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Swiss Accident Investigation Board SAIB

Aviation Division

Final Report no. 2145 by the Swiss Accident Investigation Board

concerning the serious incident (AIRPROX)

involving the Boeing 737-300,
callsign DLH 03K

and the Airbus A319-111 aircraft,
callsign EZY 529Y

on 8 July 2010

near VANAS, 50 NM SSE of Geneva

General information on this report

This report contains the Swiss Accident Investigation Board's (SAIB) conclusions on the circumstances and causes of the accident which is the subject of the investigation.

In accordance with Art 3.1 of the 10th edition, applicable from 18th 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 accident 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 prevention, due consideration shall be given to this circumstance.

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

All times in this report, unless otherwise indicated, are stated in co-ordinated universal time (UTC). At the time of the incident, Central European Summer Time (CEST) applied as local time in Switzerland. The relation between LT, CEST and UTC is: $LT = CEST = UTC + 2$ hours

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Final report

Summary

DLH 03K

Owner	Deutsche Lufthansa AG
Operator	Deutsche Lufthansa AG
Manufacturer	Boeing Commercial Airplanes, Seattle, Washington, USA
Aircraft type	Boeing 737-300
Country of registration	Germany
Registration	D-ABXS
Flight number	LH 4135
Flight rules	IFR
Type of operation	Scheduled flight
Departure point	LFMN, Nice
Destination point	EDDF, Frankfurt

EZY 529Y

Owner	EasyJet Airline Company Limited
Operator	EasyJet Airline Company Limited
Manufacturer	Airbus S.A.S, Toulouse, France
Aircraft type	A319-111
Country of registration	United Kingdom
Registration	G-EZIY
Flight number	EZY 5293
Flight rules	IFR
Type of operation	Scheduled flight
Departure point	EGKK, London Gatwick
Destination point	LIMC, Milan Malpensa
Location	Near waypoint VANAS, 50NM SSE of Geneva
Date and time	8 July 2010, 13:41 UTC
ATS unit	GVA ACC
Airspace	Class A
Applicable minimum separation	5 NM or 1000 ft
Minimum lateral and vertical distances	2.2 NM and 125 ft

Investigation

The serious incident occurred on 8 July 2010 at 13:41 UTC. It was notified on 9 July 2010 at 14:53 UTC. After collating the relevant information about the case, the Swiss Aircraft Accident Investigation Bureau (AAIB) opened an investigation on 26 July 2010 at 15:09 UTC.

The serious incident occurred in French airspace. France delegated the investigation to Switzerland. The AAIB notified the incident to the authorities of the United Kingdom, Germany and France.

The investigation report is published by the Swiss Accident Investigation Board SAIB.

Synopsis

The incident occurred near waypoint VANAS at flight level FL 320. It was caused by the dangerous convergence of an aircraft which descended lower than its cleared flight level to the same level as an aircraft which was crossing on a perpendicular route.

Causes

The serious incident is attributable to the dangerous convergence of an aircraft descending below its cleared flight level, to the same level occupied by an aircraft crossing on a perpendicular route.

Factors which played a part in the incident:

- An incorrect flight level was entered into the flight management system by the flight crew of EZY 529Y.
- The controller did not realise that the crew reported an incorrect cleared flight level during the initial contact on his frequency.
- During this contact, the flight crew did not carry out the appropriate verification of the flight level which it correctly read back.

Factual information

1.1 History of the serious incident

1.1.1 General

The history of the serious incident was established using the recordings of the radiotelephone communications, radar plots, mode S data and the statements of the flight crew members and the air traffic controllers.

At the time of the serious incident, sectors L1, L2, L3 and L4 of the Geneva ACC (Area Control Center) were combined under the designation L14 and sectors L5 and L6 were combined under the designation L56.

Sectorisation at the time the serious incident:

L6	FL 375 +	L56
L5	FL 355 – FL 374	
L4	FL 335 – FL 354	L14
L3	FL 315 – FL 334	
L2	FL 285 – FL 314	
L1	FL 245 – FL 284	

1.1.2 History of the serious incident

On 8 July 2010 at 13:31:11 UTC, the flight crew of the Boeing 737-300 aircraft on flight DLH 03K from Nice to Frankfurt called combined sector L14 on the 134.850 MHz frequency. The aircraft was approaching waypoint IRMAR and passing flight level FL 220 in a climb to FL 260. The air traffic controller cleared it to follow route IRMAR-KINES-DITON and to continue its climb, initially to flight level FL 300, then to FL 320.

In the adjacent sector L56, the pilots of the Airbus A319 aircraft on flight EZY 529Y from London-Gatwick to Milan-Malpensa were cleared at 13:35:43 UTC to leave cruising level FL 390 and to descend initially to FL 380. At this time the aircraft was near waypoint GIRKU. The controller then instructed the crew to maintain their heading and then at 13:37:14 UTC to descend to flight level FL 370.

Thirty seconds later, EZY 529Y was cleared, after coordination with sector L14, to continue its descent to flight level FL 330 at a vertical speed greater than or equal to 2000 ft/min; the instruction was read back correctly.

At 13:38:20 UTC, the flight crew of EZY 529Y reported to ATC that traffic was below them; the A319 Airbus was at this time passing flight level FL 366 at an average rate of descent of 1200 ft/min. The controller replied that it was an aircraft located more than 5 NM distant at flight level FL 360. The pilots explained that the latter had generated a TCAS (Traffic Alert/Collision Avoidance System) alert and that for this reason they had reduced their rate of descent. The controller then instructed them to continue: *“The traffic is at three six zero, so you’d better continue”*. The flight crew complied but reported that the traffic was too close and that they were obliged to reduce the rate of descent to avoid the generation of a resolution advisory (RA).

At 13:39:12 UTC, flight EZY 529Y was transferred to sector L14 on the 126.050 MHz frequency. Contact was made at 13:40:25 UTC: "*Easy five two nine Yankee, descending flight level three two zero on radar heading one three three*". The controller did not realise that this reported flight level was not level FL 330, cleared by the preceding sector L56; he identified the traffic and instructed it to maintain level FL 330. The flight crew read back this clearance correctly: "*Maintain three three zero when reaching, Easy five two nine Yankee.*"

At 13:40:49 UTC, the short-term conflict alert (STCA) was activated in sector L14 to indicate a potential conflict between EZY 529Y passing level FL 326 in descent and DLH 03K which was maintaining flight level FL 320. The recording of the radar tracks indicates that the lateral distance between the two aircraft at this time was 12.2 NM.

During the period when this alert was being issued, the controller was in radio communication with two other aircraft; he then called DLH 03K in an enquiring tone at 13:41:15 UTC, mentioning only its call sign.

The mode S transponder downlink transmission indicates that at the same time (13:41:17 UTC) an upward sense resolution advisory ("*CLIMB, CLIMB*") was issued by the onboard collision avoidance system of the Boeing DLH 03K.

Without waiting for the reply from DLH 03K, the pilots of EZY 529Y reported to ATC that traffic was at 5 NM, and then a few seconds later at 4 NM ahead of them, at the same flight level. The controller acknowledged the information and instructed them, using emergency phraseology, to turn right immediately onto heading 190°. While doing so, he instructed DLH 03K to descend back to flight level FL 320 from which the latter had deviated by some 300 feet in order to comply with its resolution advisory. The Boeing DLH 03K was at this time already in the process of re-acquiring its cruising level and its flight crew replied that they had received a resolution advisory RA.

The controller did not read back this information and spoke directly to the pilots of EZY 529Y, asking them if they were now "separated" from the traffic. The latter confirmed this and stated that they had received only a traffic advisory (TA), but not a resolution advisory RA.

A little later, at the request of ATC, they confirmed that they had in fact been cleared to descend to flight level FL 320 by the controller in the preceding sector. They stated that there they were also involved in a "*close encounter*".

The distances between DLH 03K and EZY 529Y were at their minimum at 13:41:48 UTC; by then the trajectories of the aircraft had already become divergent and the aircraft passed with a lateral distance of 2.2 NM and an altitude difference of 125 feet.

Recording of the radar tracks of flight EZY 529Y and the flight crossing at FL 360, in control sector L56

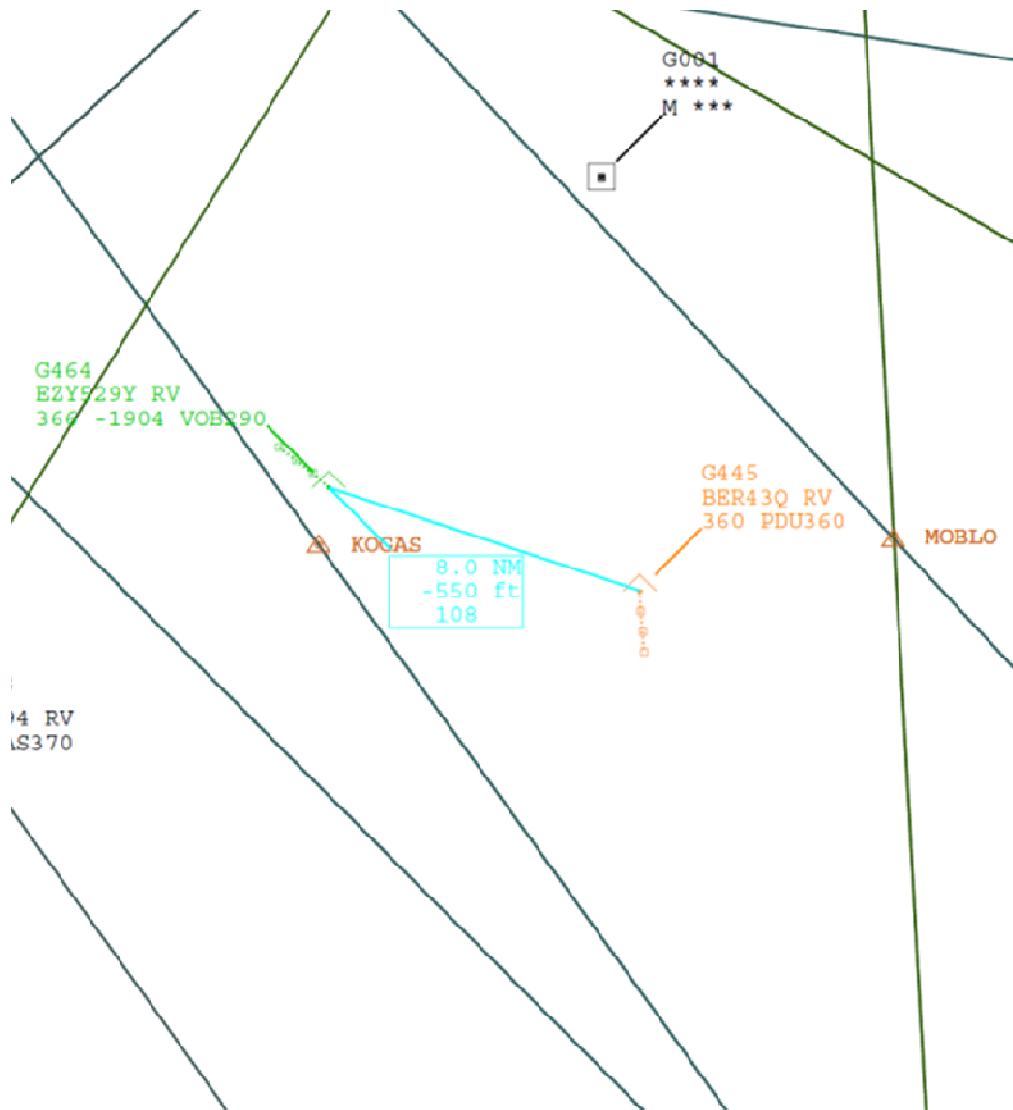


Figure 1

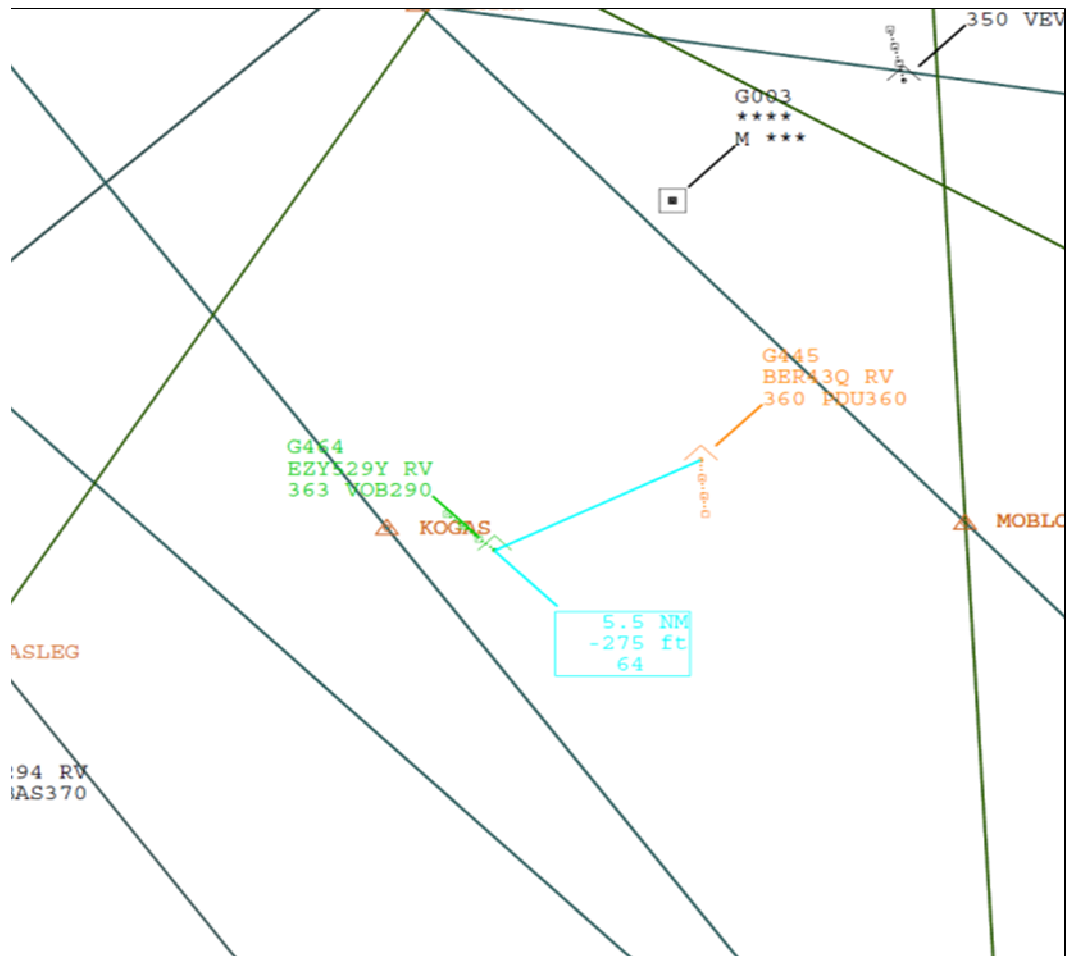
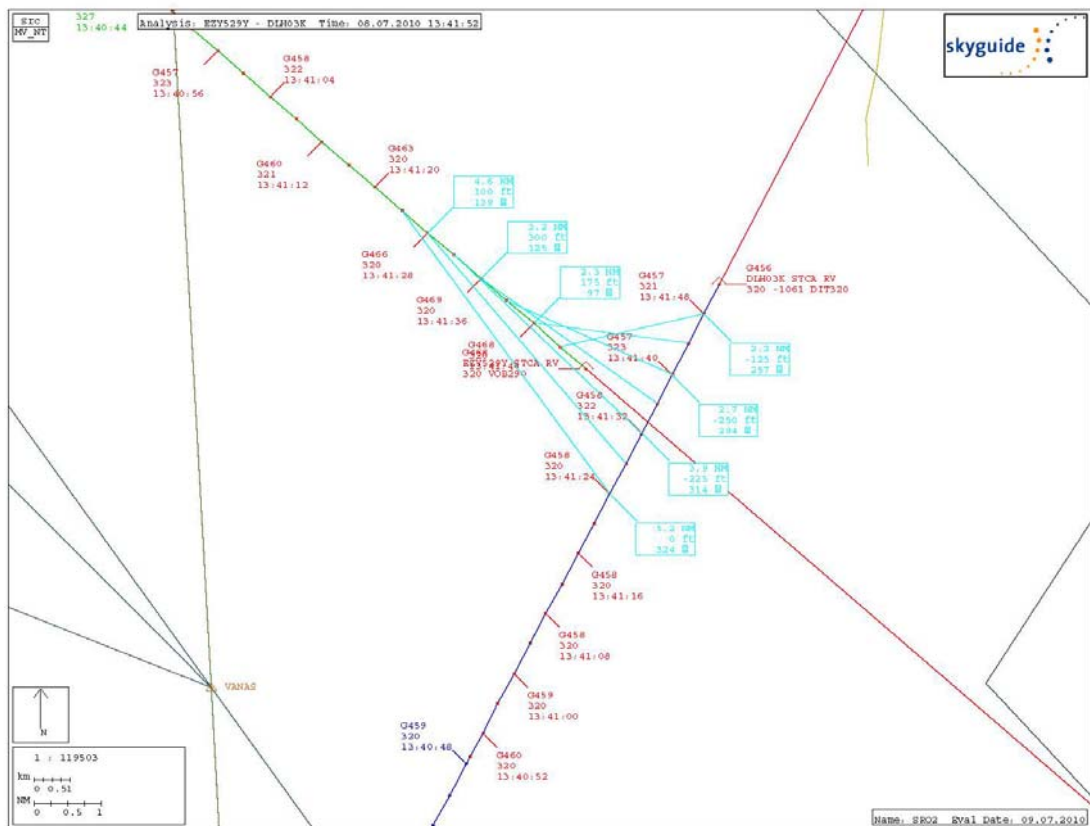


Figure 2

This traffic situation was not the cause of a loss of separation and did not generate a resolution advisory or an STCA alert.

Recording of the radar plots at the moment of the conflict in control sector L 14



1.1.3 Location of the serious incident

Geographical position	Near VANAS, 50 NM SSE of Geneva
Date and time	8 July 2010 at 13:41 UTC
Lighting conditions	Daylight
Coordinates of VANAS	45 27 25.8 N, 006 44 48.8 E
Altitude or flight level	FL 320

1.2 Personnel information

1.2.1 Crew of aircraft DLH 03K

1.2.1.1 Commander

1.2.1.1.1 Training

Person

German citizen, born 1964

Licence

ATPL(A) (air transport pilot licence aeroplane) according to Joint Aviation Requirements (JAR), first issued by the Luftfahrt-Bundesamt der Bundesrepublik Deutschland on 14 February 1990 and valid till 11 February 2015

	Ratings class/type	Type Boeing 737 300-900 commander (PIC), valid till 30 November 2010 Rating for category III approaches, valid till 30 November 2010 English Level 4, valid till 3 May 2013
	Ratings	Category III instrument flight IR(A) on Boeing 737 300-900 aircraft, valid till 30 November 2011
	Last proficiency check	3 May 2010
	Medical certificate	Class 1 / 2 without restriction Valid from 21 October 2009 and till 30 November 2010, and 30 November 2011 respectively
	Last medical examination	21 October 2009
1.2.1.1.2	Flying experience	
	Total IFR hours	5807:42 hours
1.2.1.2	Copilot	
1.2.1.2.1	Training	
	Person	German citizen, born 1983
	Licence	ATPL(A) (air transport pilot licence aeroplane) according to Joint Aviation Requirements (JAR), first issued by the Luftfahrt-Bundesamt der Bundesrepublik Deutschland on 30 July 2007 and valid till 27 November 2014
	Ratings class/type	Type Boeing 737 300-900 copilot (COP), valid till 14 November 2010. Rating for category III approaches, valid till 14 November 2010 English Level 4, valid till 24 April 2013
	Ratings	Category III instrument flight IR(A) on Boeing 737 300-900, valid till 30 November 2011
	Last proficiency check	Not communicated
	Medical certificate	Class 1 / 2 without restriction Valid from 18 November 2009 till 17 December 2010, and 17 December 2014 respectively
	Last medical examination	18 November 2009

1.2.1.2.2	Flying experience	
	Total IFR hours	1547:16 hours
1.2.2	Crew of aircraft EZY 529Y	
1.2.2.1	Commander	
1.2.2.1.1	Training	
	Person	British citizen, born 1953
	Licence	ATPL(A) (air transport pilot licence aeroplane) according to Joint Aviation Requirements (JAR), first issued by the United Kingdom Civil Aviation Authority on 3 October 2008 and valid till 2 October 2013
	Ratings class/type	CP-A319, A321, A320, FO-A320, A321, A319 Language Proficiency: English
	Function	Line Trng Capt
	Rating	Instrument flight IR(A), valid till 2 October 2013
	Last proficiency check	LPC Licence Proficiency Check, OPC Operational Control 12 January 2010, valid till 31 January 2011, LOE Line Operational Evaluation 18 July 2010 valid till 31 July 2011
	Medical certificate	Valid till 1 March 2011
	Last medical examination	2 February 2010
1.2.2.1.2	Flying experience	
	Total hours	Approx. 17,000 hours
1.2.2.2	Copilot	
1.2.2.2.1	Training	
	Person	British citizen, born 1976
	Licence	ATPL(A) (air transport pilot licence aeroplane) according to Joint Aviation Requirements (JAR), first issued by the United Kingdom Civil Aviation Authority on 19 February 2009 and valid till 18 February 2014
	Ratings class/type	FO-A320, A319 Language Proficiency: English
	Ratings	Instrument flight IR(A)
	Last proficiency check	LPC Licence Proficiency Check, OPC Operational Control 7 March 2010, valid till 31 March 2011, LOE Line Operational Evaluation 15 September 2010 valid till 30 September 2011
	Medical certificate	Valid till 26 June 2011

	Last medical examination	7 June 2010
1.2.2.2.2	Flying experience	
	Total hours	450:36 hours
1.2.3	Air traffic controllers	
1.2.3.1	Air traffic controller 1	
	Function	RE Radar Executive, sector L14
	Person	Italian citizen, born 1977
	Start of duty on the day of the incident	13:30 UTC
	Licence	Air Traffic Controller Licence on the basis of European Community Directive 2006/23, first issued by the Federal Office of Civil Aviation (FOCA) on 23 September 2005 and valid till 20 April 2011
	Rating	Rating: ACS – Area Control Surveillance Rating endorsement: RAD - Radar, OJTI – On the job training instructor Language endorsement: English Level 4, valid till 13 April 2012
	Medical certificate	Licence valid accompanied with medical certificate
1.2.3.2	Air traffic controller 2	
	Function	RP Radar Planner, sector L14
	Person	Serbian citizen, born 1969
	Start of duty on the day of the incident	08:00 UTC
	Licence	Air Traffic Controller Licence on the basis of European Community Directive 2006/23, first issued by the Federal Office of Civil Aviation (FOCA) on 14 June 2000 and valid till 8 June 2011
	Rating	Rating: ACS Rating endorsement: RAD, OJTI Language endorsement: English Level 4, valid till 17 March 2012
	Medical certificate	Licence valid accompanied with medical certificate

1.3 Aircraft information

1.3.1

DLH 03K

Registration	D-ABXS
Aircraft type	Boeing 737-300
Characteristics	Short- and medium-haul twin jet
Manufacturer	Boeing Commercial Airplanes, Seattle, Washington, USA
Year of construction	1989
Serial number	24280
Owner	Deutsche Lufthansa AG, Cologne, Germany
Operator	Deutsche Lufthansa AG, Cologne, Germany
Equipment	TCAS II, Rockwell-Collins

1.3.2

EZY 529Y

Registration	G-EZIY
Aircraft type	Airbus 319 - 111
Characteristics	Short- and medium-haul twin jet
Manufacturer	Airbus S.A.S., Toulouse, France
Year of construction	2005
Serial number	2636
Owner	EasyJet Airline Company Limited, Luton, UK
Operator	EasyJet Airline Company Limited, Luton, UK
Equipment	TCAS Honeywell

1.4 Meteorological information

1.4.1

General

The information contained in section 1.4.2 was provided by MeteoSwiss. Translation was performed by the SAIB.

1.4.2

General meteorological situation

General situation

A high-pressure area centered over Eastern Europe ensured stable summer weather in the region of the Swiss Alps and the French Alps.

Forecasts and hazards

AIRMET

No AIRMET was published for this day.

SIGMET

The serious incident took place over French territory. No SIGMET was published for this day for the region of the incident.

Significant weather chart, wind chart valid at 12 UTC:

The significant weather chart (SWC) (FL 100 - FL 450) issued by WAFC London does not indicate any significant feature in the region of the incident.

For this region the chart of the winds at FL 340 indicated westerly winds at 30 kt and a temperature of -48 °C. The chart for FL 300 also indicated a westerly wind, at a speed of 25 kt and a temperature of -38 °C.

Observed and measured values

Payerne balloon probe

Values indicated at the altitude of the incident (FL 320)

Probe	Time	Wind speed (kt) and direction	Temperature °C	Dewpoint °C
Payerne	12z	35/280	-40	-54

Radar image

No echo of precipitation is visible in the region of the incident

Satellite image

The satellite image shows very little cloud cover in the region of the incident.

Conclusions

On the basis of this information, the following weather conditions prevailed in the region at the time and place of the incident:

Cloud: 4-6/8 at 28,000 ft AMSL
 Weather: -
 Visibility: Unknown, presence of cirrus
 Wind: Westerly wind at 35 kt
 Temperature/dewpoint: -40°C / -54°C
 Atmospheric pressure: Not applicable
 Position of the sun: Azimuth 238°, elevation 56°
 Hazards: No perceptible hazards
 Natural lighting conditions: Daylight

1.5 Flight recorders

1.5.1 Flight Data Recorder – FDR

The EasyJet company did not provide the SAIB with data from the flight data recorders on flight EZY 529Y.

1.5.2 Downlink transmission of flight parameters

The flight level selected in the altitude window of the autopilot is one of the parameters listed in the downlink transmissions from the mode S transponder. At 13:38:00 UTC, flight level 320 was displayed onboard the Airbus EZY 529Y where it remained until 13:42:17 UTC when it was replaced by the value FL 290.

1.5.3 Downlink transmission of TCAS resolution advisories

When a resolution advisory is triggered, the TCAS transfers to its mode S transponder a resolution advisory report, for transmission to the ground in a "Comm-B" response. Traffic advisories are not listed.

The conflict between EZY 529Y and DLH 03K generated a resolution advisory only onboard the Lufthansa Boeing aircraft. Reading the report of this advisory reveals that it was issued from 13:41:17 to 13:41:27 UTC, that it was the positive, corrective and upward sense type, i.e. corresponding to the issue of the spoken and visual warning "*CLIMB, CLIMB*" in the cockpit. It indicates that the two aircrafts' collision avoidance systems communicated with each other but that no complementary resolution advisory was generated onboard flight EZY 529Y.

1.6 ATC procedures

According to the letter of agreement between the Geneva, Milan and Rome control centres, flights to Milan-Malpensa airport must be transferred to Milan control at a maximum flight level of FL 290.

1.7 Additional information

1.7.1 Statements

1.7.1.1 Flight DLH 03K

In their "flight report cockpit" the flight crew of flight DLH 03K stated that they complied with an upward sense resolution advisory RA "*CLIMB, CLIMB*".

1.7.1.2 Flight EZY 529Y

In their "occurrence - flight safety" report, the flight crew of flight EZY 529Y stated that they had only received a traffic advisory TA; the onboard collision avoidance system did not issue a resolution advisory RA.

1.7.1.3 The sector L14 controllers

The L14 sector controllers reported that at the time of the incident the workload was high and the traffic management complex. The radar planner RP added that the occupancy of the frequency was high.

The radar executive - RE controller stated that he did not recall having heard an audible STCA alert.

1.8 Useful or effective investigative techniques

"TA/RA range tau" and "TA/RA vertical tau" diagrams

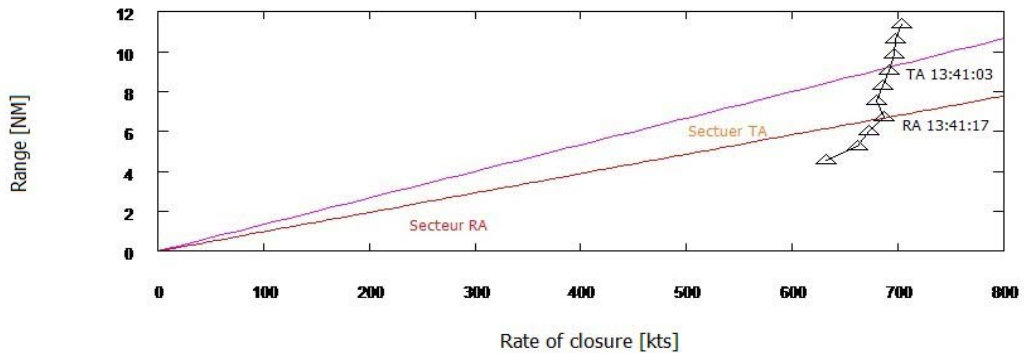
The TCAS system is based on the concept of the time "tau" which it will take an aircraft equipped with the system to cover the distance to the closest point of approach (CPA) with the conflicting aircraft. The time taken to cross the oblique distance which separates them is termed the "range tau" and the time to arrive at the same altitude the "vertical tau". When the two times fall simultaneously below threshold values which depend on the altitude band in which the conflicting aircraft are flying, traffic/resolution advisories are issued; this parameter which defines the sensitivity of the TCAS system as a function of altitude is termed the "sensitivity level" (SL).

The alert sectors can be visualised on diagrams called "TA/RA range tau" and "TA/RA vertical tau", which make it possible to visually represent the sequence of the TA and RA advisories; in reality the boundaries of these areas are changed slightly due to the need for warnings which have to be taken into account in the case of threats with a low rate of convergence.

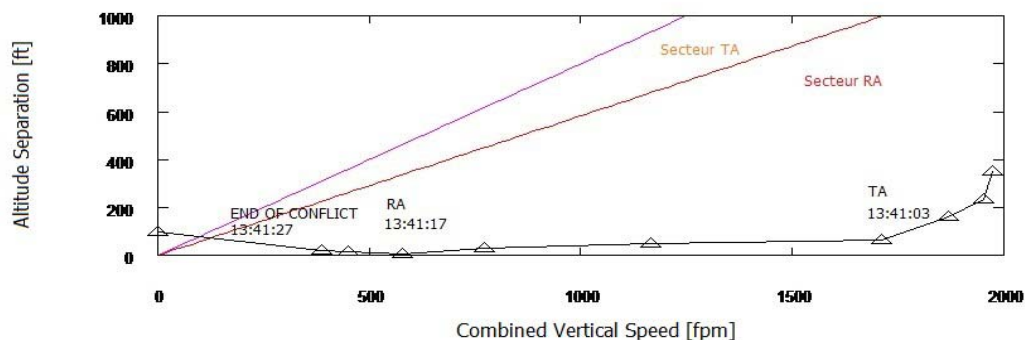
On the basis of the recordings of the radar plots, these "TA/RA" diagrams show the parameters of the relative positions of the conflicting aircraft during the critical phase of the incident, at the 4 second radar refresh rate.

Thus it can be determined that at 13:41:03 UTC the conditions for the triggering of a traffic advisory (TA) were met and at 13:41:17 UTC those for a resolution advisory (RA) were met. The conflict occurred 10 seconds later (13:41:27 UTC).

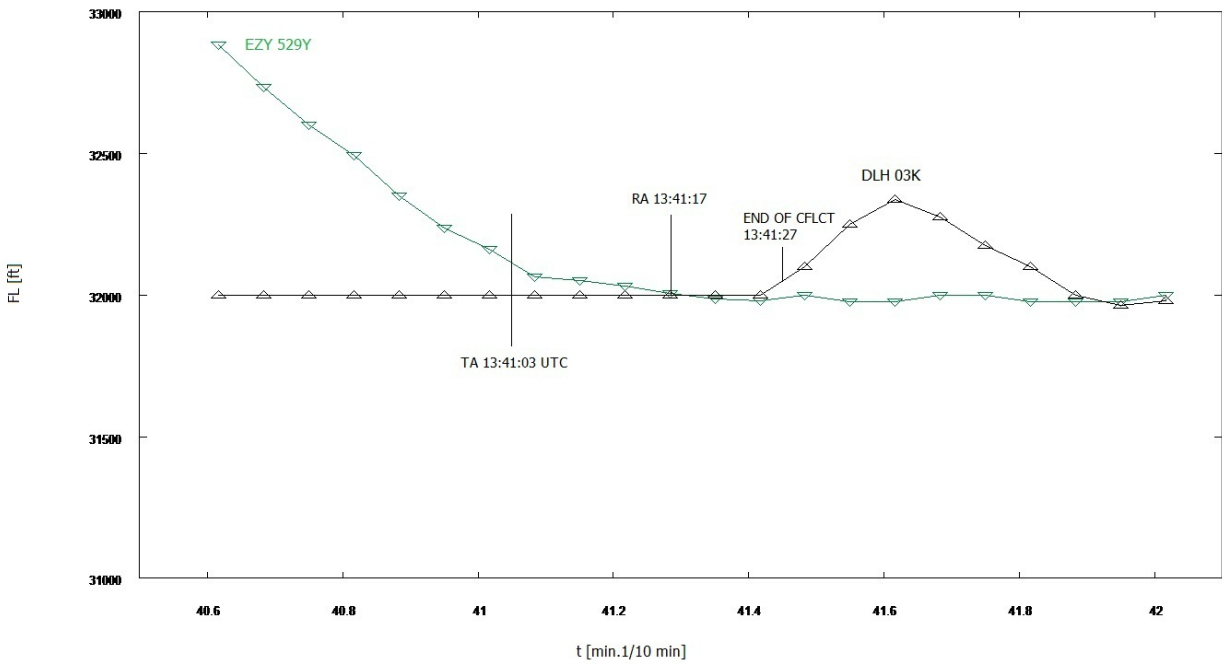
TA/RA RANGE TAU, SL7



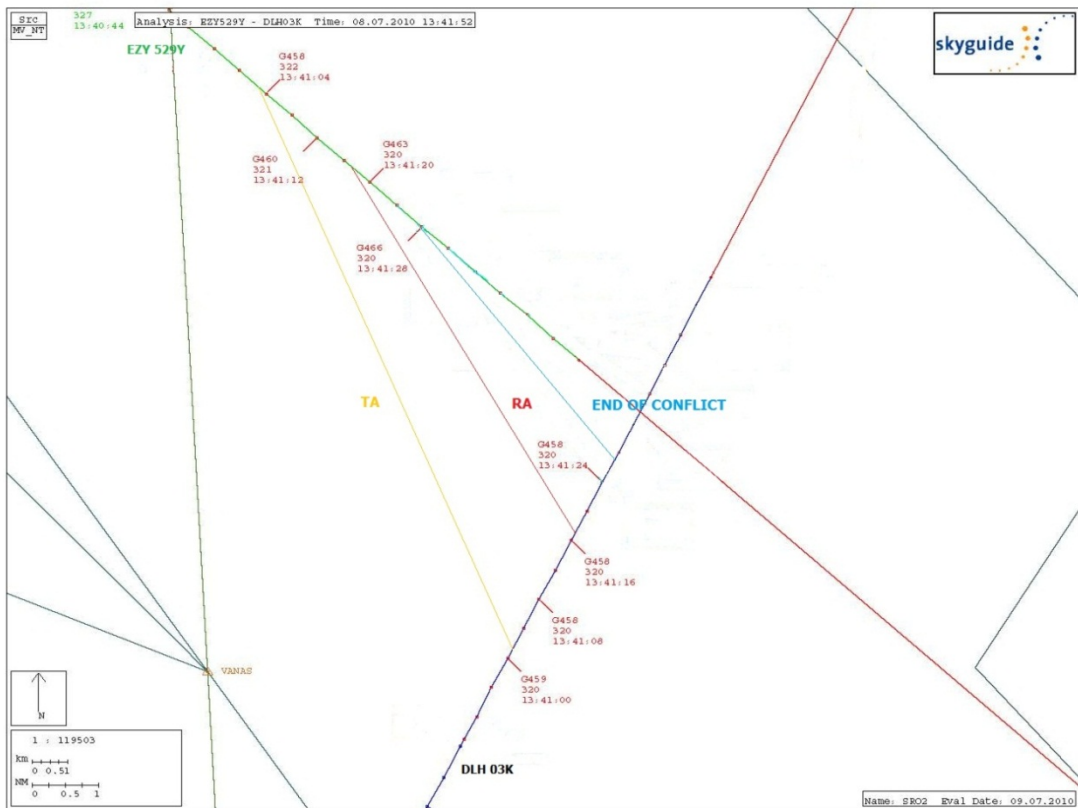
TA/RA VERTICAL TAU, SL 7



PROFILS DE VOL DE DLH 03K ET EZY 529Y



Flight profiles of the conflicting aircraft



Plan view, triggering of the traffic advisories and resolution advisories

The radar data made it possible to establish the flight profiles of DLH 03K and EZY 529Y at the time of the incident; the triggering of the traffic and resolution advisories are shown.

1.9 Technical aspects

1.9.1 Transponder mode S enhanced surveillance – EHS (Mode S enhanced)

In mode S EHS the transponder transmits a number of parameters – Downlink Aircraft Parameters (DAPs) – including the altitude selected in the flight management system.

Fixed wing aircraft that can provide the list of 8 Downlink Aircraft Parameters (DAPs) displayed in the following table are considered to be Mode S EHS capable.

BDS Register	Basic DAP Set
....	
<i>BDS 4.0</i>	<i>Selected Altitude</i>
....	

Note: Binary Data Store (BDS)

If they are appropriately equipped, ATC systems can use this data so that a warning is activated at the control position if the flight level entered by the pilot into his flight management system is different from that which has been entered by the controller into the "air traffic management (ATM)" system. Such systems are already in operation in some European control centres.

2 Analysis

2.1 Air traffic control aspects

During the first call on the L14 sector frequency, the pilot of flight EZY 529Y sector reported the flight level FL 320 entered in his flight management system. The air traffic controller did not realise that this reported flight level was not level FL 330, as cleared by the preceding sector L56. He identified the traffic and instructed it to maintain level FL 330; this clearance was read back correctly.

The recording of the radiotelephone communications revealed that the sentence "*Easy five two nine Yankee, descending flight level three two zero on radar heading one three three*" is distinctly perceptible; the controller was also wearing a headset, and this reduces the possibility of a misunderstanding caused by any ambient noise.

On the other hand, at the time of the incident the elements conducive to an error due to "confirmation bias" were met; the workload was high, traffic management was complex and occupancy of the frequency was high. Furthermore, the repeated presence of the figure "three" at the end of the readback "*... flight level three two zero on radar heading one three three.*" may have led to a reinforcement of the reductive role of thought under these stressful working conditions: the controller retained only that which justified his mental image, namely the flight level FL 330 previously coordinated with sector L56 and displayed on his radar screen." This is what defines a "confirmation bias".

In sector L14, the STCA alert was triggered when flight EZY 529Y had already violated its cleared flight level by some 400 feet. The controller did not hear the alert; he seems to have become aware of the conflict belatedly because it was not until 26 seconds after the alert that he spoke to DLH 03K in an enquiring tone, simply mentioning its call sign and without ordering any avoiding action. It was only at the moment that the pilots of EZY 529Y drew his attention to potentially conflicting traffic that he issued them an evasive heading. This is probably additional evidence of stress and a tunnel effect linked to a very high workload.

2.2 Flight management aspects

2.2.1 Reactions of the flight crews to the TCAS warnings

The traffic advisory issued onboard conflicting aircraft is intended to report to the flight crew that a specific intruder is a possible threat and thus to enable them to prepare to respond to a possible resolution advisory.

The flight crew of flight DLH 03K complied with the "CLIMB, CLIMB" resolution advisory in an appropriate manner. The manoeuvre recommended by the collision avoidance system was initiated within less than 5 seconds and the difference in relation to the cruising level FL 320 was less than 400 feet, consistent with a clear-of-conflict advisory which occurred 10 seconds after triggering of the RA.

The pilots of flight EZY 529Y were also attentive to the possible threat, to the point of reporting their convergence to the air traffic controller.

2.2.2 Flight crew of flight EZY 529Y

In the context of this investigation, the flight crew of flight EZY 529Y showed that they were responding to the traffic advisories in a manner more pronounced than that of preparing for a possible resolution advisory. When they were being controlled by control sector L56, they had reduced their assigned rate of descent of 2000 ft/min when a TA advisory was issued, without taking into account the fact that this restriction on vertical speed was instructed by the controller to ensure traffic separation. Moreover, they reported this concern to ATC and reacted in the same way to the traffic advisory they received later, when passing their cleared flight level FL 330 in descent in control sector L14.

It was certainly the focus on a traffic situation leading to a "TCAS alert" and interpreted as conflictual which disrupted the attention of the pilots EZY 529Y whilst they were cleared to descend to flight level FL 330 (13:37:44 UTC). The instruction was read back correctly but it is possible that this response was mechanical, because of the particular attention given to the traffic advisory; flight level FL 320 had been entered into the flight management system erroneously.

Contact was made with the next sector, L14, in accordance with the standard phraseology, with references to the flight level (FL320) and heading. In his reply, the controller did not note and correct the error which had been made regarding flight level but cleared flight EZY 529Y to the correct level FL 330. The crew again read back this instruction mechanically. In an Airbus A319, the verification loop by the pilots for a flight level assigned by ATC consists of confirming that it is correctly entered into the flight management system: the pilot flying (PF) displays the level in the autopilot altitude window, checks the value shown on his main PFD (Primary Flight Display) screen and the pilot not flying (PNF) confirms the accuracy of this on his PFD. This operation was clearly not carried out, since the flight level FL 330 which was read back was not level FL 320 to which the crew stated they had been cleared at 13:42:20 UTC. This represents a failure to apply the pilot procedure relating to changes in flight levels.

2.3 Technical aspects

2.3.1 Onboard collision avoidance systems

The "TA/RA range tau" and "TA/RA vertical tau" diagrams yield a resolution advisory at the same moment as that detected by the downlink mode S transmission of the DLH 03K transponder (13:41:17 UTC). No alert of this type was recorded for EZY 529Y and its flight crew stated that they had only received a traffic advisory.

This particularity is explained by the following two mitigating factors: the flight profile diagram shows that the resolution advisory was issued onboard DLH 03K at the moment when EZY 529Y was acquiring flight level FL 320; complying with it resulted in a rapid divergence of the two aircraft, which were then no longer in conflict. The advisory ceased when DLH 03K had deviated vertically by only about a hundred feet from its cruising level. Subsequently, the plan view shows that the trajectories have a closest point of approach in excess of 2 NM, located after two aircraft crossed.

In the "TA/RA vertical tau" diagram the geometry of such an encounter is characterised by a curve of the relative positions of the aircraft which is located within the TA/RA sectors but just a few seconds from their cut-offs. The threat

detection logic of TCAS version 7.0 detects these potentially low-conflict convergences and by means of HMD (horizontal miss distance) filters reduces the triggering of RAs in relation to an intruder aircraft with a large distance to the closest point of approach.

2.3.2 Mode S EHS

If the ATM equipment of the Geneva ACC were able to use data of the transponders in mode S EHS, a warning would have been activated at the control position to report the difference between the flight levels entered onboard EZY 529Y and into the ATM system. This would probably have enabled the controller to take action before a dangerous convergence took place. This system is currently being implemented in the Geneva ACC.

3 Conclusions

3.1 Findings

3.1.1 General

- The incident occurred near waypoint VANAS, 50 NM south south-east of Geneva, in class A airspace.
- At the time of the incident, sectors L1, L2, L3 and L4 were combined under the designation L14.

3.1.2 Technical aspects

- The two aircraft involved in the serious incident were equipped with an onboard TCAS collision avoidance system.
- The mode S transponder downlink transmission indicates that at 13:41:17 UTC an upward sense resolution advisory ("*CLIMB, CLIMB*") was issued by the onboard collision avoidance system of the Boeing DLH 03K.
- The conflict did not generate a resolution advisory RA onboard the Airbus EZY 529Y.
- At 13:40:49 UTC, the STCA was activated in sector L14 to indicate a potential conflict between EZY 529Y passing flight level FL 326 in descent and DLH 03K which was maintaining flight level FL 320.
- The Geneva ACC ATM equipment is not able to use the data from transponders in mode S EHS.

3.1.3 Crews

- The pilots of flights EZY 529Y and DLH 03K were in possession of the appropriate licences.
- The flight crew of flight EZY 529Y stated on the frequency that they had only received a traffic advisory TA, with no resolution advisory RA.

3.1.4 Air traffic controllers

- The L56 and L14 sector air traffic controllers were in possession of the appropriate licences.
- The L14 sector controllers stated that at the time of the incident the workload was high, traffic management was complex and occupancy of the frequency was high.
- Twenty-six seconds elapsed between the STCA alert and the first intervention on the frequency by the sector L14 RE controller.

3.1.5 History of the serious incident

- At 13:37:50 UTC the sector L56 controller cleared flight EZY 529Y to descend to flight level FL 330.
- The downlink transmissions from the mode S transponder show that at 13:38:00 UTC flight level FL 320 was entered onboard the Airbus EZY 529Y and remained there until 13:42:17 UTC when it was replaced by the value FL 290.
- At 13:41:32 UTC, the L14 sector controller instructed the flight crew of flight EZY 529Y to turn immediately right onto a heading of 190°.
- At 13:41:48 UTC, the two aircraft had a lateral distance of 2.2 NM and an altitude difference of 125 ft.

3.2 Causes

The serious incident is attributable to the dangerous convergence of an aircraft descending below its cleared flight level, to the same level occupied by an aircraft crossing on a perpendicular route.

Factors which played a part in the incident:

- An incorrect flight level was entered into the flight management system by the flight crew of EZY 529Y.
- The controller did not realise that the crew reported an incorrect cleared flight level during the initial contact on his frequency.
- During this contact, the flight crew did not carry out the appropriate verification of the flight level which it correctly read back.

Payerne, 30 October 2012

Swiss Accident Investigation Board

This final report was approved by the management of the Swiss Accident Investigation Board SAIB (Art. 3 para. 4g of the Ordinance on the Organisation of the Swiss Accident Investigation Board of 23 March 2011).

Berne, 8 November 2012