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Bureau d'enquête sur les accidents d'aviation BEAA  
Ufficio d'inchiesta sugli infortuni aeronautici UIIA  
Uffizi d'inquisiziun per accidents d'aviatica UIAA  
Aircraft Accident Investigation Bureau AAIB

# **Final Report No. 2088**

## **by the Aircraft Accident Investigation Bureau**

concerning the serious incident - Airprox  
involving the Airbus A318-111 aircraft, registration F-GUGK  
operated by Air France under callsign AFR 989Z  
and the Boeing B737-8AS aircraft, registration EI-DHK  
operated by Ryanair under callsign RYR 1702  
on 8 June 2009  
over Trasadingen beacon, 15 NM north of Zurich airport

## General information on this report

This report contains the Aircraft Accident Investigation Bureau's (AAIB) conclusions on the circumstances and causes of the serious incident which is the subject of the investigation.

In accordance with Art 3.1 of the 9<sup>th</sup> edition, applicable from 1 November 2001, of Annex 13 to 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 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 German language.

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 + 2 hours

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## Final Report

### Synopsis

#### Aircraft 1

Owner:	Société Air France, Roissy, France
Operator:	Société Air France, Roissy, France
Manufacturer	Airbus S.A.S., Toulouse, France
Aircraft type	A318-111
Country of registration	France
Registration	F-GUGK
Commercial flight number	AF 2989
ATC callsign	AFR 989Z
Radio callsign	Air France niner eight niner Zulu
Flight rules	IFR
Type of operation	Scheduled flight
Departure point	Belgrade (LYBE)
Destination point	Paris Charles de Gaulle (LFPG)

#### Aircraft 2

Owner:	Ryanair Ltd., Dublin, Ireland
Operator:	Ryanair Ltd., Dublin, Ireland
Manufacturer	Boeing Commercial Airplanes, Seattle, Washington, USA
Aircraft type	B737-8AS
Country of registration	Ireland
Registration	EI-DHK
Commercial flight number	FR 1702
ATC callsign	RYR 1702
Radio callsign	Ryanair one seven zero two

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Flight rules	IFR
Type of operation	Scheduled flight
Departure point	East Midlands (EGNX)
Destination point	Bergamo Orio al Serio (LIME)
Location	Over VOR Trasadingen Swiss sovereign territory
Date and time	8 June 2009, 12:19 UTC
ATS unit	Zurich Area Control Centre (ACC) Sector M4
Airspace	Class C
Minimum separation of the two aircraft	1.4 NM horizontally and 725 ft vertically
Applicable minimum separation	5 NM horizontally or 1000 ft vertically
AIRPROX category of the serious incident	ICAO category A - high risk of collision

## Investigation

The serious incident occurred on 8 June 2009 at 12:19 UTC. The notification was received by the Aircraft Accident Investigation Bureau (AAIB) on 9 June 2009 at 14:06 UTC. After preliminary clarifications, which are usually necessary with this type of serious incident, the investigation was opened on 10 June 2009.

The AAIB notified the investigating authorities in France and Ireland of the serious incident. Both states then nominated an authorised representative.

The present investigation report is published by the AAIB.

## Summary

On 8 June 2009, an Airbus A318, radio callsign Air France 989Z, was flying at FL 380 on the Kempten – Trasadingen – Hochwald route in the area of responsibility of Sector M4 of the Zurich Area Control Centre. Flying from the north, a Boeing 737, radio callsign RYR 1702, was flying at flight level (FL) 370 via Trasadingen to waypoint ODINA. The flight paths of the two aircraft crossed above Trasadingen. About 12 NM east of Trasadingen, the air traffic controller, who was under training, instructed Air France 989Z to descend to FL 360. The supervising coach did not notice this instruction. Shortly afterwards, a short-term conflict alert indicated the impending conflict on the radar display. The coach then took over air traffic control and allowed RYR 1702 to descend to FL 360 as well. The traffic alert and collision avoidance system generated a resolution advisory in both aircraft. The crews obeyed these instructions. The two aircraft crossed above Trasadingen with a lateral distance of 1.4 NM and an altitude difference of 725 ft.

## Causes

The serious incident is attributable to the fact that air traffic control cleared an aircraft at FL 380 to descend to FL 360 without taking account of an aircraft at FL 370 crossing the flight path. The result was that an inadvertent convergence of these aircraft occurred, involving a high risk of collision.

The following factors contributed substantially to the origin of the serious incident:

- An intervention by the supervising air traffic controller which was too late, because he had not realised that the trainee air traffic controller was overwhelmed by the challenging traffic situation.
- Within the Zurich air traffic control unit there was no function for monitoring clearances with regard to possible conflicts.

The following factors contributed to the genesis of the serious incident:

- The fact that air traffic control received no confirmation of a high rate of descent by AFR 989Z.
- The fact that the supervising air traffic controller was working without a headset.

## Safety recommendation

Within the framework of the investigation, one safety recommendation was made.

## 1 Factual information

### 1.1 History of the flight

#### 1.1.1 General

For the following description of the history of the flight, the recordings of the radiotelephony traffic, radar data and the statements of the crew members and air traffic controllers were used.

At the time of the serious incident the copilot was acting as pilot flying (PF) and the commander was acting as pilot not flying (PNF) in the cockpit of AFR 989Z.

At the time of the serious incident the commander was acting as pilot flying (PF) and the copilot was acting as pilot not flying (PNF) in the cockpit of RYR 1702.

Both flight AFR 989Z and flight RYR 1702 were taking place under instrument flight rules.

In air traffic control, Sector M4 of the Zurich Area Control Centre (ACC) was responsible for the airspace from FL 356 to FL 660.

Sector M4 was occupied by three persons: an air traffic controller under training was performing the function of radar executive (RE) (RE-M4 trainee). Her work was being monitored by a coach (RE-M4 coach). In addition, there was a third air traffic controller in Sector M4 who was performing the function of radar planner (RP-M4).

#### 1.1.2 Flight preparation

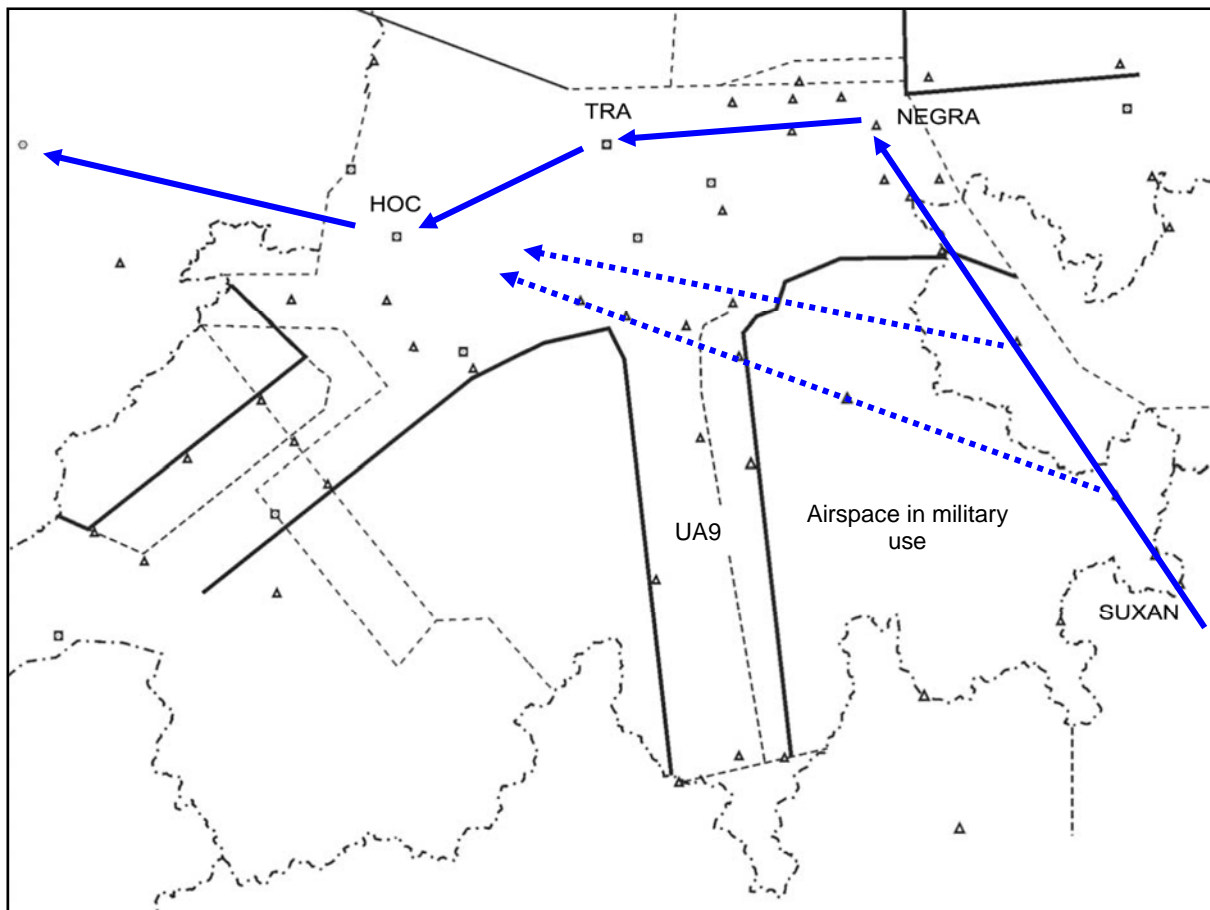
The RE-M4 trainee had commenced on-the-job training in mid-February 2009 and was therefore at the beginning of the second of three practical training phases. This took place in Sectors M1 to M4 in the range from FL 246 to FL 660. Training on sectors FL 245 and lower was not yet a component of her training. During her activity she wore a headset consisting of earphones and a microphone.

The RE-M4 coach had more than 10 years experience of on-the-job training. He had already worked together with the RE-M4 trainee for a few days. He was assigned Sector M4 together with the trainee air traffic controller. He was not expecting any extraordinary situation. No discussion of the traffic situation to be expected or of the volume of traffic took place with the trainee air traffic controller.

The RE-M4 coach did not have a workstation of his own available for monitoring the work of the RE-M4 trainee. Three workstations were envisaged for Section M4; at the time of the serious incident one of them was not yet ready for operation. The RE-M4 coach therefore sat on the left of the RE-M4 trainee, a little to her rear, and used the trainee's radar screen for monitoring her work. According to his statements, this situation restricted him somewhat in his function as a coach. He did not wear a headset during his activity.

From 11:30 UTC the airspace to the east of airway UA9 was in use by the military and was therefore available to civil air traffic control only subject to restrictions. This meant that transit traffic from waypoint SUXAN in the direction of





**Figure 1:** Standard route in the event of military flight operations over waypoints SUXAN – NEGRA and the VHF beacon TRA – HOC (blue). Possible shortcut routes are shown by a blue dotted line.

Hochwald (HOC) VHF omnidirectional radio beacon (VOR) demanded a high level of coordination with military air traffic control. The RP-M4 was mainly occupied with this coordination. Depending on an agreement between Sector M4 and military air traffic control, a shortcut through the military airspace could be assigned to civil air traffic control.

For this reason, between 11:30 and 15:00 UTC the capacity of Sector M4 had been limited to 38 flights per hour. A traffic volume of 39 flights was predicted for the period from 11:20 UTC to 12:40 UTC. Forty-three flights were counted between 11:30 and 12:30 UTC.

According to the statement by the RE-M4 coach, the RE-M4 trainee was working independently for the first 30 minutes and no assistance was necessary on his part. He subsequently realised that the RE-M4 trainee was no longer assimilating all the information communicated to her by the RP-M4. For this reason he intermittently assumed a position between the RE-M4 trainee and the RP-M4. The peak loading was reached about 11 minutes before the serious incident, when an aircraft destination Lugano flew into Section M4 at FL 410. This gave rise to a complex situation which the RE-M4 trainee was no longer able to handle independently. The RE-M4 coach then helped her and gave her instructions for the aircraft's descent. This enabled separation to be maintained.

The complexity of the traffic handling situation was additionally aggravated by the south-westerly wind situation. Since air traffic control assesses the traffic situation using ground speed, among other things, high wind speeds during heading changes lead to variable speed differences between aircraft. Consequently, possible crossing problems after a change in the direction of flight often became apparent subject to some delay. Above all, this concerned flights from the direction of SUXAN which, by agreement with military air traffic control, sooner or later turned in the direction of the Hochwald VOR and crossed flights on the route between waypoint BERSU and the Trasadingen VOR (TRA).

The Air France Airbus A318-111 aircraft, radio callsign AFR 989Z, had taken off on 8 June 2009 from Belgrade (Serbia) on a flight to Paris (France). The ACC Zurich area of responsibility was crossed from the Kempten VHF omnidirectional radio beacon (KPT) along airway UL856 over the Trasadingen (TRA) and Hochwald (HOC) VOR and waypoint MOROK at FL 380.

The Ryanair Boeing 737-8AS aircraft, radio callsign RYR 1702, had taken off on 8 June 2009 from East Midlands (United Kingdom) on a flight to Bergamo (Italy). RYR 1702 was flying from the north at FL 370 within the UAC Switzerland area of responsibility.

According to the statements of the flight crews on both aircraft, the flights had proceeded with no noteworthy anomalies up to the serious incident.

#### 1.1.3 Sequence of the serious incident

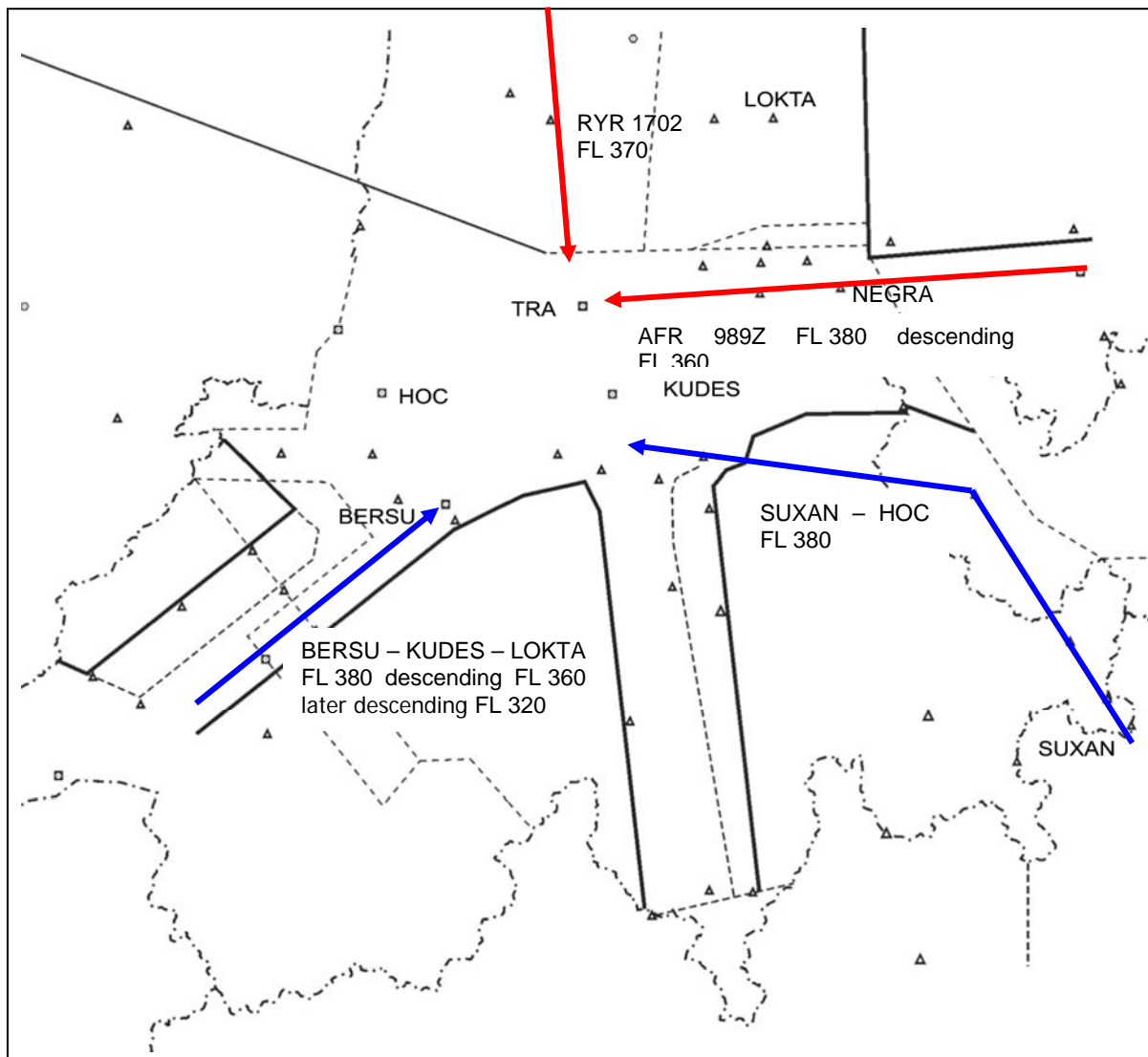
At 12:07:35 UTC, the crew of AFR 989Z reported for the first time to ACC Zurich Sector M4 on the 133.405 MHz frequency.

The RE-M4 trainee confirmed radar identification to AFR 989Z during the first call. A little later, she requested the crew to switch the transponder code to 7527. Immediately after the confirmation by the crew of AFR 989Z, the crew of flight RYR 1702 reported for the first time on the Sector M4 frequency. The RE-M4 trainee cleared the crew for the route to the Trasadingen VOR and then to waypoint ODINA.

Another flight was coming from the south east at FL 380; this would cross AFR 989Z over the HOC VHF omnidirectional radio beacon. By agreement with the RE-M4 trainee, the RP-M4 had therefore coordinated flight level FL 360 for AFR 989Z with the neighbouring Reims UAC control unit. There was another aircraft flying from the south-west at FL 380 into the Sector M4 area of responsibility along route BERSU – KUDES – LOKTA. Flight level FL 320 was coordinated for this flight with the neighbouring Rhine UAC unit. The RE-M4 trainee therefore allowed this aircraft to descend to FL 360, corresponding to the lowest possible flight level in her sector. She then handed over the aircraft to Sector M3. When the RE-M4 trainee saw on the radar display that this aircraft had left FL 360 and was descending, at 12:17:20 UTC she instructed the crew of the Air France 989Z to make a descent to FL 360. This was confirmed immediately by the crew. At this time the aircraft was some 12 NM east of the Trasadingen VOR; RYR 1702, at FL 370, still had a distance of approximately 11 NM to fly to the TRA beacon.

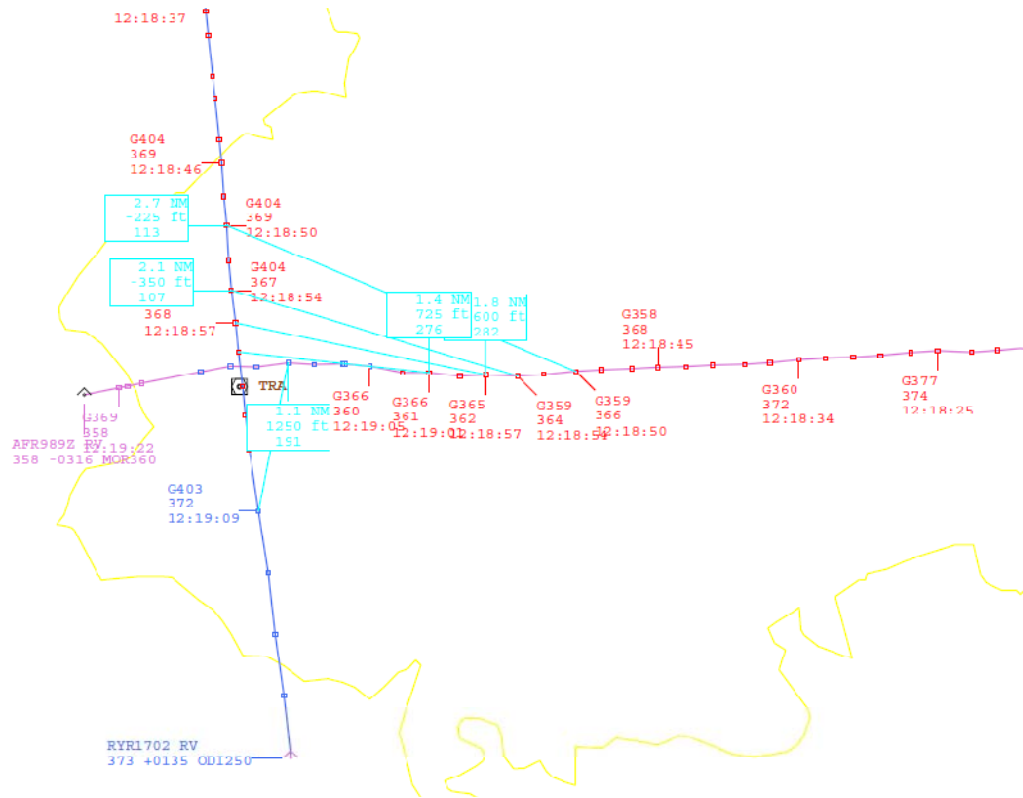
In this phase, the RP-M4 was for the most part busy with military air traffic control: coordinating shortcuts for civil aircraft routed through the airspace in use by the military. Neither he nor the RE-M4 coach had noticed the RE-M4 trainee's clearance to the crew of AFR 989Z for a descent to FL 360.

When the RP-M4 turned back to the radar display after two coordination conversations, he noticed AFR 989Z descending, shortly before the Trasadingen VOR. After repeating his question in this regard he received the RE-M4 trainee's answer, to the effect that this aircraft was descending.



**Figure 2:** Schematic representation of the flight paths of the aircraft from the south-west, direction waypoint BERSU and the aircraft from the south-east over waypoint SUXAN, direction NEGRA, with a shortcut through the airspace in military use (both shown in blue, both at FL 380). Flight AFR 989Z is approaching the TRA VHF omnidirectional radio beacon from the east at FL 380 and flight RYR 1702 from the north (both shown in red).

At 12:17:54 UTC a short-term conflict alert (STCA) appeared on the Sector M4 radar display which made the controllers aware of the dangerous situation between AFR 989Z and RYR 1702. The RE-M4 coach immediately made his way between the RE-M4 trainee and the RP-M4 and gave the RE-M4 trainee the instruction to get AFR 989Z to descend at a rate of descent of at least 3000 ft/min. This instruction was transferred immediately by the RE-M4 trainee.



**Figure 3:** Radar recording of the crossing of AFR 989Z (red) and RYR 1702 (blue). The Trasadingen beacon (TRA) is shown in brown and the national frontiers are shown in yellow.

According to the RE-M4 coach's statement, the RE-M4 trainee requested him to take over traffic control when there was no confirmation from the crew of AFR 989Z. The RE-M4 coach took over traffic control and repeated the order to the crew of AFR 989Z. To do this he used the hand-held microphone to the right of the RE-M4 trainee's workstation, as he was not wearing a headset. When there was still no answer, he instructed the crew of RYR 1702 to descend to FL 360. According to his statements, the RE-M4 coach assumed that the crew of AFR 989Z had not heard the instructions and were descending at a low rate of descent. His intention was to have RYR 1702 pass below AFR 989Z.

The RP-M4 was of the opinion that the impending conflict between AFR 989Z and RYR 1702 was already known to all those involved in the sector when the STCA was triggered.

The autopilot on AFR 989Z was switched on. According to his statements, the copilot had heard all the ATC instructions and had operated the aircraft accordingly. On the first instruction from the RE-M4 trainee to descend to FL 360, he initiated the descent using the vertical speed (VS) flight mode. He initially selected a rate of descent of 1000 ft/min. When he received the instruction to descend at a rate of descent of 3000 ft/min, he switched off the autopilot in order to be able to make the descent more quickly. At this time he was aware that there was a risk of collision. Both pilots were surprised at this high rate of descent and judged it to be inappropriate for this situation.

Shortly afterwards the traffic alert and collision avoidance system (TCAS) on AFR 989Z generated the resolution advisory (RA) '*descend, descend*'. The copilot obeyed the descent instruction according to the displays on the primary flight display (PFD). At 12:18:38 UTC the crew reported the TCAS descent. The RE-M4 coach gave the following reply: "*Air France nine eight nine zulu, traffic twelve o'clock, turn right by twenty degrees*". This instruction was confirmed immediately by AFR 989Z. At this time the aircraft was some 2.5 NM east of the TRAVOR. The commander saw the other aircraft when the copilot initiated the right turn.

When RYR 1702 received the instruction at 12:18:23 UTC to descend to FL 360, it was approximately 4 NM north of the Trasadingen VOR. After the crew had acknowledged the clearance, the coach gave the following traffic information: "*...Traffic on your left hand side, same level, five miles*". At almost the same time the crew received a TCAS traffic advisory (TA), followed immediately by an RA with the instruction "climb, climb now". The crew's answer to Sector M4 was interrupted by the report by AFR 989Z that they had initiated a TCAS descent. The RE-M4 coach's repeated question to RYR 1702 as to whether they had visual contact with the aircraft on their left also produced no result, as two simultaneous reports overlapped and the answer was not comprehensible.

The radar recording shows that RYR 1702 first descended to FL 367 and then climbed back to FL 369. The two aircraft crossed above Trasadingen with a lateral distance of 1.4 NM and an altitude difference of 725 ft. Both crews continued their flights to their destinations.

#### 1.1.4 Location of the serious incident

Geographical position	Over the Trasadingen VOR
Date and time	8 June 2009, 12:19 UTC
Lighting conditions	Daylight
Height above sea level or flight level	AFR 989Z: FL 368 RYR 1702: FL 361

## 1.2 Personnel information

### 1.2.1 Crew of AFR 989Z

#### 1.2.1.1 Commander

##### 1.2.1.1.1 Training

Person	French citizen, born 1962
Licence	Airline transport pilot licence aeroplane – ATPL(A) according to joint aviation requirements (JAR), issued by the French supervisory authority on 18 May 2009.
Ratings	Type rating Airbus A320 as pilot in command Instrument flying multi-engined aircraft IR ME(A)

	Instrument flying rating	
	Last proficiency check	Simulator check
	Medical fitness certificate	Class 1 with the following restriction: VDL – shall wear corrective lenses Valid till 31 January 2010
	Last medical examination	28 January 2009
1.2.1.1.2	Flying experience	
	Total	11 370 hours
	on the type involved in the incident	3500 hours
1.2.1.2	Co-pilot	
1.2.1.2.1	Training	
	Person	French citizen, born 1972
	Licence	Airline transport pilot licence aeroplane – ATPL(A) according to joint aviation requirements (JAR), issued by the French supervisory authority on 4 April 2007.
	Ratings	Type rating Airbus A320 as copilot
	Instrument flying rating	Instrument flying multi-engined aircraft IR ME(A)
	Last proficiency check	Simulator check
	Training on ACAS	During the last proficiency check on 16 May 2009 a TCAS situation was trained for on the simulator.
	Medical fitness certificate	Class 1 with the following restriction: VDL – shall wear corrective lenses Valid till 31 August 2009
1.2.1.2.2	Flying experience	
	Total	2720 hours
	on the type involved in the incident	286 hours
1.2.2	Crew of RYR 1702	
1.2.2.1	Commander	
1.2.2.1.1	Training	
	Person	French citizen, born 1950
	Licence	Airline transport pilot licence aeroplane – ATPL(A) according to joint aviation requirements (JAR), issued by the United Kingdom supervisory authority on 16 July

	2008.
Relevant ratings	Type rating B737 300-900, valid till 7 October 2009.
Instrument flying rating	Instrument flight aircraft IR(A) Instrument approaches on B737 300-900, last extended on 8 October 2008, valid till 7 October 2009.
Last proficiency check	Simulator check on 7 October 2008
Training on ACAS	During the last proficiency check on 7 October 2008, a TCAS situation was trained for on the simulator.
Medical fitness certificate	Class 1 VDL – shall wear corrective lenses Valid till 29 May 2010
Last medical examination	28 May 2009
1.2.2.1.2 Flying experience	
Total	17 121:42 hours
on the type involved in the incident	2287:31 hours
1.2.2.2 Co-pilot	
1.2.2.2.1 Training	
Person	British citizen, born 1980
Licence	Commercial pilot licence – CPL(A) issued by the Irish aviation supervisory authority on 4 November 2008.
Ratings	Type rating B737 300/900, valid till 30 September 2009.
Instrument flying rating	Instrument flight aircraft IR(A) Instrument approaches on B737 300/900, last extended on 16 September 2008, valid till 30 September 2009.
Last proficiency check	Operational proficiency check
Training on ACAS	During the last proficiency check on 28 March 2009, a TCAS situation was trained for on the simulator.
Medical fitness certificate	Class 1 without restrictions Valid till 20 December 2009
Last medical examination	3 December 2008

1.2.2.2.2	Flying experience	
	Total	572 hours
	on the type involved in the incident	357 hours
1.2.3	Air traffic control personnel	
1.2.3.1	Air traffic controller 1	
	Function	Radar executive Sector M4 (RE-M4) coach
	Person	Swiss citizen, born 1968
	Work days before the day of the incident	2 days
	Duty times in the 48 hours before the serious incident	06/06/09 03:20 UTC – 10:20 UTC 07/06/09 05:10 UTC – 12:10 UTC
	Start of duty on the day of the incident	11:10 UTC
	Licence	Air traffic controller licence based on European Community Directive 2006/23, first issued by the FOCA on 2 November 1995, valid till 22 March 2010
	Relevant ratings	Area control surveillance, valid till 22 March 2010 On-the-job training instructor valid till 22 March 2010
1.2.3.2	Air traffic controller 2	
	Function	Radar planner Sector M4 (RP-M4)
	Person	Swiss citizen, born 1971
	Work days before the day of the incident	1 day
	Duty times in the 48 hours before the serious incident	06/06/09 Rest day 07/06/09 14:50 UTC – 21:50 UTC
	Start of duty on the day of the incident	11:20 UTC
	Licence	Air traffic controller licence based on European Community Directive 2006/23, first issued by the FOCA on 15 November 1996, valid till 26 April 2010
	Relevant ratings	Area control surveillance, valid till 26 April 2010
1.2.3.3	Air traffic controller 3	
	Function	Radar executive Sector M4 (RE-M4) trainee



Person	German citizen, born 1984
Work days before the day of the incident	2 days
Duty times in the 48 hours before the serious incident	06/06/09 03:20 UTC – 10:20 UTC 07/06/09 14:00 UTC – 21:00 UTC
Start of duty on the day of the incident	11:10 UTC
Licence	Student air traffic controller licence based on European Community Directive 2006/23, first issued by the FOCA on 11 September 2008, valid till 16 October 2010
Relevant ratings	Area control surveillance, valid till 16 October 2010

### 1.3 Aircraft information

#### 1.3.1 AFR 989Z aircraft

Registration	F-GUGK
Aircraft type	A318-111
Characteristics	Twin-jet short-haul and medium-haul commercial aircraft
Manufacturer	Airbus S.A.S, Toulouse, France
Year of manufacture	2005
Serial number	2601
Owner:	Société Air France, Roissy, France
Operator:	Société Air France, Roissy, France

#### 1.3.2 RYR 1702 aircraft

Registration	EI-DHK
Aircraft type	B737-8AS
Characteristics	Twin-jet short-haul and medium-haul commercial aircraft
Manufacturer	Boeing Commercial Airplanes, Seattle, Washington United States of America
Year of manufacture	2005
Serial number	33820
Owner:	Ryanair Ltd., Dublin, Ireland
Operator:	Ryanair Ltd., Dublin, Ireland

## 1.4 Meteorological information

### 1.4.1 General

The information in sections 1.4.2 to 1.4.5 was provided by MeteoSwiss.

### 1.4.2 General meteorological situation

*A low-pressure zone was moving from the eastern Atlantic in the direction of the Bay of Biscay. It was pushing humid, warm air from southern France into Switzerland. At the same time the southerly air current was increasing on the face of the Alpine area. The intensity of precipitation was low on the north side of the Alps.*

### 1.4.3 Weather at the time of the serious incident

The following information on the weather at the time of the serious incident in the Trasadingen region is based on a spatial and chronological interpolation of the observations of different weather stations.

*Quotation from MeteoSwiss report*

<i>Weather/cloud</i>	<i>Outside of cloud</i>
	<i>Cloud ceiling at approximately FL 240</i>
<i>Visibility</i>	<i>Over 10 km</i>
<i>Wind</i>	<i>FL 360, 240 degrees at 75 kt</i>
<i>Temperature/Dewpoint</i>	<i>FL 360, -58 °C / -66 °C</i>
<i>Hazards:</i>	<i>None detectable</i>

### 1.4.4 Astronomical information

Position of the sun: Azimuth: 208° Elevation: 63°

Lighting conditions Daylight

### 1.4.5 Winds at high altitude

*On wind chart FL 340, west south-westerly winds at 70 kt and a temperature of minus 55 °C were forecast for this region; on wind chart FL 390 the forecast was also for west south-westerly winds at 70 kt and minus 59 °C.*

*The Payerne and Stuttgart radio probes (12:00 UTC) indicated south-westerly winds at 75 to 80 knots at the altitude of the airprox. The temperature at FL 360 was minus 58 °C and the dewpoint was minus 66 °C.*

## 1.5 Safety systems

### 1.5.1 Airborne collision avoidance system<sup>1</sup>

Functioning collision avoidance systems (traffic alert and collision avoidance system - TCAS) were fitted to both aircraft; they provided traffic information (traffic advisories - TA) and instructions for conflict resolution (resolution advisories -

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<sup>1</sup> Airborne collision avoidance system (ACAS) is the designation of the basic concept. The International Civil Aviation Organization (ICAO) uses this term when drawing up the standards with which the system must comply. The traffic alert and collision avoidance system (TCAS) is a concrete implementation of this concept.

RA). Both crews reacted to the system commands without delay. AFR 989Z descended to FL 360, whilst RYR 1702 climbed back to FL 370.

#### 1.5.2 Short-term conflict alert

The Skyguide radar system included a convergence warning system (short-term conflict alert – STCA). In the present case, in accordance with its design, it made the air traffic controllers aware of the impending conflict.

#### 1.5.3 System for monitoring clearances

Since 22 December 2005, Skyguide's flight plan processing system (stripless environment) has included a function in the Geneva Area Control Centre which monitors whether altitude clearances entered into the system will lead to a conflict between the aircraft involved. This stripless environment was not available in the Zurich Area Control Centre at the time of the serious incident.

### 1.6 Organisational and management information

#### 1.6.1 Procedures

##### 1.6.1.1 General

The relevant basis for air traffic control procedures is defined in the air traffic management manual (ATMM) for the Zurich Area Control Centre (ACC). At the time of the serious incident, the following regulations, among others, applied.

##### 1.6.1.2 Use of headsets

###### *"3 HEADSET OBLIGATION*

*RE, and other operators at ATC sectors and FIS positions, shall normally work with headsets. While working with headsets, the loudspeakers shall be switched on at an appropriate volume level.*

*RP, RC and DOM are not required to work with headsets.*

*In the following situations it is not necessary to work with headsets:*  
*- For ACC sectors/DELTA/FIC: When the adjacent sector is not active*

*- For APP/ARFA/DEP: When only one of these working positions is active*

*Note: Headsets shall be used during visits, periods of maintenance or cleaning work in the immediate vicinity of the relevant sector, or during other noise generating activities.*

*The correct operation of the headset shall be verified when taking over a working position*

*(...)"*

### 1.6.1.3 Rules concerning deployment of trainee air traffic controllers

#### *" 4 PERSONNEL UNDER TRAINING*

*Personnel under training, having passed neither a licensing or final test, nor an appropriate intermediate test, shall only work in positions that permit permanent supervision of their actions. After having passed an appropriate intermediate test, they work without supervision, taking into account the workload at the position concerned.*

*Persons holding an appropriate entry in their licence (Special authorisation for the supervision of training at working positions) only are allowed to supervise personnel under training. If the supervising person must leave the working position, the supervision task must be transferred to another authorised person, or the position must be occupied by an appropriately trained person.*

*The responsibility for the safety and efficiency of ATM services provided by a trainee lies with the OJT instructor to the same extent as if he were providing the services himself, except that he will not be held responsible for the consequences of any action taken by the trainee which disregard his instructions."*

## **2 Analysis**

### **2.1 Technical aspects**

Both for the aircraft involved and for the air traffic control systems concerned, there are no indications of any pre-existing technical defects which might have caused or influenced the serious incident.

At the time of the serious incident, unlike in the area control centre Geneva, in the area control centre Zurich there was no function available which monitored whether planned altitude clearances would lead to a conflict with other aircraft. This function would have detected the impending conflict, so it would very probably not have been possible for the serious incident to have occurred.

The fact that the RE-M4 coach had no workstation of his own available does not constitute a shortcoming, but it may have restricted him somewhat in his activity.

### **2.2 Human and operational aspects**

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

Between 11:30 and 12:30 UTC the workload in Sector M4, at 43 flights, was above the sector capacity of 38 flights. The circumstance of the strong westerly wind flow current also increased the complexity of traffic management. Furthermore, there was the additional factor that the military airspace of airway UA9 was available only subject to restrictions.

In view of these general conditions it can be concluded that the RE-M4 trainee had to work for a fairly long period at the limits of her personal performance. This also corresponds to the statement of the RE-M4 coach to the effect that the RE-M4 trainee, after a presence of about 30 minutes in sector M4 was no longer able to assimilate and process all the coordination conversations with the RP-M4. When the peak loading was reached some eleven minutes before the serious in-

cident, the RE-M4 coach had to support the RE-M4 trainee in resolving a separation problem. During this intensive phase, the RE-M4 coach did not realise that the RE-M4 trainee was overwhelmed. This meant that the RE-M4 coach allowed the RE-M4 trainee to continue working independently and did not subsequently take over traffic control.

There followed a phase of decreasing traffic volume which lightened the burden on the RE-M4 trainee somewhat. The RE-M4 coach did not notice the clearance for AFR 989Z to descend to FL 360 given in this phase by the RE-M4 trainee. This is quite probably attributable to the fact that the RE-M4 coach was not wearing a headset. Headsets attenuate ambient noise and therefore facilitate complete and accurate perception of radiocommunications. It is also conceivable that the concentration of the RE-M4 coach had lapsed a little after the demanding phase or that he was distracted by other activities.

The traffic situation in connection with the serious incident involved three aircraft which were flying at FL 380 into Sector M4 from different directions. In addition, RYR 1702 was flying from the north at FL 370 in the direction of Trasadingsen.

The attention of the RE-M4 trainee was directed at the three flights at FL 380 which had to be separated from each other. For two of these flights, including flight AFR 989Z, a descent to lower flight levels was envisaged. The RE-M4 trainee initially allowed the flight from the south-west to descend. After this flight had started descending from FL 360 and after she had noted this on the radar display, she allowed AFR 989Z to descend to FL 360; this was not noticed by the RE-M4 coach. RYR 1702, at FL 370, was at this time not part of the RE-M4 trainee's traffic concept. The fact that she did not include this flight in her traffic concept might be attributable on the one hand to her lack of experience. On the other hand, the lapse in concentration could be attributable to the previous high workload. This would explain why her attention was directed primarily at the three flights at FL 380.

After the STCA alert was triggered, the RE-M4 coach tried to resolve the problem by instructing AFR 989Z to maintain a rate of descent of at least 3000 ft/min. This instruction was issued by the RE-M4 trainee at the behest of the RE-M4 coach. This high rate of descent was not appropriate for a descent of 2000 ft. It constituted an emergency air traffic control measure to prevent a collision. For the pilots, it was an astonishing instruction. However, in order to comply with it as far as possible they were obliged to switch off the autopilot and increase the rate of descent without delay. Such a manual intervention while cruising is extraordinary and demands greater concentration from the flight crew as well as regulated application of the controls, because at high altitudes in particular there are only narrow margins relating to the aircraft's aerodynamic limits. In addition, for a descent with a comparatively small difference in altitude and a high rate of descent there is the problem that this rate can only be maintained for a short time and the descent must be levelled off after only a few seconds in order not to drop below the assigned flight level. It is therefore understandable that under these circumstances the crew of AFR 989Z was concentrating on the challenging implementation of the instruction in accordance with the generally recognised *aviate – navigate – communicate* principle and that confirmation of the instruction was omitted as a less important task.

In the present case, the RE-M4 coach interpreted the absence of a response from AFR989Z and the initially low rate of descent as non-compliance with the instruction to descend at a rate of at least 3000 ft/min. In this situation he took over traffic control and repeated the descent instruction, with no acknowledgement. The RE-M4 coach therefore sought a different solution. He instructed the crew of RYR 1702 to initiate a descent to FL 360, with the intention of allowing it to pass below AFR 989Z. This decision to clear two aircraft on a conflicting heading at the same flight level is difficult to justify and has to be attributed to the stressful situation which had arisen within a very short time.

The TCAS then made the two flight crews aware of the danger of collision and issued evasive manoeuvres. These were carried out by the crews without delay. At 12:18:38 UTC the crew of AFR 989Z were able to inform air traffic control that they were in a TCAS descent. The RE-M4 coach answered this statement with *"Air France nine eight nine zulu, traffic twelve o'clock, turn right by twenty degrees"*.

The internationally valid rules at the time of the serious incident for dealing with a TCAS evasive manoeuvre specify that after receipt of a TCAS RA message, air traffic control must not transfer any further instructions to flight crews relating to the flight path until they report *"clear of conflict"*. The air traffic controller's reaction did in fact deviate from this principle, but did not increase the risk. It is explicable in that on the one hand he was trying by any means to avoid a collision and on the other hand he may possibly have been in a reaction pattern applied earlier.

In retrospect, the reactions of the RE-M4 coach, which were not adequate to resolve the situation, show that he allowed the RE-M4 trainee to work independently for too long and waited too long before taking over traffic control himself.

### 3 Conclusions

#### 3.1 Findings

##### 3.1.1 Technical aspects

- The investigation produced no indications of any pre-existing technical faults which might have caused the incident.
- The TCAS generated a resolution advisory on both aircraft, the instructions of which were obeyed immediately and correctly by the crews.
- The Sector M4 STCA was triggered at 12:17:54 UTC.
- Since 22 December 2005, Skyguide's flight plan processing system (stripless environment) has included a function in the Geneva Area Control Centre which monitors whether planned clearances lead to a conflict between the aircraft involved.
- This stripless environment was not available in the Zurich Area Control Centre at the time of the serious incident.

##### 3.1.2 Crews

- The crews of the two aircraft involved in the serious incident were in possession of the licences necessary to exercise their activities.

##### 3.1.3 Air traffic control personnel

- The air traffic controllers and the trainee controller were in possession of the licences necessary to exercise their activities.

##### 3.1.4 History of the flight

- Flight RYR 1702 was flying from the north in the direction of the Trasadigen VOR at FL 370.
- Flight AFR 989Z was flying from the east in the direction of the Trasadigen VOR at FL 380.
- At 12:17:20 UTC the RE-M4 trainee instructed the crew of AFR 989Z to descend from FL 380 to FL 360.
- The instruction from the RE-M4 trainee to AFR 989Z to descend to FL 360 was not noticed by the RE-M4 coach.
- The RE-M4 coach gave the RE-M4 trainee the instruction to get AFR 989Z to descend at a rate of descent of at least 3000 ft/min.
- The crew of AFR 989Z switched off the autopilot in order to be able to achieve the rate of descent of 3000 ft/min for the 2000 ft reduction in altitude.
- After the STCA occurred, the RE-M4 coach took over traffic control.
- Since the crew of AFR 989Z had not confirmed the 3000 ft/min rate of descent, the RE-M4 coach repeated the instruction.
- When the crew of AFR 989Z still gave no answer, he instructed the crew of RYR 1702 to also descend to FL 360.

- The two aircraft crossed above the Trasadingen VOR with a lateral distance of 1.4 NM and an altitude difference of 725 ft.

### 3.1.5 General conditions

- The M4 workstation was occupied by an RE-M4 coach, an RE-M4 trainee and the RP-M4.
- The RE-M4 trainee was at the beginning of the second of three training phases.
- When working, the RE-M4 trainee wore a headset consisting of headphones and a microphone.
- The RE-M4 coach monitored the RE-M4 trainee without wearing a headset.
- A separate workstation was not available for the RE-M4 coach.
- The military airspace was available only to a limited extent and only after coordination had taken place.
- Between 11:30 and 15:00 UTC, the capacity of Sector M4 was limited to 38 flights per hour.
- Forty-three flights were counted in sector M4 between 11:30 and 12:30 UTC.
- The complexity of the traffic handling situation was additionally aggravated by the south-westerly wind situation.

## 3.2 Causes

The serious incident is attributable to the fact that air traffic control cleared an aircraft at FL 380 to descend to FL 360 without taking account of an aircraft at FL 370 crossing the flight path. The result was that an inadvertent convergence of these aircraft occurred, involving a high risk of collision.

The following factors contributed substantially to the origin of the serious incident:

- An intervention by the supervising air traffic controller which was too late, because he had not realised that the trainee air traffic controller was overwhelmed by the challenging traffic situation.
- Within the Zurich air traffic control unit there was no function for monitoring clearances with regard to possible conflicts.

The following factors contributed to the genesis of the serious incident:

- The fact that air traffic control received no confirmation of a high rate of descent by AFR 989Z.
- The fact that the supervising air traffic controller was working without a headset.



## **4 Safety recommendations and measures taken since the serious incident**

### **4.1 Safety recommendations**

#### 4.1.1 Safety deficit

On 8 June 2009, an Airbus A318, radio callsign Air France 989Z, was flying at FL 380 on the Kempten – Trasadingen – Hochwald route in the area of responsibility of Sector M4 of Zurich Area Control Centre. Coming from the north, a Boeing 737, radio callsign RYR 1702, was flying at flight level (FL) 370 via Trasadingen to waypoint ODINA. The flight paths of the two aircraft crossed above Trasadingen. About 12 NM east of Trasadingen, the air traffic controller, who was under training, instructed Air France 989Z to descend to FL 360. The supervising coach did not notice this instruction. Shortly afterwards, a short-term conflict alert indicated the impending conflict on the radar display. The coach then took over air traffic control and allowed RYR 1702 to descent to FL 360 as well. The traffic alert and collision avoidance system generated a resolution advisory in both aircraft. The crews obeyed these instructions. The two aircraft crossed above Trasadingen with a lateral distance of 1.4 NM and an altitude difference of 725 ft.

Within the framework of the investigation it was established that since 22 December 2005, Skyguide's flight plan processing system (stripless environment) in the Geneva Area Control Centre has included a function which monitors whether planned clearances will lead to a conflict between the aircraft involved. This stripless environment was not available in the Zurich Area Control Centre at the time of the serious incident. Such a function would have detected the impending conflict, so it would very probably not have been possible for the serious incident to have occurred.

#### 4.1.2 Safety recommendation no. 424

The Federal Office of Civil Aviation (FOCA) should ensure that the Zurich Area Control Centre is equipped in such a way that planned clearances are monitored for possible conflicts.

#### 4.2 Measures taken since the serious incident

In the area control centre Zurich, in all work sectors, a third workstation for a radar coordinator was put into service. Among other things, these workstations are also available to supervising coaches.

Payerne, 30 November 2010

Aircraft Accident Investigation Bureau

This report contains the AAIB's conclusions on the circumstances and causes of the accident/serious incident which is the subject of the investigation.

In accordance with Art 3.1 of the 9th edition, applicable from 1 November 2001, of Annex 13 to 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 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.