FINAL REPORT

of

the Commission for Investigation concerning the serious incident (Airprox) involving the Boeing B737-800 aircraft, registration marks D-ASXP, operated by SunExpress Deutschland GmbH and the Boeing B737-800 aircraft, registration marks OM-GTF, operated by Go2Sky, spol. s r. o., on 12 August 2018 in the controlled air space of the Republic of Bulgaria.

2020

Purpose of the Report and Responsibility

In accordance with Annex 13 to the Convention on International Civil Aviation of 7 December 1944, Regulation 996/2010 of the European Parliament and the Council on the investigation and prevention of accidents and incidents in civil aviation, and Ordinance 13 of 27.01.1999 of the Ministry of Transport, Information Technology and Communications, the objective of the aviation occurrence investigation is to establish the causes that have led to its realisation in order these to be eliminated and not allowed in future without apportioning blame or liability.

CONTENTS

01 List of Abbreviations

AAIU	-	Air Accident Investigation Unit;
ACC	-	Air Control Centre;
AIRPROX	-	Aircraft Proximity;
ALT	-	Altitude;
AMRAIUD	-	Aircraft, Maritime and Railway Accident Investigation Unit Directorate;
AO	-	Aircraft Operator;
AHDG	-	Assigned Heading;
SATCAS	-	Systems for Air Traffic Control Automated Services;
ATCO	-	Air traffic controller (officer);
ATS	-	Air Traffic Service
ASP	-	Assigned Speed;
BULATSA	-	Bulgarian Air Traffic Services Authority;
CALL SIGN	-	Call sign of the aircraft;
CFL	-	Cleared Flight Level;
CPA	-	Closest Point of Approach;
DAPs	-	Down-link of airborne parameters
DG CAA	-	Directorate General "Civil Aeronautical Administration";
EASA	-	European Air Safety Agency
EUROCONTROL	-	European Organization for the Safety of Air Navigation
EXE ATCO	-	Radar Air Traffic Controller;
FCU	-	Flight Control Unit;
FDR	-	Flight Data Recorder;
FIR	-	Flight Information Region;
FL	-	Flight Level;
FS	-	Family Sectors;
GAT	-	General Air Traffic;
ICAO	-	International Civil Aviation Organization;
IFR	-	Instrument Flight Rules;
SIGMET	-	Information concerning en-route weather phenomena which may affect the safety of aircraft operations;
SXD7BY	-	B737-800-8HX aircraft, registration marks D-ASXP of SunExpress Deutschland GmbH AO;
M	-	Mach number;
MSN	-	Manufacturer Serial Number;
MTITC	-	Ministry of Transport, Information Technologies and Communications;
PLN ATCO	-	Planning Air Traffic Controller;
RA	-	Resolution Advisory;
SAL	-	Selected Altitude;
SBL	-	Family Sector Sofia East Low;
STCA	-	Short-term conflict alert ;
TA	-	Traffic advisory;
TCAS/ACAS	-	Traffic Alert and Collision Avoidance System/Airborne Collision Avoidance System;
TCP	-	Control Transfer Point;
TVQ6129	-	B737-800-86J aircraft, registration marks OM-GTF of Go2Sky, spol. s r. o. AO;
UTC	-	Universal Coordinated Time;
V/S	-	Vertical speed;

1 Introduction

Date and time: The serious incident occurred on 12 August 2018 at 06:42 UTC. The difference between the local and Universal Coordinated Time is +3 hours. All times in this report are in UTC.

Notified: Aircraft, Maritime and Railway Accident Investigation Unit Directorate and Civil Aircraft Administration Main Directorate at the Ministry of Transport, Information Technology and Communications of the Republic of Bulgaria (MTITC), the European Commission, the International Civil Aviation Organization (ICAO), Aviation and Maritime Investigation Authority of the Republic of Slovakia; European Air Safety Agency,Federal Bureau of Aircraft Accidents Investigation of Germany and National Transportation Safety Board of USA.

On the grounds of the provisions of Article 9, para.1 of Ordinance No. 13, dated 27.01.1999, on Investigation of Aviation Accidents; the occurrence was classified as a serious incident by the Aircraft Accident Investigation Unit at the Aircraft, Maritime and Railway Accident Investigation Unit Directorate (AMRAIU) at the Ministry of Transport, Information Technology and Communications. The materials on the aviation occurrence have been filed in case No. 10/12.08.2018 in AAIU archives.

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, by Order No. RD-08-359, dated 22.08.2018 of the Minister of Transport, Information Technology and Communications, a Commission is appointed for investigation of the serious incident.

Summary: On 12 August 2018, the two commercial Boeing B737-800 aircraft with callsigns TVQ6129 and SXD7BY were cruising in the Bulgarian airspace under the control of the Sofia Area Control Centre (ACC).

At 06:29:48 UTC, while at FL 240, the crew of TVQ6129, performing a charter flight from Antalya (LTAI) to Bratislava (LZIB) reported to the Sofia ACC East Sector air traffic controller (ATCO), FL 240 to point ETUBA and did not want to change the current flight level. At 06:38:18, the crew of SXD7BY, performing a charter flight from Burgas (LBBG) to Frankfurt (EDDF), also reported to the ATCO climbing to FL200 to point NAVOD and requested a climb to FL380. Initially, the ATCO allowed climbing to FL220. At 06: 41:48 UTC, ATCO issued an instruction to SXD7BY on FL220 to turn left to heading 270°. Instead of carrying out the instruction, the flight crew started to climb to FL270, which led to the approximation of 2.5 NM horizontal separation from TVQ6129, which was flying on FL 240 at the time.

Because of the investigation, the Commission considers that the serious incident is due to the following causes:

- Misunderstanding by the flight crew of SXD7BY of the ATC clearance issued by EXE air traffic controller, that lead to climb to FL 270 instead to turn left onto heading 270°

- EXE and PLN air traffic controller did not detect the discrepancy between the received read-back and the issued instructions.

- EXE and PLN air traffic controller did not detect and interpret the deviation message in the track label of SXD7BY for the difference between the Selected Altitude downlinked Mode S parameter and the cleared flight level.

2 Factual information

2.1 Flight history

2.1.1 Flight number, type of operation, last point of departure, destination point of the involved aircraft

2.1.1.1 Aircraft with flight number XG3208

Radio call sign	SXD7BY

Flight rules	Instrument flight rules (IFR)
Type of operation	Commercial Air Transport-Passenger
Departure point	Burgas (LBBG)
Destination point	Frankfurt (EDDF)

2.1.1.2 Aircraft with flight number 6D6129

Radio call sign	TVQ6129
Flight rules	Instrument flight rules (IFR)
Type of operation	Commercial Air Transport-Passenger
Departure point	Antalya (LTAI)
Destination point	Bratislava (LZIB)

2.1.1.3 ATS units

Sofia Area Control Centre

Family Control Sector	Sofia East Low (SBL)
Airspace class	C

Closest point of approach between the two aircraft: 2.6 NM horizontally and 0 ft vertically.
AIRPROX category B - The Risk Analysis Tool used to define the risk showed "No risk of collision".
Minimum separation 5 NM horizontally or 1000 ft vertically.

2.1.2 Flight preparation, description of the flight and events leading to the serious incident

On 12 August 2018, the Boeing B737-800, aircraft with flight number 6D6129 and call sign TVQ6129 was performing a charter flight on the route Antalya (LTAI) - Bratislava (LZIB). According the flight plan, the aircraft will enter SOFIA FIR through TUDBU TCP at FL240, to fly one-way ATS route Q26 to point ETUBA, then one-way ATS route T226 and leave SOFIA FIR via NAVOD TCP at FL240.

The Boeing B737-800, aircraft with flight number XG3208 and call sign SXD7BY, was performing a flight on the route Burgas (LBBG) – Frankfurt (EDDF). According the flight plan, the aircraft takes off from Burgas (LBBG) to point ARNOV, after that flies the T226 one-way ATS route and leaves SOFIA FIR via NAVOD TCP planning cruising level - FL380.

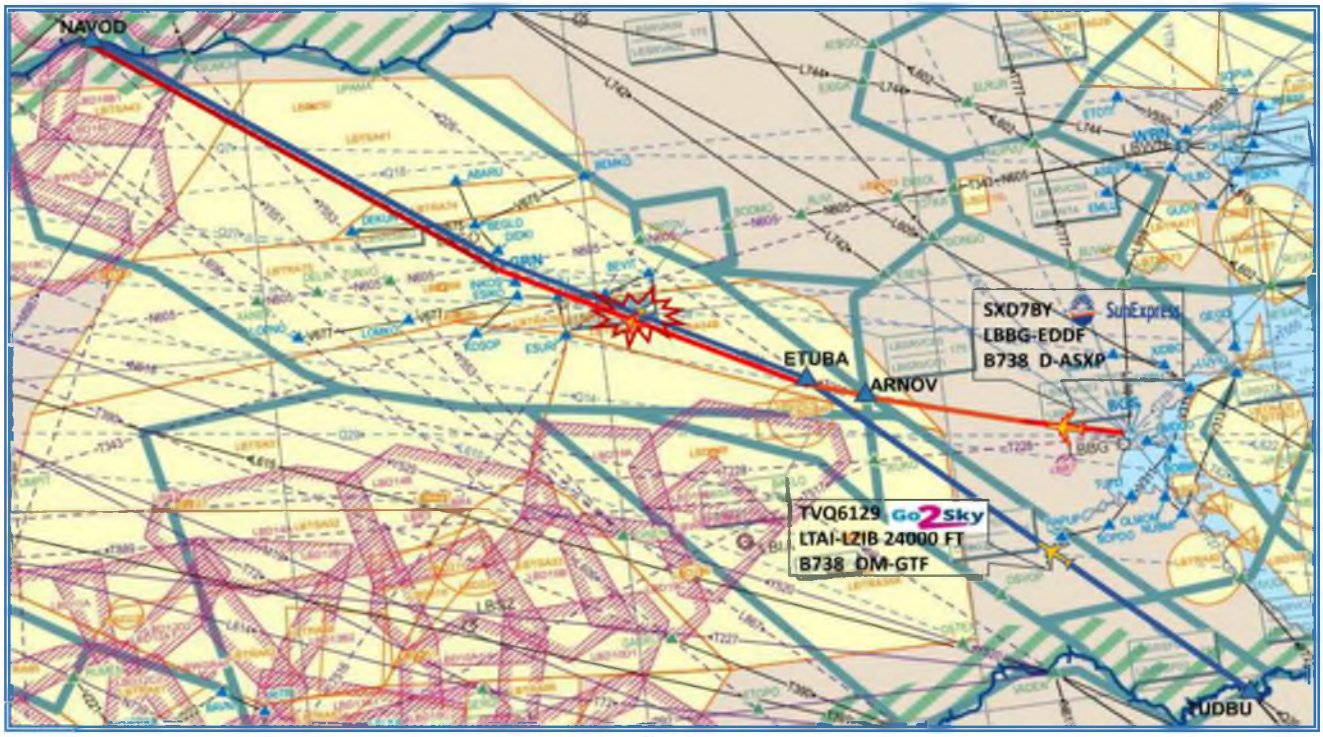

Fig.1

According to an approved schedule by the Director of ACC – Sofia, on 12 August 2018, at 06:00, a shift of ATCO, consisting of EXE ATCO and PLN ATCO took over, assuming responsibility for air traffic control of SBL sector in ACC – Sofia.

At 05:20, the Boeing B737-800, aircraft, registration OM-GTF, with flight number 6D6129 and call sign "Slovak travel six one two niner" took off from Antalya (LTAI) on a charter flight to Bratislava (LZIB). At 06:27:15, the crew reported to Sofia ACC SBL as follows: *"Sofia radar, good morning, Slovak travel six one two niner, FL two four zero"*. The air traffic controller (ATCO) acknowledged the call as follows: *"Slovak travel six one two niner, radar contact"*

At 06:20, the Boeing B737-800 aircraft, registration D-ASXP, flight number XG 3208 and call sign "*Sunrise seven bravo yankee"* took off from Burgas (LBBG) on a charter flight to Frankfurt (EDDF).

At 06:35:44, the flight crew of SXD7BY established radio communication with SBL EXE ATCO and reported *"I am climbing FL180 inbound ARNOV"*.

At 06:35:50, EXE ATCO identified the aircraft as SXD7BY and issues instruction for climbing to FL200. "*SXD7BY Sofia radar contact, climb FL200"*.

At 06:38:18, the flight crew of SXD7BY requested clearance for further climb. "*SXD7BY requesting for higher"*.

At 06:38:25, EXE ATCO issues instruction to SXD7BY for climbing to FL220 on present heading. *"SXD7BY on your present heading climb FL220"*

At 06:38:31, the flight crew of SXD7BY confirmed correctly the instruction: *"On heading climbing 220 SXD7BY"*
At 06:41:41, EXE ATCO looked for SXD7BY: "*SXD7BY"*

At 06:41:45, the flight crew of SXD7BY requested from EXE ATCO to pass message: *"SXD7BY go ahead"*.

At 06:41:48, EXE ATCO issues instruction to SXD7BY: *"SXD7BY turn left heading 270"*.
Both aircraft were on near parallel headings towards NAVOD TCP.

At 06:41:52, the flight crew of SXD7BY incorrectly understood the instruction for turning left to heading 270° and repeated that will climb to FL270. *"Climb FL270, SXD7BY"*.

At 06:41:54, the flight crew of SXD7BY entered changes to the settings of the FCU the SAL (Selected Altitude) was changed to FL270 and t*his information was downlinked from the aircraft to the SATCAS system via MODE S.(see 2.17.4)*

At 06:41:59, a deviation message was presented in the track label of SXD7BY (yellow frame visualized around the 220 FL, warning the ATCO for an existing difference between the CFL, introduced by him and the SAL FL270 by the flight crew, which was displayed on the Controller Working Position of family sector SBL. (Fig.2)

According to the radar information, it was visible that, at 06:42:06, SXD7BY started climbing instead of turning left to heading 270° according to the instruction.

At 06:42:20, SATCAS generated visual indication in bright red colour with sound alarm for a short-term conflict (STCA) between SXD7BY and TVQ6129, which was displayed on the work position of SBL family sector. At this moment, SXD7BY crossed FL223 in climb. (Fig.3)

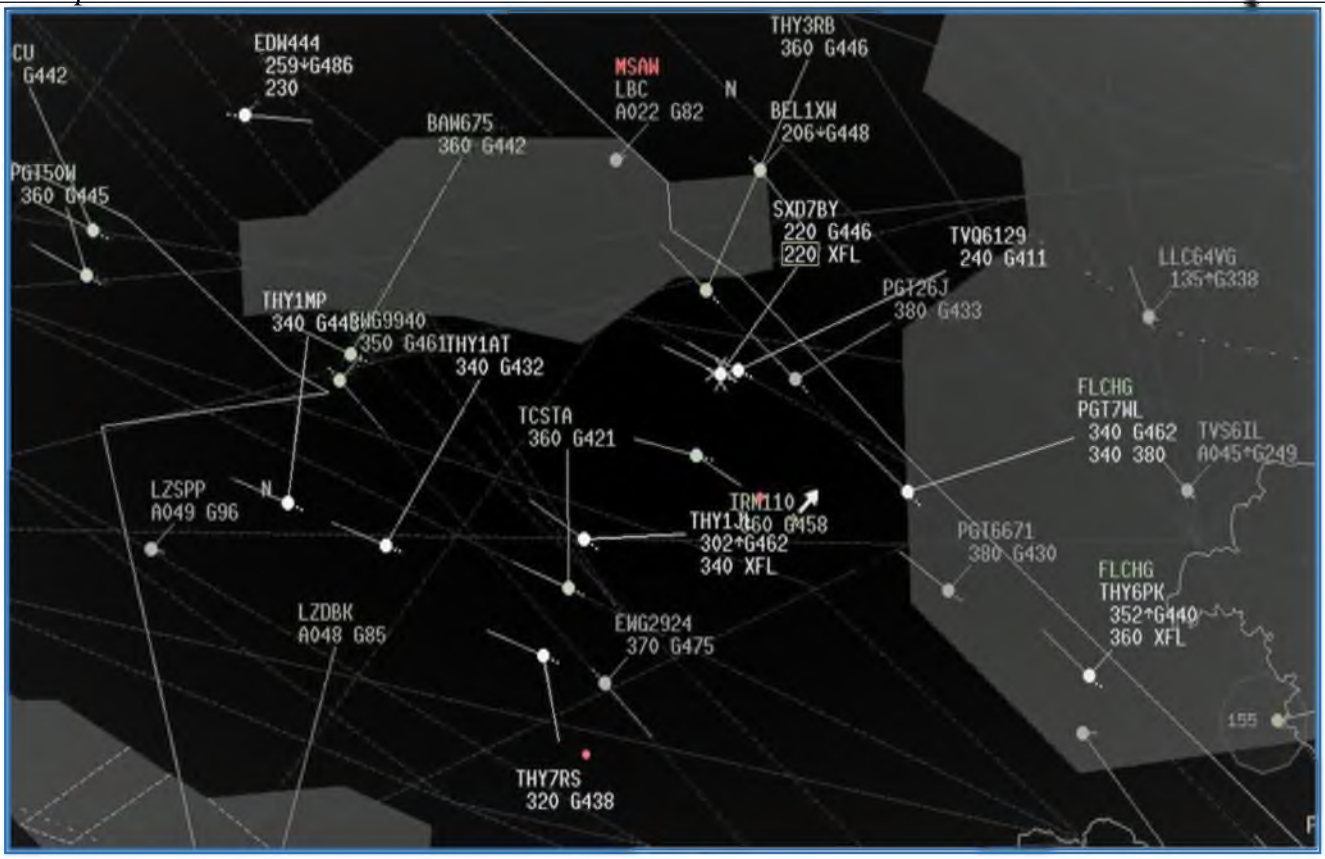

Fig.2

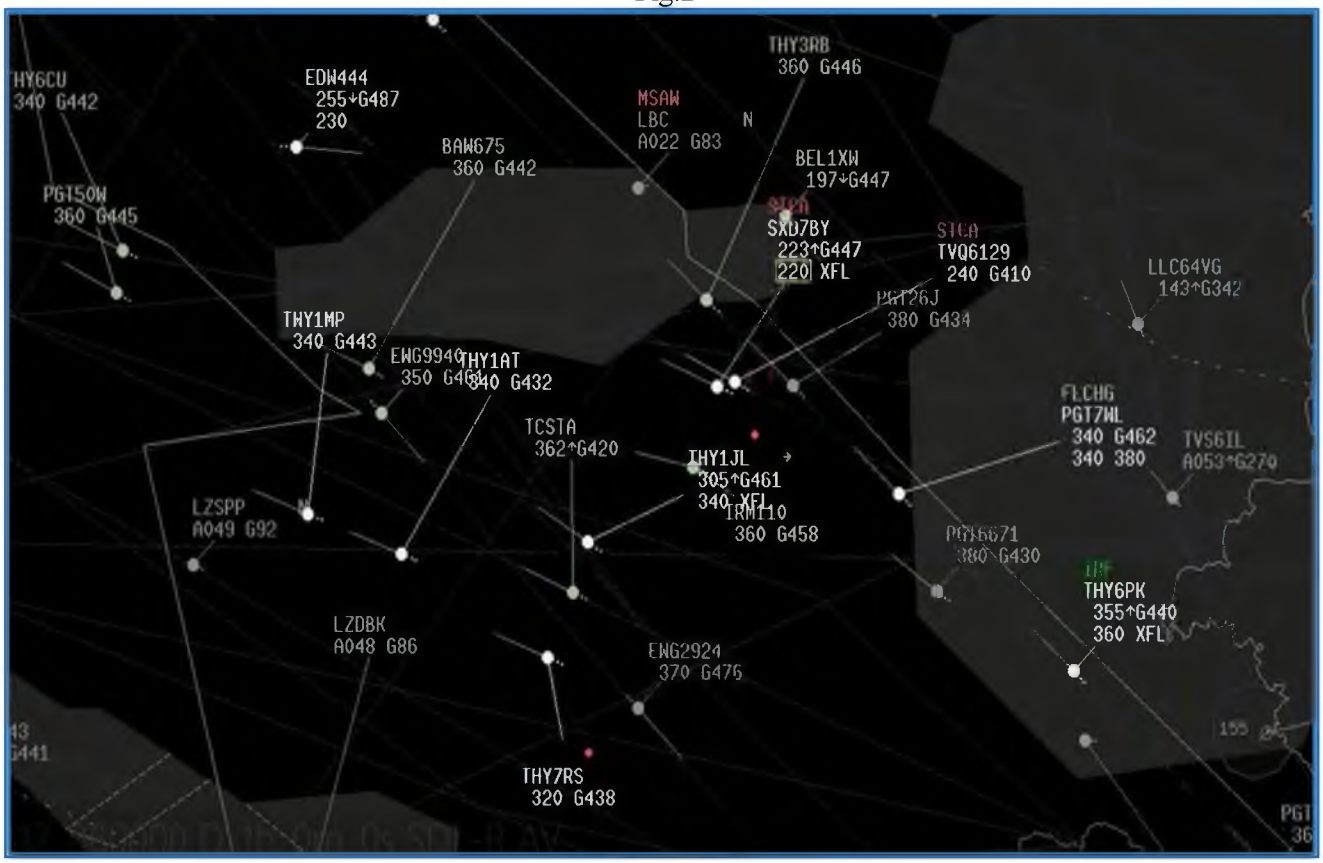

Fig.3

At 06:42:30, as a reaction on the STCA, EXE ATCO issued instruction to the flight crew of SXD7BY immediately to descent to FL220. *"SXD7BY descend FL220 immediately* „At this moment, SXD7BY crossed FL223 in climb.

At 06:42:33, the standard for minimum radar separation was infringed between SXD7BY and TVQ6129. (Fig. 4)

Fig.4

At 06:42:34, SXD7BY replied: *„Descend FL220 immediately SXD7BY"*

At 06:42:44, SXD7BY confirmed the instruction from EXE ATCO: At this point, SXD7BY was already crossing FL236 in climb with a V/S of +2900 ft/min. *"Confirm SXD7BY descending FL220?"* The closest point of approach between the two aircraft had occurred at 06:42:49. The horizontal distance between both aircraft was 2.6 NM and the vertical distance was 0 ft.

At 06:42:50, EXE ATCO issued instruction again to the flight crew of SXD7BY to immediately descent to FL220 in heading 270°: *"SXD7BY immediately 220, heading 270"*

At 06:43:06, the flight crew of SXD7BY replied "*Heading 270, descending immediately 220 SXD7BY*"

At 06:43:13, after monitoring of SXD7BY, EXE ATCO issued instruction to the flight crew to climb to FL260. The aircraft crossed FL250, which ensured vertical separation between the aircraft.

At 06:43:18, the vertical separation of more than 1000 ft between the aircraft was established.

At 06:43:18, the flight crew of SXD7BY confirmed the instruction, issued by EXE ATCO: *"Climbing FL260 SXD7BY"*

At 06:43:20, the flight crew of TVQ6129 addressed Sofia Radar: *"Sofia Radar TVQ6129"*

At 06:43:23, EXE ATCO replied "*TVQ6129"*

At 06:43:26, the flight crew of TVQ6129 informed EXE ATCO *"We have a traffic very close to us, now 5 miles, I suppose. This was well below the minimum"*

Fig.5

At 06:43:35, EXE ATCO "*Yes, there is another traffic, now climbing 260"*

At 06:43:38, the flight crew of TVQ6129 informed EXE ATCO: *"Yes, they are climbing, but minimum distance was 2.5"*

Both aircraft continued to their destinations without further incident.

2.1.3 Location of aviation occurrence

Position 85 NM North-West of Burgas Airport.
Date and time: 12 August 2018, 06:42:49 UTC
Lighting conditions: Daylight
Altitude FL 240

2.2 Injuries to persons

No injuries of crews, passengers or other persons because of the occurrence.

2.3 Damage to Aircraft

No damages to the aircraft.

2.4 Other damages

No other damages.

2.5 Personnel information

2.5.1 Pilot in command of SXD7BY

Man
License: ATPL,
DE.FCL.7631005103,
Expiry Date: 31DEC35

Ratings:	Captain;
Medical Validity:	Class 1, valid to 01.01.2021
Medical restrictions:	None.
Proficiency in English:	German LVL5, English LVL4
Flight experience:	
Total Flying Hours:	5100 FH.
Total Flying Hours on Type	2700 FH
Information on the working hours and rest:	
For the last 24 hours:	3:00 flight hours;
For the last 30 days:	No information;
For the last 90 days:	60:00 flight hours.
Flight duty 12.08.18:	10:35h;
Rest time:	57:20h.

The Commission assumes that the captain has the necessary training and qualifications for his functional duties and that there is no breach of the rules on working time and pre-flight rest periods.

2.5.2 First officer of SXD7BY

Man	
License:	CPL, DE.FCL.19263, Expiry Date: 31DEC35
Ratings:	First Officer;
Medical Validity:	Class 1, valid to 21.09.2020
Medical restrictions:	None.
Proficiency in English:	German LVL5, English LVL4
Flight experience:	
Total Flying Hours:	1977 FH.
Total Flying Hours on Type	1164 FH
Information on the working hours and rest:	
For the last 24 hours:	3:00 flight hours;
For the last 30 days:	No information;
For the last 90 days:	214:00 flight hours.
Flight duty (12.08.18):	10:35 h;
Rest time:	93:11 h.

The Commission assumes that the co-pilot has the necessary training and qualifications for his functional duties and that there is no breach of the rules on working time and pre-flight rest periods.

2.5.3 EXE ATCO:

Gender:	Male
Age:	57 Years
Year of birth:	1961
ATCL BGR.ATCL:	Certificate ATCL
Rating :	Endorsement FS Sofia ACS – RAD valid until 29.11.2018
ENGLISH:	LEVEL5 valid until 11.03.2020
Medical Certification:	valid until 04.04.2019
Check:	**Check** of Competence of ATCO on working position in ACC-Sofia "Control" (Family sector of Sofia) on 16.03.2018.

2.5.4 PLN ATCO:

Gender:	Male
Age:	42 Years
Year of birth:	1976
ATCL BGR.ATCL:	Certificate ATCL
Rating:	EndorsementFS Varna ACS – RAD valid until 27.05.2018 EndorsementFS Sofia ACS – RAD valid until 30.06.2018
ENGLISH:	LEVEL 5 valid until 18.12.2021

Medical Certification: valid until 25.09.2018

Check: **Check** of Competence of ATCO on working position in ACC-Sofia "Control" (Family sector of Sofia/Varna) on 13.03.2018.

ATCOs of ACC - Sofia possess the required qualification and medical certification to carry out their duties.

2.6 Aircraft Information

There are no data about technical failures of the on-board systems in the reports of the flight crew.

2.6.1 SXD7BY Aircraft

Registration:	D-ASXP;
Manufacturer:	The Boeing Company, USA;
Type of aircraft:	B737-800-8HX;
Factory serial number:	29684;
Manufactured:	February 2008;
State of Registry:	Germany;
Air Operator:	SunExpress Deutschland GmbH.

2.6.2 TVQ6129 Aircraft

Registration:	OM-GTF;
Manufacturer:	The Boeing Company, USA
Type of aircraft:	B737-800-86J;
Factory serial number:	28070;
Manufactured:	September 1998;
State of Registry:	Slovakia;
Air Operator:	Go2Sky, spol. s r. o.

The aviation occurrence is not related to the airworthiness of the aircraft.

2.7 Meteorological Information

The meteorological conditions within 03:00-09:00 UTC on 12 August 2018, in the area of waypoints ETUBA – ARNOV (near the town of Sungurlare):

Fig.6

Anticyclone pressure field with stable air mass and no dangerous phenomena were observed. There are no issued SIGMETS for FIR Sofia for that period and no lightning activity was detected. From the

satellite images, high and middle layer clouds were observed over Western and central Bulgaria, and a few middle layer clouds were observed in the area of ARNOV. The wind at FL180 was from North-west / 10kt, at FL240 – North-west / 15kt and at FL300 from West-northwest / 20kts. There was no Jetstream in the area of interest and the wind field should not cause moderate or severe turbulence.

The meteorological conditions at the time of the air occurrence were of no effect to the serious incident.

2.8 Navigation

Both aircraft performed the flights with the standard navigation equipment for the types of aircraft. There are no reported technical failures of the navigation equipment of the aircraft. The flights of the two aircraft were carried out in the upper air space of Bulgaria, under the conditions of area navigation and in conformity with the Instrument Flight Rules. There is no information about technical failures of the navigation facilities managed by 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 failures of technical means were recorded, which might directly affect the operational ability at the time of the occurrence.

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

2.9 Communications

Both aircraft performed the flights with the standard communication equipment for the types of aircraft. The air-ground radio communication in the FS SBL and the aircraft serviced was carried out at the frequency of 131.225 MHz in English. The Bulgarian Air Traffic Services Authority provided a transcript of the radio-communication of Sofia Control, FS SBL, at frequencies 131.225 MHz, as well as telephone communications between PLN ATCO and the adjacent ATC sectors before, during and after the time of the aviation occurrence. During the radio conversations review at the operating frequencies of FS SBL, no loss of radio communication and no interruptions and disturbances during the radio broadcasting with not a single aircraft in the sector were found by the Investigation Commision.

2.10 Aerodrome information

The occurrence is not realized at an aerodrome.

2.11 Flight data recorders

The Commission did not use data from FDR and CVR. Bulgarian Air Traffic Services Authority (BULATSA) provided radar picture and radio communications recordings, as well as recordings of the phone communication of the Planning Air Traffic Controller with the other sectors/units.

The records have been enclosed to the investigation materials in case No. 10/12.08.2018.

2.12 Wreckage and Impact Information

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 was started during the occurrence.

2.15 Survival Aspects

No survival equipment was used by the passengers and the crew.

2.16 Tests and Research

For the purpose of investigation in connection with safety, the Commission carried out and conducted the following activities:

- Collecting, documentation, studying, listening to and analysis of the radar picture recordings, radio communications, the phone communications between the working position Sofia - Control – SBL sector and the neighboring ATS sectors/units;
- Listening, transcription and analyzing of voice exchange records in the SBL sector;
- Discussions with EXE ATCO, PLN ATCO and Air Traffic Controller – Supervisor on duty during the serious incident;
- Analysis of the actions of ATCO at SBL sector;
- Analysis of the actions of flight crew of both aircraft during the aviation occurrence;

The Commission also requested, discussed and analyzed the data from:

- The flight crew report of B737-800-8HX aircraft crew with a call sign SXD7BY;
- The flight crew report of B737-800-86J aircraft with a call sign TVQ6129;
- Safety Functions Maps Event Analysis - 12 August 2018 – Separation Minimal Infringement, carried out by Eurocontrol.

2.17 Additional information

2.17.1 Activated warning systems and activation procedure

- ACAS/TCAS system on board of SXD7BY was not activated in RA and/or TA mode.
- ACAS/TCAS system on board of TVQ6129 was not activated in RA and/or TA mode.
- A deviation message is visualized in the track label of SXD7BY for an existing difference between the CFL entered by the ATCO and the SAL by flight crew, on the work position of SBL sector.
- SATCAS generated a short-term conflict alert (STCA) between SXD7BY and TVQ6129, which was displayed on the work position of SBL sector.
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2.17.2 THE READ-BACK – Procedure

ICAO Annex 10 Vol II.

1.3 COMMUNICATION METHODS

Read-back is defined as a procedure whereby the receiving station repeats a received message or an appropriate part thereof back to the transmitting station so as to obtain confirmation of correct reception.

ICAO Annex 11 Chapter 3 Para 3.7.3

3.7.3 Read-back of clearances and safety-related information

3.7.3.1 The flight crew shall read back to the air traffic controller safety-related parts of ATC clearances and instructions, which are transmitted by voice. The following items shall always be read back:

a) ATC route clearances;

b) clearances and instructions to enter, land on, take off from, hold short of, cross and backtrack on any runway; and

c) runway-in-use, altimeter settings, SSR codes, level instructions, heading and speed instructions and, whether issued by the controller or contained in ATIS broadcasts, transition levels.

3.7.3.1. Other clearances or instructions, including conditional clearances, shall be read back or acknowledged in a manner to clearly indicate that they have been understood and will be complied with.

3.7.3.1.2 The controller shall listen to the read-back to ascertain that the clearance or instruction has been correctly acknowledged by the flight crew and shall take immediate action to correct any discrepancies revealed by the read-back.

2.17.3 AIR TRAFFIC SERVICES MANUAL of the ACC-Sofia-Part 1.

Communication with Aircraft

5.1. Format of messages

5.1.1. The messages used in the radiotelephone communication consist of:

a) The full call sign of the station to which the call is transmitted;
b) The full call sign of the station transmitting the call;
c) The content of messages.

5.3 Confirmation of messages

5.3.1. Provided that the pilot of the aircraft does not confirm a message, the ATCO must request confirmation to ascertain its acceptance by the flight crew.

5.3.2. The errors made by the pilot in the confirmation of a given message by repetition (readback) are corrected by the ATCO until the pilot has transmitted the message confirmation correctly.

2.17.4 AIR TRAFFIC SERVICES MANUAL of the ACC-Sofia-Part 2.

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Chapter V Air traffic services of the-Sofia Control

4. Using the information obtained from mode S transponder.

4.1. The parameters transmitted by the aircraft in mode S (DAPs) are used by the ATCO mainly for acquiring a more complete orientation in the situation (situational awareness) and better perception of the operational environment.

4.2. The presence on the working screen of the ATCO does not cancel or change ATS procedures.

4.3. When the ATCO observes values of DAPs other than the instructions / clearances issued by him, it requires the crew check the values and confirm the received instructions / clearances.

4.4. The aircraft call sign from field 7 of the flight plan broadcast in mode S is used to correlate the radar track of the location of the aircraft with the system flight plan of the aircraft in SATCAS. If there is a discrepancy between the aircraft call sign from field 7 of the system flight plan and the aircraft call sign received from the aircraft board, the correlation in SATCAS is performed according to the aircraft SSR code.

4.5. Where there is a difference between "Selected Altitude / Level" and the aircraft's cleared altitude / flight level, the ATCO uses the following standard phraseology to avoid misunderstood, received or misinterpreted information and to reduce the likelihood of a "Level Bust":

ATCO: CHECK SELECTED LEVEL. CLEARED LEVEL IS (level)

4.6. The air traffic controller shall use the observed information on the value of the magnetic heading of the aircraft in mode S for:

a) controlling the value of the magnetic course of the aircraft after issuing an instruction for setting and / or maintaining a specific heading by the aircraft;

b) acquaintance with the current heading of the aircraft without the need to request to be sent to the crew.

4.7. The air traffic controller may use the shown aircraft speed information in mode S for:

a) getting acquainted with the current speed of the aircraft without the need to request to be sent to the crew;

a) regulating the speed of aircraft by issuing instructions for maintaining a specific speed or range of speeds;

b) determining the moment of transition from Mach Number to IAS in case of descent for landing of aircraft and from IAS to Mach Number in case of climbing aircraft.

Note When switching from Mach Number to IAS, the first symbol in the speed field in mode S changes from M (Mach) to K (knots IAS).

4.8. The air traffic controller shall not use the observed value of the vertical speed parameter obtained by the S-mode aircraft to control the issued vertical speed control instructions and shall use the value of the vertical speed of the aircraft, obtained from the processing chain of the SATCAS multi-radar tracker, to control the issued instructions for vertical speed control.

Chapter VII. Working with FREQUENTIS and SATCAS system.

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Selex Air Traffic Control Automated System – SATCAS

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11. Active fields in the aircraft label

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11.1. Visualization of parameters received in Mode S of the transponder.

11.1.1. The information received in Mode S of the transponder from the aircraft is visualized in fields with numbers 6, 9, 11 and 12 in gray color. By clicking with the middle mouse button you switch between received from the aircraft values and the values of these parameters, set by the ATCO.

Fig. 1

11.1.2. When there is a difference between the CFL introduced by the ATCO and the SAL, a yellow frame will be visualized around the relevant value at the moment, warning the ATCO about the difference between the two values. The yellow frame appears after a refresh of the radar information (~ 5 seconds for \"Control\" and ~ 3.8 seconds for \"Approach\"), if there is a difference from:

- 100 ft between CFL and SAL;
- 2 degrees between the values for AHDG;
- 10 knots for ASP;
- 0.005 M for MACH;
- 500 ft/min for the values of vertical speed.

Fig. 2

11.1.3. When the fourth row of the aircraft label is not displayed, the presence of a discrepancy between the values set by the ATCO and those received from the aircraft in Mode S of the transponder is displayed by a 'blinking yellow asterisk' (*) on the right side of the ground speed value. The presence of a match between the values set by the ATCO and received from the aircraft in Mode S is

displayed by a 'non-flashing white asterisk' (*) on the right-hand side of the ground speed value.

3 Analysis

To establish the causes for the realized serious incident, the following aspects were reviewed:

- Technical failure;
- Errors of the crews of TVQ6129 and/or SXD7BY, related to the operation of the aircraft;
- Inefficient implementation of procedures by ATCO when conducting radiotelephone communication.

The first aspect is related to the technical failure of SATCAS or the aircraft systems. On the ground of the information received, the Commission established that the SATCAS worked without interruption of its functionalities. From the information obtained, it was established that:

- STCA functionality of the SATCAS Safety Nets subsystem generated a warning in accordance with the parameters set in the subsystem specifications.
- SATCAS generated a warning in track label of SXD7BY for an existing difference between the CFL introduced by the ATCO and the SAL by flight crew.

During the investigation, the Commission did not find any information about irregularity in the aircraft systems of SXD7BY and TVQ6129.

Considering the contents of paragraphs 2.1.2, 2.6, 2.8 and 2.17 above, the Commission declined the possibility that the event has resulted from a technical failure of SATCAS or a technical failure of any of the on-board systems of the two aircraft.

The Commission associates the second aspect with the possible errors made by the crews of and/or TVQ6129 in the aircraft operating.

With regard to the flight of SXD7BY

According to the information received from BULATSA, the explanations of the flight crew of SXD7BY and the one set out in paragraph 2.1.2 during the flight in the controlled airspace of Sofia Control, SBL sector, the aircraft executed correctly the instructions of EXE ATCO for climb to FL220 to NAVOD. After that, the flight crew requested clearance for further climb in accordance with the flight plan. EXE ATCO issued an instruction to the flight crew of SXD7BY to turn left to heading 270°, in order to provide an opportunity for a safe climb and to avoid a potential conflict with another aircraft, flying at FL240 at a parallel heading of a horizontal distance of less than 5 NM. The flight crew of SXD7BY incorrectly understood the instruction for turning left to heading 270°, perceiving it as an instruction for climbing, wrongly repeating it and started to climb to FL270. During the conflict situation, the flight crew of SXD7BY did not receive an indication for TCAS TA and TCAS RA.

With regard to the flight of TVQ6129

According to the information received from BULATSA, the explanations of the flight crew of TVQ6129 and the one, set out in paragraph 2.1.2, the flight in the controlled airspace of Sofia Control, SBL sector, went normally at FL 240 to the moment, when another aircraft in 2.5NM was observed on its left side in climb without information from ATS. The flight crew immediately reported to the EXE ATCO about conflict traffic and requested information. Furthermore, during the conflict situation, the flight crew of TVQ6129 did not receive indication of TCAS TA and TCAS RA.

In view of the second aspect above, the following conclusions can be drawn:

- The flight crew of SXD7BY misunderstood the instruction issued by ATCO to turn left to heading 270°. This contributed to the occurrence of the dangerous convergence.
- The flight crew of TVQ6129 did not contribute to the emergence of the dangerous convergence.

The third aspect is related to the ineffective implementation of procedures by ATCO when conducting radiotelephone communication.

During the period of the occurrence, 11-15 aircraft were serviced simultaneously in SBL. According to the flight plan, the aircraft takes off from Burgas (LBBG) to point ARNOV, after that flies to NAVOD and leaves SOFIA FIR planning cruising FL380. The APP ATCO from Burgas transferred the control and radio communication to SBL sector. The EXE ATCO from SBL sector identified the aircraft as SXD7BY. The flight crew reported that they are flying at FL200 and willing to climb. Initially, EXE ATCO issued climb instruction to FL220. At this point, if the EXE ATCO was issued the instruction for climbing to a higher FL (FL380 in accordance with the flight plan), a potential conflict with TVQ6129 will occur, flying on FL240 in parallel heading in a horizontal distance of less than 5 NM. The EXE ATCO, after agreeing with the PLN ATCO, changed the plan to avoid potential conflict by issuing an instruction for turning left to heading 270° "*SXD7BY turn left heading 270*". The flight crew wrongly repeated the instruction *"Climb FL270, SXD7BY"*. The EXE ATCO and PLN ATCO did not react to the wrongly repeated instruction by the flight crew, after that the aircraft started a climb. Immediately after that, SATCAS visualized a deviation massage in the track label of SXD7BY for an existing difference between the CFL introduced by the ATCO and the SAL by flight crew, this was not noticed and for this reason, there was no reaction by EXE ATCO and PLN ATCO. After 21s, SATCAS generated a STCA between SXD7BY and TVQ6129. The EXE ATCO reacted to the alert and issued instructions to SXD7BY to avoid the conflict and avoid the separation infringement. It should be noted that ATCO had twice instructed the crew of SXD7BY to descent immediately to FL220, and once to fly on heading 270 for preserving the separation and the crew correctly replied but did not performed the instructions at all. The aircraft continued to climb, crossing FL236 with a vertical speed of 2900 ft/min and reached FL250. In view of the provided vertical separation between the two aircraft of 1000ft, the EXE ATCO correctly adjusted the instruction to SXD7BY to continue a climb to FL260.

In accordance with the third aspect of the possible inefficient implementation of procedures by ATCO when conducting radiotelephone communication, it could be concluded that the EXE ATCO and PLN ATCO did not correct the flight crew of SXD7BY for the wrongly understood instruction and did not detect and interpret the deviation massage in the track label of SXD7BY, thus creating conditions for a dangerous convergence.

In view of the above, it is concluded that the serious incident under investigation is most probably a result of the following dominant factors related to the second and third aspects:

- Misunderstanding by the flight crew of SXD7BY of the ATC clearance issued by EXE air traffic controller, that lead to climb to FL 270 instead to turn left onto heading 270°

- EXE and PLN air traffic controller did not detect the discrepancy between the received read-back and the issued instructions.

- EXE and PLN air traffic controller did not detect and interpret the deviation message in the track label of SXD7BY for the difference between the Selected Altitude downlinked Mode S parameter and the cleared flight level.

4 Conclusion

4.1 Findings

1. B737-800-8HX, aircraft, registration marks D-ASXP, with call sign SXD7BY of "SunExpress Deutschland GmbH" AO is airworthy at the time of the realization of air occurrence;
2. B737-800-86J, aircraft, registration marks OM-GTF, with call sign TVQ6129 of "Go2Sky" AO is airworthy at the time of the realization of air occurrence;
3. The investigation did not reveal any information about any pre-existing technical defects, which might have caused or influenced the incident.
4. There was no an imminent risk of a collision, because of that on board of TVQ6129 and on board of SXD7BY the ACAS/TCAS system did not trigger in RA and TA mode;

5. SATCAS visualized a deviation massage in the track label of SXD7BY for an existing difference between the CFL introduced by the ATCO and the SAL by the flight crew;
6. SATCAS generated a short-term conflict alert between SXD7BY and TVQ6129;
7. The flight crew of SXD7BY aircraft, Captain Pilot Flying and First Officer, had the required qualification;
8. The flight crew of TVQ6129 aircraft, Captain Pilot Flying and First Officer, had the required qualification;
9. The flight crew of SXD7BY aircraft, wrongly replied to the instruction issued by ATCO;
10. Misunderstanding of the ATC clearance by the flight crew of SXD7BY, that lead to climb to FL 270 instead to turn left onto heading 270°
11. The flight crew of TVQ6129 immediately reported to the EXE ATCO about conflict traffic;
12. The flight crew of TVQ6129 did not contribute to the emergence of the dangerous convergence;
13. The flight of SXD7BY is carried out in accordance with the flight plan along the route Burgas (LBBG) – Frankfurt(EDDF);
14. The flight of TVQ6129 is carried out in accordance with the flight plan along the route Antalya (LTAI) – Bratislava (LZIB);
15. The ATCOs, performing their official duties at the time of the event, are licensed, have the necessary qualifications and medical fitness;
16. The applicable separation minima based on ATS surveillance systems of 5 NM within area of responsibility of Sofia ACC SBL sector is infringed;
17. The aviation occurrence is contributed of the ACC-Sofia;
18. The EXE ATCO and PLN ATCO, did not detect the discrepancy between the received readback and the issued instruction;
19. EXE ATCO and PLN ATCO did not detect and interpret the deviation message for the difference between the Selected Altitude downlinked Mode S parameter and the cleared flight level.
20. The EXE ATCO detected the conflict after STCA when the climbing aircraft was passing FL226 and the conflict aircraft was at FL240;
21. The EXE ATCO issued correct instructions to both aircraft for ensuring of safety after triggering of STSA.

4.2 Causes

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

- Misunderstanding by the flight crew of SXD7BY of the ATC clearance issued by EXE air traffic controller, that lead to climb to FL 270 instead to turn left onto heading 270°

- EXE and PLN air traffic controller did not detect the discrepancy between the received read-back and the issued instructions.

- EXE and PLN air traffic controller did not detect and interpret the deviation message in the track label of SXD7BY for the difference between the Selected Altitude downlinked Mode S parameter and the cleared flight level.

5 Safety recommendations:

In view of the causes for the realized serious incident and the deficiencies found in the course of investigation, the Commission proposes the following safety recommendations to be fulfilled:

BG.SIA-2018/10/01 BULATSA to incorporate in the program for periodic training of the ATCOs simulator exercise scenarios, in breach of the Pilot-Controller communication loop (Read-back, Hear-back) and generated warning in the track label for an existing difference between the CFL introduced by the ATCO and the SAL by flight crew.

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.

After providing the Draft Final Report for the investigation to the parties concerned, the Commission on safety investigation received responses as follows:

1. The EASA declared it has no comments and no remarks on the report content;
2. German Federal Bureau of Aircraft Accident Investigation provided comment paper that include objections and suggestions for additions to the Draft Final Report, as well as notes on technical or terminological mistakes allowed in it.
3. Aviation and Maritime Investigation Authority (AMIA) of Republic of Slokakia declared it has no comments and no remarks on the report content;
4. AO Sun Express Deutschland GmbH provided personal information about the flight crew.
5. AO Go2Sky, spol. s r. o.-declared it has no comments and no remarks on the report content;
6. DG CAA of Bulgaria did not provide any comments and remarks on the report content;
7. BULATSA provided the information for using by the ATCO of the parameters transmitted by the aircraft in mode S (DAPs)

The Commission on safety investigation after discussing the comments provided made the following substantiated changes to the final report:

- Added the personal information about the flight crew of SXD7BY;
- Added procedure for using the information obtained from mode S transponder.

After a thorough analysis of the facts and circumstances information on the actions of ATCO, the state of the ATM system and the actions of the flight crews of the two aircraft at the time of event the causes are defined again.

Copies of the data and comment document received from German Federal Bureau of Aircraft Accident Investigation are attached to the case of the event under investigation.

Commission on Investigation of the serious incident

Sofia, 27 August 2020 **Air, Maritime and Railway Accidents Investigation National Board**