

# AIR TRAFFIC INCIDENT INVESTIGATION REPORT

Tallinn ACC 26.10.04

BAW 799 / BEC 001

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# SYNOPSIS

On October 26, 2004 in Tallinn UTA a serious flight incident took place between Bercut Air (Kazakhstan, flight BEC001 from Stockholm to Astana) Boeing 767 cruising at FL 370 in the south-east direction and A320 of British Airways (BAW799, flight from Helsinki to London), climbing to FL 380 inbound south-west.

BAW799 was cleared to climb initially to FL 360 and then - recleared to FL380, what created a conflict with BEC001 cruising at FL 370. The two aircraft were at the same altitude - FL 370 (FL 377) separated by 2,22 NM horizontally instead of the declared minimum of 5 NM. The conflicting crews had each other in sight and TCAS TA - "*Traffic, Traffic*" - was initiated on both aircrafts.

For conducting the investigation the following Board was appointed by the Secretary General of the Ministry of Economic Affairs and Communications:

Mr Tõnu Ader, chairman

Expert on Aircraft Accident Investigation in he  
Ministry of Economic Affairs and Communications

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Ms Eve Härm

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Senior Inspector of Air Traffic Services and  
Aerodromes Department of the Estonian CAA

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Mr Ardo Oras

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Head of the Quality Department of the Estonian ANS

Investigation started on October 27, 2004

Investigation was completed on

# CONTENT

## 1. FACTUAL INFORMATION

### 1.1. Description of the occurrence

On October 26, 2004, at 14:48 UTC (17:48 local time) BAW799, type of aircraft - BAW799 contacted Tallinn ACC – West from Tampere FIR and reported passing FL 150 and climbing to FL 240. Tallinn ACC air traffic controller (hereinafter ATCO1) cleared BAW799 to climb to FL360. Clearance was read back by the crew.

At time 14:49:25 BAW799 requested FL380 for cruising, traffic permitting. ATCO1 cleared to climb to FL380. Clearance was read back by the crew.

At time 14:52:14 BAW799 entered Tallinn FIR.

In that period Tallinn ATCO1 had 7 aircrafts on radar screen and 4 under control.

At time 14:55:30 B767 BEC001 reported that they were approaching point NEBSI at FL 370 and ATCO1 (Tallinn Control) confirmed radar contact.

At time 15:01 ATCO1 was replaced by ATCO2.

At time 15:01:38 CLAM was initiated and, without delay, CA.

At time 15:01:48 there was Russian speech on the frequency. Pilot from BEC001 was talking something about speed and asking what aircraft was there on the left from them.

At time 15:01:53 ATCO2 instructed BAW799 to turn right heading 270 immediately, which after BAW799 pilot reported that they had the other aircraft in sight about 2 miles from them.

At time 15:02:12 BEC001 reported in Russian language that they had climbed to flight level 377 and they had had TCAS advisory and ATCO2 acknowledged that.

At time 15:02:27 BAW799 pilot reported that they had assumed to have passed traffic about 2 miles and 200 feet and ATCO2 acknowledged that.

After 15:02:40 the declared horizontal separation minimum between two aircrafts was achieved.

At time 15:03:01 BAW799 pilot reported that they were clear of traffic and requested to resume direct ODRUT.

Conflict was solved.

### 1.2. Injuries to persons

There were no injuries.

### 1.3. Damage to aircraft

No damage occurred.

### 1.4. Other damage

Does not exist.

### 1.5. Personnel information

<b>ATCO1</b>	34 years old, male
Permission	Nr 0365
Valid	until 27.08.2005
Ratings	ACC, APP, TWR
Working since	1997

<b>ATCO2</b>	37 years old, male
Permission	Nr 0308
Valid	until 27.11.2004
Rating	ACC, APP
Working since	1991

**B767 Commander** male

**A320 Commander** male

### 1.7. Meteorological data

Day time, just before twilight.

Visibility more than 10 km. By Tallinn airport metoffice the clouds were 6 octas at 1000 feet and 3 octas at 1900 feet.

### 1.8. Navigational and radar aids and ATM aids

The flights were under Radar control.

Information on the Radar display of the air traffic controller was provided from Martna SSR Radar, which is located at Martna with coordinates 585105N0234850E.

The quality of the Radar picture was good. For the investigation the radar picture recordings from Tallinn Air Traffic Control Center (EETT) were used on the Simulator.

ATM computer system is EUROCAT 2000 ver. 3.7.

## **1.9. Communication**

The radio communication between the aircrafts and ATCOs was held on the frequency 132,5 MHz in English.

For the investigation the ATCO console recordings on the frequency 132,5 MHz was used. The quality of the recordings was good.

The quality of the communications was good, and there was no principal errors in the used by the ATCO phraseology.

BEC001 pilots used non-standard phraseology in Russian language from the moment, when TCAS alert started.

BAW799 pilots used non –standard phraseology during the conflict.

According to Radiotelephony Communication Transcript there were also a lot of inaccuracies in radio communications on all sides.

## **1.10. Information about the airfield**

Not relevant

## **1.11. Flight recorders**

The data from B767 aircraft FDR were used.

The description was made based on the recordings of the MSSR radar data that were presented to the investigation board.

## **1.12. Post incident investigation of the aircrafts and airport**

Not necessary.

## **1.13. Medical and pathological information**

Not available.

## **1.14. Fire**

No fires broke out.

## **1.15. Survival aspects**

Not necessary.

## 1.16. Tests and research

Were not performed.

## 1.17. Organizational and management information

Air traffic control was provided in the airspace of Tallinn FIR, by Estonian Air Navigation Services (EANS) staff. According to Regulation No 240 of the Government of the Republic of 18 July 2000 “Procedure for Use of Estonian Airspace and for Ensurance of Air Traffic services” para 46EANS is responsible for these activities.

Air Traffic Controller (ATCO1) involved in the occurrence was responsible for ACC during the Morning shift two times with total working-time 2 hr 07 and total rest time 3hr 48min before the incident and his working shift as ACC-W was over 1 minute before the incident occurred.

The other Air Traffic Controller (ATCO2) had been standing by for 1 hr.

### Information gathered for the investigation:

Air Traffic Incident Report (Tallinn ACC Air Traffic Controllers' report)	26.10.04
Explanation letters from ATCOs	26.10.04
Copies of the Strips	26.10.04
Description of the radar picture	26.10.04
Description of the FDR B767	01.11.04
Incident Report from A320 BAW 799 captain	02.11.04
Explanation letters from B767 BEC001 captain and co-pilot	05.11.04
Investigation report from FS Commission Kazakhstan	20.12.04

## 2. ANALYSIS

### 2.1. Explanation of the situation

At time 14:48:22, BAW799, when entering Tallinn controlled airspace with not very high traffic activity, called Tallinn ACC air traffic controller and reported that they were passing flight level 150

and climbing to flight level FL240. Tallinn ACC ATCO1 identified the flight and issued BAW799 clearance to climb to flight level 360:

*“Tallinn Control BAW799. Passing FL 150, climbing FL 240”*

*“BAW799 Tallinn Control. Good afternoon. Radar contact. Continue climb to FL 360”.*

*“FL 360. BAW799”*

ATCO1 changed flight level from FL 240 to FL 360 on the electronic FPS and after that he continued radio communication with two other aircrafts under control.

In a minute, at time 14:49:25 -14:49:29, BAW799 requested climb to flight level 380 for cruising if it was possible. FL 380 was preplanned in the flight plan. ATCO1 recleared BAW to climb to flight level 380 and BAW 799 pilot read the clearance back:

*“Tallinn, BAW799, we are requesting FL 380 for cruising, if possible”.*

*“BAW799, continue climbing FL 380”*

*“Climb to FL 380, BAW799”*

After that ATCO1 did not modify the new level on the display electronic strip.

This human error was not the cause of the conflict situation between the climbing BAW799 and the BEC001cruising at FL 370. The only cause was the delayed conflict detection and late activation of the Conflict Alert Function of the automated ATM System (it is known as Short Term Conflict Alert – STCA in ATM) for the BAW799 climbing to an altitude higher than the FL 360 that had been entered into the system by the ATCO..

At time 14:55:28 (it is five and half minutes after the conflicting BAW799 BAW799 got clearance to continue climb to FL 380) BEC001 contacted Tallinn Control frequency and reported flight level 370 and that they were approaching point NEBSI. ATCO1 identified the flight:

*“Tallinn Control, Good afternoon, BEC001. Approaching to NEBSI FL 370”*

*“BEC001, Tallinn Control, Good afternoon, radar contact”*

*“BEC001”*

At time between 14:59:15 and 15:01 the ATCO1 handed the shift over to ATCO2 and informed him about the situation, but did not notice the unchanged FL for BAW799 on the electronic strip and for this reason he didn't modify the cleared FL on electronic strip and neither did he inform ATCO2 that BAW799 was climbing to FL380 instead of FL360.

At time 15:01:38 ATM system Eurocat 2000 initiate CLAM and - without delay - CA.

At time 15:01:48 there was Russian speech on the frequency. Pilot from BEC001 was talking something about speed and asked about the aircraft on the left side from them:

*“Спид может? 001, что там за самолет слева от нас?”*

Obviously the beginning of the communication (Спид может?) consist the end of cockpit communication between crew.

After that at 15:01:53 ATCO2 instructed BAW799 to turn right on heading 270, which after BAW799 pilot reported that they had visual contact with another aircraft 2 miles of them.

*“BAW799, immediately turn right heading 270”*

*“799, Yes, we have traffic visually it’s coming within 2 miles with me.”*

BEC001 reported in Russian language that they had climbed to flight level 377 and they had TCAS advisory and ATCO2 acknowledged that:

*“ОКЕЙ, мы набрали 377 advisory TCAS сработала.”*

*“Понял”*

The ATCO2 instructed BAW799 to make a turn, in reality it did not affect the conflict situation due the slow reaction of the pilot of BAW799. When BAW799 started to turn the minimum horizontal separation of 5 NM was already achieved . But ATCO2 did not have time to analyze all the aspects of the dangerous situation and the instruction to BAW799 was meant at least to diminish the risk of collision.

The BEC001 captain’s climbing maneuver could have been more appropriate in case of RA (Resolution Advisory “Climb”). In this situation, when only Traffic Advisory info was in the cockpit, it wasn’t the best action. It was commenced late (when the climbing BAW799 was already crossing FL 370) and for that reason the climbing maneuver of the BEC001 even prolonged the time during which both aircrafts were at the same level. Actually the climbing BAW799 reached FL 380 exactly when BEC001 was beyond the projected conflict track.

At time 15:02:28 BAW799 pilot reported that they passed traffic about 2 miles and 200 feet and air traffic controller acknowledged that:

*“799, to Tallinn. We ... we reckon airplane, was within ... 2 miles was there and ran about 200 feet.”*

*“BAW799, roger.”*

At time 15:02:52 the pilot of BAW799 reported that they were clear of traffic and requested to resume direct ODRUT. ATCO2 cleared him direct SORLA:

*“799, we are clear of the traffic. May we resume inbound to ODRUT now”?*

*“BAW799, cleared direct to SORLA”*

## 2.2 Affecting Flight Safety

The declared horizontal minimum separation (5NM) between the aircrafts with vertical separation less than 1000 FT was lost for 45 seconds, but only during the first 18 seconds the aircrafts were on the converging headings to the projected area of potential conflict.

At time 15:02:07 the aircrafts were on the projected crossing point separated by 3 NM and at the same FL 373 and from this moment their tracks did not cross each other, even though the distance between the aircraft still continued to decrease until 2.2 NM at time 15.02.20 when the BAW799 was exactly backward to the BEC001 and the crew of BAW799 could see the conflicting aircraft in the direction over the left wing.

After the time 15:02:14 the aircrafts were on divergent courses with the angle  $> 20^\circ$ .

By Eurocontrol Safety Regulatory Requirements Reporting and Assessment of Safety Occurrences in ATM (ESSAR 2) this occurrence was qualified as Serious AT Incident (Inadequate separation).

## 2.3 Human errors of the air traffic controller (ATCO1)

**2.3.1 First error** ATCO1 made was, when he, by mistake, forgot to modify the cleared flight level for BAW799 in EUROCAT 2000 system.

Even though ATCO1 noticed the FL change (in his own explanation), he didn't change the flight level on the electronic strip and the system was continuing to monitor that flight as if at FL360. ATCO1 didn't enter the verbally cleared flight level (FL380) into the system which resulted in limited conflict detection above FL360 and he did not expect any conflicts for BAW799 at this moment, because out of all the aircrafts under control only SAS996 was in the direction intersecting BAW799 at FL360, but BAW799 solved the potential conflict by climbing to FL380 and ATCO1 calmed down. Radar track of the BEC001 at that time was not seen on the screen of ACC-W position. The BEC001 was still about 55 NM North-West from point NEBSI. The selected by ATCO radar picture scale of 150 NM covered the area of about 25 NM west of point NEBSI (on the boundary of Tallinn ACC). The Strip for the flight BEC001 from Stockholm was initiated by the system. Stockholm ACC called Tallinn ACC ATCO or assistant and they manually modified FPL for BEC001 in window, after that the electronic strip moved from the window "preliminary /proposed" to "coordinated/informed". If no conflict had occurred, the wrong FL on the Electronic Strip obviously would have been noticed by ATCO2 at the latest moment, when the BAW799 passed FL 363.

**2.3.2 Second error** was actually the cause of the conflict, because after receiving information about BEC001 passing point NEBSI at FL 370, the ATCO1 did not detect the potential conflict with the climbing aircraft BAW799 and did not take any necessary actions.

**2.3.3 Errors could have been corrected** by ATCO1 during a more detailed shift changeover procedure. If ATCO1 would have verbally informed about a potential conflict between BAW799 and BEC001, then ATCO2 would have paid more attention to the conflict at an earlier stage.

Assuming that ATCO1 would have entered the correct cleared FL380, then the STCA function of the ATM system would have detected the conflict and alerted at least 1,5 minutes before the separation infringement.

**2.3.4 Errors related to the shift duration and changeover process.** The last shift of the ATCO involved in the conflict exceeded the average practice it was more than 1,5 hr (90 minutes). Before the last portion of the shift ATCO1 had worked for 2h 07 minutes in two portions and had had the rest time two times before the mentioned shift for 3h 48 minutes.

Both ATCO-s are experienced. Their knowledge were refreshed and the skills checked during regular simulator trainings. Due to the not very complicated AT situation they did not need profound briefing during the shift changeover. But obviously, even this shift changeover process was done according to the existing rules; it was too brief to check all the necessary information and to create full situational awareness to the ATCO2 and ATCO1 didn't relay all own intentions to the replacing controller.

Probably the real shift changeover took place and signed by ATCO2 at time 15:01 and after this in a short period of time – at 15:01:38 CLAM and CA suddenly were initiated by the system. After 10 seconds there was a speech in Russian from BEC001. It is medium-short period for adaptation to the conflict situation and for resolution.

## **2.4 The late activation of the Conflict Alert function**

At time 15:01:38 the Conflict Alert function of EUROCAT 2000 system issued Conflict Alert - when BAW799 passed level 363 (Level Burst). According to the system the Cleared Level Adherence Monitoring (CLAM) parameter configuration the cleared level adherence parameter is set to 300 FT. Therefore Conflict Alert was supposed to be initiated by the system when the radar track had passed level 363, assuming the presence of another conflicting traffic.

As the Cleared Level for BAW799 known by the system was FL 360, the system detected the conflicts until level 363 (level 360 plus level adherence parameter). If the Cleared Level known by the system had been FL380, the Conflict Alert would have appeared 1,5 minutes before the separation infringement. System parameter for “look ahead” is 90 seconds before the potential separation infringement. Conflict Alert was displayed 18 seconds before the minimum horizontal separation, declared in Tallinn FIR (it is 5 NM), was infringed.

For activation vertical separation CA in EUROCAT 2000 climbing or descending aircraft could exceed cleared level 300 FT ie separation between aircrafts could be 700 FT and in case if conflicting aircraft also deviates from cleared level it could be even the less.

The CLAM function of the EUROCAT 2000 ATM system can alert about the decreased separation and the ATCO can instruct the pilot to "Check altitude and verify flight level" only in case when the aircraft actually passed cleared FL.

If flight crew accidentally enters wrong FL into the flight computer or ATCO does not enter correct cleared altitude into computerized ATM system, Eurocat 2000 system does not start CA.

## **2.5 Assessing the incident by crews of conflicting aircrafts**

The pilots of both aircrafts could see the conflicting aircraft visually and also on TCAS display.

Despite being blinded by the sunshine the crew of BAW799 had the conflicting BEC001 clearly in sight. Also the pilots of BAW799 were aware of the conflicting aircraft, because they were monitoring the radio communications between ATCO1 and BEC001 when entering Tallinn ACC and they could follow the conflicting aircraft for a relatively long period. It was not very difficult for the BAW799 crew to estimate the speed vectors for both conflicting aircrafts and take precautionary measures.

But for the pilots of BEC001 the conflicting aircraft from the left-forward-down direction approached unexpectedly. They had not heard the radio communications and visually this approaching against the not very homogeneous background of the layer of lower clouds aircraft could be visually observed only by captain on left seat, shortly before the TCAS Alert started. It was difficult for the BEC001 pilot in command to assess the headings tracks and within a short time (and also due to the stress of conducting a VIP flight) the captain did not have the possibility to evaluate precisely the converging tracks by altitude.

That is why the captain of the BEC001, simultaneously with the information to the air traffic controller, started immediately an evasive maneuver. For that he switched off the autopilot and directed aircraft to the right turn climb. Vertical acceleration by FDR was 1,167 G and maximal bank to the right during maneuver was 13,7°. After the carried out maneuver the captain in the hurry was not able to explain the altitude change and reported in Russian language to ATCO2 that they had climbed to Level 377 in response to TCAS Advisory. In fact there was no TCAS Advisory, there was only warning "*Traffic! Traffic!*"

Changing the language of the communications from English to Russian did not confuse ATCO2. As this communication in Russian language did not contain any vital information for the BAW799 crew and also the ATCO was able to communicate in Russian, this language change did not create any extra difficulties nor misunderstandings.

## **3. CONCLUSIONS**

### **3.1 Definition of the occurrence**

Occurrence was qualified as Serious AT Incident (Inadequate separation minima).

### **3.2 Findings**

**3.2.1** According to the vectors no real danger of collision existed, even if no evasive actions had been undertaken by any of the involved sides (aircrafts and ATC).

**3.2.2** The minimum stipulated horizontal safety separation (5NM) was violated during 45 sec and the minimum horizontal separation was 2,22 NM.

**3.2.3** The ATCO1 issued new clearance for level change to BAW799, but, by mistake (human error) did not enter the modified Flight Level into the ATM system. Which resulted in the late initiation of the Conflict Alert function - only after passing level 363.

**3.2.4** The ATCO1, by human error, did not predict potential conflict between BEC001 on FL 370 and BAW799 climbing to FL 380 and did not take necessary actions to avoid infringement of the separation minima.

**3.2.5** The shift changeover was carried out according to the existing rules, but very briefly. The replacing air traffic controller (ATCO2) was not able to avoid separation infringement.

**3.2.6** The initiated by the B767 evasive action (right turn with climb) was not correct and reduced the vertical separation between aircrafts during the conflict.

**3.2.7** The language change in radio communication did not affect the course of the process, since the ATCO2 was able to communicate in Russian language.

### **3.3 The cause(s) of Serious Incident**

The occurred Serious Incident was caused by Human Errors of the air traffic controller (ATCO1).

The first Error was incorrect electronic (system) update of cleared Flight Level to BAW799.

The second Error was an insufficient planning of air traffic situation, i.e. prediction of conflict situation.

## **4. SAFETY RECOMMENDATIONS**

### **4.1 Reliance automated ATM systems**

Air Traffic Controllers should not trust too much the automated ATM systems due to the existence of the possibility to enter wrong basic information by human error. ATCOs shall be informed that incorrect update of the current flight plan information of ATM system will result in incorrect functions of safety monitoring equipment..

### **4.2 Evasive maneuvers**

Evasive maneuvers, if the process of the situation is not clear and Resolution Advisory (RA) is not given by TCAS, shall not be initiated.

### **4.3 Training**

The Serious Incident and factors leading to this have to be learned by ATCO-s with ACC (APP) ratings and during next SIM exercises monitored by instructors about knowledge's and skills to resolve similar situations and appraise each ATCO for rapid and appropriate reactions to the Conflict Alert.

### **4.4 Revision of the shift changeover procedure**

Shift changeover procedure shall be reviewed. It is advisable to use more time for shift handover, for deeper explanation and analysis of the potential conflicts.

### **4.5 Revision of Ground based Safety Net STCA parameters**

Ground based Safety Net STCA parameters shall be reviewed and changed to prevent similar situations with human error. A possibility for upgrading EUROCAT 2000 system for it to be able to assess rate of climb/descent, make 5 or even 10 minutes speed vectors and alert ATCOs in case of any potential conflict/risk, shall be considered.

### **4.6 Radiotelephony communication in non-standard situations**

For flight crews it is necessary in addition to the common radio communication phraseology, during simulator trainings pay more attention for the radiotelephony communication in non-standard situations.

## 4.7 Incident report data

For investigation purposes to enter reference numbers (phone number or E-mail address) into incident reports in order to be able to take direct contact with the crew involved.

Chairman of the investigation commission

T. Ader

Members

E. Härm

A. Oras

# Chart 1

