FINAL REPORT Nr.4/2009

OF THE AIRCRAFT SERIOUS INCIDENT

INFRINGEMENT OF SEPARATION STANDARDS DURING GOING AROUND BETWEEN THE AIRBALTIC AIRCRAFT BOEING 737, YL-BBX, FLIGHT BTI3G2 AND DEPARTING AIRCRAFT SMARTLYNX AIRBUS A-320, YL-LCD, FLIGHT ART531 IN THE TERMINAL CONTROL AREA OF RIGA INTERNATIONAL AIRPORT ON FEBRUARY 13, 2009

The Transport Accident and Incident Investigation Bureau of the Republic of Latvia is a governmental, independent of all aviation authorities' organization, established by law to investigate and determine the cause or probable cause of accidents and serious incidents that occurred in the civil aviation, as well, if necessary for enhancing flight safety, incidents.

The sole purpose of such investigation is, to prevent accidents and incidents and, if the Bureau finds it appropriate, to issue safety recommendations. The term is in accordance with Annex 13 of the Convention of Chicago, as well as the Directive 94/56/EC of 21 November 1994, establishing the fundamental principles governing the investigation of civil aviation accidents and incidents of the Council of the European Union. The purpose of an investigation conducted under the responsibility of the Transport Accident and Incident Investigation Bureau Republic of Latvia is not to apportion blame or liability.

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Abbreviations

ATCC - Air Traffic Control Centre
ACC - Area Control Center
ATRACC - ATC System for Riga Area Control Centre
A-SMGCS - Advanced-Surface Movement Guidance and Control System
ACFT - Aircraft
SSR - Secondary Surveillance Radar
PSR - Primary Surveillance Radar
ARCC - Aeronautical Rescue Co-ordination Centre
ATC - Air Traffic Control
UTC - Universal Time Coordinated
UTA - Upper (Traffic) Control Area
CTA - Control Area
TMA - Terminal Control Area (ICAO)
TIA - Traffic Information Area
TIZ - Traffic Information Zone
AoR - Areas of Responsibility
CWP - Controller Working Position
Report RVSM - Reduced Vertical Separation Minimum
ODS - Operator input and Display System
APP - Approach
VOR - VHF Omni Directional Range
ILS - Instrument Landing System
DME - Distance Measuring Equipment
NM - Nautical mile
FT - Feet
MSL - Mean Sea Level
Z - Zulu = Universal Coordinated Time (UTC)
STAR - Standard Instrument Arrival
ESARR5 - EUROCONTROL Safety and Regulatory - Requirement on ATM personnel
FIR - Flight Information Region
UIR - Upper (flight) Information Region
FIS - Flight Information Services
ATS - Air Traffic Services
FPL - Filed Flight Plan (ICAO format)
RPL - Repetitive Flight Plan
HMI - Human Machine Interface
EHSI - Electronic Horizontal Situational Indicator
OSUP - Operational Supervisor
FAP - Final Approach Point
METAR - Meteorological Aviation Routine Weather
CAVOK - Ceiling and Visibility OK
VMC - Visual meteorological condition
SAR - Search and Rescue
CISM - Critical Incident Stress Management
SSR - Secondary Surveillance Radar
ESARR - Eurocontrol Safety and Regulatory Requirement
PANS-ATM - Procedures for Air Navigation Services-Air Traffic Management
STCA - Short-Term Conflict Alert
CTR - Control Zone
FL - Flight Level
RBPS - Radar Bypass System
ACFT - Aircraft

RVR - Runway Visual Range

ETD - Estimated Time Departure

ETA - Estimated Time Arrival

A-SMGCS – Advanced Surface Movement Guidance and Control System

Synopsis

Unless stated otherwise the time in this Report is UTC

On Friday, February 13, 2009, TAIIB (Transport Accident and Incident Investigation Bureau) received occurrence report from ARCC of JSC "Latvijas Gaisa Satiksme" – ACC - Air Traffic Service provider of the Republic of Latvia. ARCC reported about incident (separation minima infringement) that took place in the area of responsibility of aerodrome control TOWER at 08.52, involving a scheduled flight of airBaltic Corporation Boeing 737-300, registration YL-BBX, aircraft call sign BTI3G2 and SMARTLYNX a charter service flight, Airbus A 320, registration YL-LCD, aircraft call sign ART531. airBaltic was approaching into Riga International airport RWY36 during low visibility.

There was second air Baltic aircraft F-50, call sign BTI443 ahead, cleared to land and continuing landing to RWY 36, as well as third air Baltic aircraft call sign BTI34J, cleared to line up RWY 36 for take-off after F50 has landed. At the same time SMARTLYNX Airbus A 320 was approaching to holding point of RWY 36 and was cleared by Riga ACC aerodrome Tower controller to hold short of RWY 36. Tower controller cleared F-50, call sign BTI443 to vacate RWY 36 via TWY "C", but after landing F50 overran TWY C and for that reason took longer time on the RWY, as he needed to backtrack vacate via C.

After F50 reported RWY vacated, controller cleared the third air Baltic aircraft BTI34J for take off on RWY36. Approaching air Baltic BT13G2 at that moment was approximately 2-3Nm from the RWY and just then controller allowed SMARTLYNX Airbus A 320 to take-off. After that approaching FINNAIR FIN123 contacted Tower controller therefore Tower frequency 118.1 MHz has blocked for a while.

After there was communication misunderstanding between Tower controller and crew of airBaltic aircraft Boeing 737 call sign BTI3G2. The controller seemed that BTI3G2 noticed going around whereupon controller answer was "go around". The crew of BT13G2 respectively understood controller's answer as instruction to go around and started to go around from low altitude and low visibility. At that time departing Airbus A 320 ART531 was in the middle of RWY 36 and controller did not interrupt take-off.

When ART531 took-off and vacated RWY36, controller cleared Boeing 737, call sign BTI3G2 to land, whereupon BTI3G2 answer was negative because they started going around earlier. After that controller requested BT13G2 immediately to turn left to heading 270 as well as tried to stop climbing altitude and issued clearance to maintain 500FT, but at that time BT13G2 noticed that they have crossed over 1200FT and passed at 1500FT flight level. At this point BT13G2 saw the preceding Airbus A 320 ART531 on TCAS, the same altitude ~1nm in front. Air proximity with departing aircraft Airbus A 320 and Boeing 737 during go around was lost. At that moment controller issued instruction to stay at it altitude and after that Tower controller contacted Approach controller and notified that BT13G2 has flown at flight level 1500Ft and heading 270. Later Approach controller cleared BT13G2 to climb to 2500 Ft and gave vectors for the new approach to RWY36.

Notification

The Transport Accident and Incident Investigation Bureau of the Republic of Latvia was notified about the incident on Friday, February 13, 2009 by the duty officer of ARCC Riga, a structural part of LGS responsible for co-ordination of SAR operations within Riga FIR, Riga International Airport.

TAIIB Authorities evaluated the received information relevant to that case and initiated formal investigation into this serious incident, under the provisions of Annex 13 to the Convention on International Civil Aviation (Chicago 1944) and the Republic of Latvia Cabinet Regulation No 660, Adopted 25 November 2003.

1. FACTUAL INFORMATION

1.1. History of the incident

The time used in this investigation report is Universal Time Coordinated (UTC) that on the date of the incident was Latvian local time minus 3h.

There were bad weather conditions on February 13, 2009 at 08:00 UTC in the Riga International airport – varying RVR and fog. Arriving aircraft began to accumulate at the vicinity of an aerodrome, flying in the aerodrome traffic circuit. Because aerodrome RVR had changed constantly, arrival aircraft tried to land and at the same time there were some departure aircraft.

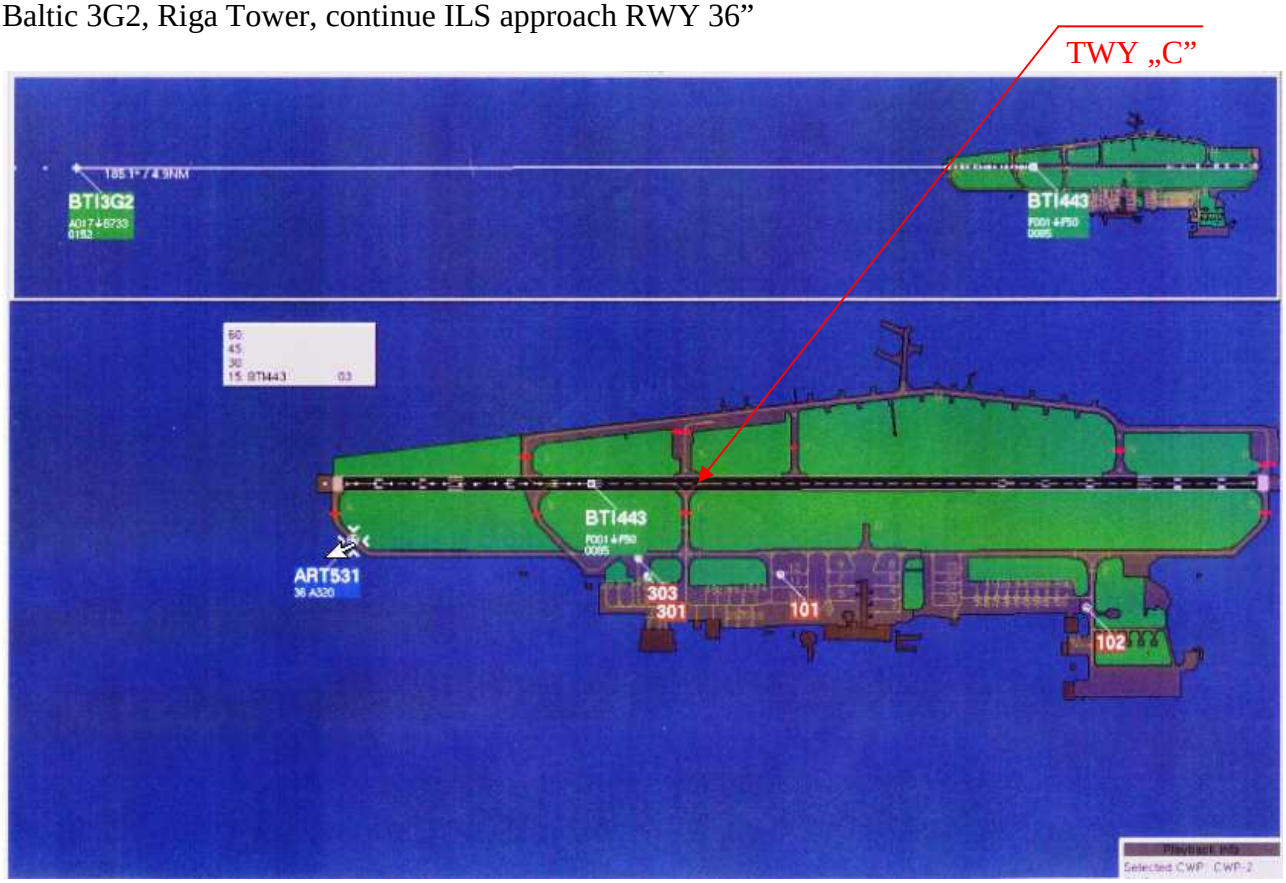
The two aircraft were directly involved in this incident in airport Riga International, respectively approaching airBaltic BT13G2 and performing Holding procedure before taking-off SMARTLYNX ART531. The influence of aircraft F-50, call sign BTI443 as well as BTI34J was indirect.

At **08.47.13** aerodrome control TOWER controller cleared BTI443 for ILS approach to RWY 36.

At **08.47.25** controller cleared BTI34J for take off from RWY 36 and told the crew to contact approach on frequency 127.3 after departure.

At **08.48.46** controller cleared BTI443 to land. At the same time SMARTLYNX ART531 contacted controller and reported approaching holding point RWY 36. Controller instructed ART531: “SmartLynx 531, Riga Tower, hold short of RWY 36 ” (Picture 1)

At **08.49.13** approaching airBaltic BTI3G2 contacted Riga Tower controller and reported: ”Riga Tower, Air Baltic 3G2 established ILS RWY 36.” Controller instructed crew BT13G2: „Air Baltic 3G2, Riga Tower, continue ILS approach RWY 36”



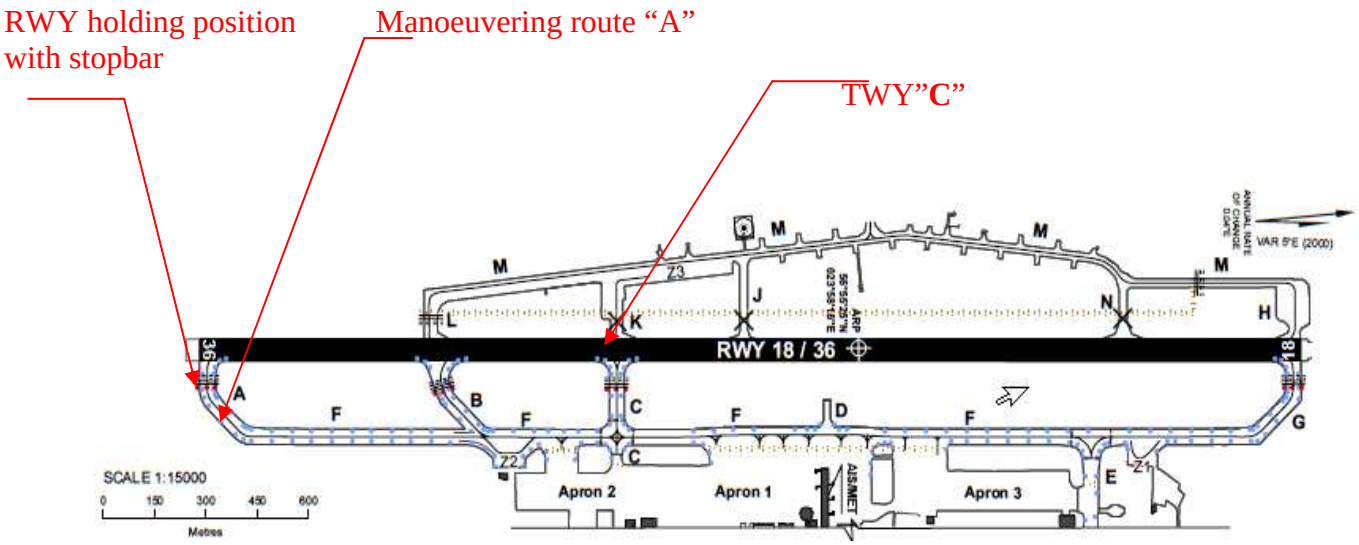
Picture 1 Radar map- Situation plan after BTI443 landing

At **08.49.33** controller asked:" Baltic 443 will you vacate via TWY C?" The crew Baltic 443 answered:" Affirm "C" 443."

At **08.49.42** controller instructed BT13G2:" Baltic 3G2, please reduce to minimum approach speed until 4 miles final." At that moment BTI443 was approximately 6 NM ahead BTI3G2.

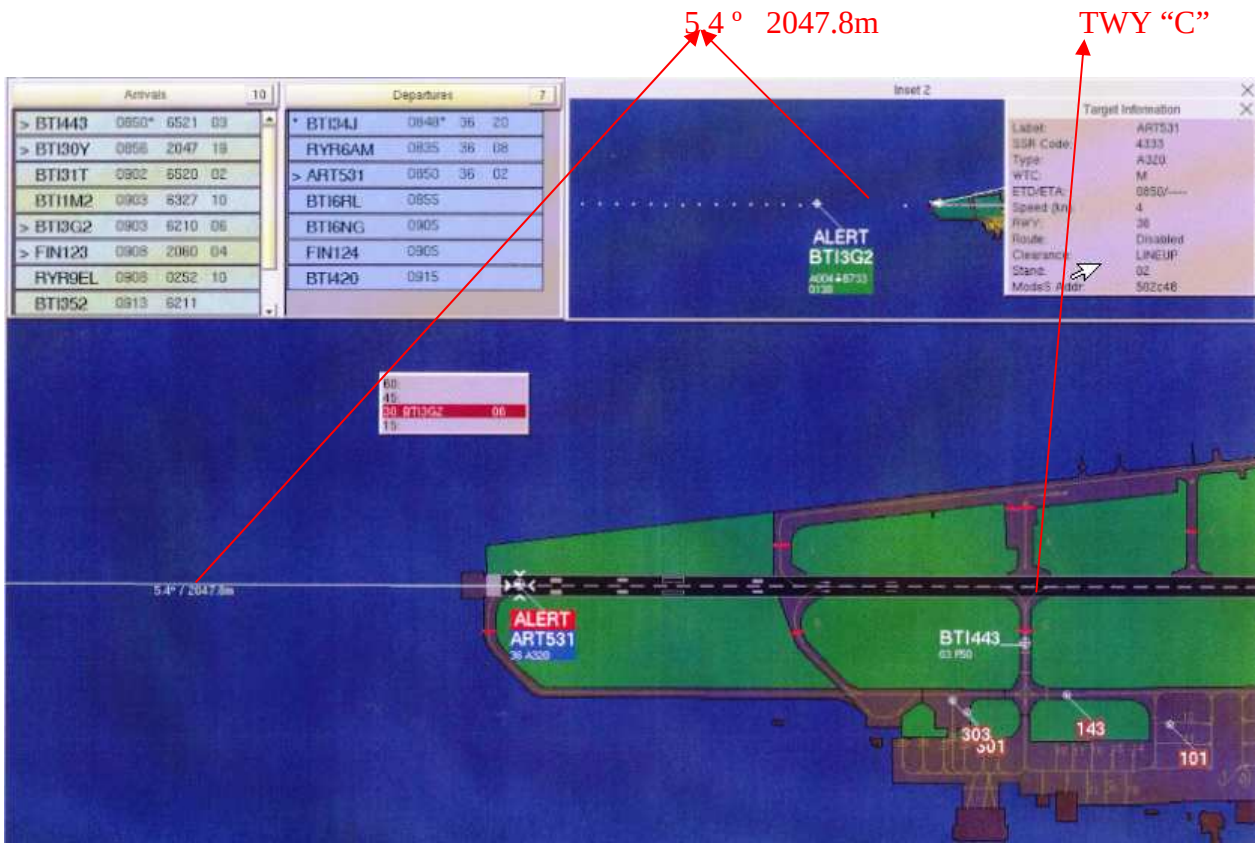
At **08.50.02** controller contacted SMARTLYNX ART531 and informed: "Smart lynx 531, please advise, if ready for immediate departure, traffic N2 is 7 miles final, Boeing 737". The crew of ART531 affirmed: "I will be ready for immediate departure, Smart lynx 531"

At **08.50.40** controller cleared SMARTLYNX ART531: "Smart Lynx 531 line up RWY 36 and wait" (Picture 4) as well as instructed BTI443 to vacate to the right via TWY "C" and told the crew to contact Ground on 118,8." (Picture 2)



Picture 2 Aerodrome ground movement chart

Picture 3 Radar map- BTI443 overrun TWY "C



Picture 4 Radar map- SMARTLYNX ART531 Clearance "Lineup, A-SMGCS "ALERT""

At **08.50.40** BTI443 has landed and overran TWY C, because crew answered controller: "118,8 via C, Baltic 443, we have to go back track very quickly to 5 second...(unreadable)" and for that reason BTI443 took longer time on the RWY. Controller answered: "Affirmative, back-track approved."

At **08.51.47** BTI443 has vacated RWY36 and declared to controller: "Air Baltic 443 is clear." (see Picture 4).

At **08.52.03 controller cleared SMARTLYNX ART531: "Smart lynx 531 RWY 36, cleared for take-off, after departure contact Approach on 127,3".**

The crew approved clearance: "Cleared for take-off RWY 36, when airborne on 127,3, Smart lynx 531".

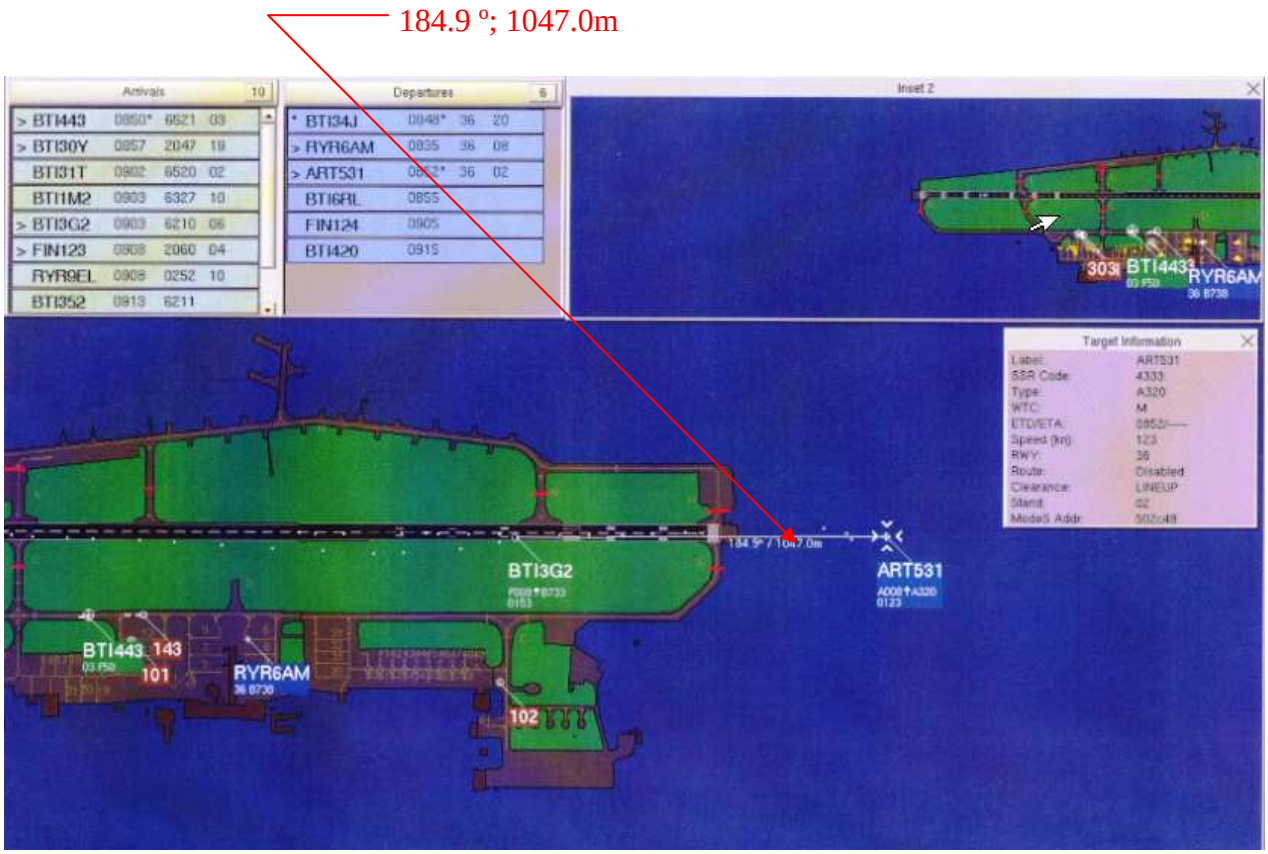
After a while at **08.52.16** Finnair 133 contacted Tower controller and declared: „Good morning Riga TWR, FINAIR 133 localizer established 36". Controller cleared Finnair 133:" FINNAIR 133, Riga TWR, continue approach RWY 36", respectively for that reason frequency 118.1 was blocked for a while (from **08.52.16** to **08.52.43**), because BT13G2 could not communicate with Tower controller.

At **08.52.43** BTI3G2 contacted Tower controller and spoke distinctly:"3G2 ... (further unreadable". After listening communication records, in investigator's minds it sounds as „stayed over main...", whereupon Tower controller cleared: „3G2 go around", although has hesitated for instant before issuing instruction. The crew answered:„Go around, go around". At that time departing SMARTLYNX ART531 was approximately in the middle of RWY 36 and controller did not interrupt take-off.

At **08.52.52** the crew BTI3G2 declared:„3G2 going around", whereupon Tower controller issued clearance: „Air Baltic 3G2 sorry, RWY 36, you are cleared to land" and after a while at **08.53.04** controller contacted BTI3G2 again and asked the crew BTI3G2 if are they able to land. The crew answered: „Negative, we going around 3G2" because they started to go around earlier.

After that Tower controller issued clearance:„Baltic 3G2 immediately turn left your heading 270 for sequences". SMARTLYNX ART531 at that moment was on Approach frequency 127.3.

Picture 5 Radar map- ART531 on the RWY 36



Picture 6. Radar map - The minimal distance at altitude 1100 Ft was 1047 meters (0.565NM)

After a while at **08.53.24** controller issued clearance for BTI3G2:"3G2 stop climb altitude 500 feet". Because at that moment BTI3G2 has passed altitude 1100 Ft the crew answered at **08.53.29**: "We are at 1200..." and controller cleared BTI3G2: "3G2 stop climbing at your altitude", called approach controller and informed him that BTI3G2 has flown at altitude 1500Ft, heading 270 º.

At **08.54.06** Tower controller contacted BTI3G2 and issued instruction: "Air Baltic 3G2 contact Approach on 127,3". After Approach controller cleared BT13G2 to climb to 2500 Ft and gave vectors for the new approach to RWY36 and conflict situation was avert. During incident ATC Tower controller was not able visually see situation over threshold and TWY C.

According to EUROCONTROL guidance material (ESARR 2 Guidance to ATM Safety Regulators, EAM 2/GUI 1, Severity Classification Scheme for Safety Occurrences in ATM, Edition 1.0, edition date 12-11-1999), see tables 6, 7, this incident is classified as **Major Incident** -B -Loss of separation **(*separation higher than half the separation minima/e.g., 4NM*)** which is not fully under ATC control.

Taking into account the Severity Classification Scheme that specifies five qualitative frequency categories this incident is classified as **B2.**

SEVERITY	A	Serious incident	A1	A2	A3	A4	A5
	B	Major incident	B1	**B2**	B3	B4	B5
	C	Significant incident	C1	C2	C3	C4	C5
	D	Not determined	D1	D2	D3	D4	D5
	E	No safety effect	E1	E2	E3	E4	E5

1	2	3	4	5
Very Frequent	**Frequent**	Occasional	Rare	Extremely rare
FREQUENCY				

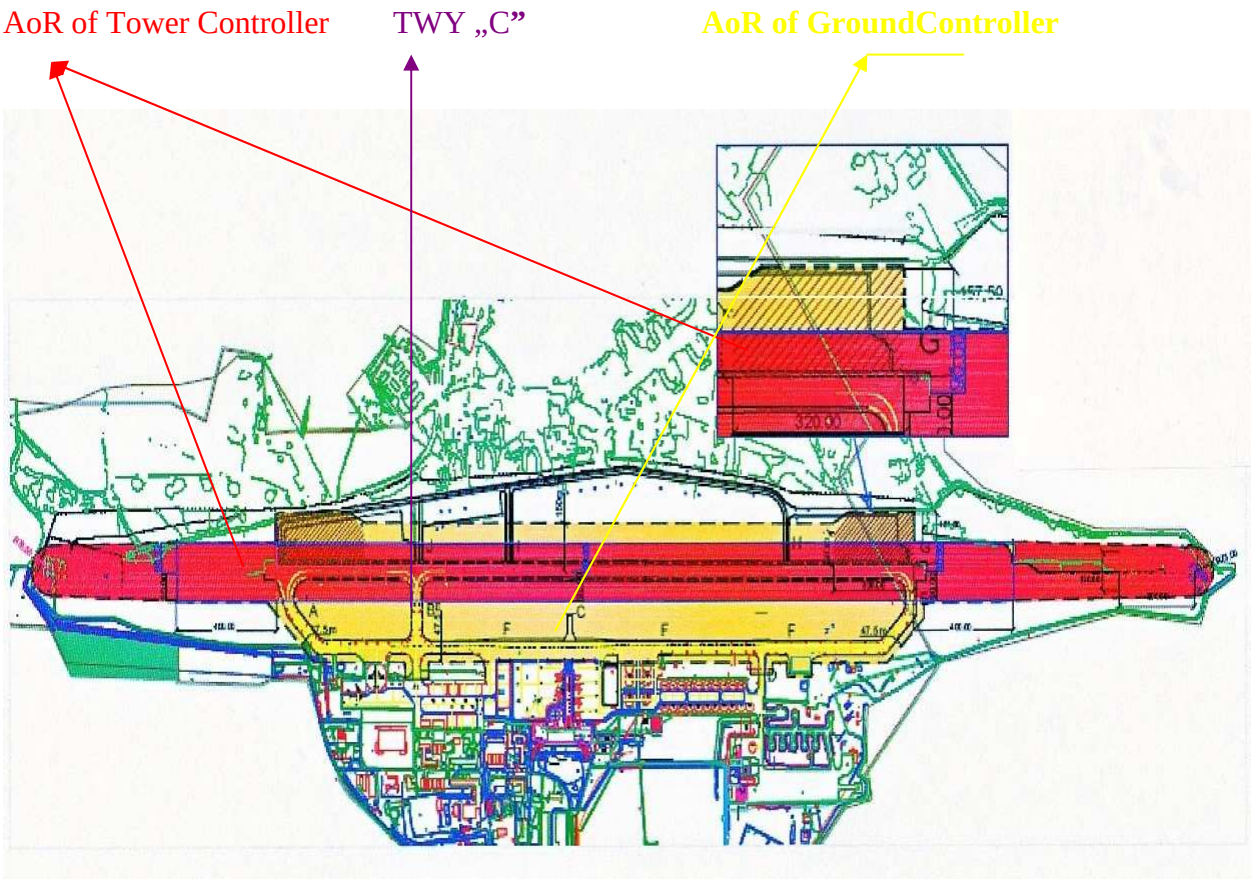
Table 6, Severity Classification Scheme for Aircraft Incidents

FREQUENCY	DEFINITION
Extremely rare	Has never occurred yet throughout the total lifetime of the system.
Rare	Only very few similar incidents on record when considering a large traffic volume or no records on a small traffic volume.
Occasional	Several similar occurrences on record - Has occurred more than once at the same location.
Frequent	**A significant number of similar occurrences already on record - Has occurred a significant number of times at the same location.**
Very Frequent	A very high number of similar occurrences already on record- Has occurred a very high number of times at the same location.

Table 7, Definitions of Accident/Incident Frequency

1.1.2. Events in the Riga ATC

At moment when the incident occurred on Friday, February 13, 2009, Tower controller was on duty on morning shift for providing air traffic services. Tower controller shall provide control and issue clearances for all vehicles and persons on the manoeuvring area in Tower area of responsibility.



Picture 7 RIX INTL AIRPORT GROUND AREAS OF RESPONSIBILITY

According to approved time-table PL-GSV/TWR-01 for February, 2008 of Latvian ATCC (GSVC), controller working shift No1 on Friday, February 13, 2009 began at 05:30 (08:30 local time). Controller logged in ATRACC+ system at 05:38, logged out at 07:14. After break time controller logged in system at 08:02 to 08:58 again. According to print out data of system ATRACC+ there was not temporary leaving of the working position or temporary substitution from 08:02 till 08:58, respectively at the moment when the incident occurred Tower controller had occupied a work position. Total working - time up to incident (at 08:53) is 51 min.

1.2. Injuries to persons

There were no injuries.

1.3. Damage to aircraft

Not damage occurred

1.4. Other damage

Objects other than aircraft not damaged.

1.5. Personnel information

Air traffic controller:
Female 29 years old
Ratings: All necessary ratings were valid (Air Traffic Controller Licence, Rating Certificate to Air Traffic Controller Licence and Medical Certificate Class 3);
Captain of BOEING 735: 37 years old;
Ratings: All necessary ratings were valid;
Total flight experience - 19000 hours; Total hours last 28 days - 93hrs 03min;
Flight time last 24 hours - 5hrs 03min; Flaying hours in incident day - 05hrs 03min;
Rest period 48h before flight - 36,78hrs; Flight experience on aircraft Boeing 735 - 3000 hours.

First officer of BOEING 735: 39 years old;
Ratings: All necessary ratings were valid;
Total flight experience - 1016 hours; Total hours last 28 days - 93hrs 33min;
Flight time last 24 hours - 7hrs 53min; Duty time in incident day - 12hrs 20min;
Rest period 48h before flight - 36,50hrs; Flight experience on aircraft Boeing 735 - 208 hours.

Captain of AIRBUS A-320

Ratings: All necessary ratings were valid;
Total flight experience - 10729 hours; Total hours as Captain – 3375; Total hours last 28 days - 39hrs 30min; Total hours last 7 days – 00hrs 00min; Flight time last 24 hours – 0 hrs 00min; Flaying hours in incident day - 12hrs 20 min;
Rest period 48h before flight – 9 days; Flight experience on aircraft AIRBUS A-320 - 313 hours.

First officer of AIRBUS A-320
Ratings: All necessary ratings were valid;
Total flight experience - 1525 hours; Total hours last 28 days – 34 hrs 50min; Total hours last 7 days – 13hrs 07min; Flight time last 24 hours – 01 hrs 07min; Flaying hours in incident day - 12hrs 20min;
Rest period 48h before flight - 12 hours 24min; Flight experience on aircraft AIRBUS A-320 - 1221 hours.

1.6. Aircraft information

Aircraft type - Boeing 737-500; Registration - YL-BBA; Owner of aircraft - „Air Baltic Corporation"; serial No.24646; TOW - 56000kg; Engines - CFM56-3C-1;
Aircraft type - Airbus A-320-211; Registration - YL-BCB; Owner of aircraft - „LatCharter"; serial No.726; TOW - 73500kg; Engines - CFM56-5A1.

1.7. Meteorological information

Weather conditions on February 13, 2009 (07:50 -10:20 UTC) in the Riga international airport:
METAR EVRA I30750Z 16005KT 0450 0400NW R36/0600N FG VV002 00/00
Q1009 R36/590240 BECMG 0800 FG=

METAR EVRA 130820Z 18002KT 0400 0350NW R36/0550N FG VV002 01/00
Q1009 R36/590240 BECMG 0800 FG=

METAR EVRA 130850Z 15003KT 1OOV170 0350 0250NW R36/1OOOU FG VV002
01/01 Q1009 R36/590240 BECMG 0800 FG=

METAR EVRA 130920Z VRB02KT 0450 0350NW R36/1000U PRFG OVC003 01/01 Q1010 R36/590240 BECMG 0800 FG=

METAR EVRA 130950Z 00000KT 0500 0400NW R36/0800N FG VV002 01/01 Q1010 R36/590240 BECMG 0800 FG=

METAREVRA131020Z 19001KT 1000 0500NW R36/1300U PRFG BR BKN002 OVC005 01/01 Q1010 R36/590240 TEMPO 0800 FG=

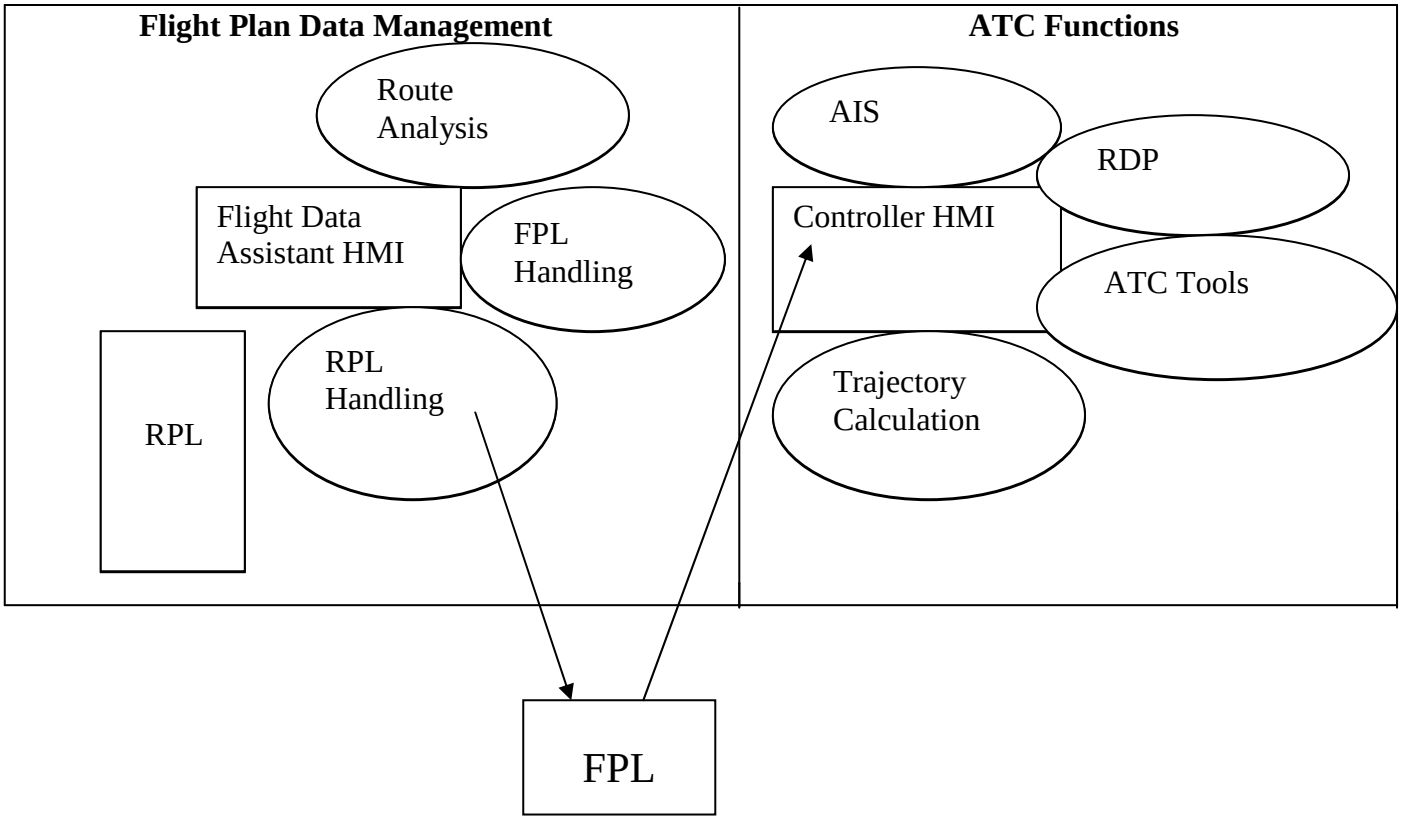
TAF forecast for the Riga international airport from February 13, 2009 09:00UTC to February 14, 2009 09:00UTC

TAF EVRA 130812Z 1309/1409 16004KT 0600 FG VV001 BECMG 1310/1312 5000 BR BKN003 OVC0I5 BECMG 1315/1317 04006KT PROB40 TEMPO 1316/1403 0500 FG VV001 TEMPO 1403/1409 2000 SN BR BKN003 OVC015=

1.8. Aids to Navigation

The flights were under Radar control. Air Traffic Control System ATRACC+ (Manufacturer' s serial No N SI P 101.1) is an ATM system for area, approach and tower Control of the Riga FIR. From a functional point of view, the system consists of two main components: a Primary System, and a Radar Bypass System. A Primary System providing multi radar tracking advanced flight plan data integration, predicted flight trajectories, OLDI (On-Line Data Interchange), silent co-ordination and paperless HMI. A Radar Bypass System for use if the primary system should fail. The Radar Operator Workstation is common for the Primary System, and the Radar Bypass System. Four main functional blocks are defined:

- The Flight Plan Data Management block
- The ATC Functions
- The Support Functional block and the ATC-Simulator



The distinct border is between the Flight Plan Data Management block and the ATC Functional block.

A Flight Data Assistant, (FDA) is working with Repetitive Flight Plans, (RPLs) and passive Flight Plans, (FPLs) in the Flight Plan Data Management block while the ATC controller is working with active FPLs in the ATC Functional block. Flight plan data management is available at flight data assistant working positions. The Flight Data Assistant HMI has efficient support for editing, browsing, queue handling and specification of complex search criteria.

RPLs can be searched, created, modified and deleted manually, but also automatically based on airline time schedules on data media. FPLs are normally created automatically from RPLs or received from AFTN. They can also be searched, created, modified and deleted manually. Received AFTN and OLDI messages are processed and checked automatically and produce updates of concerned FPLs. Billing data is automatically submitted to external systems at FPL termination. For RPLs and FPLs both, route analysis is done and route details are examined against the local airspace structure for compliance with ICAO rules.

The airspace structure defined by means of system parameters. ATC functions are available at controller working positions. Controller interaction with flights performed through extensive use of lists and flight symbols. A trajectory describing the flight path in airspace calculated with consideration to aircraft performance characteristics and current weather data. The trajectory's coverage of ATC sectors determines the distribution of flight data to working positions. Data from PSR and SSR radar stations processed by means of an advanced centralized true multi-radar tracker. The resulting system tracks are associated with FPLs. Flight symbols comprising surveillance and flight plan information presented to controllers.

1.8.1. Advanced Surface Movement Guidance und Control System

A system providing routing, guidance and surveillance for the control of aircraft and vehicles in order to maintain the declared surface movement rate under all weather conditions within the aerodrome visibility operational level (AVOL) while maintaining the required level of safety.

The information provided on an A-SMGCS display may be use for the purpose of:

- Determining the location of aircraft on the movement area and vehicles on the manoeuvering area;

- Monitoring aircraft and vehicles on the manoeuvering area for compliance with clearances and instructions;

- Determining that a runway is clear of traffic or **assisting in the assessment that a runway will be clear of traffic prior to a landing or take-off;**

- Providing information on essential local traffic on or near the manoeuvering area;

- Providing directional taxi information to aircraft when requested by the pilot or deemed necessary by the controller. Such information should not be issued in the form of specific heading instructions (except in special **circumstances, e.g.** emergencies); and

- Providing assistance and advice to emergency vehicles.

A-SMGCS alert.

An indication of an existing or pending situation during aerodrome operations, or an indication of an abnormal A-SMGCS operation, that requires attention and/or action. The term alert covers

warnings, cautions, advisories and alarms reflecting different levels of urgency or equipment performance.

1.9. Communications

Radio communications were listen to on the frequency of 118.100 MHz of Riga Airport Tower controller. The quality of radio transmissions was good, except some phrases that is unreadable.

Also another alternative radio traffic frequency 134.125 MHz has been reserved for pilot-controller communication as well as 121.500 MHz for emergency situations. The Tower controller used English in its radio communications. RADIOKOM radiostation GM 1280 for vehicles drivers - controller communication.

Tower controller monitors APP frequency to be aware that departed traffic has been successfully transferred to APP controller. For the investigation the ATCO console recordings on the frequency 118.1 MHz was used. The quality of the recordings was good.

Crew of BTI3G2 had errors of standard phraseology communicating with Tower controller. Communication Transcript there was not essential inaccuracies in radio communications on all sides.

Within the framework of Quality Management System (QMS) Riga ATCC are worked out “Regulations and procedures on ground-to-air radiotelephony” PR-GSV/AvDN-01/ 2 which are applicable for the provision of Air Traffic Services within RIGA FIR/UIR. The provisions of this document based on ICAO Scarps, ICAO Regional procedures. The provisions of this document are mandatory for ATS personal conducting direct ground-to-air radio communications.

1.10. Aerodrome information

The airport did not have any significance for the incident.

1.11. Flight recorders

The incident reconstruction has based on the radar records and voice communications transcript between controller ATCO1 of Riga ATCC and aircrafts crew- members as well as available FDM data.

1.12. Wreckage and impact information

Not damaged.

1.13. Medical and pathological information

Not relevant to this incident.

1.14. Fire

There was no fire.

1.15. Survival aspects

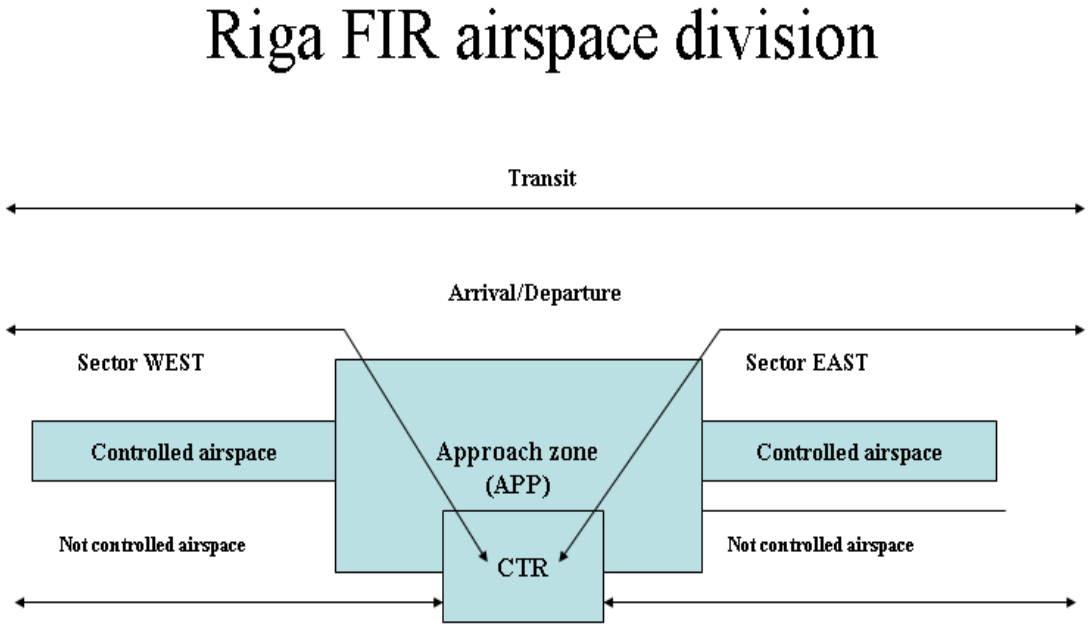
Not necessity to survey.

1.16. Tests and research

Were not performed.

1.17. Organizational and management information

According to Law on Aviation of the Republic of Latvia the authority responsible for activities of the utilizations of the airspace of the Republic of Latvia for civil and military needs and the flight of aircraft shall be controlled by the Air traffic control unit - the State Joint-Stock Company – "Latvijas Gaisa Satiksme - LGS" which is the air traffic service provider in the Republic of Latvia. Air traffic control has provided in the airspace of Riga FIR, by Latvian Air Navigation Services (LGS) staff (See Picture 8).



Picture 8

According to requirements of Operational Manual D1-GSV/TWR-01/2 Tower controller shall provide air traffic services for the following traffic:

- VFR/IFR flights entering, leaving or flying within the control zone, or otherwise operating in the vicinity of controlled aerodrome, unless they have been transferred to APP controller;
- aircraft landing and taking off;
- aircraft on the manoeuvring area in Tower area of responsibility.

Tower controller shall provide control and issue clearances for all vehicles and persons on the manoeuvring area in Tower area of responsibility.
Tower controller shall perform the following tasks:

- To maintain a continuous watch on all visible flight operations at and in the vicinity of the aerodrome as well as aircraft, vehicles and persons on the manoeuvring area in own area of responsibility;
- To observe all movements of aircrafts, vehicles and people in own area of responsibility by means of A-SMGCS display at night and/or in low visibility ;
- To issue clearances and instructions to aircraft as required for the safe and expeditious handling of aerodrome traffic by using radiotelephony communication or visual signals in case of communication failure; such clearances and instructions include the following;

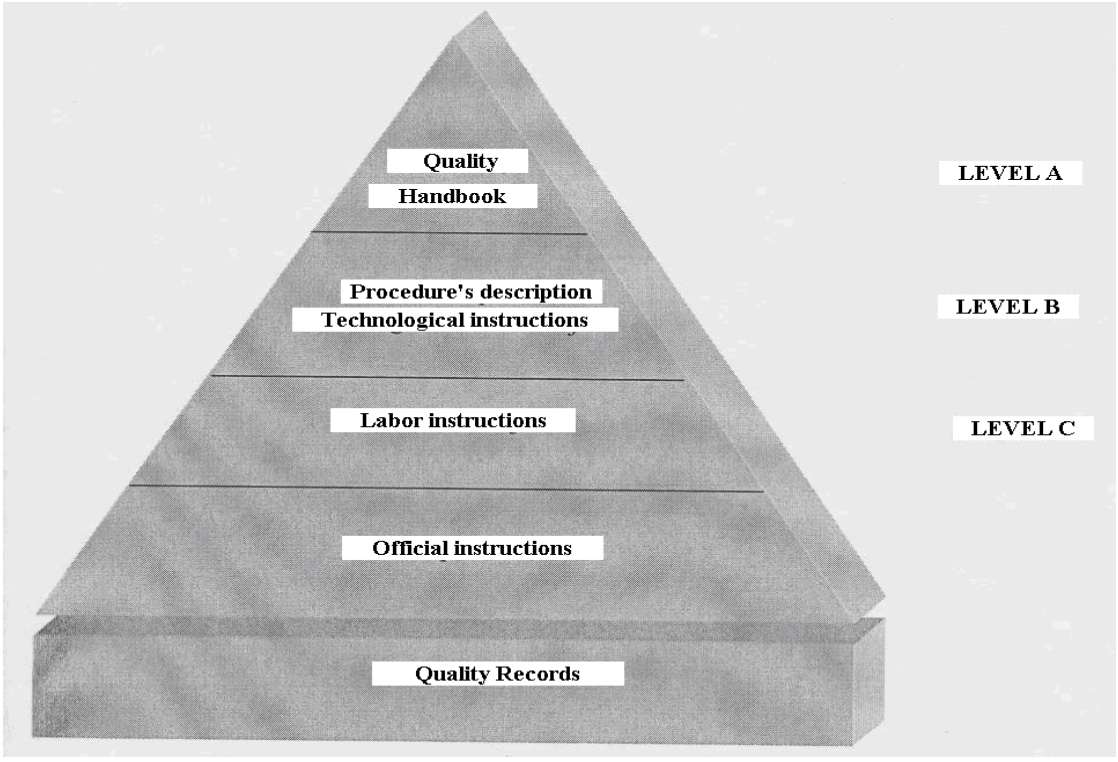
    - clearances to enter the control zone;
    - clearances to leave / cross the control zone;

- clearances to join the aerodrome traffic circuit;
- instructions to establish a take-off and landing sequence;
- instructions to taxi to the take-off(line-up) position;
- take-off and landing clearances.

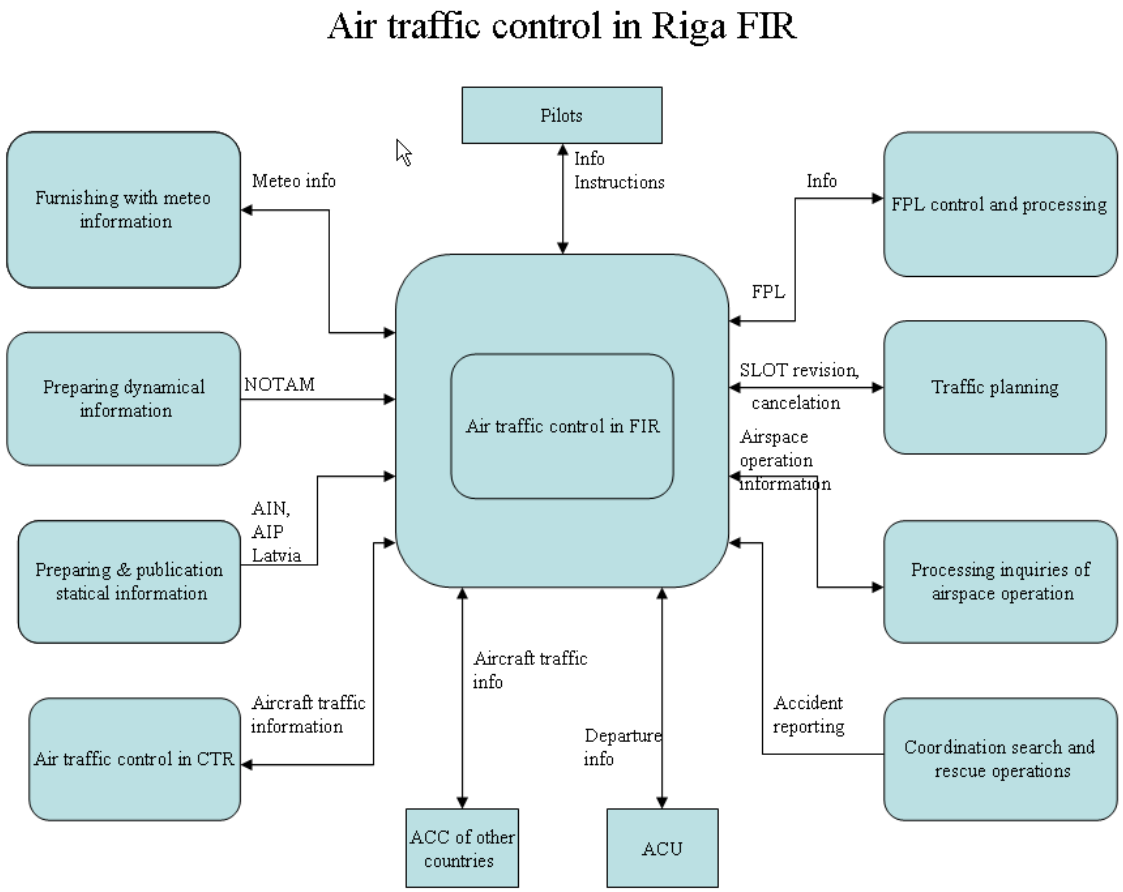
1.17.1. Quality management system

Quality Management System (hereinafter QMS) document structure and hierarchy is comprised of Quality Handbook and other subordinated document categories: procedure's description, technological instructions, flow charts, official instructions, labor instructions and quality records.

Picture 9 shows LGS document structure. On the top of document hierarchy is Quality Handbook, management document of higher level. Moving from the top of this structure downward, documents become more specific in their purpose and scope, and document content becomes increasingly detailed.



Picture 9



Picture 10

Performance criterion	Measurement	Sort of information/data
Safety	Number of pilot's complaints of low separation interval	Analysis of radiotelephony records Results of customer's opinion poll
	Coefficient of safety	Yearly estimation
	Rating of IATA assessment	IATA Annual Report
Regularity	Number pilot's complaints of delay due to controller's	Analysis of radiotelephony records Results of customer's opinion poll
	Number of pilot's complaints about not timely given information	Analysis of radiotelephony records Results of customer's opinion poll
Accuracy of information	Number of complaints of distortion information	Analysis of radiotelephony records Information from other ACC Information from airlines Results of customer's opinion poll

Table 4, Air traffic control performance criterions and measurement in Riga FIR

According to Quality Handbook chapter "Organizational structure, distribution of responsibilities and authorities" the person in charge for resolving all problems relating to air traffic control services safety, quality, documentation and prevention is Head of ATCC

Department. Head of ATCC Department is responsible for making decisions in case of inadequate services in the field of air control.

Quality system manager is responsible:

- Quality system maintenance;
- Preparing information materials for quality management reports, it planning and organization;
- Internal audit planning and organization;
- Verification the developed and implemented corrective actions as result of internal audit;
- Planning and organization of quality management reports.

The State Joint-Stock Company - "Latvijas Gaisa Satiksme - LGS" must ensure all necessary resources for maintenance Quality Management System according to requirements Latvian and international standard LVS EN ISO 9001:2000. Person in charge for making resources available is Chairman of the Board.

1.17.2. Safety Management System

In accordance with EUROCONTROL Safety Regulatory Requirement ESARR 3 „USE OF SAFETY MANAGEMENT SYSTEMS BY ATM SERVICE PROVIDERS ATM" service-providers shall have in place a safety management system (hereinafter SMS).

SMS has embraced air traffic control services provider - the State Joint-Stock Company - "Latvijas Gaisa Satiksme - LGS". SMS is founded on "cooperation approach" according to terms of EUROCONTROL document "Safety and Quality Relationships Guidelines". Because there has established, operated and has in continuous improving process QMS (ISO 9001:2000), SMS has integrated taking into account special requirements of SMS and Commission Regulation (EC) No 2096/2005 of 20 December 2005 laying down common requirements for the provision of air navigation services. For implementation, maintenance and monitoring SMS in the State Joint-Stock Company "Latvijas Gaisa Satiksme - LGS" has established as obligatory joint Safety/Quality Management Systems main procedures and Handbooks.

According to "Latvijas Gaisa Satiksme - LGS" safety responsibility terms - everyone has an individual responsibility for their own actions and managers are responsible for the safety performance of their own organizations.

In accordance with SMS Handbook the State Joint- Stock Company - "Latvijas Gaisa Satiksme - LGS" main safety management principles are:

- Safety achievement;
- Safety assurance;
- Safety promotion.

Within the framework of SMS has established risk assessment and mitigation, details of risk assessment has described in procedure "Hazards identification and risk assessment".

Safety Occurrences assessment has established and described in procedure "Dealing with nonconformities, corrective and preventive actions".

Safety objectives based on risk have established in terms of the hazards maximum probability of occurrence, derived both from the severity of its effect and from the maximum probability of the hazards effect.

Severity Classes 1, 2, 3, 4, 5 have determined in accordance with ESARR 4 Severity Classification Scheme in ATM.

At present in Europe the quantitative definitions have calculated only for Severity Class 1 as ECAC Safety Minimum of a maximum tolerable probability of ATM directly contributing to an accident of a Commercial Air Transport aircraft of $1{,}55\ 10^{-8}$ accidents per Flight/Hour or of $2{,}31\ 10^{-8}$ accidents per flight.

For Severity Classes 2, 3, 4, 5 quantitative definitions to be determined at national level based on past evidence on numbers of ATM related incidents.

The Safety Manager is responsible for SMS performance. Department managers are responsible for immediately performance appropriate measures in subordinate departments in case when risk has identified and appear necessity to implement improvements and corrective action taken.

1.18. Additional information

Not applicable.

1.19. Useful or effective investigation techniques

The incident has been investigated in accordance with Annex 13.

2. ANALYSIS

2.1. General

The investigation of the referred to serious incident – infringement of separation standards between airBaltic Boeing 737, registered YL-BBX, flight BTI3G2 and Smartlynx Airbus A320, registered YL-LCD, flight ART531 in the TMA was orientated essentially around the following questions:

- Had Air Traffic Control Services unit procedures, management, operations and instructions an influence on the incident?
- Had Tower controller actions an influence on the incident?
- Had human errors influence on the incident?
- Determination how breakdowns in human performance have caused or contributed to the incident;
- Evaluation of Threat and Error Management in Air Traffic Control;

The analysis activities of airBaltic Boeing 737 flight BTI3G2 and Smartlynx Airbus A320, flight ART531 is build on review of crew radio communications transcript with ACC controller, interview with ATC Controller involved, radar recording, air operation service instructions and manuals, analysis of State Joint Company "Latvijas Gaisa Satiksme" Quality Management System and Safety Management System.

2.2. Explanation of the situation

When at **08.48.46** Riga Tower controller cleared F50 BTI443 to land on RWY36, Smartlynx A320 ART531 reported that they have approached to holding point RWY36. Tower controller instructed ART531 to hold short of RWY36. 27 seconds later at **08.49.13** approaching airBaltic BTI3G2 contacted Tower controller and reported that airBaltic BTI3G2 established ILS RWY 36. Controller instructed crew BT13G2: „Air Baltic 3G2, Riga Tower, continue ILS approach RWY 36" and after a while asked BTI443 for readiness to vacate runway via TWY "C", BTI443 affirmed readiness.

At **08.49.42** Tower controller instructed approaching BTI3G2 to reduce to minimum approach speed until 4 miles final, because there was F50 BTI443 6NM ahead. Normally indicated airspeed on final shall not be more than 160(+/- 10) kt until 4NM final.

According to Operational Manual of airport Riga Tower controller an arriving ACFT may be instructed to maintain its "maximum speed", "minimum speed" or specified speed. Speed control should not be applied to ACFT after passing a point 4NM from the RWY THR on final approach.

At **08.50.02** controller contacted waiting on holding point ART531and asked of readiness for immediate departure as well as informed that 7 miles on final is traffic No 2 Boeing 737. It

was air Baltic BTI3G2. ART531 affirmed readiness for immediate departure and after that controller cleared ART531 to line up RWY 36 and wait. Short before F50 BTI443 landed and after landing passed by TWY "C", because after controller instruction to vacate RWY via TWY "C" and to contact Ground controller, BTI443 informed Tower controller that they have to go back track for RWY vacation. Tower controller BTI443 back track approved and respectively F50 took longer time on the RWY. After a while BTI443 informed controller that RWY is clear. In spite of F50 had took longer time on the RWY as well as there was approaching BTI3G2, controller allowed Smartlynx A320 ART531 to take-off. At **08.52.03** controller cleared Smartlynx A320 ART531**:"Smartltynx 531 RWY 36, cleared for take-off. After departure contact Approach on 127.3".** At this time air Baltic BTI3G2 was 2-3 NM to the RWY. Then at 08.52.31 tower frequency has blocked by the approaching Finnair 133, when they reported establishing Localizer 36. When tower frequency was unblocked at **08.52.43** the crew of BTI3G2 pronounced combination of words: "3G2…", further indistinctness of speech. In the airBaltic Voyage Report No 090213 the crew of BTI3G2 reported that they informed Tower controller for "short final".

According to ICAO Doc.9432 "Manual of Radiotelephony", Chapter 4"AERODROME CONTROL": AIRCRAFT, Item 4.7. FINAL APPROACH AND LANDING a "FINAL" report is made when an aircraft turns onto final within 7 km (4 NM) from touchdown. If and when the turn onto final is made at a greater distance, a "LONG FINAL" report is made. If the aircraft is making a straight-in approach, a "LONG FINAL" report is made at about 15 km (8 NM) from touchdown. **If no landing clearance is received at that time, a "FINAL" report is made at 7 km (4 NM) from touchdown.**

In the event of BTI3G2, if they want to inform controller about short final, according to radiotelephony phraseology, report of crew should be **"airBaltic BTI3G2 Final".**
According to Tower controller's interpretation crew's message has perceived him as report of "going around", whereupon controller answered: "3G2 go around". The crew of BTI3G2 interpreted controller's answer as issued clearance "go around", answered "Go around. Go around". In the event that the missed approach is initiated by the pilot, the phrase "GOING AROUND" shall be used.

At that time departing ART531 was approximately in the middle of RWY36 and controller did not interrupt take-off.

After a while at **08.52.52** BTI3G2 reported to controller: "3G3 going around" whereupon controller said: "3G2 you are cleared to land" and a little later at **08.53.04** controller asked BTI3G2:"Baltic 3G2 are you able to land?" The crew of BTI3G2 reported," Negative, we are going around, 3G2" because they have started "go-around" earlier. Taking-off ART531 at that moment operated on Approach frequency already and controller issued instruction for BTI3G2:"Baltic 3G2 immediately turn left, your heading 270 for sequences" as well as tried to stop further climbing of BTI3G2 issuing clearance:"3G2 stop climb altitude 500 feet" for securing vertical interval between taking- off ART531 and going around BTI3G2. The crew of BTI3G2 reported:" We are at 1200". Controller issued clearance:"3G2 stop climbing at your altitude". Because BTI3G2 crossed level 1200Ft at that time and passed to level 1500Ft performing "go around", as a result taking of aircraft ART531 and after missed approach going around aircraft BTI3G2 were located on same altitude 1 NM from each other. Aircraft ART531 was in front of BTI3G2 and they were visible to each other. There occurred infringement of separation standards between aircraft. It was find out that minimal distance at altitude 1100 ft was 1047.0 meters. Accordingly to airport Riga Tower controller operations manual DI-GSV/TWR-01/2 Riga ATC do not have established increased separation procedure for reduced visibility conditions. ATC "TOWER" controller was not able visually see situation over threshold and TWY C. TCAS does not provide any Resolution Advisory when A/C is below 2500 ft RA. Later controller called APP controller, informed that BTI3G2 has flown at level 1500Ft, heading 270° and handed BTI3G2 to APP frequency. After that APP cleared BTI3G2 to climb to 2500` and gave vectors for the new approach RWY36.

2.3. Air Traffic Control Service procedures, instructions and operations

In accordance with airport Riga Tower controller operations manual DI-GSV/TWR-01/2 at the start of the shift Tower controller has to login in the ATRACC+ system. The start of the shift is determined by the login time. All temporary substitutions shall be performed via login procedure. Substitution of the controller is determined by the operational or the administrative supervisor. A temporary leaving of the working position during the shift requires a substitution. Before the shift Tower controller must participate in the briefing carried out by the Supervisor on duty. Prior to taking over responsibility for a working position, Tower controller shall be assured that he/she is fully aware of the current situation and has obtained all relevant information.

2.3.1. Transfer of Duties

Tower controller is responsible for carrying out functions and responsibility of Ground controller in his/her absence. The function of Ground controller is carried out by Tower controller from 22:00 till 06.00 (local time). Tower controller did not carry out functions of Ground controller when incident occurred.

2.3.2. Transfer of control

2.3.2.1. APP-TWR. IFR arriving aircraft.

Responsibility for landing aircraft is handed over to the TWR controller by the APP/ACC **controller when this aircraft:**

- is on ILS or LLZ approach between **12,5** NM **and** 4 NM from the corresponding 18/36 THR and has reported to the APP/ACC controller **"established on ILS" or "established on Localizer",** unless APP/ACC controller has informed the crew to report **"established on ILS" or "established on Localizer"** to the TWR controller;
- **is** on VOR approach between **12,5** NM **and** 4 NM from the corresponding 18/36 THR and the crew has reported to the APP/ACC controller **"on final";**
- is on visual approach, when the APP/ACC controller has cleared visual approach and aircraft is within the horizontal border of the CTR.

2.3.2.2. TWR-APP. Departing aircraft.

Responsibility for providing air traffic control for departing traffic is handed over by the TWR controller to the APP/ACC controller immediately after take-off. *(If the aircraft is going to leave CTR at altitude 1500 ft or less, responsibility for air traffic control provision is not handed over to APP/ACC.)*

2.3.2.3. TWR-GROUND. Arriving aircraft

- Arriving aircraft should be handed over to Ground controller when aircraft is clear of RWY.

2.3.2.4. GROUND-TWR. Departing aircraft

- Taxiing aircraft should be handed over to Tower controller when it is approaching runway-holding position and aircraft is ready for departure.

2.3.3. ATS INFORMATION EXCHANGE AND CO-ORDINATION

2.3.3.1. Between Tower controller and Briefing officer.

Tower controller shall notify Briefing officer about:

The take-off time of the aircraft:

- when VFR flights proceed abroad or to controlled airport;
- when the flight is to be carried out outside Europe;
- when the flight is to the CIS (former USSR republics) or overflying them;
- on request.

The landing time of the aircraft:

- when VFR flights come from abroad or controlled airport;
- when landing in Riga as alternate;
- on request.

Receiving flight plan or changes in it from the air;

Pilot' s request to prolong the FPL for VFR aerial works and training flights.

Briefing officer shall notify Tower controller about:

- new SNOWTAM creation.

Operational Manual D1-GSV/TWR-01/2 has regulated ATS information exchange and coordination between Tower controller and other airport services, OSUP, TSUP, controllers and operators.

2.3.4. Separation minima and control procedures

The following should be considered for the sequencing of departing aircraft:

- types of aircraft and their relative performance;
- routes to be followed after take-off;
- APP controller requirements, only due to the traffic situation within TMA

Establishing the required separation TWR controller shall take into account minimum pilot reaction time and time for departure clearance (conformation) issuing.

The TWR controller shall not apply wake turbulence separation:

- for arriving VFR flights landing on the same runway as a preceding landing HEAVY or MEDIUM aircraft; and;
- between arriving IFR flights executing visual approach when the aircraft has reported the preceding aircraft in sight and has been instructed to follow and maintain own separation from that aircraft.

When issuing line-up clearance, the TWR controller shall be sure that the separation between aircraft is provided.

Take-off clearance shall not issued until:

- co-ordination with the neighboring ATC unit is performed;

- ATC clearance is relayed to and acknowledged by the aircraft concerned;

Take-off clearance may issued when:

- the aircraft is approaching the runway-holding position of the runway-in-use;
- the aircraft is taxiing to line up position of the runway-in-use;
- the aircraft is at line up position of the runway-in-use;

Departing aircraft shall be normally permit to commence take-off when:

- preceding departing aircraft has crossed the end of the runway-in-use or
- has started a turn or
- previously landed aircraft has vacated the runway-in-use.

If an **approaching aircraft commences a missed approach procedure**, the **take-off clearance** to aircraft ready for departure from the RWY-in-use **shall be issued only after additional coordination with APP.**

When **issuing landing clearance**, **the TWR controller shall be sure that the separation between aircraft is provided** and the runway-in-use is clear of any obstacles.

Arriving aircraft shall not be normally permitted to land until:

- the departing aircraft has passed the end of the runway-in-use;
- the departing aircraft has started a turn;
- previously landed aircraft has vacated the runway-in-use.

2.3.5. Order of priority for arriving and departing traffic

- **An aircraft landing or in the final stages of an approach to land shall normally have priority over an aircraft intending to take-off.**

- **Aircraft shall not be permitted to line up and hold on the approach end of a runway-in-use whenever another aircraft is effecting a landing, until the landing aircraft has passed the point of intended holding.**

- **Departures shall normally be cleared in the order in which they are ready for take-off, except that deviations may be made from this order of priority to facilitate the maximum number of departures with the least average delay.**

2.3.6. Reduction in separation minima in the vicinity of aerodrome

The separation minima may be reduced in the vicinity of aerodrome if:

- each aircraft is continuously visible to flight crews of the other aircraft concerned and the pilots thereof report that they can maintain their own separation; or

- in the case of one aircraft following another, the flight crew of the succeeding aircraft reports that the other aircraft is in sight and separation can be maintained.

2.3.7. Control of aerodrome traffic

2.3.7.1. Order of priority for arriving and departing aircraft

- An **aircraft landing or in the final stages** of an approach to land **shall normally have priority over an aircraft intending to depart.**

- Departures shall normally be clear in the order in which they are ready for take-off, except that deviations may be make from this order of priority to facilitate the maximum number of departures with the least average delay.

2.3.7.2. Control of taxiing aircraft

- When taxiing, a pilot's vision is limited. It is important therefore for aerodrome control units to issue concise instructions and adequate information to the pilot to assist him to determine the correct taxi routes and to avoid collision with other aircraft or objects.

- For the purpose of expediting air traffic, aircraft may be permitted to taxi on the runway-in-use, provided no delay or risk to other aircraft will result.

.

2.3.8. Radar separation

Radar separation may be applied between an aircraft taking off and a preceding departing aircraft or other radar-controlled traffic provided there is reasonable assurance that the departing aircraft will be identified within 1 NM from the end of the runway, and that, at the time, the required separation will exist.

2.3.8.1. Radar based control of non wake turbulence categorized departing traffic.

In all cases, when departing aircraft are entering TMA, the vertical separation of not less than 1000ft, or the longitudinal separation of **not less than 5nm** shall exist between two departing aircraft immediately after the take-off of the second aircraft.

Take-off clearance *for non wake turbulence categorized* aircraft based on the position of non wake turbulence categorized preceding departing aircraft:

- When preceding departing ACFT is faster than succeeding departing ACFT TWR controller may issue take-off clearance for succeeding departing a/c when preceding ACFT has passed the end of RWY-in-use;
- When both departing ACFT involved have same flight performances and preceding departing ACFT has passed 2 NM from the THR of RWY-in-use TWR controller may issue take-off clearance for succeeding departing ACFT;
- When preceding departing ACFT has slower flight performance TWR controller may issue take-off clearance for succeeding departing a/c when preceding ACFT has passed 3 NM from the THR of RWY-in-use.

Radar based control of arriving traffic.

- The separation between landing aircraft carrying out an instrument approach and preceding landing aircraft should be sufficient to allow the preceding landing aircraft to land and vacate the runway before the landing aircraft reaches a point of 1 NM from touchdown;
- If the runway-in-use is not vacated by the preceding landed aircraft and the landing aircraft is at the distance of 1NM from the touchdown, the landing aircraft shall **be** instructed to go around.

2.3.9. Provision of separation between aircraft

- Until arriving traffic has not crossed altitude 2500 Ft and it is handed over to the TWR controller, the APP/ACC controller is responsible for separation provision of this aircraft from all other traffic within Riga TMA AoR (area of responsibility);

- **Until departing traffic has not crossed altitude 2500 Ft, the TWR controller is responsible for separation provision of this aircraft from all other traffic within Riga CTR AoR;**

For traffic at altitude 2500 ft within CTR:

- APP controller shall inform Tower controller about traffic;
- APP controller provides separation for all other traffic within Riga TMA AoR ;
- Tower controller provides separation for all other traffic within Riga CTR AoR.
-

For traffic above altitude 1500 ft and below altitude 2500 ft within CTR:

- Tower controller shall inform APP controller about traffic;
- APP controller provides separation for all other traffic within Riga TMA AoR;
- Tower controller provides separation for all other traffic within Riga CTR AoR.

TWR controller is responsible for separation between aircraft executing VFR flight in CTR zone and aircraft executing ILS approach at altitude 1500 FT.
According to air control unit Air Traffic Control Services procedures, operations and instructions the investigation had stated following:

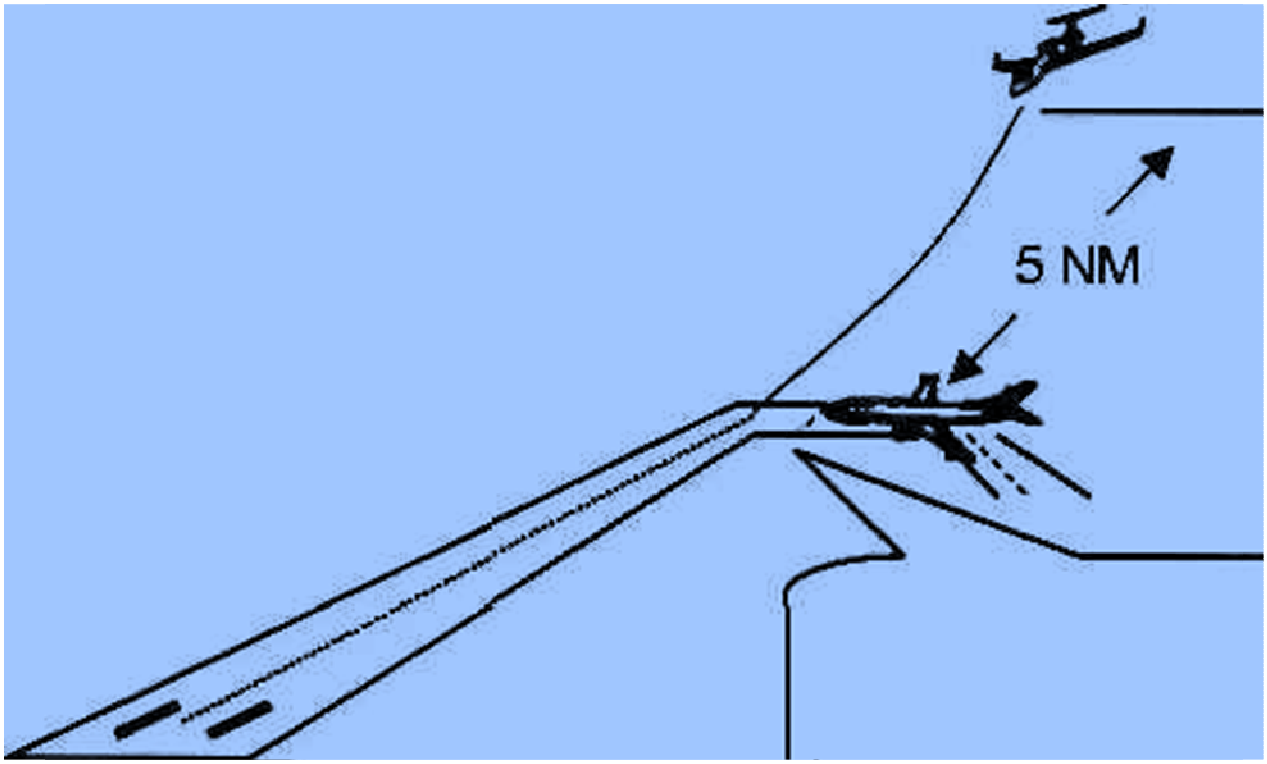
- Procedures, operations and instructions of air control unit - the State Joint Stock Company Latvijas Gaisa Satiksme (LGS) have complied with the requirements of ICAO Doc 4444-ATM 501 “Procedures for Air Navigation Services, AIR TRAFFIC MANAGEMENT” as well as ICAO Doc 9432 “Manual of Radiotelephony”;
- The scope of the Air Traffic Control Services procedures, operations and instructions had not essential influence to incident.
- a quality management system covers all provided air navigation services;

2.4. Tower controller actions

The Tower controller had a total of two years' and two months experience, all in the Riga airport ACC. She was on her first day of work after two days' leave. She had been on duty for 3 hours 23 minutes since the beginning of his shift and had been on a 48-minute rest break. She had been working this sector for 51 minutes before the incident. The incident occurred at 08.52 UTC (10.52 local daylight time).

Based on a review of available radar and radio communication information, it is likely that the Tower controller anticipated that departing aircraft ART531 has had time for take-off before approaching BTI3G2 would be come nearer when separation potentially will be lost.

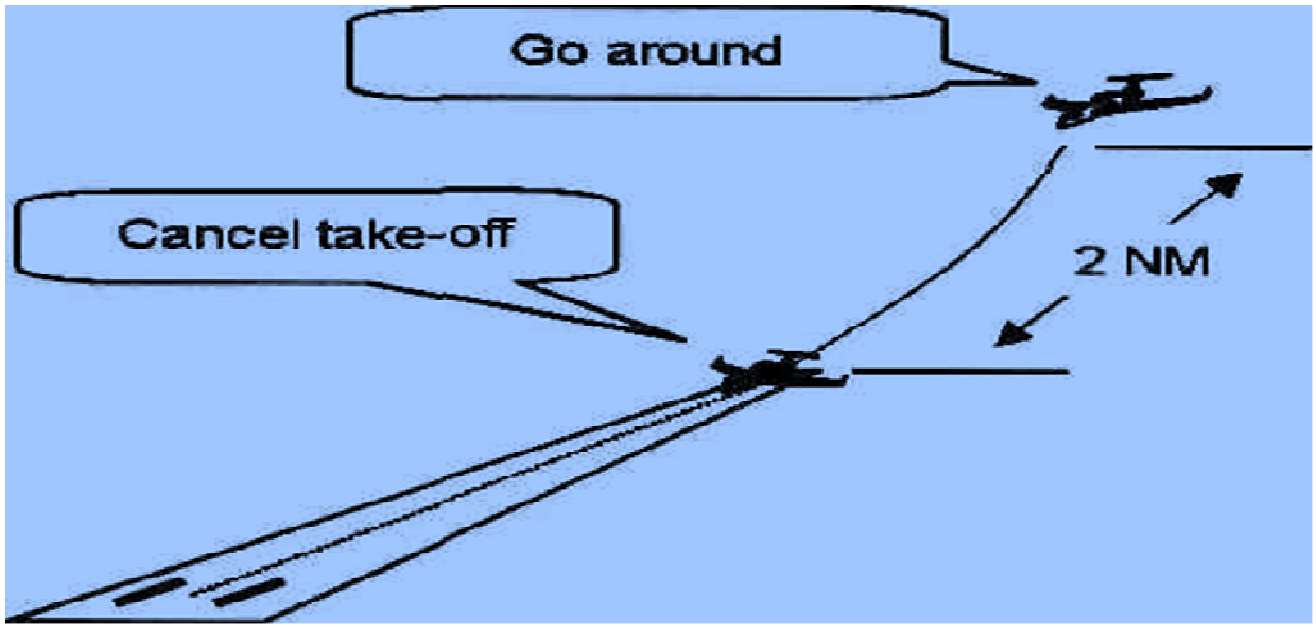
According to *Operational Manual D1-GSV/TWR-01/2* take off clearance based on the position of the arriving aircraft making an instrument approach may be issued when departing aircraft is at the **runway-holding position** of the runway-in-use and ready for immediate take-off, and the arriving aircraft, is not less than 5 NM final.



Picture 11. Ready for immediate departure from holding point position

If the departing aircraft is cleared for immediate take-off but has not started rolling, and approaching aircraft is on 2 NM final:

- the Tower controller **shall cancel take-off clearance for departing aircraft** and;
- **instruct the arriving aircraft to go around**.(see Picture 12)



Picture 12

According to Item 7.9.2. PANS-ATM a departing aircraft will not normally be permitted to commence take-off until the preceding departing aircraft has crossed the end of the runway-in-use or has started a turn or until all **preceding landing aircraft are clear of the runway-in-use.**

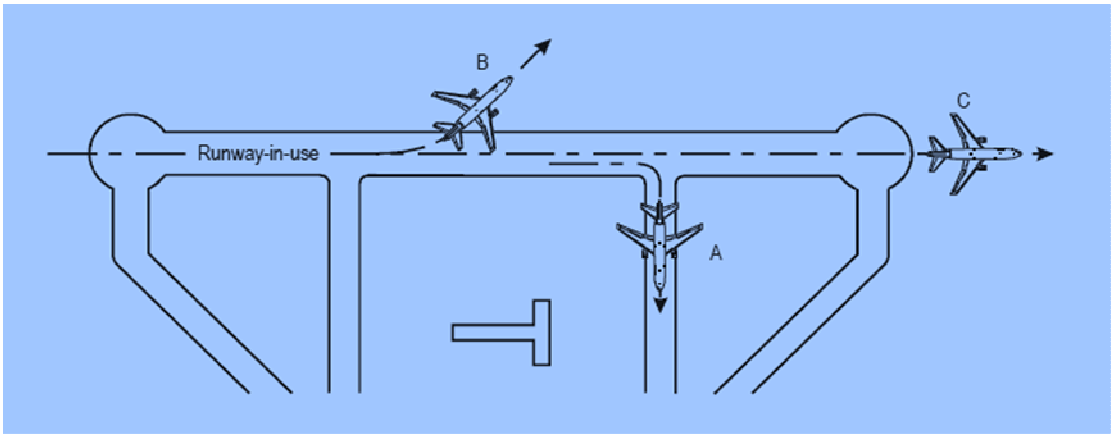
Respectively according to Item 7.10.1 a landing aircraft **will not normally be permitted to cross the runway threshold** on its final approach until the preceding departing aircraft has crossed the **end of the runway**-in-use, or **has started a turn**, or until all preceding **landing aircraft are clear of the runway**-in-use (See Picture 11).

When landing F 50 BTI443 crossed the runway threshold controller cleared ART531 to line up and to wait. At that moment system A-SMGCS switched "Alert".

When BTI443 landed it cannot immediately vacate runway by TWY "C" as controller prognosticated, because overran "C". Arriving BTI3G2 was making a straight-in approach and was 2-3NM from RWY. At that time controller cleared ART531to take-off as BTI443 vacated RWY.

Take-off clearance may be issued to an aircraft when there is reasonable assurance that the separation will exist when the aircraft commences take-off.

When an ATC clearance is required prior to take-off, the take-off clearance shall not be issued until the ATC clearance has been transmitted to and acknowledged by the aircraft concerned. The ATC clearance shall be forwarded to the aerodrome control tower with the least possible delay after receipt of a request made by the tower or prior to such request if practicable.



Picture 13. Position limits to be reached by a landing aircraft A or a departing aircraft B or C before an arriving aircraft may be cleared to cross the threshold of the RWY or a departing aircraft may be cleared to take off

The take-off clearance shall be issued when the aircraft is ready for take-off and at or approaching the departure runway, and the traffic situation permits. To reduce the potential for misunderstanding, the take-off clearance shall include the designator of the departure runway.

In the interest of expediting traffic, a clearance for immediate take-off may be issued to an aircraft before it enters the runway. On acceptance of such clearance **the aircraft shall taxi out to the runway and take off in one continuous movement.**

At 10:52 there was misunderstanding to each other between crew BTI3G2 and controller. According to controller's unsubstantiated statement, she sounded that crew BTI3G2 has declared that they go around. Listening the Voice communication recordings as well as Radiotelephony transcript do not certify this information. The crew's declaration isn't distinct– didn't express clear, however on no case crew didn't declared going around. When a missed approach is initiated, cockpit workload is inevitably high. Instructions to carry out a missed approach may be given to avert an unsafe situation. Any transmissions to aircraft going around should be brief and kept to a minimum. Controller didn't verify authenticity of crew's notification and answered go around, what crew certainly can understand as clearance "go around".

Concise and unambiguous phraseology used at the correct time is vital to the smooth, safe and expeditious operation of an aerodrome. It is not only the means by which controllers carry out their task, but it also assists pilots in maintaining an awareness of other traffic in their vicinity, particularly in poor visibility conditions.

At that time ART531 has commenced a take - off roll and ran almost half of RWY. Controller did not interrupt take-off and when ART531vacate RWY cleared BTI3G2 to land.

When an aircraft has commenced the take-off roll, and it is necessary for the aircraft to abandon take-off in order to avert a dangerous traffic situation, the aircraft should be instructed to stop immediately and the instruction and call sign repeated.

Because BTI3G2 started to go around earlier than controller gave clearance to land the crew answered that they are going around and not ready to land. When BTI3G2 declared to controller that they going around controller tried to stop further climbing and issued instruction immediately turn left with heading 270 as well as maintain flight level 500Ft, although it was too late to correct the situation before losing separation. At that time BTI3G2 passed flight level 1200Ft and during passing level 1100Ft was on same altitude 1NM in front of departing ART531.

2.5. Underlying Human Factors problems associated with incident

For revealing causation of this incident, it was put into practice the taxonomy of the Human Factors Analysis and Classification System that describes the human factors that contribute to an incident. It is based on a sequential or chain-of-events theory of accident causation. The human contribution don't build on the person approach, that focuses on the errors and violations of individuals but is based on the system approach, that traces the causal factors back into the system as a whole. The investigation view is not that Human Error is a cause of incident but that Human Error is a symptom of trouble deeper inside a system. The classification system has four levels, each of which influences the next level. These four levels are called:

- organizational influences;
- unsafe supervision;
- preconditions for unsafe acts;
- unsafe acts of operators.

Human factors played the major role in the cause of this incident and this further reinforces the requirements to examine the role of human factors in the Air Traffic Control as well as in the Flight Crew Operations.

2.6. Unsafe acts of operators

The unsafe acts can be loosely classified into two categories: errors and violations.

I. Errors

During investigation here were fixed following errors that ultimately led to the serious incident:

1. Skill-Based error

Tower controller on duty failed to take into account all factors for correctly evaluation of approaching aircraft and departing aircraft that could to have an influence on guarantee the regulatory radar separation. Unintentional errors of this type are typically associated with inattention or over-attention. When landing F50 overran TWY "C" and as a result should truck back controller inadvertently issued a clearance to take-off to ART531.

2. Decision errors

Poor decision of Tower controller was issuing take-off clearance for aircraft ART531. The incident occurred during a period of increased traffic density and complexity, during low visibility what might have caused the controller to make misjudgment of situation due to lack of experience.

II. Violations

- Investigation didn't reveal any violations such as willful disregard for the rules and regulations that govern safe flight as well as errors of omission.

2.7. Preconditions for unsafe acts

Two major unsafe subdivisions of unsafe conditions are developed:
- substandard conditions of operators;
- substandard practices of operators.

I. Substandard conditions of operators

Investigation didn't reveal any substandard conditions of operators such as adverse mental states, physiological states as well as physical/mental limitation.

II. Substandard practices of operators

Generally speaking, the substandard practices of operators can be summed up in two categories:
- resource mismanagement;
- personal readiness.

Within the context of this incident, this includes coordination both within and between aircraft with air traffic control facilities. On basis of tower controller and aircraft crew voice recordings investigation revealed poor coordination among aircrew and Tower controller - misunderstanding in communication.

Personal readiness failures occur when individuals fail to prepare physically or mentally for duty. Within the context of this incident there not revealed personal readiness failures when operators fail to prepare physically or mentally for duty.

2.8. Unsafe supervision

Exist four categories of unsafe supervision:
- inadequate supervision;
- planned inappropriate operations;
- failure to correct a known problem;
- supervisory violations.

Within the context of this incident there was not reveled any inappropriate supervision of operations.

2.9. Organizational factors influencing incidents

Fallible decisions of upper-level management directly affect supervisory practices, as well as the conditions and actions of operators. The most elusive of latent failures revolve around following issues of organizational influences:
- Resource management;

- Organizational climate;
- Operational process;

Within the context of this incident there were not find lack of human resources, budget resources, deficient planning, as well as were not find any adversarial, or conflicting, or when they are supplanted by unofficial rules and values and confusion abounds that could to have influence on creation of this serious incident.

The occurrence also highlighted the lack of a critical incident response programmed for controllers who may have been traumatized by an incident or indeed the subsequent investigations into such events, and illustrates the requirement of a similar programmed for ATC personnel as exits for most aircrew.

3. CONCLUSIONS

During process of investigation made the following conclusions:

3.1. Findings

- At the time of the incident the traffic was handled by Tower controller;
- Poor decision of Tower controller was issuing take-off clearance for aircraft ART531;
- Tower controller on duty failed to take into account all factors for correctly evaluation of approaching aircraft and departing aircraft;
- The incident occurred in a period of increased traffic density and complexity, during go around from low altitude during low visibility approach resulted in proximity with departing aircraft;
- Complexity of situation in low visibility and changing weather conditions might have caused the controller to make misjudgment of situation due to lack of experience;
- On basis of tower controller and aircraft crew voice recordings investigation revealed poor coordination among aircrew and Tower controller - misunderstanding in communication;
- The air traffic controller held valid licence and ratings and was qualified and current at the position;
- ATC controller was self-reliant that situation is safe as a result lost of situation awareness;
- According to EUROCONTROL guidance material (ESARR 2 Guidance to ATM Safety Regulators this incident is classified as Major Incident;
- Investigation didn’t reveal any violations such as willful disregard for the rules and regulations that govern safe flight;

3.2. Causes

Causes of the serious incident during go around from low altitude during low visibility approach as resulted infringement the separation minima with departing aircraft, were the following:

3.2.1. Root Cause

The source or origin of an event that played the major role that caused this incident was the fact that the Tower controller who handled an air traffic due to lack of experience cleared aircraft ATR531 to take-off.

3.2.2. Contributing causes

- Overrunning the aircraft F50 TWY “C”;
- Misunderstanding in communication between Tower controller and crew BTI3G2;
- Low visibility weather conditions.

3.2.3. Primary cause

The event after which incident became inevitable.

Controller did not make actions stop take - off aircraft ART 531.

4. FLIGHT SAFETY RECOMMENDATIONS

It is recommended that the authority responsible for air navigation services in the Latvian airspace - State Joint Stock Company Latvijas Gaisa Satiksme (LGS):

Recommendation -21 -2009

- in the framework of the Safety Management System company should provide risk assessment and mitigation measures in relation of human factors, revise company safety improvement proposals, taking into account repeating serious incidents involving human factors and such incident's tendency.

Recommendation -22 -2009

- should provide additional Human Factors training based on ICAO Human Factors digests (*Human Factors in Air Traffic Control - Circular 241*) and in accordance with EuroControl (EA TCHIP) recommendations with all controllers;

Recommendation -23 -2009

- consider opportunity for providing additional internal safety audit in the framework of company Safety Management System and Quality Management System, devoting attention to human factors.

It is recommended to JSC "Air Baltic Corporation":

Recommendation -24 -2009

- should provide most attention in training to use standard phraseology accordingly to ICAO Doc 9432 "Manual of Radiotelephony".

December 21, 2009

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