



Statens haverikommission
Swedish Accident Investigation Board

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Infraction of minimum separation between the aircraft G-KATA and OY-CNP in the airspace above Malmö/ Sturup airport, M County, on the 22nd of August 2002

Case L-083/02

SHK investigates accidents and incidents with regard to safety. The sole objective of the investigations is the prevention of similar occurrences in the future. It is not the purpose of this activity to apportion blame or liability.

Translated by Ken Welch, from the original Swedish at the request of the Swedish Accident Investigation Board.

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Statens haverikommission
Swedish Accident Investigation Board

2003-07-24

L-083/02

Swedish Civil Aviation Administration

601 79 NORRKÖPING

Report RL 2003:27e

The Swedish Accident Investigation Board (Statens haverikommission, SHK) has investigated an infraction of minimum separation that occurred on the 22nd of August 2002 in the airspace above Malmö/ Sturup airport, M County, between the aircraft with the registrations G-KATA and OY-CNP.

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.

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Contents

ABBREVIATIONS	4
SUMMARY	5
1 FACTUAL INFORMATION	8
1.1 History of the flight	8
1.2 Injuries to persons	8
1.3 Damage to aircraft	9
1.4 Other damage	9
1.5 The crew	9
1.5.1 <i>The pilots onboard G-KATA</i>	9
1.5.2 <i>The pilots onboard OY-CNP (VKG362)</i>	9
1.5.3 <i>The air traffic controller at Malmö Control</i>	9
1.6 The aircraft	10
1.7 Meteorological information	10
1.8 Aids to navigation	10
1.9 Communications	10
1.10 Aerodrome information	11
1.11 Flight recorders	11
1.12 Location of the incident	11
1.13 Medical Information	12
1.14 Fire	12
1.15 Survival aspects	12
1.16 Tests and research	12
1.17 Organizational and management information	12
1.18 Additional information	12
1.18.1 <i>Qualifications</i>	12
1.18.2 <i>Transponder</i>	13
1.18.3 <i>ACAS or TCAS</i>	13
1.18.4 <i>Airspace classification</i>	13
2 ANALYSIS	14
3 CONCLUSIONS	15
3.1 Findings	15
3.2 Causes of the incident	15
4 RECOMMENDATIONS	15
 <i>APPENDIX</i>	
1 Excerpt from the certificate registration concerning the pilot in the aircraft G-KATA (only for the Swedish Civil Aviation Administration)	

ABBREVIATIONS

ACAS Airborne Collision Avoidance System

AIP Aeronautical Information Publication –
A publication issued that contains aeronautical information of a lasting character essential to air navigation.

ANS Air Navigation Services Division -
A national body responsible for all air traffic services in Sweden with the main office in Norrköping.

ATCC Air Traffic Control Center

ATC Air Traffic Control

ATPL (A) Airline Transport Pilot Licence (Aeroplane)

ATS Air Traffic Services

°C degrees Celsius

CPL (A) Commercial Pilot Licence (Aeroplane)

CTR Control zone

CVR Cockpit Voice Recorder

ENR Enroute

ESMS ICAO-code for Malmö/ Sturup airport

FDR Flight Data Recorder

FL-certificate
Air Traffic Control certificate

FMS Flight Management System -
Onboard navigation equipment that calculates the aircraft's position by integrating navigational information from one or several position sensors with information from the aircraft's speed and altitude measuring systems. A function for vertical navigation guidance may also be included.

Ft Foot (0.3048 meter)

hPa Hectopascal

IAL-chart Instrument Approach and Landing chart

IFR Instrument Flight Rules

ILS Instrument Landing System -
Ground radio navigation equipment used by an aircraft on final approach to

determine its position. An instrument onboard shows lateral and vertical deviations from the nominal descent path, and may include indications of distance from the optimum point of landing.

JAR Joint Aviation Requirements

JAR-FCL Joint Aviation Requirements for Flight Crew Licensing

km Kilometre

LFV Civil Aviation Administration (Swedish)

m Meter

MHz Megahertz

MUST The Swedish Armed Force's Military Intelligence and Security Service

NM Nautical mile (1852 m)

OPC Operator Proficiency Check

PC Proficiency Check

PPL (A) Private Pilot Licence (Aeroplane)

QNH Atmospheric pressure at mean sea level

s second

SMHI Swedish Meteorological and Hydrological Institute

SSR Secondary Surveillance Radar

STCA Short Term Conflict Alert –
A collision warning system used by ATC

TCAS Traffic Alert and Collision Avoidance System

TMA Terminal control area

TWR Tower

UTC Universal Time Coordinated

VMC Visual Meteorological Conditions

VOR Very high frequency Omni-directional radio Range –
A navigation system consisting of a transmitter on the ground and a receiver in the air. The transmission includes information that gives continual bearing information with reference to magnetic north at the ground transmitter's position.

Report RL 2003:27e

L-083/02
Report finalized 2003-07-24

<i>Aircraft; registration, type</i>	A. G-KATA, Diamond B. OY-CNP, A320-212 Airbus
<i>Class, airworthiness</i>	Normal, valid certificate of airworthiness
<i>Owner/ operator</i>	A. Västerås flying club B. My Travel Airways A/S
<i>Time of occurrence</i>	2002-08-22, 14:52 hours in daylight <i>Note:</i> All times are given in Swedish Daylight Savings Time (UTC + 2 hours)
<i>Place of occurrence</i>	In the airspace above Malmö/ Sturup airport, M County, (pos. 5536.16N 01334.10E; 630–1,050 m above sea level)
<i>Type of flight</i>	A. Private B. Charter
<i>Weather</i>	Actual weather according to SMHI's analysis at 14:52 hours: wind 080°/10 knots, good visibility, cloud cover 1/8 cumulus at 3,800 feet altitude, temperature/ dew point 24/14 °C, QNH 1018 hPa.
<i>Persons on board: crew</i>	A. Pilots 1 B. Pilots 2 Cabin Crew 5
<i>passengers</i>	A. 1 B. 176+3 (children under 2 years)
<i>Injuries to persons</i>	None
<i>Damage to aircraft</i>	None
<i>Other damage</i>	None
<u><i>Aircraft A</i></u>	
<i>The pilot:</i>	
<i>Age, sex, certificate</i>	55 years old, man, PPL (A)-certificate,
<i>Total flying time</i>	386 hours, all on the class
<i>Flying time previous 90 days</i>	32 hours
<i>Number of landings previous 90 days</i>	61
<u><i>Aircraft B</i></u>	
<i>The Commander:</i>	
<i>Age, sex, certificate</i>	34 years old, male, ATPL (A)-certificate
<i>Total flying time</i>	7,000 hours, of which 700 hours on the type
<i>Flying time previous 90 days</i>	152.5 hours, all on the type
<i>Number of landings previous 90 days</i>	22
<i>The Co-pilot:</i>	
<i>Age, sex, certificate</i>	33 years old, male, CPL (A)-certificate
<i>Total flying time</i>	5,250 hours, of which 1,900 hours on type
<i>Flying time previous 90 days</i>	125.5 hours, all on the type
<i>Number of landings previous 90 days</i>	22
<i>The air traffic controller:</i>	
<i>Age, sex, certificate</i>	26 years old, female, FL-certificate since 1999

The Swedish Accident Investigation Board (SHK) was notified on the 26th of September 2002 that an infraction of minimum separation had taken place between two aircraft with the registrations G-KATA and OY-CNP in the airspace above Malmö/ Sturup airport, M County, on the 22nd of August 2002 at 14:52 hours.

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

Rickard Jørgensen assisted SHK as the expert on air traffic control.

The investigation was followed by Max Danielsson representing the Swedish Civil Aviation Administration.

SUMMARY

The pilot on the aircraft G-KATA, together with a passenger, was going to fly from Malmö/ Sturup to Västerås. He had submitted a VFR flight plan for the flight.

South of Malmö/ Sturup was the aircraft OY-CNP, with the flight number VKG362, on an IFR approach to runway 17. When VKG362 reported to the air traffic controller that they were descending to 5,000 feet altitude, she gave them clearance to continue the descent to 3,000 feet.

The air traffic controller in the airport tower gave the pilot onboard G-KATA the clearance “cleared to line up runway 17, enroute clearance DOMEN¹, 1,500 feet or lower”. Then he received clearance to take off. The pilot took off and had the transponder² selected to code 7000 and mode A, which meant that a radar echo was displayed on the air traffic controller’s radar screen, however without information about the aircraft’s altitude. Approximately six minutes later he reported to the air traffic controller that he was over DOMEN at 1,500 feet and was directed to the air traffic controller at Malmö Control. When the pilot contacted the air traffic controller at Malmö Control, he reported that he “had just left Malmö Sturup enroute to Västerås according to the flight plan”. The pilot was requested to set in code 2727 on the transponder. Then the air traffic controller cleared VKG362 to descend to 2,000 feet and cleared them for a visual approach to runway 17 via the outer marker. During the time that the air traffic controller spoke with VKG362, she saw that the aircraft G-KATA’s radar echo displayed an altitude of 2,400 feet. She then informed him that he had not received clearance to fly in controlled airspace.

The investigation showed that the pilot was unaccustomed with the aircraft type and did not notice that the aircraft continued to climb through the cleared altitude (1,500 feet). The aircraft reached 2,500 feet in controlled airspace before the climb was arrested.

The aircraft OY-CNP was equipped with TCAS, but did not receive a warning because the aircraft G-KATA had not selected the mode on his transponder that includes altitude reporting. According to the register from MUST, the minimum distance between the two aircraft was approximately 130 meters horizontally and 420 meters vertically.

The incident was caused by the inadequate monitoring of the flight by the pilot in the aircraft G-KATA. His limited experience on the aircraft type was a contributing factor.

RECOMMENDATIONS

None.

¹ DOMEN - a navigational exit point east of the airport.

² Transponder - A receiver/ transmitter that replies to the correct interrogating signal with information of the aircraft’s altitude, position and speed on another frequency than that of the interrogating signal.

1 FACTUAL INFORMATION

1.1 History of the flight

The pilot on the aircraft G-KATA, together with a passenger, was going to fly from Malmö/ Sturup to Västerås. He had submitted a VFR flight plan for the flight. In the flight plan, he had noted that the flight would pass via the navigation points NEXIL, ROXEN, BEDOS, ELPAX, and TINKA at an altitude of 5,500 feet.

South of Malmö/ Sturup was the aircraft OY-CNP, with the flight number VKG362, on an IFR approach to runway 17. When VKG362 reported to the air traffic controller that they were descending to 5,000 feet altitude, she gave them clearance to continue the descent to 3,000 feet.

The air traffic controller in the airport tower gave the pilot onboard G-KATA the clearance “cleared to line up runway 17, enroute clearance DOMEN³, 1,500 feet or lower”. Then he received clearance to take off. The pilot took off and had the transponder⁴ selected to code 7000 and mode A, which meant that a radar echo was displayed on the air traffic controller’s radar screen, however without information about the aircraft’s altitude. Approximately six minutes later he reported to the air traffic controller that he was over DOMEN at 1,500 feet. The air traffic controller replied to him that he could obtain a higher altitude if he contacted Malmö Control on frequency 135.9 MHz. When the pilot contacted the air traffic controller at Malmö Control, he reported that he “had just left Malmö Sturup enroute to Västerås according to the flight plan”. The air traffic controller saw that there was no altitude reporting on the aircraft’s radar echo 7000. The pilot was requested to set in code 2727 on the transponder. Then the air traffic controller cleared VKG362 to descend to 2,000 feet and cleared them for a visual approach to runway 17 via the outer marker. During the time that the air traffic controller spoke with VKG362, she saw that the aircraft G-KATA’s radar echo displayed an altitude of 2,400 feet. She asked the pilot what altitude he was at. The pilot reported that he was at an altitude of 2,500 feet. She then informed him that he had not received clearance to fly in controlled airspace.

VKG 362 had visual contact with G-KATA, but did not receive a warning from the collision warning system TCAS. When the air traffic controller received the altitude information from G-KATA via the radar echo, the two aircraft had already passed each other.

The incident occurred on the 22nd of August 2000 at 14:52 hours at the position 5536.16N 01334.10E; 630-1,050 m above sea level.

1.2 Injuries to persons

	<i>Crew</i>	<i>Passengers</i>	<i>Others</i>	<i>Total</i>
Fatal	–	–	–	–
Serious	–	–	–	–
Minor	–	–	–	–
None	8	176+3	–	184+3
Total	8	176+3	–	184+3

³ DOMEN - a navigational exit point east of the airport.

⁴ Transponder - A receiver/ transmitter that replies to the correct interrogating signal with information of the aircraft’s altitude, position and speed on another frequency than that of the interrogating signal.

1.3 Damage to aircraft

None.

1.4 Other damage

None.

1.5 The crew

1.5.1 *The pilot onboard G-KATA*

The pilot, male, was 55 years old at the time of the incident and held a valid PPL (A)-certificate.

Total flying time: 386 hours, all on the class.

Flying time previous 90 days: 32 hours.

Number of landings previous 90 days: 61.

Most recent PC performed on the 14th of September 2001.

The pilot had only flown the actual aircraft one time previously during a demonstration flight. He has stated that he was unaccustomed with the aircraft's performance and cockpit design. The passenger also had a pilot licence and assisted by talking on the radio. When the pilot levelled the aircraft at 1,500 feet, he did not notice that the speed increased and that the aircraft slowly began to climb. The pilot has stated that during the time the aircraft was flown towards DOMEN, they both studied the instrumentation in the aircraft. It was first when the air traffic controller asked what altitude they were at that the pilot became aware that he was at the wrong altitude. He was well aware of the different altitude restrictions for controlled areas.

1.5.2 *The pilots onboard OY-CNP (VKG362)*

The commander, male, was at the time of the incident 34 years old and had a valid ATPL (A)-certificate.

Total flying time: 7,000 hours, of which 700 on the type.

Flying time previous 90 days: 152.5 hours.

Number of landings on the actual type previous 90 days: 22.

Most recent PC/OPC performed 2002-06-25.

Co-pilot, male, was at the time of the incident 33 years old and had a valid CPL (A)- certificate.

Total flying time: 5,250 hours, of which 1,900 on the type.

Flying time previous 90 days: 125.5 hours.

Number of landings on the actual type previous 90 days: 22.

Most recent PC/OPC performed 2002-02-14.

The pilots onboard VKG362 never received information that they were involved in an infraction of minimum separation and neither did they receive a TCAS warning. They therefore did not write a report on the occurrence.

1.5.3 *The air traffic controller at Malmö control*

The air traffic controller, female, was at the time of the incident 26 years old and had held a FL-certificate since 1999. At the time of the incident she was undergoing familiarization in the position and an instructor was present to assist.

1.6 The aircraft

Both aircraft had a valid certificate of airworthiness.

G-KATA was equipped with an SSR-transponder with mode A and altitude reporting mode C. At takeoff, the pilot set code 7000 and mode A (i.e. no altitude reporting).

The pilots onboard VKG362 had their SSR-transponder set to code 2620 mode C. The aircraft was also equipped with a TCAS system. The system only gave information of the presence of traffic, but not at which altitude that traffic was, or if there was any risk for collision.

1.7 Meteorological information

Actual weather according to SMHI's analysis at 14:52 hours: wind 080°/10 knots, good visibility, cloud cover 1/8 cumulus at 3,800 feet altitude, temperature/ dew point +24/+14 °C, QNH 1018 hPa.

1.8 Aids to navigation

According to the IAL-chart for Malmö/ Sturup airport. The ILS for runway 17 was in use.

1.9 Communications

The radio communication between the air traffic controller in the tower, the air traffic controller at Malmö Control, and the pilots in the aircraft G-KATA and VKG362:

Remark: TA and GTA are shortened forms for G-KATA

Time	From	Information
12:42:18	TWR	Yes TA now you can also line up 17, enroute clearance DOMEN, 1,500 feet or lower.
	GTA	Line up runway 17 and it is via DOMEN 1,500 feet or lower, STA [”Sigurd Tore Adam”].
	TWR	SML now you are cleared to take off 17.
	SML	Cleared to take off runway 17, SML.
	TWR	GTA you are cleared to la..., cleared to take off 17.
12:43:46	GTA	Cleared take off 17, TA.
12:48:10	VKG	Malmö good afternoon, Viking 362 information Yankee, we are descending to 5000.
	ATCC	Viking 362 radar contact... Viking 362 radar contact, good afternoon descend to altitude 3000 feet.
	VKG	Recleared 3000, Viking 362.
Approx. 12:48:40	GTA	Malmö GTA, DOMEN 1,500 feet
	TWR	TA yes, and you will receive a higher altitude when you call Malmö 135.9.
	GTA	135.9, TA.
12:50:40	GTA	Yes Malmö from, from G-KTATA [Reports “Gustav Kalle Tore Adam, Tore Adam”].

	ATCC	G-KATA on Malmö
	GTA	Yes, I have just left Malmö Sturup enroute to Västerås according to the flight plan.
	ATCC	GTA set your transponder to 2727.
	GTA	Transponder 2727, TA.
	ATCC	Viking 362, descend to altitude 2,000 feet.
12:51:12	VKG	2,000 feet, 362.
	TWR *	Tower.
	ATCC *	Martin, can Viking come in visually?
	TWR *	Yes he may.
	ATCC *	OK, I'll get back with OAA
	VKG	Viking 362, we have the field in sight for a visual any time.
	ATCC	Viking 362 cleared...
	ATCC	Viking 362 cleared left hand visual approach 17 via NS.
	VKG	Cleared left hand 17 visual via NS, Viking 362.
	ATCC	GTA report altitude. ["Golf Tango Alfa"]
	ATCC	GTA from Malmö. ["Gustav Tore Adam"]
	GTA	TA go ahead.
	ATCC	GTA report what altitude you are at.
12:52:16	GTA	At 2,500 feet.
	ATCC	GTA you do not have clearance to 2,500 feet, you should be at 1,500 feet, which is uncontrolled airspace.
	GTA	GA climbing... descending down to 1,500 feet.
	ATCC	Can you repeat.
	GTA	(We're) descending down to 1,500 feet (TA).
	ATCC	Viking 362 contact tower on 118.8.

*Note: * Interphone/telephone contact between ATC positions*

1.10 Aerodrome information

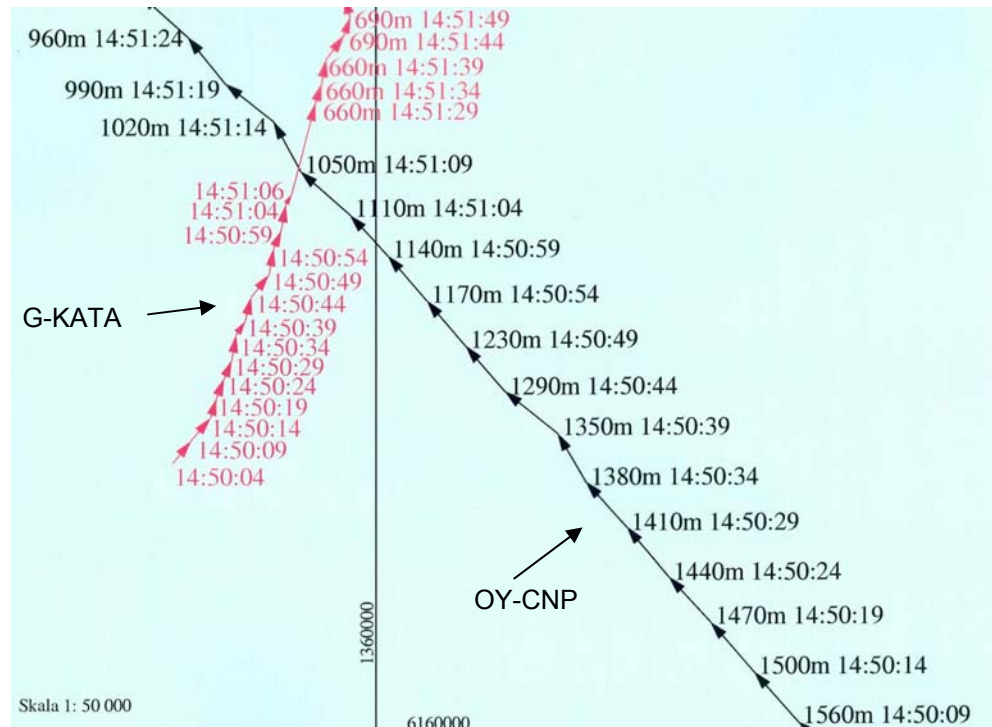
The airport had status according to the AIP-Sweden.

1.11 Flight recorders

A flight recorder was not carried onboard G-KATA, nor was it required. Playback of the flight or cockpit voice recorders onboard OY-CNP has not been done.

1.12 Location of the incident

The flight paths of the two aircraft have been registered by MUST and are presented in the figure below. From the register, it has been calculated that the minimum distance between the two aircraft was approximately 130 meters horizontally and 420 meters vertically, which occurred at 14:51:09 hours (see next page).



Remark: The heights given are for the standard air pressure of 1013.2 hPa and are not adjusted for the actual air pressure at the time of the incident.

1.13 Medical information

No medical investigation was carried out.

1.14 Fire

Not applicable.

1.15 Survival aspects

Not applicable.

1.16 Tests and research

Not applicable.

1.17 Organizational and management information

Not applicable.

1.18 Additional information

1.18.1 Qualifications

A pilot may not command an aircraft that carries passengers if he has not within the previous 90 days carried out at least three takeoffs and three landings as the pilot in an aircraft of the same type/class.

The actual aircraft, G-KATA, does not require a separate type rating, but rather is included under the class rating that the pilot already possessed. With another variant of aircraft within a certain class rating, it is required that the pilot performs familiarity training. According to the common civil aviation regulations JAR-FCL 1.235, the familiarity training involves, among other things, that the pilot acquires knowledge about the aircraft type's performance.

1.18.2 *Transponder*

Since the 1st of January 2000, it is a requirement that aircraft shall be equipped with a functioning SSR-transponder in order to be able to fly according to VFR within a control zone or control area. Within control areas, transponders shall be set to include altitude reporting (mode C) if nothing else has been informed by ATC. At the time of the incident, there was the following supplement to AIP ENR 1.6.4: *“Note: This does not apply, however, for VFR flights under terminal areas or under 3,000 feet GND, unless ATC requests it.”* This was due to limitations in the air traffic controller's equipment that could not handle too many radar echoes with altitude reporting simultaneously.

Since the month of April 2003, this radar problem is resolved and the remark has been removed from the AIP. If a transponder is onboard, it shall be operated (code 7000 mode C) for all flights, regardless of airspace class, in the case that an individual code is not allotted by ATC. Should an aircraft not have a transponder with mode C or if the equipment is unserviceable, the pilot is consequently required to obtain clearance for the flight.

The conflict warning system (STCA) that is found at ATCC Stockholm and Malmö is also dependent on the transponders being set to mode C.

1.18.3 *ACAS or TCAS*

ACAS or TCAS is an onboard collision warning system that shall be installed on turbine powered aircraft that have a maximum certified takeoff mass that exceeds 15,000 kg or that have an approved cabin configuration that is established for more than 30 passengers. The system uses signals from SSR-transponders in order to supply the pilot with advisory information of a potential collision risk with other SSR-transponder equipped aircraft.

1.18.4 *Airspace classification*

The airspace is divided into controlled and uncontrolled areas. For VFR flights in controlled areas, it is required that, among other things, that the pilot leave a flight plan and/or receive clearance before entering the area, as well as have two-way radio communication according to AIP-Sweden ENR 1.2.

The airspace division in elevation is described in the AIP and on VFR charts that are used as a basis for navigation for VFR traffic.

During recent years there has been an increase in the number of reported incidents of VFR flights that enter controlled areas without clearance. SHK will illustrate these issues in an investigation concerning the case L-092/02.

2 ANALYSIS

According to the MUST register, the aircraft came as close as approximately 130 meters horizontally and 420 meters vertically, which means that the infraction of minimum separation was serious from a flight safety point of view.

The pilot onboard G-KATA had acknowledged the cleared altitude of 1,500 feet and was aware that this altitude constituted the base of the terminal control area. However, nothing indicates anything other than that the climb through the cleared altitude was involuntary from the pilot's side.

As an explanation, the pilot stated that he was unaccustomed with the aircraft type, its cockpit layout, and its performance. Therefore, a lot of information points to a situation where the pilot during the climb devoted so much time studying the aircraft's instruments and controls that he did not notice that the aircraft continued to climb despite the fact that he – as he believed – had “levelled off” at 1,500 feet altitude. The aircraft ought to have continued to climb at a rate of approximately 500 feet per minute.

Taking into account the fact that the pilot was well aware of the terminal control area above his assigned flight altitude, SHK considers that there was a deficiency in his monitoring of the flight when he did not notice earlier that he had climbed too high and correct for this. It was first when the air traffic controller attracted his attention to this situation that he arrested the climb and descended down under the terminal control area. The aircraft had by this time climbed approximately 1,000 feet in controlled airspace.

Whether the pilot's familiarity training on the aircraft type can be considered adequate can be questioned because he likely had not carried out a closer study of the aircraft and its performance before the flight was begun. In this case it could have been well founded for the pilot to have flown the aircraft on some training flights together with an instructor who had experience on the aircraft type before he went out on longer flights by himself.

VKG362 was cleared down to 2,000 feet and had visual contact with the aircraft G-KATA. Because the transponder in G-KATA was not selected on a mode that gave altitude reporting, the pilots onboard VKG362 did not receive a TCAS/ACAS warning and did not perceive the situation as serious.

The exception that earlier was written in AIP ENR 1.64, namely that altitude reporting is not to be used during VFR flights, was not satisfactory. This meant that the anti-collision system (ACAS or TCAS) and the conflict warning system (STCA) did not react to certain aircraft. With the changes that have been made concerning the transponder settings in controlled airspace, this problem appears to have been resolved.

3 CONCLUSIONS

3.1 Findings

- a)* The pilots were qualified to perform the flights.
- b)* Both aircraft had a valid certificate of airworthiness.
- c)* The aircraft G-KATA was equipped with a transponder, but the mode that includes altitude reporting was not initially selected.
- d)* The aircraft G-KATA was cleared to 1,500 feet, but climbed to 2,500 feet in controlled airspace before the climb was arrested.
- e)* The aircraft OY-CNP was cleared to 2,000 feet.
- f)* The aircraft OY-CNP was equipped with TCAS, but did not receive a warning.
- g)* According to the register from MUST, the closest distance the aircraft came within each other was approximately 130 meters horizontally and 420 meters vertically.

3.2 Causes of the incident

The incident was caused by the inadequate monitoring of the flight by the pilot in the aircraft G-KATA. His limited experience on the aircraft type was a contributing factor.

4 RECOMMENDATIONS

None.