



**Statens haverikommission**  
Swedish Accident Investigation Board

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## **Report RL 2003:26e**

***Infraction of minimum separation  
between the aircraft SE-LHB and  
SE-EKW in the airspace east of  
Norrköping/Kungsängen airport,  
E County, Sweden, on the 12<sup>th</sup> of  
September 2002***

Dnr L-082/02

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Translated by Dennis Lynn Anderson; from the original Swedish, at the request of the Swedish Accident Investigation Board.

In case of discrepancies between the English and Swedish texts, the Swedish text is to be considered the authoritative version.

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2003-07-24

L-082/02

Swedish Civil Aviation Administration

601 79 NORRKÖPING

**Report RL 2003:26e**

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The Swedish Accident Investigation Board (Statens haverikommission, SHK) has investigated an infraction of minimum separation that took place on the 12<sup>th</sup> of September 2002 at Norrköping/Kungsängen airport, E County, Sweden, between two aircraft with the registration E-EKW and SE-LHB respectively.

In accordance with section 14 of the Ordinance on the Investigation of Accidents (1990:717) the Board herewith submits a final report on the investigation.

The Board of Accident Investigation respectfully awaits a response by the 25<sup>th</sup> of January concerning the follow-up of the recommendations included in this report.

Göran Rosvall

Monica J. Wismar

## Table of contents

	<b>ABBREVIATIONS</b>	4
	<b>SUMMARY</b>	5
<b>1</b>	<b>FACTUAL INFORMATION</b>	8
	<b>1.1 History of the flight</b>	8
	<b>1.2 Injuries to persons</b>	9
	<b>1.3 Damage to aircraft</b>	9
	<b>1.4 Other Damage</b>	9
	<b>1.5 Crew members</b>	9
	1.5.1 <i>The Flight crew members onboard SE-LHB</i>	9
	1.5.2 <i>The pilot onboard SE-EKW</i>	9
	1.5.3 <i>The Flight crew members duty schedules (SE-LHB)</i>	10
	1.5.4 <i>The air traffic controller</i>	10
	<b>1.6 The aircraft</b>	10
	<b>1.7 Meteorological information</b>	10
	<b>1.8 Aids to navigation</b>	10
	<b>1.9 Communications</b>	10
	<b>1.10 Aerodrome information</b>	10
	<b>1.11 Flight recorders</b>	11
	<b>1.12 Location of the incident</b>	11
	<b>1.13 Medical information</b>	12
	<b>1.14 Fire</b>	12
	<b>1.15 Survival aspects</b>	12
	<b>1.16 Tests and research</b>	12
	<b>1.17 Organizational and management information</b>	12
	1.17.1 <i>The operator</i>	12
	1.17.2 <i>Operational routines</i>	12
	1.17.3 <i>Checklist</i>	13
	<b>1.18 Additional information</b>	13
	1.18.1 <i>Air traffic control procedures</i>	13
	1.18.2 <i>The operator's procedures and adaptation of checklists</i>	14
	1.18.3 <i>Flight safety activities</i>	14
<b>2</b>	<b>ANALYSIS</b>	15
	<b>2.1 The incident</b>	14
	<b>2.2 Checklists and routines</b>	14
	<b>2.3 Issuing of clearances and air traffic control procedures</b>	16
<b>3</b>	<b>CONCLUSIONS</b>	17
	<b>3.1 Findings</b>	16
	<b>3.2 Causes of the incident</b>	16
<b>4</b>	<b>RECOMMENDATIONS</b>	17
	<b>APPENDICES</b>	
<b>1</b>	Extracts from Register of Licences regarding the pilots (to the Swedish Civil Aviation Administration only)	
<b>2</b>	Radio communications	

## Abbreviations

<b>A-licence</b>	National Private Pilot Licence	<b>m</b>	Meter
<b>AIP</b>	Aeronautical information publication	<b>MUST</b>	Military Intelligence & Security Service (Swedish)
<b>ANS</b>	A national organization for air traffic services in Sweden with headquarters in Norrköping	<b>NDB</b>	Non-directional radio beacon. A radio beacon which transmits non-directional radio signals, by means of which one can determine the bearing to the beacon by use of on-board equipment.
<b>APA</b>	Altitude Preselect Alert	<b>NM</b>	Nautical mile (1852 m)
<b>ATPL (A)</b>	Airline Transport Pilot Licence Aeroplane	<b>OM</b>	Operations Manual
<b>ATC</b>	Air Traffic Control	<b>ON</b>	The NDB-beacon approx. 3.5 nm east of runway 09/27 at Norrköping/Kungsängen airport
<b>ATS</b>	ATC (supervisory)	<b>OPC</b>	Operator proficiency check
<b>BFT</b>	Air Traffic Control Regulations (Swedish)	<b>PC</b>	Proficiency check
<b>°C</b>	Degrees Celsius	<b>PF</b>	Pilot flying
<b>CVR</b>	Cockpit Voice Recorder	<b>PNF</b>	Pilot not flying
<b>D-licence</b>	National ATPL	<b>QNH</b>	The air pressure at sea level
<b>FDR</b>	Flight Data Recorder	<b>s</b>	Second
<b>FL</b>	Flight Level/Altitude at standard airpressure	<b>SID</b>	Standard instrument departure
<b>FL-licence</b>	Air Traffic Controller Licence	<b>SMHI</b>	Institute of Meteorology & Hydrology (Swedish)
<b>FMS</b>	Flight Management System. Navigational equipment which determines the aircraft position by integrating navigational information from one or more position indicators, i.e. the aircraft airspeed indicator and altimeter systems. A vertical navigation function may be included.	<b>TWR</b>	Air traffic control tower
<b>hPa</b>	Hectopascal	<b>UTC</b>	Universal Time Coordinated
<b>IAL-chart</b>	Instrument Approach and Landing chart	<b>VMC</b>	Visual Meteorological Conditions
<b>IFR</b>	Instrument Flight Rules	<b>VOR</b>	Very high frequency Omnidirectional radio Range
<b>km</b>	Kilometer		
<b>LFV</b>	The Swedish Civil Aviation Administration		

## Report RL 2003:26e

L-082/02

Report finalized 2003-07-24

<i>Aircraft; registration, type</i>	A. SE-LHB, Jetstream 3200-3201 B. SE-EKW, Beech D95A
<i>Class, airworthiness</i>	Normal, valid certificate of airworthiness
<i>Owner/operator</i>	A. First Security Bank NA/Svenska Direktflyg AB B. Kungsair Training AB, Norrköping
<i>Date and time</i>	2002-09-12, at 16:04 hours in daylight Note: All times refer to Swedish daylight saving time (UTC + 2 hours)
<i>Place of occurrence</i>	In the airspace east of Norrköping/ Kungsängen airport, E County, Sweden, (pos. 5835.2N 01614.8E; 1,130 m above sea level)
<i>Type of flight</i>	A. Scheduled traffic B. Private skill test
<i>Weather</i>	According to SMHI's analysis: wind 330°/08 knots, variable between 280° and 340°, good visibility, no clouds, temperature/dewpoint +23/+11 °C, QNH 1027 hPa.
<i>Persons onboard;</i>	
<i>crew members</i>	A. 2    B. 2 (one of which was a flight examiner from the Swedish Civil Aviation Administration)
<i>passengers</i>	A. 10   B. 0
<i>Injuries to persons</i>	None
<i>Damage to aircraft</i>	None
<i>Other damage</i>	None
<u><i>Aircraft A</i></u>	
<i>Commander:</i>	
<i>age, sex, licence</i>	57 years old, male, Swedish D licence
<i>total flying time</i>	10,271 hours, of which 1,165 hours on the type
<i>flying hours previous 90 days</i>	76 hours, all on the type
<i>number of landings previous 90 days</i>	124
<i>Co-pilot:</i>	
<i>age, sex, licence</i>	28 years old, male, ATPL (A)
<i>total flying time</i>	3,700 hours, of which 1,740 hours on the type
<i>flying hours previous 90 days</i>	115 hours, all on the type
<i>number of landings previous 90 days</i>	79

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***Aircraft B******Commander:***

<i>age, sex, licence</i>	28 years old, male, A- licence
<i>total flying time</i>	270 hours, of which 13 hours on the type
<i>flying hours previous 90 days</i>	13 hours, all on the type
<i>number of landings previous 90 days</i>	12

<i>Air traffic controller</i>	23 years old, male, FL-licence since 2001
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The Swedish Accident Investigation Board (SHK) was notified on the 13<sup>th</sup> of September 2002 that an infraction of minimum separation had taken place between two aircraft with registration SE-LHB and SE-EKW respectively, in the airspace east of Norrköping/Kungsängen airport, E County, Sweden, on the 12<sup>th</sup> of September 2002 at 16:04 hours.

The incident has been investigated by SHK represented by Göran Rosvall, Chairperson, and Monica J. Wismar, Chief Investigator.

Lennart Löfström has assisted SHK as air traffic control expert.

The investigation has been followed by The Swedish Civil Aviation Administration, through Max Danielsson.

**Summary**

During the afternoon of the 12<sup>th</sup> of September 2002, the crew of the aircraft SE-LHB, a Jetstream 3200-3201 with the flight number HS476, was to fly from Norrköping to Visby.

When the passengers had boarded HS476 the crew informed the air traffic controller in the control tower at the airport that they were ready to taxi. They received clearance to line-up on runway 09. During the taxi-out, the air traffic controller issued the clearance "476 cleared Visby via ON, thereafter Visby VOR 3,000 feet, transponder<sup>1</sup> 5315." The Commander, who was the PNF, copied the clearance down and repeated it to the air traffic controller.

Simultaneously as HS476 was going to takeoff, there was another aircraft, SE-EKW, of type Beech B95A, in the area east of the airport at 4,000 feet in the holding pattern at the NDB-beacon ON.

The air traffic controller at Ostgota Control acquired radar contact with HS476 when it had become airborne. By observing the radar image he saw that the airplane was ascending rapidly and at a constant rate. During the time the PNF was transmitting, the air traffic controller observed the aircraft passing 3,300 feet and still climbing. He tried to interrupt on the frequency but did not succeed until the PNF had finished his transmission. At that time he issued the instruction "descend immediately to 3,000 feet!" "Traffic above at your one o'clock distance four, 4,000 feet maintaining."

The investigation indicates that the aircraft equipment (APA), which was set to 9,000 (FL 90), was not reset to 3,000 feet which was the cleared altitude and that the airplane exceeded the cleared altitude and reached 3,500 feet before the ascent was stopped. According to the transcription from MUST, the closest proximity of the two aircraft was approximately 500 meters horizontally and 180 meters vertically.

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<sup>1</sup> Transponder – Transmitter/receiver that, with the right interrogation signal, sends a response signal on a frequency other than the incoming transmission.

The incident was caused by the pilots onboard HS476 (SE-LHB) forgetting that the aircraft was only cleared to 3,000 feet and thereby ascending through the cleared altitude. Contributory to the incident was that the pilots had not set the cleared altitude on the APA.

### **Recommendations**

The Swedish Civil Aviation Administration is recommended to

- ensure that aviation companies design checklists so that as many items as possible can be performed prior to the taxi-out for takeoff being initiated (*RL 2003:26e R1*), and
- ensure that air traffic controllers, to the greatest extent possible, issue clearances to flight crew members before the taxi-out for takeoff has been initiated (*RL 2003:26e R2*).

# 1 FACTUAL INFORMATION

## 1.1 History of the flight

During the afternoon of the 12<sup>th</sup> of September 2002 the flight crew members onboard SE-LHB, a Jetstream 3200-3201 with the flight number HS476, were to fly from Norrköping to Visby. It was their first flight of the day.

When the passengers had boarded HS476 and the flight crew members had gone through the checklists and other preparations for the flight, such as a review of the takeoff and departure procedures etc., the engines were started. Thereafter the flight crew members informed the air traffic controller in the airport tower that they were ready to taxi. They received clearance to line-up on runway 09. During the taxi-out, the air traffic controller issued the clearance, "476 cleared Visby via ON, thereafter Visby VOR 3,000 feet, transponder<sup>2</sup> 5315." The Commander, who was the PNF, copied the clearance down and repeated it to the air traffic controller. Thereafter they received clearance for takeoff. The air traffic controller asked them to contact Östgöta Control after takeoff on frequency 132.95 MHz.

Simultaneously as HS476 was going to takeoff there was another aircraft, SE-EKW, of type Beech B95A, in the area east of the airport. Onboard were a pilot who was performing a skill test for an instrument and twin-engine rating, and a flight examiner from the Swedish Civil Aviation Administration. They had performed a sortie in the area and had received a clearance from the air traffic controller at Östgöta Control to hold at 4,000 feet in the holding pattern at the NDB-beacon ON.

HS476 took off on runway 09 and during the climb-out they received an unusual indication on one of the engine instruments that caught their attention. The PNF called Östgöta Control approximately one minute after having been asked to change frequency. He reported that they were climbing to FL 90 towards Visby.

The air traffic controller at Östgöta Control acquired radar contact with HS476 when it had become airborne. By observing the radar image he saw that the airplane was ascending rapidly and at a constant rate. At the same moment as he was about to inquire if HS476 was on the frequency, the aircraft transmitted to him. During the time the PNF was transmitting, the air traffic controller observed the aircraft passing 3,300 feet and continuing the climb. He tried to interrupt on the frequency but did not succeed until the PNF had finished his transmission. At that time he issued the instruction "descend immediately to 3,000 feet!" "Traffic above at your one o'clock distance four, 4,000 feet maintaining." He also requested the pilot in aircraft SE-EKW to climb to 4,500 feet.

The pilots in both aircraft attained visual contact with one another and the PF in HS 476 decreased altitude to 3,000 feet while the pilot in SE-EKW maintained an altitude of 4,000 feet after receiving clearance for this from the air traffic controller.

Thereafter HS476 continued the flight to Visby.

The incident occurred at position 5835.2N 01614.8E; 1,130 meters above sea level.

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<sup>2</sup> Transponder – Transmitter/receiver that, with the right interrogation signal, sends a response signal on a frequency other than the incoming transmission.



## 1.2 Injuries to persons

	<i>Crew members</i>	<i>Passengers</i>	<i>Other</i>	<i>Total</i>
Fatal	–	–	–	–
Serious	–	–	–	–
Minor	–	–	–	–
None	2/2	10	–	14
Total	4	10	–	14

## 1.3 Damage to aircraft

None.

## 1.4 Other damage

None.

## 1.5 Crew members

### 1.5.1 *The flight crew members onboard SE-LHB*

The commander, male, was 57 years old at the time and held a valid National Airline Transport Pilot Licence.

Total flying time: 10,271 hours, of which 1,165 hours on the type.

Flying time previous 90 days: 76 hours, all on the type.

Number of landings previous 90 days: 124.

Latest PC was carried out on the 19<sup>th</sup> of December 2001 and latest OPC on the 19<sup>th</sup> of August 2002.

The co-pilot, male, was 28 years old at the time and held a valid National Airline Transport Pilot Licence.

Total flying time: 3,700 hours, of which 1,740 hours on the type.

Flying time previous 90 days: 115 hours, all on the type.

Number of landings previous 90 days: 79.

Latest PC was carried out on the 29<sup>th</sup> of May 2002 and latest OPC on December 3<sup>rd</sup> 2001.

Both pilots had commander's rank. According to the work schedule, the older commander was the one who had the responsibility as commander for the flight. However, they decided that the younger pilot would sit in the left pilot seat during the flight to Visby. The other commander was accustomed to sitting in the right pilot seat as he also served as an instructor pilot within the company.

### 1.5.2 *The pilot onboard SE-EKW*

The pilot, male, was 28 years old at the time and had a valid National Private Pilot License.

Total flying time: 270 hours, of which 13 on the type.

Flying time previous 90 days: 13 hours, all on the type.

Number of landings previous 90 days: 12.

The pilot was performing a skill test for an instrument and twin-engine rating at the time of the incident.

### 1.5.3 The flight crew members schedules (SE-LHB)

During the week prior to the occurrence the flight crew members had the following duty schedule:

	<i>The commander</i>	<i>Number of flights</i>	<i>The co-pilot</i>	<i>Number of flights</i>
2002-09-05	04:30-11:10	4	06:15-17:15	4
2002-09-06	18:30-22:40	2	Day off	
2002-09-07	Day off		Day off	
2002-09-08	Day off		Day off	
2002-09-09	04:30-11:10	4	04:30-11:10	2
2002-09-10	15:10-19:55	2	15:10-19:55	2
2002-09-11	04:30-11:10	4	04:30-11:10	4
2002-09-12	15:15-		15:15-	

### 1.5.4 The air traffic controller

The on-duty air traffic controller at Östgöta Control, male, was 23 years old at the time and was qualified for this duty since the year 2001.

## 1.6 The aircraft

Both aircraft had a valid certificate of airworthiness.

## 1.7 Meteorological information

According to SMHI's analysis: wind 330°/08 knots, variable between 280° and 340°, good visibility, no clouds, temperature/dewpoint +23/+11 °C, QNH 1027 hPa.

## 1.8 Aids to navigation

Not applicable.

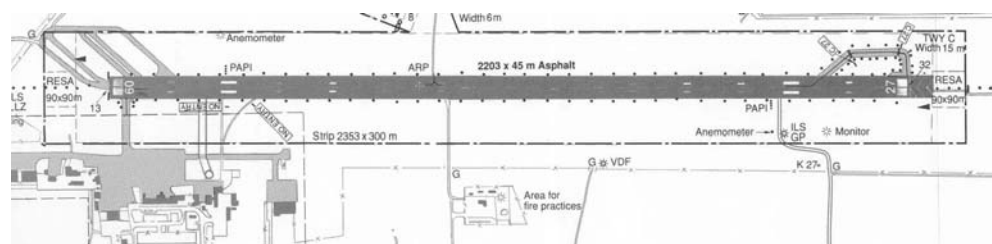
## 1.9 Communications

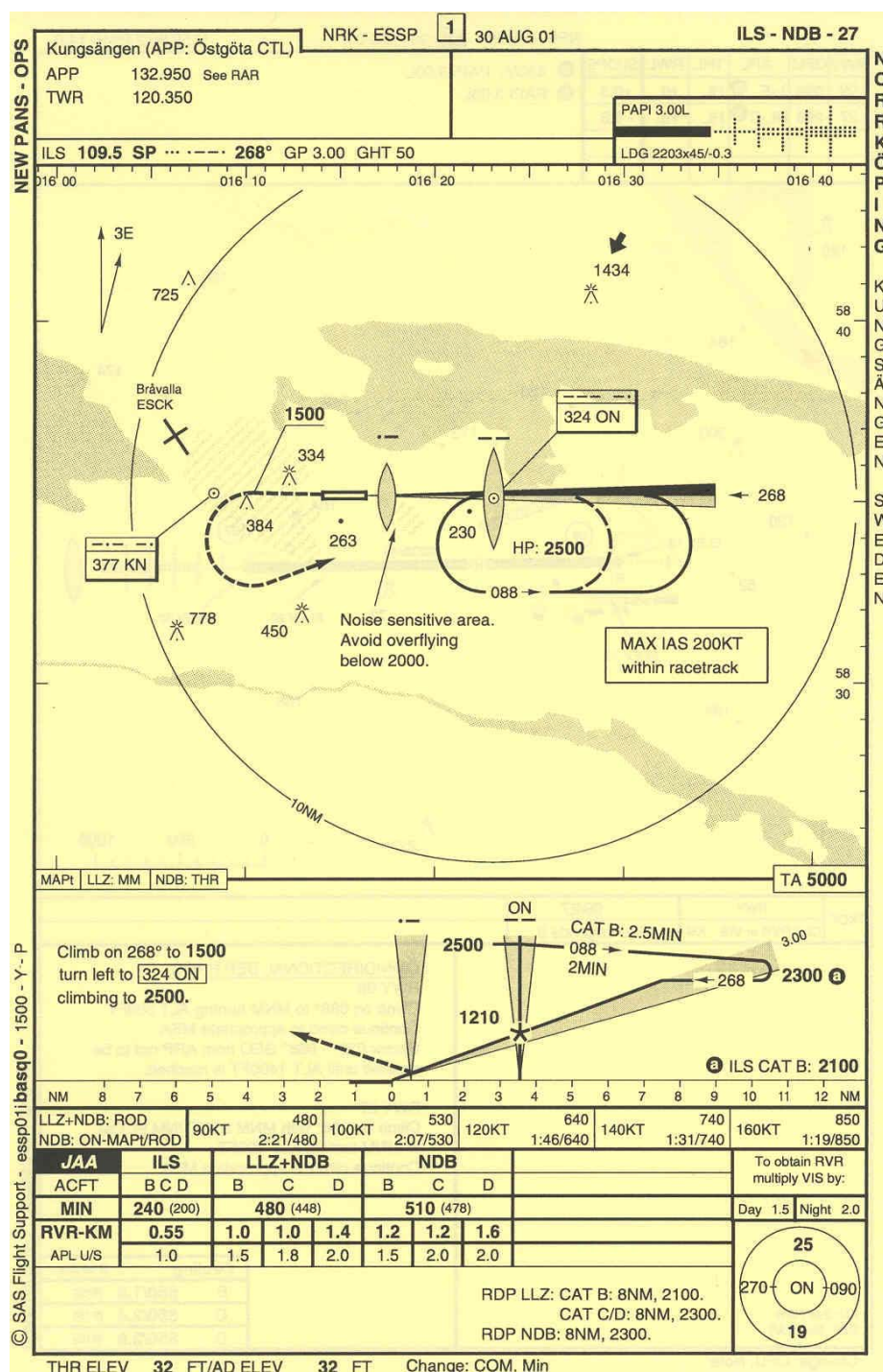
The radio communication between the involved parties is included in appendix 2.

## 1.10 Aerodrome information

The airport had operational status in accordance with the Swedish AIP (Aeronautical Information Publication).

Norrköping/Kungsängen airport





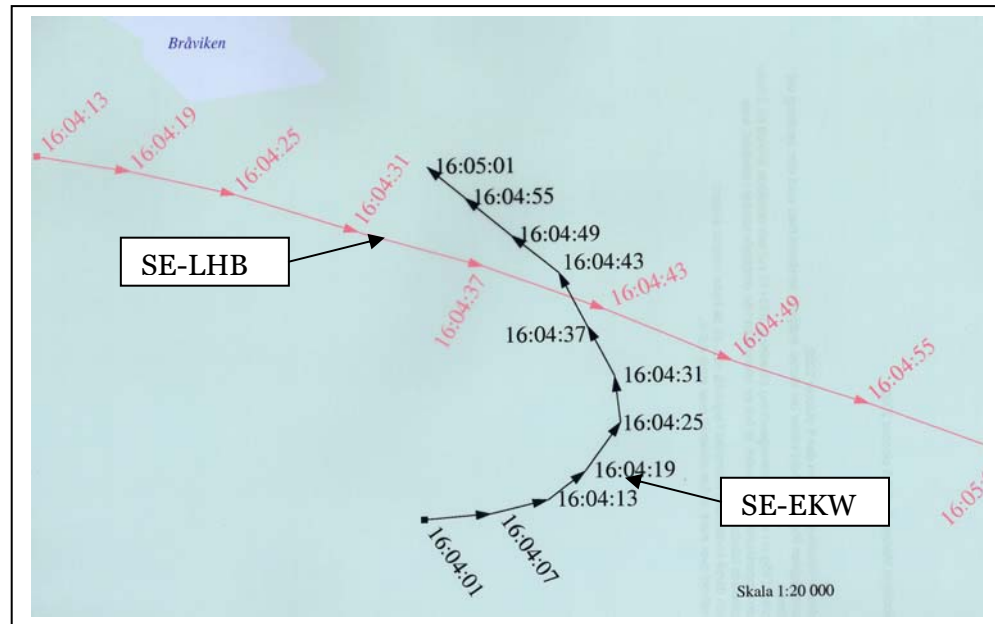
### 1.11 Flight recorders

No transcripts from the flight and voice recorders have been made.

### 1.12 Location of the incident

The infringement of minimum separation occurred immediately east of the NDB-beacon ON.

The flight paths of the two aircraft have been registered by MUST. From the registration it has been calculated that the minimum distance between the aircraft was approximately 500 meters horizontally and approximately 180 meters vertically. This occurred at time 16:04:41 as seen in the illustration below.



### 1.13 Medical information

No medical investigation has been accomplished.

### 1.14 Fire

Not applicable.

### 1.15 Survival aspects

Not applicable.

### 1.16 Tests and research

Not applicable.

### 1.17 Organizational and management information

#### 1.17.1 The operator

The operator Svenskt Direktflyg AB has its headquarters in Hultsfred and its main office in Västerås. The company pursues scheduled traffic, from Norrköping, Linköping and various other cities. They operate under Skyway's Regional Operations Manual, Part B for Jetstream 32.

#### 1.17.2 Operational routines

In the Part B chapter for "Normal Procedures" of the Operations Manual, which describes the procedure to be used when clearance has been given to an altitude lower than the transition level<sup>3</sup> and the actual QNH value is still set on the altimeter, is it stated;

<sup>3</sup> Transition level – Lowest available flight level above the transition altitude.

Transition altitude – The altitude above sea level at or under which an aircraft's vertical position is controlled with reference to altitude above sea level, (QNH).

b) Setting Altimeters: "If initially cleared to altitude, the PNF places the Checklist on the center console on **hold** and calls: "*Holding at altimeters*". When cleared to FL, the PF calls: "*Altimeter 1013, reading ..... feet*". The PNF responds: "*Altimeter 1013, plus/minus ..... feet, altimeters cross-check*".

An unofficial practice that has been developed by the flight crews within the company is that the off-going crews prepare the next flight by setting the navigational frequencies for the upcoming flight as well as the altitude on the APA which is normally used for the outbound flight. The APA is an instrument that is connected to the altimeters and issues a warning signal approximately 800 feet before the aircraft reaches the set altitude. It also produces a warning if the attained or established altitude is deviated from by more than 300 feet.

In the case under investigation the off-going crew had set the APA to 9,000 (FL90). Both pilots repeated the clearance they had received, to climb to 3,000 feet, but do not recall if they checked what was set on the APA. However, they never altered the setting which was left at 9,000 at the time of takeoff and the checklist was not placed in the position that is stated in the OM.

### 1.17.3 Checklist

Checklist items prior to takeoff during the taxi-out.

<b>TAXI</b>		
<b>Taxi Light</b>	On	CO
<b>Flaps</b>	Set 10° / Ckd	CR
<b>Take Off Data / Bugs</b>	Reviewed / Set	CR
<b>Flight &amp; Engine Instruments</b>	Ckd / Set	CR
<b>Crew Briefing</b>	Complete	CR
<b>Nav &amp; Com &amp; GPS</b>	Set	CR
<b>TAKEOFF</b>		
<b>Flight Controls</b>	Ckd On Top / Bottom	CR
<b>Stall Protection</b>	Tested / On	CR
<b>Engine &amp; Prop Heat</b>	As Required	C
<b>Pitot Heat</b>	Re-Ckd On	CO
<b>Radar</b>	As Required	CO
<b>Cabin</b>	Clear	CO
<b>Strobe &amp; Lights &amp; Stall Prot</b>	On	CO
<b>Ignition</b>	As Required	C
<b>Transponder</b>	On	CO
<b>Flows &amp; Fans</b>	Off	CO
<b>RPM Levers</b>	High	C
<b>Gyros / Eng Instr / CAP</b>	Rwy Hdg / Ckd / Norm	CR
<b>TTL Test</b>	Performed	CR

## 1.18 Additional information

### 1.18.1 Air traffic control procedures

For every flight of this type there is a flight plan filed at ANS by the aviation company. Later, when the aircraft is ready to start up the engines or begin to taxi, the pilot informs the air traffic controller in the TWR of this. Subsequently the air traffic controller calls the control unit for the area and requests a clearance that contains route of flight, altitudes and transponder code, which is then transmitted to the pilot.

Prior to issuing a clearance, the area controller must check if other air traffic can come into conflict with the aircraft which is about to takeoff. In the case at hand the air traffic controller at Östgöta Control had an aircraft in the holding pattern at 4,000 feet over the outer marker ON and an aircraft inbound from the south for landing on runway 27 at Norrköping/Kungsängen airport.

The most common clearance for the route HS476 was going to fly was "direct Visby, FL 90". For this particular flight the pilots received "cleared Visby via ON, thereafter Visby VOR 3,000 feet".

The routine at certain airports is that the crew is to contact air traffic control some time prior to departure (for example 10 min prior to departure time) in order to receive a clearance that contains the departure route, the initial flight altitude and the routing to the destination. If no altitude is issued, it can be published on the SID (Standard Instrument Departure) plate which describes the departure route.

At several airports in Sweden the clearance is issued to the pilots when the airplane has initiated its taxi-out to the takeoff position. This routine is customary at Norrköping/Kungsängen airport.

### 1.18.2 *The operator's procedures and adaptation of checklists*

Several operator's have experienced inaccuracies when expected altitudes and routes are pre-selected prior to clearance issue. Even remaining transponder codes from previous flights have caused confusion if the crew has not entered the new code. Therefore, some aviation companies have introduced the procedure to set completely improbable altitudes and codes, for example 9,900 on the altitude pre-select and 2,000 on the transponder. This is done so that the crew will react and realize that they have not set anything yet and therefore avoid misunderstandings.

Since the issuance of clearance to the pilots most often occurs during the taxi-out, at a time when they most need to have their attention directed outside the aircraft, some aviation companies try to adapt their checklist so that most of the checklist items can be gone through prior to the taxi-out being commenced.

### 1.18.3 *Flight safety activities*

During a flight safety seminar in March of 2003 for air traffic controllers, pilots and representatives from LFV thoroughly discussed the possibilities for pilots to receive clearance prior to the taxi-out. By doing this, both pilots are given the possibility to calmly and jointly concentrate on receiving the clearance, the read-back, the setting of the navigational equipment and the briefing that the PF is required to conduct prior to takeoff. After this, the pilots can concentrate on the taxi-out with minimal disruptions due to other tasks.

## **2 ANALYSIS**

### **2.1 The incident**

According to the registration from MUST the two aircraft came as close to each other as approximately 500 meters horizontally and 180 meters vertically, which indicates that this was a serious infraction of minimum separation with regard to safety of flight.

The flight from Norrköping to Visby was routine for both pilots onboard the airliner and something they had done many times before. The previous crew had, according to the unofficial practice, prepared their flight by setting valid frequencies in the aircraft navigational equipment and had set the APA to 9,000, in other words the expected altitude FL 90 to Visby.

The continued chain of events would indicate that, to an extent, the pilots handled the flight too routinely (complacency). During the taxi-out for takeoff, when they received the clearance to fly via the NDB- beacon ON and climb to 3,000 feet, it was copied down by the PNF and was also repeated by the PF. However, neither of them reacted to the fact that this clearance was an unusual one for that flight. Nor did it dawn on either of them to re-set the APA from 9,000 to the new designated altitude.

Even though they both had confirmed the outbound altitude of 3,000 feet after takeoff, they seemed to have been mentally disposed to proceed with a departure route according to ordinary routines with a direct climb to FL 90. Furthermore, the pre-set altitude on the APA gave them a confirmation of their expectations. This is confirmed by the PNF, who after takeoff during the call to Östgöta Control, reported that they were climbing to FL 090, and by the fact that neither of them reacted when the aircraft passed 3,000 feet climbing.

They were indeed distracted after takeoff by an abnormal indication on an engine instrument; however it is doubtful whether this had any effect on the subsequent chain of events.

The air traffic controller at Östgöta Control observed on his radar, that the aircraft was climbing at a rapid rate and understood that it would climb through the cleared altitude. When the air traffic controller was able to transmit his message the aircraft had already climbed to 3,300 feet, and reached 3,500 feet before the descent was initiated. In absence of the air traffic controller's attention and immediate response and the PF's rapid reaction to initiate a descent, the infraction of minimum separation would most likely have been significantly more serious.

## 2.2 Checklists and routines

Relevant checklists and well established routines are some of the basic foundations for attaining requisite flight safety. This may of course lead to repetitive flights along the same route by the same crews becoming very mundane to the pilots. Therefore there is a risk that these types of flights – as the flight investigated within this report – are performed in such a routine manner that the pilots do not pay attention to important information which deviates from the expected. However routine a flight may be, demands must be placed on each and every pilot in commercial aviation to treat every individual flight as unique and to be prepared for and receptive to unexpected directives and occurrences of varying kinds.

The function the APA has to warn when approaching the cleared altitude was in this case rendered useless by an incorrect setting. Even though there is no requirement for the air traffic controllers to issue any information regarding other aircraft in the area, it is likely that the pilots would have reacted to the deviation from the normal clearance if it had contained information pointing out that there was other air traffic over ON.

It is imperative that these problems are treated during the education and training of pilots who pursue commercial aviation. Especially during flights performed using a two pilot system. In the case at hand, the question arises if perhaps the pilots within this company have developed routines a bit too elaborately when the boarding pilot can expect that specific settings on the radio and navigational systems for the upcoming flight have already been pre-selected when they take over the aircraft. The risk of misunderstandings and inaccuracies arising with such routines is obvious.

In this connection it is also imperative that aviation companies develop operational routines that endeavor to make the pilots' workload as smooth as possible. In connection with takeoff for example, checklists should be adapted so that as many checklist items as possible can be performed prior

to the taxi-out being initiated. This, because at that time the pilots' attention should be focused on what's happening outside the aircraft.

It is also important that the air traffic control personnel are aware of the pilots' varying workload during different phases of the flight and, if possible, avoid issuing clearances at times when the pilots' workload is at its greatest. Nowadays many aircraft are equipped with advanced computerized navigational equipment (for example FMS) which take time to program. Revisions to departure and flight routings can cause departure delays and incorrect programming can create serious problems after takeoff.

In the case under investigation the flight crew consisted of two pilots with aircraft commander rank. There is a certain degree of risk with this, due to the fact that the commander who acts as co-pilot must perform tasks other than he or she normally performs. It is not totally unusual that misunderstanding occurs or that mistakes are made with this type of crew composition. SHK understands that it in practice can be hard to avoid these pilot combinations and cannot judge whether this had any significant influence upon the chain of events.

## 2.3 Issuing of clearances and air traffic control procedures

During all controlled flights an air traffic controller should certainly be able to rely on concerned flights following issued clearances. Yet one must also be aware that human errors, for example in the form of passing through a cleared altitude, can always be committed for various reasons; even by the most careful and safety conscious crew.

Given this, it was unfortunate that the air traffic controller had placed an aircraft in the holding pattern above the same beacon that another aircraft about to takeoff was utilizing as a departure fix. Considering the light prevailing traffic at the airport at the time, there should not have been any problem for the air traffic controller to assign another holding fix to SE-EKW. Another alternative would have been to utilize runway 27 for the departure, which would indeed have entailed a longer taxi distance, although it would not have involved any conflict with other air traffic.

## 3 CONCLUSIONS

### 3.1 Findings

- a) The flight crew members were qualified to perform the flights.
- b) The aircraft had a valid Certificate of Airworthiness.
- c) The aircraft with flight number HS476 (SE-LHB) was cleared to 3,000 feet, which was read back and copied down by the pilots.
- d) The aircraft APA, which was set at 9,000 (FL90), was not reset to 3,000 feet.
- e) The aircraft SE-LHB climbed through the cleared altitude of 3,000 feet and reached 3,500 feet before the climb was discontinued.
- f) According to the transcription from MUST, the closest proximity of the two aircraft was approximately 500 meters horizontally and 180 meters vertically.
- g) Within the operator Svenskt Direktflyg AB an unofficial practice has been found, that off-going crews perform pre-settings on certain equipment in the aircraft.



### 3.2 Causes of the incident

The incident was caused by the flight crew members onboard HS 476 (SE-LHB) forgetting that the aircraft was only cleared to 3,000 feet and thereby ascending through the cleared altitude. Contributory to the incident was that the pilots had not set the cleared altitude on the APA.

## 4 RECOMMENDATIONS

The Swedish Civil Aviation Administration is recommended to

- ensure that aviation companies design checklists so that as many items as possible can be performed prior to the taxi-out for takeoff being initiated (*RL 2003:26e R1*), and
- ensure that air traffic controllers, to the greatest extent possible, issue clearances to flight crew members before the taxi-out for takeoff has been initiated (*RL 2003:26e R2*).

## Radio traffic SE-EKW and High Swede 476

### Headings

**Time:** Time of the transmission, UTC. Local time = UTC + 2 hours. The accuracy of times stated is dependent upon how exact the time is set in the registration recorder. Normally, the time is correct to within a few seconds.

**From:** Source of the message.

SKW - SE-EKW, Beech D95A.

476 - High Swede 476, SE-LHB, Jetstream from Direktflyg.

TC - Östgöta Control.

TWR - Tower Kungsängen . *Traffic on TWR frequency is written in italics.*

**Note:** Comments

# - Interphone / telephone contact between ATC positions.

**Information:** The message written-out in plain language.

?? means that it has not been possible to interpret the information. (Parenthesis are used to indicate that the interpretation is uncertain).

[Brackets are used to indicate comments].

Time	From		Information
13.55.26	TC	#	TC.
13.55.27	TWR	#	Kungsängen, now I have High Swede 476 runway 09, at three past the hour.
13.55.33	TC	#	09, 03, High Swede 476 is cleared to Visby via Oscar November, Visby VOR, 3,000 feet and transponder 5315.
13.55.44	TWR	#	Cleared to Visby via Oscar November, Visby VOR, 3,000 feet, 5315.
13.55.47	TC	#	Yes.
13.55.48	TWR	#	Thanks.
13.55.48	TC	#	After this takeoff Scandinavian 1828 is comming visual to 27.
13.55.53	TWR	#	After this I get SAS (141) 27.
13.56.40	?	#	Two.
13.56.42	TC	#	TC with takeoff, High Swede 476 zero three.
13.56.44	?	#	03, 3345.
13.56.46	TC	#	3345, thanks.
13.57.38	TC		SKW, new QNH 1027.
13.57.42	SKW		1027, SKW.
13.58.33	SKW		Östgöta, SKW request 3,000 feet.
13.58.35	476		<i>Kungsängen tower, Sky Express..., High Swede 476 (is my call sign, ready to taxi).</i>
13.58.40	TC		SKW unable to give you 3,000 feet now due to landing and departure. Stay at 4,000 feet, I will call you back.
13.58.42	TWR		<i>O Yea, High Swede 4(2)6, (taxi, clear) line-up runway 09. ["476" is spoken so that it sounds like "426"].</i>
13.58.45	476		<i>Taxi, line-up runway 09, 476.</i>
13.58.48	TWR		<i>4(7)6 cleared Visby via ON, thereafter Visby VOR 3,000 feet, transponder 5315.</i>
13.58.50	SKW		Roger SKW.
13.59.00	476		<i>Cleared Visby via ON, thereafter Visby VOR, 3,000 feet, 5315, 476.</i>
13.59.09	TWR		<i>4(7)6</i>

13.59.36	TWR		High Swede 476, runway cleared for takeoff.
13.59.42	476		Runway 09, cleared for takeoff 476.
14.02.21	TWR		High Swede 476, kontakt Östgöta on 132.95
14.02.26	476		Östgöta, 13295, 476 good-bye.
14.03.24	476		Östgöta High Swede 476 (climb now) for Flight Level 90..
14.03.27	TC		High Swede...
14.03.28	476		... inbound Visby.
14.03.29	TC		High Swede 476, descend immediately to 3,000 feet!
14.03.33	TC		Traffic above at your one o'clock distance four, 4,000 feet maintaining.
14.03.40	476		Descending immediately to 3,000 feet, High Swede 476.
14.03.44	TC		SKW climb to 4,500, traffic at your nine o'clock distance two miles. Descending to 3,000, 3,500 now.
14.03.53	SKW		Traffic in sight and 4,500, SKW.
14.03.58	TC		KW, passing traffic below now.
14.04.03	SKW		Roger KW, may we stay at 4,000?
14.04.06	TC		KW, stay at 4,000.
14.04.08	SKW		Continue 4,000, SKW.
14.04.30	TC		And High Swede 476, free of traffic now. Climb to Flight Level 90.
14.04.34	476		Climb now to Flight Level 90, High Swede 476.
14.04.37	TC		476, write a report then, I have 3,000 on my strip but we will have to listen to the tape with tower what I have said and what you have received and what you have read back and so forth.
14.04.46	476		Yes indeed, 476.
14.05.02	TWR	#	Kungsängen
14.05.03	TC	#	TC, it is really important that you send High Swede early when I have this much traffic in and out and in holding.
14.05.09	?	#	You don't want to?
14.05.10	TC	#	Yes, it is important that you send it early.
14.05.12	?	#	I did that.
14.05.13	TC	#	OK, he didn't call in, he climbed through. He said he climbed to 90.
14.05.16	?	#	Oh shit.
14.05.17	TC	#	Mmm
14.05.18	?	#	We'll have to listen to this then.
14.05.19	TC	#	Yes, we will have to do that.
14.05.20	?	#	Yes.
14.05.20	TC	#	Good.
14.05.21	?	#	Yeah, good-bye.
14.05.23	TC		SKW, you are cleared 3,000 feet in holding now.
14.05.26	SKW		Cleared 3,000 feet, SKW.
14.06.44	SKW		Östgöta, SKW request approach runway 27.
14.06.48	TC		SKW you are cleared ILS approach, full procedure runway 27.
14.06.53	SKW		Full procedure, cleared approach runway 27, SKW.
14.06.57	TC		High Swede 476 contact Stockholm 133.45.
14.07.01	476		Stockholm 133.45, High Swede 476.
14.07.05	TC		Good-bye.
14.07.06	476		Good-bye.
14.07.10	TC		And SKW, are you descending for approach now, or are you passing Oscar November one more time?
14.07.18	SKW		Descending for approach yes, SKW.
14.07.20	TC		KW, Roger. Met report, wind is 330, 8 knots, variable 280 to 340, it's CAVOK, temperature 23, dew point 11 and QNH 1027
14.07.34	SKW		1027, SKW