

FINAL REPORT

on

an investigation of a serious incident, related with a going around procedure during Boeing 737-500, registration No LZ-BOQ final approach, because of a presence of a vehicle on the runway, realized on 15.07.2007 at Sofia Airport



2007

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LIST OF ABBREVIATIONS

AO	- Air operator;
AC	- Aircraft;
GD CAA	- General Directorate of Civil Aviation Authority;
ATC SE	- Air Traffic Control State Enterprise
ACr	- Aircraft crew;
CAA	- Civil Aviation Act;
ACom	- Aircraft commander;
AF	- Airway fix;
ACT	- Airport Control Tower;
MT	- Ministry of Transport;
ATS	- Air Traffic Service;
RWY	- Runway;
FL	- Flight level;
TWY	- Taxi way;
ATC	- Air Traffic Control;
WS	- Work station;
GR	- Ground radar;
ATCo	- ATCo;
RATCo	- Radar air controller – Approach control;
AAIU	- Air Accident Investigation Unit
AC	- Approach control;
DME	- Distance measuring equipment;
ICAO	- International Organization of Civil Aviation;
ILS	- Instrument Landing System;
NDB	- Nondirectional radio-beacon
TCAS	- Traffic Collision Avoidance System;
UTC	- Coordinated universal time;
VOR	- VHF omnidirectional radio range.

Introduction

On the 15.07.2007 Boeing 737 airplane, reg. No LZ-BOQ, conducting flight LZB2472 from Madrid to Sofia, was performing final approach for landing on RWY27. At the same time a vehicle of Information and Coordination Centre (ICC) of Sofia Airport was performing an inspection of the runway after a given permission by the ATCo at Sofia Tower, which forced the Boeing 737 crew to go around in order to avoid a collision with the ICC vehicle. During the execution of the go-around procedure the Boeing 737 has overtaken a BAe 146, reg. No LZ-HBA, conducting flight LZB461 from Sofia to Amsterdam, which has taken-off before and the horizontal separation between the two aircraft has been violated. The Boeing 737 aircraft commander took decision to make a right-hand turn in order to avoid the dangerous closure with the aircraft taken-off.

The following organizations have been notified about the aviation occurrence: Aircraft Accident Investigation Unit; General Directorate of Civil Aviation Authorities; ICAO and Eurocontrol.

On the base of Article 9, Para.1 - (Rev. - SG, No 83 of 2004, addition, SG No 77 of 2005) and in accordance with p.1 and 5 of Enclosure No 7 and Enclosure No 4a to Para.8 of additional provisions of Regulation No 13 of 27.01.1999 of the Minister of Transport, the aviation occurrence has been classified by AAIU as a serious incident. The materials on the aviation occurrence are classified under state file number 06/15.07.2007 in the archives of AAIU.

On the base of Article 142, Para.2 of Civil Aviation Act of Republic of Bulgaria (last revisions and additions SG No 108/29.12.2006 and Article 10, Para. 1. Rev. - SG, No 83 of 2004), in relation with Art.2, Para.1 of Regulation No 13 of MT of 27.01.1999, by an order RD-08-371/ 27.07.2008 of the Minister of Transport a commission for investigation of the aviation occurrence has been appointed.

The serious incident didn't lead to any consequences for the passengers, crew and aircraft.

The difference between the local time and Universal Coordinated Time (UTC) is + 3 hours.

1. Factual Information

1.1 History of Flight

1.1.1 Description of the occurrence

At 07:00 local time the air dispatcher of ICC at Sofia Airport asked Sofia Tower ATCo for permission of a visual inspection of the runway. After getting the permission the air dispatcher started the inspection of the runway in direction 09-27 and after that proceeded in direction 27-09. During the inspection, Sofia Tower ATCo informed him about a taxiing for take-off from RWY27 aircraft and it forced him to interrupt the inspection and leave the runway.

At 07:03 h at Sofia Tower the working shift was replaced and to that moment the situation was as follows: an airplane taxiing for take-off - BAe 146; an airplane B 737 performing final approach, an aircraft at engine start and a vehicle of ICC, conducting runway inspection.

After the BAe 146 take-off the air dispatcher of ICC asked for permission to continue the runway inspection. Sofia Tower ATCo cleared him to continue and the air dispatcher proceeded the runway inspection in direction 27-09. Before this, B 737 reg. No LZ-BOQ was cleared for landing on RWY27.

The crew of the landing aircraft saw the vehicle on the runway and immediately reported to Sofia Tower but did not receive any additional information or command and started a go around procedure. During the climb the crew saw on TCAS an aircraft in front. The horizontal separation between both aircraft has been reduced to 2.8 NM. In order to avoid dangerous closure with the airplane taken-off, the aircraft commander took the independent decision in visual flight condition to make a right-hand turn to heading of 090⁰ and to limit the climb at 4000 ft and proposed to Sofia Tower ATCo to conduct visual approach for landing on RWY27. After Sofia Tower ATCo's clearance he performed landing approach for RWY27 and landed without any consequences.

1.1.2. Acceptance of duty by Sofia Tower ATC and RAC

The briefing of the ATCo has been conducted by the shift leader at ACT according to the technology established for ACT. After the end of the procedure for going to and off duty at 07:05, the new ATCo at Control Tower took the control of three aircrafts: BAe 146, taxiing for take-off from RWY27; B 737 at landing approach for RWY27; B 737 taxiing for RWY09. At the same time the ATCo controlled at Network No 14 the vehicle of ICC, conducting inspection of RWY.

The briefing of the radar approach ATCo has been conducted by the shift leader at RC of Sofia ATS according to the technology established for radar approach air controller WS for RC of Sofia ATS. After the end of the procedure for going to and off duty at 07:03:47, the new radar approach ATCo during the period from 07:03:47 till 07:20:00 controlled three aircrafts: A320, taken-off from Sofia Airport and going to AF GODEK; B 737, descending and vectored for landing on RWY27 at Sofia Airport; BAe 146, taken-off from RWY27 at Sofia Airport in continuous climb to AF GODEK.

1.1.3. Acceptance of duty by air dispatcher at ICC department at Sofia Airport

On the base of an order of General Director of CAA the air dispatcher of ICC should inspect the operational readiness of the airfield before acceptance of duty.

At 07:02:30 the inspecting air dispatcher requested permission from acting ATCo at Sofia Tower to come out to the maneuvering area along TWY "N", "Q", "H", "A" up to the line-up for runway inspection. At 07:05:27 the air dispatcher reported to the just entered on duty ATCo that he was at line-up and requested permission for runway inspection. He was cleared by Sofia Tower ATCo and the ICC vehicle went to RWY and the air dispatcher started the visual check. At 07:09:50 the inspection of RWY was ceased because of taxiing airplane for take-off from RWY27. At 07:12:03 the air dispatcher requested to proceed with runway inspection in direction 27-09, he was cleared by Sofia Tower ATC and at that B 737 airplane, flight number LZB2472 went around in order to avoid collision with ICC vehicle.

1.2 Injuries to Persons

No injuries as a result of the aviation occurrence.

1.3. Damage to Aircraft

No damages on the aircraft.

1.4. Other Damages

No other damages.

1.5 Personnel Information

Because of the character of the aviation occurrence the personnel information is related mainly with ATS personnel.

1.5.1. ATCo at Air Traffic Services Regional Center, shift leader at ACT - aged 51, with valid license and medical certificate.

1.5.2. Flight control officer at WS at ATS body, ACS ATC at Sofia ATC RC – aged 52, with valid license and medical certificate.

1.5.2. Flight control officer at WS at ATS body, ACS ATC at Sofia ATC RC – aged 54, with valid license and medical certificate.

1.5.4. Flight control officer at WS at ATS body, ACS ATC at Sofia ATC RC – aged 41, with valid license and medical certificate.

1.5.5. Flight control officer at WS at ATS body, ACS ATC at Sofia ATC RC – female, aged 30, with valid license and medical certificate.

1.5.6. B 737 aircraft commander – aged 54, with valid license and medical certificate.

1.5.6. B 737 co-pilot – aged 30, with valid license and medical certificate.

1.6. Aids to navigation

In the day of the aviation occurrence the following aids to navigation has been in operation: VOR, ILS, NDB, DME and their functioning wasn't related with the occurrence realization.

1.7. Communications

Communication before, during and after the aviation occurrence has used the following operational frequencies:

- Sofia Tower – 118.1MHz;
- Sofia Radar (Approach WS) – 123.7 MHz;
- Network 14 of ICC at Sofia Airport - 121.825 MHz.

On the 15.07.2007 ATC SE submitted to AAIU a record of radio exchange of Sofia Tower frequency 118,1 MHz, Sofia Radar 123,7 MHz, radio network No 14 and intercom between the two working stations at the moment of the aviation occurrence.

1.8. Airport

Coordinates of Sofia Airport's reference point: N 42°41'42" and E 023°24'30". Elevation is 531.7 m. A new runway is introduced in operation 091⁰ and 271⁰ (designated as 09/27), 3600m long and 45m wide. The new runway is displaced to the east regarding the old

one and the coordinates of thresholds are for **09** N42°41'51,05" and E 023°23'58,50"; for **27** N42°41'42,38" and E 023°26'22,99", and this has changed the operational conditions.

A new terminal - No 2 has been commissioned. It is situated in such a place that it hides about 320m from the eastern end of RWY in the observation and visibility sector of Sofia Tower ATC. The whole area to the east of Terminal No 2 in the observation and visibility sector of Sofia Tower ATC from 072° to 086°, including telescopic walkways No 1, No and No 3, parking No4A и No 4B, whole TWY L and about 1000m of TWY H are not observable visually by Sofia Tower ATC.

The airport is operational with continued repair and construction works. At the moment of the aviation occurrence K, B and D taxiways has been closed. H TWY between the crossings with B TWY and C TWY has been closed, too. TWY H between the crossings with TWY C and TWY L has been also closed. TWY N between the crossings with TWY H and TWY Q has been closed. TWY J between the H inner middle holding position and crossing with TWY M has been closed. TWY J between the crossing with TWY B and the apron has been closed.

1.9 Flight data recorders

The following records of conversations have been listened to:

1. Radio exchange of Sofia Tower frequency 118.1 MHz.;
2. Sofia Radar at 123.7 MHz.;
3. Radio network No 14;

4. Intercom conversations between the two working stations at the moment of aviation occurrence. The records of these conversations have been submitted by ATC SE.

The general radar picture of the situation and the air traffic in the period of development and realization of the aviation occurrence has been analyzed.

The record of Flight Data Recorder (FDR) of the B 737 airplane also has been taken.

References have been made about the results of analyses of each of above mentioned records and the generalized radar picture. The references are enclosed to the deed on aviation occurrence investigation.

The analyses of information of these recorders confirmed the description of the occurrence given in Para1.1.1.

In the record of FDR of LZ-BOQ aircraft regarding the flight under consideration no collision emergency signalization „Resolution Advisory” of TCAS has been registered.

1.10 Wreckage and impact information

The occurrence has not led to aircraft destruction.

1.11 Medical and pathological information

Not performed because of the nature of the air occurrence.

1.12 Fire

No fire appeared.

1.13 Survival aspects

No emergency equipment has been used.

1.14 Tests and research

Inspections have been made at Sofia Tower working station, of the visualization system of aircraft movement on the maneuvering area of the airdrome and of the technical equipment used at ACT.

Decoding and analyses of records of radar, flight data recorder of LZ-BOQ aircraft, radio exchange of officials participating in aviation occurrence realized, as well of intercom exchange between the Sofia Tower and Sofia Radar working stations have been made.

1.15. Additional information

In order to help the work at Sofia Tower working station in conditions of deficiency of direct observation, ATC SE uses surface movement radar and additional visual observation system with 5 video cameras.

After commissioning of new RWY and new Terminal 2, new conditions of safety, management and control are present. The technology for Control Tower ACT WS is not updated in accordance with new operational conditions.

1.16. Organizational and management information

The activities of ATC SE, directly related with the flight safety at the moment of the aviation occurrence realization are regulated by two documents:

1. The Flight Safety Program for air traffic control of Air Traffic Control State Enterprise;

2. Safety Manual of ATC SE.

At the end of ATC SE signed a contract with Eurocontrol for support in the creation of the safety management system. In accordance with this contract as to the end of March 2008 the established Safety Management System should be in accordance with the European requirements of ICAO. Materials about developments under the contract haven't been given to the commission.

In Article 5, Para.3, of Regulation No 2096/05.12.2006 for conditions and order of issuing of certificate for supplying with air navigation services in the controlled civil airspace of Republic of Bulgaria is given that the persons candidates for air navigation services suppliers (ANSS) should submit an exemplum application to the General Director of CAA, with following enclosures:

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6. Safety Management System;

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9. List of manuals and generalized report on them;

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It is not clear what should be enclosed to item 6, the stated above document or description of the safety management system.

For item 9 it is not clear what kind of working manuals are required, is the ATC SE Safety Manual included and the requirements of Article 3 of Regulation 2096/2005 of 25.12.2005 are not fulfilled, because from the generalized report on working manuals for the national supervising authorities at CAA it is impossible to determine the conformity of ANSS to the general requirements. It is expedient these manual to be approved by CAA.

The stated under number 1 above Flight Safety Program for air traffic control of Air Traffic Control State Enterprise has been developed in 2004 and it is approved by CAA. The title of this program is not in conformity with the requirements of Article 21 and the content of item 3 of the same article of Regulation No 16/27.01.1999 on air accidents investigation. The flight safety requirements are mentioned in the program, without description of the ways

for realization of these requirements. The program hasn't been updated in relation with ICAO Accident Prevention Program published in 2005.

Flight safety management system in ATC SE is described in ATC SE Safety Manual. The commission has made the following ascertainties regarding the content of this manual:

- The manual is not approved by CAA;
- There is no list of the risk factors, related with the changes in Sofia Airport infrastructure.
- The requirement of Article 8 of Regulation No13/27.01.1999 on immediate report to AAIU in case of accident or serious incident with civil aircraft by using of the most convenient and fast communication means is not included.
- The requirement for reporting of aviation occurrences in relation with Directive 2003/42/EU, reflected in Art. 22 of Regulation No13/27.01.1999.

In relation with the safety management system functioning, the Safety Control Activities in 2007 Schedule has been presented to the commission, which is most likely a replacement of the mentioned in Para1.2.3.4.2 of the Manual Safety Promotion Plan and the mentioned in Para5.5.2 Annual Plan for Control Activities on Safety. In Para 5.5.2 of the Annual Plan for Control Activities on Safety of ACT SE it is written that the Annual Plan should be approved by the General Director of ATC SE, but the schedule submitted has been approved by the Director of the Safety Directorate. The safety control activities consisted in inspections, checks and observations. Ten inspections have been planned according to the schedule - 5 inspections in months of April and October. No reports and check lists from the inspections have been submitted to the commission. Five check lists for checks conducted - 4 in May and 1 in August - have been presented to the commission. There were no reports about the observations on the safety. The schedule doesn't foresee any control activities related with ATC SE in conditions of changed infrastructure of Sofia Airport.

2. Analysis

The aviation occurrence is a result of objective existent facts and circumstances and subjective omissions and violations.

2.1. Objective facts and conditions

Facts and circumstances, related with commissioning of the new RWY and new terminal at Sofia Airport are present. These circumstances create new conditions and requirements for safe work. At the same time they complicate the execution of functional obligations of the Tower ATCo, who works at the old tower.

The ICC vehicle has stopped at the end of TWY E, which is outside the visibility area of Tower ATCo WS.

The commission has discovered difficult for the ATC to control visually the aircraft's and vehicle's movement on the maneuvering area of the airdrome without technical equipment.

The technical equipment used by Tower ATCo for execution of his functional obligations consists of:

1. Communication equipment

During the work the planning ATCo at Tower WS is controlling the movements of aircraft and all transport vehicles on the maneuvering area of the airdrome, as well the aircraft movements at Lesnovo Airfield in the area of responsibility of Tower ATC at Sofia Airport. For this he should maintain radio communications with the respective objects at three different frequencies:

- 118.1 MHz, for communications between Tower ATC and aircraft on the maneuvering area of the airdrome till their change-over to Approach ATC (after take-off);
- Network 14 frequency(121.825 MHz), for vehicle control on the maneuvering area of Sofia Airport;

- Lesnovo Airfield frequency (400 MHz) for communication between Tower ACT and aircraft operating in circling and flight maneuvering area at Lesnovo Airfield.

There is an internal telephone line between Tower WS and Approach.

Two objects have been participating in the aviation occurrence – B 737 airplane, reg. No LZ-BOQ, which has been in contact with Sofia Tower at 118,1 MHz and conducting final approach to RWY27 and a Toyota vehicle of ICC, conducting inspection of RWY27, that has been in contact with Sofia Tower at Network 14 frequency.

2. Surface movement radar.

The surface movement radar has been commissioned at Sofia Airport by an order No 46 of 17.02.2000 of the Director General of CAA.

ATC SE presented to the commission Radar Operational Conformity Certificate No PC – 161 of 02.03.2006 and a Quality Certificate No 006/25.10.99, a report for factory acceptance trials of 27.10.1999, a report for receiving and acceptance tests of 18.10.1999 and a report for execution of 72-hours operational tests of 10.01.2001.

The commission determined:

- The radar has no full coverage of the entire airdrome maneuvering area .
- The working schedule of the radar has shown that during the aviation occurrence the radar has been working.

3. Video observation system.

In accordance with Doc 9426/1984 of ICAO at Tower working place is allowable to support ATCo by the use of such a system. The video system is the only possibility for visualization of the part of airdrome maneuvering area and the part of RWY, hidden from Tower ATCo's view. As to the day of occurrence it hasn't been commissioned. Afterward it has been commissioned by a different order of Director General of ATC SE. Operation and maintenance manuals for the system have been approved.

There is a section of TWY L, which is not covered by video observation system during the aircraft ground movement for 6 seconds with an average taxiing speed of 30 km/h.

During the investigation the commission has established that from ergonomic point of view the working place of Tower ATC has the following disadvantages:

- The screens of auxiliary video system cameras are placed at high and right-hand position of the ATCo's view. When observing them, ATCo cannot observe the maneuvering area and the radar.

- The radio terminals of Lesnovo Airport and Network 14 are placed low in the middle between the ACT and the assistant and he should move in order to use them when necessary. It additionally detracts Tower ACT attention.

The described above shows that the Tower ACT work is conducted in complicated conditions and increased risk of loss of control over aircraft and vehicles on airdrome maneuvering area, especially in cases with heavy traffic and bad visibility.

The commission has established that the ICC vehicle conducting inspection of RWY 27 has been at Network 14 frequency and because of this the air dispatcher from ICC, conducting RWY inspection, hasn't been informed about the landing clearance for RWY27 given to B737 aircraft.

Frequency 118.1MHz is listened to at the ICC building at Sofia Airport. At the same working place there is no contact at Network 14 frequency in order to prevent ICC dispatcher to interfere in the control of ground means. This control is conducted by the Tower ATCo only. That's why the ICC dispatcher is not able to warn by the radio the air dispatcher conducting RWY inspection about landing or taking-off aircraft.

2.2 Subjective factors

2.2.1. ATCo

ATCo at working station Sofia Tower should control the movements of aircraft and ground vehicles on the maneuvering area of Sofia Airport on the ground of Art. 38, item 8, Section One of Sofia Tower, Sofia Approach and Sofia Control Air Traffic Servicing Technology.

In relation with the aviation occurrence the commission has analyzed the following aspects related to the ATCo at Tower working station:

On the 15.07.2007 at 07:04:00, after on duty briefing and after procedure for going to and off duty, Tower ATC entered in duty after introduction in the situation by the previous shift. At 07:05:07, the BAe 146 crew reported ready for taxi. Tower ATCo cleared taxi through J, M, L, H taxiways to the holding point of RWY 27. At 07:05:27 h Tower ACTo cleared ICC vehicle to inspect airfield and at the same time informed him that BAe 146 aircraft had already started to taxi for RWY 27. At 07:09:50 h the air dispatcher reported from ICC vehicle that he had cleared runway at TWY E. Tower air controller established this by checking the clearance of the runway using surface movement radar. After BAe 146 taking-off at 07:11:12 the air dispatcher in ICC vehicle had no information about the landing aircraft and requested to continue the RWY inspection at 07:11:56 h. Tower air controller permitted at 07:12:03 h to continue inspection. At 07:11:55h Tower air controller cleared landing for B 737 aircraft and at 07:12:04h the aircraft crew confirmed landing clearance on RWY 27. At 07:12:26h the crew reported presence of a vehicle on the RWY and took decision independently for going around. Tower ATCo after coordination with radar air controller proposed to aircraft crew to deviate to right and with left-hand turn to joint the circle for landing on RWY09, which is in contradiction with the go-around chart at Sofia Airport. Because of this, the B 737 crew two times requested Tower ACT and requested once more confirmation for landing on RWY09. Right after the second request Tower ATCo proposed to the aircraft crew to perform right-hand turn according the chart for landing on RWY27. At the same time B 737 aircraft crew has already taken independently decision and performed such maneuver to avoid dangerous closure with BAe 146, which was visible on the TCAS screen. Tower ACTo didn't inform B 737 crew for the BAe 146 aircraft and didn't redirect it for control under Approach ATC. By this the technology of air traffic servicing has been violated. As a result of this violation a reducing the horizontal separation to 2,8 NM between B 737 and BAe 146 has been made, with the two aircrafts climbing in the same direction, but under control of two separate working places.

After the request of the on duty air dispatcher to continue inspection, Tower ATC cleared it. In the following radio exchange between the Tower ACT and the air dispatcher after the B 737 go around, Tower ATCo explained to the air dispatcher that he had understood that the air dispatcher wanted to proceed the inspection on the taxiways. After the listening of the radio exchange at the frequency of Network 14 it was clear for the commission that the air dispatcher has requested permission to continues inspection of RWY, but not taxiways. Such clearance might be explained with insufficient concentration of Tower ATCo after receiving of the air and ground situation from the previous shift.

On the base of the listened records and written explanations of tower ATCo the commission has established that the procedure for going to and off duty between the two shifts has been performed formally in the frame of 2-3 minutes and the it hasn't been conducted in full. During the procedure for going to and off duty between the two shifts no familiarization and introducing with the situation has been performed about movements of aircraft and vehicles on the maneuvering area of the airdrome.

The commission has established that as to the moment of aviation occurrence the entire shift was present at Tower working station, but the shift leader was absent. The ATCo

of the previous shift also was absent, which led to incomplete information of working ATCos of the shift.

On the base of the research the commission has established that at Tower working station there is fluctuation of the personnel, which is the reason for lack of sufficient experience for part of the personnel in factual need of work in complicated situation after commissioning of the new RWY and new terminal.

Radio exchange and telephone conversation between Tower ATC and Approach ATC are given in Enclosure No 3.

2.2.2. Crew

The crew of B 737 airplane conducted flight from Madrid to Sofia under flight No LZB2472. At 06:58:10 the crew reported to the Approach ATC that is approaching control point NISVA at flight level 210. The aircraft has been identified by radar and it was cleared to descent to FL150 by Approach ATC. After overflying NISVA CP Approach ATCo cleared the crew to follow VOR SOF for radar vectoring and conducting a final approach by ILS/DME for RWY27. Approach ATCo has given at 07:01:04 instruction to the crew to descent down to 9000 ft by QNH 1024 and to keep this altitude because of taking-off traffic from RWY27. After the change of shift at ATC at 07:03:47 the new Approach ATC gave instruction to the aircraft crew to proceed in the same heading. Approach ATC at 07:05:42 cleared the crew to continue the descent down to 7000 ft by QNH 1024. At 07:06:38 the aircraft crew requested further descent down to 4000 ft and was cleared for this. The crew was asked at 07:08:52 h, by Approach ATCo about his readiness for approach and after confirmation Approach ATCo cleared left-hand turn to heading 280⁰ and asked to report ILS interception on heading. The crew reported at 07:10:32 interception of ILS for RWY27. Approach ATCo informed the crew that it is at a distance of 5 nm from touchdown point and advised the crew to establish contact with Tower. At 07:10:41 the crew established contact with Tower ATCo and reported having intercepted ILS 27 and at a distance of 5 nm from touchdown point. The aircraft crew was cleared for landing by Tower ATC. At 07:12:26 the aircraft crew saw a vehicle on the RWY and reported to Tower ATCo. At 07:12:29 the crew took independent decision for a go around, started climbing and followed the go-around procedure. The aircraft crew observed on the TCAS display an aircraft flying in the same heading in climb regime. At 07:13:22 the aircraft crew was ordered by Tower ATCo to go around by a right-hand turn and after that to join the base leg of circling for RWY09. Tower ATCo didn't specified flight heading and altitude. The aircraft crew estimated that dangerous closure with the other aircraft was possible, limited the climb at 4000 ft in visual flight conditions and started right-hand turn to heading 090⁰, proposing to Tower ATC to conduct landing approach for RWY27 by right-hand visual circling. After confirmation from Tower ATCo the crew conducted landing approach for RWY27 and at 07:20:00 landed.

On the base of the facts described and explanations of the participants in the aviation occurrence the commission established, that:

- aircraft crew has acted timely and properly in the created situation endangering the flight safety, taking independently a proper decision for the go around;
- the aircraft crew adhered to published in Air Navigation Information Publication (AIP) of Republic of Bulgaria go-around procedure;
- the aircraft crew has taken into account fast reducing of horizontal separation with the BAe 146 taken-off and proposed to Tower ATC a correct for the case decision for landing on RWY27 at Sofia Airport.

The radio exchange between the aircraft crew and Tower ATC are given in Enclosure No 1.

2.2.3. Senior air dispatcher at Information and Coordination Centre

On the base of Art. 166 of Civil Aviation Act, Art. 6, Para. 1, Para. 2 of Structural Regulation of CAA, in relation with increasing of frequency of incidents in aircraft servicing at international airports and the need of strengthen of control on airfield maintenance and airport operators, by order No 45-01-320/20.09.2005 of Director General of CAA air dispatchers at ICC department have been appointed in order to conduct control functions related with maintenance of airfield in operational usability. The list of ICC employees authorized to conduct inspections of airfield has been updated on 30.12.2005 by the head of department of ICC. The senior air dispatcher of ICC department who has conducted inspection of the airfield, is included in this list and authorized for this.

He has gone on duty at the same time when the shifts at ACT and Sofia ATC RC. At 07:02:30 he requested clearance by Tower ATCo to pass through N, Q, H, and A taxiways for runway inspection. After Tower ATCo's clearance he started the runway inspection in direction 09-27. During the inspection the air dispatcher has been warned by Tower ATCo for an aircraft taxiing for take-off from RWY27, which forced him to cease inspection and clear the RWY. After the end of inspection in 09-27 direction the air dispatcher started inspection in 27-09 direction and cleared RWY at E taxiway, reporting to Tower ATCo. After the aircraft took-off he requested to proceed with RWY inspection. After the clearance by Tower ATC he continued inspection in 27-09 direction. During the inspection B 737 airplane conducted go-around and flew over the vehicle. After the end of the inspection the ICC vehicle cleared the RWY at A taxiway.

In accordance with the requirements of Regulation No 14/29.09.2000 and Airport Sofia Management and Operation Manual the runway inspection should be conducted in direction opposite the used for take-off and landing. This requirement has been violated by the senior air dispatcher during the RWY inspection in 27-09 direction.

Radio exchange between the ICC radio dispatcher and Tower ATC are given in Enclosure No 2.

On the base of stated above the commission has made the following **conclusions**:

1. The situation at Sofia Tower WS with a view to change of shifts at ACT at the moment of the aviation occurrence assumes omissions by Tower ACT in control of aircraft and ground vehicles on the airdrome maneuvering area.
2. Tower ATC works in complicated conditions at his working place and is restrained to follow visually the aircraft and vehicles on airdrome maneuvering area of Sofia Airport.
3. Tower ATC gave clearance to senior air dispatcher to go to RWW 8 seconds after giving landing clearance to B 737, which is evidence for insufficient concentration of Tower ATC.
4. The air dispatcher conducted the second inspection in direction of landing traffic in violence of safety requirements.
5. Approach ATC has issued instructions, which has complicated situation after the aircraft going around.
6. After Tower ACT receiving of instruction by Radar ATC to direct the aircraft by left-hand turn for RWY09, he failed to give the aircraft altitude to the place of climb and to inform it about the type of approach.
7. Initially advised approach by Tower ATC and coordinated between Tower ATC and Approach ATC for landing on RWY09 is not adequate to situation emerged and might complicate it additionally.
8. ATC hasn't informed the air dispatcher for incoming landing traffic before giving clearance for inspection.

9. ATC at Tower WS hasn't used the standard radio exchange when communicated with air dispatcher from inspecting ICC vehicle.
10. Wrong distribution of obligation between Tower ATC and the assistant during the work at ACT and lack of attention by Tower ATC on control of vehicles on airdrome maneuvering area in complicated situation of visual observance.

3. Conclusion

The technical investigation conducted, the results of examination and analysis give the grounds to the commission to show the following

Main cause for serious incident origination:

Incomplete and incorrect assessment of situation and wrong actions of Tower ATCo, that led to presence of a vehicle on the RWY after landing clearance had been given.

Contributing Factors:

1. Non-observance of procedure for exchange of on duty teams, which should ensure possibility for introduction with the situation.
2. Working station at Sofia Airport Tower is not adequate to the new infrastructure of Sofia Airport, what creates real conditions for increasing of risk level during the management of movements on airdrome maneuvering area.
3. Violated inspection procedure by ICC air dispatcher inspecting RWY.
4. The work in complicated conditions is related with:
 - commissioning of new elements in the airdrome infrastructure;
 - insufficient efficiency of distribution of functions between the assistant ATC and Tower ATC.

4. Safety recommendations

1. ATC SE to develop and introduce effective procedure ensuring possibility for detailed introduction in the situation for the new working shift. For this purpose it is necessary to provide a period for introducing in the actual situation.
Time: 1 month after handing in the report.
Person responsible: General Director of ATC State Enterprise
2. ATC SE to conduct analysis with all the personnel about the coordination between the Tower ATC WS and Approach ATC WS, which has led to the serious incident during the situation.
Time: 10 days after handing in the report.
Person responsible: General Director of ATC State Enterprise
3. ATC SE to develop working procedure for ACT WS for control of aircraft and vehicles in the visual and technical observation of the part of maneuvering area at Sofia Airport.
Time: 1 month after handing in the report.
Person responsible: General Director of ATC State Enterprise
4. ATC WS to develop Air Accident Prevention and Flight Safety Program, in accordance with requirements of Art. 21 item 3 of Regulation No 13/27.01.1999 on Air Accident Investigation of the Minister of Transport
Time: 2 months after handing in the report.
Person responsible: General Director of ATC State Enterprise

5. The schedule of implementation of controlling activities on safety in ATC SE should be approved by the Director General and to include inspections, checks and observations.

Time: Constantly.

Person responsible: General Director of ATC State Enterprise

6. CAA should order the ICC vehicles conducting inspections of RWYs, to listen the Tower frequency at all international airports of Republic of Bulgaria.

Time: 2 months after handing in the report.

Person responsible: Executive Director of MD CAA.

7. CAA should order implementation of a system for recording of radio exchange of ICC at all international airports of Republic of Bulgaria.

Time: 2 months after handing in the report.

Person responsible: Chief Director of CAA.

On the base of Art.19, Para.7, item 2 of Regulation No 13/27.01.1999 all organization to which safety measures have been sent in the final report on investigation, should notify AAIU and CAA about the measures taken and the time of their implementation.

Enclosure: № 1: Radio exchange between Tower ACT and aircraft crew.

Enclosure No 2 Radio exchange between Tower ATC and ICC air dispatcher on Network 14.

Enclosure No 3 Telephone conversations between Tower ATC and Approach ATC (HOT LINE)

ENCLOSURE No 1

Radio exchange between Tower ACT and aircraft crew.

ATC – ATCo at Tower working station

FB – Crew of LZ-BOQ, conducting flight LZB2472 with call sign FB – Flying Bulgaria 2472

FB: „Sofia, good morning, FB 2472, following ILS 27, five to run”.

ATC: „FB 47 ...2472, good morning, continue approach 27, expect landing clearance”.

FB: „Continue 2472”.

„Lufthansa”: „Sofia tower, Lufthansa 2UP.....”

ATC:

ATC: „FB 2472 wind 060/4 kt, clear to land 27”.

FB: „Clear to land 27, FB 2472”.

ATC: „Lufthansa 2UP...”

„Lufthansa”:

FB: There is a vehicle on the runway.... Going around”.

ATC: „Copied ”.

ATC: „FB 2472 execute missed approach with right turn to join base leg for RWY 09 with left turn”.

FB: „With right-hand, or with left-hand turn?”.

ATC: „FB 2472 report turning base leg RWY 09”.

FB: „Confirm base leg for RWY 09, or for RWY 27, FB 2472”.

ATC: „FB 2472, if you prefer clear with right turn base leg 27”.

FB: „Right turn, turning now to heading 091 for downwind RWY 27, FB 2472”.

ATC: „Flying Bulgaria 2472 report turning base leg 27”.

FB: „Will do”.

FB: „Turning base FB 2472”.

ATC: „FB 2472 report short final 27”.

FB: „Roger”.

„Lufthansa”: „Lufthansa 2UP...”

FB: „Final, ready to land FB 2472”.

ATC: „FB 2472 wind 060/3 kt, clear to land 27”.

FB: „Clear to land 27, 2472”.

„Lufthansa”...FB: „Confirm clear to land 2472”.

ATC: „Affirmative 080/3 kt”.

„Affirmative 080/3 kt”.

ATC: „FB 2472 vacate via „C””.

„FB 2472 vacate via „C””.

FB: „Via „C”, 2472”.

Via „C”, 2472”.

FB: „FB 2472 confirm OQ..”.

„FB 2472 confirm OQ..”.

FB: „Affirme”.

ATC: „FB 2472 now taxi to the apron, follow the marshal. Have a nice rest.

FB: Thank you.

FB: „Sofia, what aircraft took-off from the runway before we going around?”

ENCLOSURE No 2

Radio exchange between Tower ATC and ICC air dispatcher on Network 14

T- Senior air dispatcher of ICC inspecting RWY with Toyota call sign ATC – ATCo at Tower working station

T: Tower to Toyota

ATC: Most attentively

T: For landing?

ATC: After 20 minutes.

T: Tower to Toyota

ATC: Toyota, Tower is hearing.

T: Good morning, it's a doctor, „N”, „Q”, „H”, „A” to holding point is possible?

ATC: Toyota, you are cleared to holding point.

T: Roger, to holding...

T: Tower to Toyota, Alfa holding point.

ATC: For inspection?

T: Waiting for clearance for inspection.

ATC: OK, doctor.

T: May I go?

ATC: Yes, go, consider one Jumbolino [BAe 146 aircraft] is starting to taxi for 27.

T: Copied.

T: Tower to Toyota, runway cleared at Eco...

ATC: Copied.

T: Tower to Toyota, may I proceed runway inspection?

ATC: Go on

T: Roger, going.

ATC: FOLLOW ME, where are you, Toyota to Tower?

T: Toyota is listening.

ATC: Where are you?

T: On the runway, you cleared me, aren't you?

ATC: Doctor, I've told you up to you told me you would proceed on taxiways.

T: I've told to proceed with runway inspection and you told me "go on"!

ATC: Copied.

T: Tower to Toyota

ATC: Hearing.

T: Toyota, I've cleared runway, here is cleared.

ATC: Toyota -3 to Tower.

T: Hearing.

ATC: You are a group there in charge ... for November

T: Group?

ATC: Let you clear for an aircraft to go by you.

T: Copied.

T: I'll wait here on N.

T: Telescopic walkway No 10 to FOLLOW ME.

ATC: Roger, telescopic walkway.

ATC: Toyota from N, you may proceed your job.

T: Roger, thanks.

ENCLOSURE No 3

Telephone conversations between Tower ATC and Approach ATC (HOT LINE)

Radar ATC: OK, but tell him to repair the transmitter, it's whistling when pushing the button.

Tower ATC: Yes, at the beginning it was whistling, after that was OK, now started again...

...

Tower ATC: Al Italia 523 took-off.

Tower ATC: Flying Bulgaria 851 is going, take-off in 27.

Radar ATC: OK.

Tower ATC: 851 took-off.

Radar ATC: Thank you.

Tower ATC: In seconds I'm clearing engine start for Speedbird 893 from 27 Godek 2, 8000 ft.

Radar ATC: OK.

Tower ATC: In two minutes go, 25 is taking-off...

...

Tower ATC: Speed 893 took-off and Flying Bulgaria 461 is starting engines, 27, Godek, 2 eco, 170

...

Tower ATC: ...461 is going, taking-off.

Radar ATC: OK. Any incident with these ... landing?

...

Tower ATC: 461 took-off.

Radar ATC: OK.

Tower ATC: Go-around 0...4...2472, how do you want it?

Radar ATC: Repeat!

Tower ATC: Going around 2472

Radar ATC: E-er... the German clear him, now...!

Radar ATC: Give from 27, now...!

Tower ATC: „UP”, start of taxiing for 09 and Godek, 2, uniform 2.

Radar ATC: Copied.

Radar ATC: Why happen so, did you know....?

Tower ATC: I knew, because the doctor went to the runway without asking, without e-er...clearance.

Radar ATC: Now you should ask him... and to tell me,did you record the time of going around or all only.....?

Tower ATC: Will ... arrange it.....”

Tower ATC: „LH” is going and ... take-off.

Radar ATC: Copied.

Tower ATC: LH took-off.

Radar ATC: Copied.

Radar ATC: Change to frequency....!