DATA SUMMARY

LOCATION

Date and time	**Sunday, 16 October 2005; 13:15 h UTC[1]**
Site	**Flight level 280 approximately 40 NM away from VOR Zaragoza**

AIRCRAFT

Registration	**HA-LOM**	**EC-HAF**
Type and model	**BOEING 737-800**	**AIRBUS 320-214**
Operator	**Malév Hungarian Airlines**	**Iberia**

Engines

Type and model	**CFM-56-7B26**	**CFM-56-5B4/P**
Number	**2**	**2**

CREW

Pilot in command

Age	**43 years**	**39 years**
Licence	**ATPL**	**ATPL**
Total flight hours	**9,813:49 h**	**9,693 h**
Flight hours on the type	**3,066:09 h**	**1,388 h**

INJURIES

	Fatal	Serious	Minor/None	Fatal	Serious	Minor/None
Crew			**4**			**6**
Passengers			**91**			**145**
Third persons			**0**			**0**

DAMAGE

Aircraft	**None**	**None**
Third parties	**None**	**None**

FLIGHT DATA

Operation	**Commercial Air Transport – Scheduled International – Passenger**	**Commercial Air Transport – Scheduled International – Passenger**
Phase of flight	**En route – Level flight**	**En route – Descent**

REPORT

Date of approval	**28 November 2007**

[1] Reference time used in this report is UTC unless otherwise specified. To obtain local time, add 2 hours to UTC.

1. FACTUAL INFORMATION

1.1. History of the flight

On Sunday, 16 October 2005, a Boeing 737-800 with call sign MAH 581, was flying from Madrid to Budapest (LEMD-LHBP). In the opposite direction, an Airbus 320-214 with call sign IBE 3523 was en route from Dusseldorf to Madrid (EDDL-LEMD). At around 13:15, when both aircraft were under the Zaragoza (ZGZ) control sector of the Madrid Area Control Center (LECM), MAH 581, at flight level (FL) 280 in level flight, received a TCAS descend resolution advisory (RA) after traffic was detected (IBE 3523). According to radar information, the minimum distances between the aircraft at the time of the TCAS RA were 400 ft vertically and 6 NM horizontally.

According to communications with LECM, some twenty-five seconds prior to the warning (at 13:14:24), the controller had detected the possible conflict and had ordered the aircraft (in Spanish to IBE 3523 and in English to MAH 581 to alter their respective courses 20° to the left.

IBE 3523 initially acknowledged a 20° turn to the right, which prompted the controller to reiterate the instruction to turn to the left. The crew of IBE 3523 then corrected its maneuver. MAH 581 initiated the evasive maneuver, informing ATC it was receiving a TCAS RA. It later communicated its intention to file a report concerning the incident.

No damage or injuries were recorded in either aircraft or its respective occupants.

1.2. Personnel information

1.2.1. *Captain MAH 581*

Gender, Age:	Male, 43
Nationality:	Hungarian
License:	ATPL
Type rating:	B737 Captain
Medical exam valid until:	07-05-2006
Proficiency check valid until:	31-03-2006
Total flight hours:	9,813:49 h
Hours on the type:	3,066:09 h
Hours in the previous 72 h:	11:28 h
Hours in the previous 30 days:	65:06 h

Activity period prior to the incident date:	5:25 h (15-10-05)
Rest period prior to the incident date:	25:33 h

1.2.2. *Copilot MAH 581*

Gender, Age:	Male, 54
Nationality:	Hungarian
License:	ATPL
Type rating:	B737 Copilot
Medical exam valid until:	09-02-2006
Proficiency check valid until:	31-03-2006
Total flight hours:	10,018:49 h
Hours on the type:	4,725:47h
Hours in the previous 72 h:	5:53 h
Hours in the previous 30 days:	68:19 h
Activity period prior to the incident date:	12 h (13-10-2005)
Rest period prior to the incident date:	58:01 h

1.2.3. *Captain IBE 3523*

Gender, Age:	Male, 39
Nationality:	Spanish
License:	ATPL
Type rating:	A320
Medical exam valid until:	27-08-2006
Proficiency check valid until:	25-05-2006
Total flight hours:	9,693 h (on 30-09-2005)
Hours on the type:	1,388 h (on 30-09-2005)
Hours in the previous 72 h:	8:31 h
Hours in the previous 30 days:	45:40 h
Activity period prior to the incident date:	5:30 h (15-10-2005)
Rest period prior to the incident date:	14 h

1.2.4. *Copilot IBE 3523*

Gender, Age:	Male, 33
Nationality:	Spanish
License:	ATPL
Type rating:	A320
Medical exam valid until:	26-10-2006
Proficiency check valid until:	18-06-2006
Total flight hours:	6,943 h (on 30-09-2005)
Hours on the type:	135 h (on 30-09-2005)
Hours in the previous 72 h:	8:31 h
Hours in the previous 30 days:	58:34 h
Activity period prior to the incident date:	5:30 h (15-10-2005)
Rest period prior to the incident date:	14 h

1.2.5. *Controller at the Madrid Control Center (LECM)*

Total experience as an air traffic controller:	29 years
Local certification as airway controller at LECM:	4-2-1992

The controller was also an instructor at the Madrid ACC since 1-9-2005.

Medical exam valid until:	13-7-2007
Activity on the day of the incident:	As logged in the corresponding Control Sheet, he signed into the Control Room to begin his official watch period from 13:00 until 20:00. He was part of the team that had been assigned the ZGZ (Zaragoza) sector, and he had a trainee under his charge and responsibility
Previous rest period:	24 h

AENA logs indicate he had received the required ongoing training.

1.3. Information provided on the radar screen. Conflict alerts

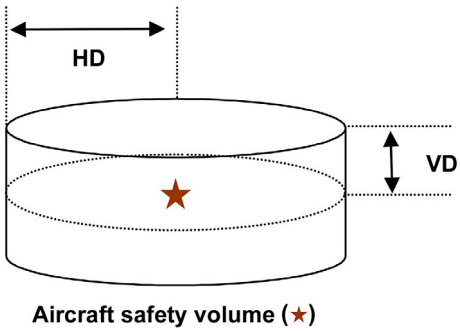
The information presented on the controller's radar screen concerning a loss of separation between aircraft is issued by way of *conflict alerts*. The aim of these alerts is to anticipate or detect the moment at which the proximity between two or more aircraft exceeds established safety limits.

There are two types of conflict alerts:

- CPA (Conflict Prediction Alert)
- CVA (Conflict Violation Alert)

A *conflict prediction alert* is issued when the system forecasts that an aircraft is going to violate another aircraft's safety volume within a time period below the alarm time (AT). The AT is the predicted time to entering said safety volume and is defined beforehand in the system. The safety volume is delineated by a cylinder, with the aircraft at its center, whose dimensions can be configured within the system. In the current version of this system, the parameters are set as follows:

Vertical level	Horizontal distance (NM) HD	Vertical distance (ft) VD
0-307	7.2	800
307-1,000	7.2	1,700



A *conflict violation alert* is issued when the system detects the entry by one aircraft into another's defined safety volume.

When such an alert is issued by the system, the number of alerts, the time at which they appear and the minimum distances between the aircraft are logged in the database. The relevant data for a loss of separation event between aircraft can thus be recovered.

1.4. Aircraft trajectories and communications with ATC.

Aircraft MAH 581 was climbing away from LEMD on airway UN-870 on a heading of 080° (see Figure 1), although at the time of the incident it was in level flight at FL 280. Aircraft IBE 3523 was descending toward LEMD on airway UW-100 on a heading of 240° and on standard terminal arrival route (STAR) TERSA ONE BRAVO.

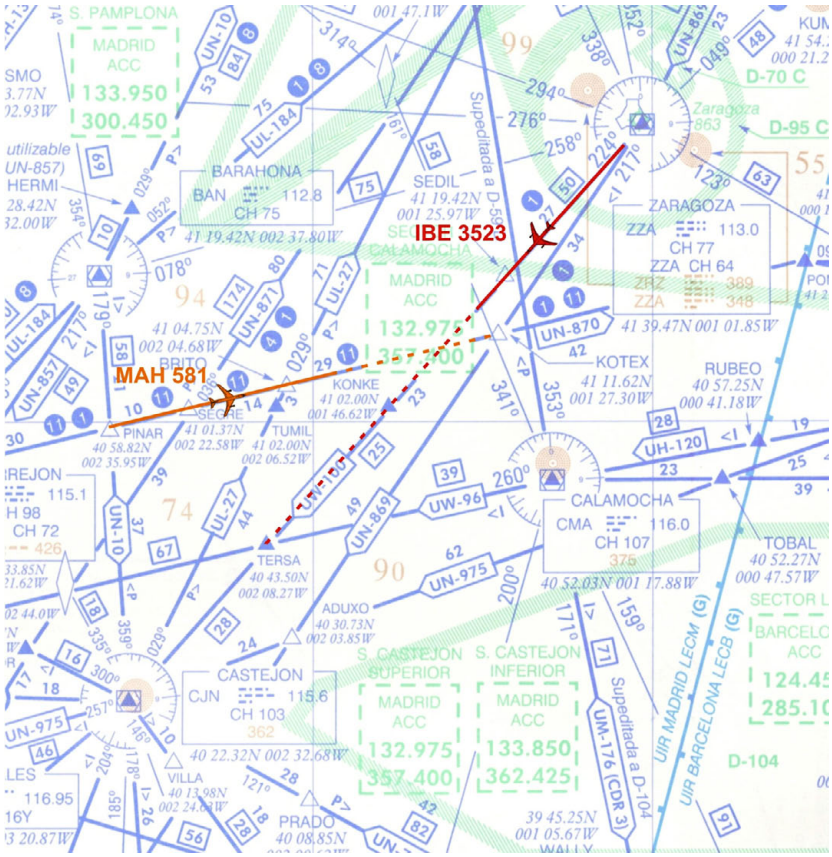


Figure 1. Planned routes for the two aircraft

According to ATC communications, at 12:54:46, LECM established radar contact with IBE 3523 and informed it of the runway in use at Madrid Barajas Airport (33L) and of the STAR procedures (TERSA 1B) to be followed. The instructions were acknowledged by IBE 3523.

12:54:46 LECM (Spanish) "IBERIA THREE FIVE TWO THREE GOOD DAY, RADAR CONTACT TERSA ONE BRAVO THREE THREE LEFT IN SERVICE, PROCEED TO TERSA"

12:54:53 IBE 3523 (Spanish) "THREE THREE IN SERVICE TERSA ONE BRAVO TO TERSA THREE FIVE TWO THREE"

At 13:07:32 LECM cleared IBE 3523 to FL 250. The crew once again acknowledged the instruction.

13:07:32 LECM (Spanish) "IBERIA THREE FIVE TWO THREE DESCEND TO FLIGHT LEVEL TWO FIVE ZERO"

13:07:33 IBE 3523 (Spanish) "TWO FIVE ZERO, THREE FIVE TWO THREE"

At 13:08:15 LECM established radar contact with MAH 581, cleared it to climb to FL 280 and requested the desired FL. MAH 581 acknowledged the assigned FL (FL 280) and requested FL 380. LECM initially requested that it maintain FL 280 and that it would call back to authorize a higher FL. MAH 581 acknowledged the instruction to maintain FL 280.

13:08:15 LECM (English) "MALEV FIVE EIGHT ONE MADRID BUENAS TARDES RADAR CONTACT CLIMB TO FLIGHT LEVEL TWO EIGHT ZERO REPORT FINAL REQUESTED"

13:08:21 MAH 581 (English) "CLIMBING TWO EIGHT ZERO AND THE...REQUESTING EH...LEVEL THREE, THREE EIGHT ZERO PLEASE"

13:08:28 LECM (English) "ROGER, INITIALLY MAINTAIN TWO EIGHT ZERO AND I'LL CALL YOU BACK FOR HIGHER, MALEV FIVE EIGHT ONE"

13:08:32 MAH 581 (English) "...MAINTAIN TWO EIGHT ZERO, MALEV FIVE"

At 13:14:24 LECM contacted IBE 3523 to reiterate that the authorized FL was 290 (at that moment IBE 3523 was at FL 286, according to radar information) and requested that it turn left twenty degrees for separation purposes. IBE 3523 acknowledged a 20° turn to the right and was immediately corrected by the controller, who reiterated the instruction to turn left, this time by 15°. Once this new instruction was acknowledged, the controller asked MAH 581 to also turn to its left 20°. Just as the crew was initiating the acknowledgment, the TCAS descend RA warning came in.

13:14:24 LECM (Spanish) "IBERIA THREE FIVE TWO THREE I CONFIRM YOU ARE CLEARED TO FLIGHT LEVEL TWO NINE ZERO, TURN LEFT TWENTY DEGREES FOR TRAFFIC SEPARATION NOW"

13:14:29 IBE 3523 (Spanish) "TURNING NOW TO THE RIGHT TWENTY DEGREES, THREE FIVE TWO THREE UH... ROGER..."

13:14:35 LECM (Spanish) "TO THE LEFT IBERIA THREE FIVE TWO THREE, FIFTEEN DEGREES LEFT NOW"

13:14:39 IBE 3523 (Spanish) "FIFTEEN DEGREES TO THE LEFT NEW HEADING ONE NINE FIVE THREE FIVE TWO THREE"

13:14:43 LECM (English) "MALEV FIVE EIGHT ONE TURN LEFT TWO ZERO DEGREES FOR TRAFFIC SEPARATION NOW"

13:14:49 MAH 581 (English) "...FIVE EIGHT ONE EH T-C-A-S TO DESCEND"

According to radar information, the first conflict prediction alert (CPA) appeared on the radar screen at 13:14:25. This information is consistent with the time at which the controller started giving instructions to achieve separation between both aircraft. According to this information on the conflict alerts, the first conflict violation alert (CVA) was received at 13:14:53 as the separation between the aircraft reached a minimum: 400 ft vertically and 6 NM horizontally (see Figures 2 and 3). MAH 581 had relayed the receipt of a TCAS RA a few seconds earlier.

In the ATS incident notification report filed by MAH 581, the captain stated that all communications between ATC and IBE 3523 were made in Spanish, thus preventing the MAH 581 crew from being aware of the situation of IBE 3523 with respect to the former and of its crew's intentions.

For his part, the captain of IBE 3523 alleged in his ATS incident notification report that the FL assigned by ATC was 250 and not 290, as stated later by the controller when he had to give instructions to obtain the separation.

The controller on duty filed an ACAS report, in which he stated that IBE 3523 was descending to FL 290 and MAH 581 was at FL 280. IBE 3523 continued its descent and was ordered (in Spanish) to turn 20 degrees left at FL 286. The same instruction was then given (in English) to MAH 581 to execute a 20º turn to the left.

Information extracted from LECM's communications with all the traffic implicated while in the process of controlling IBE 3523 and MAH 581 shows that the controller was responsible for several IBE flights and TERSA 1 BRAVO arrivals at the time. The FL assigned to the various aircraft upon approach to point TERSA is 290. At approximately 13:06:31, the controller spoke with the adjacent sector (Castejón Bajo Sector (CJL)) to request a lower FL for IBE 3477, which had just informed that it was reaching FL 290.

13:05:59 IBE 3477	(Spanish) "IBERIA THREE FOUR SEVEN SEVEN APPROACHING LEVEL TWO NINE ZERO"
13:06:028 LECM	(Spanish) "IBERIA THREE FOUR SEVEN SEVEN, ROGER, MAINTAIN FLIGHT LEVEL TWO NINE ZERO UPON REACHING IT DUE TO TRAFFIC, EXPECT LOWER LEVEL IN A MINUTE"
13:06:0814 IBE 3477	(Spanish) "THREE FOUR SEVEN SEVEN COPY, WILL MAINTAIN TWO NINE ZERO"
13:06:25 LECM	(Spanish) "ZARAGOZA...? CAN YOU GIVE ME A LOWER LEVEL FOR IBERIA THREE FOUR SEVEN SEVEN? IS TWO SEVEN OK? ... TWO FIVE ZERO, THANK YOU"

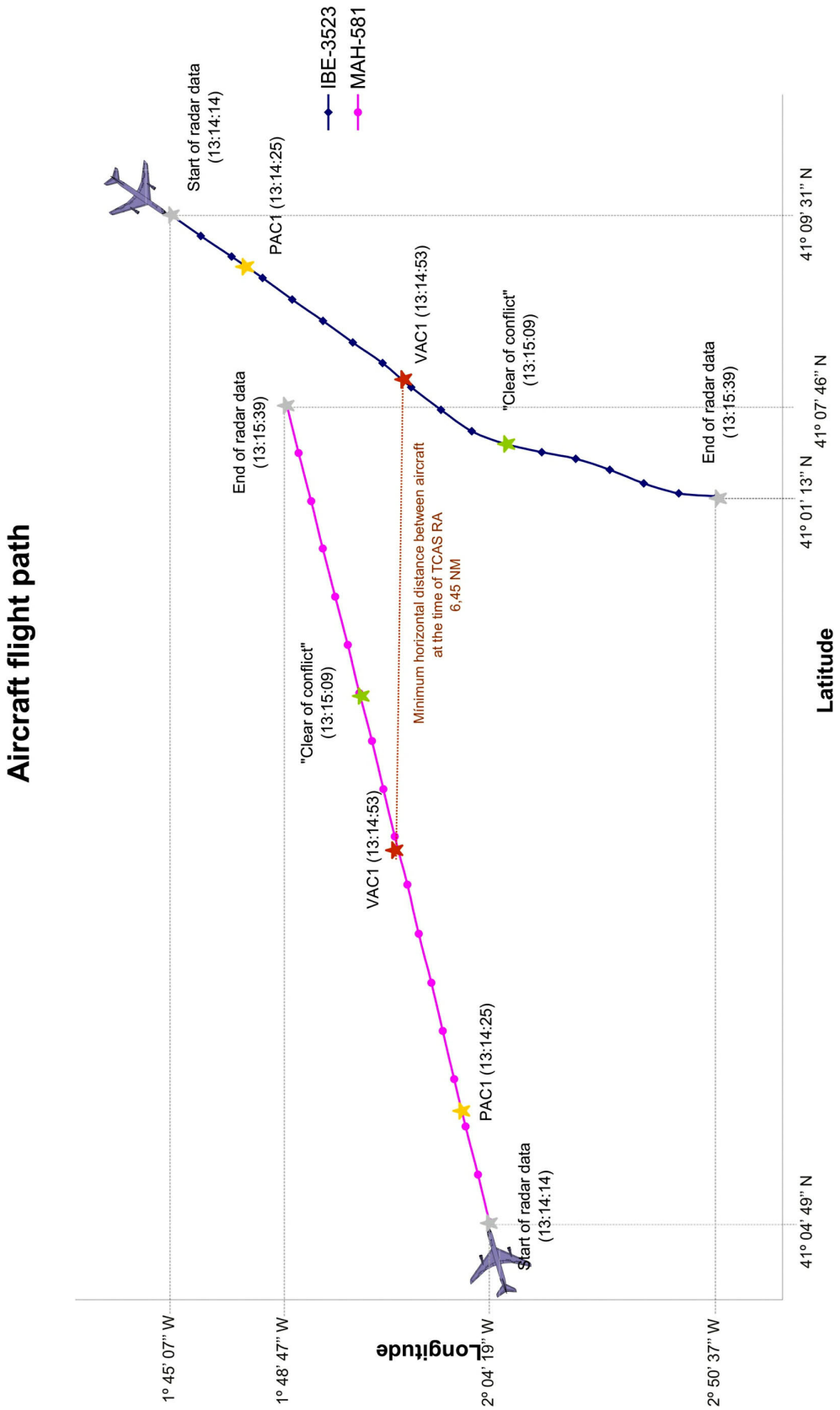


Figure 2. Flight path of the two aircraft

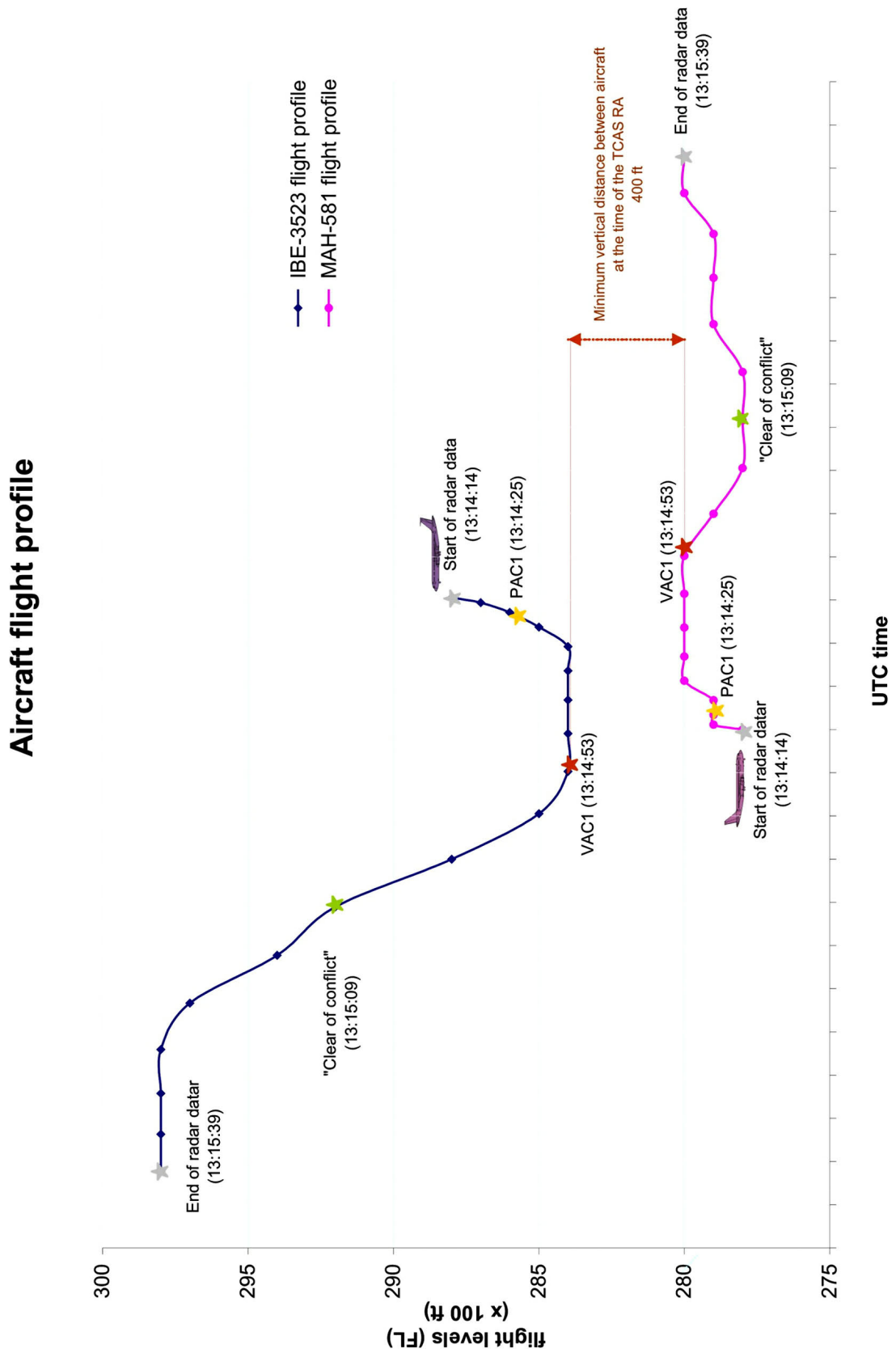


Figure 3. Flight profile of the two aircraft

The controller then cleared IBE 3477 to FL 250 and some 36 seconds later, after a couple of communications with other flights, gave the same clearance to IBE 3523, which was on the same airway behind IBE 3477.

13:06:49 LECM (Spanish) "IBERIA THREE FOUR SEVEN SEVEN RECLEARED TO FLIGHT LEVEL TWO FIVE ZERO AND CALL MADRID ON ONE THREE THREE EIGHT FIVE, GOOD DAY"

13:06:56 IBE 3477 (Spanish) "FOR FLIGHT LEVEL TWO FIVE ZERO AND MADRID ON THREE THREE EIGHT FIVE, GOOD DAY. IBERIA THREE FOUR SEVEN SEVEN"

Other extraneous communications

13:07:32 LECM (Spanish) "IBERIA THREE FIVE TWO THREE DESCEND TO FLIGHT LEVEL TWO FIVE ZERO"

13:07:33 IBE 3523 (Spanish) "TWO FIVE ZERO, THREE FIVE TWO THREE"

1.5. Language to be used in communications

1.2.1. *Domestic requirements*

The language requirements contained in the Air Traffic Regulations (RCA in Spanish) were modified on 5 September 2005 (pursuant to Order PRE 2733/2006 dated 28 August, which introduced modifications to the Air Traffic Regulations approved by Royal Decree 57/2002, dated 18 January, concerning traffic flow and communications management). The relevant points are shown below, where the newly incorporated text concerning the RCA in effect at the time of the incident is underlined.

10.5.2.1.1. Language to be used

10.5.2.1.1.1 Land-air radio communications are to be made in the language normally used by the ground station or in English.

Note: The language used by the ground station need not be that of the State in which it is located. Another language may be used, if so agreed, by the ground stations in the region in question.

10.5.2.1.1.2 English shall be used at all ground stations serving those designated airports and airways used by international carriers if so requested by any aircraft.

10.5.2.1.1.3 The languages available at a given ground station shall be listed on aviation publications and other official aviation references which contain information on those facilities.

These modifications were drafted pursuant to Annex 10 of the ICAO and frame the previous text to make the general use of English even more evident, especially when requested by an aircraft. Said modifications, however, do not consider the possible exclusive use of English at international airports or during operations involving a non-Spanish speaking pilot.

1.2.2. *Previous occurrences*

In keeping with the regulations in effect in Spain, it seems consistent that English be used in situations involving foreign crews so as to give them a clearer and more uniform understanding of the traffic situation. The lack of knowledge of this language on the part of some Spanish pilots operating in common areas (general aviation, for example), however, must also be taken into account. This issue was already addressed in previous incidents both in Spain and abroad, specifically as a consequence of incident IN-060/2002, which resulted in the following safety recommendation:

REC 25/03. It is recommended that the DGAC establish a working group in conjunction with AENA and with representatives from operators, as well as pilots' and controllers' unions to study the possibility of regulating the exclusive use of English during ATC communications when a non-Spanish speaking pilot is involved, as well as the conditions for implementing said regulation.

To date, the CIAIAC is unaware of any measures taken in response to this safety recommendation; however, the aforementioned modifications to the Air Traffic Regulations are considered to conform to the requirements of Annex 10 of the ICAO and are directed at complying with this recommendation.

1.6. Regulations on controller training

Concerning the training of new controllers and the procedures detailing said process, European Directive 2006/23, issued on 27 April 2006, provides guidance on the licensing of Community air traffic controllers. Implementation of this Directive is still pending within the national regulations, which make reference to the requirement on the part of air traffic control service providers to enact the so-called "Unit Training Plan," which details the procedures and timing required to allow the unit procedures to be applied to the local area under the supervision of an on-the-job training instructor. This Plan must be approved by a body created by each member State, designated the *national supervisory authority*. The deadline for incorporating this Directive into each State's internal regulations is 17 May 2008.

2. ANALYSIS AND CONCLUSIONS

In accordance with ATC communications, IBE 3523 was cleared to FL 250 and not 290 as was later alleged by the controller. The information was compared by checking the flight progress strips, where the controller notes the flight levels requested by the crew and those actually assigned. In this case it is not clear whether the handwritten flight level was 250 or 290; however, the clearance for FL 250 issued by ATC was acknowledged by IBE 3523 and not corrected by ATC. It should be noted that a determination could not be made as to whether the control was being provided by the instructor or by the trainee and, if the latter, whether the trainee was under the instructor's constant supervision such that flight level assignment errors could have been avoided.

The controller identified the conflict via a conflict prediction alert issued by his screen and immediately proceeded to give instructions to both aircraft to attain separation. Initially, both acted in accordance with ATC instructions, and later followed the instructions from their respective TCAS.

It should be added that the conversation held in Spanish between LECM and IBE 3523 resulted in MAH 581's complete unawareness of the intruding traffic and of its intentions.

Concerning ATC personnel organization, functions and training, the following points should be kept in mind:

- The operating environment at the time of the incident was complex insofar as the number of movements, similar types of operations and call signs were concerned.
- The swing shift officially started at 13:00 and the incident took place a few minutes later (approx. 13:15).
- It is uncertain who (instructor or trainee) was providing ATC services to the aircraft in this sector.
- The incident took place minutes after the start of a new ATC shift. The controller's attention to and visualization of the operating environment is thus considered to have been less than optimal.
- The details concerning the methodology and criteria used for assigning the trainee schedules in the control room and the difficulty level of the workload used during said training are unknown.

After presenting and analyzing the information, the root cause that led to the loss of separation between the aircraft and the subsequent TCAS alert and evasive maneuvers is considered to have been the incorrect assignment of FL 250 to IBE 3523, possibly due to the controller's confusion over having assigned that FL to a similar flight (IBE 3477) a few seconds earlier. The complex operating environment during a training session minutes after assuming the duty following a shift turnover contributed to the incident.

The actions taken by both aircraft, as well as those taken by the controller once the conflict was detected, were correct.

3. SAFETY RECOMMENDATIONS

REC 52/07. It is recommended that AENA revise the criteria and methodology employed for assigning trainees to the different operating posts until the transposition and entry into force of the aforementioned European Directive 2006/23.