

DATA SUMMARY

LOCATION

Date and time	Thursday, 11 October 2012 at 09:44 UTC¹
Site	Sabadell Airport (LELL)

AIRCRAFT

Registration	EC-DMC	M-WINT
Type and model	CESSNA F152	PILATUS PC-12/47E
Operator	Aero Club Barcelona-Sabadell	Privado

Engines

Type and model	LYCOMING O-235-L2C	PRATT&WHITNEY PT6A-67P
Serial Number	1	1

CREW

	Pilot in command	Pilot in command
Age	47 years	48 years
Licence	CPL(A)	CPL(A)
Total flight hours	2,439:29 h	6,718 h
Flight hours on the type	1,800 h	3,000 h

INJURIES

	Fatal	Serious	Minor/None	Fatal	Serious	Minor/None
Crew			2			2
Passengers						4
Third persons						

DAMAGE

Aircraft	None	None
Third parties	None	None

FLIGHT DATA

Operation	General aviation – Instructional – Dual	General aviation – Business
Phase of flight	Takeoff – Initial climb	Approach

REPORT

Date of approval	25 June 2014
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¹ All times in this report are in UTC unless otherwise specified. To obtain local time, add 2 hours to UTC.

1. FACTUAL INFORMATION

1.1. History of the flight

On 11 October 2012, a Pilatus PC-12/47E aircraft, registration M-WINT, was on a private flight between Denham Airport (EGLD) in the United Kingdom and Sabadell Airport (LELL). Onboard were the pilot, one support staff to provide in-flight assistance and four passengers. Also at that time, a CESSNA F152 aircraft, registration EC-DMC, was on a local instruction flight using dual controls. Onboard were the instructor and a student. The aircraft was doing landings and takeoffs, entering the downwind leg of the Runway 31 circuit after each takeoff (see Appendix A).

That morning, a student controller from service provider ferroNATS was being evaluated in the Sabadell control tower (hereinafter "control tower") as part of the process of changing air traffic service providers from AENA to ferroNATS. In the control room of the tower there were four other people: a student under instruction (from ferroNATS) who was going to relieve the student being evaluated, an ATC instructor (assisting with the evaluation), an evaluator and an observer, the last three AENA employees.

Aircraft M-WINT had reached Terrasa (entry point N to the Sabadell ATZ²), and was holding above this point. At 09:38:22 h the aircraft was cleared by the student being evaluated in the tower to enter the right downwind leg of the Runway 31 circuit (see Appendix A). He also informed it that it was number 3 in the sequence to enter the traffic pattern for Runway 31 and that the preceding aircraft (aircraft EC-DMC) was a Cessna 152 that was on the first third of the downwind leg for said pattern. The pilot of aircraft M-WINT acknowledged that it was number 3 in the sequence. Aircraft M-WINT then flew in a counter-clockwise direction around point N, while aircraft EC-DMC continued in the right-hand pattern for Runway 31.

At 09:42:23 h the student being evaluated cleared aircraft EC-DMC to execute a touch and go maneuver on Runway 31. The student being evaluated then contacted the pilot of aircraft M-WINT, who reported that he was making the turn to final for Runway 31. The student being evaluated then cleared the pilot of M-WINT to continue his approach and informed him that number one in the sequence was on short final on Runway 31 (aircraft EC-DMC). Aircraft M-WINT acknowledged the clearance to continue the approach as number one. However, aircraft M-WINT was making a left turn and lining up on the opposite, Runway 13.

At 09:42:42 h, another aircraft (EC-KOQ) that was at the Runway 31 holding point contacted the control tower once more, waiting for the clearance from the Barcelona Control Center (LECB). The student being evaluated provided the necessary information

² Aerodrome transit zone: 8-km radius circle centered at the ARP.

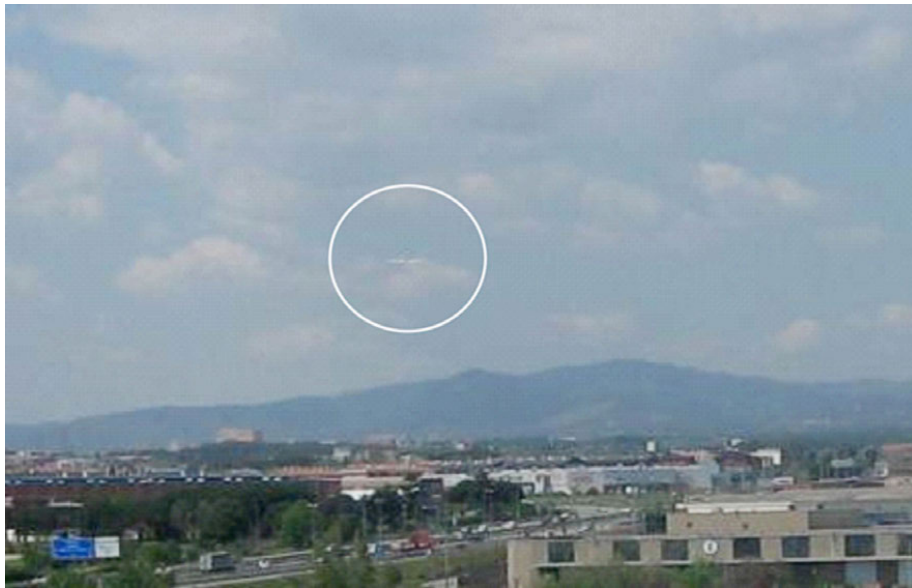


Figure 1. View from the tower of an aircraft in the approximate position as in the incident

and at 09:43:56 h another aircraft (EC-EPY) contacted the tower requesting clearance to enter the right base leg of the circuit. The student being evaluated notified by the instructor that M-WINT was proceeding toward Runway 13 instead of 31, instructed the aircraft to “break³ right”. Finally, after crossing, the student being evaluated cleared aircraft M-WINT to land on Runway 13 and also provided wind information. The pilot of aircraft M-WINT replied that he was cleared to land and completed the maneuver without further incident.

Based on radar information, the aircraft crossed at a horizontal distance of 0 NM and a vertical distance of 100 ft.

No occupants on either aircraft were injured and the aircraft were undamaged.

1.2. Personnel information

1.2.1. Information on the crew of aircraft M-WINT

The pilot of aircraft M-WINT, a 48 year old British national, had a JAR-FCL Commercial Pilot License (CPL(A)) with a valid and in force Pilatus PC12 rating. He also had a valid and in force class 1 medical certificate. He had a total experience of 6,718 flight hours, of which 3,000 had been on the type. The pilot had flown into Sabadell on nine other occasions, the last three on 10, 12 and 14 September.

³ Change the initial heading, deviate.

Even though aircraft M-WINT is certified for single-pilot operations, there was another occupant in the cockpit with aviation knowledge to provide support in assisting the passengers during the flight.

1.2.2. *Information on the crew of aircraft EC-DMC*

The instructor pilot of aircraft EC-DMC, a 47 year old Spanish national, had JAR-FCL Commercial Pilot (CPL(A)) and Private Pilot (PPL(A)) licenses with a Flight Instructor (FI(A)) rating, all valid and in force. He also had valid and in force class 1 and 2 medical certificates. He had a total of 2,439:29 flight hours, of which 1,800 had been on the type.

The student pilot was a 24 year old Spanish national who had a valid and in force student pilot permit. He also had valid and in force class 1 and 2 medical certificates. He had a total of 25:45 flight hours, of which 7 had been on the type.

1.2.3. *Information on the control personnel*

In the control post at the time of the incident there were a student under instruction who was being relieved, a student being evaluated who was going on duty, an instructor (assistant evaluator), an evaluator and an observer.

The student being evaluated, a 29 year old Belgian national, had an EU air traffic controller's license and a class 3 medical certificate, both of them valid and in force. He had an aerodrome control visual rating (ADV) and aerodrome control instrument rating⁴ (ADI) with the control tower (TWR), ground movement control (GMC) and air control (AIR) rating endorsements⁵ since 19 July 2011, and the radar control rating endorsement (RAD) since 5 July 2012. He had a linguistic competency level of 4 in both Spanish and English. He also had a unit endorsement⁶ for the Hierro Airport (GCHI) tower, issued in July 2011 and valid until July 2012. This controller worked for the company ferroNATS and was completing his on-the-job training, in which a candidate provides air traffic control service in an actual operational setting under the guidance of an instructor⁷.

The instructor (assisting with the evaluation) was a 40 year old Spanish national and AENA employee. He had an EU air traffic controller's license and a class 3 medical certificate, both valid and in force. He had, among other ratings (APP, APS, ACP y

⁴ Rating: authorization entered on or associated with a license and forming part thereof, stating specific conditions, privileges or limitations pertaining to such license.

⁵ Rating endorsement: authorization entered on and forming part of a license, indicating the specific conditions, privileges or limitations pertaining to the relevant rating

⁶ Unit endorsement: authorization entered on and forming part of a license, indicating the ICAO location indicator and the sectors and/or working positions where the holder of the license is competent to work.

⁷ This phase is part of the unit training for the Sabadell tower and is required to receive the unit endorsement and provide ATC services at the station.

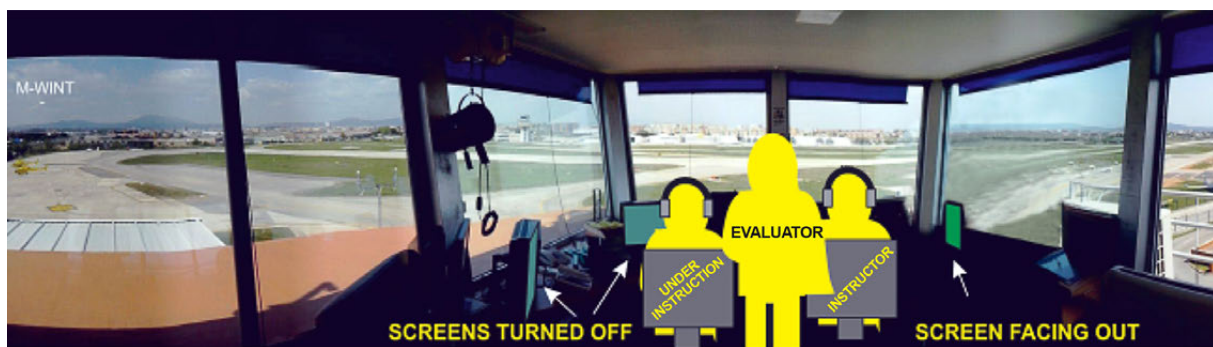


Figure 2. View of the control room with the positions of the controllers

ACS)⁸, specifically the two aerodrome ratings (ADV and ADI) and the pertinent rating endorsements and on-the-job training instructor (OJTI) ratings. He had a unit endorsement for LELL, where he had been a controller since January 2008. He had been the head instructor at LELL since June 2009. He had a level 6 language proficiency rating in Spanish and a 4 in English.

The evaluator, a 33-year old Spanish national, worked for AENA and had an EU air traffic controller's license and a class 3 medical certificate, both valid and in force. He had, among other ratings (APP, APS, ACP and ACS), specifically the two aerodrome ratings (ADV and ADI) and the pertinent rating endorsements an on-the-job training instructor (OJTI) rating. He had a unit endorsement for LELL, where he had been a controller since July 2009, and a level 6 language proficiency rating in both Spanish and English.

Also in the tower was an individual observing the evaluation. This person was also a controller who worked for AENA, and his function consisted of ensuring the proper conduct of the evaluation.

At the time of the incident the student being evaluated was seated in the controller's post (LCL), with the instructor to his right. Behind them was the evaluator and further back the observer.

1.3. Aircraft information

1.3.1. General information on aircraft M-WINT

Aircraft M-WINT was a PILATUS PC-12/47E with serial number 1346. It was equipped with a PRATT&WHITNEY PT6A-67P engine. This aircraft model is certified for a single pilot. Its maximum authorized takeoff weight is 4,740 kg. The aircraft's registration and airworthiness certificates and other documentation were all valid and in force.

⁸ APP: Approach Control Procedural, APS: Approach Control Surveillance, ACP: Area Control and ACS: Area Control Surveillance.

The aircraft had 195.8 flight hours. As per its Maintenance Program, it had passed its last 100 h inspection on 02-10-2012 with 187.7 flight hours on the aircraft.

1.3.2. General information on aircraft EC-DMC

Aircraft EC-DMC was a CESSNA F152 with serial number 1783. It was equipped with a LYCOMING O-235-L2C engine. Its maximum authorized takeoff weight is 758 kg. The aircraft's registration and airworthiness certificates and other documentation were all valid and in force.

The aircraft had 12,664 flight hours and it had passed its last 200 h inspection on 24-08-2012 with 12,641 flight hours.

1.4. Meteorological information

The 09:30 and 10:00 METARs for the Sabadell Airport indicated visibility in excess of 10 km with few clouds at 2000 ft. The average wind speed was between 5 and 6 kt from an average direction between 250° and 260°.

1.5. ATC communications

A complete transcript of the communications is included in Appendix B.

The recording of the oral communications shows that the executive controller (student under instruction) was relieved between 09:36:50 h and 09:37:04 h. From 09:37 h until 09:45 h, all communications were handled by a single controller (the student being evaluated), who talked to seven different aircraft, three of which were doing touch-and-go's. The communications were in Spanish and English, depending on the aircraft involved.

Aircraft	Maneuver	Communications
EC-KOQ	Taxi for takeoff (ATC clearance)	Spanish/English
M-WINT	Hold at point N; enter the traffic circuit and land.	English
EC-EQB	Takeoffs and landings	Spanish
N-446BD	Taxi for takeoff	English
EC-EPY	Hold at point N; enter the traffic circuit and land	Spanish/English
EC-JSM	Takeoffs and landings	English
EC-DMC	Takeoffs and landings	Spanish

1.6. Aerodrome information

The Sabadell Airport is located 2 km south of the city of Sabadell. It is at an elevation of 485 ft and it has one 1,050 m long, 30 m wide asphalt Runway in a 13/31 orientation. Only traffic flying under visual flight rules (VFR) is allowed to operate there. The airport's traffic circuit, located north of the Runway, is a wide circuit since aircraft must avoid flying over the city. The circuit is published in the Visual Approach Chart for Airplanes, AIP Spain AD-2 LELL VAC 1 (see Appendix A).

1.7. Information on the air traffic service

1.7.1. *Airspace and control service information*

The airspace for which the Sabadell control tower is responsible is called its ATZ. On the ground it is defined as a circle with an 8 km radius centered around the ARP (Aerodrome Reference Point). The vertical extent is limited to 3,500 ft above mean sea level. This airspace is classified as D, in keeping with the classification table established by the ICAO. The services provided and the requirements applicable to VFR flights in this airspace are as follows:

- Separation is not provided, meaning the crews themselves are responsible for ensuring proper separation.
- Traffic control and information services are provided (as is anti-collision guidance upon request).
- Traffic is subject to ATC clearance, and as such must comply with the instructions provided by the air traffic control service.
- Traffic must be in continuous two-way radio contact with control.

The control tower has a radar display that can be used, as per the AIP, to carry out the following functions:

- Radar assistance to aircraft on final approach;
- Radar assistance to other aircraft in the vicinity of the aerodrome;
- Establish radar separation between successive aircraft on departure; and
- Provide navigational assistance to VFR flights.

In this case, however, in keeping with AENA's Unit Training Plan, the evaluation was being conducted under actual traffic conditions, meaning initially no radar assistance was being provided, since the Sabadell Airport is a VFR aerodrome and in order to obtain the aerodrome ratings the candidate must be able to manage traffic without radar assistance. Therefore, at the time of the incident, the radar screens were not made available to the student being evaluated. The one to his left was off and the one to his right, alongside the instructor, was turned around so the student being evaluated was unable to see it.

1.7.2. *Information on the service provider*

FerroNATS is an air traffic services provider that is certified by Spain's national supervisory authority, the National Aviation Safety Agency (AESA). AENA used a bidding process to award the control service at the LELL TWR to ferroNATS.

At the time of the incident, the navigation services providers, AENA and ferroNATS, were undergoing a transition period to change service providers. During this period the controllers from ferroNATS had to obtain their unit endorsement. This step is required in order to be able to provide service at a specific station. The students first had to pass a theory phase that covered both general topics and some specific to the unit, as specified mainly in the unit's operating manual. Students then had to successfully complete an on-the-job training phase in which the student controller worked in a setting with actual traffic always under the supervision of an instructor. Upon completing this phase, the student controller had to pass two evaluations involving two control sessions with real traffic.

1.8. Statements

1.8.1. *Statements from the aircraft crews*

The instructor onboard aircraft EC-DMC stated that while on the downwind leg of the traffic pattern, he heard a transmission from the tower in English to aircraft M-WINT, instructing them to enter the right downwind leg for Runway 31 as number 3. This meant that it would be entering behind them. He shortened the pattern as much as possible to maintain their distance due to the different speeds.

After making the approach and the touch-and-go, he looked forward to search for the preceding traffic, a C172R that was also practicing landings and takeoffs. Upon seeing it on the horizon, he was surprised to see a small white light. While instructing the student to "clean up the airplane"⁹, he continued watching the preceding traffic. He noticed that it was not the C172 and that it stayed directly ahead of them. A few seconds later he confirmed that an airplane was heading for them, since he could clearly make out the two landing lights, and he instructed the student to make a smooth turn to the left.

The pilot of aircraft M-WINT stated that he prepared for the flight by checking the weather and ensuring that it was suitable for doing a VFR flight. He indicated that he was familiar with the Sabadell Airport since he had flown there on nine previous occasions, five of them in 2012 with aircraft M-WINT. He also stated that he prepared for the approach during the cruise phase. He listened to the Barcelona ATIS¹⁰ during the flight, which

⁹ Reconfigure the aircraft after takeoff: adjust the throttle, turn off the landing lights, retract the flaps.

¹⁰ Automatic Terminal Information Service.

reported that the wind was about 10 kt primarily from 290°, which led him to believe the Runway for landing would be 31. When he was instructed to circle above point N, he saw on the onboard traffic alert system that there was one aircraft holding above the same point and several contacts in the vicinity of the airport. During this phase he heard several exchanges in Spanish between ATC and the aircraft. The pilot stated that aircraft M-WINT was instructed to enter the left downwind leg from point N. When he was on the left base leg of the traffic pattern for Runway 13, he reported his position and proceeded to make the turn to final. After reporting that he was on final for Runway 13, he was cleared to land on said Runway, which he acknowledged.

The pilot of aircraft M-WINT stated that at no time did ATC inform him that he was in the wrong position in the traffic pattern. During the turn to the final leg, he saw a small Cessna to the right that was maneuvering to its left, but it did not appear sufficiently close to pose a threat¹¹. The pilot also stated that during the final approach he saw traffic waiting at the Runway 13 threshold and another aircraft at the opposite threshold. He added that on previous visits to Sabadell he had seen dual runway operations in use on Runway 13 and Runway 31.

1.8.2. *Statements from ATC personnel*

The student being evaluated stated that he was aware that the workload was high during the handover and that he was aware of that fact. In his opinion the turnover was carried out correctly and he was situationally aware of the traffic. He was being evaluated as a single controller¹² without radar assistance and he thought he could handle all the workload. As per his statement, visibility conditions were not entirely ideal and he indicated that the traffic pattern is far from the Runway to avoid having airplanes fly over the city of Sabadell, which made it difficult to see the traffic flow.

The evaluator indicated that the student being evaluated assumed the turnover from the outgoing controller was disorganized as he did not accurately convey the traffic situation nor did he leave the flight progress strips in the bay in a way that reflected the status of the traffic.

The instructor stated that from the position of the student being evaluated there was visual access to two radar displays, so one of them was turned off and the closest to his position was turned on but turned around so that the student being observed was unable to see it. He was sitting beside the student controller with his PTT (push-to-talk) unit connected to the number two console and tuned in to the local frequency. He did it this way to avoid audio problems during the evaluation, since on other occasions pilots had experienced problems when both the AENA and ferroNATS headsets were

¹¹ It was in fact aircraft EC-JSM, a Cessna 172R not involved in the incident.

¹² A single controller carrying out the tasks of both the local (LCL) and ground movement (GND) posts.

connected to same console at the same time. The situation during the turnover with the previous controller was one of unstable traffic and a medium/high workload. After aircraft M-WINT was instructed to proceed on the downwind leg, the instructor saw the aircraft proceed to a point over Castellar del Vallés, which is near the start of the downwind leg of the right-hand pattern for Runway 31. He thus assumed the aircraft was going to follow the instructions provided. After several exchanges on the frequency with other aircraft, aircraft M-WINT reported that it was on final on Runway 31. The instructor tried to locate it visually at this position but could not, at which point he noticed that it was on final approach in the other direction, something he confirmed on the radar display nearest his position. Since any message he sent out could have been heard over that of the student being evaluated, leading to confusion due to the numerous communications on the frequency, and in order to avoid wasting additional time if the messages overlapped, he decided to instruct the controller directly to have aircraft EC-DMC abort the maneuver, which he did, with this aircraft initiating a turn to the left to open distance with the flight path of aircraft M-WINT. The student being evaluated reported seeing aircraft M-WINT on final for Runway 13 just as the instructor said to him to "Tell him to turn left".

The observer stated that everyone who was in the tower was focused on the approaches to Runway 31, since that is where most of the traffic was. No one was expecting the flight path taken by aircraft M-WINT.

The student being evaluated stated that sometimes aircraft would confuse Runway 31 with 13 due to their similar nomenclatures, leading to situations in which an aircraft would make the approach to a Runway for which it had not been cleared.

1.9. Organizational and management information

1.9.1. LELL TWR Operations Manual

In accordance with the ferroNATS operations manual for the LELL tower, the functions of an executive controller when in a single controller configuration are as follows:

- To provide all landing and takeoff clearances and control all aircraft in the air;
- To authorize all aircraft Runway crossings;
- To approve start-up and give ground and air taxiing instructions, separating taxiing aircraft from each other and from aircraft leaving the Runway;
- To manage the SACTA¹³, which includes placing strips in the strip holder, noting the transponder code and creating flight plans for flights as required;
- To coordinate with Barcelona ACC and the traffic office and to answer external phone calls.

¹³ SACTA: Automated Air Traffic Control System.

This document also lists the airport's stated capacity in the event that the tower is in a single controller configuration as being 15 arrivals and 15 departures (30 total movements) in one hour.

1.10. Additional information

1.10.1. *Information on the Spain's Air Traffic Regulations*

Appendix B provides information on how to perform ground-air communications between the aircraft and ATC, with special emphasis on readbacks.

1.10.2. *European Action Plan for Air Ground Communications Safety*

This document, published by Eurocontrol, includes a set of best practices and recommendations on communications whose ultimate goal is to improve the safety of air operations. It is intended mainly for air navigation service providers and air operators, but it is also targeted at national supervisory authorities.

One of the recommendations aimed at service providers and operators specifies to maintain proper discipline in radio communications and to use standard phraseology.

For controllers it states to:

- Always listen carefully for clearance readback.
- Correct any mistake in the readback and insist on it until there is no doubt that the clearance has been correctly understood.
- Begin each transmission with the callsign of the aircraft for which it is intended.

For flight crews it states to:

- Always provide full readbacks of clearances provided by ATC.

2. ANALYSIS

Aircraft M-WINT was on a private flight from the aerodrome at Denham (EGLD) to the Sabadell Airport (LELL). At the same time, aircraft EC-DMC was being used for an instructional flight with dual controls originating from and going to LELL, where it was practicing landings and takeoffs on Runway 31.

Weather conditions were good for visual flight and the prevailing wind conditions meant that Runway 31 was in use.

On the date of the incident, ATC at the Sabadell tower was in a transition phase as the air traffic services provider was being changed from AENA to ferroNATS. Both had signed an agreement to cooperate during this period when ferroNATS controllers were being trained to obtain their unit endorsements, with AENA personnel instructing and evaluating the ferroNATS trainees. During a certain part of the evaluation¹⁴, the student being evaluated had to provide ATC services without using the radar display, since only VFR flights operate at the Sabadell Airport. In the control room were the student being evaluated, with the instructor-assistant evaluator sitting beside him, the evaluator and finally an observer standing behind the control position. The instructor had his headset plugged into a different console from the student since they had noticed on previous occasions that when the ferroNATS and AENA headsets, which were different models, were connected to the same console it caused problems with the communications. During the investigation it was noted that communications were not degraded nor was there interference when radio checks were conducted with aircraft. AENA reported that the problem had only been detected when a microtelephone and a headset plugged into the same console were used at the same time, or with a specific reference headset already identified.

The controllers changed over at about 09:37. The off-going controller was also a student under instruction. Based on the information gathered, when the student being evaluated took over control of the traffic, it was in an unstable situation and the workload was average/high. As per his statement, however, he had gained situational awareness of the traffic present and thought the workload was manageable, though he admitted that had he not been undergoing an evaluation, he probably would not have accepted a turnover under those conditions.

A minute later, at 09:38:22, the student being evaluated cleared the pilot of aircraft M-WINT to join the right downwind leg for the Runway 31 traffic pattern, informing him that he was Number 3 in the approach sequence. He also gave him information on the preceding aircraft. The crew of the aircraft only acknowledged that they were Number 3 in the approach sequence. Subsequently, in his statement, the pilot of aircraft M-WINT stated that the clearance had been for joining the left downwind from point N. This misunderstanding likely resulted in the flight path he would eventually take. The phraseology used by the pilot of aircraft M-WINT to acknowledge receipt of the ATC clearance was not complete (as required by Spain's Air Traffic Regulations and the relevant international regulation) and did not allow the controller to decide if it had been understood correctly. Likewise, neither the student being evaluated nor the instructor corrected the faulty acknowledgment by requesting a readback of the clearance given. As a result he was unaware of any possible misunderstandings and took no steps to correct them.

After that message from the tower, the flight path taken by aircraft M-WINT did not follow any of the traffic patterns. The aircraft did not fly the traffic pattern for Runway

¹⁴ To obtain the unit endorsement, required to be an executive controller and provide ATC services.

31, as it had been cleared to do, nor did it fly the pattern for Runway 13, which the pilot thought he had been cleared for. The aircraft flew in a circular trajectory with left-hand turns around reporting point N (over the city of Terrassa). Even though the pilot of the aircraft had flown to the Sabadell Airport on other occasions and had prepared the approach during the flight, the flight path taken did not match the published procedure. The instructor saw aircraft M-WINT in the vicinity of the town of Castellar del Vallés, which is close to the zone where the right tailwind leg for Runway 31 initiates and thus assumed that it was heading to that area to comply with the instruction given by the student being evaluated. From that moment on, none of the controllers (the student being evaluated or those on the evaluation team) noticed that aircraft M-WINT was not complying with the instruction provided. Instead they were all focused on the Runway 31 approach area, which is where most of the traffic was. Since the radar display was not being used it was only possible to visually detect the incorrect trajectory being flown by the aircraft. Two safety recommendations are issued in this regard.

At 09:42:33, aircraft M-WINT reported that it was turning to the final leg for Runway 31. At that time, according to radar information, the aircraft was actually turning onto the final leg for Runway 13 in the vicinity of point N. The student being evaluated cleared the aircraft to continue the approach, and informed it that number one in the sequence was on short final. The pilot acknowledged being number one using incorrect and incomplete phraseology. Neither the student being evaluated nor anyone on the evaluation team acted on the faulty acknowledgment, as a result of which it was not corrected. After that, the student being evaluated started giving instructions to an aircraft on the apron. A minute later the instructor, who was looking for aircraft M-WINT in the sector where it should have been, noticed (visually at first and then on the radar screen to his right) that it was in the wrong position, and asked the student controller to direct aircraft EC-DMC to perform an evasive maneuver. According to his statement, the instructor did not give this instruction over the frequency for fear that it might overlap with a message the student controller was relaying and that the instruction would not be received. The student being evaluated tried to provide an instruction to aircraft EC-DMC to maintain separation and attempted to interrupt the exchange he was having with aircraft EC-EPY (09:43:58), but he did not include the call sign of aircraft EC-DMC, meaning the instruction to break right was, for all intents and purposes, given to EC-EPY with which he was communicating at that time and not to the intended one, EC-DMC. At the same time, the instructor onboard EC-DMC also detected the incorrect position of M-WINT and instructed the pilot to turn left for separation. The pilot of M-WINT did not detect the presence of EC-DMC. M-WINT was eventually cleared by the student being evaluated to land on Runway 13 to avoid conflicting with other aircraft that were on approach to Runway 31. The phraseology used by the pilot to acknowledge was once again incomplete, as he only acknowledged the clearance to land without indicating the Runway. In this regard, proper discipline in radio communications, both by the crews and by air traffic controllers, is essential to the efficiency and safety of air transport. Considering the repeat nature of the faulty acknowledgments by the pilot of M-WINT and the lack of detection of ATC personnel to correct them, a safety recommendation is issued to ferroNATS to

ensure that its controllers and crews maintain discipline during radio communications. This recommendation is in keeping with the European Action Plan for Air Ground Communications Safety, published by Eurocontrol, and complements another recommendation already issued to AENA Air Navigation¹⁵ in this regard, which is why this recommendation is not directed at AENA.

During the investigation it was verified that no traffic was waiting on the opposite Runway and that all the aircraft operating in that section flew the right-hand traffic pattern for Runway 31.

3. CONCLUSIONS AND CAUSES

3.1. Findings

- The documentation of both aircraft was valid and in force.
- Both aircraft were airworthy.
- Weather conditions were ideal for visual flight.
- The prevailing weather conditions indicated that Runway 31 was the most favorable runway to use.
- The orientation of the Runway at the Sabadell Airport is unusual in that its two denominations (31-13) can lead to confusion.
- The crews had valid and in force licenses and medical certificates.
- The controllers had valid and in force licenses and medical certificates.
- At the time there was a transition taking place between the air traffic service providers at the Sabadell tower (from AENA to ferroNATS).
- Present in the control room were a student being evaluated (ferroNATS), an instructor seated to his right, the evaluator and an observer, the last three from AENA.
- The student being evaluated relieved another student controller under instruction.
- At the time of the relief the work load was medium/high with a work peak at that moment.
- The student being evaluated assumed the duty despite the complexity of the situation.
- The ferroNATS student was being evaluated in visual conditions without the use of the radar display.
- The instructor did not have the radar display in plain sight.
- In its first message from the tower, aircraft M-WINT was cleared to join the right downwind leg for Runway 31.
- The acknowledgment by the pilot of aircraft M-WINT was incomplete and not corrected by ATC.

¹⁵ See **REC 01/13** of report **IN-043/2011**: It is recommended that AENA evaluate the incorporation of topics involving the use of standard phraseology and the recommendations issued by Eurocontrol, as well as information concerning faulty acknowledgments and its consequences, into the continuing training programs for control personnel so as to raise controller awareness regarding the importance of these aspects.

- Aircraft M-WINT did not follow the approved flight path, instead making a left turn above point Terrassa before making the approach to Runway 13.
- Neither the student being evaluated nor the evaluation team (instructor and evaluator) detected the erroneous flight path followed by M-WINT until it was on the final leg of the Runway 13 pattern with aircraft EC-DMC climbing after landing on Runway 31.
- The controller instructor noticed the erroneous flight path taken by M-WINT and notified the student being evaluated.
- The student controller being evaluated tried to instruct aircraft EC-DMC to turn right, but his instruction did not include the call sign, as a result of which it was in fact directed at another aircraft with which the controller was communicating at the time.
- The instructor onboard aircraft EC-DMC detected the conflict and instructed loudly his student to turn left to avoid aircraft M-WINT.
- The pilot of aircraft M-WINT did not detect the conflict and did not make an evasive maneuver.
- The aircraft came within 0 NM horizontally and 100 ft vertically of each other.

3.2. Causes

The incident occurred because M-WINT mistakenly followed a flight path that had not been authorized that took it to the final leg of the traffic pattern for Runway 13, when it should have joined the pattern for Runway 31, which was the Runway in use and on which EC-DMC was doing a touch-and-go maneuver at the time. ATC personnel did not notice the flight path of M-WINT either visually or on radar (not visually accessible at the time) and were unaware of its erroneous final position until seconds before the two aircraft crossed each other.

Contributing to the incident is the fact that:

1. The pilot of M-WINT used non-standard and incomplete phraseology by only partially acknowledging the instructions provided by the control tower. In light of the flight path taken, these instructions were misheard not understood.
2. The controllers present in the tower did not react to these incomplete acknowledgments and did not correct them.

4. SAFETY RECOMMENDATIONS

During the evaluation of the visual control service, the radar system was not used, as this was not allowed for an evaluation used to obtain the unit endorsement. Had someone on the evaluation team been monitoring this system, the conflict could have been detected earlier. As a result, the following recommendations are issued:

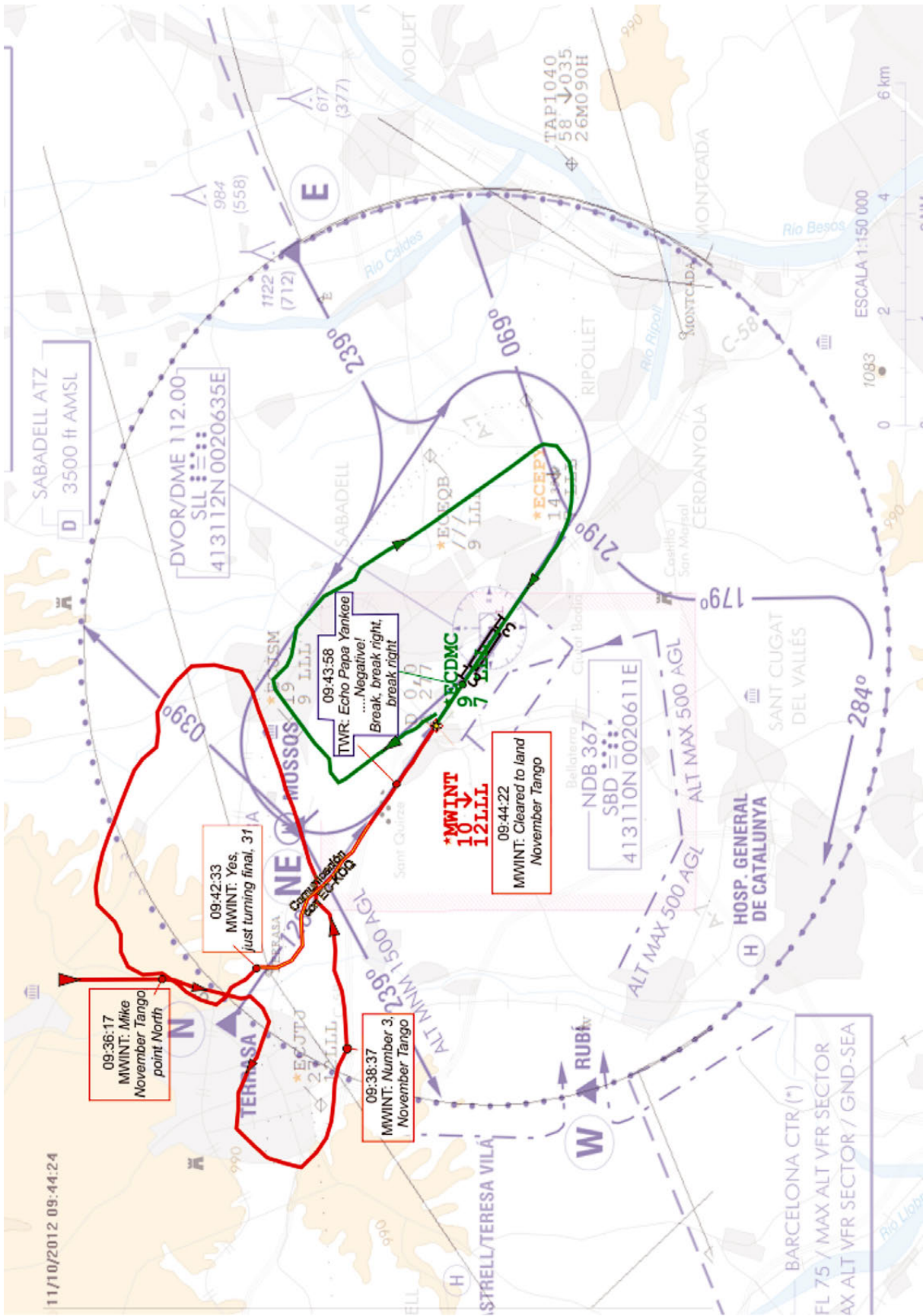
- REC 32/14.** It is recommended that AENA Air Navigation have the instructor-assistant on the evaluation team make use of all the information at their disposal, specifically that one from the radar display system, as a support to facilitate detecting potential conflicts that jeopardize the safety of aircraft whenever an aerodrome control (visual) evaluation is being conducted.
- REC 33/14.** It is recommended that ferroNATS have the instructor-assistant on the evaluation team make use of all the information at their disposal, specifically that one from the radar display system, as a support to facilitate detecting potential conflicts that jeopardize the safety of aircraft whenever an aerodrome control (visual) evaluation is being conducted.

The standard phraseology to be used is specified in the ICAO documentation and is applicable internationally. Moreover, studies carried out by Eurocontrol and other organizations, the results of which are contained in the "European Action Plan for Air Ground Communications Safety", have given rise to a series of recommendations regarding the use of phraseology intended to establish a standard setting for all of the parties involved and thus avoid potential conflicts, including some already identified. In light of the facts present in this incident, the following recommendation is issued:

- REC 34/14.** It is recommended that ferroNATS consider incorporating into the continuing training programs for its control personnel those aspects related to the use of standard phraseology and the recommendations included in the "European Action Plan for Air Ground Communications Safety", as well as information on defective or non-existent acknowledgments and their undesired results, so as to raise awareness in ATC personnel and cement the importance of these aspects.

APPENDICES

APPENDIX A



APPENDIX B
Transcript of the communications
(original communications in bold. Approximate
translation is provided where necessary)

Time	Station	Text
09:34:09	120.8	Echo Charlie Delta Mike Charlie, pista 31, autorizado a toma y despegue, viento 250, 4 kt. Echo Charlie Delta Mike Charlie, Runway 31, cleared for touch and go, wind 250, 4 kt.
09:34:18	EC-DMC	Autorizado a toma y despegue 31, Delta Mike Charlie. Cleared for touch and go 31, Delta Mike Charlie.
09:34:31	EC-EPY	Sabadell TWR, good morning again, EC-EPY
09:34:37	120.8	EC-EPY, good morning again, go ahead
09:34:40	EC-EPY	Over Tarrasa to N instructions for approach and landing
09:34:44	120.8	EC-EPY, hold over Tarrasa. Traffic departing to NE. I call you back
09:34:51	EC-EPY	Holding Tarrasa EC-EPY
09:35:02	120.8	EC-KOQ, Sabadell
09:35:10	M-WINT	Sabadell Tower, Mike Whisky India November Tango.
09:35:18	120.8	Mike Whisky India November Tango, Sabadell Tower, go ahead.
09:35:23	M-WINT	Mike Whisky India November Tango, inbound 5 miles to run heading to point North.
09:35:31	120.8	Mike Whisky India November Tango, standby.
09:35:53	EC-EQB	Torre, EC-EQB en base derecha de la 13, de la 31 Tower, EC-EQB on right base of 13, of 31.
09:36:03	120.8	EC-EQB pista 31, autorizado toma y despegue viento 250° 6 kt EC-EQB Runway 31, cleared for touch and go, wind 250 6 kt.
09:36:09	EC-EQB	Autorizado toma y despegue EC-EQB Cleared for touch and go, EC-EQB.
09:36:17	M-WINT	Mike November Tango, point North.
09:36:21	120.8	Mike Whisky India November Tango, copy traffic information, there is one traffic, Mooney 20 waiting over November, same altitude now, 2,500 ft, QNH 1010, Runway in use 31.
09:36:32	M-WINT	A visual November Tango.
09:36:35	120.8	Echo Papa Yankee, copie tráfico, tiene una arribada llegando a punto November, 2.500 ft, misma altitud, también estando sobre Terrassa. Echo Papa Yankee, copy traffic information, inbound arriving at point November, 2,500 ft, same altitude, also over Terrassa.
09:36:41	EC-EPY	Sí, we have traffic in sight, thank you, Echo Papa Yankee.
09:36:47	M-WINT	November Tango, do you want us still hold over North?
09:36:50	120.8	Yes.

Time	Station	Text
09:36:59	EC-KOQ	Sabadell la OQ listo rodar. Sabadell OQ, ready to taxi.
09:37:04	120.8	EC-KOQ me confirma aeromotor? EC-KOQ confirm aeroengine?
09:37:07	EC-KOQ	Afirma. Affirm.
09:37:09	120.8	Recibido. Ruede punto de espera 31 con viento 240° 10 kt QNH 1010 Copy. Taxi to 31 holding point, wind 240°, 10 kt, QNH 1010.
09:37:16	EC-KOQ	1010, pista 31. Rodamos para. OQ 1010, Runway 31, taxiing. OQ.
09:37:33	120.8	Mike Whisky India November Tango, Sabadell.
09:37:37	M-WINT	Yes, go ahead.
09:37:39	120.8	I'll call you back in one second, standby.
09:37:43	M-WINT	Roger.
09:38:00	N446BD	Sabadell TWR N446BD ready to taxi.
09:38:08	120.8	Station calling say again call sign.
09:38:11	N446BD	N446BD.
09:38:14	120.8	Stand by Sir.
09:38:19	120.8	M-WINT, Sabadell.
09:38:21	M-WINT	Yes, go ahead.
09:38:22	120.8	You may join right downwind now, Runway 31? You will be number 3 behind Cessna... Cessna 152 joining first third of the downwind. Runway 31.
09:38:37	M-WINT	Number 3, November Tango.
09:38:39	120.8	Echo Charlie Echo Quebec Bravo, Sabadell.
09:38:44	EC-EQB	Sí, adelante, para Echo Quebec Bravo. Yes, go ahead for Echo Quebec Bravo.
09:38:48	—	(Bloqueado) (Jammed)
09:38:50	120.8	Echo Charlie Echo Quebec Bravo, para su información será número 4, detrás de una Pilatus, una PC 12, de November a viento en cola derecha pista 31. Echo Charlie Echo Quebec Bravo, for your information you will be number 4, behind a Pilatus, a PC 12, from November to right downwind Runway 31.
09:39:02	EC-EPY	Sí, ¿la Papa Yankee qué número tenemos? Yes, Papa Yankee here, what number are we?

Time	Station	Text
09:39:06	EC-EQB	Recibido número 4 para Echo Quebec Bravo, ya mirando fuera a ver si encontramos la Pilatus. Copy number 4 for Echo Quebec Bravo, looking outside to see if we can find the Pilatus.
09:39:12	120.8	Echo Papa Yankee, para separación mantenga sobre November, le llamo. Echo Papa Yankee, hold over November for separation, I'll call you.
09:39:16	120.8	EC-JSM continúe la aproximación, le llamo. EC-JSM continue the approach, I'll call you.
09:39:35	EC-KOQ	EC-KOQ en punto de espera de la 31, listos para copiar. EC-KOQ at 31 holding point, ready to copy.
09:40:03	EC-KOQ	EC-KOQ en punto de espera de la 31, listos para copiar. EC-KOQ at 31 holding point, ready to copy.
09:40:13	120.8	EC-KOQ, I call you back with the authorization break, break. EC-JSM Runway 31. Clear for touch and go the wind 270° 06kt
09:40:26	EC-JSM	EC-JSM Runway 31 cleared for touch and go.
09:40:30	120.8	EC-EPY Sabadell.
09:40:31	EC-EPY	Go Ahead.
09:40:34	120.8	Join right downwind. Runway 31. Now crossing C150 over NE joining right downwind Runway 31. You will be number five
09:40:46	EC-EPY	To right downwind 31 EC-EPY
09:40:52	EC-DMC	En base derecha con precedente a la vista, la Delta Mike Charlie. On right base with preceding in sight, the Delta Mike Charlie.
09:40:55	120.8	Recibido. N446BD Sabadell. Copy. N446BD Sabadell.
09:41:01	N446BD	N446BD.
09:41:03	120.8	Are you approved when you report ready to taxi?
09:41:05	N446BD	Taxiing for Runway 31 is approved?
09:41:10	120.8	Confirm stand sir.
09:41:12	N446BD	We have flight plan Z and the 20.
09:41:20	120.8	Confirm around R3.
09:41:23	N446BD	We are in 314 ND.
09:41:29	120.8	Taxi Runway 31 the wind 240° SKT SQUAWK 5567 QNH 1010.
09:41:38	N446BD	5567 QNH 1010 and the taxi 31 ¿?
09:41:48	EC-EPY	Sabadell Tower, Echo Papa Echo Papa Yankee, right downwind 31.

Time	Station	Text
09:41:52	120.8	Do you confirm visual with the traffic, with the Cessna 150 on middle of downwind 31?
09:42:00	EC-EPY	Is for EPY this information?
09:42:02	120.8	Confirm visual with Cessna 150 entering downwind Runway 31.
09:42:09	EC-EPY	Negative for Echo Papa Echo Papa Yankee.
09:42:12	120.8	It's just abeam the Tower. Break break. Echo Mike Delta Mike Charlie, Runway 31, cleared for touch and go, the wind 240 degrees, 6 kt.
09:42:23	120.8	Echo Mike Delta Mike Charlie, pista 31, autorizado a toma y despegue, viento 240 grados, 6 kt. Echo Mike Delta Mike Charlie, Runway 31, cleared for touch and go, wind 240 degrees, 6 kt.
09:42:28	EC-DMC	Autorizado a toma y despegue 31, Delta Mike Charlie. Cleared for touch and go 31, Delta Mike Charlie.
09:42:31	120.8	Mike Whisky India November Tango, Sabadell.
09:42:33	M-WINT	Yes, just turning final, 31.
09:42:36	120.8	Roger, continue number one on short final.
09:42:39	M-WINT	Continue, number one, thanks.
09:42:42	EC-KOQ	Sabadell la EOQ estamos listos y listos copiar. Sabadell, EOQ here, ready to copy.
09:42:45	120.8	Estamos esperando a su autorización de Barcelona. Espere, le llamo. We're waiting for your clearance from Barcelona. Stand by, I'll call you.
09:42:51	120.8	EC-KOQ listo copiar? EC-KOQ ready to copy?
09:42:55	EC-KOQ	Afirma, KOQ. Affirm, KOQ.
09:42:57	120.8	EC-KOQ, Barcelona aproximación le autoriza a 4.000 ft en espera visual sobre Sabadell, después de la salida mantenga salida estándar hasta NE y posterior viraje a la izquierda de vuelta al campo. Notifique librando 3.000 ft. QNH 6334, corrección QNH 1010 responda 6334. Hora actual 09:43. EC-KOQ, you are cleared by Barcelona approach to 4,000 ft and visual hold over Sabadell, then after departure maintain standard departure to NE and subsequent turn left back to the airfield. Report passing 3,000 ft. QNH 6334, correction QNH 1010, squawk 6334. Current time 09:43.
09:43:29	EC-KOQ	Barcelona control autoriza EC-KOQ a esperas visuales sobre el campo en curso a NE con posterior viraje en la milla 3 izquierda y respondiendo 6334 QNH 1010. Barcelona control clears EC-KOQ for visual hold over airfield on NE heading with subsequent turn left at mile 3, squawk 6334 QNH 1010.

Time	Station	Text
09:43:44	120.8	Notifique librando 3.000 ft Report passing 3,000 ft.
09:43:46	EC-KOQ	Notificaremos librando 3000 ft. EC-KOQ Will report passing 3000 ft, EC-KOQ.
09:43:50	120.8	Es correcto. Mantenga posición tráfico en final. Correct. Hold position, traffic on final.
09:43:53	EC-KOQ	Mantenemos. Un tráfico en final EC-KOQ Holding. Traffic on final, EC-KOQ.
09:43:56	EC-EPY	La Echo Papa Yankee, ¿podemos entrar en base derecha 31? This is Echo Papa Yankee, can we join right base 31?
09:43:58	120.8	Echo Papa Yankee... ¡Negative! Break, break right, break right.
09:44:07	EC-DMC	¿¡Sabadell, de la Delta Mike Charlie!? Sabadell, for Delta Mike Charlie?
09:44:09	120.8	Traffic on final, Runway 13, say again callsign. Mike Whisky India November Tango cleared to land 13, cleared to land 13, the wind 240 degrees, 5 kt.
09:44:22	M-WINT	Cleared to land, November Tango.
09:44:26	120.8	Echo Charlie Delta Mike Charlie, Sabadell?
09:44:28	EC-DMC	Sí, ¿dígame? Yes, go ahead.
09:44:30	120.8	Sí, lo siento, pues ha entrado por la pista opuesta, proceda para viento en cola, derecha pista 31. Yes, I'm sorry, he came in on the opposite Runway, proceed for right downwind, Runway 31.
09:44:38	EC-DMC	«Él» ha entrado por la pista opuesta, no yo. He came in on the opposite Runway, not me.
09:44:42	120.8	Es afirma. That's affirm.
09:44:43	EC-DMC	Ah, de acuerdo, bueno, seguimos circuito. Oh, OK. Well, we're continuing in the pattern.
09:44:48	EC-EPY	¿Echo Papa Yankee en base derecha 31? Echo Papa Yankee on right base 31?
09:44:52	120.8	Sí, advertido hay tráfico tomando por la 13. Yes, be aware traffic landing on 13.
09:45:03	EC-EPY	Bien, entonces nos mantendremos. OK, we'll hold then.

APPENDIX C

Spain's Air Traffic Regulations

Spain's Air Traffic Regulations

3.3.7.3.1. The flight crew shall fully read back to the air traffic controller those parts of the clearances and instructions pertaining to safety that are relayed orally by ATC. The following elements shall be read back in full:

- a) ATC route clearances (including ATFM slots);
- b) clearances and instructions to enter, land, take off, hold at distance, cross or backtrack on any Runway; and
- c) runway in use, altimeter settings, SSR codes, level instructions, heading, speed and transition level instructions, whether issued by the controller or included in ATIS broadcasts.

3.3.7.3.1.1. Other clearances or instructions, including conditional clearances, shall be read back or acknowledged in a way that clearly indicates that they are understood and will be complied with.

3.3.7.3.1.2. The controller shall listen to the readback to ensure that the flight crew has correctly acknowledged the clearance or instruction and shall take immediate measures to correct any discrepancy revealed by the readback or lack thereof.

10.5.2.1.6.3.3.3. So as to minimize any confusion, controllers and pilots shall always include the callsign of the aircraft to which the clearance is applicable when giving and reading back ATC clearances.

10.5.2.1.8.2. Acknowledgment. The receiving operator shall ensure that the message has been properly received before acknowledging.

10.5.2.1.8.2.2. Every aircraft station shall acknowledge receipt of important messages from air traffic control or sent on its behalf, reading them back and ending the readback with its callsign.

Note 1. *Air traffic control clearances, instructions and the information contained therein that must be repeated are defined in Book Four.*

The correspondence between points of national regulations and ICAO regulations can be seen below:

RCA	Annex 11 Air Traffic Services	Annex 10 vol. II Communication Procedures
3.3.7.3.1	3.7.3.1	
3.3.7.3.1.1.	3.7.3.1.1	
3.3.7.3.1.2.	3.7.3.1.2	
10.5.2.1.6.3.3.3		5.2.1.7.3.3.3
10.5.2.1.8.2		5.2.1.9.2
10.5.2.1.8.2.2		5.2.1.9.2.2