



Statens haverikommission
Swedish Accident Investigation Board

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Report RL 2003:31e

***Infraction of minimum separation
between the aircraft SE-IBX and
TS-INC in the airspace north of
Gothenburg/Landvetter airport,
O County, Sweden, on the 5th of
November 2002***

Dnr L-092/02

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

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

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L-092/02

Swedish Civil Aviation Administration

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Report RL 2003: 31e

The Swedish Accident Investigation Board (Statens haverikommission, SHK) has investigated an infraction of minimum separation that occurred on the 5th of November 2002 in the airspace north of Gothenburg/-Landvetter airport, O County, Sweden, between two aircraft with the registrations SE-IBX and TS-INC.

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 Swedish Accident Investigation Board kindly awaits a reply by the 1st of March 2004 concerning how the recommendations issued in the report have been complied with.

Göran Rosvall

Monica J. Wismar

Henrik Elinder

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Abbreviations

AIP	Aeronautical information publication/containing permanent information of significance for air traffic	JAA	Joint Aviation Authority
ANS	National agency for air traffic services in Sweden with headquarters in Norrköping	km	Kilometer
ATPL (A)	Airline Transport Pilot Licence Aeroplane	LFV	Civil Aviation Administration (Swedish)
ATC	Air Traffic Control	m	Meter
ATCC	Air traffic control center	MUST	Military Intelligence & Security Service (Swedish)
ATS	Air Traffic Services	NDB	Non-directional (radio) beacon
°C	Degrees Celsius	NM	Nautical mile (1,852 m)
CPL (A)	Commercial Pilot Licence Aeroplane	OTH	Others
CTR	Control Zone	PC	Proficiency check
CVR	Cockpit Voice Recorder	PF	Pilot flying
DME	Distance Measuring Equipment	PNF	Pilot not flying
FDR	Flight Data Recorder	PPL(A)	Private Pilot Licence Aeroplane
FL	Flight Level, surface with constant atmospheric pressure based on a pressure of 1013,2 hPa	QNH	Atmospheric pressure at Mean Sea Level
FL-lic.	Air traffic controller licence	RPU	Radar Presentation Equipment
Ft	Foot (0,3048 meters)	s	Second
GS	Ground Speed	SFF	Air traffic controllers organization (Swedish)
hPa	Hectopascal	SMHI	Institute of Meteorology & Hydrology (Swedish)
ICAO	International Civil Aviation Organization	STCA	Short Term Conflict Alert
IFR	Instrument Flight Rules	TCAS	Traffic Alert and Collision Avoidance System
ILS	Instrument Landing System/Ground-based equipment used by aircraft instrumentation during final approach to determine the position of the aircraft defined by vertical and horizontal deviations from the optimum flight path and to gain information concerning the distance to the touchdown point	TE	Terminal East
IMC	Instrument Meteorological Conditions	TW	Terminal West
IOR	Recording and registration of radar data	UTC	Universal Time Co-ordinated
		VMC	Visual Meteorological Conditions
		VOR	Very high frequency Omni directional radio Range/Navigation system consisting of a transmitter on the ground and an airborne receiver. The transmission contains information which provides a constant bearing with reference to magnetic north at the position of the ground station.

Rapport RL 2003:31e

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Report finalized 2003-08-29

<i>Aircraft; registration, type</i>	A. SE-IBX, Cessna 172 B. TS-INC, Airbus 320
<i>Class, airworthiness</i>	Normal, valid certificate of airworthiness
<i>Owner/Operator</i>	A. Hagshult Flyg AB/Värnamo Aeroclub B. Nouvelair, Tunisia
<i>Date and time</i>	2002-11-05, 19:20 hours in darkness <i>Note:</i> All times refer to Swedish Standard Time (UTC + 1 hour)
<i>Place of occurrence</i>	Approximately 20 km north of Gothenburg/Landvetter airport, O County, Sweden, (pos. 5749N 01222E; 915 m above sea level)
<i>Type of flight</i>	A. Training flight B. Charter
<i>Weather</i>	According to SMHI's analysis: wind 230 ^o /7 knots, visibility > 10 km, clouds 5-7/8ths with base at 3,000 feet, temp./dew point +2/-2 °C, QNH 1026 hPa
<i>Persons on board:</i>	A. Pilot and an instructor pilot
<i>crew members</i>	B. 2 Flight crew members and 4 cabin crew members
<i>passengers</i>	B. 157 +2 (children under the age of 2)
<i>Injuries to persons</i>	None
<i>Damage to aircraft</i>	None
<i>Other damage</i>	None
<u><i>Aircraft A</i></u>	
<i>Instructor pilot:</i>	
<i>Age, sex, licence, total flying time</i>	38 year-old male, CPL (A), 960 hours, of which 570 hours on the class
<i>Flying hours previous 90 days</i>	114 hours, of which 112 hours on the class
<i>Student pilot:</i>	
<i>Age, sex, licence, total flying time</i>	35 year-old male, PPL (A) , 108.4 hours, of which 71.8 hours on the class
<i>Flying hours previous 90 days</i>	27.3 hours, of which 19.9 hours on the class
<u><i>Aircraft B</i></u>	
<i>Commander:</i>	
<i>Age, sex, licence, total flying time</i>	54 year-old male, ATPL (A), 13,400 hours, of which 635 hours on the type
<i>Flying hours previous 90 days</i>	240.9 hours, of which 93.9 hours on the type
<i>Co-pilot:</i>	
<i>Age, sex, licence, total flying time</i>	30 year-old male, CPL (A), 577 hours, of which 290 hours on the type
<i>Flying hours previous 90 days</i>	163 hours, all on the type

Air traffic controller

Age, sex, licence

55 year-old male, FL licence since 1980

The Swedish Accident Investigation Board, (SHK), was notified on the 19th of November that an infraction of minimum separation had taken place on the 5th of November 2002 at 19:20 hours, north of Gothenburg/Landvetter airport, O County, Sweden; involving two aircraft with registration SE-IBX and TS-INC respectively.

The incident has been investigated by SHK represented by Göran Rosvall, Chairperson, Monica J. Wismar, Chief Investigator Flight Operations and Henrik Elinder, Chief Technical Investigator Aviation.

Björn Royme has assisted SHK as air traffic control expert.

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

Summary

The student pilot and his instructor were to perform a night navigation flight in aircraft SE-IBX. They had prepared for the flight by completing an operational flight plan and had filed the flight plan with ATS. The flight was to depart from Hagshult airport and proceed to Gothenburg/Säve airport via the HAR VOR station. They took-off from Hagshult at 18:30 hours.

As they approached the community of Länghem, approximately 10 NM southwest of Borås, the pilots contacted Gothenburg Control and reported their position, altitude, flight according to VFR flightplan and transponder code. The air traffic controller answered with a confirmation of their transmission and reported the actual QNH at Landvetter. Thereafter the pilots continued the flight at an altitude of 3,000 feet in the direction of HAR.

After passage of the HAR VOR, the pilots continued the flight on a course of 259 degrees towards Gothenburg/Säve airport. As the aircraft entered the area immediately northwest of the Landvetter control zone, still maintaining 3,000 feet, both pilots on board observed an aircraft obliquely to the right of them. They were not able to determine the altitude or the distance of the aircraft but saw that it was in a right-hand turn towards them. Simultaneously they heard on the radio that a pilot (the pilot on board aircraft TS-INC) had contacted Gothenburg Control and reported that he had received a TCAS warning and had initiated a climb. The pilot in SE-IBX then reduced power and initiated a descent to an altitude of 2,500 feet.

Subsequent to the missed approach, aircraft TS-INC performed a new approach to runway 21 with radar vectoring and landed without problems.

The investigation has shown that SE-IBX flew into Gothenburg/-Landvetter's terminal area without clearance. The air traffic controller did not notice the encroachment. This was due to, among other things, the fact that the radar presentation of other controlled and uncontrolled traffic in the area took place with the function "OTH OFF", in other words without labels, and that he had not programmed the SE-IBX flight into the radar system. The closest the two aircraft came to each other was 117 meters horizontally and approximately 300 meters vertically.

A misunderstanding between the air traffic controller and the pilot in SE-IBX caused the incident. Contributory to the incident has been deficiencies in air traffic control routines.

Recommendations

The Swedish Civil Aviation Administration is recommended to

- clarify the phraseology and supplement valid routines concerning air traffic control's communications with VFR air traffic in the vicinity of controlled airspace, so the risk of misunderstandings is eliminated. (*RL 2003:31e R1*),
- consider if special rules or restrictions should be developed concerning the use of the function "OTH OFF" in the RPU system (*RL 2003:31e R2*), and to
- consider the need to install a collision avoidance system, STCA, at Gothenburg/Landvetter ATS (*RL 2003:31e R3*).

1 FACTUAL INFORMATION

1.1 History of the flight

The student pilot and his instructor on board aircraft SE-IBX were to perform a night navigation flight. They had prepared for the flight by completing an operational flight plan and filing the flight plan with ATS. The flight was to depart from Hagshult airport and proceed to Gothenburg/Säve airport via the VOR station HAR. At Säve they were to perform a landing with an immediate takeoff, a so-called "touch and go", and thereafter fly to Jönköping airport to perform another "touch and go" and then fly back to Hagshult.

They took-off from Hagshult at 18:30 hours. When they had climbed to an altitude of 3,000 feet the pilot contacted Malmö Control and activated the flightplan. At this time they received a transponder code¹ of 2732.

As they approached the community of Länghem, approximately 10 NM southeast of Borås, Malmö Control instructed them to contact Gothenburg Control. The pilot contacted Gothenburg Control and reported position, altitude, flight according to VFR flightplan and transponder code. The air traffic controller answered with a confirmation of their transmission and reported the actual QNH at Landvetter. Thereafter the pilot continued the flight at an altitude of 3,000 feet in the direction of HAR.

The air traffic controller identified the aircraft on radar. As the position of the aircraft was about 20 minutes flying time from Gothenburg's terminal area, he saw no reason to clear the aircraft for entry into the controlled airspace at that time. However the controller did procure the information strip with the data filed in the flightplan, the so-called "flight strip", and placed it on the strip table for later use.

After station passage of HAR the pilot continued on a course of 259 degrees towards Gothenburg/Säve airport. When the aircraft was in the area immediately northwest of Landvetter control zone, still maintaining 3,000 feet, both pilots on board observed an aircraft obliquely to their right. They were not able to determine the altitude or distance of the aircraft but saw that it was in a right-hand turn towards them. Simultaneously they heard on the radio that a pilot (the pilot on board aircraft TS-INC) had contacted Gothenburg Control and reported that he had received a TCAS warning and had initiated a climb. The pilot in SE-IBX then reduced power and initiated a decent to an altitude of 2,500 feet.

After the incident the air traffic controller ordered SE-IBX to descend to an altitude of 1,500 feet and turn to a westerly heading. At the same time

¹ Transponder - Receiver/Transmitter which upon the correct inquiry signal transmits a response signal on a frequency other than the incoming transmission concerning altitude, airspeed and transponder code.

the pilots were requested to contact the air traffic controller on the telephone after completion of the flight. Thereafter they completed the remaining portion of the flight as planned.

Subsequent to the missed approach, aircraft TS-INC performed a new approach to runway 21 with radar vectoring and landed without problems.

The incident took place on the 5th of November 2002 at position 5749N 01222E; 915 meters above sea level.

1.2 Injuries to persons

	<i>Crew members</i>	<i>Passengers</i>	<i>Other</i>	<i>Total</i>
Fatal	–	–	–	–
Serious injuries	–	–	–	–
Minor injuries	–	–	–	–
No injuries	8	157/2*	–	165/2*
Total	8	157/2*	–	165/2*

*Children under the age of 2

1.3 Damage to aircraft

None.

1.4 Other damage

None.

1.5 Crew members

1.5.1 The flight crew members on board SE-IBX

The instructor pilot, male, was 38 years old at the time and held a valid CPL (A).

<i>Flying hours</i>			
<i>previous</i>	<i>24 hours</i>	<i>90 days</i>	<i>Total</i>
All types	4	114	960
This type	4	112	570

Number of landings this class previous 90 days: 330.

Latest PC carried-out 2002-05-30.

The student pilot, male, was 35 years old at the time and held a valid PPL (A).

<i>Flying hours</i>			
<i>Previous</i>	<i>24 hours</i>	<i>90 days</i>	<i>Total</i>
All types	-	27.3	108.4
This type	-	19.9	71.8

Number of landings this class previous 90 days: 81.

Latest PC carried-out 2002-06-10.

1.5.2 The flight crew members on board TS-INC

The commander, male, was 54 years old at the time and held a valid ATPL (A).

<i>Flying hours</i>			
<i>previous</i>	<i>24 hours</i>	<i>90 days</i>	<i>Total</i>
All types	-	240.9	13,400
This type	-	93.9	635

Number of landings this type previous 90 days: 40.

Latest PC carried-out 2002-06-12/13.

The co-pilot, male, was 30 years old at the time and held a valid CPL (A).

<i>Flying hours</i>			
<i>Previous</i>	<i>24 hours</i>	<i>90 days</i>	<i>Total</i>
All types	-	163	577
This type	-	163	290

Number of landings this type previous 90 days: 54.

Latest PC carried-out during September 2002.

1.5.3 *The air traffic controller*

The air traffic controller, male, was 55 years old and held a valid FL licence since 1980.

1.6 **The aircraft**

Both aircraft had valid certificates of airworthiness.

SE-IBX was equipped with an altitude reporting transponder Mode C, which was set to code 2732.

TS-INC was equipped with an altitude reporting transponder Mode C, which was set to code 0273. The aircraft was also equipped with a TCAS system. The TCAS system computes the risk of possible conflicts with other air traffic, based on, among other things, transponder data from aircraft in the vicinity. Initially the system produces a warning that a conflict risk exists and thereafter instructions that the aircraft should climb or descend in order to avoid a collision.

1.7 **Meteorological information**

According to SMHI's analysis: wind 230°/7 knots, visibility > 10 km, clouds 5-7/8ths with base at 3,000 feet, temp./dew point +2/-2 °C, QNH 1026 hPa.

1.8 **Aids to navigation**

1.8.1 *The airport*

Gothenburg/Landvetter airport is equipped with NDB, VOR/DME and ILS for both runway 03 and runway 21. The area has radar coverage with the Swedish Civil Aviation Administration's IOR system.

1.8.2 *Air traffic control*

At the time of the incident, sectors TE and TW within Gothenburg Control were consolidated into one control position. The responsible air traffic controller experienced the traffic volume situation as being between normal and light. Other than a few arriving and departing aircraft to and from Gothenburg/Landvetter airport there were flight activities at the adjacent

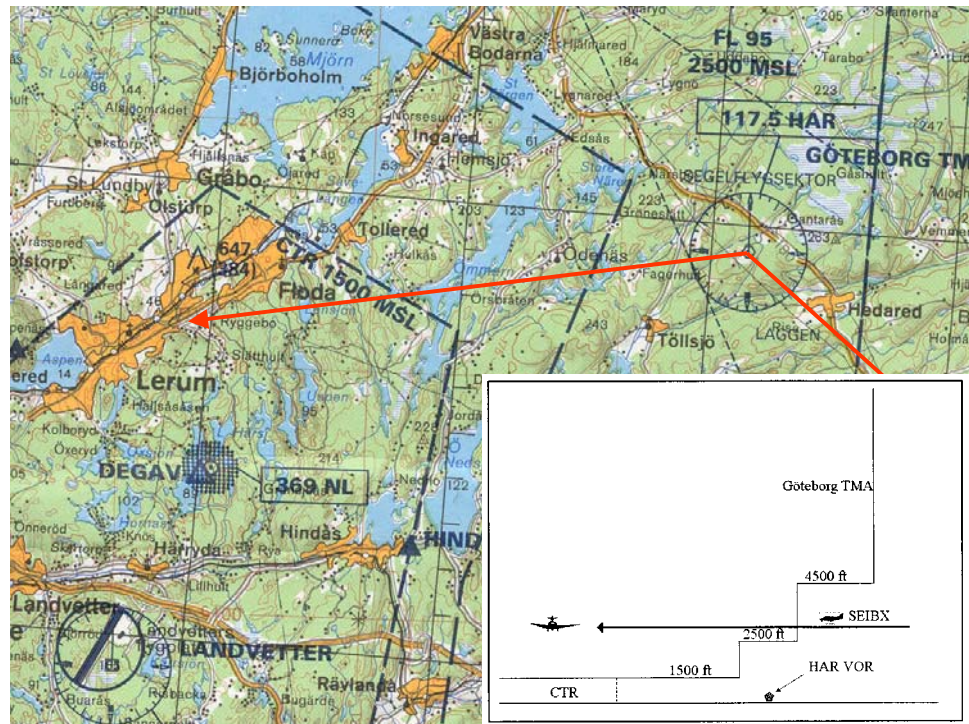
airports of Sätenäs and Säve. However the air traffic controller at Landvetter was not controlling the traffic there.

When the pilot in SE-IBX initially contacted Gothenburg Control the aircraft was in uncontrolled airspace southwest of Gothenburg/Landvetter airport. The air traffic controller identified the aircraft on the radar screen and knew by means of the filed flightplan the intended flight routing of the aircraft. He intended to issue clearance into the terminal area later when the aircraft was nearer and he could better determine the traffic in the area. He prepared for clearance issue by procuring the flight plan information, the so-called "flight strip" for the flight and placing it on the right-hand portion of his strip table, in order to later to move it forward into position. No further measures were taken.

At this time the air traffic controller had chosen a radar presentation of the traffic that he was not controlling using the function "OTH OFF", without so-called labels (see paragraph 1.17.2), which entailed that the radar presentation of SE-IBX only consisted of a symbol on the radar screen. His intent was to utilize this function a short while and then to return to a normal presentation with labels. This changeover had not been accomplished when the incident occurred.

1.8.3 SE-IBX

The aircraft SE-IBX was equipped for instrument flight. During the flight towards Gothenburg the pilots used the VOR station HAR as a navigational reference. They were aware of the fact that they must obtain clearance from the air traffic controller before they were allowed to fly within the controlled airspace surrounding Gothenburg/Landvetter airport. They were of the opinion that the air traffic controller had issued such a clearance in connection with their initial contact with Gothenburg Control when they were cleared to continue at an altitude of 3,000 feet (914 m); since the route of flight to Säve implied a penetration of the terminal area. (See depiction below.)



1.8.4 TS-INC

The aircraft TS-INC was equipped for instrument flight and was performing an ILS approach to runway 21. The Commander has stated that the aircraft was at an altitude of about 3,000 feet when the TCAS system issued a warning concerning other traffic in the area and that they acquired visual contact with the other aircraft. He followed the instructions from the TCAS warning by breaking-off the approach and initiating a climb.

1.9 Communications

Radio communication between the air traffic controller at Gothenburg Control and the different crews is presented in appendix 2. From this appendix it can be seen that the initial contact from SE-IBX on the frequency took place according to the following: (*transcription from tape recording in appendix 2*)

SBX: -Gothenburg Control SESBX, good evening.

TE: -BX

SBX: -Yes, SBX on VFR flightplan to ESGP just north of Länghem at three thousand feet transponder 2732.

TE: -BX roger, QNH one thousand twenty-six.

SBX: -QNH one thousand twenty-six SBX.

1.10 Aerodrome information

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

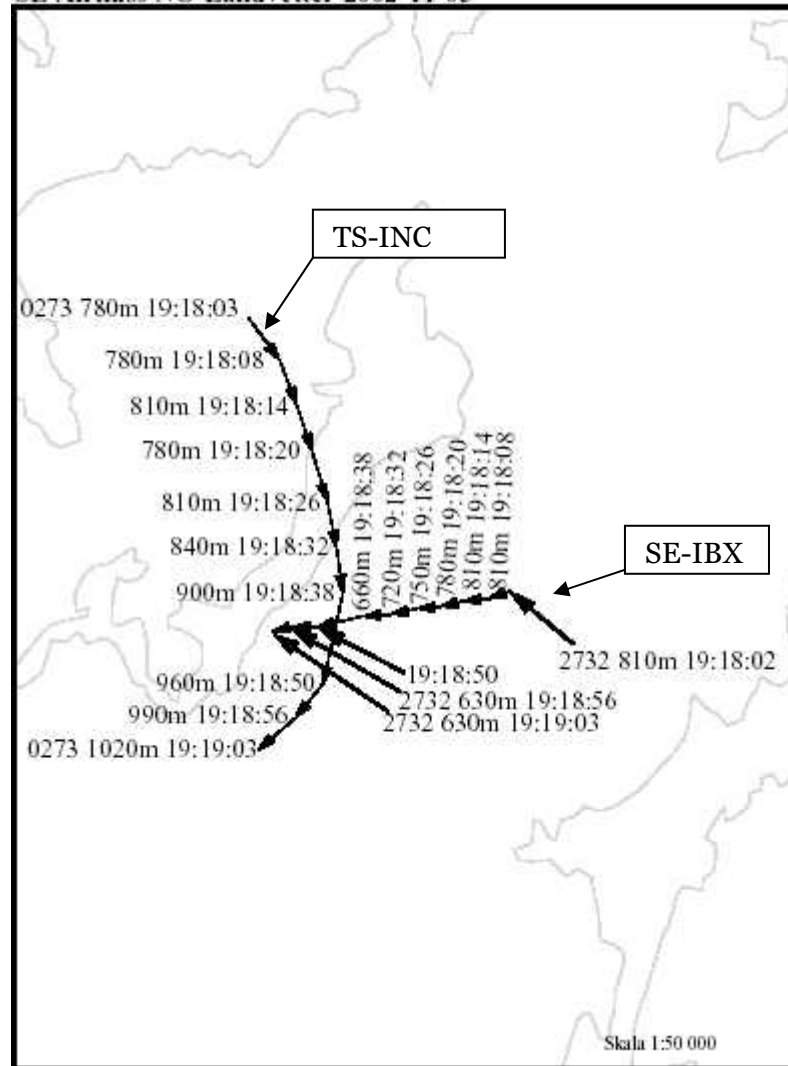
1.11 Flight and voice recorders

There was no requirement to carry a Flight Data Recorder (FDR) or a Cockpit Voice Recorder (CVR) on board aircraft SE-IBX and neither was fitted. The flight and voice recorders on board aircraft TS-INC have not been transcribed, as recorded radar information is available which describes the flight paths of the two aircraft.

1.12 Incident site

The incident occurred approximately 20 km north of Gothenburg/Landvetter airport at approximately 984 meters above ground level. The flight paths of both aircraft have been recorded by MUST and are presented below.

SE Airmiss NO Landvetter 2002-11-05



Note: The heights are based on the standard atmospheric pressure, 1013,2 hPa and are not corrected for actual atmospheric pressure.

It has been calculated from the recording that the minimum distance between the two aircraft was 117 meters horizontally and about 300 meters vertically and this occurred at time 19:18:42. At that time aircraft TS-INC had a ground speed of 320 km/h and had initiated a climb. Aircraft SE-IBX had a ground speed of 160 km/h and had initiated a descent. When the aircraft were at the same altitude of 3,000 feet (914 m) they were approximately 1 NM (1,852 m) from each other.

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

None.

1.17 Air traffic control working methods

1.17.1 Basic methods

In order to control aircraft within controlled airspace, air traffic controllers use “flight strips”, with flightplan information for the aircraft concerned, and a special table where the strips are placed. During management of air traffic the controller manually moves the “strips” on the table according to a system which assures that no conflicts arise between aircraft. Only strips for flights that have been cleared into the actual airspace are placed on the table. A clearance was never issued to aircraft SE-IBX. Therefore the accompanying “strip” was not placed on the strip table.

1.17.2 Radar presentation equipment (RPU-system)

The operator positions for the RPU system at Gothenburg ATS are equipped with two display screens, NR. 1 and NR. 2. Screen NR. 1 presents the positions of aircraft and their movements while screen NR. 2 is primarily used for the presentation of meteorological information and programming of flight planning data. Adjustments to the display screen presentation are also accomplished on screen NR. 2.

The radar presentation of aircraft that the air traffic controller is controlling, consists of a radar symbol and an attached “label” with information concerning, among other things, the altitude, speed and transponder code of the aircraft. After entering aircraft data in the system, the transponder code is replaced by the call sign of the aircraft.

In addition to radar presentation of such traffic, other traffic in the area such as traffic that is being controlled by other air traffic controllers in adjacent sectors or flights within uncontrolled airspace is also presented. This traffic can be presented with or without the label by use of the function “OTH ON” or “OTH OFF”. Normally the presentation of other traffic takes place with labels, i.e. with the function “OTH ON”. Sometimes the air traffic controller uses the function “OTH OFF” during short periods during high traffic intensity in order to obtain a “cleaner” presentation and to more easily be able to survey his own traffic. Information about which presentation alternative is active is indicated on screen NR. 2 by the color of an indication symbol.

1.17.3 Label handling

According to the Civil Aviation Administration’s Air Traffic Service, information from “strips” concerning controlled air traffic shall be entered into the radar system as soon as possible, so that the corresponding labels may be attached to the respective radar echo.

1.18 Additional information

1.18.1 Collision warning system, STCA

STCA is a computerized warning system that continuously calculates whether possible risks for collision exist, and if so informs the air traffic controller of this. In Sweden the system is only installed within Stockholm and Malmö ATCC. A prerequisite for the system is that the involved aircraft are equipped with a transponder with Mode C, which both aircraft here under discussion were.

1.18.2 *Division of airspace*

Airspace is divided into controlled and uncontrolled areas. According to AIP-Sweden ENR 1.2; it is required that in addition to the requirement for the aircraft to have two-way radio communications in order to be able to fly VFR within controlled areas, that

- the pilot has filed a flightplan for the flight,
- and that the aircraft receives a clearance for entry into the area.

The geographical and vertical division of airspace is described in the AIP and on VFR charts that are utilized as a basis for navigation for VFR traffic. (See fig. Section 1.8)

1.18.3 *Flight within controlled airspace without clearance*

It is a regular occurrence that aircraft fly into controlled airspace without clearance. During 2002, 149 such cases were reported in Sweden and the trend was increasing. A majority of such encroachments are due to the pilot not contacting air traffic control to obtain a clearance. The causes for this are myriad. To a large part it pertains to a misunderstanding between pilots and air traffic control. If the air traffic controller, upon receiving a call from a pilot; responds with for example “Stand-by, I’ll get back to you”, “Radar contact” or “Roger”, this may be interpreted as a clearance. This is especially valid when the pilot has filed a flightplan. In other cases it can be due to faulty navigation. One theory is that the all more frequent use of GPS for navigation has resulted in some VFR pilots not confirming their exact position on the map to the same extent as previously.

The problem with unauthorized traffic within controlled airspace is considered especially great within the airspace over southern Sweden; particularly during the summer season when uncontrolled VFR traffic between Sweden and the continent is frequent. Air traffic controllers at Malmö Control and Gothenburg Control experience that many foreign VFR pilots have insufficient knowledge of the division of Swedish airspace.

1.18.4 *Measures taken*

In cooperation with several professional interest groups within general aviation, The Civil Aviation Safety Authority has, in Project H50P, published a booklet which, among other things, deals with division of airspace, flightplans, clearance issue, etc.

Subsequent to this incident ANS has discussed the problem with unclear phraseology in an internal memorandum, IM-ANS, dated 2003-05-01 with the subject heading ”Instructional methods for the management of VFR”. This has been sent to all air traffic controllers.

The problem was also discussed during SFF’s Flight Safety Seminar in March of 2003.

2 ANALYSIS

2.1 The incident

Unauthorized VFR traffic in controlled airspace is a well-known problem and constitutes a serious flight safety risk. In the case here under discussion the encroachment resulted in a passenger aircraft and a private aircraft temporarily coming within 1 NM of each other, almost on a collision course and at the same altitude. Thanks to one of the aircraft being equipped with TCAS, the crew and air traffic control became aware of the collision risk in time and were able to take appropriate measures.

This occurrence constitutes a textbook example of how a misunderstanding arises between air traffic controllers and VFR pilots. There is no doubt

that the pilots on board SE-IBX were well aware of the clearance requirement to be able to fly into controlled airspace and that the flight from HAR to Säve at an altitude of 3,000 feet would entail them entering the Gothenburg TMA. No such clearance was ever issued and the pilots on board IBX should therefore have requested clearance prior to passing the border of the terminal area. At the same time, SHK does have an understanding that the pilots thought that a clearance had been issued. This due to the fact that the air traffic controller, after radar identification, accepted the continued flight towards Gothenburg/Säve at 3,000 feet because this route of flight would implacably lead them into the terminal area.

Even if the air traffic controller had not received an entry request from the pilots in SE-IBX or issued a clearance for entry into the terminal area, a partial explanation of the aircraft nevertheless ending-up there can be found in deficiencies within air traffic services.

Considering that unauthorized VFR traffic within controlled airspace is a well-known problem, all communication with VFR traffic in the vicinity of such areas should be conducted with such phraseology and clarity that the risk of the aforementioned misunderstanding is eliminated.

At the time of the incident the air traffic controller had selected the radar presentation of "OTH OFF" without entering information concerning SE-IBX into the system, although air traffic in the area was determined to be normal to light. Besides the fact that there were fewer radar echoes with labels, the air traffic controller's attention was drawn to the selected function solely by the different color of a symbol on his screen. This would indicate that the air traffic controller forgot to return the presentation to the normal position, i.e. "OTH ON". The consequences of this were that the presentation of SE-IBX on the screen took place only in the form of a radar symbol among other symbols. This could have been a contributory cause of the air traffic controller not realizing that SE-IBX flew into the controlled airspace.

The function "OTH OFF", radar presentation without labels, is of-course a valuable aid, allowing the air traffic controller to obtain a clearer picture of his own traffic when other traffic in the area is heavy. However, the function also implies a risk that the controller may then lose, or forget other important traffic. There does not appear to be any regulation or restriction concerning the use of the "OTH OFF" function within air traffic control. Therefore there is reason for the Civil Aviation Administration to consider whether special routines for the use of this function should be developed and if the indication of when the function is in use, can be made more distinct.

Considering that it should have been quite evident to the air traffic controller that SE-IBX would be flying through the terminal area; the question arises why he did not, as early as when the pilot first reported-in on the frequency, program the aircraft into his own controller position. Then the radar presentation of the aircraft would have automatically taken place with a label – regardless of how the other traffic was presented. For the same reason the air traffic controller should have updated the "strip" and placed it in the slot for traffic to/from Gothenburg/Landvetter. Traffic-wise there was hardly any hindrance to this. If he had done this, he probably would have been more aware of the actions of the aircraft and could have taken suitable measures earlier.

2.2 The STCA collision warning system

In the case at hand, the conditions were such that the collision risk would have been discovered and the air traffic controller would have been warned if the RPU at Gothenburg Control had been equipped with STCA, regardless

of the aircraft's TCAS system or which radar presentation was in use. Considering the extensive traffic that exists within the Gothenburg area and the safety enhancement effect that such a system provides, there is reason for the Civil Aviation Administration to consider the installation of such a system at Gothenburg/Landvetter ATS.

3 CONCLUSIONS

3.1 Findings

- a) The flight crew members were qualified to perform the flights.
- b) The aircrafts had valid certificates of airworthiness.
- c) The radar presentation of other controlled and uncontrolled traffic in the area took place with the function "OTH OFF", i.e. without labels.
- d) The air traffic controller had not programmed the SE-IBX flight into the radar system.
- e) SE-IBX flew into Gothenburg/Landvetter's terminal area without clearance.
- f) The closest proximity of the two aircraft to each other was 117 meters horizontally and approximately 300 meters vertically.

3.2 Causes of the incident

The incident was caused by a misunderstanding between the air traffic controller and the pilot in SE-IBX. Contributory to the incident has been deficiencies in air traffic control routines.

4 RECOMMENDATIONS

The Swedish Civil Aviation Administration is recommended to

- clarify the phraseology and supplement valid routines concerning air traffic control's communications with VFR traffic in the vicinity of controlled airspace, so the risk of misunderstandings is eliminated.
(*RL 2003:31e R1*),
- consider if special rules or restrictions should be developed concerning the use of the function "OTH OFF" in the RPU system.
(*RL 2003:31e R2*), and to
- consider the need to install a collision avoidance system, STCA, at Gothenburg/Landvetter ATS (*RL 2003:31e R3*).

Appendix 2

**Tape recording of LBT 982 and SEIBX on the 5th of Nov.
between the hours of 17:57 UTC and 18:30 UTC on frequency
124.67 position TE.**

- 1757 SBX: –Gothenburg Control SESBX, good evening.
TE: –BX
SBX: –Yes, SBX on VFR flightplan to ESGP just north of Långhem at three thousand feet transponder 2732.
TE: –BX roger, QNH one thousand twenty-six.
SBX: –QNH one thousand twenty-six SBX.
- 1804 LBT982: –Good evening this is Novelair 982 descending to flightlevel niner zero inbound to GOTEX.
TE: –Novelair niner eight two good evening, radar contact. Cleared Landvetter – direct backa, backa one fox arrival runway two one.
LBT982: –Roger, we proceed direct to bravo alpha kilo and it will be runway two one, Novelair nine eight two, thank you.
TE: –After backa, backa one fox arrival.
LBT982: –Roger, after bravo alpha kilo Novelair niner eight two, thanks.
TE: –Novelair nine eight two descend to flightlevel seven zero.
- 1810 LBT982: –Flightlevel zero seven zero, Novelair nine eight two.
- 1813 TE: –Novelair nine eight two descend to three thousand feet, cleared for approach QNH one zero two six.
LBT982: –Three thousand feet cleared for approach QNH one zero two six, Novelair niner eight two.
- 1818 LBT982: –Gothenburg, Novelair niner seven zero we are climbing to avoid traffic.
TE: –Scandinavian one four three eight continue on present heading call you back for inbound turn. (*SK1438 is following as number two behind LBT982*).
LBT982: –Novelair nine eight two ----- *unreadable*.
TE: –Two on the same time. Novelair nine eight two, say again.
LBT982: –We are climbing on a heading two one six to avoid the traffic Novelair nine eight two.
TE: –Confirm you got TCAS-warning?
LBT982: –Affirm.
TE: –It must be a VFR traffic on a very low altitude.
LBT982: –Exactly it's flying on three thousand feet, we are established --- *difficult to decipher, may be inbound four thousand feet*, Novelair nine eight two.
TE: –Nine eight two, roger. Scandinavian one four three eight descend to three thousand feet now.
- 1820 LBT982: –Novelair eight niner two I proceed right turn now to for another --- *unreadable*.
TE: –Make a left turn heading two five zero.
LBT982: –Left turn two five zero, Novelair niner eight two.
TE: –BX descend to fifteen hundred feet.
SBX: ---- *unreadable* SBX.
- 1821 SBX: –Gothenburg Control SBX.
TE: –BX go ahead.
SBX: –Yes BX what happened here we had to descend to fifteen hundred feet here right?.
- 1823 LBT982: –Novelair niner eight two maintaining four thousand.
TE: –Niner eight two continue present heading call you back for inbound turn.

- 1824 TE: –Novelair nine eight two left heading two niner zero.
LBT982: –Heading two niner zero, Novelair eight niner two.
- 1825 TE: –Novelair nine eight two heading two five zero, cleared for approach report established.
LBT982: –Cleared approached heading two five zero, Novelair eight niner two.
LBT982: –Confirm we established localizer out of four thousand feet.
TE: –You have three thousand feet and cleared for approach.
LBT982: –OK, understand three thousand.
TE: –BX Säve tower 119.05.
- 1827 TE: –SBX Gothenburg.
SBX: –Yes BX we are just arriving here at Säve we intend to shift over to 119.05.
TE: –Yes, after landing you can call Gothenburg on 941144.
SBX: –Yes, that is understood 941144 SBX.
TE: –BX Säve tower 119.05.
TE: –Novelair niner eight two Landvetter tower 118.6 and are you able to give a telephone call after your landing.
LBT982: –You can come to the aircraft if you like-----
TE: –Niner eight two Landvetter 118.6.

Transcribed from tape recording the 11th of Nov. 2002
Stig Ove Schagerlind