
Near-miss, Infraction of minimum separation between the aircraft SE-KOL and SE-ISV at Stockholm/Arlanda airport, AB County, Sweden, on 28 November 2001

Micro-summary: A near-miss occurs when an airplane took off while another was overhead, resulting in a collision risk.

Event Date: 2001-11-28 at 1100 UTC

Investigative Body: Swedish Accident Investigation Board (AIB), Sweden

Investigative Body's Web Site: <http://www.havkom.se/>

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Report RL 2002:11e

*Infraction of minimum separation
between the aircraft SE-KOL and SE-ISV
at Stockholm/Arlanda airport, AB County,
Sweden, on 28 November 2001*

Dnr L-085/01

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

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

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2002-05-08

L-085/01

Swedish Civil Aviation Administration

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Report RL 2002: 11e

The Board of Accident Investigation (Statens haverikommission, SHK) has investigated an incident that took place on the 28th of November 2001 at Stockholm/Arlanda airport, AB County, Sweden, between two aircraft with the registrations of SE-KOL and SE-ISV.

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.

Olle Lundström

Monica J Wismar

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Report finalized 2002-05-08

<i>Aircraft; registration, type</i>	A. SE-ISV, SAAB SF340A (SKX 303) B. SE-KOL, Beech 300 LW (CBN 12)
<i>Class, airworthiness</i>	For both: Normal, valid certificate of airworthiness
<i>Owner/operator</i>	A. ABB Creditfinans AB/Skyways Express AB B. Holmenco AB/WaltAir AB
<i>Date and time of the occurrence</i>	2001-11-28, 12:00 hours in daylight <i>Note:</i> All times in the report refer to Swedish Standard Time (UTC + 1 hour)
<i>Place of occurrence</i>	Stockholm/Arlanda airport, AB County, Sweden, (pos. 5939N 01755E; between 300 and 600 meters above sea level)
<i>Type of flight</i>	A. Scheduled traffic B. Utility aviation
<i>Weather</i>	According to SMHI's ¹ analysis: Wind 120°/8 knots, visibility > 10 km in light rain, clouds 1/8 stratus with bases at 700 feet, 3/8 with bases at 1,200 feet, 7/8 with bases at 1,500 feet, temperature/dewpoint +2/+1 °C, QNH 1014 hPa.
<i>Persons on board;</i>	
<i>crew</i>	A. 2/1 B. 2
<i>passengers</i>	A. 11 B. 1
<i>Injuries to persons</i>	None
<i>Damage to aircraft</i>	None
<i>Other damage</i>	None
<i>Aircraft commanders:</i>	
<i>Age certificate</i>	A. 58 years old, Airline Transport Pilot License (Swedish D) B. 34 years old, Commercial Pilot License with Instrument Rating (Swedish B).
<i>Total flying time</i>	A. 20,495 hours, of which approximately 9,000 hours on the type B. 2,000 hours, of which 200 hours on the type
<i>Flying hours</i>	
<i>previous 90 days</i>	A. 132 hours, of which 109 hours on the type B. 200 hour, of which 30 hours on the type
<i>Number of landings</i>	
<i>previous 90 days</i>	A. 152, of which 111 on the type B. 320, of which 22 on the type

¹ SMHI = Swedish Meteorological and Hydrological Institute

*Co-pilots:**Age, certificate*

- A. 34 years old, Commercial Pilot License with Instrument Rating (Swedish B)
- B. 23 years old, Commercial Pilot License with Instrument Rating (Swedish B)

Total flying time

- A. 3,145 hours, of which 1,548 hours on the type
- B. 470 hours, of which 60 hours on the type

Flying hours previous 90 days

- A. 126 hours, of which 125 hours on the type
- B. 80 hours, of which 60 hours on the type

Number of landings previous 90 days

- A. 136, of which 125 on the type
- B. 75, of which 50 on the type

Cabin crew

- A. Employed since the year 2000

Air traffic controller

- 27 years old, FL License since the summer of 2000.

The Board of Accident Investigation (SHK) was notified on the 28th of November 2001 that an infraction of minimum separation had taken place between two aircraft with the registrations SE-ISV and SE-KOL respectively, at Stockholm/Arlanda airport, AB County, Sweden, on that same day at 12:00 hours.

The incident has been investigated by SHK represented by Olle Lundström, Chairman and Monica J. Wismar, Chief Investigator Flight Operations.

Rickard Jörgensen has assisted SHK as air traffic control expert.

The investigation has been followed by The Swedish Civil Aviation Administration through Kåre Jernling.

Summary

The pilots in aircraft SE-KOL, with call sign CBN 12 (Calibration 12), were to carry out a number of calibration flights in connection with the new runway (01R/19L) at Stockholm/Arlanda airport. The calibration flights entailed the performance of takeoffs and landings in both directions for the purpose of testing the ground radar.

Before the fourth takeoff, which was to take place on runway 01R, the air traffic controller informed them that a departure was to take place from runway 08 and she would get back to CBN. Sky Express with flight number SKX 303 had lined-up on runway 08 for departure. They received takeoff clearance with a right turn-out, to report when they were at 1,500 feet climbing. After one minute she re-contacted CBN and issued the clearance "after takeoff climb on heading 050 degrees 2,500 feet". Her thought was that afterwards, when Sky Express had turned-out and cleared the intended flight path of CBN, to issue "takeoff at your discretion" to CBN. However the pilots in CBN took off without having received takeoff clearance according to established phraseology and this resulted in an infraction of minimum separation between the aircraft. The pilots in CBN obtained visual contact with the other aircraft and there was no danger of a collision. The closest they came to each other was 0.23 N.M.² (425 meters) with a vertical separation of 700 feet (213 meters).

This was an unusual type of flight, with takeoff and landing outside the established maneuvering area. A special maneuvering area had not been established for runway 01R/19L.

² nm – nautical mile (1.852 km)

In the investigation SHK has discovered that there was no briefing accomplished with the traffic controller prior to the flights and that the traffic controller did not use the correct phraseology upon dispatching the air traffic control clearance. Furthermore, there was a lack of routines within the aviation company's operational flight rules, concerning calibration flights.

At various airports around the country, minor variations exist in the method of giving clearance for takeoff, when activities outside the maneuvering area are concerned. It has also been shown that some extent of uncertainty is prevalent with pilots, in reference to conduct and phraseology pertaining to operations outside the maneuvering area.

The incident was caused by the pilots in aircraft CBN taking off without having received clearance for this and a violation of minimum separation ensued with an oncoming aircraft. Contributory causes may have been that incorrect phraseology was used during clearance issue and inadequate routines for unusual types of flights.

Recommendations

The Civil Aviation Administration is recommended to

- revise the existing rules, phraseology and routines concerning air traffic control during operations outside the maneuvering area, in order to reduce uncertainty and minimize misunderstanding (*RL 2002:11e R1*),
- revise the routines, contained in the operational flight regulations of aviation companies, dealing with flights of an unusual character (*RL 2002:11e R2*), and to
- inform flight instructors and pilots about the importance of phraseology, regulations and procedures during operations on takeoff and landing surfaces outside the maneuvering area, but within a control zone (*RL 2002:11e R3*).

1 FACTUAL INFORMATION

1.1 History of the flight

The pilots in aircraft SE-KOL, with call sign CBN 12 (Calibration 12), had reserved time with the air traffic control at Stockholm/Arlanda airport in order to accomplish a number of calibration flights in connection with the new runway (01R/19L). It was decided that this should take place around lunchtime. This period had been established with the thought in mind that the workload for the traffic controllers would be moderately low during that time. In addition to the pilots, there was a person on board from the Civil Aviation Administration who maintained telephone contact with technicians in the new control tower who were testing the new ground radar.

CBN departed from Visby on the island of Gotland at 09:48 hours and landed one hour later on Arlanda's new runway, 19L (left). After a few minutes the first officer, herein referred to as the co-pilot, radioed the air traffic controller in the regular tower and reported that they were taxiing back to the end of runway 19L for a new takeoff. He also informed the tower that they wished to make a new approach to runway 19L and land thereafter. The air traffic controller informed him that two aircraft were to depart on runway 08 before CBN could take off and issued the clearance: "left 160 degrees, climb to 2,500 feet for vectoring to 19 left." After the co-pilot had read-back the clearance, the controller stated that she would get back to him. Four minutes later the controller stated that the wind on runway 19R (right) was 110 degrees at 7 knots and requested CBN to report when they were airborne.

CBN was handed over to approach control on frequency 126.65 for radar vectoring to runway 19L. Subsequently the pilots received the directive "Land your discretion, report on the ground", from the tower controller. They landed and reported this to the tower.

Thereafter CBN performed two takeoffs with approach and landing on runway 01R (right).

At time 11:58 CBN lined up on runway 01R for a new takeoff. The supposition was that after takeoff they were to perform a low fly-by at a height of 150 feet (approximately 45 meters) above the runway from the north and thereafter continue with radar vectoring to runway 19R for landing.

When they reported that they were ready for takeoff they were informed that the traffic controller had a departure on runway 08 and that they would have to wait.

Sky Express with flight number SKX 303 had lined-up on runway 08 for a flight to Kramfors. They received takeoff clearance, with a right turnout, to report when they were at 1,500 feet climbing.

At time 11:59 the tower controller called-up CBN and notified them that after departure they were to climb on course 050 degrees to 2,500 feet. Less than one minute later SKX 303 reported that he was 1,500 feet climbing and received clearance to turn right to a heading of 270 degrees. Simultaneously the traffic controller observed that CBN's echo had appeared on the radarscope. The two radar echoes from CBN and SKX 303 overlapped and the traffic controller inquired during a transmission that was interrupted if CBN had taken off. The air traffic controller didn't have time to see the altitude indication that CBN had but the flight echoes were separated thereafter. CBN responded with his callsign, and the traffic controller informed them that she had not given him takeoff clearance. At the same time SKX 303 reported that they had received a TCAS³ warning.

³ TCAS – Traffic alert and avoidance system

The pilots in CBN obtained visual contact with the other aircraft and there was no danger of a collision.

The incident took place at position 5939N 01755E; at an altitude of between 300 to 600 meters above sea level.

1.2 Injuries to persons

	<i>Crew</i>	<i>Passengers</i>	<i>Other</i>	<i>Total</i>
Fatal	–	–	–	–
Serious	–	–	–	–
Minor	–	–	–	–
None	5	12	–	17
Total	5	12	–	17

1.3 Damage to aircraft

None.

1.4 Other damage

None.

1.5 Personnel information

1.5.1 The aircraft commanders

Aircraft commander A was 58 years old at the time and held a valid Airline Transport Pilot License (Swedish D).

Flying hours

<i>Latest</i>	<i>24 hours</i>	<i>90 days</i>	<i>Total</i>
All types	2.1	132	20,495
This type	2.1	109	Approximately 9,000

Number of landings this type previous 90 days: 111.

Latest PC (proficiency check) was carried out 2001-06-05 in the SAAB 340 simulator.

Aircraft commander B was 34 years old at the time and held a valid Commercial Pilot License (Swedish B) with an Instrument Rating.

Flying hours

<i>Latest</i>	<i>24 hours</i>	<i>90 days</i>	<i>Total</i>
All types	–	200	2,000
This type	–	30	200

Number of landings this type previous 90 days: 22.

Latest PC was carried out 2001-11-25 on the Beech 300 LW.

1.5.2 The co-pilots

Co-pilot A was 34 years old at the time and held a valid Commercial Pilot License (Swedish B) with an Instrument Rating.

<i>Flying hours</i>			
<i>Latest</i>	<i>24 hours</i>	<i>90 days</i>	<i>Total</i>
All types	2.1	126	3,145
This type	2.1	125	1,548

Number of landings this type previous 90 days: 125.
Latest PC was carried out 2001-09-02 in the SAAB 340 simulator.

Co-pilot B was 23 years old at the time and held a valid Commercial Pilot License (Swedish B) with an Instrument Rating.

<i>Flying hours</i>			
<i>Latest</i>	<i>24 hours</i>	<i>90 days</i>	<i>Total</i>
All types	–	80	470
This type	–	60	60

Number of landings this type previous 90 days: 50.
Latest PC was carried out 2001-10-14 on the Beech 300 W.

1.5.3 *Cabin crew*

One flight attendant was on duty in the cabin of aircraft SE-ISV. She was employed in the company in the year 2000 and completed the latest emergency training in January of 2001.

1.5.4 *Air traffic controller*

The air traffic controller was 27 years old at the time and held a valid FL license since the summer of 2000.

1.5.5 *The pilots' and the air traffic controller's duty schedules*

The pilots on board CBN 12 and the air traffic controller's duty schedules the seven days prior to the occurrence.

<i>Date</i>	<i>Aircraft Cmdr.</i>	<i>Co-pilot</i>	<i>Traffic Controller</i>
2001-11-21	Day off	2.5 hours	00:00–07:00 hrs.
2001-11-22	Day off	3.8 hours	14:00–21:00 hrs.
2001-11-23	Day off	4.8 hours	08:00–16:00 hrs.
2001-11-24	Day off	Day off	Day off
2001-11-25	PC flight	4.8 hours	14:00–22:00 hrs.
2001-11-26	Day off	Day off	14:00–21:00 hrs.
2001-11-27	Day off	Day off	06:30–14:30 hrs.

1.6 **The aircraft**

Manufacturer	A. Saab-Scania AB	B. Beech Aircraft Corp.
Type	A. SAAB SF340A	B. Beech 300LW
Serial number	A. 340A-045	B. SA189
Year of manufacture	A. 1985	B. 1989

Both aircraft had a valid certificate of airworthiness.

1.7 Meteorological information

According to SMHI's analysis: wind 120°/8 knots, visibility > 10 km in light rain, clouds 1/8 stratus with bases at 700 feet, 3/8 with bases at 1,200 feet, 7/8 with bases at 1,500 feet, temperature/dewpoint+2/+1 °C, QNH 1014 hPa.

1.8 Aids to navigation

Both aircraft were equipped for instrument flight. CBN was radar vectored for several approaches to runway 01R respective 19L at Stockholm/Arlanda airport. The airport's runway 01R/19L was equipped with ILS⁴.

1.9 Communications

When a takeoff is made from outside the airport's maneuvering area, which the new runway was at the time of the incident, the phraseology to be used shall be according to the Civil Aviation Administration's "Bestämmelser för Flygtrafikledning" (BFT) section 11 paragraph 2.5.10.1. " (färdtillstånd för flygning), STARTA [MED] EGEN UPPSIKT" (1) and "ANMÅL I LUFTEN" (2).

When using English the phraseology is as follows: " (flight clearance) TAKE OFF AT OWN DISCRETION" (1) and "REPORT AIRBORNE" (2)

- (1) "*Implication:* There is no traffic in the airspace that prevents takeoff. The statement does not have the status of a flight clearance. The aircraft commander is solely responsible for the avoidance of ground collisions with aircraft, vehicles, persons or other obstacles; for acceptable surface quality and for obstruction clearance during departure from the takeoff point in question. For airborne movements clearance is issued in the normal manner."
- (2) "When the takeoff cannot be observed from the tower."

Also, concerning instructions for departure according to paragraph 2.3.1, the phraseology shall be "[EFTER AVGÅNG] HÖGERSVÅNG (eller VÄNSTERSVÅNG) [TILL KURS (3 siffror)]" and the English "[AFTER DEPARTURE] TURN RIGHT (or left) [HEADING (3 digits)]".

During the calibration flights the tower position was manned by three different traffic controllers, designated below as A, B, and C. No thorough briefing about the flights was conducted with them before they began their duty. They were only informed that the flights were to take place.

The phraseology that was used during the four takeoffs was:

A. time 10:55

TWR	Well, I have two departures from zero eight before you can be on your way, but the clearance is left 160 degrees, climb to 2500 feet for vectors to 19 Left.
CBN	Left 160 and 2500 feet and vectors 19 Left yes, Calibration 12.
TWR	12, I'll get back to you.
TWR	Calibration 12, on runway 19 Right the wind is 110 degrees 7, report airborne.

⁴ ILS – Instrument Landing System

A. time 11:19

CBN	Left 16.. or 160 degrees yes and 2500 feet and vectors, Calibration 12.
TWR	Click Click [acknowledgement from TWR.]
TWR	Calibration 12, then hold in position, I have a departure proceeding southbound so I will get back to you when it is suitable for takeoff.
CBN	Yes, we hold in position, Calibration 12.
TWR	Calibration 12, take off at your discretion, and I'll get back to you later.
CBN	Take off at my discretion, Calibration 12.

B. time 11:41

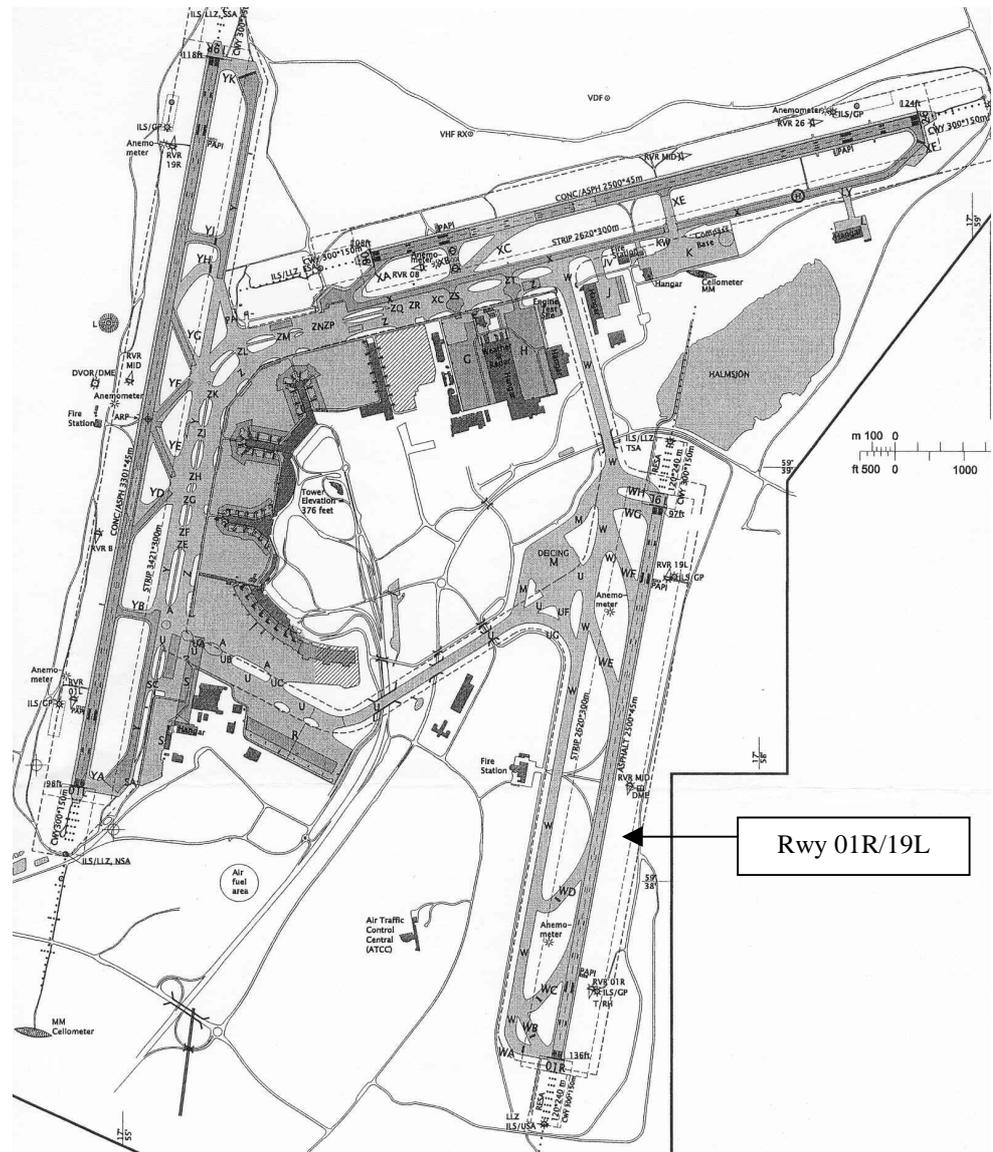
TWR	Calibration 12, take off your discretion with a right turn.
CBN	Ehh.. clear our discretion we take off and right turn yes, Calibration.

C. time 11:58–12:00

CBN	Tower, Calibration 12 is ready.
TWR	Calibration 12, I'll get back to you, I have a departure on 08.
SKX303	Good morning, Sky Express 303.
TWR	Sky Express 303, report 1500 feet climbing. Right turn out, cleared for takeoff 08.
SKX303	Clear for take off zero eight. We call you 1500 feet climbing with right turn. Sky Express 303.
TWR	Click Click [acknowledgement from TWR.]
APP-C	APP-C
TWR	Hi there, Calibration is ready now.
APP-C	But let's set it out at 50 degrees, two point five then maybe.
TWR	050 and 2500 feet.
APP-C	And to 20.5.[Frequency 120.5]
TWR	20.5. Thanks, bye.
TWR	Calibration 12 after takeoff climb on heading 050 degrees 2500 feet.
CBN	After takeoff 050 degrees and climb to 2500 feet, Calibration 12.
SKX303	1500 climbing, Sky Express 303.
TWR	Sky Express 303 turn right heading 270.
SKX303	270 Sky Express 303.
TWR 12.00.29	Calibration 10 have you taken.... [the transmission is interrupted]
TWR	Calibration [the transmission is interrupted]
CBN	(Tower) Calibration 10
TWR	Yes Calibration 10. Yes roger.
TWR	Calibration 10 I had not given you permission to take off yet, it was only after takeoff.
TWR	Sky Express 303 contact departure 123,75.
SKX303	23.75 Sky Express 303, yes, that one caused a warning on the TCAS.
TWR	Yes, I understand that because I had not given him takeoff clearance on 01 Right.

The complete transcription of the radio traffic is presented in appendix 2.

1.10 Aerodrome information



At the time of the occurrence Stockholm/Arlanda airport was for scheduled traffic using runway 08 for departures and runway 19R for arrivals. Air traffic was then still controlled from the old low tower.

On and around the new third runway construction work was still in progress and therefore the runway and its taxiways were not within the airport's maneuvering area. At a controlled airport the maneuvering area normally consists of runways and taxiways. However aircraft parking stands and similar surfaces normally are not included in the maneuvering area.

Within the maneuvering area, air traffic control has the responsibility that aircraft and vehicles may be conveyed without the risk of accident or incident. Therefore, in order to be able to move about or loiter within the maneuvering area requires permission from air traffic control. It is also therefore required that the maneuvering area can be visually supervised from the control tower, which was not possible with reference to the new

third runway. In order that an area shall have status as a maneuvering area, this must be stipulated in the local regulations of the airport and in addition published in the Civil Aviation Administration's AIP (Aeronautical Information Publication).

In areas outside the maneuvering area, pilots and vehicle drivers are themselves responsible to avoid accidents and near-accidents. Consequently air traffic control has no formal right to issue permission for movements within this area. Not until an aircraft has taken off from such an area does it become the responsibility of air traffic control.

It happens periodically at many airports that aircraft, especially helicopters and glider aircraft, want to takeoff and land on airport areas outside the maneuvering area. In order to be able to still handle these situations without the use of normal clearance issue, there is, as mentioned in section 1.9, special phraseology developed.

1.11 Flight recorders

Flight and sound recorders were fitted on board SKX 303 but have not been analyzed. CBN did not have such equipment and it was also not required.

1.12 Location of the incident

The incident took place in the airspace over Stockholm/Arlanda airport just southeast of runway 08 at an altitude of between 300 and 600 meters above sea level.

1.13 Medical information

Nothing indicates that the mental or physical condition of the pilots had been impaired prior to or during the flight.

1.14 Fire

There was no fire.

1.15 Survival aspects

The incident occurred during VMC⁵ and the pilots in CBN had visual contact with the oncoming aircraft. Therefore no risk of collision existed.

1.16 Tests and research

Not applicable.

1.17 Organizational and management information

1.17.1 General

WaltAir AB was founded in 1980 and is an aviation company with headquarters in Norrköping. The company holds an operating permit (AOC⁶)

⁵ VMC – Visual meteorological conditions

⁶ AOC – Air Operator Certificate

according to JAR-OPS⁷ 1 and pursues scheduled (since 18 February 2002) and non-scheduled traffic with three aircraft of type Beech. The majority of the flights consist of service traffic and taxi flights.

The calibration flights here under discussion, so-called radar target flights, were ordered by the Civil Aviation Administration. They did not demand any calibration instrumentation in the aircraft or special calibration flight training of the pilots. The aircraft commander had however performed calibration flights earlier with another aviation company that had been utilized by the Civil Aviation Administration.

1.17.2 Routines during calibration flights

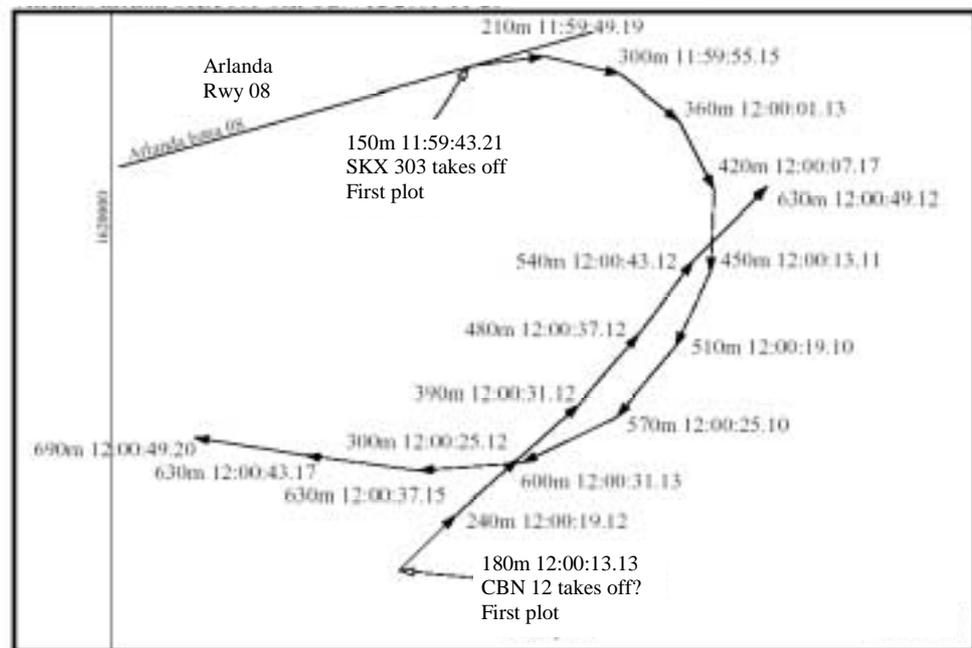
The company does not have any stipulated routines for calibration flights but operates according to its established Operations Manual, which is valid for all categories of flights. The aircraft commander, who carried out calibration flights while employed at another company, has had as a rule to make personal contact with the air traffic control personnel at smaller airports and give a briefing about the content of the flights. At larger airports such as Stockholm/Arlanda this has been impracticable to accomplish.

1.18 Additional information

1.18.1 Radar plot and data analysis

Aided by information from the Swedish Military Intelligence & Security Service (MUST), it has been possible to reconstruct the flightpaths and altitudes of the aircraft. The aircraft altitude reporting transponder reply, with an accuracy of ± 50 feet (± 15 m), has been used as height information.

Airmiss between SKX 303 and CBN 12, 2001-11-28



Through analysis of the radar data from Arlanda's MSSR⁸ radar, the following relative positions/correlations have been ascertained.

⁷ JAR-OPS - Joint Aviation Requirements - Operations

⁸ MSSR – Monopulse secondary surveillance radar

<i>Time</i>	<i>Event</i>	<i>Alt. SKX303</i>	<i>Alt. CBN12</i>	<i>relative range</i>
11.59.45	SKX303 is initially observed on radar	500 feet	–	–
11.59.56	SKX303 is observed to initiate right turn	1,000 feet	–	–
12.00.14	CBN12 is initially observed on radar	1,500 feet	600 feet	1.28 nm
12.00.19		1,700 feet	800 feet	0.83 nm
12.00.26		1,900 feet	1,000 feet	0.33 nm
12.00.32	The aircraft have passed each other	2,000 feet	1,300 feet	0.23 nm
12.00.38		2,100 feet	1,600 feet	0.77 nm

1.18.2 Measures taken after the occurrence

Since the occurrence took place, the following measures have been taken within the Arlanda ATS⁹:

- flight operations on runway 01R/19L may only take place after approval of C Drift TWR (on-duty supervisor in the tower *remark SHK*)
- in the event of future flights on runway 01R/19L (before it is officially opened) the crew shall be called to a meeting with ATS personnel in order to lay down the terms of the flight
- it has been recommended to use the methodology of “withholding” departure clearance, until takeoff can actually take place from the runway, without any conflict arising from other aircraft.

This recommendation has resulted in the adoption of a general regulation, OFA¹⁰ ATS Arlanda, that for takeoffs outside the maneuvering area (within the CTR¹¹), clearance issue shall only be given when the aircraft does not constitute any separation factor to other traffic within the CTR. In this context clearance issue implies flight path description (altitude, heading, route of flight, departure fix etc.).

The Civil Aviation Administration (ASP¹²) intends to examine the need to develop the phraseology in order to improve the ability to manage situations with aircraft on “non-maneuvering areas” within the control zone. The problem with the present phraseology (“takeoff/land at own discretion”) is that it is used so seldom that both ATS personnel and pilots are unsure of its meaning and use. From 1 April 2002, the responsibility for phraseology has been assigned to the Civil Aviation Administration, Aviation Safety Department.

1.18.3 Takeoff and landing procedures outside the maneuvering area at other airports

SHK has investigated the conditions and procedures at a number of other airports in the country that have takeoffs and landings outside the maneuvering area with helicopters, private aviation and glider aircraft. This displayed the existence of minor variations from airport to airport. During departures where air traffic control had visual contact with a helicopter, for example, and the helicopter’s takeoff area was in the vicinity of the maneuvering area, which could constitute a conflict with other traffic, one chose to actively control the takeoffs by issuing “cleared for takeoff” and “cleared to land” only when no conflict could arise. Others, especially where they did not have visual contact with the aircraft, chose to issue clearance such as altitude and departure fix and “takeoff at own discretion”, “report air-

⁹ ATS Air traffic services, generic concept for air traffic control.

¹⁰ OFA Supervisory order

¹¹ CTR Control zone, controlled airspace from the ground up to a stated upper limit.

¹² ASP Civil Aviation Administration, ATM-Standards and Procedures

borne". Some had the routine of issuing a clearance and waiting with "takeoff at own discretion" until it was time for takeoff. Some had the experience that pilots reacted differently when a delay was made between the different phrases and had taken off all the same before they had received "takeoff at own discretion". At certain airports where, for example, there was glider traffic with multiple takeoffs and landings during a specific time period, a sector was loaned out within which the aircraft could take off and land at their own discretion, without having to report this each time.

There are other smaller airports located in the outer portions of Arlanda's control zone where radio contact cannot be established when an aircraft is on the ground. Some pilots telephone the air traffic control unit before their intended takeoff, others takeoff and report when they are in the air. Some do neither and are discovered as a radar echo at air traffic control. This also takes place at other airports within the country that have remote takeoff and landing sites within the control zone.

Pilots that SHK has spoken with, experience a great deal of uncertainty when confronted with the procedures at different airports. Some however, do not consider it as presenting a problem.

1.18.4 *The pilots in aircraft CBN 12*

The pilots chose to use the Swedish language in order not to render the communication more difficult when they were to explain their intentions prior to each flight. They followed their normal procedures with respect to the two-pilot concept and were both aware that a departure would take place from runway 08 on the occasion of their fourth takeoff. They understood the clearance they received, as meaning that they had takeoff clearance and were to report in the air.

The different calibration procedures were not specified prior to their arrival at Arlanda, but were relayed by telephone beforehand from test personnel in the new tower, to the person from the Civil Aviation Administration on board CBN 12.

1.18.5 *The air traffic controllers*

Calibration flights are very infrequent and imply a deviation from normal duties for the air traffic controllers. The phraseology is not used very often and this also implies uncertainty of its use. In the case at hand, they chose to be over-explicit with their own phraseology.

The desire has been expressed, that a briefing prior to the flight would facilitate understanding of the procedures and allow for a review of the phraseology.

1.18.6 *Issuing of clearances*

At larger airports the issuing of clearances takes place from a particular position in the tower called AD or Ground. This means that the route of flight that a crew receives, is issued prior to the aircraft assuming the take-off position, unless a route revision occurs just prior to the aircraft taking off. The clearance is issued as early as possible in order, among other things, not to create too many burdens on pilots, who possibly have to re-program their navigation equipment or have their departure delayed.

1.18.7 *Aviation language and phraseology*

Concerning aviation within Sweden, the pilot of an aircraft decides what language shall be used in a radio link. It is recommended that the English language be used during IFR flights. This is to facilitate the monitoring of radio traffic by non-Swedish speaking pilots and to allow them to form

themselves a conception of the traffic situation, which also promotes flight safety and contributes to orderly traffic conditions.

The phraseology that is specified in BFT and shall be used between aircraft and ATS units is not, however intended to be all-inclusive. In cases where deviations occur from the expressions stated, pilots and ATS personnel are expected to utilize the help of other suitable phrases.

2 ANALYSIS

2.1 The flight

The pilots in aircraft CBN were to execute calibration flights for testing of the new ground radar. There was no established description of the procedure to be undertaken, only a time of accomplishment had been agreed upon with air traffic control. This may mean that a flight can be decided upon with short notice depending upon weather. The air traffic controllers simply received information that calibration flight was to be accomplished, at the time they began their duty shift.

The pilots received altitude and heading clearances. Since ATS does not have the formal right to instruct someone to hold their position, the traffic controllers chose to be over-explicit by reporting that they had departures from another runway and that they would get back to CBN or, nevertheless requested CBN to hold their position. The problem involved with requesting an aircraft to hold its position when the traffic controller does not have visual contact, can imply a danger in and of itself, depending on what the situation is at the site. The third air traffic controller who took over before the fourth takeoff, also reported that she had a departure on runway 08 and would contact CBN later on. She returned after one minute and issued the clearance “after takeoff climb on heading 050 degrees 2,500 feet”. Her thought was that afterwards, when the departing aircraft from runway 08 had turned-out and cleared the intended flight path of CBN, to issue “takeoff at your discretion” to CBN. The pilots took off without having received takeoff clearance according to established phraseology and this resulted in an infraction of minimum separation between CBN and the aircraft that had departed from runway 08.

Since the crew of CBN did not at all reflect over the fact that they have to receive clearance for takeoff in the form of “takeoff at your discretion” or “report airborne” it could possibly be what led them to takeoff were the words “after takeoff”. Previous clearances had contained either “I’ll get back to you” or “hold your position” before “takeoff at your discretion” or “report airborne” was issued. It was, on their part, a lack of attention and of knowledge of phraseology, probably coincident with the circumstance that the air traffic controller used the words “after takeoff”, which – as previously mentioned – is not correct according to the stipulated phraseology.

This demonstrates on the one hand how easy misunderstandings can arise, and on the other hand the value of both pilots and air traffic controllers having the possibility to become familiar with the procedures and the phraseology prior to execution of an exercise such as this.

According to the radar information that exists and the fact that the pilots in CBN had visual contact with the on-coming aircraft, there was no risk of a collision. The aircraft were closest to each other at time 12:00:32, horizontally at a distance of 0.23 nm (425 meters) and with a vertical separation of 700 feet (213 meters). Nevertheless it was a very unpleasant experience for the air traffic controller, who did not have visual contact with the aircraft from the position she was in, but only observed the radar echoes overlap on the radar screen.

2.2 Routines

As mentioned earlier, the pilots in CBN did not have any special routines or procedures for calibration flights. It could be considered as a shortcoming of the company, not to have established any extra routines concerning this type of flight operation, which differs from the normal types of operation such as taxi and service traffic. This places larger demands upon the attention of the pilots, while at the same time one has not considered the fact that this is a deviation for the traffic controllers as well. It is also necessary to consider if a briefing shouldn't be accomplished before every calibration flight, with pilots, airport technicians concerned or the like and air traffic controllers. It is always advantageous to meet personally with those concerned and this should be strived for. Due to various reasons, this may not always be practical to accomplish, but one should then in some other fashion, accomplish a briefing and above all, clarify the phraseology.

Since not so many flights of this and similar character take place and there are many air traffic controllers that work in the tower at Arlanda, several years may pass before they get the opportunity to once again use the phraseology.

A solution to the case now under discussion, could have been that a temporary control unit had been established on-scene, which had direct contact with the traffic controllers and visual contact with the aircraft. With such a procedure one establishes a temporary maneuvering area and can issue takeoff and landing clearance. This is found during military operations with temporary takeoff and landing areas.

Since different routines exist around the country, it can be appropriate to review the phraseology and the regulations concerning air traffic within "non-maneuvering areas" and in close proximity to maneuvering areas.

Being that a condition of uncertainty exists among pilots about how they are supposed to conduct themselves concerning phraseology and procedure in differing situations, the Civil Aviation Administration should initiate measures to correct this. First and foremost, some pilots should refresh their knowledge concerning how they are to conduct themselves during takeoffs and landings, outside the maneuvering area, but within the control zone. It often happens that pilots don't want to contact air traffic control when they take off and land at remote airports within the control zones of larger airports. This results in a feeling of insecurity and a lot of guessing about their intentions, on the part of traffic controllers, which creates an increase in their workload. More information and training can enhance the understanding of pilots and controllers for each other's job and reduce misunderstandings.

2.3 Language and phraseology

In several investigations of incidents and accidents it has been found that if everyone spoke the same language, meaning English, and used the phraseology which is stipulated, many misunderstandings could be avoided. Other pilots would then be able to know what was taking place in the airspace and at the airports, thereby increasing the possibilities to avoid incidents and accidents. SHK can sympathize with the fact that Swedish was used in the case under investigation, taking into account the special nature of the communication involved. However one must always realize that at an international airport such as Arlanda there are many other operators, who do not have knowledge of the Swedish language and who then do not attain information about traffic in the area, that may affect them.

3 CONCLUSIONS

3.1 Findings

- a) The pilots were qualified to perform the flight.
- b) The air traffic controller was qualified to perform her duties.
- c) The aircraft had valid certificates of airworthiness.
- d) The flight was of an unusual character with takeoffs and landings outside the ordinary maneuvering area. A special maneuvering area was not established for runway 01R/19L.
- e) There was no briefing accomplished with the air traffic controller prior to the flights.
- f) The air traffic controller did not have visual contact with aircraft CBN when it was on the surface of runway 01R/19L.
- g) The air traffic controller did not use the correct phraseology during clearance issue.
- h) The pilots in aircraft CBN took off without having received clearance for this according to stipulated phraseology.
- i) A violation of minimum separation ensued between aircraft CBN and SKX 303. The closest they came to each other was 0.23 nm (425 meters) with a vertical separation of 700 feet (213 meters).
- j) There was a lack of routines in the aviation company's operational regulations concerning calibration flights.
- k) Minor variations exist at airports around the country, in the method of issuing permission for takeoff, with respect to activities outside the maneuvering area.
- l) There is a prevailing uncertainty among pilots, concerning conduct and phraseology outside the maneuvering area.

3.2 Causes of the incident

The incident was caused by the pilots in aircraft CBN taking off without having received clearance for this and an infraction of minimum separation ensuing with an oncoming aircraft. Contributory causes could have been that incorrect phraseology was used during clearance issue and that routines for flights of unusual character were lacking.

4 RECOMMENDATIONS

The Civil Aviation Administration is recommended to

- revise the existing regulations, phraseology and routines concerning air traffic control during operations outside the maneuvering area, in order to reduce uncertainty and minimize misunderstanding (*RL 2002:11e R1*),
- revise the routines, contained in the operational flight regulations of aviation companies, dealing with flights of an unusual character (*RL 2002:11e R2*), and to
- inform flight instructors and pilots about the importance of phraseology, regulations and procedures during operations on takeoff and landing surfaces outside the maneuvering area, but within a control zone (*RL 2002:11e R3*).

Calibration 12 Radio Communication, 2001-11-28

This transcript is produced from a tape cassette with recorded radio communication. The recording on the tape cassette is in monophonic sound with the telephonic time signal superimposed, which sometimes results in the time information being concealed by the radio transmissions. Only communication concerning Calibration 12 has been included.

Captions

Time: Time of the message, UTC (local time minus 1 hour). The accuracy of the time denunciation is correct within a few seconds.

From: The source of the message.

CBN - Calibration 12

TWR - Tower Arlanda. Until approximately 10:44 hours, Tower Controller 1.
From 11:03 hours until 11:54, Tower Controller 2. From 11.54 hours
Tower Controller 3.

SKX303 - Sky Express 303

APP-C - The Approach Control position at Arlanda

DIR - Arlanda Director

Note: Notes

- Interphone / telephone contact within ATC.

Information: The message in clear text.

?? indicates that it has not been possible to decipher the information.

(Parentheses are used to indicate that the rendering is uncertain).

[Brackets are used to indicate comments].

<i>Time</i>	<i>From</i>	<i>Note</i>	<i>Information</i>
10.44.19	CBN		Tower, Calibration 12 established 19 Left.
	TWR		Calibration 12, continue 19 Left and the wind is 110 degrees at 8 on 19 Right.
10.44.29	CBN		Continue in on 19 Left, Calibration 12.
10.45.12	TWR	#	Tower.
	DIR		Hi, it's Director. Uh, Calibration 12, do you have time to ask him if in his opinion he is right on the centerline, because on radar he is just a tiny bit to the right of the centerline.
	TWR	#	OK. Are you listening? On my frequency or?
	DIR	#	Yes..
10.45.25	TWR	#	Thanks.
10.45.28	TWR		Calibration 12 from tower.
	CBN		Yes.
10.45.31	TWR		On radar it looks as if you are somewhat to the right of the centerline, how does it look from the airplane?
	CBN		Right down the center, Calibration 12.
10.45.40	TWR		OK, thanks.
10.46.32	TWR		Calibration 12, the wind is still steady and report on the ground.
10.46.35	CBN		We'll report on the ground, Calibration 12.
10.47.47	CBN		Tower, Calibration 12, can you control the lights on runway three from your position?
	TWR		No, I can't.
	CBN		Not even the PAPI?
	TWR		No.
	CBN		OK.

10.47.58	TWR		Perhaps there is someone in the new tower who can hear me, if so they would like to have PAPI on 19 Left.
10.48.58	CBN		Tower, Calibration 12 on the ground.
	TWR		Yes, then you can begin with your intentions later on.
10.49.04	CBN		Calibration 12.
10.51.04	CBN		Tower from Calibration 12, we'll taxi down and line-up zero., wrong, 19 Left and we would like to do another approach like this with a full stop on 19 Left.
10.51.16	TWR		OK.. you say taxi down, but you mean that you taxi north again and want to take off 19 Left for a new approach?
	CBN		Yes that's correct, taxi north yes. Calibration 12.
10.51.28	TWR		OK, then I'll be back with a clearance.
10.54.36	APP-C	#	APP-C.
	TWR	#	Well, now he's underway here again.
	APP-C	#	He's underway. What does he want now?
10.54.40	TWR	#	Now he wants to take off runway 19 Left and make a new approach like he just did and land.
	APP-C	#	To 19 Left?
	TWR	#	To 19 Left.
	APP-C	#	OK, but then 160 degrees from there and 2500 feet and 126,65.
	TWR	#	Two point five, hundred and sixty.
	TWR	#	Look, I have two departures underway to take off so that it doesn't take place until after that.
	APP-C	#	But an approach with a full stop.
	TWR	#	You bet.
10.55.04	APP-C	#	Thanks.
10.55.09	TWR		Calibration 12 from tower.
10.55.11	CBN		Calibration 12 yes.
10.55.13	TWR		Well, I have two departures from zero eight before you can be on your way but the clearance is left 160 degrees, climb to 2500 feet for vectors to 19 Left. [SK 1551 and SK 2010]
10.55.24	CBN		Left 160 and 2500 feet and vectors 19 Left yes, Calibration 12.
	TWR		12, I'll get back to you.
10.59.09	TWR		Calibration 12, on runway 19 Right the wind is 110 degrees 7, report airborne.
10.59.17	CBN		Report airborne, Calibration 12.
10.59.53	CBN		Tower Calibration 12 airborne.
10.59.56	TWR		Calibration 12.
11.01.11	TWR		Calibration 12, contact 26,65. [Parallel interphone conversation between TWR and another position. - APP-C?]
11.01.16	CBN		26,65 Calibration 12.
11.01.16	APP-C?	#	..well I can turn him up but .. you're taking the departures into account, right?
11.01.18	TWR	#	Yes.
11.10.39	CBN		Tower, Calibration 12 established 19 Left.
11.10.43	TWR		Calibration 12 roger. Do you intend to land now?
	CBN		Yes indeed, a full stop. Calibration 12.
11.10.48	TWR		Calibration 12, roger, the winds are 110 degrees 6 knots. Land your discretion, report on the ground.
11.10.55	CBN		Report on the ground, Calibration 12.
11.13.41	CBN		Tower, Calibration 12 on the ground.
11.13.44	TWR		Calibration 12.
11.15.59	CBN		Tower from Calibration 12.
11.16.01	TWR		Go ahead.
11.16.03	CBN		Now we would like to taxi northbound and line-up on 19 Left and then make a full stop landing on 01 Right.

11.16.13	TWR		Roger that, report in position 19 Left.
	CBN		Report 19 Left, Calibration 12.
11.16.22	TWR		And it will be a visual circuit to 01 Right or what?
11.16.30	CBN		Well, we would really like to have radar vectors if that is possible, Calibration 12.
	TWR		OK, how many miles final?
11.16.37	CBN		8 please, Calibration 12.
	TWR		OK, to the same runway as 01 Right?
	CBN		01 Right, yes, Calibration 12.
11.16.46	TWR		Yes.
11.17.35	APP-C	#	APP-C
	TWR	#	Hi Ester it's the tower.
	APP-C	#	Hi.
	TWR	#	Now Calibration wants to take off on the eastern runway southbound.
	APP-C	#	Yes.
	TWR	#	And have vectoring to 01 Right.
	APP-C	#	OK.
	TWR	#	Are you going to hold or are you going to hold or?
11.17.47	APP-C	#	Ah, we'll take it. Can we make it 160 degrees again, is that alright with you or?
	TWR	#	That will be perfect.
	APP-C	#	160 degrees two point five and 26,65.
	TWR	#	160, two point five and 26,65.
	APP-C	#	Yes, and do you know if it is a full stop this time too or?
11.18.01	TWR		Calibration 12, the next approach, is that going to be a full stop or do you want a missed approach?
	CBN		It will be a full stop landing, and then we would like another full stop landing from 19 Right.. or 01 Right, Calibration 12.
	TWR		OK.
	APP-C	#	I heard.
	TWR	#	OK.
	APP-C	#	Great. Bye.
11.18.17	TWR	#	Bye.
11.19.00	TWR		Calibration 12.
11.19.03	CBN		Yes, I'm here.
11.19.05	TWR		According to the personnel in the new tower, after these two approaches, or when you are finished, they would like you to make a low fly-by at 150 feet and preferably from the north.
11.19.17	CBN		Yes, roger that, Calibration 12.
11.19.20	TWR		Then we'll do that later, and this clearance is as before, 160 degrees and climb to 2500 feet for vectors.
11.19.28	CBN		Left 16.. or 160 degrees yes and 2500 feet and vectors, Calibration 12.
11.19.37	TWR		Click Click [acknowledgement from TWR.]
11.20.35	TWR		Calibration 12, then hold in position, I have a departure proceeding southbound so I will get back to you when it is suitable for takeoff.
11.20.43	CBN		Yes, we hold in position, Calibration 12.
11.22.00	TWR		Calibration 12, take off at your discretion, and I'll get back to you later.
11.22.05	CBN		Take off at my discretion, Calibration 12.
11.23.14	TWR		Calibration 12, contact approach on 126,65 for vectors.
11.23.21	CBN		Approach 126,65. Calibration 12.
11.23.29	CBN		And control, Calibration 12, hi again.
11.23.33	APP-C		Hi again, Calibration 12. Then you have 01 Right this time.
11.23.37	CBN		01 Right yes, Calibration 12.
11.23.42	APP-C		I'll try to get it exactly eight miles this time.

11.23.47	CBN		Yea, don't worry about it, Calibration 12.
11.28.03	CBN		And tower, Calibration 12 established 01 Right.
11.28.07	TWR		Calibration 12, roger. Land 01 Right at your discretion, the wind is 110 degrees, 8 knots.
11.28.15	CBN		Land at my own discretion, Calibration 12.
11.30.34	CBN		Wind check from Calibration 12.
11.30.37	TWR		Over here the wind is 110 / 6.
11.30.39	CBN		??.
11.31.21	CBN		Tower, Calibration 12 on the ground.
11.31.25	TWR		Calibration 12.
11.31.39	TWR		One more of the same then?
11.31.41	CBN		Yes indeed, but we want to taxi over to 01 Right and line-up, Calibration 12.
11.31.48	TWR		Yes, roger, line-up 01 Right. Same clearance except with a right turn now to heading 160 degrees 2500 feet.
11.31.57	CBN		Taxi, line-up 01 Right and right turn 160 to two-thousand five, climb 2500 feet, Calibration 12.
11.32.27	??	#	(East)
	TWR	#	Hi east, it's tower. Now Calibration is on the ground, now he wants to takeoff 01 Right, he has got right turn to 160 degrees, same altitude, 2500 feet.
	??	#	160 degrees two point five.
	TWR	#	For a full stop 01 Right again.
11.32.40	??	#	OK. Thanks.
11.34.33	TWR	#	Hi, it's tower again.
	??	#	Hi.
	TWR	#	It will surely take four or five minutes before he is airborne..
	??	#	Yes, he's taking off 01 Right?
	TWR	#	Yes.
11.34.38	??	#	OK.
11.37.46	CBN		Tower Calibration 12.
11.37.47	TWR		Go ahead.
11.37.48	CBN		Can you find out if we can get runway lights on 01 Right?
11.37.54	TWR		They have tried and were going to send up another man to turn on both PAPI and runway lights, but that ?? as it's called was blocked. But they are trying.
11.38.04	CBN		OK, thanks very much.
11.39.03	CBN		Tower, Calibration 12.
11.39.06	TWR		12 yes, I'll get right back to you.
11.41.11	TWR		Calibration 12, take off your discretion with a right turn.
11.41.15	CBN		Ehh.. clear our discretion we take off and right turn yes, Calibration.
11.41.58	CBN	#	Tower, Calibration 12 airborne.
11.42.01	TWR		Calibration 12.
11.43.02		#	Calibration 120,5
11.43.04		#	120,5 thank you.
11.43.06	TWR		Yes. Calibration 12 vectors on frequency 120,5.
11.43.10	CBN		120,5, Calibration 12.
11.48.14.	CBN		Yes, Tower, Calibration 12, established 01 (right).
11.48.17	TWR		Calibrat... wind 130 degrees, 7 knots, land 01 Right, your discretion.
11.48.23	CBN		Land 01 Right, my discretion, Calibration 12.
11.49.53	TWR		Calibration 12 are you VMC now?
11.49.57	CBN		I am VMC, Calibration 12.
11.50.05	TWR		Ah, Calibration 12, for your information I have a departure runway 08 and in case of a go-around, climb straight ahead VMC.
11.50.11	CBN		Calibration 12.
11.51.01	CBN		Yes tower Calibration 12 ?? [Obscured by the time sig-

			nal on the playback]
11.51.04	TWR		Calibration 12 roger. What about that low fly-by then?
11.51.09	CBN		Yes we would like to accomplish that, it was from the north right, Calibration?
11.51.12	TWR		Yes exactly, you want to do it right away or what?
11.51.19	CBN		Yes we would like to. ?? taxi down to 01 Right and then takeoff,, Calibration 12.
11.51.26	TWR		OK, taxi and line-up then 01 Right and I'll get back with the clearance.
11.51.30	CBN		Taxi and line-up 01 Right, Calibration 12.
11.52.05	APP-C	#	APP-C
11.52.06	TWR	#	(AD 4). Calibration 12 is on the ground now.
11.52.07	APP-C	#	OK, good.
11.52.08	TWR	#	In 4 to 5 minutes he wants to take off 01 Right, turn out in.., turn right for a left-hand circuit to 19 Left.
11.52.18	APP-C	#	Right for a left-hand circuit, yea but get back when he is underway right?
11.52.21	TWR	#	I'll get back and then it will be a low fly-by, he will not land then, but continue.
11.52.27	APP-C	#	OK.
11.54.40	CBN		Yes tower, Calibration 12.
	TWR		Calibration 12 go ahead.
	CBN		Yes, when we have finished the low fly-by here now, we wish to land by the easiest way.
	TWR		You mean on the normal runway?
	CBN		Yes, we can also land on the third runway if we can just taxi over to some suitable parking place afterwards.
	TWR		Ah, I don't think that's possible. Then you will have to taxi, or land on 19 Right later (I think that will be it).
	CBN		19 Right then yes, thanks.
11.55.26	CBN		Tower, for information we will be established at 150 feet QFE here at distance 2 prior to the threshold runway 19 Left and we will also fly out about one nautical after the runway.
	TWR		Calibration 10, roger. We see how many you fly.
	CBN		One is probably enough, Calibration 10 ..excuse me 12.
	TWR		Yes, roger.
11.56.37	APP-C	#	APP-C.
11.56.39	TWR	#	Hi there, it's (AD number four).
	APP-C	#	Hi.
	TWR	#	Calibration is doing a low pass.
	APP-C	#	On 19.
	TWR	#	On 19 Right yes. And then he wants to go in and land. Then we'll just see if 19 Right is good or if he maybe wants to take it to 26 or something like that maybe.. visual circuit.
	APP-C	#	Yes of course.
	TWR	#	Or something like that maybe.
	APP-C	#	But he's going to take off 01?
	TWR	#	He takes off 01 Right yes.
11.56.59	APP-C		01 Right and go to 19 Left.
	TWR	#	Exactly, he does a left-hand circuit.. and then at distance 2 he is 150 feet and then he wants to go one mile after that and then he wants to go in and land somehow.
	APP-C	#	Yes, but then we lead him in and send him to you then.
	TWR	#	Do that. OK bye.
11.58.00	CBN		Tower, Calibration 12 is ready.
	TWR		Calibration 12, I'll get back to you, I have a departure on 08.
	SKX303		Good morning, Sky Express 303.
	TWR		Sky Express 303, report 1500 feet climbing. Right turn

			out, cleared for takeoff zero eight.
11.58.14	SKX303		Clear for takeoff zero eight. We call you 1500 feet climbing with right turn. Sky Express 303.
	TWR		Click Click [acknowledgement from TWR.]
11.59.09	APP-C	#	APP-C
	TWR	#	Hi there, Calibration is ready now.
	APP-C	#	But let's set it out at 50 degrees, two point five then maybe.
	TWR	#	050 and 2500 feet.
	APP-C	#	And to 20,5.[Frequency 120,5]
	TWR	#	20,5. Thanks, bye.
11.59.26	TWR		Calibration 12 after takeoff climb on heading 050 degrees 2500 feet.
11.59.33	CBN		After takeoff 050 degrees and climb to 2500 feet, Calibration 12.
12.00.10	SKX303		1500 climbing, Sky Express 303.
12.00.12	TWR		Sky Express 303 turn right heading 270.
12.00.16	SKX303		270 Sky Express 303.
12.00.29	TWR		Calibration 10 have you taken.... [the transmission is interrupted]
12.00.34	TWR		Calibration [the transmission is interrupted]
12.00.39	CBN		(Tower) Calibration 10
12.00.41	TWR		Yes Calibration 10. Yes roger.
12.00.48	TWR		Calibration 10, I had not given you permission to take off yet, it was only after takeoff.
12.00.56	TWR		Sky Express 303 contact departure 123,75.
12.01.05	SKX303		23,75 Sky Express 303, yes, that one caused a warning on the TCAS.
12.01.10	TWR		Yes, I understand that because I had not given him takeoff clearance on 01 Right.
12.01.15	SKX303		Yes, good bye.
12.01.16	TWR		Good bye.
12.01.17	CBN		Tower, Calibration 12, then we made a very big mistake, I sincerely apologize.
12.01.21	TWR		Calibration12 contact 126 wrong, 120,5.
12.01.26	CBN		120,5. 12.