Technical report

IN-034/2019

Incident involving a Boeing 787-9 aircraft with registration LN-LNI operated by Norwegian Air Shuttle Asa, and an AIRBUS - A319 aircraft with registration VP-BHJ operated by Siberia Airlines, on approach to runway 07L at Barcelona Airport (LEBL) on 07 July 2019.

Please note that this report is not presented in its final layout and therefore it could include minor errors or need type corrections, but not related to its content. The final layout with its NIPO included (Identification Number for Official Publications) will substitute the present report when available.

GOBIERNO DE ESPAÑA
MINISTERIO DE TRANSPORTES, MOVILIDAD Y AGENDA URBANA
SUBSECRETARÍA
COMISIÓN DE INVESTIGACIÓN DE ACCIDENTES E INCIDENTES DE AVIACIÓN CIVIL

NOTICE

This report is a technical document that reflects the point of view of the Civil Aviation Accident and Incident Investigation Commission regarding the circumstances of the accident object of the investigation, its probable causes and its consequences.

In accordance with the provisions in Article 5.4.1 of Annexe 13 of the International Civil Aviation Convention; and with Articles 5.6 of Regulation (EU) No 996/2010 of the European Parliament and of the Council of 20 October 2010; Article 15 of Law 21/2003 on Air Safety; and Articles 1 and 21.2 of RD 389/1998, this investigation is exclusively of a technical nature, and its objective is the prevention of future aviation accidents and incidents by issuing, if necessary, safety recommendations to prevent their recurrence. The investigation is not intended to attribute any blame or liability, nor to prejudge any decisions that may be taken by the judicial authorities. Therefore, and according to the laws detailed above, the investigation was carried out using procedures not necessarily subject to the guarantees and rights by which evidence should be governed in a judicial process.

Consequently, the use of this report for any purpose other than the prevention of future accidents may lead to erroneous conclusions or interpretations.

CONTENTS

ABBREVIATIONS

00º 00´ 00´´ ..... Degrees, minutes and seconds

ºC ..... Degrees Celsius

AEMET ..... Spain's State Meteorological Agency

ACARS ..... Aircraft communication addressing and reporting System

ACAS ..... Airborne collision avoidance system

ACC ..... Air control centre

ATC ..... Air traffic control

ATPL ..... Airline transport pilot license

CAS ..... Calibrated air speed

CPL ..... Commercial pilot license

CVR ..... Cockpit voice recorder

EASA ..... European Aviation Safety Agency

FMS ..... Flight management system

FL ..... Flight level

fpm ..... Feet per minute

ft ..... Feet

g ..... Gravitational acceleration

IF……Intermediate approach fix

IFR ..... Instrumental flight rules

ILS ..... Instrument landing system

IR ..... Instrument Rating

kt ..... Knots

MHz ..... Megahertz

min ..... Minutes

NM ..... Nautical miles

PAC ..... Conflict prediction alert

s ..... Seconds

sector F07……. Final sector for Barcelona's TMA east configuration

sector T4E……. Feeder sector for Barcelona's TMA east configuration

sector XAL……. Sector of the Barcelona TMA.

RA ..... Resolution Advisory from the TCAS

RNAV1 ..... Air navigation specification.

STAR ..... Standard instrument arrival

STCA ..... Short term conflict alert

TA ..... TCAS traffic alert.

TCAS ..... Traffic collision avoidance system

CC..... Cabin crew

UTC..... Coordinated universal time

VOR ..... VHF Omnidirectional range

SYNOPSIS

Date and time	Sunday 07/07/2019: 10:40 UTC
Place	Barcelona Airport TMA
Aircraft	Aircraft 1: AIRBUS A319, registration: VP-BHJ. Aircraft 2: BOEING 787-9, registration LN-LNI. Aircraft 3: AIRBUS A320, registration EC-MXP.
Operators	Aircraft 1: Siberia Airlines Aircraft 2: Norwegian Air Shuttle Asa Aircraft 3: Vueling Airlines SA
Damage to the aircraft	None
Types of operation	Aircraft 1: Commercial air transport - Scheduled - International - Passengers Aircraft 2: Commercial air transport - Scheduled - International - Passengers Aircraft 3: Commercial air transport - Scheduled - International - Passengers
Flight rules:	IFR
Operational phases	Approach - Intermediate approach
Date of approval:	26 January 2022

Synopsis:

On Sunday 07 July 2019, at 10:41 UTC[1], the Airbus A319 aircraft with registration VP-BHJ flying from Saint Petersburg, Russia (ULLI) to Barcelona, Spain (LEBL) was following approach procedure SLL1E towards the final sector for runway 07L at Barcelona Airport.

At the time of the incident, there were four holding patterns at Barcelona airport, two to the north and two to the south, and all aircraft were being coordinated to follow a single approach path from the southwest to runway 07. Aircraft VP-BHJ, which was coming from the northeast holding pattern, turned south and crossed the approach path. This resulted in a loss of separation between the VP-BHJ aircraft and the Boeing 787-9 aircraft with registration LN-LNI. It also led to the air control service diverting the Airbus A320 aircraft with registration EC-MXP. Both aircraft were bound for Barcelona Airport and ready to commence the final approach. The first had departed from Newark, USA (KEWR) and the second from Tel Aviv-Yafo, Israel (LLBG). There were no injuries, and the aircraft did not sustain any damage.

The investigation has concluded that the incident was caused by the VP-BHJ crew's failure to adhere to Barcelona Airport's approach procedures.

[1] Unless specified otherwise, all times in this report are UTC.

1. FACTUAL INFORMATION

1.1. Description of the incident

On Sunday 07 July 2019, the Airbus A319 aircraft, operated by Siberia Airlines, with registration VP-BHJ and flight code SBI6105, was flying from Saint Petersburg, Russia (ULLI) to Barcelona (LEBL) with 136 passengers on board.

Aircraft B787-9, operated by Norwegian Air Shuttle Asa, with registration LN-LNI and flight code NAX76C, was flying from Newark, USA (KEWR) to Barcelona with 352 passengers on board.

The Airbus 320 aircraft operated by Vueling Airlines SA, with registration EC-MXP and flight code VLG7845, was flying from Tel Aviv-Yafo, Israel (LLBG) to Barcelona with 152 passengers on board.

All the aircraft were following approach procedures to runway 07L, which required the RNAV1 navigation specification. The procedures consisted of flying an outbound leg that took the aircraft away from the runway on a south-westerly heading before capturing the locator for runway 07. During this sector, the aircraft had to wait for vectors for the final approach and not turn onto final without the mandatory clearance from ATC.

The VP-BHJ aircraft was ahead of the LN-LNI aircraft in the approach procedure, but instead of continuing its approach via the transition leg on a south-westerly heading, it turned south towards the ASTEK (IF) waypoint. On this first occasion, the controller told the crew that they were not following the transition sector of the instrument approach and instructed them to turn north. As a result, the LN-LNI aircraft entered the final sector for runway 07 ahead of the VP-BHJ aircraft.

Due to this manoeuvre, the VP-BHJ aircraft positioned itself behind the LN-LNI aircraft. This LN-LNI traffic communicated with the final sector.

The controller of sector F07 issued instructions to the two traffics, LN-LNI and EC-MXP to move them away from the path of the VP-BHJ aircraft that had crossed the approach path from the locator for runway 07L to the south.

1.2. Injuries to persons

Aircraft 1: AIRBUS A319, registration: VP-BHJ

Injuries	Crew	Passengers	Total in the aircraft	Others
Fatal				
Serious				
Minor				
Unharmed	5	136	141	
TOTAL	5	136	141	

Aircraft 2: BOEING 787-9, registration LN-LNI

Injuries	Crew	Passengers	Total in the aircraft	Others
Fatal				
Serious				
Minor				
Unharmed	9	335	344	
TOTAL	9	335	344	

1.3. Damage to the aircraft

None.

1.4. Other damage

None.

1.5. Personnel information

Information is provided for each of the different aircraft:

1.5.1 VP-BHJ

It was the first flight of the day for the crew, who were then due to fly the return route: Barcelona- Saint Petersburg.

Commander

The commander was 56 years old. He had an airline transport pilot license (ATPL) with an A319/320/321 type rating valid until 04/10/2019. His English proficiency level was 4.

His CLASS 1 medical certificate was valid until 21/09/2019.

He had 15,578 hours of flight experience (844 hours in type).

He had been working for the operator since 1997, and prior to the incident flight (SBI6105), he had flown a single flight from Moscow to Barcelona on 06/05/2019 (SBI891).

Co-pilot

The co-pilot was 23 years old. He had a commercial pilot license (CPL) with an A319/320/321 type rating valid until 02/06/2020. His English proficiency level was 4.

His CLASS 1 medical certificate was valid until 08/11/2019.

He had 486 hours of flight experience (336 hours in type).

He had been working for the operator since December 2018, and prior to the incident flight (SBI6105), he had flown two flights to Barcelona, one on 11/04/2019 and another on 06/06/2019, with the same commander. Both the flights were from Moscow (SBI891).

1.5.2 LN-LNI

Commander

The commander had an airline transport pilot license (ATPL) with a B777/787 type rating and an instrument flight rating (IR) valid until 31/05/2020.

His CLASS 1 medical certificate was valid until 20/06/2020.

Co-pilot

The co-pilot had an airline transport pilot license (ATPL) with a B777/787 type rating and an instrument flight rating (IR) valid until 28/02/2020.

His CLASS 1 medical certificate was valid until 20/06/2020.

1.5.3 Control personnel

Information about the control personnel involved in the incident is provided below:

Sector T4E

The executive controller of the T4E sector was 59 years old. He had a valid LECB TMA license with an APS/TCL rating valid until 21/01/2020.

His medical certificate was valid until 17/12/2019.

The T4E sector planning controller was 52 years old. He had a valid LECB TMA license with an APS/TCL rating valid until 31/07/2020.

His medical certificate was valid until 18/08/2019.

In their testimonies, both sector controllers said they were handling a typical workload when the incident occurred.

Sector F07

The executive controller of the F07 sector was 58 years old. He had a valid LECB TMA license with an APS/TCL rating valid until 06/05/2020.

His medical certificate was valid until 18/01/2020.

The incoming instructor executive controller of the F07 sector was 57 years old. He had a valid LECB TMA license with an APS/TCL rating valid until 09/11/2019.

His medical certificate was valid until 24/08/2020.

The incoming student executive controller of the F07 sector was 46 years old. He had a valid LECB TMA license with an APS/TCL rating valid until 09/07/2020.

The executive controllers, the instructor and the student-controller all deemed their workload at the time of the incident to be average.

His medical certificate was valid until 17/07/2020.

The F07 sector planning controller was 54 years old. He had a valid LECB TMA license with an APS/TCL rating valid until 04/10/2020.

His medical certificate was valid until 17/02/2020.

The F07 sector planning controller did not make an assessment of the perceived workload in his statement.

1.6. Aircraft information

1.6.1 VP-BHJ

The model A319-114 S/N 2369 aircraft was registered in Bermuda in July 2019 by the BCAA. It had a valid airworthiness certificate at the time of the incident, which had been renewed on 19 July 2019 and was valid until 12 August 2020. The aircraft was equipped with a version 7.1 TCAS.

1.6.2 LN-LNI

The model B787-9 S/N 37307 aircraft was registered in Norway. It had a valid airworthiness certificate at the time of the incident, which had been renewed on 20 February 2019 and was valid until 21 February 2020.

1.7. Meteorological information

Assessment of the meteorological conditions by AEMET

The meteorological information for Barcelona Airport forecast easterly winds at the time of the SBI6105 flight's arrival in Barcelona, which leads us to assume the flight crews were prepared and had planned to carry out their arrivals, approaches and landings in the east configuration.

1.8. Aids to navigation

The aircraft were following an RNAV1 instrument approach procedure. According to the ENAIRE report, all the airport's necessary navigation aids were operational, and none of the aircraft reported any failures in this regard.

The radar traces have been integrated into the communications section to facilitate a better understanding of the event.

1.9. Communications

We obtained the communications between the aircraft and the air traffic control units. In the summary of the communications, the flights are identified by their callsigns to facilitate a better understanding of the service provided by the control centre.

The callsign of the Airbus A319 aircraft with registration VP-BHJ, operated by Siberia Airlines, was SBI6105. The callsign of the aircraft operated by Norwegian Air Shuttle Asa with registration LN-LNI was NAX76C, and the callsign of the aircraft operated by Vueling Airlines SA with registration EC-MXP was VLG7845.

This section summarises the communications most relevant for the subsequent analysis of the incident:

- At 10:10:56 UTC, the aircraft with callsign SIB6105 established initial contact with the XAL sector controller. He identified the aircraft and instructed it to fly the BISBA1E STAR for runway 07L and then the SLL1E transition. The aircraft's crew did not acknowledge the instruction. This prompted the controller to ask the crew if they had received the instruction. The crew of the SIB6105 aircraft confirmed that it was the BISBA1E STAR for runway 07L with the sierra lima lima transition, but did not specify the full name of the transition. The controller of the XAL sector replied in the affirmative, without correcting the error of not giving the full name of the transition (SLL1E).

- At 10:23:35 UTC, the aircraft with callsign NAX76C established initial contact with the T4E sector controller, who instructed it to descend to FL 150. The aircraft acknowledged the instruction correctly.

- At 10:26:06 UTC, the controller of the T4E sector instructed the aircraft with call sign NAX76C to reduce its speed to 260 kt, and the crew of the aircraft correctly acknowledged the instruction. The controller of said sector then told the aircraft to stay on its current heading and that he would contact them in a minute. The crew of the aircraft acknowledged the communication correctly.

- At 10:26:50 UTC, the T4E sector controller instructed the aircraft with callsign NAX76C to proceed directly to Vilafranca. The crew of the aircraft acknowledged the communication correctly.

- At 10:27:19 UTC, the T4E sector controller instructed the NAX76C aircraft to descend to FL 130. The crew of the aircraft acknowledged the communication correctly.

- At 10:28:54 UTC, the T4E sector controller instructed the NAX76C aircraft to reduce speed to 240 kt and descend to FL 110. The crew of the aircraft acknowledged the communication correctly.

- At 10:28:54 UTC, the T4E sector controller instructed the NAX76C aircraft to reduce speed to 230 kt. The crew of the aircraft acknowledged the communication correctly.

- At 10:29:47 UTC, the SIB6105 aircraft established initial contact with the Sector T4E controller and informed him they were descending to FL 90 at 220 kt. The T4E sector controller instructed it to proceed to point BL541. The crew of the aircraft acknowledged the communication correctly.

- At 10:30:54 UTC, the T4E sector controller instructed the NAX76C aircraft to reduce speed to 220 kt, and the crew acknowledged correctly. Next, he instructed aircraft SBI6105 to descend to 6,000 ft, and the crew acknowledged correctly.

- At 10:32:50 UTC, another executive controller took over the executive controller position for the T4E sector. The incoming controller instructed the NAX76C aircraft to descend to FL 80. The crew of the aircraft acknowledged the communication correctly.

- At 10:34:22 UTC, the T4E sector controller instructed the NAX76C aircraft to descend to FL 80, and the crew acknowledged correctly.

- At 10:35:23 UTC, the T4E sector controller instructed the SBI6105 aircraft to descend to 5,000 ft, and the crew acknowledged correctly.

- At 10:36:11 UTC, the T4E sector controller instructed the SBI6105 aircraft to descend to 4000 ft, and the crew acknowledged correctly.

- At 10:36:26 UTC, the T4E sector controller instructed the NAX76C aircraft to descend to 7000ft with QNH 1013. The crew acknowledged 7000 ft and requested confirmation of the QNH. The controller repeated the instruction, and the crew acknowledged the communication correctly.

- At 10:37:14 UTC, the T4E sector controller called aircraft SBI6105, the crew of the aircraft responded with their callsign and the controller informed them that they were not following the transition assigned to them and instructed them to maintain 4,000 ft and turn left to head north. The crew acknowledged correctly.

- At 10:37:35 UTC, the T4E sector controller instructed the NAX76C aircraft to descend to 5,000 ft with QNH 1013, and the crew acknowledged correctly.

- At 10:37:55 UTC, the T4E sector controller transferred the NAX76C aircraft to sector F07 (119.105 MHz), and the crew acknowledged correctly.

- At 10:38:20 UTC, aircraft NAX76C established initial contact with sector F07, which instructed it to descend to 3,000 ft, turn left on HDG 100º and cleared it for the ILS Z RWY 07 approach. The crew of the aircraft acknowledged the communication correctly.

- At 10:38:39 UTC, the T4E sector controller instructed the SBI6105 aircraft to return to point BL541 and fly the Sabadell1E transition. The crew acknowledged that they were proceeding to point BL541 without confirming that they were to fly the Sabadell1E transition. The T4E sector controller did not correct the crew's incomplete acknowledgement [transition SLL1E].

- At 10:39:09 UTC, the F07 sector controller instructed the NAX76C aircraft to reduce speed to 200 kt, and the crew acknowledged the instruction correctly.

- At 10:39:50 UTC, the STCA-PAC function between the NAX76C aircraft and the traffic RYR78W on the outbound leg of a procedure from the south was activated.

  At 10:40:24 UTC, the T4E sector controller transferred the SBI6105 aircraft to sector F07 (119.105 MHz), and the crew acknowledged correctly.

- At 10:40:42 UTC, the controller position for the T4E sector was taken over by an instructor-controller and a student-controller. The VLG7845 aircraft then established initial contact with sector F07. The communication was made in English. The controller asked the aircraft to confirm in Spanish. The VLG7845 aircraft repeated its callsign in English and, once again, the controller told them, in Spanish, to hold.

- At 10:40:48 UTC, aircraft SBI6105 established initial contact with sector F07, and informed it that they were maintaining 4,000 ft on course to the ASTEK (IF) point, with an IAS of 210kt; the controller of this sector immediately instructed the NAX76C aircraft to turn right. Aircraft SBI6105 transmitted something, but only its callsign could be heard.

- At 10:40:53 UTC, the T4E sector controller called the SBI6105 aircraft in case it was on its frequency. There was no answer.

- At 10:41:04 UTC, aircraft VLG7845 called the F07 sector controller in English. The controller answered and instructed it, in Spanish, to descend

to 3,000 ft and turn immediately to the left on a southerly HDG. The crew acknowledged the instruction correctly.

- At 10:41:13 UTC, the loss of separation between the SBI6105 aircraft and the NAX76C aircraft occurs (2.8 NM and 200 ft).

- At 10:41:19 UTC, the F07 sector controller instructed the NAX76C aircraft, on two occasions, to immediately turn south. The crew replied that they had traffic in view and a TCAS RA alert. At that point, the separation between the SB16105 aircraft and the NAX76C aircraft was 2.4 NM and 200 ft.

- At 10:41:33 UTC, the F07 sector controller instructed the NAX76C aircraft to descend to 3,000 ft. The crew responded that they were descending to 3,000 ft with traffic in view behind them and asked if they could turn left to final as they were clear of traffic. The controller answered affirmatively. The crew reported that they were turning to their left and continuing the descent on the approach pathway. The controller issued instructions while the NAX76C aircraft was following the TCAS RA manoeuvre.
  The separation between the SB16105 aircraft and the NAX76C aircraft was 1.0 NM and 0 ft.

- At 10:41:38 UTC, the minimum separation between the SBI6105 aircraft and the NAX76C aircraft occurs (0.7 NM and 100 ft).

- At 10:41:58 UTC, the separation between the SBI6105 aircraft and the NAX76C aircraft was 0.4 NM and 700 ft.

- At 10:42:05 UTC, aircraft SBI6105 reported that it was conflict-free and was then instructed by the controller to maintain 4,000 ft and a southerly heading. The crew of the aircraft acknowledged the communication correctly. The separation between the SB16105 aircraft and the NAX76C aircraft was 0.5 NM and 800 ft.

  At 10:42:24 UTC, the F07 sector controller instructed the VLG7845 aircraft, in Spanish, to turn left on a 310º heading, and the crew acknowledged the instruction correctly, also in Spanish. Aircraft NAX76C then reported that they were returning to the locator at 3,000 ft following the path.

- At 10:42:42 UTC, the T4E sector controller position was taken over by the controller who had been in the position prior to the previous handover (10:40:42). The controller of sector F07 acknowledged receipt of the information transmitted by the NAX76C and asked if they could complete the ILS approach from their current position. The crew answered affirmatively, so the controller cleared them to carry out the ILS Z RWY

07L approach. Next, in Spanish, the controller instructed the VLG7845 aircraft to turn to its right on a 330º heading. The crew correctly acknowledged the instruction in Spanish and informed the controller that they had previously been instructed to turn left. The controller acknowledged the information and instructed the crew to maintain 3,000 ft and continue the turn in the direction it had already started. The crew confirmed, in English, that they were turning left to a 330º heading. The separation between the SB16105 aircraft and the NAX76C aircraft was 2.6 NM and 800 ft.

- At 10:42:43 UTC, the required separation between the SBI6105 aircraft and the NAX76C aircraft was recovered.

1.10. Aerodrome information

Barcelona Airport is located 10 km southwest of Barcelona and has an elevation of 4m above sea level.

It is an exclusively IFR airport closed to visual operations.

The airfield has 3 asphalt concrete runways, two of which are parallel, 07-25R and 07-25 L.

The approach procedure the aircraft were following during the event was for runway 07L, which is 3,352 m long and 60 m wide.

1.11. Flight recorders

The cockpit voice and data recorders were re-recorded over after the flights, and it was not possible to retrieve the information directly. However, the airlines provided the data recorded during the incident.

Aircraft registration VP-BHJ

Based on the records, we have drawn up a chronological description of the aircraft's operating modes at different points along its radar trace, which has been superimposed onto the Barcelona approach chart. Thus, the points marked in red in figure 29 are described below:

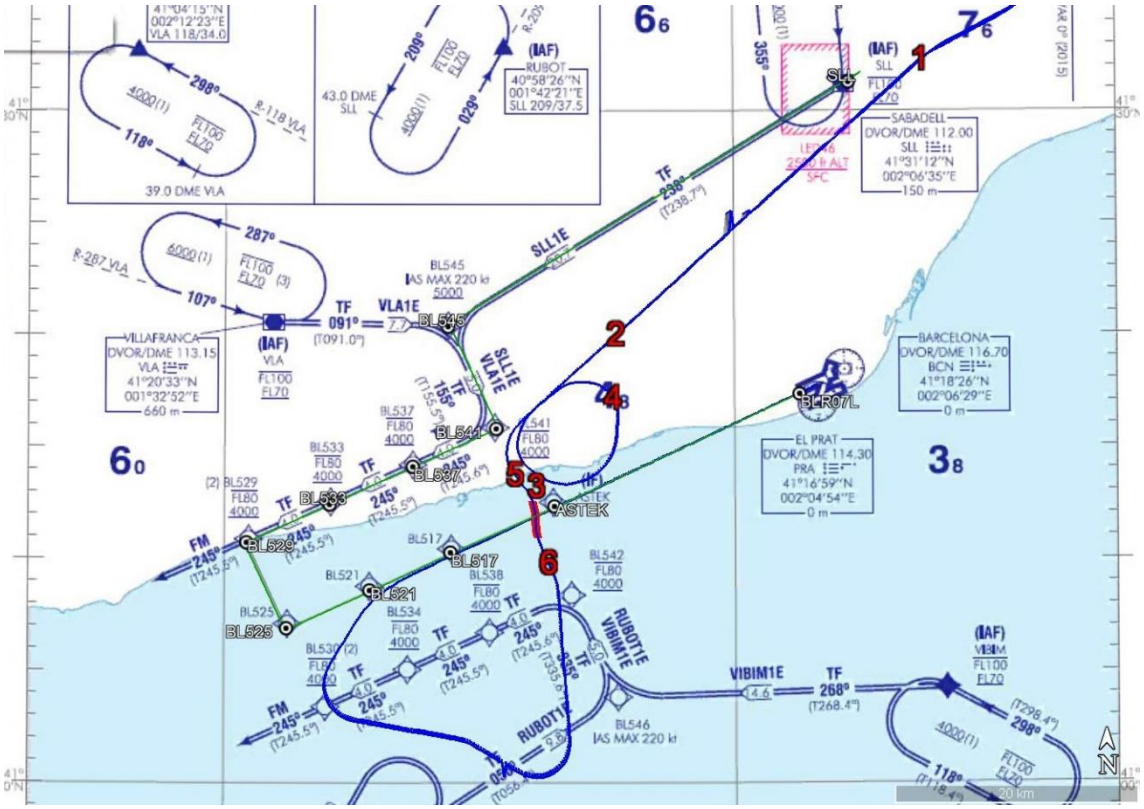


Figure 29; Trace of aircraft VP-BHJ and significant moments

- Point 1

At 10:30:37, the aircraft with registration VP-BHJ was heading to SLL configured in autopilot and horizontal "navigation" mode, as per the flight plan loaded in the FMS.

Before reaching SLL, the aircraft changed course towards BL541. At this point, the vertical navigation sub-mode kept the altitude constant.

- Point 2

Approximately 5 minutes later, the vertical navigation sub-mode changed to keep the vertical speed constant, and the altitude dropped to 4,000ft before remaining constant again.

- Point 3

At 10:37:19, the aircraft changed its horizontal navigation mode to "Heading" mode, in which the aircraft ceases to be guided by the FMS flight plan and follows the course set by the pilot.

- Point 4

At 10:39:01, the aircraft returned to horizontal navigation mode and following the FMS flight plan.

- Point 5

At 10:40:55, the "Heading" mode was selected again. Shortly afterwards, the TCAS TA signal was recorded. This was followed by the TCAS RA with the ‘UP’ resolution (red mark in Figure 29). The autopilot disconnected, and the aircraft began to climb.

- Point 6

At 10:41:57 (point 6), the aircraft had climbed to 4,150 ft, and the autopilot had re-engaged; 10 seconds later, the TCAS alert was cleared.

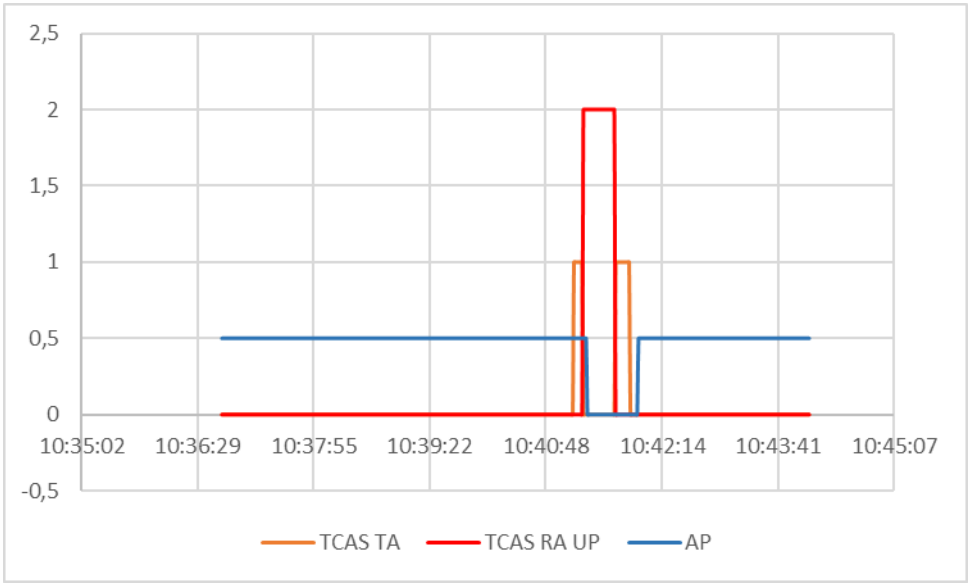


Figure 30;TCAS alerts and autopilot configuration of the VP-BHJ aircraft

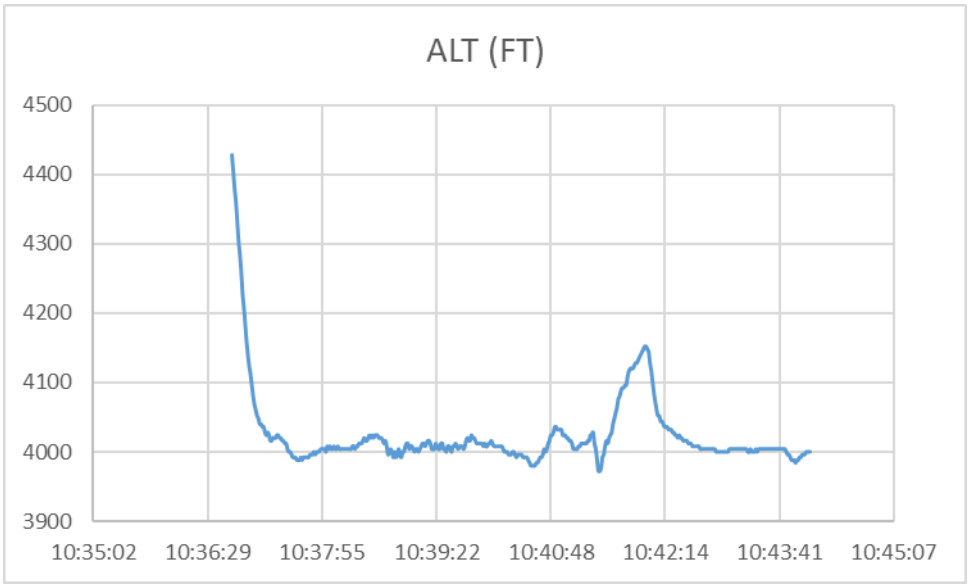


Figure 31; Altitude of the VP-BHJ aircraft

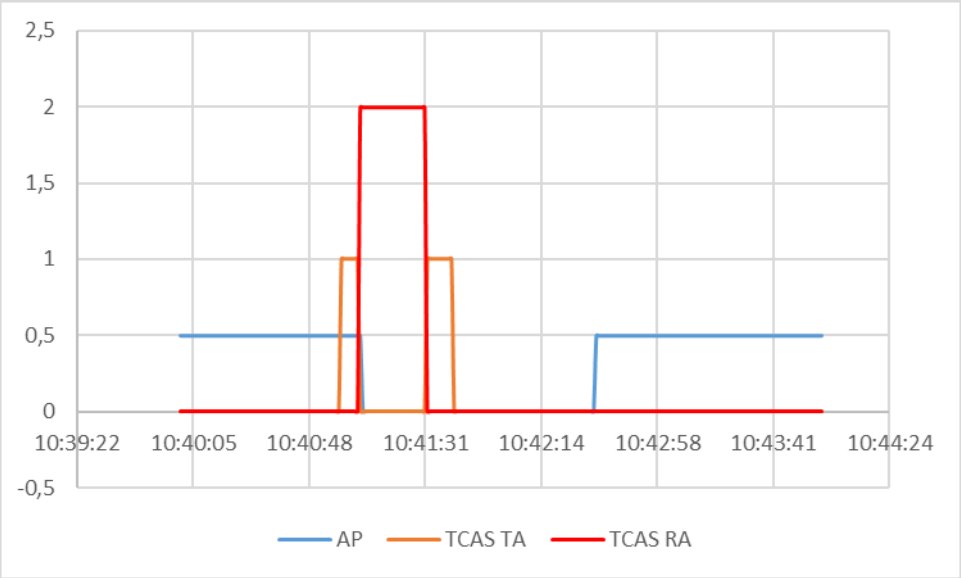
Aircraft registration LN-LNI

According to the records of the aircraft with registration LN-LNI, the approach procedure to Barcelona was carried out without incident. At 10:41:00, the aircraft is on autopilot with the ILS path captured when the TCAS TA alert is generated.

At 10:41:06, the autopilot disengages, and the TCAS RA alert appears showing DOWN, with a descent of -1,500 ft/min.

The aircraft's descent rate begins to increase, and its heading changes from 80 degrees to 130 degrees.

At 10:41:20, the aircraft stops descending, and the TCAS RA alert disappears. Ten seconds later, the TCAS TA alert also disappears.



The aircraft slows down and at 10:42:34, the autopilot is reactivated and the initial heading is restored.

Figure 32; TCAS alerts and autopilot configuration of the LN-LNI aircraft

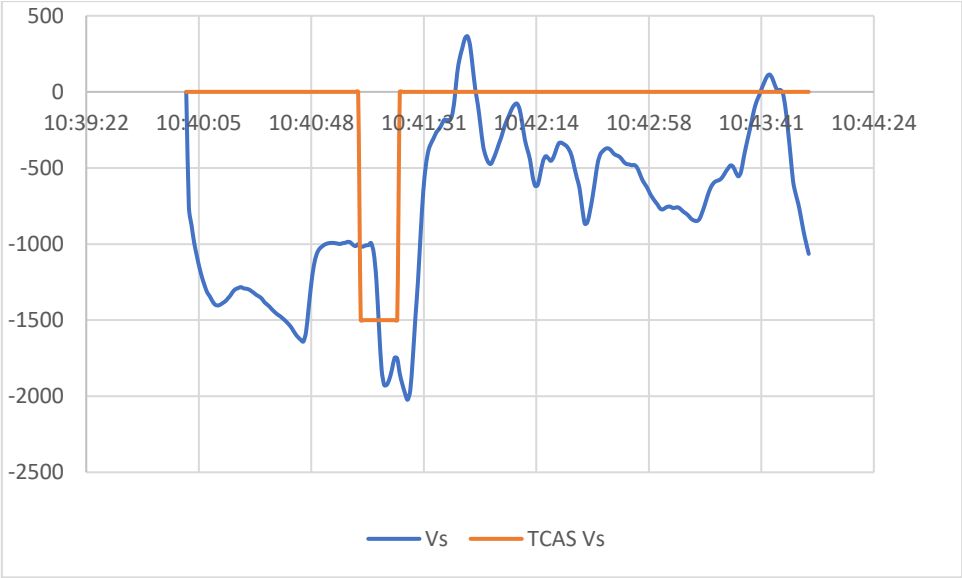


Figure 33; Vertical speed and speed commanded by the TCAS on board aircraft LN-LNI

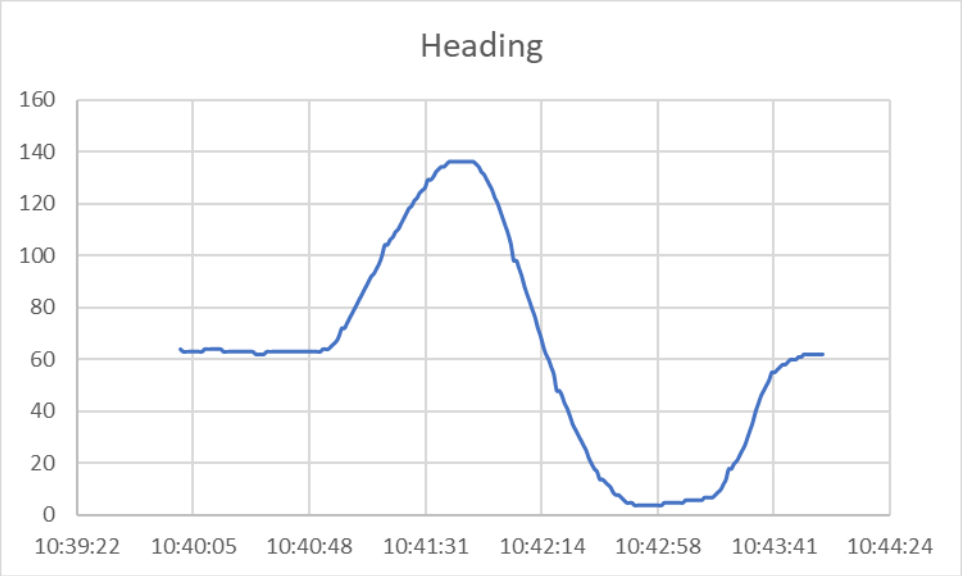


Figure 34; Heading of aircraft VP-BHJ

1.12. Aircraft wreckage and impact information

Not applicable.

1.13. Medical and pathological information

Not applicable.

1.14. Fire

Not applicable.

1.15. Survival aspects

Not applicable.

1.16. Tests and research

Not applicable.

1.17. Organisational and management information

1.17.1 Approach procedures at Barcelona ACC

This section will describe the Barcelona Airport approach procedures in force at the time of the incident, as per Annexe B of the Barcelona ACC Operating Manual.

During this loss of separation event, the airport was operating in the east configuration, with runway 07L being used for arrivals. The sectors involved are described below:

The VP-BHJ aircraft came from the north. The first Barcelona TMA sector it made contact with was the XAL sector, which had to assign it a STAR. In this case, the traffic was assigned the BISBA1E STAR with the Sabadell1E transition (SLL1E).

By contrast, the LN-LNI aircraft came from the northwest and was assigned the VLA1E transition, and the EC-MXP aircraft was following the RUBOT1E transition from the southwest. All the approaches were RNAV1 approaches.

After this, and once the aircraft were descending to commence the transition procedure, the next sectors to intervene were the feeder sectors (see figure 36); in this case, T4E for traffic entering from the north (aircraft VP-BHJ and LN-LNI) and T3E for those coming from the south, (EC-MXP), as shown in the operating manual:

En Configuración E los sectores son:

Despegadores	T1E/D1E T2E
Alimentadores	T4E T3E
Final	F07

Figure 35; Feeder sectors and the Barcelona TMA final

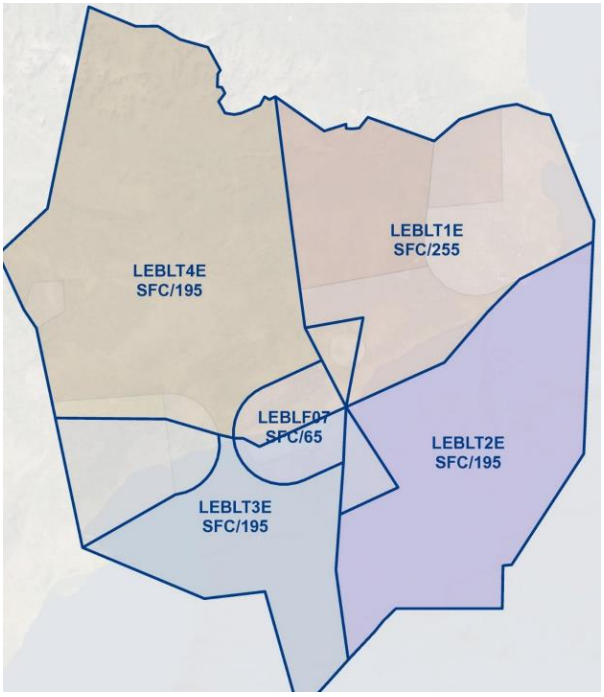


Figure 36; Map of the Barcelona TMA feeder sectors and final approach, east configuration

Subsequently, when the aircraft are in the north transition outbound leg and descending to 5,000 ft or, in the case of traffic coming from the South, descending to 4,000 ft, the aircraft are transferred by the feeder sectors (T4E and T3E) to the F07 final approach sector.

Once they are established on the outbound transition leg, the aircraft must wait to receive a vector guide to the final approach from the final sector, F07. The AIP states that aircraft should not turn to final approach without ATC clearance, except in the event of a communications failure.

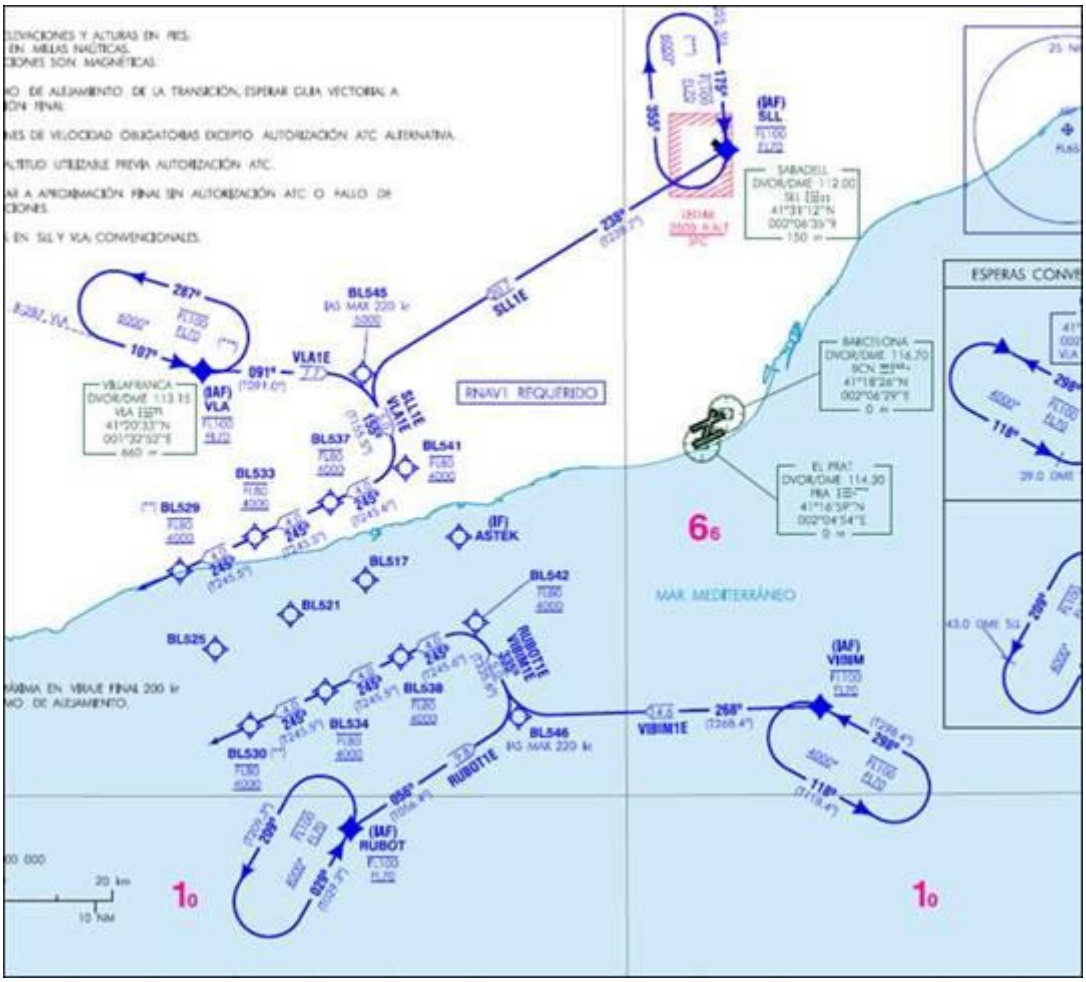


Figure 37; Barcelona approach chart

1.17.2 Safety investigation carried out by ENAIRE

ENAIRE carried out an investigation into the incident and issued a report in which it identified several factors as causes of the event, including:

- The failure to detect an incorrect acknowledgement.
- An inadequate handover procedure.
- Use of the wrong language.
- Error in assigning levels and headings.

In addition, it identifies deficiencies on the part of the operators, such as the failure of aircraft VP-BHJ to comply with the transition leg and the insufficient linguistic competence of the crew.

As a result of the findings of the investigation, it issued the following series of recommendations:

TYPE	DETAIL	RECOMMENDATION
Air Navigation	ATS. ATC instructions and clearances.	Send the investigation report to all the ATCs involved to share knowledge of the causal factors.
Air Navigation	ATS. ATC instructions and clearances.	Send the investigation report to the Training Department so that it can be included in future training sessions.
Air Navigation	ATS. ATC instructions and clearances.	Action to improve knowledge and awareness around the operation of the transition procedure (Poster in the control room)
Air Navigation	ATS. Operating Manual. Review	SOP/Circular to clarify that recovery must be carried out using vector guidance and not transition points should a breach of the transition occur.
Air Navigation	ATS. Operating Manual. Review	Reduce the receiving ATC's uncertainty around traffic that has to fly the transition. Achieve behavioural certainty, for example, by using the "E" field.
Air Navigation	ATS. Vectoring and spacing techniques. Radar surveillance	Issue a Safety Note highlighting the importance of paying attention to read-backs and recovering from transition deviations using vectors.
Operators	SIBERIA AIRLINES	Send the relevant findings of the investigation to the company.

1.18. Additional information

1.18.1 Background of previous similar events

According to information provided by the company itself, the commander of the VP-BHJ aircraft had previously made an approach to Barcelona Airport on 06/05/2019, during a flight with the callsign SBI891.

On that occasion, the runway assigned for landing was 25R.

According to the information provided by ENAIRE, the SBI891 aircraft flew the BISBA1W STAR and the LESBA1W transition.

In communication with the Barcelona TMA XAL sector, the aircraft went to the aforementioned LESBA1W transition, but incorrectly read back BISBA1W, which was the STAR it was flying.

Once transferred to the T2W sector frequency, which was the feeder sector at that time, it was stressed that it should fly the LESBA1W transition.

Once in sector F25 and commencing the transition leg, it received radar vector guidance to complete the ILS Z approach to runway 25R.

1.18.2 Integration of facts

This section integrates and summarises the information from the flight data recorders installed on the aircraft, the radar surveillance from the ATC units, the ATC communications and the testimonies of the controllers and crews involved in order to provide an overall chronological description of the incident. The incident occurred at 10:40 UTC, but the most relevant events are outlined below due to their influence.

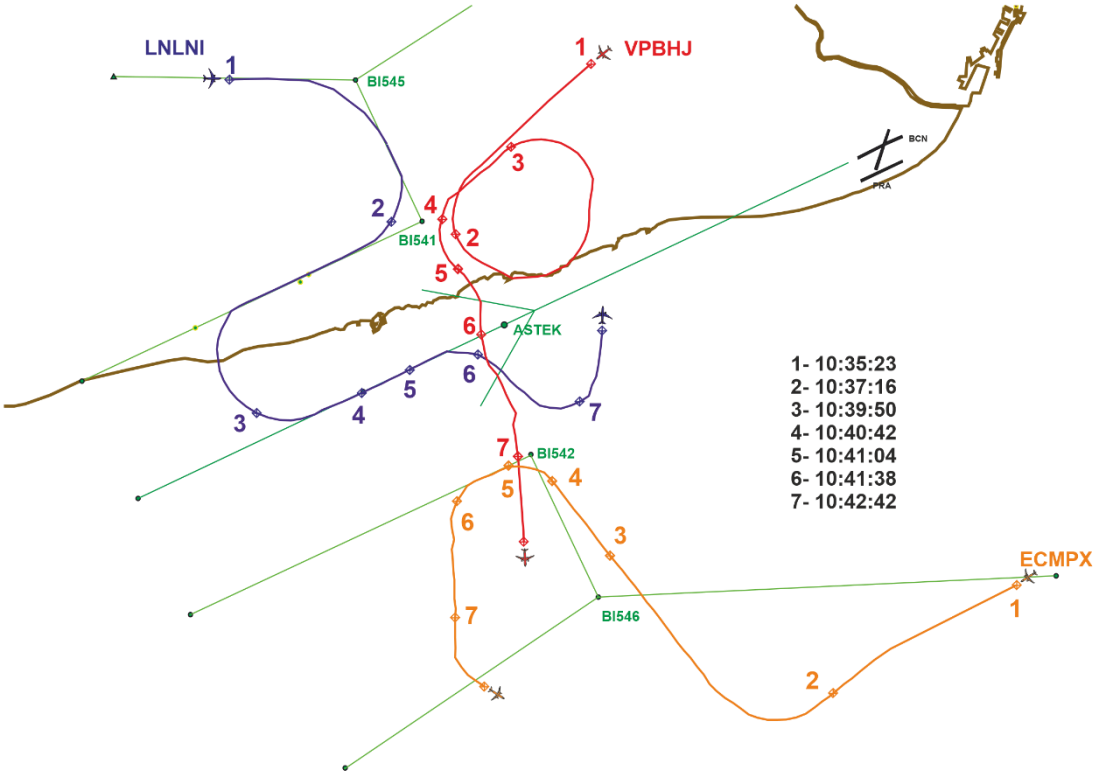


Figure 38; Aircraft traces and chronological description

- Prior to the event

At 10:10:56 UTC, the flight recorder shows the VP-BHJ aircraft was in "navigation" mode, in which the FMS guides the aircraft according to the flight plan. According to the crew's testimony, this flight plan was included by the company via the ACARS.

At the time of the event, the approach sector to Barcelona being used was the T4E sector. The control centre had planned for the VP-BHJ aircraft to approach runway 07L in Barcelona, following the BISBA1E STAR procedure.

According to the ENAIRE recordings, the aircraft made initial contact with the XAL sector controller, and he instructed it to fly the BISBA1E STAR followed by the SLL1E transition. The aircraft did not issue a correct read-back of the instruction, so the controller had to insist.

The LN-LNI aircraft was making its approach following the VLA1E transition. According to the ENAIRE recordings, control issued flight level and speed instructions to the aircraft. The crew of the aircraft acknowledged the communication correctly.

According to the testimony of the T4E sector controller, at this initial stage of events the LN-LNI aircraft was behind the VP-BHJ aircraft for transfer to the F07 sector.

Both aircraft, therefore, were expected to approach point BL541, aircraft LN-LNI from the VLA1E transition and the VP-BHJ aircraft from the SLL1E transition.

- Point 1

At 10:35:23 UTC, the T4E sector controller instructed the VP-BHJ aircraft to descend to 5,000 ft, and approximately one minute later issued a new instruction to descend to 4,000 ft. The crew of the aircraft read back the communication correctly. The VP-BHJ aircraft recorder shows the vertical navigation modes were modified to descend to 4,000 ft.

- Point 2

According to the recording, two minutes later, at 10:37:19, the T4E sector controller called the VP-BHJ aircraft to inform it that it was not following the transition and instructed it to maintain 4,000 ft and turn left to the north. The VP-VHJ crew acknowledges.

At this time, the flight data of the VP-BHJ aircraft indicates that the pilot changed the guidance mode from "navigation" to "heading". In this new guidance mode, the aircraft stops following the flight plan loaded in the FMS and instead navigates to capture a fixed course selected by the pilot. Thus, the aircraft changed its course in the “heading” mode.

According to the recording, the controller of the T4E sector continued with his instructions to aircraft LN-LNI and then transferred it to sector F07. The crew acknowledged the instruction correctly.

One minute later, the T4E sector controller instructed the VP-BHJ to return to point BL541 and fly the SLL1E (Sabadell 1E).

In their acknowledgement, the VP-BHJ crew confirms that they will proceed to BL541 but uses the callsign SBI6051 instead of SBI6105.

- Point 3

According to ENAIRE’s data, at 10:39:50 UTC, the STCA PAC proximity alert was activated between the LN-LNI, which was proceeding to intercept the locator for runway 07L and the EC-MXP that was on the outbound leg of the RUBOT1E transition from point BL542.

According to the testimony of the F07 sector controller, he was monitoring the runway 07L locator interception manoeuvre of the aircraft with registration LN-LNI because he thought it had triggered the STCA alert with a traffic on the outbound leg of the RUBOT1E procedure.

In the meantime, according to the flight recorder data, the VP-BHJ aircraft returned to the horizontal navigation autopilot guidance mode.

The controller of sector T4E transferred aircraft VP-BHJ to sector F07 (on the 119.105 MHz frequency), and the crew correctly acknowledged.

He was instructed to use “callsign only” with the next sector.

- Point 4

According to ENAIRE's data, the controller in the executive position for the F07 sector of the Barcelona ACC was relieved at 10:40:42 UTC. According to the testimony of the outgoing executive controller, the incoming instructor-controller proposed the relief to proceed with the evaluation of a controller under evaluation. However, the outgoing controller delayed the handover as he was monitoring the STCA-PAC alert between the LN-LNI aircraft and the EC-MXP aircraft. When said alert disappeared, the handover was carried out with an instructor-controller and a student-controller taking over the position.

According to the testimony of the incoming executive controller, the outgoing executive controller did not convey any sense of a potential conflict or that any traffic was violating authorisations. Furthermore, the outgoing executive controller indicated that he failed to bring the deviation of the VP-BHJ aircraft that was already proceeding to point BL541 to the attention of the incoming controller, in line with standard practice.

The EC-MXP aircraft then established initial contact with the F07 sector. This communication was in English. The student-controller asked him to confirm his aircraft in Spanish. The EC-MXP aircraft repeated its callsign in English and, again, the student-controller instructed it to wait in Spanish.

The VP-BHJ aircraft made initial contact with the F07 sector. Its crew reported that they were maintaining 4,000 ft on course to the ASTEK (IF) point, with a speed of 210kt. The sector controller immediately instructed the LN-LNI aircraft to turn right. Aircraft VP-BHJ transmitted something, but only its callsign could be heard. According to the flight data recorder of the VP-BHJ aircraft, the pilot changed the guidance mode from "navigation" to "heading".

According to the testimony of the T4E sector controller, he realised that the VP-BHJ aircraft had turned south again without following the transition and tried to call it again in case it was still on his frequency. However, the VP-BHJ aircraft was no longer on his frequency, and when he failed to elicit a response, he warned the F07 sector verbally about the aircraft.

- Point 5

Aircraft EC-MXP called the F07 sector controller in English at 10:41:04. The student-controller answered and instructed it, in Spanish, to descend to 3,000 ft and turn immediately to the left on a southerly course. The crew read back the instruction in English.

Shortly afterwards, the loss of separation between the VP-BHJ aircraft and the LN-LNI aircraft occurred, with 2.8 NM and 200 ft between them.

The TCAS RA signal was recorded in the VP-BHJ aircraft with an UP resolution. The aircraft's autopilot disconnected, and it began to climb.

The student-controller of the F07 sector instructed the LN-LNI aircraft, on two occasions, to turn south immediately. The LN-LNI crew reported that they had traffic in view and a TCAS RA alert. At that point, the separation between the VP-BHJ aircraft and the LN-LNI aircraft was 2.4 NM and 200 ft.

According to the testimony of the F07 instructor-controller, the very high level of ambient noise inhibited a sufficient understanding of communications with the LN-LNI aircraft, and at no time did the conflict alert sound as a result of the positions of the LN-LNI aircraft and the VP-BHJ aircraft, despite the fact that the VP-BHJ aircraft turned towards the LN-LNI aircraft which was complying with the instruction received. He also stated that at no time did he hear the TCAS RA notification of any of the traffics.

The student-controller of the F07 sector instructed the LN-LNI aircraft to descend to 3,000 ft. The crew responded that they were descending to 3,000 ft with traffic in view behind them and asked if they could turn left to final as they were clear of traffic. The student-controller answered affirmatively. The crew reported that they were turning to their left and continuing the descent on the approach pathway.

- Point 6

Point 6 is the moment when the minimum separation between the VP-BHJ aircraft and the LN-LNI aircraft occurs (0.7 NM and 100 ft) at 10:41:38 UTC.

Half a minute later, aircraft VP-BHJ reported that it was conflict-free, and the controller subsequently instructed it to maintain 4,000 ft and a southerly heading. The crew read back the instruction but confused the numbers of their callsign (using SB16505 instead of SB16105).

Next, the student-controller of the F07 sector instructed the EC-MXP aircraft, in Spanish, to turn left on a 310º heading, and the crew acknowledged the instruction correctly, also in Spanish. Aircraft LN-LNI then reported that they were returning to the locator at 3,000 ft following the glide path.

- Point 7

At 10:42:42 UTC, the F07 sector controller position was taken over by the controller who had been in the position prior to the previous handover (10:40:42). The incoming controller of sector F07 acknowledged receipt of the information transmitted by the LN-LNI aircraft and asked if they could complete the ILS approach from their current position. The crew answered affirmatively, so the controller cleared them to carry out the ILS approach to runway 07L. Next, in Spanish, the controller instructed the EC-MXP aircraft to turn to its right on a 330º heading. The crew correctly acknowledged the instruction in Spanish and informed the controller that they had previously been instructed to turn left. The controller acknowledged the information and instructed the crew to maintain 3,000

ft and continue the turn in the direction it had already started. The crew confirmed, in English, that they were turning left to a 330º heading.

A short while later, the required separation between the VP-BHJ aircraft and the LN-LNI aircraft was recovered.

1.19. Useful or effective investigation techniques

Not applicable.

2. ANALYSIS

- Communication problems with the VP-BHJ aircraft

During the event, the VP-BHJ aircraft issued several incomplete read-backs and even transmitted its callsign incorrectly. Nonetheless, the crew of the aircraft has the necessary linguistic competence.

However, before the aircraft with registration VP-BHJ even arrived at Barcelona approach, a breach of the standard control communications procedures had already occurred: the Barcelona ACC XAL route sector instructed the VP-BHJ aircraft to fly the BISBA1E STAR and the SLL1E transition to runway 07L. In the first instance, the crew of the VP-BHJ aircraft did not acknowledge the instruction, so the controller had to ask if they had received it. The VP-BHJ aircraft then responded with an incomplete read-back of the transition instruction. The controller of said sector did not correct the incomplete read-back made by the VP-BHJ aircraft.

After the incomplete read-back by the VP-BHJ aircraft, which failed to follow procedures, the T4E sector controller instructed it to proceed to point BL541 and follow the SLL1E transition. However, the crew only acknowledged point BL541, and the T4E sector controller did not correct the incomplete read-back.

- Breach of the Barcelona ACC operating manual

The T4E controller instructed the VP-BHJ aircraft to descend to 4,000 ft in breach of the provisions of the Barcelona ACC Operating Manual. In the VP-BHJ aircraft's first violation of the approach procedure, when the Barcelona ACC T4E sector controller detected that it was not complying with the planned procedure, he initially instructed it to fly north and maintain 4,000 ft, despite the fact that Enaire's applicable procedures state that the North/West feeder has to deliver the traffic from the corresponding transitions in a single sequence, descending to 5,000 ft for the final sector. Despite not complying with the operating procedures, this instruction meant that, initially, the first time the VP-BHJ aircraft deviated from standard procedures, the vertical distance between that aircraft and the LN-LNI aircraft was greater than if it had been instructed to fly at 5,000 ft.

- Problems with the FMS configuration in the aircraft with registration VP-BHJ

The first time the VP-BHJ aircraft failed to follow the published procedure for the aforementioned transition and proceeded to the locator for runway 07L, the FMS guidance mode was set to navigation. We can, therefore, deduce that the VP-BHJ crew did not have the procedure correctly loaded into the FMS.

On the other hand, the company loaded the procedure through ACARS, and given the weather forecasts, the approach assigned to the aircraft was foreseeable. This procedure could still have been modified by the crew, although in their statements, the pilots stress that they had no problems and knew the procedure perfectly.

- Insufficient knowledge of the procedure in force on the part of the VP-BHJ crew

It should be noted at this point that despite the VP-BHJ crew's insistence that they were familiar with the procedures, had no problems during the event and had indeed received the appropriate training, they failed to comply with those procedures on two occasions, despite having been repeatedly instructed to do so.

In the initial communication between the student-controller of the F07 sector and the VP-BHJ aircraft, it reported that they were proceeding towards the ASTEK (IF) point. In the approach procedure, the IF point is approached from the southwest after receiving clearance from control, never from the north.

Immediately, the student controller instructed the LN-LNI aircraft, established at the runway 07L locator, to turn south. At that moment, the VP-BHJ aircraft acknowledged an instruction, but the only audible part of the message was its callsign at the end.

- ATC management

Any instance of a traffic not following a published procedure generates a potential risk of conflict with other traffic because it involves an aircraft flying a path not foreseen by the controller.

Furthermore, the student-controller of the F07 sector communicated with and issued instructions to aircraft VLG7845 in Spanish on several occasions, despite the crew having called him in English.

- Instructions issued to the LN-LNI aircraft during the TCAS RA procedure

Although the LN-LNI aircraft had reported and was following a TCAS RA alert, it still received instructions from ATC, which is in breach of the SERA regulation. In this case, it was of no consequence because both the TCAS RA and the ATC instruction were to initiate a descent manoeuvre. At no point was the TCAS RA warning of the VP-BHJ aircraft heard, although the moment it notified “clear of conflict” was distinguishable.

3. CONCLUSIONS

3.1. Findings

- The VP-BHJ crew failed to properly acknowledge ATC instructions on more than one occasion.

  The VP-BHJ aircraft did not follow the established procedure as instructed by the controller on two occasions.

- The controller of sector T4E instructed the VP-BHJ aircraft to descend to 4,000 ft without transferring it to the F07 sector.

- The FO7 sector controller issued instructions during a TCAS event.

3.2. Causes/contributing factors

The incident occurred as a consequence of the aircraft with registration VP-BHJ failing to adhere to the approach procedures at Barcelona Airport.

4. OPERATIONAL SAFETY RECOMMENDATIONS

Given that ENAIRE has already made the pertinent recommendations, no safety recommendations are issued.