DATA SUMMARY

LOCATION

Date and time	**Wednesday, 8 February 2012; 08:30 local time[1]**
Site	**Approach to the Barcelona Airport (Spain)**

AIRCRAFT

Registration	**OO-SSR**	**EC-HAG**
Type and model	**AIRBUS A-319**	**AIRBUS A-330-214**
Operator	**Brussels Airlines**	**Iberia**

Engines

Type and model	**CFM 56 7B**	**CFM 56-5-B4**
Number	**2**	**2**

CREW

	Captain	First officer	Captain	First officer
Age	**43**	**29**	**37**	**35**
Licence	**ATPL(A)**	**CPL(A)**	**ATPL(A)**	**CPL(A)**
Total flight hours	**9,460 h**	**3,450 h**	**11,568 h**	**7,461 h**
Flight hours on the type	**70 h**	**600 h**	**4,267 h**	**7,461 h**

INJURIES

	Fatal	Serious	Minor/None	Fatal	Serious	Minor/None
Crew			**5**			**6**
Passengers			**122**			**48**
Third persons						

DAMAGE

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

FLIGHT DATA

Operation	**Commercial Air Transport – Scheduled – International – Passenger**	**Commercial Air Transport – Scheduled – Domestic – Passenger**
Phase of flight	**Approach**	**Approach**

REPORT

Date of approval	**28 November 2012**

[1] To obtain UTC, subtract one hour from local time.

1. FACTUAL INFORMATION

1.1. Description of the event

On 8 February 2012 at 08:30, two airplanes approaching runway 25R at the Barcelona Airport received a TCAS RA warning when separated horizontally by 2.2 NM and at the same height, requiring an evasive maneuver. The minimum radar separation reached was 1.4 NM horizontally and 400 ft vertically.

One of them (call sign BEL3HH) had taken off from Brussels and had 122 passengers and 5 crew. The other (call sign IBE0716) had departed from Madrid with 48 passengers and 6 crew.

Also converging during the approach was a Boeing 777 (with heavy wake turbulence) with call sign DAL114 and operated by Delta Airlines.

The controller established a landing sequence with DAL114 first, IBE0716 second and BEL3HH third.

Shortly thereafter, the controller saw that DAL114 and BEL3HH, once they were established on final, were separated by a distance of 8 NM and the speed of the second was 30 kt faster than the first's. The controller concluded that there was not enough room for IBE0716 to enter behind DAL114 since the required 5 NM separation due to the latter's heavy wake turbulence could not be guaranteed.

As a result the order was changed and IBE0716 was rerouted left to place it behind BEL3HH in the landing sequence. The TCAS RA warning took place while IBE0716 was turning (see Figure 1).

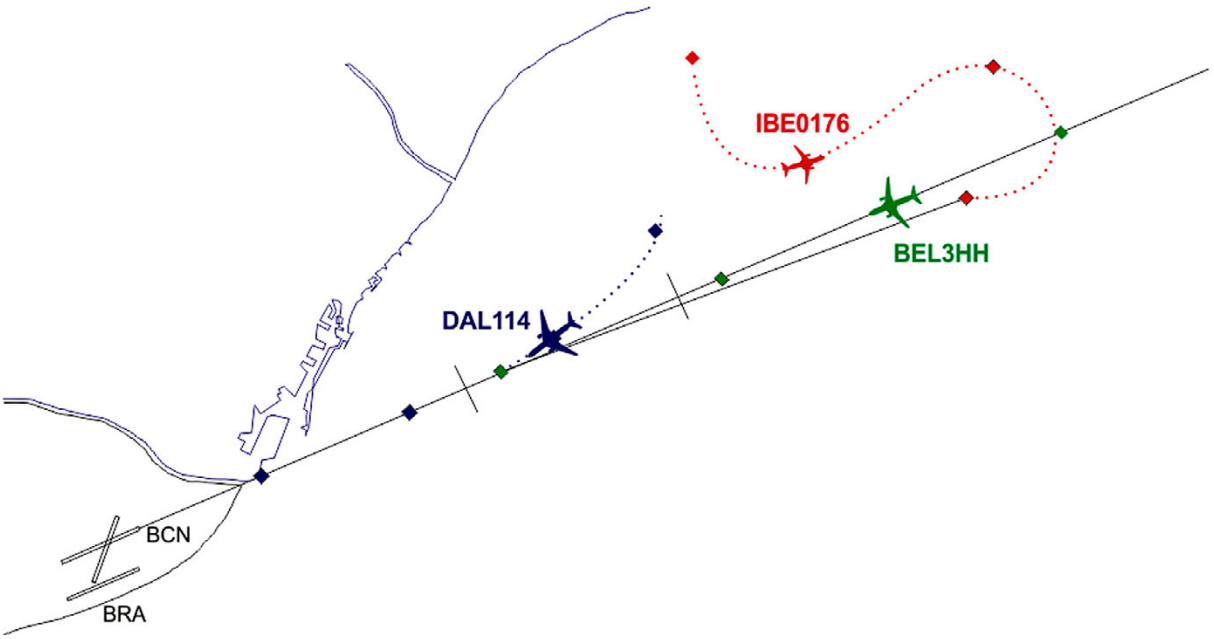

Figure 1. Position of the three aircraft at the time of the TCAS warning

The controller addressed BEL3HH in English and IBE0716 in Spanish for the duration of the maneuver.

1.2. Personnel information

1.2.1. *Crew of airplane OO-SSR (BEL3HH)*

Both the captain and the first officer had valid airline transport pilot licenses (ATPL(A)) and medical certificates.

The captain had 9,460 flight hours, of which 70 had been on the type. The first officer had 3,450 flight hours, of which 600 had been on the type.

1.2.2. *Crew of airplane EC-HAG (IBE0716)*

Both pilots had valid airline transport pilot licenses (ATPL(A)) and medical certificates.

The captain had 11,568 flight hours, of which 4,267 had been on the type. The first officer had 7,461 flight hours, all of them on the type.

1.2.3. *On-duty controllers in Barcelona Approach*

The executive controller, who was in contact with the aircraft at the time of the event, had an LECB ROUTE rating since August 2002 and an LECB approach rating since May 2008.

The planning controller had an LECB ROUTE rating since April 1999 and an LECB approach rating since April 2003.

1.3. Airport information

The Barcelona Airport (LEBL) has three runways, designated 02–20, 07L–25R and 07R–25L, the first two of which cross.

All three are 45 m wide. Runway 02-20 is 2,645 m long, runway 07L-25R is 3,472 m long and runway 07R-25L is 2,780 m long.

Runways 07L-25R and 07R-25L are used simultaneously, the former for landings and the latter for takeoffs. The most typical configuration is west (WRL), due to the

predominant winds in the area. With this configuration traffics land on runway 25R and take-off from runway 25L.

As per the standard terminal arrival route chart published in the AIP (see Figure 2), arrival routes to the airport by airplanes arriving from the west when the airport is in this configuration (runways 25R/L) must be via the Sabadell DVOR/DME (SLL), which is 12,8 NM to the north, whereas traffic arriving from the north must do so via the Calella DVOR/DME (CLE), which is 31,1 NM to the northeast.

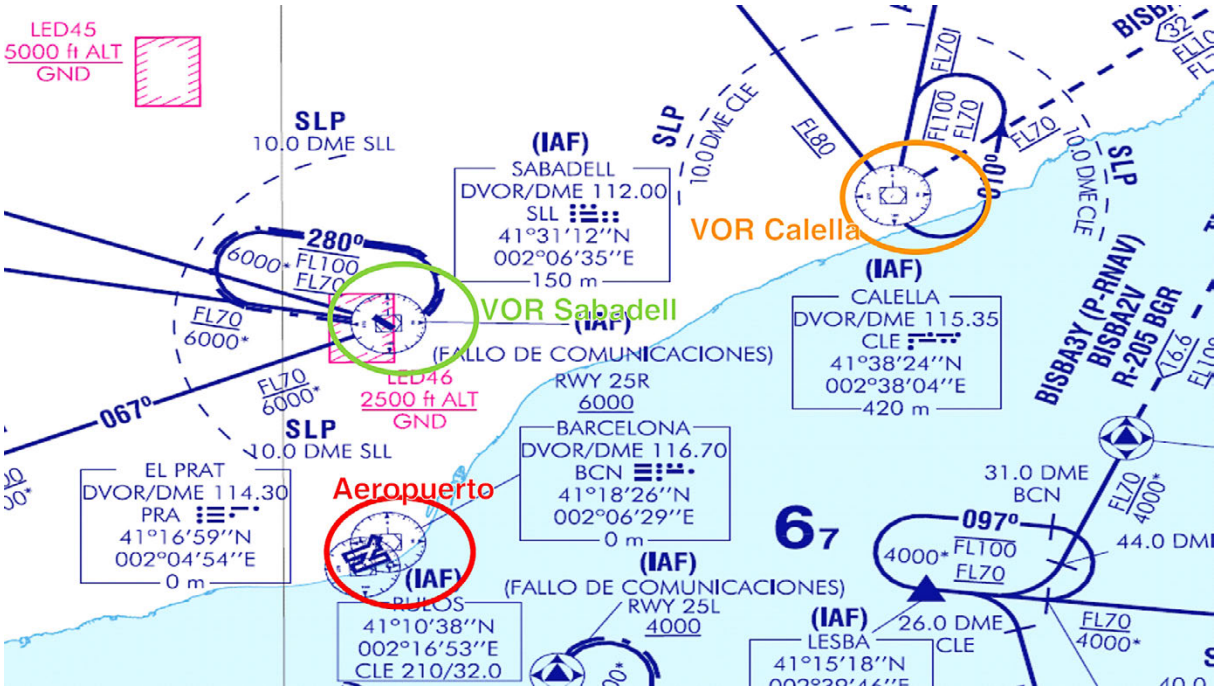

Figure 2. Standard terminal arrival route chart

1.4. Information provided by eyewitnesses

1.4.1. *Captain of aircraft BEL3HH*

The captain reported that the first officer was the pilot flying. When they were cleared to the runway 25R ILS, were established on the localizer and had a descent rate of 1,000 ft/min to reach 2,300 feet and intercept the glide slope, a TCAS caution was activated with an amber traffic signal close in at the 2 o'clock position (their right) at a slightly higher level (+3) and climbing. They did not establish visual contact. They immediately received a TCAS RA warning in red that lasted 2 seconds and instructed them to descend at a rate of 1,500 ft/min. The first officer made the necessary input commands as per the RA to resolve the conflict. The captain communicated ATC the TCAS RA. There were no comments or explanations from ATC, but the other traffic

reported receiving a climb instruction. They continued on the runway 25R ILS and landed normally.

1.4.2. *Captain of aircraft IBE-0716*

The captain stated they were making a radar vector approach to runway 25R at Barcelona. In keeping with the last clearance from ATC, they were at 4,000 ft and 220 kt on a heading of 180° toward the 25R ILS LOC behind another aircraft for landing. ATC then instructed them to turn left to heading 060° since the aircraft in front had delayed its turn longer than expected. This turn took them close to another aircraft that was established on the localizer, so the controller instructed them to continue turning to heading 050°. Even though they continued turning, they could not avoid the TCAS RA climb warning. They carried out the evasive maneuver and climbed to about 4,700 ft, which they reported to ATC. Once the warning cleared, they returned to 4,000 ft. They were in visual contact with the other traffic at all times. The controller apologized for the maneuver and gave them vectors to return to the localizer.

1.4.3. *Executive controller*

He was working the final approach to runway 25R and had three aircraft at the time, trying to establish their sequence. He initially decided that first in the sequence would be DAL114, which was coming from the Sabadell VOR, then IBE0716, coming from the same VOR, and finally BEL3HH, which had left the Calella VOR. This traffic had been transferred from Sector T1 in descent to 5,000 ft and was cleared by the final controller to descend to 4,000 ft and to continue to the runway 25R localizer.

After giving intermediate vectors to both DAL114 and IBE0716, he decided to change the sequence such that BEL3HH would be number 2 and IBE0716 number 3. He instructed IBE0716 to turn to heading 060°, parallel to the localizer and thus to the flight path of BEL3HH, and to maintain 4,000 ft. He also instructed BEL3HH to descend to 2,300 ft.

Since IBE0716 turned later than expected and with a wider turn radius than anticipated, the separation between this airplane and BEL3HH decreased. On noticing this, the controller told IBE0716 to turn to heading 050°, and in the next exchange told BEL3HH to accelerate its descent rate. Despite this, both airplanes received a TCAS RA warning.

He eventually guided IBE0716 to the localizer after BEL3HH.

The planning (assistant) controller asked him if he wanted to be relieved. The supervisor also inquired about him. At first he declined to be relieved, though he was relieved shortly thereafter.

1.4.4. *Planning controller*

He agreed with his coworker's recounting of the facts. Nonetheless he noted that the change in the landing sequence order was due to the longer than expected delay in DAL114 turning onto final.

He also stated that IBE0716 had made a very wide turn that brought it closer to BEL3HH, which was already established on the localizer.

He confirmed that both aircraft reported the TCAS warning and said the controller apologized to both.

He then offered to relieve him on the spot, but the executive controller opted to continue for a few minutes before finally being relieved.

1.5. Flight recorders

By the time the CIAIAC became aware of the incident, there was no possibility of retrieving any of the information on the flight recorders (FDR and CVR) from either aircraft.

It was also impossible to obtain the data from the QAR on BEL3HH.

The data from the QAR on IBE0716 were available, however, an analysis of which enabled investigators to establish the airplane's flight path and the actions taken in response to ATC's instructions.

At 08:29:32, ATC informed the crew that the preceding aircraft had delayed in turning and asked them to turn to heading 060. At that time they were flying south (180°) at 3,804 ft and 212.4 kt. The no. 2 autopilot was engaged, meaning the first officer was the pilot flying.

The course change took place a few seconds later (08:29:39), and was fully executed in 55 s (by 08:30:33). The bank angle and turn rate used were slightly below those associated with a standard turn, resulting in a lower separation between the aircraft.

At 08:30:04, the controller asked them to keep turning to a heading of 050°, but the TCAS RA warning was received at 08:30:24, while they were still on course 078° and nine seconds before reaching 060°.

Just as the TCAS warning cleared, the airplane reached 060° but they continued turning to course 050°, in keeping with the controller's instructions. It steadied on that course at 08:30:48.

1.6. Organizational and management information

The control stations feature a predictive system called STCA (Short Term Conflict Alert), which warns controllers when a loss of separation between two aircraft is imminent. The information from this system is only valid if both aircraft maintain course and speed and, unlike the TCAS onboard aircraft, does not give avoidance instructions.

The STCA in the Barcelona TMA is normally inhibited below FL195 so as to reduce the number of nuisance warnings, meaning that on the day of the incident, the STCA was not operational in the space in which the TCAS warning took place.

AENA has no general procedures on the use of the STCA system in terminal areas (TMA), though it reported that it is working to improve the predictability of the system so that it can be activated in these areas.

AENA reported that it had conducted a study that analyzed the incidents in the Barcelona TMA in 2010 and 2011 involving go-around maneuvers, and also those resulting in a loss of separation. All incidents involving the use of runway 25R between 2004 and 2011 were also included in the study.

The conclusion reached was that the main cause of incidents involving go-arounds was precisely a lack of separation with the preceding aircraft due, as many times, to destabilized approaches, i.e., approaches performed to improper altitude, speed or position. The frequency of this type of incident, however, was considerably reduced from 2010 to 2012.

As for the TMA, it was detected over the course of the last year that sometimes, in order to avoid delays, much adjusted approaches were performed, thus any minimum delay in reducing speed or heading change originates go-around maneuvers.

With regard to the factors responsible for the incidents on runway 25R from 2004 to 2011, these involved mainly the pilots (non-compliance with ATC clearances or with regulations and procedures), followed by those involving ATC (mistakes in assigning speeds, headings or levels, and improper or late instructions or planning), and lastly those involving the operational environment (requiring controllers to multi-task).

AENA also conducted its own internal investigation into the incident and concluded that the proper course of action, once it was decided to take out the Iberia traffic of the sequence and given the traffic heights, would have been to have IBE0716 turn right to move it away from BEL3HH, and that it was advisable to highlight during training for terminal area controllers to assign proper courses for intercepting localizers on approach and to plan potential conflict situations ahead of time so that vertical separation is maintained at all times.

They also stressed the importance of using the English language when it is spoken by any aircraft crew and widespread above investigation.

1.7. Information on the language used during ATC operations

1.7.1. *Background*

The investigation into the accident of 8 September 2006 at the Barajas Airport involving an A-300-600 revealed that communications held on different frequencies with a final exchange that kept the crew from learning vital evacuation information, as well as the fact that many of the communications on the tower frequency with other stations were held in Spanish, meant that the crew was not kept updated on the situation.

For that reason, REC 11/10 was issued in which it was recommended that AENA improved the procedures in case of aircraft with difficulties, anomalies and emergencies, to guarantee in these cases that the information and coordination interchange between the controllers and the crew be more efficient. It was also recommended to avoid the changes in frequency and to maintain the communications in a language known by all the parts involved, especially by all the aircraft in frequency.

1.7.2. *Information on the English usage procedures and guides*

Eurocontrol has published several guides that reference the proper and effective use of the language, such as "*Radio discipline, Language, A guide to phraseology*" and "*Effective Pilot/Controller Communications*", which highlight the problems that can arise from the improper use of language. These documents give clear references and provide examples of how to use language properly. One of the problems detected and analyzed in these guides is precisely the conflict that can arise when using a local language in a setting involving several aircraft with one or more crewmembers who do not speak that language, and which is particularly relevant during the taxi and approach phases. This problem has even resulted in incidents caused by the inability of one crew to understand the instructions given to another.

In keeping with the above, AENA issued circular DOSC-12_CIN-016-1.0 on the "use of English" as a reminder that when any doubt exists as to anyone's ability to understand Spanish, or during conflict situations involving an aircraft whose crew does not speak Spanish, to conduct radio communications in English so that everyone involved has accurate information on the situation.

In this regard, Spain's Air Traffic Regulations state:

"10.5.2.1.1.1 Air-ground telephony communications shall be carried out in the ground station's normal language or in English.

Note: The language normally used by the ground station need not necessarily be that of the State in which it is located. A common regional language could be agreed upon as a requirement for ground stations in the region in question.

10.5.2.1.1.2 English shall be used at the request of any aircraft station at all ground stations serving designated airports and routes used by international air services."

2. ANALYSIS

The fact that the controller changed the landing sequence is not the most relevant issue, since (even though this could not be established with any certainty) DAL114 may have made an overly wide turn, as stated by the planning controller, which would have necessitated the change.

This notwithstanding, even if DAL114 had delayed in turning, the sequence was not selected properly since 3 NM were required for IBE0716 to have entered ahead of the BEL3HH.

This decision was made because when DAL114 started to turn, and due to the north wind, BEL3HH was already at the localizer, 8 NM away from DAL114 and going 30 kt faster, meaning it was impossible for IBE0716 to go in behind DAL114 while maintaining a separation of 5NM.

To divert IBE0716's flight path, the controller made it turn left without taking into account the fact that this airplane was 3 NM away from the localizer and that turning would put it on an intercept course with BEL3HH.

At the same time, the controller asked BEL3HH to descend to 2,300 ft and IBE0716 to maintain 4,300 ft without realizing that BEL3HH was about to reach 4,000 ft, meaning they were not only on intercept courses but they would be at the same altitude as well.

If the controller had instructed IBE0716 to turn right and maintain altitude, or had he taken out the BEL3HH traffic instead of the Iberia one, the airplanes' courses would have diverged instead of converged.

An analysis of the QAR parameters on IBE0716 shows that the start of the turn was slightly delayed with respect to the controller's instruction (7 s), and that the execution lasted a little longer as it was not a standard turn, though it was within normal parameters, resulting in decreased separation.

As regards the fact that the STCA system was inhibited at the Barcelona TMA, this had no bearing in this case since it would not have served its purpose, which is to detect a conflict, because the controller was already aware of the problem and had turned IBE0716 in an effort to resolve it.

The investigation revealed a concern on the part of AENA to reduce the number of incidents in the Barcelona TMA, and that an effort is being made to implement the use of the STCA in every TMA. In any event, as long as the system is not used in certain areas, it would be beneficial to issue general guidelines for activating or not activating it.

Lastly, it should be noted that certain deficiencies were detected in the ATC communications, first due to the controller's failure to respond to the crew of BEL3HH following the TCAS alert, as expressed by the captain. The controller should have given an explanation to the crew of BEL3HH, as he did to that of IBE0716.

Also, neither aircraft was given traffic information nor IBE0716 was instructed to execute the turn promptly so as to maintain separation with another aircraft.

Another consideration is the fact that the controller was speaking to the crew of IBE0716 in Spanish and to the other two crews in English throughout the event, meaning the latter were unaware of the instructions being given to IBE0716, which kept them from having a complete picture of the situation.

This event is an example of improper use of language since the correct practice in those cases that involve several aircraft whose crews speak different languages is to use English so that everyone is aware of the situation. This does not appear to be a case of improper mastery of English, but rather of a bad practice that could result in safety deficiencies.

3. CONCLUSION

The incident was caused by a miscalculation on the part of ATC when attempting to adjust flight paths.

The resolution of the conflict was not adequate. Once it was decided to have IBE0716 turn, this aircraft shouldn't have been allowed to turn left without taking into account the altitudes of the aircraft or their possible converging flight paths. It would have been better handled by making IBE0716 turn right.

Also contributing to this incident were deficient ATC communications.

4. SAFETY RECOMMENDATIONS

REC. 79/12. It is recommended that, during the Unit Competence Scheme theory instruction phase for controllers, AENA stress the importance of using English phraseology in those situations that involve crews who speak different languages.

REC. 80/12. It is recommended that, during the Unit Competence Scheme theory instruction phase for controllers, AENA stress the importance of vectoring and spacing techniques and of speed control.