Schweizerische Eidgenossenschaft
Confédération suisse
Confederazione Svizzera
Confederaziun svizra

Swiss Confederation

Schweizerische Sicherheitsuntersuchungsstelle SUST
Service suisse d'enquête de sécurité SESE
Servizio d'inchiesta svizzero sulla sicurezza SISI
Swiss Transportation Safety investigation Board STSB

Aviation Division

Final Report No. 2229 of the Swiss Accident Investigation Board SAIB

concerning the serious incident (Airprox)

between the Piaggio P180 Avanti II aircraft, registration D-IKSI

and the Cessna C525 aircraft, registration N600HS

on 22 March 2013

near waypoint VALOR

16 NM south-west of Sion airport

Aéropôle 1, 1530 Payerne
Tel. +41 58 466 33 00, Fax +41 58 466 33 01
info@sust.admin.ch
www.stsb.admin.ch

General information on this report

This report contains the Swiss Transportation Safety Investigation Board's (STSB) conclusions on the circumstances and causes of the serious incident which is the subject of the investigation.

In accordance with Article 3.1 of the 10th edition, applicable from 18 November 2010, of Annex 13 to the Convention on International Civil Aviation of 7 December 1944 and Article 24 of the Federal Air Navigation Act, the sole purpose of the investigation of an aircraft accident or serious incident is to prevent accidents or serious incidents. The legal assessment of accident/incident causes and circumstances is expressly no concern of the investigation. It is therefore not the purpose of this investigation to determine blame or clarify questions of liability.

If this report is used for purposes other than accident/incident prevention, due consideration shall be given to this circumstance.

The definitive version of this report is the original in the French language.

All information, unless otherwise indicated, relates to the time of the serious incident.

All times in this report, unless otherwise indicated, follow the coordinated universal time (UTC) format. At the time of the incident, Central European Time (CET) applied as local time (LT) in Switzerland. The relation between LT, CET and UTC is:
LT = CET = UTC + 1 hour.

For data protection reasons, this report is drawn up using exclusively the generic masculine.

Table of contents

Final Report

Synopsis

D-IKSI	
Owner	Kroschke Sign-International GmbH, Kroschkestrasse 1, D-38112 Braunschweig, Germany
Operator	Kroschke Sign-International GmbH, Kroschkestrasse 1, D-38112 Braunschweig, Germany
Manufacturer	Piaggio Aereo Industries S.p.A., Via Cibrario 4, I-16154 Genoa, Italy
Aircraft type	P180 Avanti II
Country of registration	Germany
Registration	D-IKSI
Flight rules	Instrument flight rules – IFR
Type of operation	Private
Departure point	Sion (LSGS)
Destination point	Braunschweig (EDVE)
N600HS	
Owner	N600HS Corp Trust, PO BOX 1347, Wilmington, DE 19899, USA
Operator	Schumann Aviation, 17 Ave Robert Schumann, F-92100 Boulogne, France
Manufacturer	Cessna Aircraft Company, 3 Cessna Blvd, Wichita, KS 67215, USA
Aircraft type	Cessna C525 Citation Jet
Country of registration	United States of America
Registration	N600HS
Flight rules	Visual flight rules – VFR
Type of operation	Private
Departure point	Paris-Le Bourget (LFPB)
Destination point	Sion (LSGS)
Location	3 NM north east of waypoint VALOR
Date and time	22 March 2013, 10:24 UTC
ATS service	Geneva area control centre (ACC), Sion aerodrome control tower (TWR)
Airspace	Class C
Minimum applicable separation	5 NM laterally or 1000 ft vertically
Closest point of approach during the airprox	2.8 NM laterally and 650 ft vertically
Airprox category	ICAO category B

Investigation

The serious incident occurred on 22 March 2013 at 10:24 UTC. It was notified on 25 March 2013 at 14:20 UTC. The Swiss Accident Investigation Board (SAIB) opened the investigation on 11 April 2013 at 13:30 UTC.

The SAIB reported the serious incident to the German and American authorities. The German authorities designated an accredited representative.

The airspace in which the serious incident took place is over Swiss territory.

The final report is published by the STSB.

Summary

The serious incident occurred near waypoint VALOR. It was caused by the convergence of two aircraft, one on approach to Sion airport under visual flight rules, the other departing from Sion airport under instrument flight rules. The first was in radiotelephony contact with Geneva ACC sector INI SE, whilst the second was in contact with Sion control tower.

Causes

The serious incident is due to the hazardous convergence of two aircraft flying in opposite directions, one on approach under visual flight rules, the other departing under instrument flight rules, following non-compliance with an instruction given by air traffic control to the pilot on approach.

An inadequate air traffic control tactic contributed to the serious incident.

Safety recommendations

In the context of the investigation, one safety recommendation was issued.

Safety recommendations

According to the provisions of Annex 13 of the International Civil Aviation Organization (ICAO) and Article 17 of Regulation (EU) No. 996/2010 of the European Parliament and of the Council of 20 October 2010 on the investigation and prevention of accidents and incidents in civil aviation and repealing Directive 94/56/EC, all safety recommendations listed in this report are intended for the supervisory authority of the competent state, which must decide on the extent to which these recommendations are to be implemented. Nonetheless, any agency, any establishment and any individual is invited to strive to improve aviation safety in the spirit of the safety recommendations pronounced.

Swiss legislation provides for the following regulation regarding implementation in the Ordinance on the Safety Investigation of Transport Incidents (OSITI):

„Art. 48 Safety recommendations

[1] The STSB shall submit the safety recommendations to the competent federal office and notify the competent department of the recommendations. In the case of urgent safety issues, it shall notify the competent department immediately. It may send comments to the competent department on the implementation reports issued by the federal office.

[2] The federal offices shall report to the STSB and the competent department periodically on the implementation of the recommendations or on the reasons why they have decided not to take measures.

[3] The competent department may apply to the competent federal office to implement recommendations."

The STSB shall publish the answers of the relevant Federal Office or foreign supervisory authorities at www.stsb.admin.ch in order to provide an overview of the current implementation status of the relevant safety recommendation.

Safety advices

The STSB may publish safety advices in response to any safety deficit identified during the investigation. Safety advices shall be formulated if a safety recommendation in accordance with Regulation (EU) No. 996/2010 does not appear to be appropriate, is not formally possible, or if the less prescriptive form of a safety advices is likely to have a greater effect. The legal basis for STSB safety advices can be found in Article 56 of the OSITI:

"Art. 56 Information on accident prevention

The STSB may prepare and publish general information on accident prevention."

1 Factual information

1.1 History of the serious incident

1.1.1 General

The history of the serious incident was established using:

- recordings of radiotelephony communications and telephone coordination between the control units
- radar data
- the log of the short-term conflict alert (STCA)
- the testimony of members of flight crews and air traffic controllers.

The recordings of the radiotelephony communications and radar data from Sion were no longer available for the investigation.

At the time of the serious incident, sectors INI South and INI East were combined as INI SE.

1.1.1.1 Control sectors involved – Geneva

Sector	Vertical limits
L123	FL[1] 245 - FL 334
INI SE	Lower limit of airways – FL 244

1.1.1.2 Control positions involved – Sion

The aerodrome control (ADC) and coordinator (COOR) workstations were occupied.

1.1.1.3 Flight crews

Two pilots were flying the aircraft registered D-IKSI. Only the commander, in the left seat, was in possession of the aircraft type rating. The flight took place under instrument flight rules.

A single pilot was flying the aircraft registered N600HS. At the time of the serious incident, the flight was being conducted under visual flight rules.

1.1.2 History of the serious incident

On the morning of 22 March 2013, a Cessna C525 Citation Jet type aircraft, registered as N600HS, was making a flight from Paris-Le Bourget to Sion at FL 250.

Its flight plan envisaged changing from instrument flight rules to visual flight rules at waypoint VALOR.

At 10:07:40 UTC, when the Cessna was close to waypoint MOKIP, located 45 NM north-west of Geneva, the pilot made contact with Geneva sector L123. He received a clearance to maintain FL 250 and to follow the route via the VHF omnidirectional radio range (VOR) GVA and then VALOR.

Meanwhile, the take-off of an aircraft from Sion airport in the direction of the St Prex (SPR) VOR was in preparation. The flight plan envisaged an IFR flight with an initial climb clearance to FL 180. The INI SE sector controllers were informed of this by means of a printed control strip.

[1] FL: flight level

Just before take-off and in accordance with the procedures in force, the Sion controller coordinated the departure and the initial flight level with Geneva sector INI SE by telephone. This coordination was concluded and the flight was approved by sector INI SE at 10:15:04 UTC.

At 10:15:15 UTC, the pilot of aircraft N600HS was requested to contact sector INI SE on frequency 124.225 MHz, which he did without delay.

At 10:15:50 UTC, when questioned about his intentions, the pilot replied: « [...] *Descent ... towards VALOR and on final, visual* [...] »The radar executive (RE) controller gave him a clearance to descend to FL 210. The latter was collated correctly by the pilot.

At this time, the Swiss military flight service was active (MIL ON). This means that military traffic has priority in the airspace outside the permanent ATS routes. The military control centre (Air Defence and Detection Centre - ADDC) provides air traffic services (ATS) for IFR flights to Sion between waypoint VALOR and Sion approach control.

At 10:17:36 UTC, the INI SE sector radar planner (RP) coordinator was coordinating the modalities of the transfer of control of N600HS with the ADDC by telephone. The latter replied: « [...] *okay, november six hundred hotel sierra, leave VALOR heading zero eight zero and… flight level one niner zero* [...] ». The planned flight departing from Sion with an initial FL 180 was also mentioned.

The RP coordinator entered the transfer conditions on the strip for N600HS (fig. 1) and informed the radar controller sitting by his side.

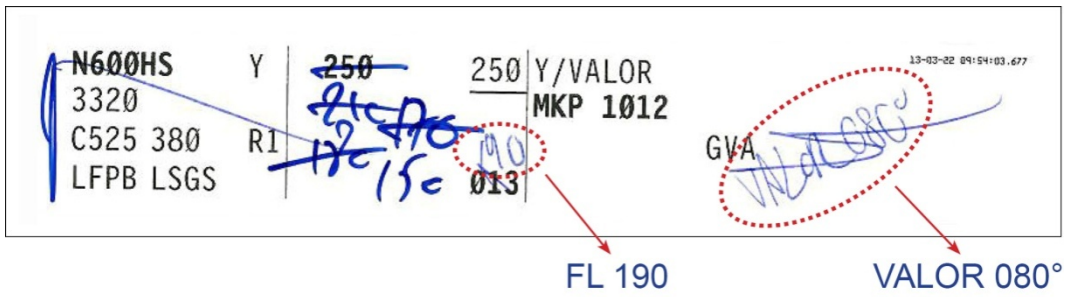


Figure 1: Control strip for N600HS containing transfer conditions with the ADDC.

The RE controller's tactic was to have N600HS descend quickly so that it would continue its flight under visual flight rules and enter the Swiss Class E airspace located below the Class C airspace.

At 10:18:30 UTC, the RE controller cleared the pilot of N600HS to descend to FL 180. He then informed him of the military flight service activity in the Sion region and clarified: « [...] *to continue visual, you will need to pass below the Charlie airspace, i.e. to enter Swiss territory below level one hundred and thirty* [...] ». The pilot replied that he could descend to FL 130 or FL 120.

Aircraft D-IKSI was cleared to take off and climb to FL 180. The aircraft took off from Sion at 10:19 UTC and the ADC controller instructed the crew to call him back when passing 13,000 ft QNH.

At 10:19:13 UTC, the RE controller cleared the pilot of N600HS to descend to FL 170 because of an aircraft flying from the south, bound for Geneva and passing FL 165 in descent.

At 10:19:24 UTC, the RP controller informed the ADDC that N600HS was descending towards Sion and that he would cancel its IFR flight plan without it entering the airspace managed by the ADDC. This information was also passed on

to Sion control at 10:20:01 UTC. The Sion COOR coordinator asked the RP controller for the position of N600HS. He replied: « [...] *It is North of Mont Blanc... 20, 15 nautical from Mont Blanc* [...] ».

At 10:20:17 UTC, the pilot of N600HS was cleared to continue his descent to FL 150, which corresponds to the minimum IFR flight level at this location. Air traffic control asked the pilot about flight conditions. He replied that they were excellent. The RE controller then asked the pilot to call him back when he was ready to cancel the IFR flight plan and informed him of the take-off from Sion towards the south-west of an aircraft operating under instrument flight rules. The RE controller also asked the pilot to increase his rate of descent. At 10:20:46 UTC, N600HS passed FL 184 and its rate of descent increased from 1400 ft/min to 2400 ft/min.

In Geneva, a controller arrived at sector INI SE to replace the RE controller on duty, who was reaching the end of his shift. The latter notified his intention to remain at his ~~post~~ position for two more minutes in order to complete the crossing of N600HS and D-IKSI. However, the replacement of the RE controller by the RP coordinator took place before this.

At 10:21:24 UTC, D-IKSI appeared on the radar screen of Geneva sector INI SE passing FL 88 in a climb (fig. 2). N600HS was passing FL 170 in descent and was 20 NM west of D-IKSI.

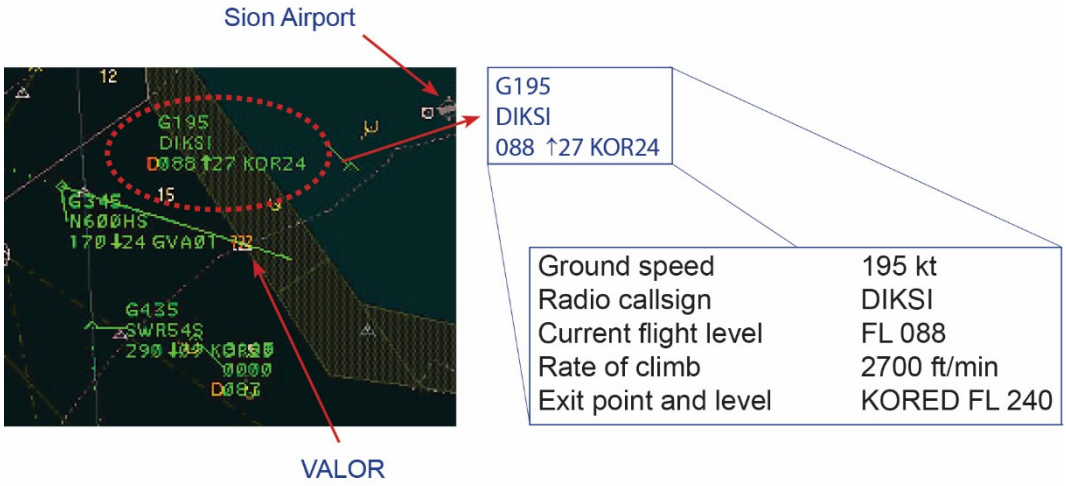


Figure 2: Radar image of sector INI SE at the time of the first appearance of D-IKSI.

At 10:22:24 UTC, when N600HS was reaching FL 150, the pilot received the following traffic information from the RE controller: « [...] *november six hundred hotel sierra, your traffic take-off Sion, is at your eleven o'clock, twelve nautical, climbing to level one hundred and twenty* [...] ». The pilot replied: « [...] *not in sight yet, we can descend lower if you want, in very good conditions... below 120* [...] ». The RE controller then asked him if he was ready to cancel his IFR flight plan, to which the pilot replied in the affirmative.

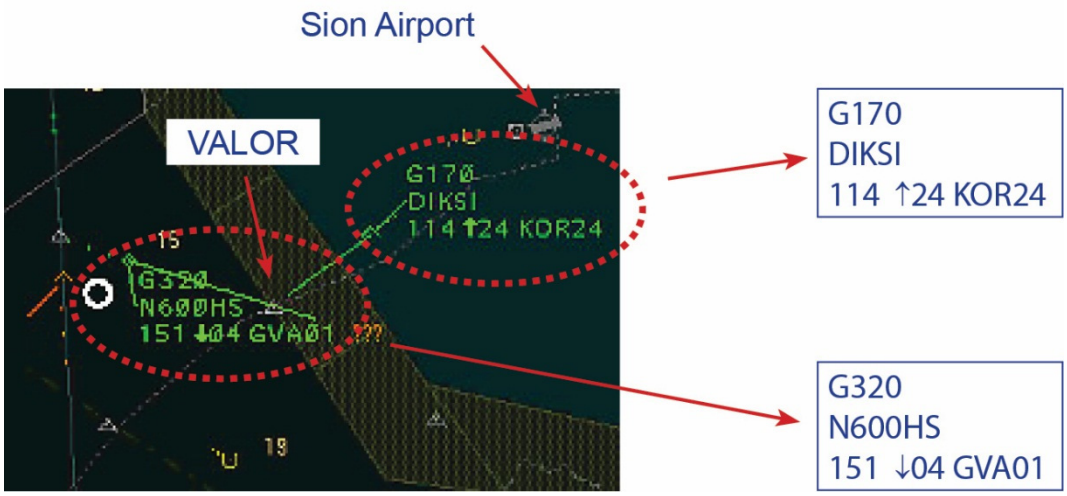


Figure 3: Radar image of sector INI SE at the time of the first traffic information transmitted to the pilot of N600HS.

At 10:22:44 UTC the RE controller transmitted to him: « [...] *IFR flight plan cancelled at eleven twenty three, Geneva QNH one thousand ten, descent at your discretion* [...] ». The pilot asked him if he could contact Sion approach. The RE controller asked him to remain on this frequency.

N600HS crossed the Franco-Swiss frontier at 10:23:11 UTC at FL 149. D-IKSI was at FL 133, climbing to FL 180. The distance between the two aircraft was 7.4 NM.

At 10:23:14 UTC, the Sion COOR coordinator asked the RP coordinator for the position of N600HS in relation to the aircraft on take-off from Sion. The RP coordinator replied that a traffic information had been transmitted to N600HS and the crossing of the two aircraft would be « *at levels* », i.e. with a vertical spacing. When the Sion coordinator noticed N600HS on the radar screen, he informed his ADC colleague of its position. Essential traffic information was immediately transmitted to the crew of D-IKSI.

At 10:23:16 UTC, the STCA was triggered on the screens of sector INI SE. The radio callsigns and speed vectors are displayed in red (fig. 4) and a conflict alert window appears (fig. 5). It contains information relevant to the traffic involved. At this moment, N600HS was passing FL 149 in descent and D-IKSI was passing FL 134 in a climb. The distance between the two aircraft was 6.9 NM.

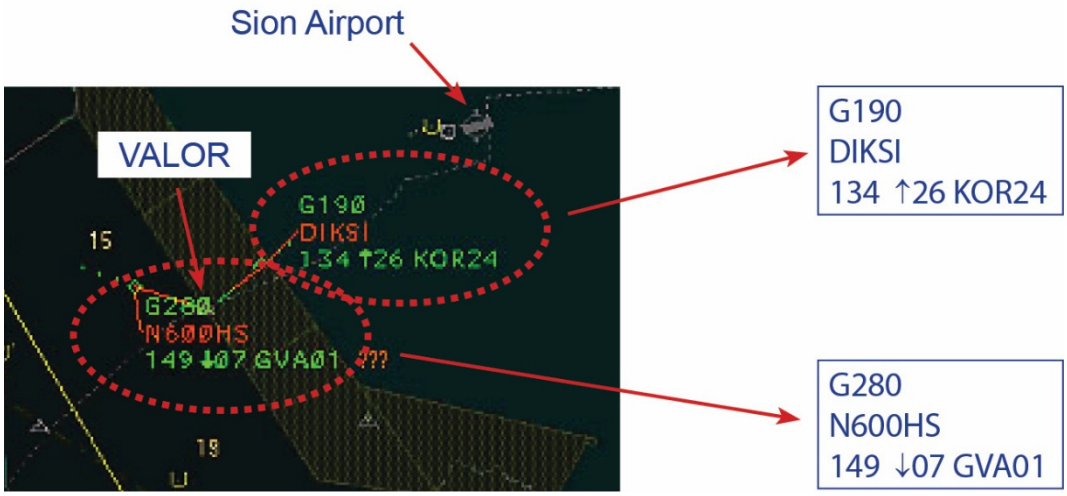


Figure 4: Radar image of sector INI SE at the moment the STCA was triggered.

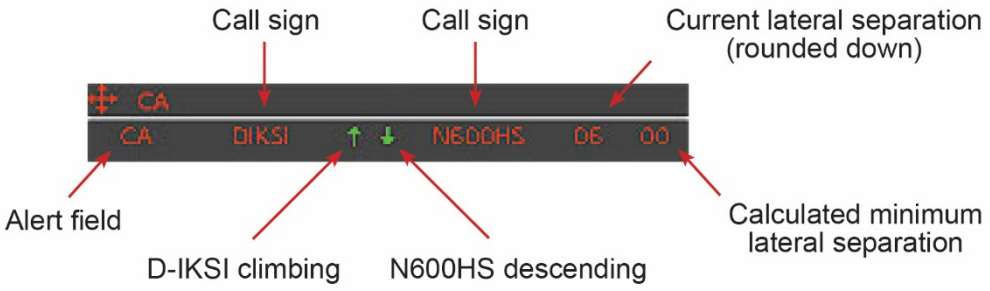


Figure 5: Conflict alert window.

At 10:23:25 UTC, the RE controller transmitted a second traffic information to the pilot of N600HS: « [...] *November six hundred hotel sierra your traffic now, six miles, left-right, and…climbing on… climbing and passing level one four zero* [...] ». The pilot replied that he was at FL 140 and descending.

At 10:23:40 UTC, N600HS was at FL 142 and D-IKSI was at FL 141. The lateral distance between the two aircraft was 4.2 NM. Four seconds later, N600HS was at FL 141 and D-IKSI was at FL 142.

The maximum convergence took place at 10:23:50 UTC. The lateral distance was 2.8 NM and the vertical distance was 650 ft. N600HS was at FL 139 and D-IKSI was at FL 145. The flight crews did not have visual contact. The serious incident occurred 3 NM NE of VALOR and approximately 16 NM SW of Sion airport.

N600HS was transferred to Sion control at 10:24:09 UTC. D-IKSI was transferred to the sector INI SE frequency after the crossing.

1.1.3 Location of the serious incident

Position	3 NM NE of waypoint VALOR
Flight level	FL 140
Date and time	22 March 2013, 10:24 UTC
Lighting conditions	Daylight

1.2 Personnel information

1.2.1 Crew of D-IKSI

1.2.1.1 Commander

1.2.1.1.1 General

Person	German citizen, born 1950
Licence	Airline transport pilot licence aeroplane – ATPL(A) according to Joint Aviation Requirements (JAR)

There is no indication that his state of health was affected at the time of occurrence of the serious incident.

1.2.1.1.2 Flying experience

Total hours	10,734 hours
of which on the type involved	201 hours
In the last 90 days	44 hours
of which on the type involved	20 hours

1.2.1.2 Second pilot

Person	German citizen, born 1961
Licence	Commercial pilot licence aeroplane – CPL(A) according to JAR

The pilot was not qualified on the type P180 and was in charge of the radio communications.

1.2.2 Pilot of N600HS

1.2.2.1 General

Person	French citizen, born 1939
Licence	ATPL(A)) issued by the Federal Aviation Administration (FAA), United States of America

There is no indication that his state of health was affected at the time of occurrence of the serious incident.

1.2.2.2 Flying experience

Total hours	5947 hours
of which on the type involved	214 hours
In the last 90 days	25 hours
of which on the type involved	13 hours

1.2.3 Air traffic controllers

1.2.3.1 Sector INI SE Geneva

1.2.3.1.1 Air traffic controller 1

Function	Radar executive (RE)
Person	French citizen, born 1983
Working days before the day of the serious incident	20 March: 04:50 - 11:50 UTC 21 March: leave
Start of duty on the day of the serious incident	04:50 UTC
Licence	Air traffic controller licence, based on European Community (EC) Directive 2006/23, first issued by the Federal Office of Civil Aviation (FOCA) on 11 September 2008.
Relevant qualifications for position	Ratings: area control surveillance (ACS) Rating endorsement: radar RAD (ACS) All valid till 6 May 2014 Radiotelephony in English Language proficiency: English level 4, valid until 14 September 2014

1.2.3.1.2 Air traffic controller 2

Function	Radar planner (RP) Radar executive (RE)
Person	Swiss citizen, born 1978
Working days before the day of the serious incident	19 March: 04:50 - 11:50 UTC 20 March: 11:30 - 18:30 UTC 21 March: 06:00 UTC, simulator session
Start of duty on the day of the serious incident	05:40 UTC
Licence	Air traffic controller licence, based on European Community (EC) Directive 2006/23, first issued by the Federal Office of Civil Aviation (FOCA) on 24 September 2002.
Relevant qualifications for position	Ratings: area control surveillance (ACS) Rating endorsement: radar RAD (ACS) All valid till 2 March 2014 Radiotelephony in English Language proficiency: English level 4, valid until 6 March 2015

1.2.3.1.3 Air traffic controller 3

Function	Radar planner (RP)
Person	Swiss citizen, born 1976
Working days before the day of the serious incident	20 March: 15:10 - 22:10 UTC 21 March: 06:00 - 13:00 UTC
Start of duty on the day of the serious incident	10:30 UTC
Licence	Air traffic controller licence, based on European Community (EC) Directive 2006/23, first issued by the Federal Office of Civil Aviation (FOCA) on 14 September 2001.
Relevant qualifications for position	Ratings: area control surveillance (ACS) Rating endorsement: radar RAD (ACS) All valid till 7 December 2013 Radiotelephony in English Language proficiency: English level 5, valid until 6 November 2013

1.2.3.2 Sion control tower

1.2.3.2.1 Air traffic controller 1

Function	ADC controller
Person	Swiss citizen, born 1969
Working days before the day of the serious incident	20 March: leave 21 March: 12:00 - 19:00 UTC

	Start of duty on the day of the serious incident	05:30 UTC
	Licence	Air traffic controller licence, based on European Community (EC) Directive 2006/23, first issued by the Federal Office of Civil Aviation (FOCA) on 4 April 1995.
	Relevant qualifications for position	Ratings: aerodrome control instrument (ADI), approach control surveillance (APS) Rating endorsements: radar (RAD), radar APS, surveillance radar approach (SRA), tower control (TWR) All valid till 15 April 2014 Radiotelephony in English Language proficiency: English level 4, valid till 1 March 2014

1.2.3.2.2 Air traffic controller 2

	Function	COOR coordinator
	Person	Swiss citizen, born 1963
	Working days before the day of the serious incident	21 March: leave
	Start of duty on the day of the serious incident	05:30 UTC
	Licence	Air traffic controller licence, based on European Community (EC) Directive 2006/23, first issued by the Federal Office of Civil Aviation (FOCA) on 2 February 1996.
	Relevant qualifications for position	Ratings: aerodrome control instrument (ADI), approach control surveillance (APS) Rating endorsements: radar (RAD), radar (APS), surveillance radar approach (SRA), tower control (TWR) All valid till 19 December 2013 Radiotelephony in English Language proficiency: English level 5, valid until 8 April 2014

1.3 Aircraft information

1.3.1 D-IKSI

	Aircraft type	Piaggio P180 Avanti II
	Characteristics	Twin-engine, turboprop executive aircraft
	Manufacturer	Piaggio S.p.A., Italy
	Owner	Kroschke Sign-International GmbH, Kroschkestrasse 1, D-38112 Braunschweig, Germany

	Operator	Kroschke Sign-International GmbH, Kroschkestrasse 1, D-38112 Braunschweig, Germany
	Significant equipment	TCAS I [2]

1.3.2 N600HS

Aircraft type	Cessna C525 Citation Jet
Characteristics	Twin jet, executive aircraft
Manufacturer	Cessna Aircraft Company, USA
Owner	N600HS Corp. Trustee, P.O. Box 1347, Wilmington DE, 19899, USA
Operator	Schumann Aviation, 17 av. R. Schumann, F-92100 Boulogne, France
Significant equipment	TCAS I

1.4 Meteorological information

1.4.1 General meteorological situation

An area of low pressure located to the West of the British Isles was directing mild air toward the Alps. A ridge extended from Tunisia to Switzerland.

1.4.2 Meteorological situation at the time of the serious incident

High cloud was arriving from the north-west. The base was at approximately 26,000 ft. The weather was dry and visibility was 45 km and over. A west north-west wind of approximately 16 knots prevailed at 14,500 ft.

Weather/cloud	1/8 altocumulus at 11,000 ft AMSL 4/8 cirrocumulus at 26,000 ft AMSL	
Visibility	45 km and over	
Wind	290° / 16 kt	
Hazards	None	

1.4.3 Astronomical information

Position of the sun	Azimuth: 152°	Elevation: 52°
Natural lighting conditions	Daylight	

[2] The International Civil Aviation Organization - ICAO uses the term airborne collision avoidance system (ACAS) for the general description of a concept describing an on-board anti-collision system. The traffic alert and collision avoidance system (TCAS) is an implementation of this concept. ACAS I generates traffic advisories (TA), information facilitating the initiation of measures in accordance with the « see and avoid » principle, but does not generate resolution advisories (RA).

1.4.4 Webcam

Figure 6: Les Attelas (Verbier) webcam, 2700 m AMSL, 22 March 2013, 10:30 UTC, looking west.

1.5 Communications

The quality of the radiotelephony transmissions between Geneva control and N600HS was normal. Radiotelephony transmissions between INI SE and N600HS initially took place in French, then in English, except for the second traffic information.

The recordings of the Sion control radiotelephony communications were no longer available for the investigation.

1.6 Additional information

1.6.1 Flight crews on D-IKSI

The commander was the pilot flying (PF). He was qualified to perform instrument approaches in Sion and had flown approximately 15 flights to this destination in the 24 months prior to the serious incident.

The second pilot was not qualified on the type P180 and was in charge of the radio communications.

The commander stated that no traffic advisory (TA) had been generated by the TCAS I system and he did not establish visual contact with the opposing traffic because D-IKSI was partially in cloud at the time of the crossing. He was able to note the presence of converging traffic on the navigation screens.

The flight continued normally, without any avoiding manoeuvre.

1.6.2 Pilot of N600HS

The pilot was alone on board and qualified to perform instrument approaches to Sion. During the month preceding the serious incident, he had carried out two take-offs from Sion airport and performed various approaches in the past.

The pilot stated that no traffic advisory (TA) had been generated by the TCAS I system and he did not establish visual contact with the opposing traffic. He had a « IFR Jeppesen high altitude » chart. In reply to a question in relation to possession of a VFR chart of the region, he stated: *"Yes, but at level 150 to which I had descended in accordance to instructions from Swiss RADAR, it is difficult to see the border guards and the customs gate! This is a strange question for an IFR flight at FL 130 / 150!"* The onboard instrumentation did not make it possible to locate the Franco-Swiss frontier.

1.6.3 Air traffic controllers

1.6.3.1 Sector INI SE

The INI SE sector controllers assessed the workload before and during the serious incident as low to moderate and of a low level of complexity.

1.6.3.2 Sion control tower

The Sion tower controllers assessed the workload and the level of complexity before and during the serious incident as moderate.

1.7 Safety nets

1.7.1 Ground-based system

Integrated into the radar processing system serving the civil sectors of the Geneva Control Centre, the short-term conflict alert (STCA) is a safety net which, in the event of a convergence putting aircraft at risk in the vertical and lateral planes respectively, warns the controller by means of an aural and visual alert.

The STCA system makes it possible to detect an imminent conflict between two aircraft in flight, assuming one transmits a transponder code allocated to IFR traffic, and the other a transponder code, and that both transmit altitude information. To fulfil its role optimally, the STCA is parameterised in a specific way; it is adapted both to the airspace and the traffic. This is necessary in order to generate only useful alerts.

In the airspace in which the serious incident took place, the STCA is set to generate an alert in the event of a predicted convergence at distances less than 4.9 NM in the lateral plane or below 750 ft in the vertical plane. The earliest the alert is generated is 60 seconds before loss of separation. Moreover, if two aircraft are evolving vertically (one climbing and one descending) to the same flight level, the system assumes they will acquire this level (fig. 7). An alert is generated when the aircraft are at a vertical distance less than or equal to 1900 ft and when there is a risk of loss of lateral separation.

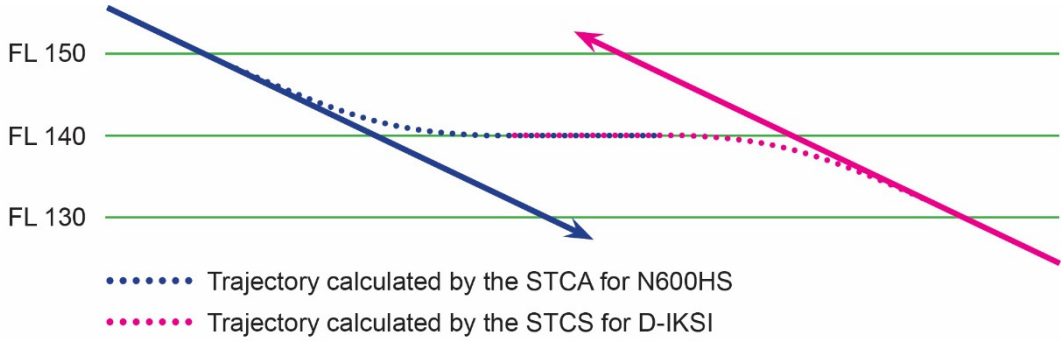


Figure 7: Operation of the STCA with traffic evolving vertically.

N600HS appeared for the first time in the STCA log at 10:22:43 UTC; it was maintaining flight level FL 150 (14,975 ft), a level to which it had been cleared at 10:20:17 UTC. D-IKSI, visible on the radar screens of sector INI SE from FL 88 onward, passed flight level FL 120 (12,027 ft) in a climb at 10:22:43 UTC. The vertical distance between the two aircraft was then 2948 ft. Following the cancellation of the IFR flight plan, the pilot of N600HS left FL 150 in descent. At 10:23:11 UTC the STCA detected an altitude of 14,921 ft and rate of descent of 129 ft/min for N600HS. D-IKSI was passing 13,314 ft with a rate of climb of 2660 ft/min. The vertical distance between the aircraft was 1607 ft and the lateral separation was 7.4 NM.

At 10:23:15 UTC, N600HS passed 14,824 ft with a rate of descent of 785 ft/min, D-IKSI passed 13,464 ft with a rate of climb of 2666 ft/min. The vertical and lateral distance between the two aircraft were 1360 ft and 6.97 NM respectively. The STCA system triggered an alert which was displayed at 10:23:16 UTC on the radar screens when the image was refreshed.

Sion Control was not equipped with a STCA system.

1.7.2 Onboard system

The two aircraft were equipped with an ACAS I. This generates traffic advisories (TA) but, unlike the ACAS II system, it does not issue resolution advisories (RA).

No ACAS system was required for the two aircraft.

1.8 Arrangements applicable to Swiss Class C and E airspace for VFR flights

The airspaces below are described in accordance with the VFR Manual.

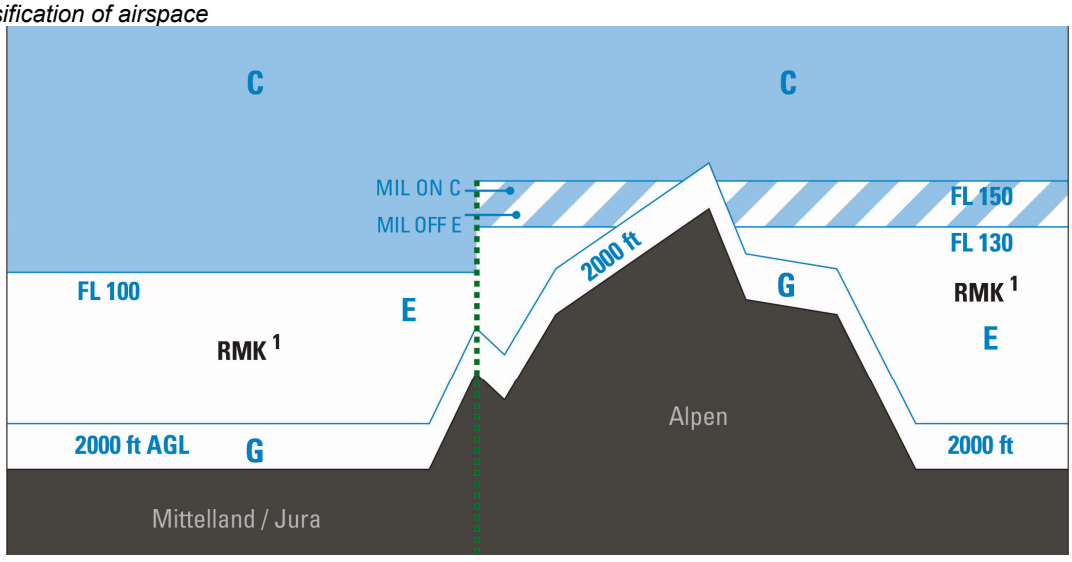
1.8.1 Class C – Controlled airspace

« Separation assured:	*VFR with IFR*
Services provided:	*ATC for separation with IFR* *VFR traffic information (and on request, suggestions for avoiding manoeuvres)*
Radiocommunications	*Continuous two-way*
ATC clearance:	*Necessary*
The Class C airspace comprises:	*"Alpen" airspace above FL 150 (MIL OFF)* *"Alpen" airspace above FL 130 (MIL ON) »*

1.8.2 Class E – Controlled airspace

« Separation assured:	*No*
Services provided:	*As far as possible, traffic information*
Radiocommunications	*Not required*
ATC clearance:	*Not required*
The Class E airspace comprises:	[…] *"Alpen" airspace from 2000 ft / 600 m AGL to FL 150 (MIL OFF)*[3] *"Alpen" airspace from 2000 ft AGL to FL 130 (MIL ON)* […] »

General classification of airspace



1) Transponder ON code 7000 mandatory >7000 ft AMSL, mandatory below, if fitted

Figure 8: Airspace over Swiss territory.

[3] AGL: above ground level

1.9 IFR procedures at Sion – MIL ON

1.9.1 Arrival procedures

« IFR ARRIVALS LSGS

COORDINATION BETWEEN INI AND AIR DEFENCE AND DETECTION CENTRE – ADDC

INI shall coordinate verbally (via telephone) with ADDC the transfer of control for the traffic with ADES [destination aerodrome] *LSGS (no silent transfer).*

[…]

AIRSPACE RELEASE FOR IFR ARRIVALS SION

IFR arrivals to LSGS airport during MIL OPS hours are transferred by civil control sectors (INI East/South) to ADDC upon leaving the permanent ATS route network.

[…] »

Ref: ATMM Geneva ACC B.5.3 MIL

« […] *The INI sector concerned issues the standard clearance on the STAR and initiates a transfer of control to the ADDC before the flight leaves the permanent ATS route network.*

He then descends the aircraft to the flight level coordinated with the ADDC and transfers it to "Swiss Military Radar".

ROUTES AND FLIGHT LEVELS

VALOR –VALOR 1W	*MNM FL190 to be corrected according to the correction system of FL180 over the Alps*
Clearance limit:	*GRANA*

RESPONSABILITIES DURING HOURS OF MILITARY ACTIVITY

The ADDC provides Air Traffic Control outside the permanent ATS route network, and Approach Control for Sion.

[…].

COORDINATION FOR IFR ARRIVALS

As soon as possible, INI shall pass to ADDC the VADAR/VALOR estimate by telephone. A confirmation is marked in the TEXTCOM field of the strip […] »

Ref.: ATMM GENEVA ACC REG – LSGS ENR E-4 and E-5

1.9.2 Departure procedures

« IFR DEPARTURES FROM LSGS

SIDS AND FLIGHT LEVELS

SID Standard High Performance CFL [clear flight level]

[…] »

SPR 1J 2U 180

BEFORE TAKE-OFF

Shortly before departure, Sion TWR coordinates with INI S who may, subject to his traffic, set a time frame of 5 minutes for take-off.

DEPARTURE

SION TWR enters the ATD [actual time of departure] *in SYCO as follows:*

- *PTID1 TOS (Take Off Sion),*
- *TO1 Departure time.*

A strip is automatically distributed to DLT [Delta] *position, who passes ATD to INI S*

TRANSFER OF COMMUNICATION

Sion TWR transfers the flight according to DELTA instructions to:

- *INI S when passing 13,000 ft AMSL on the SPR / ROCCA SIDs*

[…] »

Ref.: REG - LSGS ATMM GENEVA ENR ACC E-4.2 – 4.6

« SID ALLOCATION

For civil IFR departures only the SPR, ROCCA and GOLEB SIDs shall be assigned. During MIL ON, COOR shall coordinate the SID with ADDC before departure. When approving a civil IFR departure, the following phraseology shall be used by ADDC:

[…]

- *When the aircraft does not need to adhere to the maximum altitudes published in the relevant SID: (callsign) APPROVED, DISREGARD MAXIMUM ALTITUDES*

[…] »

Ref.: ATMM LSGS SECTION 4 TOWER

1.9.3 Sion airport – standard instrument departure routes

1.9.3.1 « High performance » departure routes

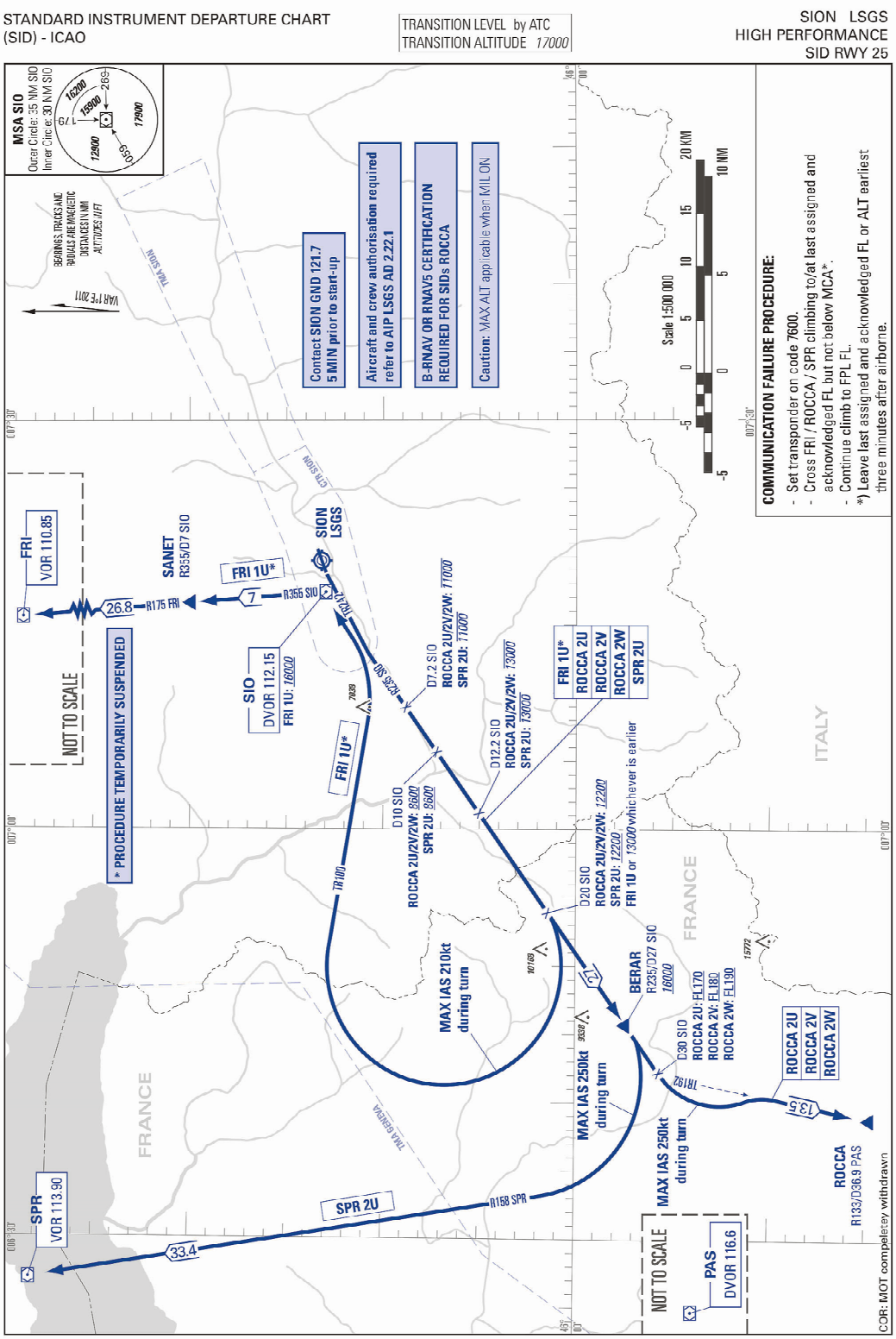


Figure 9: « High performance » standard instrument departure routes.

1.9.3.2 Departure route SPR 2U

SAINT-PREX 2U (SPR 2U) PDG: 13.4% to 8100ft, 4.8% to 12300ft	*Climb straight ahead. At the end of the RWY proceed on TR242, intercept R235 SIO. Proceed to BERAR. At BERAR turn right (MAX IAS 250KT during turn), intercept R158 SPR, proceed to SPR.*	*Cross: D7.2 SIO MAX 11000ft, D10 SIO MNM 8600ft, D12.2 SIO MAX 13000ft, D20 SIO MNM 12200ft, BERAR MNM 16000ft.*

1.10 IFR flight plan cancellation procedures

« *CHANGE OF FLIGHT RULES*

IFR TO VFR

A flight crew wishing to change from IFR flight to VFR flight shall explicitly notify the appropriate ATS unit that the IFR flight is cancelled and advise any changes to be made in the current flight plan.

A change from IFR flight to VFR flight shall not take place unless the flight can be conducted under VFR for an extended period of time.

Change from IFR flight to VFR flight is only acceptable when a message initiated by the PIC containing the specific expression;

CANCELLING MY IFR FLIGHT

Together with the changes, if any, to be made to his current flight plan, is received by an ATS unit.

No reply, other than the following acknowledgment, should normally be made by an ATS unit:

Phraseology:

IFR FLIGHT CANCELLED AT (time)

No invitation to change from IFR flight to VFR flight is to be made either directly or by inference, (e.g. by requesting the flight crew to confirm it intends to cancel the IFR flight plan, when it has given no indication that this is its intention). »

Ref.: ATMM Switzerland, Rules of the air

1.11 Aerodrome information

1.11.1 General

Sion airport is located in the Rhone valley in south-west Switzerland. It is open to civil and military VFR and IFR traffic.

1.11.2 Operation and use of radar in Sion control tower

The Sion control tower is equipped with a radar screen providing an image from a single secondary radar whose source is a military identification system situated on the airport. Radar coverage is limited due to the surrounding mountainous topography.

1.11.3 Airspace

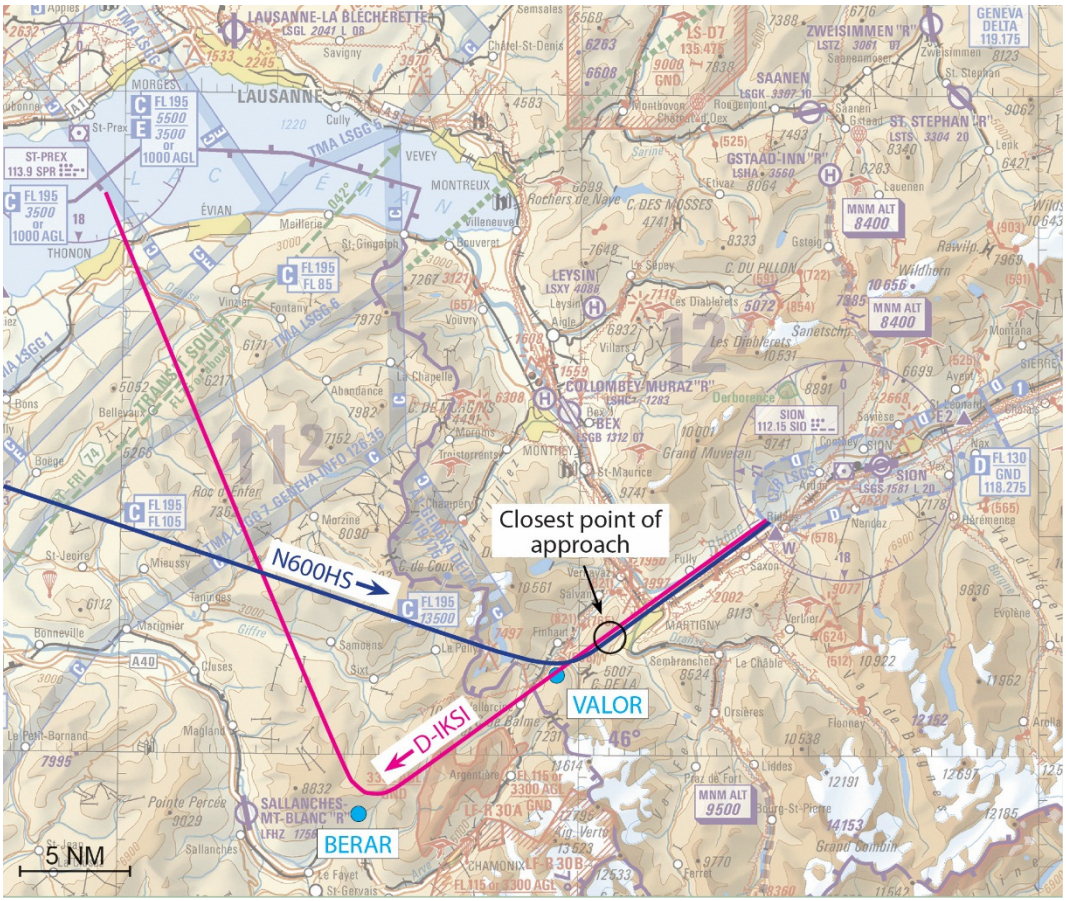


Figure 10: Extract of aeronautical chart OACI 1:500 000 with the trajectories of N600HS and D-IKSI.

The CTR as well as the temporary Sion terminal control areas (TMA) are in airspace Class D. The airspace outside the CTR and TMAs between 2000 ft AGL and FL 130 (MIL ON) and FL 150 (MIL OFF), respectively, is in airspace Class E.

The altitude limit of Class C and Class E airspace varies as a function of the military flight service. This causes changes in procedures for the management of flights.

2 Analysis

2.1 Technical aspects

The investigation revealed no indications of any technical defects which could have played a part in the serious incident.

2.2 ATC aspects

2.2.1 Sector INI SE – Geneva

2.2.1.1 The RE controller

After passing waypoint VALOR, the pilot of N600HS wanted to continue towards Sion airport under visual flight rules. A transfer of control at FL 190 had been co-ordinated between sector INI SE and military control. The tactic of the RE controller, who wanted to expedite the descent of N600HS, was to send the aircraft into Swiss Class E airspace as soon as it crossed the Franco-Swiss frontier, in order to avoid the Class C airspace managed by military control. He was informed of an IFR departure from Sion.

The RE controller drew up a different plan from the one initially envisaged with military control without informing the RP coordinator of this.

The descent of N600HS was delayed by traffic, destination Geneva, as well as by the minimum IFR altitude. As soon the aircraft passed FL 190, air traffic control were waiting for the cancellation of the IFR flight plan which had to be requested by the pilot of N600HS. The aircraft was cleared to descend to FL 150, corresponding to the minimum IFR flight level.

The RE controller was aware of a possible conflict between N600HS and D-IKSI. Before the latter was visible on his radar screen, he had informed the pilot of N600HS of an imminent departure from Sion.

Several factors, including in particular the topography of central Valais, mean that it is difficult to assess the moment when an instrument departure from Sion appears on the radar of a Geneva INI sector. Therefore to allow a traffic bound for Sion to cancel its IFR flight plan whilst a take-off under instrument flight rules in the opposite direction is in progress, did not guarantee a sufficient spacing at the time of crossing and presented risks. The procedure, as described in the Geneva ATMM, stipulates the transfer of control of instrument flights to the ADDC in order to ensure separation.

2.2.1.2 The RP coordinator taking over the function of RE controller

The coordination of the transfer of control of N600HS to the ADDC corresponded to the published IFR procedure.

When the RP coordinator noted that the RE controller had applied a different tactic, which no longer involved N600HS entering the Class C airspace controlled by the ADDC, he informed the ADDC and Sion control.

From the moment when N600HS descended below FL 190, the possibilities to intervene on traffic were limited. After the change of work position, the new RE controller had little room for manoeuvre to prevent the hazardous crossing.

Realising that the situation was becoming critical, he transmitted traffic information to the pilot of N600HS. It was not possible for him to intervene rapidly in relation to the traffic departing from Sion as the latter was still on the Sion frequency.

The flight plan was cancelled at FL 150, twenty-six seconds before the frontier was crossed. The late cancellation request no longer permitted N600HS to rejoin

Swiss airspace Class E by flying directly to waypoint VALOR as originally planned.

Generally, a change of operator just before a potential conflict is not optimal.

2.2.2 Sion Control

The Sion controllers correctly coordinated the departure of D-IKSI and were informed in good time of the arrival of N600HS. Their response capabilities were very limited because they had no information on their radar screens about N600HS and this traffic was not in radio contact with Sion control.

2.2.3 Traffic management between Sion and Geneva

The procedures differ depending on the activity status of the military flight service. Depending on the activity, the subdivision and management of the airspace are different. This complicates the controllers' task.

During activity of the military flight service, the procedures envisage a transfer of control to the ADDC for instrument flights with Sion as their destination. On the other hand, there is no specific procedure governing the departure from Sion of IFR traffic conducted simultaneously with VFR traffic destination Sion flying in Swiss Class C airspace or Class D airspace respectively over French territory.

At the time of the hazardous convergence, the two aircraft were on different frequencies handled by different control units. The frequency changes took place after the hazardous convergence. It is possible that the respective controllers thought that they might still be able to influence the situation in this way. A change of frequency just before the crossing could have resulted in a momentary loss of radio communication.

Earlier display of the traffic on the radar screens would have facilitated the management of the crossing. The controllers would then have been able to better anticipate the situation and thus influence the crossing of the two aircraft in good time.

2.3 Flight management aspects

2.3.1 Aircraft D-IKSI

The flight crew correctly followed their departure route, complying with the altitude constraints.

2.3.2 Aircraft N600HS

The RE controller told the pilot of N600HS that his entry into Swiss territory should take place below FL 130, i.e. in Class E airspace, because of the activity of the military flight service. The pilot accepted this instruction but did not comply with it, even though he possessed a VFR chart of the region, the only onboard resource enabling him to locate the Franco-Swiss frontier.

The pilot requested cancellation of his IFR flight plan very late. It was then no longer possible for him to fly to Sion directly without entering Class C Swiss airspace. He neither modified the control of his aircraft in order to comply with the air traffic control instruction nor did he inform the latter about his inability to comply.

3 Conclusions

3.1 Findings

3.1.1 General framework

- The serious incident took place 3 NM north-east of waypoint VALOR and approximately 16 NM south-west of the Sion aerodrome, in Class C controlled airspace.
- At the time of the serious incident, sectors INI South and INI East were combined as INI SE.
- One of the aircraft involved in the serious incident was flying under instrument flight rules, while the other was flying under visual flight rules.

3.1.2 Technical aspects

- The investigation revealed no technical defect which could have played a part in or contributed to the serious incident.
- The STCA safety net in the Geneva control centre was triggered.
- The two aircraft involved in the serious incident were equipped with a TCAS I on board anti-collision system.
- The pilots did not receive any traffic advisories from their TCAS.

3.1.3 Flight crews

- The pilots of the two aircraft involved in the serious incident were in possession of adequate licences.
- There is no indication that their state of health was affected at the time of occurrence of the serious incident.
- The pilots of both aircraft were unable to establish visual contact with the opposing traffic.
- The pilot of N600HS was making his approach to Sion for the first time.

3.1.4 Air traffic controllers

- The air traffic controllers were in possession of adequate licences.
- There is no indication that their state of health was affected at the time of occurrence of the serious incident.
- The sector INI SE controllers judged that the workload was low to moderate at the time of the serious incident.
- The Sion control tower controllers judged that at the time of serious incident the workload was moderate.

3.1.5 History of the serious incident

- At 10:15:31 UTC the first call by the pilot of aircraft N600HS took place on the sector INI SE frequency.
- At 10:17:36 UTC, a coordination took place between sector INI SE and the ADDC regarding the modalities for transfer of control of N600HS
- At 10:18:30 UTC, the RE controller cleared the pilot of N600HS to descend to FL 180.

- At 10:20:17 UTC, the RE controller cleared the pilot of N600HS to descend to FL 150.
- At 10:21:24 UTC, D-IKSI appeared on the sector INI SE radar screens.
- At 10:22:24 UTC, the pilot of N600HS received traffic information for the first time. At 10:23:25 UTC, he received traffic information for a second time. Both were issued by the RE controller.
- The pilot of D-IKSI received traffic information from the Sion ADC controller.
- At 10:23:16 UTC, the STCA was triggered on the screens of sector INI SE.
- At 10:23:50 UTC, the closest point of approach occurred; the distances were 2.8 NM laterally and 650 ft vertically.
- The pilots of the aircraft involved were unable to establish visual contact with the opposing traffic throughout the serious incident.

3.2 Causes

The serious incident is due to the hazardous convergence of two aircraft flying in opposite directions, one on approach under visual flight rules, the other departing under instrument flight rules, following non-compliance with an instruction given by air traffic control to the pilot on approach.

An inadequate air traffic control tactic contributed to the serious incident.

4 Safety recommendations, safety advices and measures taken since the serious incident

Safety recommendations

According to the provisions of Annex 13 of the International Civil Aviation Organization (ICAO) and Article 17 of Regulation (EU) No. 996/2010 of the European Parliament and of the Council of 20 October 2010 on the investigation and prevention of accidents and incidents in civil aviation and repealing Directive 94/56/EC, all safety recommendations listed in this report are intended for the supervisory authority of the competent state, which must decide on the extent to which these recommendations are to be implemented. Nonetheless, any agency, any establishment and any individual is invited to strive to improve aviation safety in the spirit of the safety recommendations pronounced.

Swiss legislation provides for the following regulation regarding implementation in the Ordinance on the Safety Investigation of Transport Incidents (OSITI):

„Art. 48 Safety recommendations

[1] The STSB shall submit the safety recommendations to the competent federal office and notify the competent department of the recommendations. In the case of urgent safety issues, it shall notify the competent department immediately. It may send comments to the competent department on the implementation reports issued by the federal office.

[2] The federal offices shall report to the STSB and the competent department periodically on the implementation of the recommendations or on the reasons why they have decided not to take measures.

[3] The competent department may apply to the competent federal office to implement recommendations."

The STSB shall publish the answers of the relevant Federal Office or foreign supervisory authorities at www.stsb.admin.ch in order to provide an overview of the current implementation status of the relevant safety recommendation.

Safety advices

The STSB may publish safety advices in response to any safety deficit identified during the investigation. Safety advices shall be formulated if a safety recommendation in accordance with Regulation (EU) No. 996/2010 does not appear to be appropriate, is not formally possible, or if the less prescriptive form of a safety advices is likely to have a greater effect. The legal basis for STSB safety advices can be found in Article 56 of the OSITI:

"Art. 56 Information on accident prevention

The STSB may prepare and publish general information on accident prevention."

4.1 Safety recommendations

4.1.1 Air traffic management at Sion airport

4.1.1.1 Safety deficit

An aircraft was making a flight under instrument flight rules to Sion airport. The pilot wanted to conduct the final phase of the flight under visual flight rules. A flight plan indicating these intentions was filed.

At the same time, an aircraft operating under instrument flight rules was taking off from Sion airport. The two traffic converged on the same region.

The Geneva controller decided to let the aircraft heading for Sion enter into Class E airspace, located below the controlled Class C airspace, which was managed by a different control unit. In the course of the descent, the instrument rules flight plan was cancelled and the aircraft continued its flight under visual flight rules.

The two aircraft crossed with minimum distances of 2.8 NM laterally and 650 ft vertically in the Class C airspace.

At the time of the hazardous convergence, the two aircraft were in radio contact with different control units. Visual contact was not established at any time. Both aircraft were equipped with a TCAS I system. No avoiding manoeuvre was carried out.

There is no defined procedure governing the departure from Sion of IFR traffic conducted simultaneously with VFR traffic destination Sion flying in Swiss Class C airspace or Class D airspace over French territory.

4.1.1.2 Safety recommendation no 496

The Federal Office of Civil Aviation should ensure the implementation of a specific procedure for Sion airport, governing the departure of an IFR traffic, subject to the arrival of a VFR traffic operating within Swiss class C airspace, respectively class D airspace over French territory.

4.2 Safety advices

None

4.3 Measures taken after the serious incident

Since January 2014 the Sion coordinator's workstation work position has been provided with a radar image originating from Geneva.

The following reminder has been published to all controllers :

« *In case of an arriving IFR traffic cancelling at VALOR :*

- *If there is no departure yet, IFR flight plan may be cancelled and the flight continues*
- *If a departure with climb to FL180 has been approved to Sion, the arrival- remains at FL190 until the departure has passed and is allowed to cancel thereafter*

In case of an arriving traffic already under VFR towards VALOR :

- *No approval to Sion for a departing aircraft*
- *Once the VFR traffic passes FL130, the departure is approved to Sion. A traffic information is issued to both flight crews*. »

Payerne, 23 March 2015 Investigation Office STSB

This final report was approved by the Board of the Swiss Transportation Safety Investigation Board STSB (Art. 10 lit. h of the Ordinance on the Safety Investigation of Transportation Incidents of 17 December 2014).

Berne, 31 March 2015

Annex

Airspace and chronological profiles