uh, Three One Six Kilo as far as we could see we had the greens in front of us we were uh, cleared to cross Three, the runway, behind the aircraft taxiing in front of us uh, we did not see a 330 so uh, I think there was a bit of confusion there was no red stop bars we had green lights in front of us to cross the runway
16:56:05	118.750	AIRN	Copied, we will check from our side sir, I am just taking over the position and advised that there was a traffic rolling



16:56:11	118.750	NJE316K	Yeah we understand now, but eh I think the whole clearance was a bit confusing, eh so that is the when I've seen the problem
16:56:18	118.750	AIRN	Thanks Three One Six Kilo ... the problem, we will check from our side, we will file a report either way, thank you
16:56:25	118.750	NJE316K	Tower, thank you very much
16:56:27	118.750	AIRN	Fraction Three One Six Kilo hold your position, you contact Ground One Two One decimal Six Five
16:56:31	118.750	NJE316K	One Two One ... Six Five

Appendix 2. OMDB Aerodrome Chart

