



# **Final Report No. 2183 of the Swiss Accident Investigation Board SAIB**

Concerning the serious incident  
(AIRPROX)

involving an A319-111 aircraft, callsign  
EZS 98DJ

and an A321-112 aircraft, callsign  
AZA 23B

on 6 August 2011, 14 NM WNW of  
Geneva

Near waypoint MILPA

## General information on this report

This report contains the Swiss Accident Investigation Board's (SAIB) conclusions on the circumstances and causes of this serious incident.

In accordance with Art. 3.1 of the 10<sup>th</sup> edition, applicable from 18 November 2010, of Annex 13 of the Convention on International Civil Aviation (ICAO) 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 expressly not the purpose of this report to determine blame or clarify questions of liability.

If this report is used for purposes other than accident prevention, this may give rise to erroneous interpretations.

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

Unless otherwise indicated, all times in this report are stated in co-ordinated universal time (UTC). At the time of the serious incident, Central European summer time (CEST) applied as local time (LT) in Switzerland. The relationship between LT, CEST, and UTC is:  $LT = CEST = UTC + 2 \text{ hours}$ .

## Table of contents

<b>Summary</b> .....	<b>5</b>
<b>Investigation</b> .....	<b>6</b>
<b>Synopsis</b> .....	<b>6</b>
<b>Cause</b> .....	<b>6</b>
<b>Safety recommendation</b> .....	<b>6</b>
<b>0 Foreword</b> .....	<b>7</b>
<b>1 Factual information</b> .....	<b>7</b>
<b>1.1 History of the serious incident</b> .....	<b>7</b>
1.1.1 General.....	7
1.1.2 History of the serious incident .....	8
1.1.3 Location of the serious incident.....	12
<b>1.2 Personnel information</b> .....	<b>13</b>
1.2.1 Crew of EZS 98DJ.....	13
1.2.1.1 Commander .....	13
1.2.1.2 Copilot.....	14
1.2.2 Crew of AZA 23B.....	15
1.2.2.1 Commander .....	15
1.2.2.2 Co-pilot .....	16
1.2.3 Air traffic controllers.....	17
1.2.3.1 Radar Executive Sector L34.....	17
1.2.3.2 Radar Planner Sector L34 .....	17
1.2.3.3 Radar Executive Sector L56.....	17
1.2.3.4 Radar Planner Sector L56 .....	18
<b>1.3 Aircraft information</b> .....	<b>18</b>
1.3.1 Aircraft 1 .....	18
1.3.2 Aircraft 2 .....	18
<b>1.4 Meteorological information</b> .....	<b>19</b>
1.4.1 General meteorological situation.....	19
1.4.2 Meteorological situation at the time of the incident .....	19
<b>1.5 Safety nets</b> .....	<b>19</b>
1.5.1 The STCA system in Geneva.....	19
1.5.2 Onboard equipment.....	20
<b>1.6 Additional information</b> .....	<b>21</b>
1.6.1 Flight crews .....	21
1.6.2 Air traffic controllers.....	21
<b>1.7 Useful or effective investigation techniques</b> .....	<b>22</b>
1.7.1 TCAS simulation.....	22
<b>1.8 Technical aspects</b> .....	<b>22</b>
1.8.1 Transponder Mode S Enhanced Surveillance – EHS .....	22
<b>1.9 Parameterisation of the STCA</b> .....	<b>22</b>
<b>2 Analysis</b> .....	<b>23</b>
<b>2.1 Technical aspects</b> .....	<b>23</b>
<b>2.2 Human and operational factors</b> .....	<b>23</b>
2.2.1 Air traffic control .....	23
2.2.1.1 Sector L34 controllers.....	23
2.2.1.2 Sector L56 controllers.....	23

2.2.1.3	The Marseille sector Y1 radar controller.....	23
2.2.2	Procedures and systems.....	24
2.2.3	Flight crews .....	24
2.2.3.1	EZS 98DJ .....	24
2.2.3.2	AZA 23B .....	24
2.2.3.3	General considerations.....	24
<b>3</b>	<b>Conclusions.....</b>	<b>25</b>
<b>3.1</b>	<b>Findings.....</b>	<b>25</b>
3.1.1	General framework.....	25
3.1.2	Technical aspects.....	25
3.1.3	Flight crews .....	25
3.1.4	Air traffic controllers.....	25
3.1.5	History of the serious incident .....	25
3.1.6	Environmental aspects.....	26
<b>3.2</b>	<b>Cause .....</b>	<b>26</b>
<b>4</b>	<b>Safety recommendations and measures taken after the serious incident .</b>	<b>27</b>
4.1	Measures taken after the serious incident .....	27
<b>Annexes.....</b>		<b>28</b>
Annex 1	Trajectories: EZS 98DJ and AZA 23B.....	28
Annex 2	Flight profiles and alerts .....	29
Annex 3	Radar plot.....	30

## Final report

### Summary

#### EZS 98DJ

Owner	Celestial Aviation Trading 30, Limited Aviation House, Shannon, Co. Clare, Ireland
Operator	EasyJet Switzerland SA, Case postal 831, 1215 Geneva, Switzerland
Manufacturer	Airbus SAS, Toulouse, France
Aircraft type	A319-111
Country of registration	Switzerland
Registration	HB-JZQ
Flight number	EZS 1059
Callsign	Topswiss niner eight Delta Juliet
Flight rules	IFR
Type of operation	Scheduled flight
Departure point	Basel-Mulhouse LFSB
Destination point	Palma de Mallorca LEPA

#### AZA 23B

Owner	JB576 INC., 2711 Centerville Road, Wilmington, USA
Operator	Alitalia Linee Aeree, Piazza Almerico da Schio 3, 00054 Fiumicino (RM), Italy
Manufacturer	Airbus SAS, Toulouse, France
Aircraft type	A321-112
Country of registration	Italy
Registration	I-BIXN
Flight number	AZA 325
Callsign	Alitalia three two Bravo
Flight rules	IFR
Type of operation	Scheduled flight
Departure point	Paris Charles de Gaulle LFPG
Destination point	Rome Fiumicino LIRF
Location	14 NM WNW of Geneva, near waypoint MILPA
Date and time	6 August 2011, 16:30 UTC
ATS unit	Geneva ACC
Airspace	Class A
Applicable separation minima	5 NM or 1000 ft
Minimum lateral and vertical distances	2.1 NM and 670 ft

## Investigation

The serious incident occurred on 6 August 2011 at 16:30 UTC. It was notified on 9 August 2011 at approx. 13:57 UTC. After gathering preliminary information on the case, the AAIB opened an investigation on 26 August 2011 at 15:26 UTC.

The AAIB reported the incident to the French and Italian authorities which nominated an accredited representative. The airspace in which the serious incident took place is located in France. The competent authorities of this country delegated the investigation to their Swiss counterparts.

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

## Synopsis

The incident occurred near waypoint MILPA. It was caused by the convergence of a cruising aircraft and another aircraft in climbing phase, the routes of which crossed at right angles. Air traffic control issued the crew of the climbing aircraft a flight level 2000 ft below the first aircraft. The crew read back the cleared flight level correctly but entered an incorrect flight level into their navigation system, i.e. above that of the cruising aircraft.

## Cause

The serious incident is due to a dangerous convergence of a cruising aircraft and an aircraft which climbed higher than its cleared flight level following the entry of an incorrect flight level into the flight management system.

Factor contributing to the serious incident:

Absence of a system capable of detecting the discrepancy between the flight level cleared by ATC and that selected by the crew.

## Safety recommendation

A safety recommendation for a similar serious incident on 10 June 2011 was issued in report no.2165. (HHN 201-GWI2529).

According to the directives of Annex 13 of the ICAO the safety recommendations formulated in this report are addressed to the supervisory authorities of the State concerned. It is up to its authorities to decide what action to take. However all organisations, companies and individuals are invited, in the sense of the safety recommendation, to improve flight safety.

In the ordinance on the investigation of aircraft accidents and serious incidents, the Swiss legislation prescribes the following directives concerning safety recommendations:

*"Art. 32 Recommendations concerning safety*

<sup>1</sup> *DETEC, on the basis of the safety recommendations in the reports of the SAIB and in the reports of foreign origin, shall address implementation orders or recommendations to the FOCA.*

<sup>2</sup> *The FOCA periodically informs DETEC of the implementation of the orders or recommendations issued.*

<sup>3</sup> *DETEC shall inform the SAIB at least twice a year of the status of implementation in the FOCA."*

## 0 Foreword

Similar incidents have been the subject of investigations in the past. Flight crew members had correctly read back a cleared flight level but entered an incorrect flight level into the altitude window, thereby creating potentially dangerous situations.

## 1 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 radiotelephony communications, the coordinations between the control sectors, the radar recordings, the flight data (digital flight data recorder - DFDR), the log of the Short Term Conflict Alert (STCA) system and those of the Mode S data downlinks. It is also based on the depositions and incident reports of the air traffic controllers and the crew members.

At the time of the serious incident, sectors L1 and L2 were coupled under the designation L12, L3 and L4 under L34, and sectors L5 and L6 under the designation L56.

L6	FL 375 +	L56
L5	FL 355 – FL 374	
L4	FL 335 – FL 354	L34
L3	FL 315 – FL 334	
L2	FL 285 – FL 314	L12
L1	FL 245 – FL 284	
	Lower limit of air corridors - FL 244	INI North

Fig. 1 Sectorisation at Geneva at the time of the serious incident

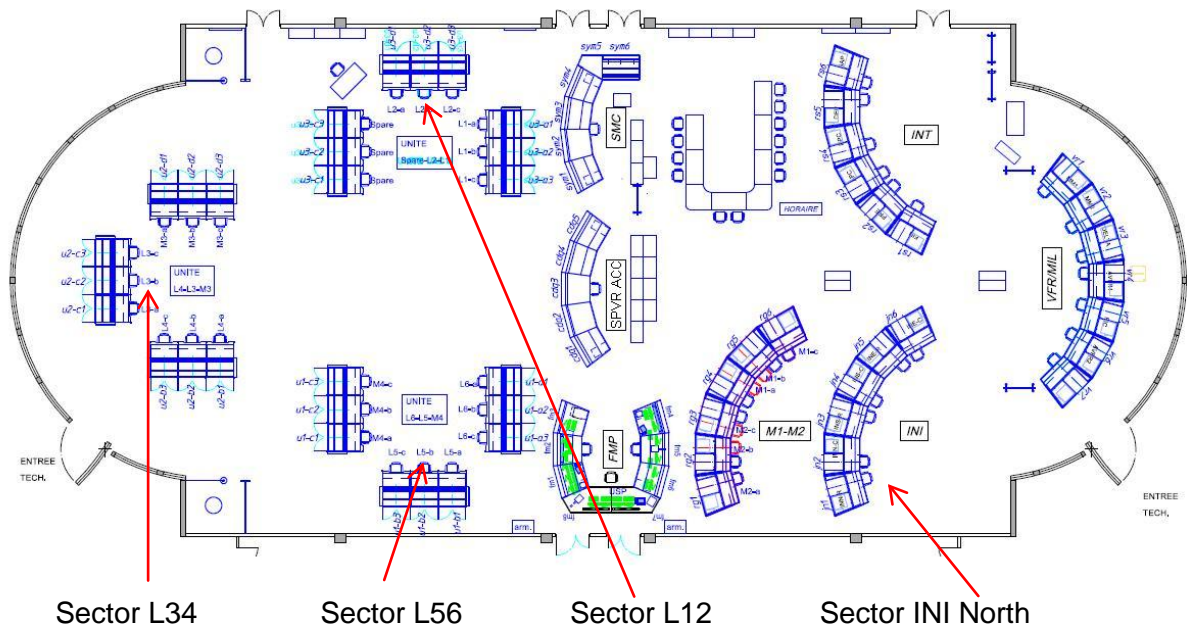


Fig. 2 Workstations – control sectors at Geneva at the time of the incident

#### EZS 98DJ

During the flight, the co-pilot was at the controls of the aircraft (pilot flying - PF); he was in the line training phase. The commander performed the function of assistant pilot (pilot not flying - PNF).

#### AZA 23 B

During the flight, the co-pilot was at the controls of the aircraft (PF); the commander performed the function of assistant pilot (PNF).

The flights of the two aircraft took place under instrument flight rules (IFR).

#### 1.1.2 History of the serious incident

On 6 August 2011, an EasyJet Switzerland Airbus A319, callsign Topswiss 98DJ, was en route from Basel-Mulhouse to Palma de Mallorca. At 16:16:36 UTC, the pilot made contact with sector INI North of Geneva Control Centre on the 134.025 MHz frequency. He reported he was heading for waypoint GILIR and passing flight level FL 140 towards flight level FL 190. ATC confirmed radar contact and at 16:17:24 UTC cleared him to continue the climb to flight level FL 240. These clearances were read back correctly.

At 16:19:19 UTC, control cleared EZS 98DJ to flight level FL 260. Subsequently, the pilot was requested to contact sector L12 on the 134.850 MHz frequency.

At 16:20:38 UTC, the pilot reported on the sector L12 frequency: "Swiss radar hello Topswiss nine eight Delta Juliet, climbing flight level two six zero, direct GILIR... passing flight level two three zero." Control cleared him to continue climbing to flight level FL 300 and instructed him to maintain a minimum rate of climb of 1000 ft/minute.

At 16:21:54 UTC, flight EZS 98DJ was cleared to flight level FL 310; the restriction on the rate of climb was lifted.



At 16:22:17 UTC, flight EZS 98DJ received clearance to fly via waypoints TUROM - MILPA - BALSJ.

At 16:22:33 UTC, flight EZS 98DJ was transferred to the sector L34 frequency, 134.315 MHz. During the first call on this frequency at 16:23:12 UTC, the controller cleared the crew to continue their climb to flight level FL 350. This clearance was read back correctly. The crew entered flight level FL 390 into the altitude window of the flight management system without either of the two crew members realising the mistake.

At 16:28:47 UTC, flight EZS 98DJ was transferred to the Marseille Control Centre frequency of 127.540 MHz. It was 8 NM north of waypoint MILPA, passing flight level FL 345 with a rate of climb of 1400 ft/min.



Fig. 3 Radar image at the time of the transfer of communication of flight EZS 98DJ from Swiss radar to the Marseille Control Centre

Meanwhile, an Alitalia Airbus A321, callsign AZA 23B, was making a scheduled flight from Paris Charles de Gaulle to Rome Fiumicino. It was maintaining flight level FL 370 and was in radio contact with sector L56 which controlled the airspace above that controlled by sector L34. The flight was following a route at right angles to that of flight EZS 98DJ.

In the Marseille Control Centre, the STCA was triggered at 16:29:11 UTC, when flight EZS 98DJ was 4 NM north of MILPA and passing flight level FL 350 in a climb. The aircraft was outside the image as displayed on the Y1 sector screen and the pilot had not yet made his first call on the frequency.

At 16:29:19 UTC, the pilot of flight EZS 98DJ reported on the Marseille frequency: "*Marseille hello Topswiss niner eight delta juliet, MILPA BALSJ flight level three five four climbing three niner zero.*" The aircraft was approximately 3 NM north of MILPA but still did not appear on the screen.

The controller was unable to determine the origin of the call and addressed a different aircraft at 16:29:35 UTC. During this period the occupancy of the frequency was high.

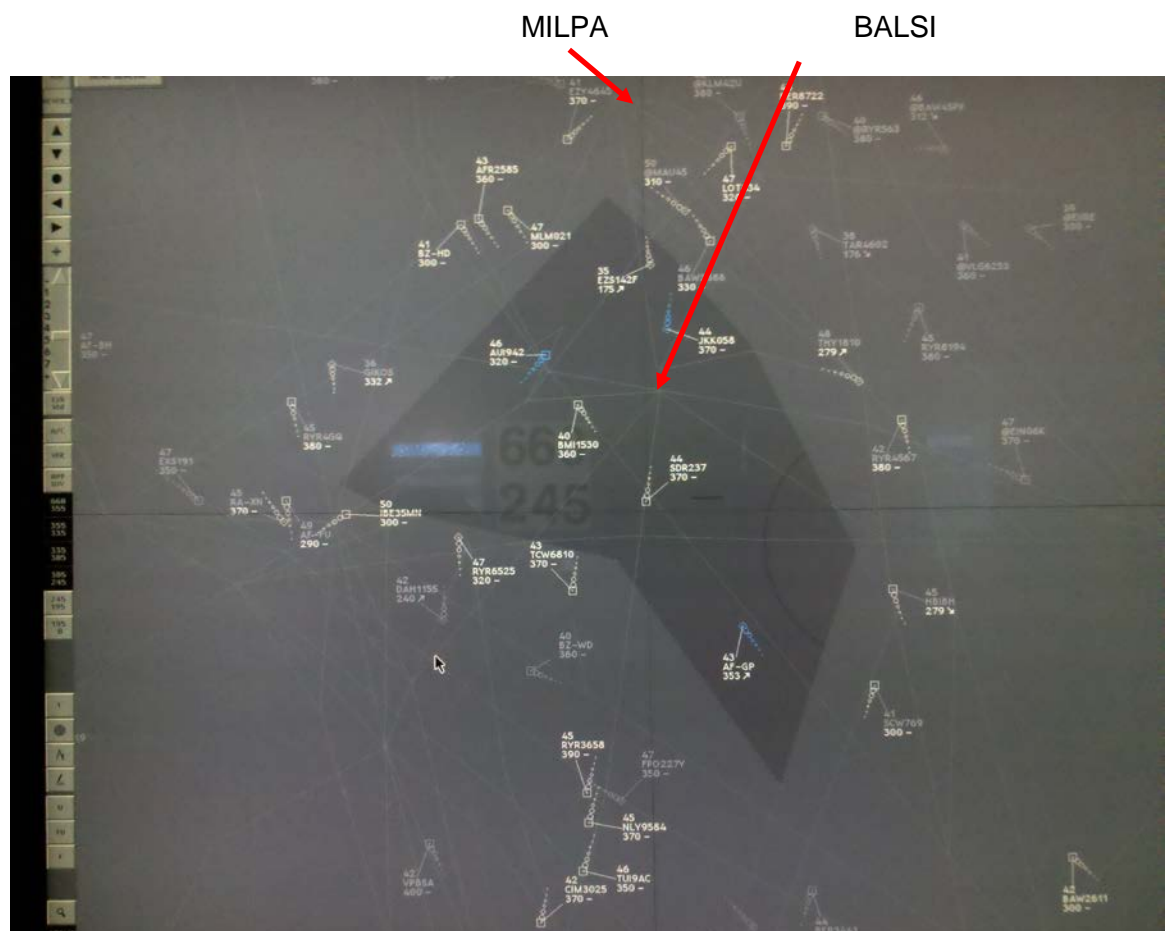


Fig.4 Image on the screen of the Marseille sector Y1 controller at 16:29:19 UTC at the time of the first call from the pilot of flight EZS 98DJ on this sector's frequency. The aircraft is not yet visible on the screen.

At 16:29:32 UTC, according to the DFDR data, the crew of flight AZA 23B received a traffic advisory (TA) from their traffic alert and collision avoidance system (TCAS). At the same time, the crew of flight EZS 98DJ also received a TA; the distances between the two aircraft were 5.9 NM laterally and 1430 ft vertically.

At 16:29:41 UTC, the Marseille Y1 sector controller replied to flight EZS 98DJ: "*Top swiss niner eight delta juliet, hello. Maintain three five zero reaching.*" The

pilot replied: "Maintain three niner zero reaching, Top swiss niner eight delta juliet". The controller corrected him, saying: "Top swiss delta juliet, I confirm level three five zero." At this moment, EZS 98DJ had just passed flight level FL 361 in a climb.

Following a call from another aircraft, the Marseille controller again contacted the crew of flight EZS 98DJ, instructing them to descend immediately to flight level FL 350 and informing them of the presence of other traffic just above, at flight level FL 370. The pilot read back this instruction correctly.

A little earlier, at 16:29:23 UTC, the label of flight EZS 98DJ appeared on the radar screens at Geneva Control Centre sector L56; the flight was passing flight level FL 353 in a climb. Since this flight was not known to this sector, the radar planner RP then initiated a telephone coordination with sector L34: "How high is that Topswiss climbing?" The sector L34 RP replied that this flight had been cleared to flight level FL 350 and that the pilot had read back this flight level. The sector L56 RP urged the sector L34 controllers to instruct flight EZS 98DJ to make an immediate descent and to inform it of converging traffic at flight level FL 370. The L34 RP replied that flight EZS 98DJ was in contact with Marseille.



Fig. 5 First appearance of the radar label of flight EZS 98DJ on the screens of sector L56



Fig 6 The STCA is triggered in Geneva sectors L34 and L56

At 16:29:38 UTC, the short term conflict alert (STCA) safety net was triggered in sectors L34 and L56; the distances between the two flights were 5.15 NM laterally and 1300 ft vertically.

At 16:29:48 UTC, the crew of flight AZA 23B received a climb resolution advisory (RA). The crew immediately initiated a climb manoeuvre.

At 16:29:54 UTC, when flight EZS 98DJ was passing flight level FL 361 in a climb, it received a resolution advisory (RA) of the "adjust vertical speed" type. Its distance from flight AZA 23B was 3.5 NM.

At 16:29:58 UTC, flight EZS 98DJ received a descend resolution advisory. Flight EZS 98DJ climbed to flight level FL 363 before initiating the descent.

At 16:30:01 UTC, the sector L56 RE issued essential traffic information to the pilot of flight AZA 23B: "*Alitalia two three Bravo, essential traffic information at your... eleven o'clock... Position range 1 mile and is not in contact with us, climbing through your level.*" The pilot replied to him that they were following a TCAS climb resolution advisory.

At 16:30:10 UTC, the maximum convergence between the two flights took place; the respective distances were 2.1 NM laterally and 670 ft vertically.

At 16:30:15 UTC, the L34 RP, aware of a telephone coordination with Marseille sector Y1, was informed that at the time of the first call on the Marseille frequency the crew of flight EZS 98DJ had reported that they were climbing to flight level FL 390.

The crew of flight EZS 98DJ did not inform ATC of the triggering of a resolution advisory (RA).

The pilots of the two aircraft did not have visual contact with the other aircraft.

### 1.1.3 Location of the serious incident

Location	14 NM WNW of Geneva, near waypoint MILPA
Date and time	6 August 2011, 16:30 UTC

Lighting conditions	Daylight
Coordinates	46 18 09 N 005 52 47 E
Altitude or flight level	FL 370
<b>1.2 Personnel information</b>	
1.2.1 Crew of EZS 98DJ	
1.2.1.1 Commander	
Training	
Person	British citizen, born 1962
Licence	ATPL(A) (air transport pilot licence aeroplane) according to Joint Aviation Requirements (JAR), first issued by the Federal Office of Civil Aviation (FOCA) on 11 March 2011 and valid till 15 April 2016.
Ratings class/type	Type A320 pilot in command (PIC), valid till 6 November 2011. English Level 6 unlimited.
Ratings	Instrument flight IR(A), Night flight NIT(A), flight instructor TRI (Type Rating Instructor) (A) restricted, valid till 26 March 2014
ACAS training	Training course with Eastern Airways in 2001
Medical certificate	Class 1 / 2, without restriction Valid from 16 April to 29 April 2012
Last medical examination	16 April 2011
Start of aeronautical training	1997
Flying experience	
Total hours	7500 hours
Of which on the type involved	5000 hours
During the last 24 hours	3:24 hours
Of which on the type involved	3:24 hours
As commander	3:24 hours
Duty times and rest times	
Start of duty in the 48 hours before the serious incident	Rest day 4 August
End of duty in the 48 hours before the serious incident	Rest day 5 August
Period of flight duty in the 48 hours before the serious incident	6:30 hours

	Rest period in the 48 hours before the serious incident	41:30 hours
	Flight duty time at the time of the serious incident	5:30 hours
1.2.1.2	Copilot	
	Training	
	Person	British citizen, born 1984
	Licence	CPL(A) (commercial pilot licence aeroplane) according to Joint Aviation Requirements (JAR), first issued by the United Kingdom Civil Aviation Authority (CAA) on 1 November 2010 and valid till 31 October 2015.
	Ratings class/type	Type A320
		Language Proficiency English
	Ratings	Instrument flight IR(A)
	ACAS training	Training course May 2011
	Medical certificate	Class 1 / 2, without restriction
		Valid from 12 January 2011 to 30 January 2012 (class 1), and to 30 January 2016 (class 2) respectively
	Last medical examination	12 January 2011
	Start of aeronautical training	July 2009
	Flying experience	
	Total hours	408 hours
	Of which on the type involved	223 hours
	During the last 24 hours	3:24 hours
	Of which on the type involved	3:24 hours
	As co-pilot	3:24 hours
	Duty times and rest times	
	Start of duty in the 48 hours before the serious incident	Rest day 4 August
	End of duty in the 48 hours before the serious incident	Rest day 5 August
	Flight duty time in the 48 hours before the serious incident	6:30 hours
	Rest period in the 48 hours before the serious incident	41:30 hours

	Flight duty time at the time of the serious incident	5:30 hours
1.2.2	Crew of AZA 23B	
1.2.2.1	Commander	
	Training	
	Person	Italian citizen, born 1966
	Licence	ATPL(A) (air transport pilot licence aeroplane) according to Joint Aviation Requirements (JAR), first issued by the Italian Civil Aviation Authority (ENAC) on 25 October 2005 and valid till 30 October 2015
	Ratings	Instrument flight IR(A) on A320, renewed on 25 January 2011 and valid till 31 March 2012. English Level 5, valid till 28 September 2016.
	Last proficiency test	25 January 2011
	Medical certificate	Class 1 Valid from 1 June to 1 December 2011
	Last medical examination	1 June 2011
	Flying experience	
	Total hours	9342:34 hours
	During the last 24 hours	6:10 hours
	Of which on the type involved	6:10 hours
	As commander	6:10 hours
	Duty times and rest times	
	Start of duty in the 48 hours before the serious incident	4 August 2011: rest day 5 August 2011: 12:05 UTC 6 August 2011: 14:40 UTC
	End of duty in the 48 hours before the serious incident	4 August 2011: rest day 5 August 2011: 21:45 UTC 6 August 2011: 16:30 UTC
	Period of flight duty in the 48 hours before the serious incident	9:40 hours
	Rest period in the 48 hours before the serious incident	38:20 hours
	Flight duty time at the time of the serious incident	1:50 hours

1.2.2.2	Co-pilot	
	Training	
	Person	Italian citizen, born 1972
	Licence	ATPL(A) (air transport pilot licence aeroplane) according to Joint Aviation Requirements (JAR), first issued by the <i>Ente Nazionale per l'Aviazione Civile</i> (ENAC) on 12 February 2009 and valid till 26 April 2014.
	Ratings Class/Type	Type A320 co-pilot, valid till 24 November 2011. English Level 5, valid till 25 October 2016.
	Ratings	Instrument flight IR(A) on A320, renewed on 15 November 2010 and valid till 24 November 2011.
	Last proficiency test	15 November 2010
	Medical certificate	Class 1, without restriction Valid from 3 December 2010 to 3 December 2011
	Last medical examination	3 December 2010
	Flying experience	
	Total hours	7602:19 hours
	During the last 24 hours	6:59 hours
	Of which on the type involved	6:59 hours
	As co-pilot	6:59 hours
	Duty times and rest times	
	Start of duty in the 48 hours before the serious incident	4 August 2011: rest day 5 August 2011: 12:05 UTC 6 August 2011: 14:40 UTC
	End of duty in the 48 hours before the serious incident	4 August 2011: rest day 5 August 2011: 21:45 UTC 6 August 2011: 16:30 UTC
	Period of flight duty in the 48 hours before the serious incident	9:40 hours
	Rest period in the 48 hours before the serious incident	38:20 hours
	Flight duty time at the time of the serious incident	1:50 hours



- 1.2.3 Air traffic controllers
- 1.2.3.1 Radar Executive Sector L34
- Person German citizen, born 1984
- Start of duty on the day of the incident 14:20 UTC
- Licence Air Traffic Controller Licence on the basis of Directive 2006/23 of the European Community, first issued by the Federal Office of Civil Aviation (FOCA) on 14 September 2007.
- Ratings Ratings: Area Control Surveillance ACS. Rating Endorsement: Radar RAD (ACS), Licence Endorsement: On-the-Job Training Instructor OJTI
- Current competences: Unit endorsement: Location LSAG, Sector group Upper Control Area UTA
- Language endorsement English Level 5, valid till 8 October 2016
- Medical certificate Class 3, without restriction, valid till 18 October 2011
- 1.2.3.2 Radar Planner Sector L34
- Person Swiss citizen, born 1976
- Start of duty on the day of the incident 13:30 UTC
- Licence Air Traffic Controller Licence on the basis of Directive 2006/23 of the European Community, first issued by the Federal Office of Civil Aviation (FOCA) on 18 December 1998.
- Ratings Ratings: Area Control Surveillance ACS. Rating Endorsement: Radar RAD (ACS), Licence Endorsement: On-the-Job Training Instructor OJTI
- Current competences: Unit endorsement: Location LSAG, Sector group UTA
- Language endorsement English Level 5, valid till 25 January 2017
- Medical certificate Class 3, without restriction, valid till 10 February 2012
- 1.2.3.3 Radar Executive Sector L56
- Person German citizen, born 1985
- Start of duty on the day of the incident 14:20 UTC
- Licence Air Traffic Controller Licence on the basis of Directive 2006/23 of the European Community, first issued by the Federal Office of Civil Aviation (FOCA) on 10 March 2009.
- Ratings Ratings: Area Control Surveillance ACS. Rating Endorsement: Radar RAD (ACS)

		Current competences: Unit endorsement: Location LSAS, Sector group UTA W
	Language endorsement	English Level 4, valid till 31 March 2012
	Medical certificate	Class 3, without restriction, valid till 3 March 2013
1.2.3.4	<b>Radar Planner Sector L56</b>	
	Person	Swiss citizen, born 1974
	Start of duty on the day of the incident	10:40 UTC
	Licence	Air Traffic Controller Licence on the basis of Directive 2006/23 of the European Community, first issued by the Federal Office of Civil Aviation (FOCA) on 18 December 1996.
	Ratings	Ratings: Area Control Surveillance ACS. Rating Endorsement: Radar RAD (ACS), Licence Endorsement: On-the-Job Training Instructor OJTI  Current competences: Unit endorsement: Location LSAG, Sector group UTA
	Language endorsement	English Level 4, valid till 27 October 2013
	Medical certificate	Class 3, without restriction, valid till 20 April 2012
<b>1.3</b>	<b>Aircraft information</b>	
1.3.1	<b>Aircraft 1</b>	
	Registration	HB-JZQ
	Aircraft type	Airbus A319 -111
	Characteristics	Twin jet engine, short and medium haul
	Manufacturer	Airbus S.A.S., Toulouse, France
	Year of manufacture	2005
	Serial no.	2450
	Owner	Celestial Aviation Trading 30 Limited Aviation House, Shannon, Co. Clare, Ireland
	Operator	EasyJet Switzerland, Case postale 831, 1215 Geneva, Switzerland
	Equipment	TCAS II
1.3.2	<b>Aircraft 2</b>	
	Registration	I-BIXN
	Aircraft type	Airbus A321-112
	Characteristics	Twin jet engine, short and medium haul
	Manufacturer	Airbus S.A.S., Toulouse, France
	Year of manufacture	1996

Serial no.	576
Owner	JB 576, INC., 2711 Centerville Rd, Suite 400, Wilmington 19808 Delaware, USA
Operator	Alitalia Linee Aeree, Piazza Almerico da Schio 3, I – 00054 Fiumicino(RM), Italy
Equipment	TCAS II

## 1.4 Meteorological information

### 1.4.1 General meteorological situation

A low pressure area centred over the British Isles was bringing warm and humid air from the south of France towards the Alps. Switzerland was in an extended warm sector, behind a warm front which extended from Luxembourg to the Bavarian pre-Alps.

### 1.4.2 Meteorological situation at the time of the incident

At altitudes between 36,300 and 37,000 ft the air was not saturated with moisture. The two aircraft were very probably in a cloud-free zone. This is corroborated by the ascents of radio probes at Payerne at 12:00 UTC and 00:00 UTC and by satellite images showing the temperature of the upper cloud limit. Most of the cloud in the region of waypoint MILPA had temperatures above  $-20^{\circ}$  C. The coldest cloud to the west of Geneva had values of  $-35$  to  $-30^{\circ}$  C, between 18:00 UTC and 18:30 UTC. This corresponds to the altitude of the cloud ceilings between 28,000 ft and 30,000 ft.

It is probable that the aircraft in level flight at FL 370 was generating partial condensation trails.

The following values represent an average of the radio probe ascents at Payerne made at 12 UTC and 00 UTC. The calculation of the average value is reliable, to the extent that Payerne was in a warm air sector throughout these 12 hours.

<i>Wind FL 370</i>	<i>260 degrees / 44 kt</i>	
<i>Temperature / dew point</i>	<i>-53 °C / -60 °C</i>	
<i>Wind FL 363</i>	<i>260 degrees / 45 kt</i>	
<i>Temperature / dew point</i>	<i>-51 °C / -57 °C</i>	
<i>Position of the sun</i>	<i>Azimuth: 269°</i>	<i>Elevation: 25°</i>
<i>Natural lighting conditions</i>	<i>Daylight</i>	

## 1.5 Safety nets

### 1.5.1 The STCA system in Geneva

Among the equipment of the processing chain for radar data 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 either vertical or horizontal planes, warns the controller by means of an audible and visual alert. It is activated with an advance warning time to allow for the reaction of the controller/pilot/aircraft loop: the controller evaluates the conflict situation, determines the appropriate action and if necessary issues appropriate instructions to the pilots.

At the time of the serious incident, the STCA was activated in the two Geneva control sectors; according to the STCA log the distances between the aircraft were 5.15 NM horizontally and 1290 ft vertically.

### 1.5.2 Onboard equipment

When two aircraft are equipped with an onboard TCAS collision avoidance system, they exchange complementary resolution advisories in a way which ensures that the resolution advisories issued are compatible; the latter are then deemed to be "coordinated".

Extracts from the EasyJet standard operating procedures (SOP),

Provided that the autopilot is engaged, the PF enters flight level. He confirms it by observing his primary flight display (PFD) and by announcing aloud:

*"FL XXX, BLUE, OPEN CLIMB"*

or

*"FL XXX, BLUE, CLIMB"*

The PNF in turn then confirms the entered flight level, stating:

*"CHECKED"*.

In fact, the PNF does not repeat the flight entered by the PF level but validates display by pronouncing the word "CHECKED". In this way he verifies the correspondence between the instructions received from ATC, the oral restitution of these by himself and the PF, and the entry of the flight level.

EasyJet and Alitalia procedures in the event of TCAS alerts

- *"Traffic advisory: "TRAFFIC" messages:  
Do not perform a maneuver based on a TA alone*
- *Resolution advisory: All "CLIMB" and "DESCEND" or "MAINTAIN VERTICAL SPEED MAINTAIN" or "ADJUST VERTICAL SPEED ADJUST" or "MONITOR VERTICAL SPEED" type messages*

*AP – auto pilot (if engaged) OFF*

*BOTH FDs – flight directors OFF*

*Respond promptly and smoothly to an RA by adjusting or maintaining the pitch, as required, to reach the green area and/or avoid the red area of the vertical speed scale.*

*Note: Avoid excessive maneuvers while aiming to keep the vertical speed just outside the red area of the VSI – vertical speed indicator, and within the green area. If necessary, use the full speed range between Vamax – maximum maneuvering speed - and VMAX – maximum speed.*

*Respect stall, GPWS, or windshear warning*

*(....)"*

TCAS resolution advisories

Extracts from: ICAO Doc 8168, Volume 1, Part VIII, Chapter 3.

*ACTION BY THE FLIGHT CREW*

*“In the event of an RA the flight crew shall:*

- respond immediately by following the RA as indicated, unless doing so would jeopardize the safety of the aircraft;*
- follow the RA even if there is a conflict between the RA and an ATC instruction to maneuver;*
- not maneuver in the opposite sense to an RA;*
- as soon as possible, as permitted by workload, notify the ATS unit of any RA which requires a deviation from the current air traffic control instruction or clearance;*

*(...)”*

**1.6 Additional information**

The following information is extracted from the respective statements.

**1.6.1 Flight crews**

EZS 98DJ

For the co-pilot this was a line flight under supervision (LIFUS). VMC on top conditions prevailed at the time of the incident.

AZA 23B

In its Aviation Safety Report (ASR), the crew mentioned that they had received a climb resolution advisory. Applying the procedure published by the company, the aircraft climbed to flight level FL 375.

**1.6.2 Air traffic controllers**

Sector L34

The two controllers rated the workload as low at the time of the incident.

The RE had cleared flight EZS 98DJ to flight level FL 350 and had transferred it to the Marseille frequency during the climb phase. Noting that the aircraft continued to climb beyond the cleared flight level, the sector controllers had assumed that Marseille control had previously requested clearance from sector L56 to continue the climb ("*release for climb*").

The RP carried out a "quick-look up", i.e. he pressed the button which makes it possible to view the aircraft flying above his sector. At the same time, the sector L56 RP telephoned to inquire about the flight level to which flight EZS 98DJ had been cleared.

At the time the STCA triggered, the RP was making a telephone call to his counterpart at the Marseille Control Centre.

Sector L56

The two controllers rated the workload as low at the time of the incident.

They became aware of the presence of flight EZS 98DJ at the moment the radar label appeared on their screens and noted the appearance of a potential conflict with flight AZA 23B. The RP immediately asked sector L34 for the cleared flight level and directed the sector L34 RP to instruct it to descend again immediately.

Initially, the RE believed that this flight was going to acquire flight FL 360. At the moment when flight EZS 98DJ passed flight level FL 358 at a rate of climb of the order of 1500 to 1800 ft/min, the RE realised it would exceed this flight level and immediately issued essential traffic information to the flight crew of AZA 23B.

## **1.7 Useful or effective investigation techniques**

### **1.7.1 TCAS simulation**

On the basis of the recording of the radar plots, Eurocontrol's InCAS software tool makes it possible to reconstruct the conflicting trajectories of the aircraft and to recreate the alerts which were probably issued by their onboard collision avoidance systems. The traffic advisories and resolution advisories are reliable, even though the sequence of the latter may be subject to a delay of a few seconds compared to the actual events: this is because the operations of the algorithms of onboard collision avoidance systems follow a cycle which repeats at a nominal rate of at least once per second, whereas the radar data has a longer refresh period.

The consistency of the results of this simulation must be checked against other sources of information such as the statements of the flight crews, the recordings of the TCAS parameters, the Mode S data, etc.

## **1.8 Technical aspects**

### **1.8.1 Transponder Mode S Enhanced Surveillance – EHS**

In Mode S EHS, the transponder can transmit eight parameters - downlink aircraft parameters (DAPs), including the altitude selected by the crew in the flight management system.

Using specific equipment, the "selected altitude" data can be used by the "air traffic management" (ATM) system to activate an alert at the control position if the flight level entered by the pilot into the flight management system differs from that entered by the controller into the ATM system. Such systems are installed in some European control centres.

At the time of the serious incident, the Geneva controllers did not have this tool at their disposal.

## **1.9 Parameterisation of the STCA**

This incident indicated that the safety nets of the Geneva and Marseille control centres trigger on different criteria in terms of time and altitude.

## **2 Analysis**

### **2.1 Technical aspects**

The investigation did not reveal any technical malfunctions which could have contributed to or caused the serious incident.

### **2.2 Human and operational factors**

#### **2.2.1 Air traffic control**

##### **2.2.1.1 Sector L34 controllers**

At the time of the first call on the sector frequency, the RE cleared the crew of flight EZS 98DJ to continue their climb to flight level FL 350, the level coordinated with Marseille for the transfer of control. The crew read back this level correctly. Observing that flight EZS 98DJ was climbing at a sustained rate and that it was nearing its cleared level, the RE initiated the transfer of communication to Marseille Control Centre. His intention was to enable the Marseille controller to carry out a coordination for the continuation of the flight.

This procedure is common between control centres and the fact that the aircraft was still some distance from the control transfer point does not constitute an exceptional feature. By acting in this way the controller no longer had the possibility of intervening directly in relation to the flight.

##### **2.2.1.2 Sector L56 controllers**

Flight EZS 98DJ was unknown to sector L56 because it was not expected to cross it. At the time of the appearance of the radar label of this flight on the sector L56 screens, the controllers did not know the level to which this traffic was climbing. The RP called sector L34 without delay to obtain information. In the light of the circumstances, this reaction was appropriate.

The sector L56 RE had initially thought of the possibility that flight EZS 98DJ would halt its climb at flight level FL 360, even though no coordination to this effect had been carried out. Having noted that the flight was continuing to climb at a high rate, that a conflict with flight AZA 23B was becoming inevitable and that there was no way of intervening in relation to flight EZS 98DJ, the RE logically issued essential traffic information to the flight crew of AZA 23B.

##### **2.2.1.3 The Marseille sector Y1 radar controller**

At first, the radar controller did not react to the triggering of the STCA because the two conflicting aircraft were not yet visible on the screen (see fig. 4, page 11). This can be explained by the time required for the analysis of the STCA alert.

At the time of the first call by the flight crew of flight EZS 98DJ on the Marseille frequency, the radar controller, having ascertained the flight level but not the callsign, thought it was another aircraft which was on the same route at flight level FL 390 and which was visible on his screen. As soon as the controller realised that it was actually flight EZS 98DJ climbing to flight level FL 390, he initiated corrective action by instructing it to maintain flight level FL 350.

The pilot replied to him that he would maintain flight level FL 390 when he reached it. At that moment, the controller realised that flight level FL 350 had not been entered by the crew. He therefore twice directed them to descend immediately to the cleared flight level of FL 350 and to maintain it. This rapid

intervention, together with the resolution advisories issued on board the two aircraft, avoided a more dangerous convergence between them.

## 2.2.2 Procedures and systems

To avoid this kind of incident, it would be useful to be able to use the Mode S downlink data to generate an alert in the control sector in the event of non-conformity of the flight level selected by the pilot (selected flight level - SFL) and that cleared and entered by control (cleared flight level - CFL). This would have made it possible to detect the discrepancy between the flight levels more than 6 minutes before the Geneva STCA alarm was triggered.

## 2.2.3 Flight crews

### 2.2.3.1 EZS 98DJ

With regard to the selection of the flight level, the principle of confirmation of information received (closed loop) did not operate. Indeed, the entry of the flight level by the PF, which did not correspond to the information heard and repeated correctly by the PNF, was not validated by the latter.

The SAIB considers that EasyJet's SOPs relating to the entry and checking of a cleared flight level merit reconsideration.

### 2.2.3.2 AZA 23B

Stable at flight level FL 370, the crew of flight AZA 23B reacted correctly and promptly to the triggering of the RA type TCAS advisory by following the indications given by their onboard system and leaving their flight level for a higher level. The report to ATC took place without delay.

### 2.2.3.3 General considerations

Several similar incidents, in which the entered flight level did not match the collated information, took place in the months preceding this incident.

The fact that the PNF is not required to repeat aloud the flight level entered by the PF may be the source of this type of error.



### 3 Conclusions

#### 3.1 Findings

##### 3.1.1 General framework

- The incident occurred 14 NM west-north-west of Geneva, near waypoint MILPA, in class A controlled airspace.
- At the time of the incident, sectors L3 and L4 were coupled under the designation L34, and sectors L5 and L6 were coupled under the designation L56.
- The aircraft involved in the conflict were flying under instrument flight rules IFR.

##### 3.1.2 Technical aspects

- The two aircraft involved in the serious incident were equipped with a TCAS II onboard collision avoidance system.
- The pilots of the two aircraft involved in the serious incident received TCAS resolution advisories, which they obeyed.

##### 3.1.3 Flight crews

- The crews of the two aircraft involved in the serious incident were in possession of adequate licences.
- The flight crew of EZS 98DJ entered into the flight management system an incorrect flight level, having correctly read back the cleared flight level.
- The flight crew of EZS 98DJ did not inform ATC of the triggering of resolution advisories.

##### 3.1.4 Air traffic controllers

- The air traffic controllers were in possession of adequate licences.
- The Geneva controllers rated the workload at the time of the incident as low.
- At the time of the incident, occupancy of the Marseille sector Y1 frequency was high.

##### 3.1.5 History of the serious incident

- At 16:23:12 UTC, flight EZS 98DJ was cleared to climb to flight level FL 350. The readback was correct. The pilot entered flight level FL 390 into the flight management system.
- At 16:28:47 UTC, flight EZS 98DJ was transferred to sector Y1 of the Marseille Control Centre.
- 16:29:11 UTC, the safety net was activated in sector Y1.
- At 16:29:38 UTC, the short term conflict alert (STCA) safety net was triggered in sectors L34 and L56.
- At 16:30:10 UTC, the respective distances between the two aircraft were 2.1 NM laterally and 670 ft vertically.

- Visual flight conditions applied at the time and location of the incident; the pilots of the aircraft involved stated that they did not acquire visual contact with the conflicting traffic.

#### 3.1.6 Environmental aspects

- The meteorological conditions had no effect on the history of the serious incident.

### 3.2 Cause

The serious incident is due to a dangerous convergence of a cruising aircraft and an aircraft which climbed higher than its cleared flight level following the entry of an incorrect flight level into the flight management system.

Factor which played a part in the serious incident:

Absence of a system capable of detecting any discrepancy between the flight level cleared by ATC and that selected by the crew.

## 4 Safety recommendations and measures taken after the serious incident

A similar serious incident occurred on 10 June 2011 (report no.2165) and was the subject of a safety recommendation calling for the introduction of an alert system in the event of a discrepancy between the authorized and the selected level.

### 4.1 Measures taken after the serious incident

With effect on June 29<sup>th</sup> 2012 a Mode S IDentification tool (MSID) is available to controllers. By hooking the label of a specific flight, a window containing the Mode S data opens. This window contains, among other data, the flight level selected by the pilot (SFL).

The implementation of a discrepancy alert between the cleared flight level CFL and SFL is planned for the end of 2013 at the same time as step 2 of Stripless Switzerland (SLCH).

Payerne, 16 May 2013

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, 25 June 2013*

Annexes

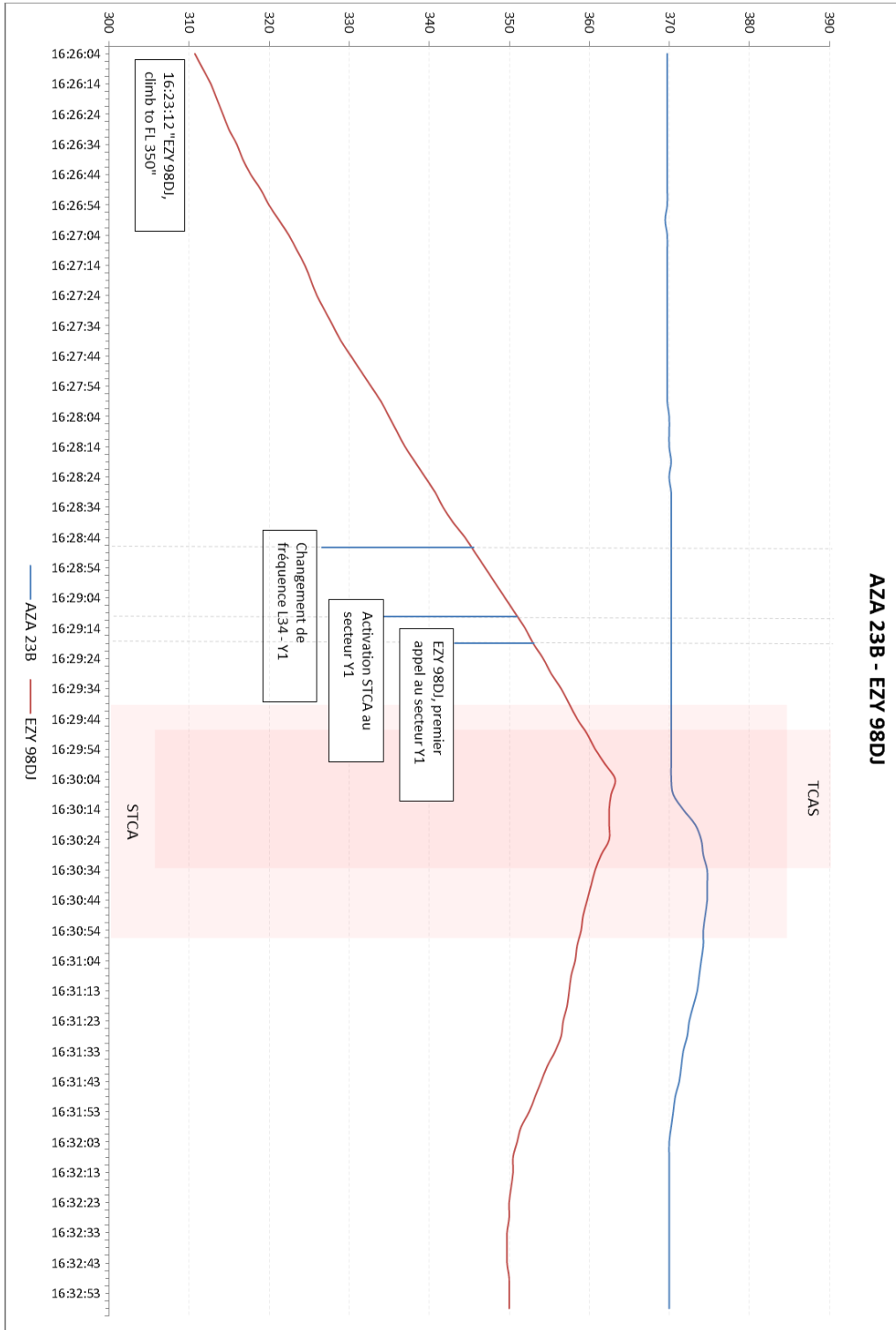
Annex 1 Trajectories: EZS 98DJ and AZA 23B

EZS 98DJ

AZA 23B



Annex 2 Flight profiles and alerts



First call to sector Y1      STCA triggered at Y1      Frequency change from L34-Y1

Annex 3 Radar plot

