



AIR, MARITIME AND RAILWAY ACCIDENT  
INVESTIGATION NATIONAL BOARD  
9, Dyakon Ignattii Street, 1000 Sofia, Bulgaria

# Safety Investigation Report

**Ref.:**  
**AAI-2022-01**

**Issue date:**

**April 24, 2023**

**Status:**  
**FINAL**



**SERIOUS INCIDENT, OCCURRED ON FEBRUARY 21, 2022 AT SOFIA AIRPORT, BULGARIA, INVOLVING FALCON 2000EX AIRCRAFT, REGISTRATION MARKS CS-DFG, OPERATED BY „NETJETS EUROPE“.**

## **Purpose of Report and Responsibility Level**

Under Annex 13 of the Chicago Civil Aviation Convention, Regulation 996/20.10.2010 of the European Parliament and the Council on the investigation and prevention of accidents and events in Civil Aviation, the Civil Aviation Act and Ordinance No. 13/27.01.1999 of MT (last amendment and addition - 22.01.2016), the investigation of an aviation event aims at identifying the reasons that led to the event to eliminate and exclude these in future **without identifying someone's guilt or liability**.

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## List of abbreviations

AO	- Airline Operator;
AMRAINB	- Aircraft, Maritime and Railway Accident Investigation National Board;
A-SMGCS	- Advanced Surface Movement Guidance and Control System;
ARP	- Aerodrome reference point;
ATCO	- Air traffic controller;
ATCL	- Air traffic controller Licensing;
ATIS	- Automatic terminal information service;
ATPL (A)	- Airline Transport Pilot Licence;
BULATSA	- Bulgarian Air Traffic Services Authority;
BKN	- Cloud amount - broken (5-7 oktas);
CAA	- Civil Aviation Authority;
DG CAA	- Directorate General Civil Aviation Authority;
EASA	- European Aviation Safety Agency;
ENZV	- Stavanger/Sola Airport
FDR	- Flight Data Recorder;
FEW	- Cloud amount - few (1-2 oktas);
FH	- Flight Hour;
FMS	- Flight Management System;
FL	- Flight level;
ft	- Foot;
METAR	- Meteorological Terminal Air Report;
NOSIG	- No Significant Change;
NJE550Q	- Aircraft FALCON 2000EX with registration CS-DFG;
ICAO	- International Civil Aviation Organization;
KT	- Knots;
RAAS	- Runway Awareness Advisory System
RWY	- Runway;
LBSF	- Sofia Airport
MAG	- Magnetic course
MSN	- Manufacturer Serial Number;
MTITC	- Ministry of transport, information technology and communications;
NOTAM	- Notice to airmen (съобщение за екипажите);
p.	- page;
QNH	- Altimeter sub-scale setting to obtain elevation when on the ground;
PIC	- Pilot in command;

RWY	- Runway;
SCT	- Cloud amount - scattered (3-4 oktas);
SRIS	- Safety Recommendations Information System;
TDZ	- Touchdown zone;
TEMPO	- Temporary or temporarily;
TWY	- Taxiway;
UTC	- Universal Coordinated Time;
VC	- Vicinity of the aerodrome;
VHF	- Very high frequency;
VRB	- Variable.

## 1. Introduction

**Date and time of the aviation event:** February 21, 2022, 13:12 h UTC.

All times in the Report are given in UTC.

**Notified:** Air, Maritime and Railway Accidents Investigation National Board (AMRAINB), Directorate General "Civil Aviation Administration" (DG CAA) of the Republic of Bulgaria, the European Commission, the European Aviation Safety Agency (EASA), The International Civil Aviation Organization (ICAO), the National Bureau of Aviation Occurrences Investigation (BEA) of the Republic of France and the Office for the Prevention and Investigation of Accidents in Civil Aviation and Rail (SIA/NIB PT).

On the grounds of the provisions of Article 9, Para1 of Ordinance No 13 dated 27.01.1999 on Investigation of Aviation Accidents the occurrence was classified as a serious incident by the AMRAINB. The materials on the aviation occurrence have been filed in case No 01/21.02.2022 in Aviation Transport Unit archives at AMRAINB.

In accordance with the provisions of Article 5, para 1 of Regulation (EU) No. 996/2010 on the investigation and prevention of accidents and incidents in civil aviation, Article 142. Para. 2 of the Civil Aviation Act of the Republic of Bulgaria, dated 01.12.1972, and Article 10, para. 1 of Ordinance No. 13 of the Ministry of Transport, dated 27.01.1999, on the Investigation of Aviation Occurrences, and on the grounds of the provisions of Article 6, para 1, point 8 of the Rules of procedure on the activity, structure and organization of the AMRAINB by Order No. RD-08-05, dated 14.03.2022 of the Chairperson of the Management Board, a Commission is appointed for investigation of the serious incident.

The investigation was conducted by the Commission of the AMRAINB with the support of the aviation operator Net Jets Europe, the airport operator "SOF Connect" JSC and BULATSA.

### Summary:

On February 21, 2022, the Falcon 2000EX aircraft, registration marks CS-DFG, operated by NetJets Europe performing flight NJE550Q from LBSF Sofia (Bulgaria) to ENZV (SVG)-Stavanger/Sola. The flight crew was cleared for line up and take-off from Runway 09. Instead of that, pilots began take-off roll from Taxiway 'H', which is parallel to Runway 09. Then ATCO of Sofia TWR cancelled take-off clearance. At 40kts, the Runway Awareness Advisory System (RAAS) triggered the aural advisory message 'On Taxiway, On Taxiway'. The aircraft reduced rolling speed and stopped before the intersection of TWY "C". After coordination with the flight crew, Sofia Tower ATCO issues instructions for a reverse turn and taxiing on TWY "H", line-up and take-off from RWY09.

Based on the analysis performed, the Commission points out that the serious incident resulted from the following **cause**:

The failure of the flight crew to positively identify that they were on the correct surface for take-off

### Contributing factor:

- Ineffective crew coordination during the short taxi time from the parking stand to the line up of Runway 09, consisting in the lack of detailed briefing before taxiing and take-off by the PIC, lack of control by the co-pilot of the aircraft's movement on the aerodrome's manoeuvring area and erroneous change of the VHF radio frequency by the flight crew resulted in the inability to hear the ATCO's repeated warnings.

- Presence of an unusually taxiway "H" with dimensions larger than those of a normal taxiway parallel to runway (former Sofia Airport runway), located adjacent to and upstream of runway09;

- An early Issuance of the line up and take off clearance by the ATCO Tower to the flight crew before crossing Taxiway "H".

## 2. Factual information

The commission received information about the realization of an aviation occurrence from written explanations from the flight crew, witnesses of the event, data from the AO Net Jets Europe, data and video recording from the A-SMGCS system at Sofia Airport from the BULATSA and video recording from airfield surveillance cameras, provided by company SOF Connect JSC.

### 2.1.1. Flight number and type, the last point of departure and time, and planned destination point

Flight Number: NJE550Q.

Type of flight: Non-Commercial Air Transport – Relocation-Ferry

Last point of departure: Sofia Airport (LBSF), Bulgaria.

Take-off time: planned at 13:11

Planned destination point: Stavanger/Sola ENZV (SVG).

### 2.1.2. Flight preparation and description of the flight

On February 21, 2022, the Falcon 2000EX aircraft, registration marks CS-DFG, operated by „ Net Jets Europe“ was at aircraft stand № 43 at Sofia airport and was preparing for carrying out the ferry flight from Sofia (LBSF) to Stavanger/Sola ENZV. On board were two pilots and one cabin crew. This was day 5 of a 6-day tour and the 3rd sector of the day.

In the previous days, the flight crew had operated flights to Jeddah (OEJN), Cairo (HECA) and Larnaca (LCLK) with passengers and accumulated delays resulting in reduced crew rest. Rest in hotels was in noisy conditions, long travel to and from airports, slow service and late arrival of passengers. Fatigue had already accumulated, despite the crew's claims that it had not affected their ability to work. There is almost an hour and a half layover in Sofia. Weather was very good and a relaxed departure from Sofia airport was expected.

At 13:04, the flight crew of NJE550Q establish radio communication with Sofia Tower ATCO requesting the respective clearances for start up and take-off.

At 13:04:26 the flight crew of NJE550Q requesting the respective clearances for start up and take-off. At this moment at Sofia Airport is used RWY27: *“Sofia ground, hello again, NJE550Q, with information V, G apron, request clearance and start up, destination Norway, please.*

Sofia Tower ATCO: *“Hello again NJE550Q, Sofia Tower, start up approved, information V, QNH 1007.”*

Flight crew of NJE550Q: *Start up approved, QNH1007, NJE550Q.*

Sofia Tower ATCO: *And NJE550Q, cleared to destination RWY27, OGOTA2T departure, FL240, squawk 4552.*

Flight crew of NJE550Q: *Cleared to destination OGOTA2T departure, FL240, squawk 4552, NJE550Q.*

Sofia Tower ATCO: *NJE550Q, readback correct.*

At 13:09:29, after engines started, the flight crew requested taxi clearance. Before the start of taxiing and after coordination with an Executive Controller of Sofia Approach, the Sofia Tower ATCO offers RWY09 for take-off to the flight crew of NJE550Q in order to reduce taxi time due to lack of traffic and light south-easterly winds.

Sofia Tower ATCO issued a correction of the departure route OGOTA 3S and an instruction for taxiing to the holding point at RWY09. The flight crew accept the proposal.

At 13:09:29 the flight crew of NJE550Q: *“Tower, NJE550Q, ready to taxi.”*

Sofia Tower ATCO: *“NJE550Q, right now RWY09 is also available for departure, surface wind is 120 degrees, 3 knots, for shorter taxi. Advice, which you prefer.”*

Flight crew of NJE550Q: *We take 09, NJE550Q.*

Sofia Tower ATCO: *“NJE550Q, taxi right, W, T, J, B, holding point RWY09 and the revision is OGOTA3S”.*

Flight crew of NJE550Q: *Revision OGOTA3S departure, and taxiing W, T, J and B, NJE550Q.*

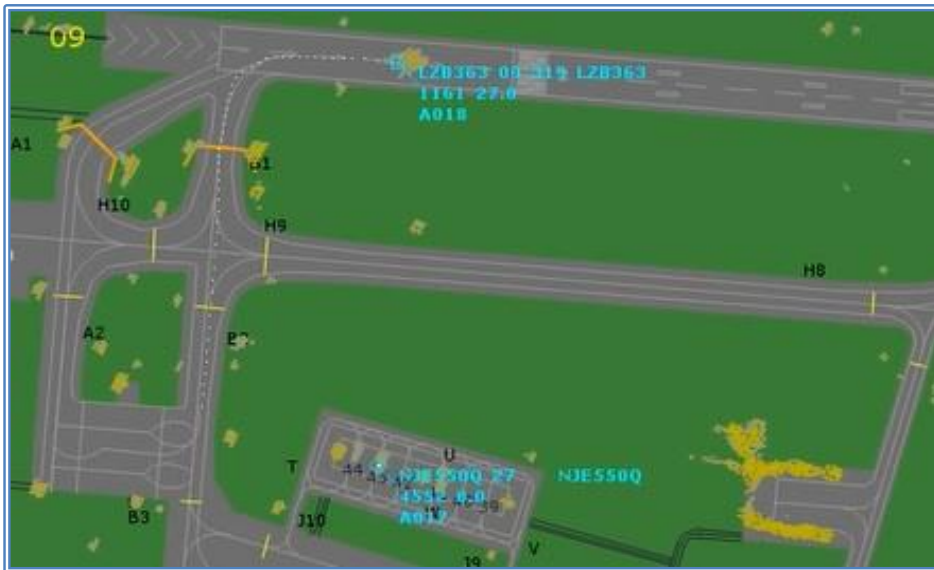


Fig. 1

The commander, as pilot-in-command, began taxiing in accordance with this instructions and the co-pilot started reprogramming the FMS without visually monitoring the movement of the aircraft. A short briefing by the PIC followed as the aircraft approached the holding point on Taxiway "B". The revised conditions are not significantly different from the initial conditions, the PIC does not stop the taxing for a thorough review the departure schemes and comparison of the data in the navigation displays entered into the computer by the co-pilot.



Fig. 2



At 13:11:28, Sofia Tower ATCO issued to the flight crew of NJE550Q an instruction for line up RWY09 and requested a report on the readiness for departure. The allowed FL 240 for climbing after departure has been specified.



Fig. 3

At 13:11:28, Sofia Tower ATCO: - „NJE550Q, line up RWY 09, report ready for departure.“

At 13:11:33, Flight crew of NJE550Q: - „, We are ready, NJE550Q. Is the FL240 still valid for us?“

At 13:11:38, Sofia Tower ATCO: - „, NJE550Q, affirm, FL240. “

At 13:11:41, Flight crew of NJE550Q: - “FL240, copied.“

At 13:11:56, Sofia Tower ATCO issues a clearance for take-off from RWY09 to the flight crew of NJE550Q. At this moment aircraft, NJE550Q taxis on TWY "B" and crosses the center line of TWY "H" towards holding point RWY09 at "B". (Fig. 4)



Fig. 4

At 13:11:56 Sofia Tower ATCO: ” NJE550Q, surface wind is 090 degrees, 4 knots, RWY09, cleared for take off. When airborne, contact Sofia Approach 123.7. Have a nice flight. “

At 13:12:06, Flight crew of NJE550Q: „, 123.7, have a good day, NJE550Q, cleared take off.“

At 13:12:21, Sofia Tower ATCO registered the execution of a right turn on TWY "H" and informed the flight crew of NJE550Q accordingly, while issuing instructions for continuing taxiing on TWY

"B" and coming out for line up RWY09. Instead of that, the commander suddenly executed a sharp turn to the right towards the axis of PR "B" and without stopping the aircraft set the engines to rolling take-off. (Fig. 5)

Meanwhile, the co-pilot of NJE550Q had switched the VHF to the Sofia Approach frequency prior to the subsequent initiation of the take-off run and the last instructions of the Sofia Tower ATCO were not confirmed and accepted by the crew.

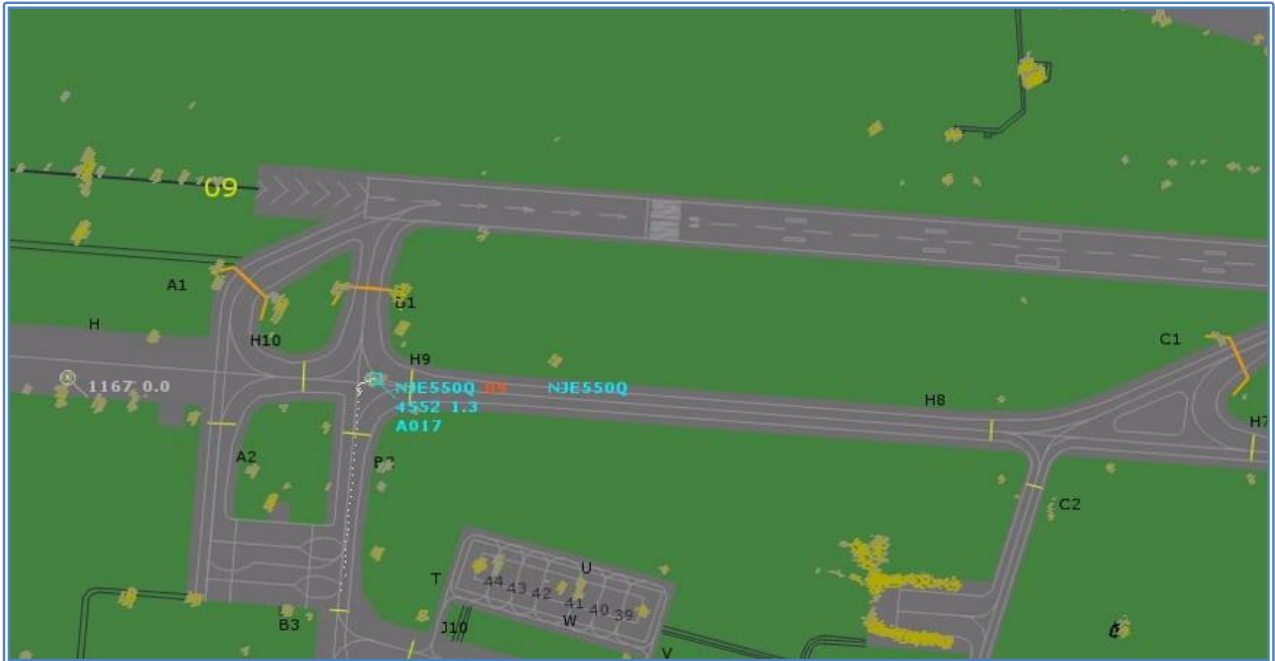


Fig. 5

At 13:12:21 Sofia Tower ATCO: “NJE550Q, this is TWY H, continue via B, line up RWY09.”  
No response from the flight crew of NJE550Q

At 13:12:32 Sofia Tower ATCO: “NJE550Q, do you copy?”  
No response from the flight crew of NJE550Q

At 13:12:29, the take-off roll was initiated and at 13:12:34 an advisory ‘On Taxiway, On Taxiway’ was triggered by the RAAS. The crew reacted promptly to the advisory and rejected the take-off. Brakes applied very gently, and throttles brought to idle, since the crew felt that there was no reason to brake abruptly. Fig. 6



Fig. 6



Fig. 7

At 13:12:49 Sofia Tower ATCO: “NJE550Q, you are taxiing on TWY H, this is not the RWY.”  
No response from the crew of NJE550Q

At 13:13:00, the flight crew of NJE550Q reduce their speed and switch to the frequency of Sofia Tower again, in order to coordinate with Sofia Tower ATCO the taxi route to RWY09. Fig. 7

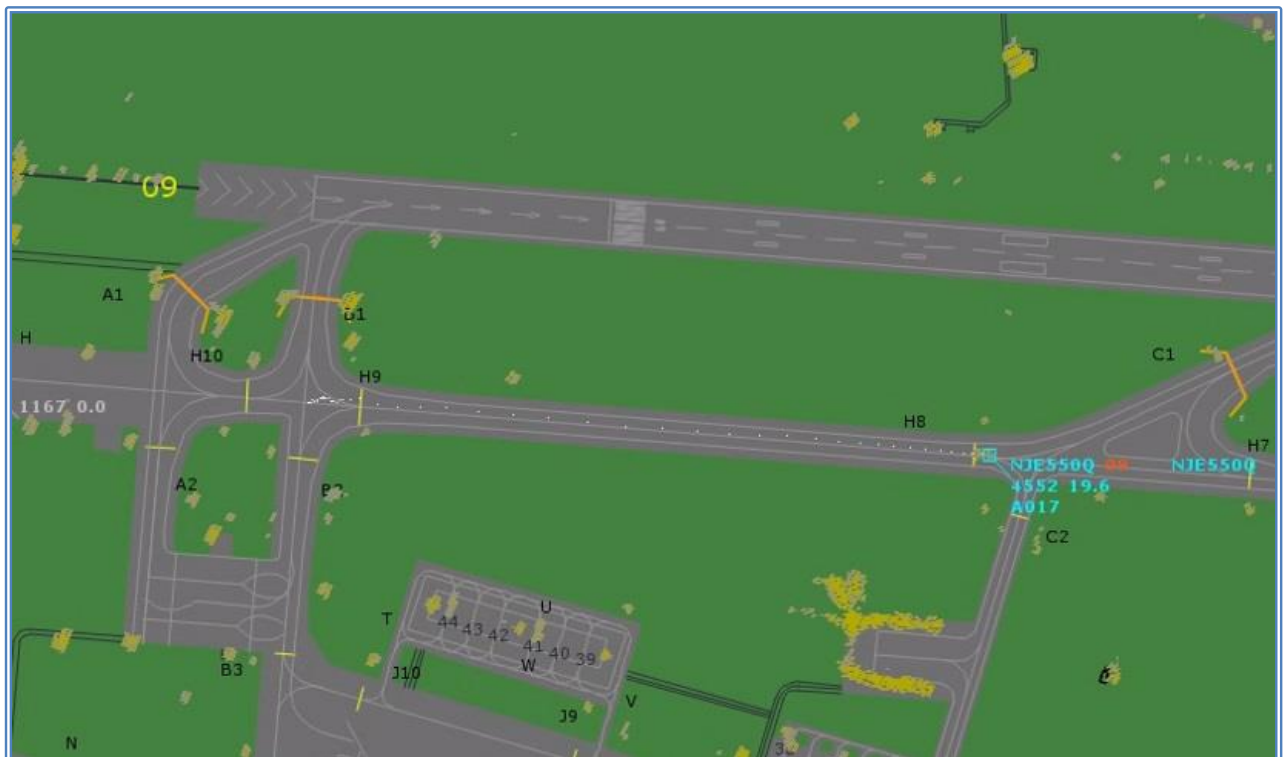


Fig. 8

At 13:13:00, flight crew of NJE550Q: “Tower, NJE550Q, I think we made a little mistake.”  
At 13:13:03 Sofia Tower ATCO: “NJE550Q, affirm, will you make one eighty or do you prefer via C to taxi again?”

At 13:13:11 Flight crew of NJE550Q: “One eighty, NJE550Q.”

At 13:13:14 Sofia Tower ATCO: “Roger, make one eighty on your current position and taxi back H, B, holding point RWY09.”

At 13:13:20 Flight crew of NJE550Q: “One eighty and holding point RWY09, NJE550Q.”

Subsequently, upon approaching the holding point RWY09, Sofia Tower ATCO issues a take-off clearance for aircraft NJE550Q.

At 13:15:06 Sofia Tower ATCO: “NJE550Q, just to inform you, the aborted take off will be noted.”

Flight crew of NJE550Q: “Thank you that is copied, so we are ready now.”

Sofia Tower ATCO: “NJE550Q, line up and cleared for take off RWY09, surface wind 110 degrees, 3 knots. When airborne contact Sofia Approach 123.7. Nice flight.”

Flight crew of NJE550Q: 123.7, airborne, NJE550Q.

The aircraft NJE550Q takes-off from RWY09 at 13:16.

The aircraft subsequently continued to its destination points.

### 2.1.3. Location of aviation occurrence

Location: Sofia Airport (LBSF) Bulgaria;  
 Date and time: February 21 2022, 13:12 UTC;  
 Lighting conditions: Daylight;  
 The control point is with coordinate's 42°41'42"N 023°24'30"E.

## 2.2. Injuries to persons

<i>Injuries</i>	<i>Crew</i>	<i>Passengers</i>	<i>Total in the aircraft</i>	<i>Others</i>
<i>Fatal</i>	0	0	0	0
<i>Serious</i>	0	0	0	0
<i>Minor</i>	0	0	0	0
<i>None</i>	3	0	3	<i>Not applicable</i>
<i>Total</i>	3	0	3	0

### 2.3. Damage to aircraft

No damages to the aircraft.

### 2.4. Other damages

No other damages.

## 2.5. Personnel information

### 2.5.1. Flight crew

#### 2.5.1.1 Commander

Man: 52 years old  
 License: ATPL (A);  
 Issued by Belgian CAA on May 26, 2003  
 Valid until January 31, 2022.  
 Qualifications: CAPTAIN FALCON 2000EX.  
 Medical Validity: Class 1 CPL; ATPL (A), valid to April 15, 2022.

Medical restrictions:	None.
Proficiency in English:	Level 6.
Flight experience:	
Total Flying Hours FALCON 2000 EX:	4093:55 FH.
Information on the working hours and rest:	
For the last 24 hours:	06:50 FH;
For the last 90 days:	200:50 FH.

The Commission assumes that the captain possess the required qualification and medical fitness for flights in accordance with existing regulations and that there is no breach of the rules on working time and pre-flight rest periods.

### 2.5.1.2 Co-pilot

Man	56 years old
License:	ATPL(A); Issued by France CAA on January 24, 2007 Valid until June 30, 2022
Qualifications:	FALCON 2000 EX Easy IR/PBN.
Medical Validity:	Class 1, CPL; ATPL(A) valid to October 18, 2022
Medical restrictions:	None.
Proficiency in English:	Level 6.
Flight experience:	
Total Flying Hours FALCON 2000 EX:	863:20 FH.
Information on the working hours and rest:	
For the last 24 hours:	6:50 FH;
For the last 90 days:	126:40 FH

The Commission assumes that the co-pilot possess the required qualification and medical fitness for flights in accordance with existing regulations and that there is no breach of the rules on working time and pre-flight rest periods.

### 2.5.1.3 Cabin crew

Woman	40 years old
License:	Cabin Crew Issued by CAA – Portugal on November 19, 2018
Medical Validity:	Valid until September 11, 2023
Medical restrictions:	None.
Proficiency in English:	Level 6

## 2.5.2. Air traffic control personnel

### 2.5.2.1 Sofia Tower ATCO:

Man	32 years old
ATCL BGR.ATCL:	Certificate ATCL
Rating :	Permissions LBSF ADI/TWR valid until Mach 30, 2023
ENGLISH:	LEVEL4 valid until August 25, 2023
Medical Certification:	valid until November 18 2022
<b>Check:</b>	<b>Check</b> of Competence of ATCO on working position in Sofia Tower on February 8, 2021.

The Commission assumes that the Sofia Tower ATCO possess the required qualification and medical fitness for flights in accordance with existing regulations and that there is no breach of the rules on working time and pre-flight rest periods.

## 2.6. Aircraft Information

Aircraft type: FALCON 2000EX,

Serial number: 0044

The Dassault Falcon 2000 is a business jet produced by French Dassault Aviation,

Produced - more than 310 aircrafts

First flight 4 March 1993

Dassault Falcon 2000EX - the aircraft variant was certified in 2003 with two Pratt & Whitney PW308C turbofan jet engines - Canadian manufacture.

Falcon 2000EX Easy - the commercial designation of the 2000EX has modified avionics, pressurization and oxygen system, certified in 2004.

General characteristics of Falcon 2000EX:

Crew: 2

Capacity: from 8 to 19

Overall length: 20,228 m

Overall height: 7,047 m

Wingspan: 19,328 m

Wing Reference surface area: 49,00 m<sup>2</sup>

Wing sweep at 25 % of wing length: 29°/24°50

Diameter of fuselage: 2,5 m

Passenger cabin length: 7,976 m

Range: to 6999 km

Maximum speed: Mach 0.85-0.862

Rate of climb: 17,4 m/s

Service ceiling: 14 300 m

Max take-off weight (MTOW): 19 142 kg

Max Certificated landing weight (MLW): 17826 kg

Empty weight): 9 435 kg

Power plant: 2 × Pratt & Whitney Canada PW308C turbofan engines.

### 2.6.1. Airworthiness Information

French Dassault Aviation manufactured the FALCON 2000EX aircraft, serial No. 0044.

The aircraft is owned by NetJets Europe, Sociadate Unipessoal, Lda.

The aircraft is registered with registration marks CS-DFG and is entered in the Register of Civil Aircraft of the Republic of Portugal by Portuguese CAA on May 9, 201 under No. 2537/23. The aircraft was issued an Airworthiness Certificate under No PT-0011 on November 11, 2008. The aircraft has a certified Airworthiness Review Certificate do CAA PT-DFG-322/20 on April 14, 2021 with validity on May 4, 2022.

The operator of the aircraft holds an Air Operator's Certificate PT-01/02 with date of issue ON February 24, 2021.

### 2.6.2. Information on the fuel used and its condition

The aircraft was refuelled with JET A1 fuel at Sofia Airport before the flight. The fuel had no influence on the realisation of the event.

### 2.6.3. Equipment

The aircraft is equipped with Runway Awareness and Advisory System (RAAS)

Overview: The Runway Awareness and Advisory System (RAAS) is one of a number of related software enhancements available on later-model Enhanced Ground Proximity Warning Systems.

RAAS is designed to improve flight crew situational awareness, thereby reducing the risks of runway incursion, runway confusion and runway excursions.



F2000EX EASY	<b>ATA 34_11 NAVIGATION (EASY II)</b> <b>RAAS (OPTION)</b>	02-34_11-00
CODDE 1		PAGE 1 / 22
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<b>GENERAL</b>		
<b><u>INTRODUCTION</u></b>		
<p>The Runway Awareness and Advisory System (RAAS) is an optional software enhancement hosted in the EGPWM unit.</p> <p>In order to lower the probability of runway incursion events, the RAAS improves the situational awareness in providing the flight crew with timely aural advisory messages during taxi, take-off and landing rolls, and short final approach.</p>		

02-34_11-00	<b>ATA 34_11 NAVIGATINO (EASY II)</b> <b>RAAS (OPTION)</b>	F2000EX EASY
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<b><u>RAAS FUNCTIONS</u></b>		
<p>The RAAS provides aural advisories to the flight crew in a significant number of scenarios that are known to have led to runway incursion incidents and accidents.</p> <p>These aural advisories are grouped into two categories:</p> <ul style="list-style-type: none"> <li>- Routine advisories,</li> <li>- Non-routine advisories.</li> </ul>		
<b>Routine Advisories</b>		
<p>Routine advisories are voice messages that the flight crew will hear during routine operations. They are intended to enhance the flight crew's awareness of the position of the airplane.</p> <p>There are five routine advisories:</p> <ul style="list-style-type: none"> <li>- Approaching runway in flight,</li> <li>- Approaching runway on ground,</li> <li>- On runway,</li> <li>- Distance remaining,</li> <li>- Runway end.</li> </ul> <p>The first three routine advisories ("approaching runway in flight", "approaching runway on ground" and "on runway") will be heard by the crew in normal operations, providing increased position awareness relative to the runway during taxi and flight operations. They are intended to reduce the risk of a runway incursion.</p> <p>The remaining two routine advisories ("distance remaining" and "runway end") provide information about the airplane location along the runway, and are intended to reduce the risk of overruns.</p>		

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The "extended holding on runway" advisory is suppressed after a RTO is detected according to the "distance remaining rejected take-off" advisory (described further). The "extended holding on runway" advisory is reset when the airplane leaves the runway.

■ **Taxiway Take-off**

This advisory voice message ("ON TAXIWAY!, ON TAXIWAY!") enhances crew awareness of excessive taxi speeds or an inadvertent take-off on a taxiway. It is enabled when the following conditions are met:

- Ground speed of the airplane is greater than 40 knots and,
- Airplane is on a surface other than a runway.

**NOTE**

The RAAS functions are based on a database of runway locations. The system does not have knowledge of the location of taxiways.

"On Taxiway!  
On Taxiway!"

FIGURE 02-34\_11-00-11 - "TAXIWAY TAKEOFF" ADVISORY MESSAGE

DASSAULT AVIATION Proprietary Data

**2.7. Meteorological information**

**2.7.1. Weather conditions at Sofia Airport**

Early in the morning on August 5, 2020, the Mediterranean Depression was observed over the Adriatic Sea, along which moist and warm air was transported over the southern part of the Croatian coast and Albania, and active convective processes developed there. Bulgaria remains outside the scope of this circulation, but there is a well-defined eastern transfer, especially in the western part of the country, as the wind is oriented from east / southeast and with a speed of about 10 knots.

**2.7.2. Aviation routine weather report METAR at Sofia Airport**

Interval of issuance from 10:00 to 14:00 UTC on February 21 2022

*LBSF 211000Z VRB02KT 9999 FEW061 11/04 Q1012 NOSIG=*

*LBSF 211030Z 35004KT 290V050 9999 FEW058 12/04 Q1011 NOSIG=*



LBSF 211300Z 29004KT 9999 FEW064 SCT080 15/05 Q1007 NOSIG=  
LBSF 211100Z VRB03KT 9999 BKN063 12/04 Q1010 NOSIG=  
LBSF 211130Z VRB03KT 9999 FEW061 SCT070 13/04 Q1009 NOSIG=  
LBSF 211200Z VRB02KT 9999 SCT074 14/04 Q1008 NOSIG=  
LBSF 211230Z VRB02KT 9999 FEW065 BKN076 15/04 Q1008 NOSIG=  
LBSF 211330Z VRB03KT 9999 FEW066 16/04 Q1007 NOSIG=  
LBSF 211400Z VRB03KT 9999 SCT079 16/03 Q1007 NOSIG=

### 2.7.3. ATIS emission

Information „V“

- ATIS Report at 1300Z;
- ILS „Z“ approach;
- Runway in use 27
- Flock of birds in the VC of the RWY, ALT unknown.
- Transition Level 140
- APPRON TWY J is closed between TWY J1 and TWY J2.
- TDZ 280/4 kt
- 10 km
- FEW 6400 ft, SCT 8000 ft
- Temperature 16°
- Dewpoint 5, QNH 1007 hPa
- TREND NOSIG

The meteorological conditions at the time of the realization of the occurrence did not affect the serious incident.

### 2.8. Navigation systems

The aircraft performed the flights with the standard navigation equipment for the aircraft type FALCON 2000EX.

There are no reported technical failures of the navigation equipment of the aircraft.

There is no information about technical failures of the navigation system of the Bulgarian Air Traffic Services Authority (BULATSA), which could cause the occurrence.

All facilities included in the national net for course navigation operated normally.

In the daily briefing statement of the ACC Sofia, no technical failures were recorded, which might directly affect the operational ability at the time of the occurrence.

### 2.9. Communication systems

The aircraft performed the flights with the standard communication equipment for the types of aircraft.

The air-ground radio communication in the FS Tower, the Approach and the aircraft serviced was carried out at the frequency of 118,100 MHz and 123.7 MHz in English.

After hearing the radio conversations at the operating frequencies of FS Tower and Approach, the Investigation Commission found that there had been no loss of radio communication and that there were no interruptions and disturbances during the radio broadcasting with not a single aircraft in the sector.

### 2.10. Aerodrome information

Aerodrome Location Indicator and Name – LBSF/SOFIA;

ARP coordinates and site at aerodrome - N42°41'42" E023°24'30", RWY centre;

Elevation - 1742 ft (531m);

Designations / RWY 09/27 - MAG 091°/271°;

Dimensions of RWY (m) - 3600 x 45 m;

Taxiway “H” was previously a runway. This change occurred in 2006, after the construction of the new runway at Sofia Airport. This taxiway is located immediately south of and parallel to the runway 09.

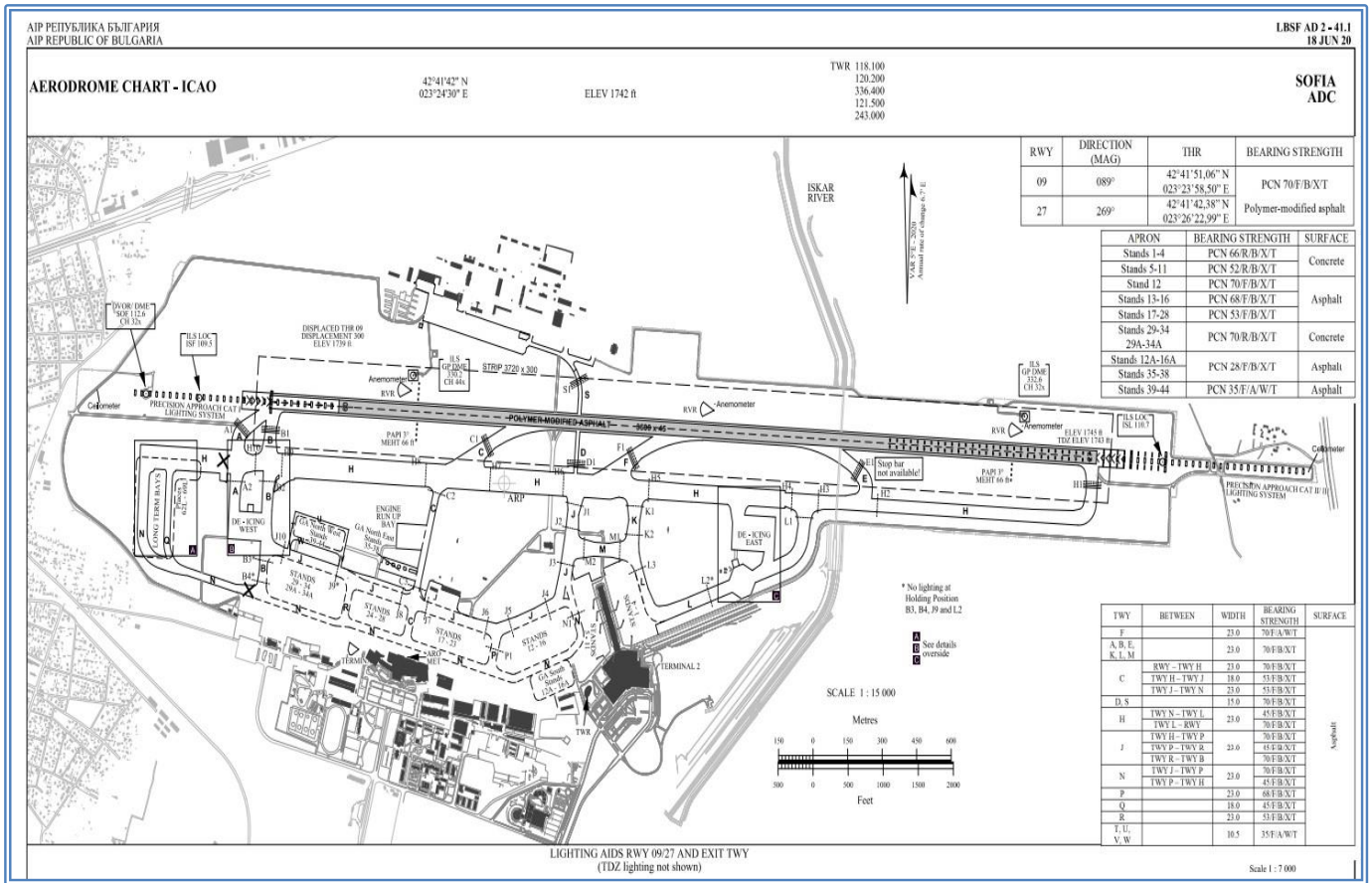


Fig. 9

2.10.1. Advanced Surface Movement Guidance and Control System



Fig. 10

SOFIA TOWER controls the movement of aircraft and vehicles on the manoeuvring area of the airport, maintaining two-way radio communication with all traffic participants.

The air traffic controllers of SOFIA TOWER shall use A-SMGCS as an assistant technical tool to visualise the location of aircraft and vehicles during procedural of airport traffic control during take-off, landing and on the manoeuvring area.

## 2.11. Flight recorders

For the analysis are used decoded data by Flight Data Systems provided by AO NetJets

At 13:06:56 – Engine start

At 13:09:52 - Taxi start

At 13:12:20 - Line up taxiway H

At 13:12:29 – Thrust Lever Angle set for Take-Off

At 13:12:33 – Indicated Air Speed = 40 knots

At 13:12:36 - Thrust Lever Angle reduction

At 13:12:38 – Indicated Air Speed = 75 knots

At 13:12:41 – Brakes applied

At 13:12:58 - Start 180° turn (Lowest groundspeed: 3.9knots)

At 13:13:26 - End 180° turn

At 13:15:49 - Line up on runway 09

At 13:16:12 – Take-off from runway 09



Figure 11 – Rejected take-off at taxiway H



Figure 12 – Take-off from runway 09

The data frame layout of the Falcon 2000 Easy QAR does not record any parameters from the Runway Awareness Advisory System; therefore, it is not possible to identify the exact time of the RAAS aural alert.

## 2.12. Information about the impact and the debris

The occurrence was not related to the aircraft destruction.

### 2.13. Medical and pathological information

Because of the nature of the aviation occurrence, medical and pathological research was not performed.

### 2.14. Fire

No fire arising.

### 2.15. Factors for Survival

The occurrence was not related to the need to carry out emergency rescue actions.

### 2.16. Tests and research

For the safety investigation, the following activities were carried out:

1. Collecting, summarising and analysing factual information about the aviation event at Sofia;
2. Discussions with witnesses of the event from BULATSA and Sofia Airport;
3. Requested and analyzed video and photo material from Sofia Airport during the movement of the aircraft on the taxiway;
4. Inspection of the condition of the horizontal and vertical markings on the aircraft's path from the parking area along the taxiways, take off roll and braking at the take-off abort in order to detect effective misleading information;
5. Listening of the recordings of the radio communication between the flight crew of NJE550Q and Sofia Tower ATCO provided by BULATSA;
6. Analysis of the crew's written explanations;
7. Analysis of NJE550Q flight crew documents - validity of licenses, checks, flight simulator training, medical certificates;
8. Analysis of NJE550Q flight crew flight time, time commitment and rest time information as specified in 2.5;
9. Analysis of operational and operational technical documentation requested and provided electronically by the operator NetJets Europe;
10. Analysis of the flight crew actions during the aviation event;
11. Analysis of the operational documentation, instructions and other instructions provided by DG CAA and BULATSA;
12. Analysis of the actions of the Sofia Tower ATCO during the aviation occurrence;
13. Analysis of the written explanations of Sofia Tower ATCO;
14. Analysis of the documents of Sofia Tower ATCO - validity of licenses, checks, simulator training, medical certificates;
15. Analysis of the information on the flight time, committed time and rest time of Sofia Tower ATCO, mentioned in point 2.5;
16. Analysis of the meteorological conditions in the Sofia Airport area and the condition of the runway at the time of the event;
17. Analysis of similar incidents with other aircraft at Sofia Airport over the last 10 years;
18. Analysis of the reports of the internal investigations of the event carried out by BULATSA, Sofia Airport and the aviation operator NetJets Europe;
19. Working meeting with representatives of DG CAA, BULATSA and Sofia Airport to identify short and long-term measures to avoid recurrence of similar events;
20. Logical-probabilistic analysis of possible causes for the realization of the occurrence.

The materials from the interviews and analyses have been attached to the case for investigation of the serious incident.

### 2.17. Information for organization and management.

”...“

#### 2.17.1. Issuance of takeoff clearance

ICAO Document 4444 *Procedures for air navigation service, Air Traffic Management*, states that the takeoff clearance shall be issued when the aeroplane is ready for takeoff and at or approaching the



departure runway, and the traffic situation permits. To reduce the risk for misunderstanding, the takeoff clearance shall include the designator of the departure runway.

...”

### **2.17.2. Air Traffic Service Manual**

The basic document defining the rules, procedures, instructions and information for the implementation of Air Traffic Service in the ACC Sofia is the "Air Traffic Service Manual of BULATSA":

Section V.

Air Traffic Control from SOFIA TOWER

Responsibilities of SOFIA TOWER ATCO

1.2.1. The SOFIA TOWER ATCO controller shall:

- (a) Apply the established separation standards in his area of responsibility;
- (b) Issue instructions and clearances to the aircraft;
- (c) Continuously listen to the operating frequency and communicate with the aircraft by radiotelephone;
- (d) Coordinate and, if necessary, propose adjustments to the planned landing and take-off sequence of the aircraft;
- (e) Coordinate with the EXE Approach a change to a departure clearance;
- (f) Determine the aircraft taxi sequence and inform the PIC of the take-off sequence for entry into SATCAS;
- (g) Notify the PLN SOFIA TOWER ATCO in the event of a potential or actual contingency or emergency;
- (h) Control the movement of aircraft and vehicles on the aerodrome manoeuvring area;
- (i) Coordinate snow clearing of the runway, taxiways and apron with the Operational Centre, informing the EXE Approach in a timely manner of the start, end and measured braking effect in order to reduce aircraft delay time in holding areas.

1.2.2. The controller of the SOFIA TOWER ATCO gives the start up clearance:

- (a) in the presence of a flight plan (FPL);
- (b) in accordance with the estimated time of departure (ETA), if one has been received;
- (c) depending on the air situation and the runway to be used.

1.2.3. The SOFIA TOWER ATCO shall transmit a departure clearance to the flight crew prior to the start of taxi or prior to launch if the pilot calls to request it in advance.

Note: The SOFIA TOWER ATCO shall include in the departure clearance: 'follow the SID altitude restriction', if requested by the APPROACH ATCO.

1.2.4. If necessary, the Coala controller shall assign a departure runway other than that broadcast on ATIS, in agreement with the Approach controller or at the request of the flight crew, in which case the Coala controller shall inform the pilot of the estimated time of departure (ETD).

1.2.5 When the runway to be assigned is different from a usable runway broadcast in ATIS, the SOFIA TOWER ATCO shall transmit a departure clearance to the flight crew no later than the clearance of the start up.

1.2.6. When the flight crew reports that it cannot execute the instructions of the departure clearance, the SOFIA TOWER ATCO shall coordinate with the EXE APPROACH another departure clearance, which it shall transmit to the flight crew.

1.2.7. When the aircraft is reported ready to taxi, flight crew shall clear the aircraft for taxi clearance, transmitting the taxi route and conditions to the flight crew.

### **2.17.3. Operational Manual of NetJets**

The Operations Manual of NetJets described, as part of the takeoff procedures, that before entering the departure runway, it should be verified that the runway and runway entry point are correct.

## 2.17.4. NetJets OM-A 8.3.24.7

### **8.3.24.7 CHANGE OF DEPARTURE RUNWAY OR CLEARANCE**

Pilots shall not accept a runway or departure change unless there is sufficient time to re-brief, set up / crosscheck the avionics, and recalculate performance prior to departure.

The aeroplane shall be stopped and parking brake set so these tasks can be performed with attention from both pilots and without hazard to the taxi activity. ATC should be advised of any delay expected.

If the Commander requests a change of take-off runway for safety reasons, the safety reason shall be declared to Air Traffic Control.

## 2.17.5. NetJets OM-A 8.3.25

### **8.3.25 LINE-UP**

Flight crew should not enter a runway for departure if not ready to take-off. ATC shall be advised without delay if additional time on the runway is required.

Prior to entering a runway, flight crew shall make a visual check of the runway threshold and final approach area, and be aware that accepting rapid exit taxiways or oblique or angled taxiways for line-up may limit the ability to check these areas.

Prior to lining up, the flight crew shall ensure that the cabin is secure.

For aeroplanes that are carrying cabin crew, line up is not authorised until the 'CABIN SECURE' call from the cabin crew has been received.

## 2.18. Additional information

### 2.18.1. Repeatability of this type of occurrence

In 2006, after the construction of the new runway at Sofia Airport, the previous one has been transformed into TWY "H" and it is located immediately south of and parallel to the runway. Presently, for the last 10 years, the following aviation occurrences have been registered at Sofia Airport, related to erroneous initiation of a turn by the flight crew when taxiing on TWY "B" to holding point RWY09 and respectively incorrect line up on TWY "H", as follows:

On 16.10.2012, the flight crew of AFR1587, taxiing on TWY "B" after clearance for line up and take-off RWY09, turn right on the parallel to RWY09 TWY "H" and start Repeatability of this type of occurrence a take-off run. The Sofia Tower ATCO reacts in due time and issues instructions to stop the take-off, which are executed by the flight crew of AFR1587.

On 06.02.2018, an aircraft of LOT632, taxiing on TWY "B" shortly before the intersection with TWY "H", after clearance for line up and take-off RWY09, reduces the speed of taxiing and starts a turn on TWY "H". Sofia Tower ATCO immediately issues an instruction to the LOT632 aircraft to stop on position.

On 05.02.2019, the flight crew of THY6UQ make a turn on TWY "H", instead to line up RWY09. Sofia Tower ATCO issues an instruction to the flight crew of THY6UQ to execute a 180-degree turn and line up RWY09.

On 13.02.2022, the flight crew of SWT771P, after clearance for line up RWY09, make a turn on TWY "H". Sofia Tower ATCO informs the flight crew of SWT771P about their location and issues instructions to come out on RWY09 via TWY "H".

On 21.02.2022, the flight crew of NJE550Q, during taxiing on TWY "B" to line up and respectively take-off from RWY09, make a turn to the right on TWY "H" and initiate take-off run, regardless of the timely response of Sofia Tower ATCO, who informs them of the wrong position and cancels the take-off clearance. Subsequently, the flight crew of NJE550Q stop the take-off after a warning from the RAAS on-board system, because they had meanwhile switched to the Sofia Approach frequency.

### 3. Analysis

The Safety Investigation Commission considered the following main hypotheses for possible causes leading to the serious accident:

Hypothesis One: Improperly positioned or misleading taxiway markings on the taxiways to line up of RWY09.

Hypothesis Two: Incorrect instructions issued by the ATCO - Tower to taxi, hold to the line up and aborted take-off. Lack of or ineffective control of aircraft movement on the aerodrome maneuvering area.

Hypothesis 3: Incorrect acceptance and execution of instructions by the flight crew of NJE550Q during taxi and take-off from RWY, pilot errors due to fatigue or follow the flight preparation procedure.

Regarding the first hypothesis:

Following the aviation occurrence, the Commission inspected the condition of the horizontal and vertical markings on the taxiways, the holding point and the line up of RWY 09 at Sofia Airport.

It should be noted that there was no non-compliance with the requirements of the regulatory documents - "Regulation 14 on airports and airport security", Article 316(1) and Regulation (EU) 139/2014, CS ADR-DSN.N785(b) (1).

According to the AIP of the Republic of Bulgaria the taxiway "H" is 23 meters wide, in reality the total width with the artificial surface around it is the size of an operational runway - 60 meters wide, straight throughout, adjacent to Runway 09, parallel to it. It is in fact the former Sofia Airport runway, transformed into a taxiway in 2006 after the new runway was built and in operation.

In fact, the horizontal and vertical markings are in good condition, fully compliant with ICAO Annex 14 and Regulation 14 of the Ministry of Transport and there is good visibility to them.

It should be noted that there are no additional indication markings on TWY 'B' before and after crossing TWY 'H', non-standard large ground markings on the pavement and visually reduced end stripes with distinctive colour on TWY 'H'.

Finally, it can be concluded that a parallel taxiway with dimensions of RWY introduces the risk of assuming the taxiway as the runway. This risk may be elevated if there are no non-standard ground

markings on the pavement on the taxiways to the line up of RWY 09 and visually reduced edge stripes with the distinctive colour of TWY "H"

Regarding the second hypothesis:

Regarding this hypothesis, the Commission analyzed the audio recordings of the radio communications between the Sofia Tower ATCO and the flight crew of NJE550Q, the video recordings of the aircraft movement on the maneuvering area of Sofia Airport, the documents of the pilots and the ATCO.

According to the flight plan, aircraft NJE550Q takes off Sofia (LBSF), Republic of Bulgaria, with destination Stavanger (ENZV), Kingdom of Norway. The aircraft is located at parking stand 43 on apron GA (General Aviation). NJE550Q's flight crew is monitoring for ATIS information "V" at Sofia Airport, and preparing for departure from Runway 27. At 13:04:26 h, NJE550Q's flight crew established radio communication with Sofia Tower ATCO requesting clearance for departure and engine start in accordance with the ATIS "V" broadcast. At the next moment, the ATCO Tower issued a clearance for start up and departure: *"Hello again NJE550Q, Sofia Tower, start up approved, information V, QNH 1007."NJE550Q, cleared to destination, RWY 27, OGOTA 2T departure, FL240, squawk 4552"*.

This is a standard communication and is in accordance with the requirements of ICAO Doc 4444, "BULATSA Air Traffic Services Manual".

Due to the lack of heavy traffic and in order to increase expeditiousness and reduced the effect of aircraft noise over the city of Sofia, after starting the engines and before the aircraft started taxiing, the ATCO Sofia Tower changed the initially issued clearances and proposes to the flight crew of NJE550Q to use RWY 09 for take-off. The flight crew accepted this offer and commenced taxiing. It should be noted that the change of the previously issued departure clearance by ATCO after the start of the engines of the aircraft awaiting taxi clearance has contributed to a distraction in the crew, a breach of the preliminary briefing and a change of SID, thereby increasing the risk of possible errors.

When taxiing on TWY "B", approaching the centerline of TWY "H", the flight crew reported to Sofia Tower ATCO that they are ready for take-off, and then received the appropriate clearance as well as an instruction to transfer communication after take-off. In principle, the departure clearance is issued when the aircraft is ready for take-off and is on or approaching the runway, and as the situation so permits. The Tower ATCO has complied with this rule.

Despite the information transmitted on the Sofia Tower frequency, the NJE550Q aircraft continued taxiing on the TWY "H"(eastbound) and initiated a take-off rolling.

ATCO Sofia Tower canceled departure clearance and re-transmits information that NJE550Q aircraft is on TWY "H". The flight crew did not respond to the issued instructions due to a radio frequency switch.

Between the time that a takeoff clearance is issued and the time the takeoff run actually takes place, circumstances may change and thus be different from originally thought. Therefore, especially when an early departure clearance has been issued, ATCO should continue to monitor the aircraft to ensure that it continues to taxi on the correct route. In the present case, the flight crew has switched the frequency of radio communication to the next sector.

Based on the operational situation and its expert judgment, the ATCO Tower did not assess the possible switching of the radio communication frequency as a risk for the fact that it had issued an instruction. However, the aircraft had not passed the beginning of taxiway "H" when the departure clearance was issued, so there was still a risk that the aircraft would taxi incorrectly. ATCO Tower transferred the communication before the transfer of control was performed. The transfer of control shall be carried out at the boundary of the area of responsibility.



In this case, one of the safety barrier did not work as the ability of Sofia Tower to ensure the safety of ATS was violated due to the switching from the TWR frequency to that of APPROACH Control, performed by the flight crew on TWY "H" before take-off, regardless of the timely actions taken by the ATCO.

Regarding the third hypothesis:

According to the information provided by the aviation operator "NetJets Europe", the explanations and the documents of the pilots, the Commission found that the two pilots flying NJE550Q were licensed, well trained and able to perform their duties.

For the take-off from LSBF to ENZV the flight crew had 1 hour and 20 minutes and (as the flight crew stated) they could finally relax and had enough time to prepare the flight and rest. There was no time pressure to take-off due to airport slots or following flights.

However, the time between the start of the taxi and the actual departure from Runway 09 was 10 min. and 22 sec. The fact is that, the flight crew accepted the proposed take-off RWY 09 by the ATCO "Sofia-Tower", different from the one broadcast in the ATIS and a change in the take-off clearance, respectively taxi instructions to the line up of the RWY 09. The commander, as the pilot in command, started the taxi, while the co-pilot focused on reprogramming the departure on FMS for runway without visually monitoring the aircraft movement.

During this time, the crew did not stop the aircraft to re-brief the taxi route as it was considered clear and uneventful. The operational manual of NetJets OM-A 8.3.25 as required prior entering the taxiway, the flight crew shall made a visual check of the runway threshold and whether it has clearance to do so.

The ATCO Tower has issued a clearance to the flight crew to taxi to the line up and take off before the flight crew crossed the "H" taxiway. Immediately after the clearance, the taxiway 'H' appeared on their right. In combination with the crew's perceptions and the fact that the taxiway was much wider than a normal taxiway, this all contributed to the PIC's erroneous assumption that he was seeing runway 09. The flight crew did not make a visual check of the aircraft's location before entering the taxiway.

It should be noted that the crew did not comply with the NetJets operator's OM-A procedures "CHANGE OF DEPARTURE RUNWAY OR CLEARANCE" и "LINE-UP".

The flight crew of NJE550Q aborted the initiated the take-off roll on TWY "H" after RAAS aural alert and informed Sofia-Tower of the error. Subsequently, after declaring readiness to execute a 180-degree turn, correctly executes the issued taxi instructions to line up Runway 09 and take-off. Repeated instructions this time were carried out accurately and the flight to Stavanger proceeded uneventfully.

The taxiing time from the parking stand "G" location to the line up of Runway 09 is under 6 minutes. In this time, the flight crew must review the appropriate taxi chart for the new route, the new departure scheme, adjust the new cleared altitude, readjust the airborne pilot navigation system, and the pilots must conduct a joint briefing.

Therefore, these clearances are issued prior to the start of the engines so that the pilots can discuss all the details of the manoeuvring area and, during taxiing, concentrate on monitoring compliance with the instructions issued and ensuring traffic safety.

Because these instructions were changed after the flight crew report of taxi readiness, the crew was in a time deficient in preparing for departure, despite the fact that they were not urged by the Sofia Tower ATCO to hurry.

At the moment the FALCON 2000EX initiated the take off from Taxiway H, no other aeroplanes or vehicles were present on that taxiway. A take off from a taxiway is a hazardous situation, since a taxiway is not intended for take offs. In this case, a safety effective barrier worked as the flight crew had reacted immediately to the RAAS aural alert preventing the take-off so that the consequences of the serious incident were limited in time.

The Commission considers that the aviation occurrence was the result of an error made by the crew and a deviation from the instructions of the ATCO Sofia Tower to taxi to the line up and take off from Runway 09. The subsequent instructions to abort the take off were not accepted by the pilots due to change of radio frequency.

## **4. Conclusion**

### **4.1. Findings**

As result of the investigation, the Commission made the following conclusions:

1. The Aircraft FALCON 2000EX, serial number No 0044, registration CS–DFG was manufactured in year 2004, manufacturer Dassault Aviation France.
2. The aircraft has Registration Certificate No 2537/23, issued on May 9 2019 by the Portuguese Civil Aviation Authority;
3. The aircraft has a Certificate of Airworthiness No PT-0011, issued on November 19 2008 by the Portuguese Civil Aviation Authority
4. Airworthiness review certificate of the aircraft No PT-DFG-322/20 has been issued on on April 14, 2020 by the Portuguese Civil Aviation Authority with validity on May 4, 2022.
5. The flight crew of aircraft FALCON 2000EX, Commander and Co-pilot possess the required qualification and medical fitness for flights in accordance with existing regulations;
6. There is no evidence of technical failure of the aircraft that caused the realisation of the serious incident.
7. The weather at Sofia Airport were very good during the day and in excellent visibility.
8. The horizontal and vertical markings on the manoeuvring area of Sofia Airport are placed in accordance with the regulatory documents, correct and clearly visible.
9. The available markings are fully consistent with the information in the AIP for Sofia Airport and the published navigation charts and schemes.
10. The flight planned in accordance with the procedures of the aviation operator.
11. The flight was for relocation from Sofia (Bulgaria) to Stavanger (Norway).
12. The flight crew had the appropriate medical fitness and required rest prior to the flights.
13. There is no evidence that physiological factors or loss of ability have affected the crew's operational capability.

14. The flight crew had no cause to rush the taxi due to a slot for takeoff or other operational reason.
15. The flight crew did not initiate a taxi stop for a briefing in accordance with NetJets OM A - "CHANGE OF DEPARTURE RUNWAY OR CLEARANCE" paragraph 8.3.24.7.
16. The flight crew did not make a visual check of the runway threshold in accordance with paragraph 8.3.25. "LINE UP".
17. The ATCO "Sofia Tower" with valid license and has carried out radio communication in understandable and correct aviation English.
18. The radio communication was conducted without interference and in the absence of other traffic, which would have impeded and overloaded the broadcasting.
19. The change in taxi and departure instructions after the engines were started, and the short taxi time to the executive start of Runway 09, contributed to the crew's haste in preparing for takeoff despite the lack of traffic.
20. During the occurrence, the ability of Sofia Tower to ensure the safety of ATS was violated due to the switching from the TWR frequency to that of APPROACH Control, performed by the flight crew on TWY "H" before take-off, regardless of the timely actions taken by the ATCO.
21. The flight crew reacted immediately to the RAAS aural alert preventing the take-off

#### 4.2. Causes

Based on the analysis performed, the Commission points out that the serious incident resulted from the following **cause**:

The failure of the flight crew to positively identify that they were on the correct surface for take-off

##### **Contributing factor:**

- Ineffective crew coordination during the short taxi time from the parking stand to the line up of Runway 09, consisting in the lack of detailed briefing before taxiing and take-off by the PIC, lack of control by the co-pilot of the aircraft's movement on the aerodrome's manoeuvring area and erroneous change of the VHF radio frequency by the flight crew resulted in the inability to hear the ATCO's repeated warnings.
- Presence of an unusually taxiway "H" with dimensions larger than those of a normal taxiway parallel to runway (former Sofia Airport runway), located adjacent to and upstream of runway09;
- An early Issuance of the line up and take off clearance by the ATCO Tower to the flight crew before crossing Taxiway "H".

#### 5. Safety Recommendations

Taking into account the causes of the serious incident and the deficiencies found in the investigation, the Commission recommends that the following measures should be taken to ensure the flight safety:

**BG.SIA-2022/01/01.** DG CAA should require the operators providing ground-handling services at civil airports for public use in the Republic of Bulgaria to monitor the accumulated fatigue of GSE drivers and to update monthly work schedules if necessary.

**BG.SIA-2022/01/01.** DG CAA DG CAA should require the aerodrome operator SOF Connect to implement additional nonstandard, large ground markings on the pavement:

- "RUNWAY AHEAD" on TWY "B" indicating the runway location.
- "TAXIWAY AHEAD" at the beginning of TWY "H"
- TWY "H" to be visually reduced in width at the areas of potential confusion to be visually reduced in areas of potential confusion by painting some of the edge areas with a distinguishable colour.

**BG.SIA-2022/01/02.** The BULATSA to provide awareness to the relevant Air Traffic Controllers of the impact of departure runway change on flight crew.

**BG.SIA-2022/01/03.** The ANSP to perform an operational risk assessment of the potential flight crew confusion between RWY and TWY and analyse the necessity of additional mitigation measures, including but not restricted to issue take-off clearance not far from the respective RWY Holding Point.

### 5.1. Safety measures taken

The DG CAA has informed the Aircraft, Maritime and Railway Accident Investigation National Board in writing dated 20 September 2022 that additional horizontal markings have been introduced:

- "RUNWAY AHEAD" on TWY "B" indicating the direction of the RUNWAY.(Fig. 13)



Fig. 13

- An additional horizontal marking before the holding point of TWY "B" before TWY "H"

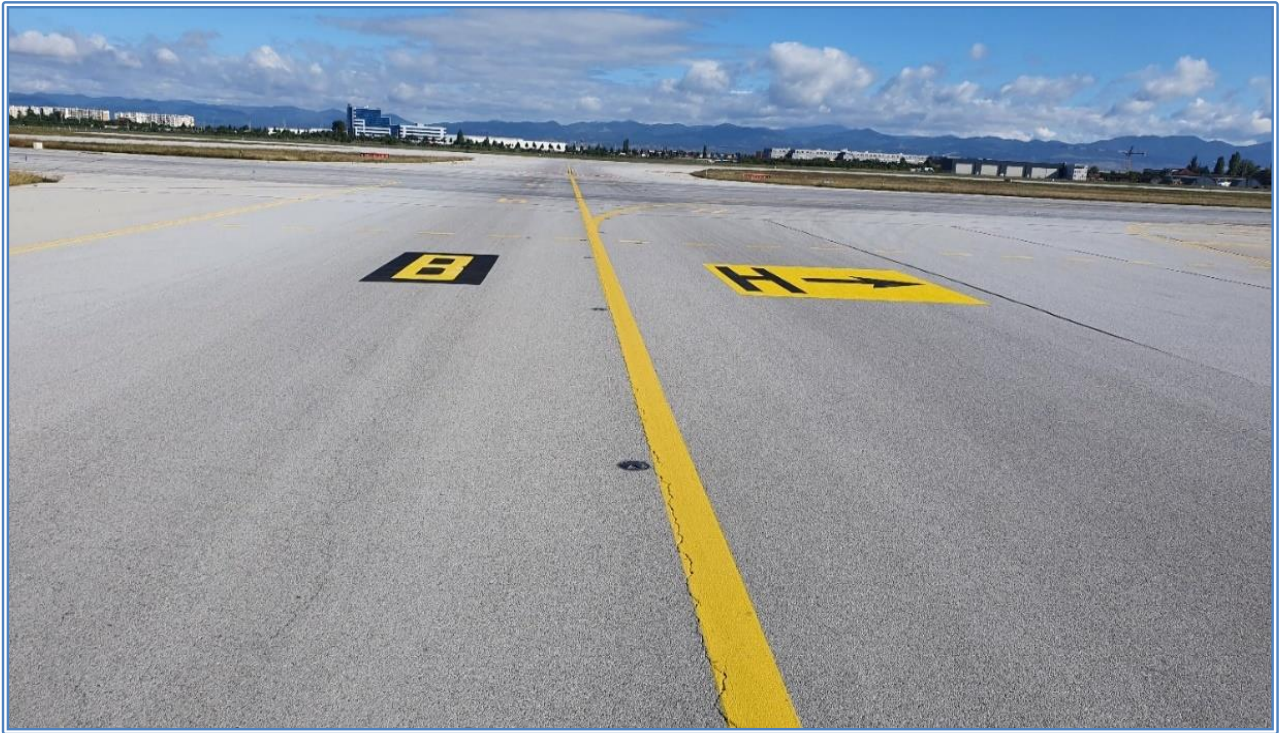


Fig. 14

Following an internal investigation, AO NetJets has taken the following internal measures to prevent such events.

””””

#### **Flight Operations:**

- OM-A to include a clear policy for RAAS alerts.
- Falcon 2000 Easy OM-B line-up check list to include step-requiring crew to confirm the runway in use for departure. It is the only NetJets fleet OM-B that does not require this step and is not aligned with OM-A 8.3.25.
- Communicate this event to all company crewmembers and identified contributing factors. On March 6th, the Head of Flight Operations issued a Safety Alert addressing this recommendation.
- Implement a company policy for the Falcon fleet regarding use of the installed (currently non-approved) vs portable EFB.
- Clarify and align between OM-A and OM-Bs what actions are required following a rejected take-off. Namely, which checklist(s) should be used prior the next take-off attempt.
- Standards Captains recommended focus item addition: Compliance with OM-A 8.3.24.7 and 8.3.25
  - Pilot Monitoring actively monitoring taxi and not solely looking inside
  - Clarify and provide guidelines, regarding company expectations when following an event on the ground. Should the crew debrief the event during the flight? Should the crew always call the office before the next take-off to inform about the event?
- Feasibility note for Sofia (LBSF) airport to highlight crewmembers that taxiway “H” is much wider taxiway than normal, it used to be a runway.
- Communication reminding crewmembers, that “fast pace can easily be normalised – the defence to this is to consciously slow the pace down, take your time, and SOPs are your best protection” (Ops Safety Alert, March 6, 2022).

#### **Training:**

To be included in a training phase recurrent program rejected take-off scenario with RAAS aural advisories.

#### **Safety:**

- Safety data analysis, using flight data, to ascertain fleets compliance with brake cooling times, following a rejected take-off.

- Include this event in the next company Safety News edition.

...“

The Commission does not consider any further measures necessary to recommend.

On the grounds of Article 18, §5 of Regulation (EU) 996/2010, the safety recommendation issued will be recorded in the centralized European system SRIS (Safety Recommendations Information System).

*The Investigation Commission reminds all organizations, to which flight safety recommendations are sent that, on the grounds of Article 18 of Regulation (EU) 996/2010 on Investigation and Prevention of Accidents and Incidents in Civil Aviation and Article 19, paragraph 7 of Ordinance No. 13 on the Investigation of Aviation Accidents are obliged to notify the Air, Maritime and Railway Accidents Investigation National Board in writing of the action taken on the recommendations made.*

### **COMMISSION ON INVESTIGATION OF THE SERIOUS INCIDENT**

**Sofia**

**April 24, 2023**