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Final report RL 2012: 03e

**Serious incident on 21 January 2011
with aircraft SE-LLO
and EW-303PJ at Stockholm/Arlanda airport.**

Case no: L-05/11
2012-03-08

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Swedish Transport Agency

601 73 NORRKÖPING

Final report RL 2012: 03e

The Swedish Accident Investigation Authority (SHK) has investigated a serious incident that occurred on January 21 2011 at Stockholm/Arlanda airport, Stockholm County, involving two aircraft, with the registrations SE-LLO and EW-303PJ.

In accordance with Regulation (EU) No 996/2010 on the investigation and prevention of accidents and incidents in civil aviation, the SHK investigation team hereby submits a report on the investigation.

On behalf of the SHK investigation team

Göran Rosvall

Stefan Christensen

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General

The Swedish Accident Investigation Authority (SHK) is an independent government authority with the task of investigating accidents and incidents with the aim of improving safety. SHK accident investigations are intended so far as possible to determine both the sequence of events and the cause of the events, along with the damage and other effects. An investigation shall provide the basis for decisions which are aimed at preventing similar events from occurring again, or limiting the effects of such an event, as well as for an assessment of the operations performed by the emergency services in respect of the event and, as the case may be, for improvements to these emergency services.

SHK accident investigations aim at answering three questions: *What happened? Why did it happen? How can a similar event be avoided in the future?*

SHK does not have any supervisory role and its investigations do not deal with issues of guilt, blame or liability for damages. Such issues are, therefore, neither investigated nor described in the reports. They may on the other hand be dealt with by judicial authorities or, for example, by insurance companies.

The task of SHK also does not cover how persons affected by an accident or incident have been cared for by hospital services, once an emergency operation has been concluded. Measures in support of such individuals by the social services, for example in the form of post crisis management also do not form part of the task of SHK.

The investigation of aviation incidents are governed mainly by the Regulation (EU) No 996/2010 on the investigation and prevention of accidents and incidents in civil aviation. The investigation is carried out in accordance with Annex 13 of the Chicago Convention.

The investigation

On 24 January 2011 SHK was informed that an incident involving two aircraft with registrations SE-LLO and EW-303PJ had occurred at Stockholm/Arlanda airport, Stockholm County, on 21 January 2011.

The incident has been investigated by an SHK investigation team, consisting of Mr Göran Rosvall, Chairperson, Mr Stefan Christensen, Investigator in Charge, Mr Nicolas Seger, Operations Investigator and Ms Pia Jacobsson, HF investigator.

The investigation was followed by Mr Jan Eriksson of the Swedish Transport Agency.

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Aircraft: registration and type	SE-LLO, BAe ATP, EW-303PJ, CRJ-200
Class/Airworthiness	SE-LLO: Normal, Certificate of Airworthiness and valid Airworthiness Review Certificate (ARC) EW-303PJ: Normal, valid Certificate of Airworthiness
Owner/Operator	SE-LLO: Arafart AB/Nex Time Jet AB EW-303PJ: Government of Belarus/Belavia - Belarusian Airlines
Time of occurrence	21/01/2011 at 18.58 in darkness Note: All times refer to Swedish standard time (UTC + 1 hour)
Place	Stockholm/Arlanda airport, AB County, (pos. 5940N 01755E; 17 m above sea level)
Type of flight	Commercial air transport
Weather	According to the SMHI analysis: Wind 180- 220/6-8 knots, visibility >10 km, broken clouds with base 500 ft, temp./dew point -3/-4°C, QNH 1025 hPa
Persons on board:	(LLO): 3
Crew members	23
Passengers	(303PJ): 3
Persons on board:	33
Crew members	
Passengers	
Injuries to persons	None
Damage to aircraft	None
Other damage	None
Commander (LLO)	
Age, licence	32, ATPL
Total flying time	2583 hours, of which 1060 hours on type
Flying hours previous 90 days	120 hours, all on type
Number of landings previous 90 days	110
Co-pilot (LLO)	
Age, licence	26, CPL
Total flying time	1732 hours, of which 1232 hours on type
Flying hours previous 90 days	12 hours, all on type
Number of landings previous 90 days	40
Cabin crew (LLO)	1 person
Commander (303PJ)	
Age, licence	28, valid State Pilot Licence
Total flying time	3203 hours
Flying hours previous 90 days	126 hours, all on type
Number of landings previous 90 days	94
Co-pilot (303PJ)	
Age, licence	26, valid State Pilot Licence
Total flying time	548 hours
Flying hours previous 90 days	78 hours, all on type
Number of landings previous 90 days	54
Cabin crew (303PJ)	1 person

Summary

An aircraft aborted at a late stage the landing on runway 26 at Arlanda airport at the same time as another aircraft took off from runway 19R. At missed approach to runway 26 right turn should be carried out as soon as possible in order to avoid conflict with departing traffic from another runway. The aircraft that aborted the landing followed the prescribed procedures for missed approach only after three calls from the controller.

Although the conflict was observed by the air traffic control – and the departing aircraft had been instructed to change its course – a separation infringement occurred. Minimum distance when the aircraft were on the same altitude was 1.38 Nm.

Interviews with the Commander of the landing aircraft revealed that it was the Co-pilot that was PF¹ at the current flight. During the landing phase, however, the Commander judged that a safe landing could not be performed, and therefore took the decision to abort the landing. During the go around the Commander also took over the control of the aircraft.

The Commander's taking over the controls at a late stage probably resulted in his not having sufficient remaining capacity to immediately follow the published missed approach procedure. A contributing factor to the infringement of separation was that the go around was initiated approximately 2.3 kilometres from the published missed approach point.

Recommendations

None.

¹ PF: Pilot Flying

1. FACTUAL INFORMATION

1.1 History of the flight

1.1.1 Conditions

On the evening in question, Next Jet ATP (A/C 1) was about to take off from runway 19R at Arlanda airport for a scheduled flight to Lycksele. The clearance issued was in the form of a low speed heading², in which A/C 1 had been instructed to initially turn towards heading 270° after take-off, and was then handed over to the radar controller on heading 290°.

At the same time, Belavia CRJ200 (A/C 2) was on final approach to runway 26 after a scheduled flight from Minsk in Belarus. A/C 2 had been radar vectored to final and had started final approach to the runway.

1.1.2 The incident

At the same time as A/C 1 took off from runway 19R, A/C 2 was initiating the landing phase on runway 26. Just before touchdown, however, the Commander of A/C 2 decided to abort the landing attempt and commenced the procedure for missed approach ("go around - GA"). The published missed approach procedure for runway 26 is right turn (as soon as practicable) to heading 300° and climb to 1500 feet (see 1.10.2).

When A/C 2 initiated the go around, the pilots announced this by radio. In connection with this the tower (position TWR-E³) gave an additional clearance to continue the climb to 2,000 feet. When this had been acknowledged, tower instructed A/C 2 to turn right to the published heading of 300°. During the go around, however, A/C 2 did not follow the published procedure but instead turned left to heading 227° (heading according to radar data), which was a deviation of 73° from the published procedure.

The tower controller then gave two additional instructions to A/C 2 to turn right. At the third request A/C 2 turned towards the published heading of 300°. At the same time a colleague in the tower (position TWR-W⁴) had observed that a conflict situation was about to arise and instructed A/C 1 to turn left towards heading 200° to avoid a near collision with A/C 2, which was rapidly approaching with its prevailing deviation.

² Low speed heading: Standardized departure procedure for propeller traffic.

³ TWR-E: Air traffic controller in the tower who manages traffic in the eastern sector.

⁴ TWR-W: Air traffic controller in the tower who manages traffic in the western sector.

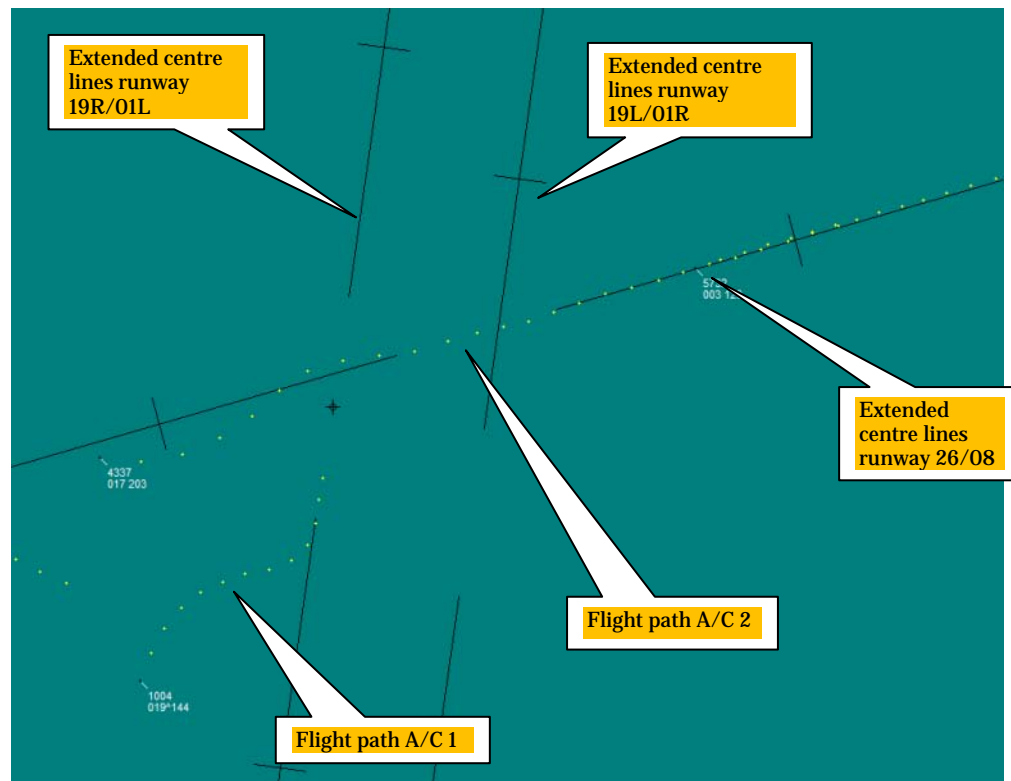


Figure. 3. Radar image of the sequence of events. Source: LFV.

The image in fig 3 above is an excerpt from radar images that graphically display the sequence of events. The solid lines represent the different runway directions (approach lines) for the three runways at Arlanda. The breaks in the lines show the location of the runways.

The yellow dotted lines show the flight paths of the two aircraft. With regard to A/C 1, it can be seen that after take-off from runway 19R the aircraft started turning towards heading 270° , but had to cancel the turn when the controller instructed the crew to turn left instead on a southerly heading (200°) in order to avoid the impending conflict.

The flight path of A/C 2 can be followed from the right edge of the image along the approach path to runway 26. When A/C 2 made a go around, it can be seen that after a slight change of heading to the right, the aircraft turned left on a heading measured at 227° . During the stage that followed, the TWR-E controller instructed the aircraft three times to turn right to 300° , while at the same time the TWR-W controller cleared A/C 1 away from the conflict.

Despite the evasive actions, there was a separation infringement between the aircraft. The minimum separation permitted between aircraft in this situation is 3 Nm. The minimum horizontal distance when the aircraft were at the same altitude (1600 ft) was 1.38 Nm, or just over 2500 metres, in this case. Both aircraft were in clouds and never had visual contact with each other. The incident also triggered an STCA⁵ Alarm with the radar controller who was monitoring the traffic in the actual sector (DIR-E).

1.1.3 Interview with commander of A/C 2

SHK has interviewed the Commander of A/C 2 twice. He stated that Arlanda could be considered a “normal” airport in operational terms and that the procedure for missed approach on runway 26 was not difficult to understand.

⁵ STCA: Short Term Conflict Alert (Warning alarm for radar air traffic controllers when a conflict situation between aircraft is about to occur)

The Commander also said that the Co-pilot – who had very low flight experience – was PF during the flight from Minsk to Stockholm/Arlanda. The Commander had flown to Arlanda airport about ten times in the past. The approach had been preceded by an “approach briefing” in which the pilots jointly reviewed all points on the approach maps, including the procedure for missed approach.

The approach initially followed normal routines until the final stage, when the landing was to be carried out. The Commander made a late assessment that the aircraft was coming in too fast and high, and took the decision to abort the landing. At the time when the landing was aborted, the aircraft position was estimated at approximately 500 metres into runway 26 and, according to the Commander, was in flare, i.e. at the stage just prior to touchdown.

When the decision to abort the landing was taken, the Commander took control of the aircraft from the Co-pilot. The reason for this decision was reported to be that the Co-pilot was inexperienced and that the Commander wanted to manoeuvre the aircraft himself during the go around procedure. The Commander did not consider that the go around procedure for the aircraft CRJ200 was complicated or difficult.

The Commander also said he was aware that the heading to intercept after a go around was 300°, but that a “certain delay” had probably occurred in this respect. The deviation in the wrong direction, according to the Commander, had however not been intentional. According to the Commander’s statement, the wind could have contributed to that the aircraft drifted in the wrong direction after go around. On board A/C 2, the crew were not aware of the conflict with the aircraft taking off. The Commander of A/C 2 had not noted any malfunctions or anomalies in the aircraft or its systems during the procedure when the go around manoeuvre was executed.

1.2 Injuries to persons

No persons were injured in the incident.

1.3 Damage to aircraft

No damage occurred to the aircraft.

1.4 Other damage

No other damage.

1.5 Crew members

1.5.1 Commander A/C 1

The Commander was 32 at the time and held a valid ATPL. At the time of the incident the Commander was the PF.

Flying time (hours)				
Previous	24 hours	7 days	90 days	Total
All types	0	7	120	2583
Current type	0	7	120	1060

Number of landings, current type, previous 90 days: 110.

Training on type was completed on 19 May 2008.

Latest PC (proficiency check) took place on 26 November 2010 on Bae ATP.

1.5.2 Co-pilot A/C 1

The Co-pilot was 26 at the time and held a valid CPL. At the time of the incident the Co-pilot was PNF⁶.

Flying time (hours)				
Previous	24 hours	7 days	90 days	Total
All types	0	12	104	1732
Current type	0	12	104	1242

Number of landings, current type, previous 90 days: 40.

Training on type was completed in September 2008.

Latest PC was completed on 9 September 2010 on Bae ATP.

1.5.3 Cabin crew A/C 1

1 person

1.5.4 Commander A/C 2

The Commander was 28 at the time and held a valid State Pilot Licence. At the time of the incident the Commander was PF.

Flying time (hours)				
Previous	24 hours	7 days	90 days	Total
All types	5	22	126	3203
Current type	5	22	126	1215

Number of landings, current type, previous 90 days: 94.

Training on type was completed on 15 March 2008.

Latest PC was completed on 10 September 2010 on CRJ 200.

1.5.5 Co-pilot A/C 2

The Co-pilot was 26 at the time and held a valid State Pilot Licence. At the time of the incident the Co-pilot was PNF.

Flying time (hours)				
Previous	24 hours	7 days	90 days	Total
All types	6	16	78	548
Current type	6	16	78	332

Number of landings, current type, previous 90 days: 54.

Training on type was completed on 28 January 2010.

Latest PC was completed on 13 August 2010 on CRJ 200.

1.5.6 Cabin crew A/C 2

1 person

1.5.7 Crew members' duty schedule

The crew members on both aircraft had worked according to regulations.

⁶ PNF: Pilot Non Flying (pilot who assists PF)

1.6 Aircraft information

1.6.1 Airworthiness and maintenance A/C 1

The aircraft

TC holder	BAe Systems Ltd.
Type	Advanced Turbo Prop (ATP)
Serial number	2023
Year of manufacture	1990
Total flying time	24,177 hours
Time period after latest inspection	499 hours
Fuel filled before incident	JET A1

The aircraft had a Certificate of Airworthiness and a valid Airworthiness Review Certificate (ARC⁷).



BAe ATP, SE-LLO. Photo: Stefan Sjögren

1.6.2 Airworthiness and maintenance A/C 2

The aircraft

TC holder	Bombardier Inc.
Type	CRJ-200, CL6002B19
Serial number	7436
Year of manufacture	2000
Total flying time	20,429 hours
Time period after latest inspection	424 hours
Fuel filled before incident	JET A1

The aircraft had a valid Certificate of Airworthiness.



CRJ 200, EW-303PJ. Photo: Jetphotos.net

⁷ ARC - Airworthiness Review Certificate

1.6.2 Accessibility and utility of TCAS

Both aircraft were equipped with TCAS⁸. No TCAS warnings for required action (RA) in connection with the incident were reported by either of the aircraft crews. It appeared, however, that a traffic advisory (TA) for the traffic conflict was indicated in the TCAS system onboard A/C 2.

1.6.3 Navigational aids during go around – A/C 2

The aircraft of type CRJ200 (A/C 2) that was operating during the incident is equipped with a standard navigation system in which the PFD screen (Primary Flight Display) is the central part. In addition to flight information, a large number of modes are also displayed which are activated by the different aircraft systems, including navigation systems and the autopilot.

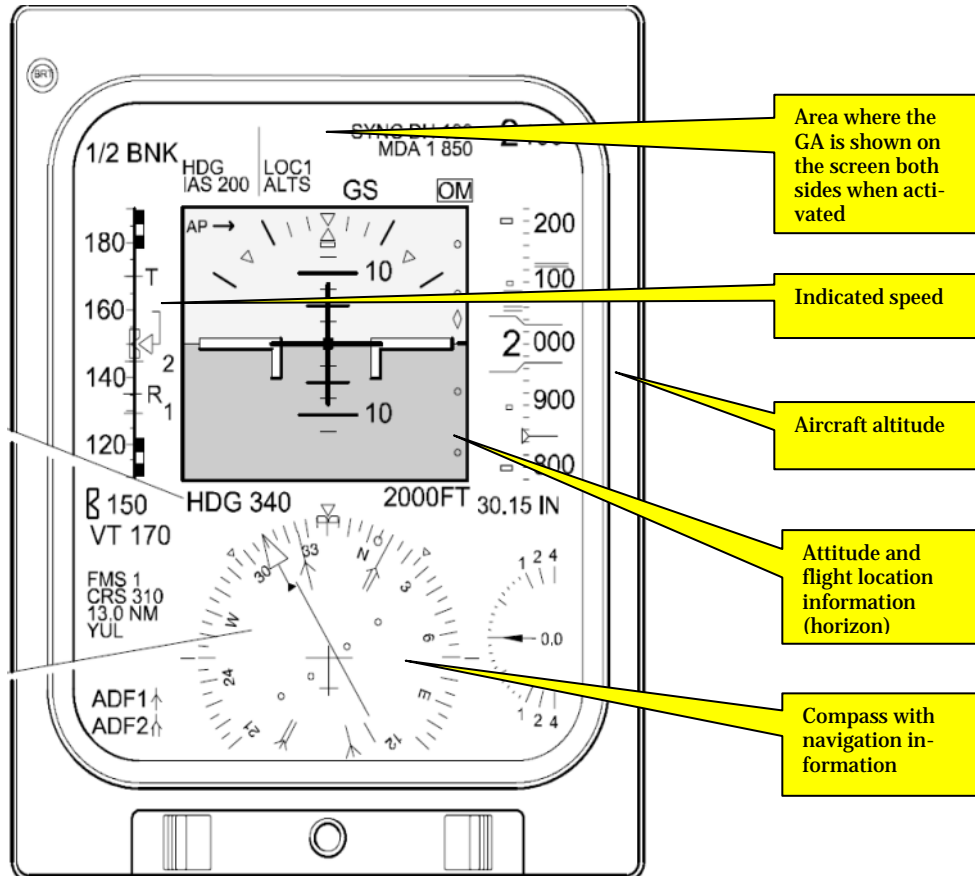


Figure 4.

There are switches on the throttles for activation of the go around modes that are implemented in the aircraft's systems. If a decision is made to abort an approach and/or landing and initiate a go around, the switch on the throttles is activated and the systems go into another mode.

When the go around mode is activated, the previously selected information on the pilots' PFD screens are changed, and the following conditions for the continued operation of the aircraft are introduced:

- "GA" appears as the active mode on both pilots' screens
- The autopilot is disabled and the aircraft must initially be flown manually
- Heading information in the PFD is locked at the prevailing heading when GA was activated.

⁸ TCAS: Traffic Collision Avoidance System.

- The bank angle is restricted to five degrees.
- All other lateral modes are disabled.

In addition to the above, the pilots must carry out a series of practical actions during a go around including, among other things: Increased power, flap position changed, landing gear retracted, radio communications, etc.

1.7 Meteorological information

According to the SMHI analysis:

Wind 180-220/6-8 knots, visibility >10 km, broken clouds at 500 ft, temp./dew point -3/-4°C, QNH 1025 hPa. Wind at 1,000 and 2,000 feet: 230°/10-15 knots.

1.8 Aids to navigation

Not relevant.

1.9 Radio communications

The following communications between tower air traffic controllers and the aircraft involved are excerpts from recordings of radio traffic that were saved in connection with the incident. During radio communications aircraft registrations are not used as call signs, but the flight number instead:

A/C 1 (SE-LLO) has the call sign: Nextjet444A
A/C 2 (EW-303PJ) has the call sign: BRU855

- TWR-E: Belavia 855 climb to 2,000 feet
- BRU855: 2,000 feet Belavia 855
- TWR-E: and Belavia 855 when ready turn right heading 300°
- BRU855: right heading 300 Belavia 855
- TWR-E: Belavia 855 turn right heading 300 (ATC STCA)
- BRU855: right heading 300 Belavia 855
- TWR-E: Belavia 855 turn right **now** heading 300
- BRU855: now heading 300 Belavia 855 (turning right)
- TWR-W: Nextjet 444A continue present heading now
- Nextjet444A: continue present heading now Nextjet 444A (heading 250)
- TWR-W: Ehh, please turn left to 200 shortly we had a go-around on 26 going on heading 260 now
- Nextjet444A: Turning left on heading 200 Nextjet 444A

When listening to the tapes, the controller heavily stresses the word “now” at the third call to A/C 2 to turn to 300°. At about the same time as the tower controller urges A/C 2 to turn right the second time, the STCA alarm by the radar controller at DIR-E is activated.

1.10 Airport data

1.10.1 General

The airport had operational status under AIP⁹-Sverige/Sweden. Runway 26 where A/C 2 intended to land has a length of 2,500 meters. The approach to the runway usually takes place using ILS¹⁰. Runway 26 has CAT I status, which in this case means that a missed instrument approach in the current aircraft

⁹ AIP: Aeronautical Information Publication

¹⁰ ILS: Instrument Landing System

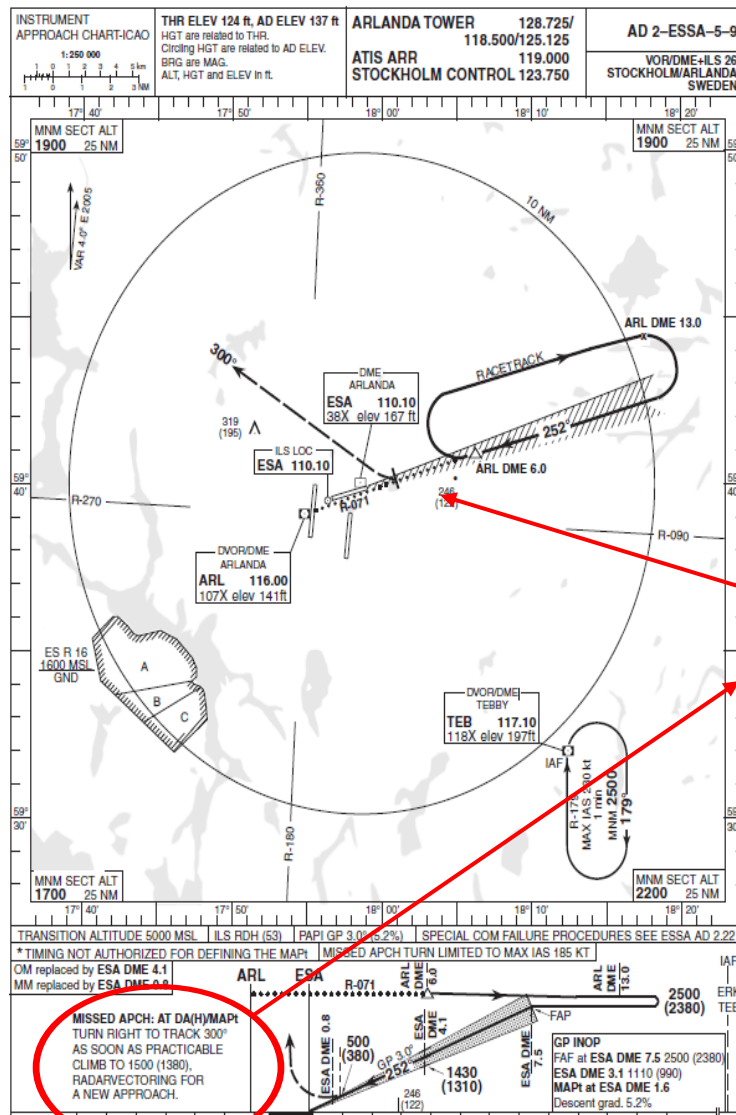
category (C) must be completed no later than an altitude of 370 feet above the ground (490 ft QNH). The distance to threshold is then just over 1,800 metres.

1.10.2 Missed approach procedure for runway 26

All airports that have procedures for instrument approaches also publish procedures for missed approach (go arounds). Most of the go arounds that are carried out, is under weather conditions with low cloud base or reduced visibility and are usually due to pilots not having visual contact with the runway approach lights at the prescribed minimum altitude.

Most procedures for missed approach start with a climb straight ahead. The reason for this is that manoeuvres at low altitude should not be made more difficult than necessary with early turns. The reason that runway 26 at Arlanda has a procedure that involves an early turn is connected with departing traffic management. In order to have simultaneous takeoffs from runway 19R, traffic aborting approach and landing on runway 26 must be directed away from the takeoff sector for runway 19R to avoid conflicts.

Although the procedure with a turn after go around cannot be said to be standard, it is applied at large airports with intersecting traffic flows and at some other airports for reasons of noise reduction, environment or topography.



MISSED APCH: AT DA(H)/MAPt
 TURN RIGHT TO TRACK 300°
 AS SOON AS PRACTICABLE
 CLIMB TO 1500 (1380)
 RADARVECTORING FOR
 A NEW APPROACH

Figure. 5. Approach chart for runway 26 at Arlanda.

The image shown in fig 5 above is an extract from AIP showing the instrument approach procedure for runway 26 at Arlanda. The chart also contains information about the procedure for missed approach (go around – GA). The information on this procedure is both drawn and described in text as follows:

Missed approach procedure: At decision height/point for missed approach

Turn right to track 300° as soon as practicable.

Climb to 1500 (1380). Radarvectoring for new approach.

The chart instructions above describes the procedure to be followed by an aircraft making a go around at decision altitude DA. There is no alternative procedure described on the approach chart for go around at later stages of an approach/landing.

1.11 Flight recorders

Information from recorders has not been used in this investigation.

1.12 Location of incident

Not relevant.

1.13 Medical information

Nothing has emerged to suggest that the pilots' mental or physical condition was impaired before or during the incident.

1.14 Fire

Not relevant.

1.15 Survival aspects

Not relevant.

1.16 Tests and research

1.16.1 Air Traffic Control.

For capacity reasons, traffic management in the tower is divided into different positions. Normally, this means that departing traffic is managed by the two positions TWR-W and TWR-E, each with responsibility for traffic in different sectors within the airport's control zone. Arriving aircraft are handed over to tower controllers from respective radar controller (DIR functions) when they are on final approach, and in a corresponding way, departing aircraft are handed over to radar controllers after takeoff.

Division of tower air traffic control into different positions results in different frequencies being used for radio traffic, for natural reasons. In the current case, this meant that the aircraft involved did not hear each other's radio communications with the tower.

1.17 Company organization and management

1.17.1 General

Belavia is a state-owned airline company in Belarus. The company's route network extends to European cities and some destinations in the Commonwealth of Independent States (CIS). Traffic services are also operated to certain destinations in the Middle East.

Recently the company has almost completely replaced the ageing fleet of Russian-manufactured aircraft (Tupolev 134/154) with newer Western aircraft of the types Bombardier and Boeing.

1.17.2 Training and procedures

Belavia pilots are trained at the international training centres in Berlin and Morlaix. All simulator training and theory is carried out by the company's own instructors. According to an interview with the company's chief pilot, it has sometimes been difficult to recruit pilots with high flying experience, why pilots with relatively low experience have been recruited. This has put higher demands on the organization's educational and training resources.

In the interview with the chief pilot, it was stated that normal procedures are followed relating to the assignment of work in the cockpit between the Commander and the Co-pilot when manoeuvring the aircraft. This means, among other things, that if the Co-pilot is PF on a flight then it is normally also he who will perform a go around after a missed approach.

According to the company's Aircraft Operations Manual, there is however an alternate procedure described. If the Commander judges that a safe approach and landing not can be performed, he can make the decision to abort and initiate the missed approach procedure himself.

1.18 Additional information

1.18.1 Equal opportunity issues

The current event has also been examined from a gender equality perspective, i.e. whether there are circumstances suggesting that the current incident or its effects were caused or influenced by the men and women involved not having the same opportunities, rights and obligations in various aspects. No such circumstances however were found.

1.18.2 Measures taken

The operator of A/C 2, Belavia, has on account of the incident decided to implement training of the go around procedure runway 26 at Arlanda Airport. The procedure will be trained from different altitudes to touch down. The training will be mandatory for all cockpit crew scheduled for flights to Arlanda.

2. ANALYSIS

2.1 Conditions

2.1.1 *Operator –the approach*

It may be noted that the Co-pilot had a very low level of experience, with only 548 hours' total flying time. The Commander's decision to allow the Co-pilot to conduct all phases of flight – including approach and landing – should be weighed against the Co-pilot's experience and the expected level of difficulty of the flight.

The prevailing weather conditions at Arlanda on the day in question cannot be considered particularly difficult. The pilots had to plan a normal instrument approach via ILS to runway 26, where contact with the landing lights/runway was expected well before the stipulated minimum altitude. There were no strong winds that could increase the level of difficulty of the approach or landing.

The procedure for approach – and missed approach – had, according to interviews with the Commander, been reviewed and discussed by the pilots during the “approach briefing”, which was carried out before the approach was commenced. It has not emerged that either of the pilots felt any special difficulties were to be expected prior to the planned approach and landing. SHK sees no reason to question the Commander's decision to allow the Co-pilot to perform the flight on the day in question.

2.1.2 *Airport - missed approach procedure*

The procedure laid down for missed approach to runway 26 is not standard, i.e. the departure path is not straight and it is assumed that the aircraft will turn to the right as soon as this is “practicable”. The reason for this discrepancy is safety for departing traffic when there are simultaneous takeoffs from runway 19R.

In reviewing this procedure, SHK cannot see that it is difficult to understand or to perform. It may also be stated that this procedure for go around after missed approach, involving a change of heading, is not a unique phenomenon. It is applied for various reasons at other airports.

The text which is published in the description of the procedure has also been given the addition, “as soon as practicable”. This is intended to give pilots the necessary time to stabilize the aircraft regarding attitude and configuration before the turn is started. It should be noted, however, that this procedure is intended to be started at the point of go-around for a missed instrument approach, i.e. approximately 1.8 kilometres before the start of the runway.

Overall, however, there is no reason to question the published missed approach procedure as a risk factor for air safety, nor as a determining factor in the sequence of events in this incident.

2.2 Actions during incident

2.2.1 Commander A/C 2 – general

As previously mentioned, the Co-pilot was flying the aircraft during the final approach to the runway. According to the interviews, the final stage was executed too fast and high - “hot and high”. Possible reasons why the approach was misjudged by the Co-pilot are numerous, but probably the main reason was his lack of experience.

The Commander is always the person who has ultimate responsibility for control of the aircraft. The decision to abort the approach/landing was probably based on an assessment that the landing could not be executed within the prescribed safety margins. In this respect, the Commander’s decision is deemed to have been fully in line with regulations as well as practice.

When the decision to go around was taken, however, the Commander also took the decision to take over the controls. This is in accordance with the company’s operational procedures. Even so, SHK believes that the decision was understandable given that the Co-pilot had not succeeded in safely landing the aircraft. A go around from low altitude can be a relatively difficult manoeuvre, which is why the captain probably felt that the best option in the situation in terms of flight safety was for him to take over control of the aircraft.

An extensive chain of events are set in motion during a go around, consisting of both automatic and manual handling. Taking over control of an aircraft at an altitude of perhaps less than 10 metres and at the same time starting a go around manoeuvre means a significant increase in a person’s workload. The pilot who “takes over” may not be fully aware of the exact status of the aircraft regarding throttle vs. speed, rudder angle vs. trim rudder settings and so on. In short, a feeling must be built up by the pilot who will take over flying in a situation like that at the time of the incident.

In such a situation, it is easy to understand why air safety and manoeuvrability of the aircraft was initially given a higher priority than the prescribed turn to 300°.

2.2.2 Commander A/C 2 - the omitted turn

As noted in the preceding paragraph, it is easy to imagine that the Commander of Belavia was relatively busy when the controller’s first request to turn right was received. That request was supplemented, however, with the addition, “when ready”, which may have made the Commander believe it was not urgent.

According to interviews conducted with the Commander, he was fully aware of the procedure in force for the missed approach. In this context, it may be noted that concentration and attention in a crew during an instrument approach is focused on the approach until the minimum altitude. At this altitude the approach is aborted unless the required visual references are obtained.

In this case the cloud base was well above the required minimum altitude, which probably meant that the crew relaxed that part of their concentration which was focused on minima – with the associated procedure for missed approach – and instead focused on the impending landing phase.

In the situation that subsequently occurred when the commander took over there were probably factors with a higher priority than the prescribed change of heading to 300°. To go back to the procedure for missed approach in this situation probably contributed to the delay that occurred, which in turn caused the separation infringement.

Although it cannot be excluded that the aircraft was handed over with a trim setting that was not neutral, the automation in the aircraft's systems is designed so that control information in a go around maintains the current heading when the system is activated. It is therefore likely that the commander, despite the available heading information and awareness of the applicable procedures, devoted so much of his capacity to stabilizing the aircraft that deviations from procedure occurred and the aircraft started to drift towards the left.

This is also supported by the fact that the controller had to repeat the instruction to turn on three occasions before any response could be noted. The commander's theory that the wind carried the aircraft to the left during the go around procedure can probably be considered as an attempt to explain the deviation. At the time the wind was 230°/10-15 knots, i.e. from the left. If the wind had affected the aircraft, it would have caused it to drift to the right of the track.

2.2.3. *Air Traffic Control*

The go around performed by A/C 2 could not have been anticipated by the air traffic controllers. The procedure for missed approach usually starts at minimum altitude and not when the landing phase has been initiated. It was probably a surprise to the controller when the aircraft announced a go around.

The effects of the heading deviation that then took place were probably exacerbated by the fact that the go around point was approximately 2.3 kilometres further forward than the point published on approach charts. This meant that A/C 2 came into conflict more rapidly with A/C 1, which had just commenced takeoff from runway 19R.

It can be noted that the air traffic controllers in the positions affected in the tower quickly understood the situation after A/C 2 announced that it was going around. The controller at TWR-E who was managing landing aircraft promptly gave repeated instructions to the aircraft to turn right.

His colleague in the tower, the controller in the second position of TWR-W, was clear and gave instructions to A/C 1 to cancel its initiated right turn and turn towards the left instead. In summary, these decisions largely resulted in a threatening conflict being averted.

3 STATEMENT

3.1 Findings

- a)* The pilots had authorization to perform the flights.
- b)* SE-LLO (A/C 1) had a Certificate of Airworthiness and a valid Airworthiness Review Certificate (ARC).
- c)* EW-303PJ (A/C 2) had a National Airworthiness Certificate.
- d)* The Co-pilot of A/C 2 had low flight time experience.
- e)* The Commander of A/C 2 took over the controls immediately prior to going around.
- f)* The go around mode on CRJ200 shows the current heading on activation.
- g)* The aircraft deviated from the prescribed heading for go around by 73°.
- h)* The controller repeated the instruction to turn on three occasions.
- i)* The go around took place in a flight phase where this is not usually performed.
- j)* The go around was initiated approximately 2.3 kilometres from the published missed approach point.
- k)* The tower controllers acted swiftly and without delay.
- l)* The established minimum separation distance (3 Nm) was infringed.
- m)* The shortest distance between the aircraft when they were at the same altitude was 1.38 Nm.

3.2 Causes of the incident

The Commander's taking over the controls at a late stage probably resulted in his not having sufficient remaining capacity to immediately follow the published missed approach procedure. A contributing factor to the infringement of separation was that the go around was initiated approximately 2.3 kilometres from the published missed approach point.

4. RECOMMENDATIONS

None.

