Report
IN-019/2019

Incident involving a Boeing 737-86N, registration G-GDFS, and a Diamond DA20-C1, registration EC-KMH, near point E in the Reus Airport CTR on 12 May 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

Foreword

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

In accordance with the provisions in Article 5.4.1 of Annex 13 of the International Civil Aviation Convention; and with articles 5.5 of Regulation (UE) nº 996/2010, of the European Parliament and the Council, of 20 October 2010; Article 15 of Law 21/2003 on Air Safety and articles 1., 4. and 21.2 of Regulation 389/1998, this investigation is exclusively of a technical nature, and its objective is the prevention of future civil aviation accidents and incidents by issuing, if necessary, safety recommendations to prevent from their reoccurrence. The investigation is not pointed to establish blame or liability whatsoever, and it's not prejudging the possible decision taken by the judicial authorities. Therefore, and according to above norms and regulations, the investigation was carried out using procedures not necessarily subject to the guarantees and rights usually used for the evidences in a judicial process.

Consequently, any use of this report for purposes other than that of preventing future accidents may lead to erroneous conclusions or interpretations.

This report was originally issued in Spanish. This English translation is provided for information purposes only.

CONTENTS

ABBREVIATIONS

° ‘ “	Sexagesimal degrees, minutes and seconds
°C	Degrees centigrade
ACC	Area control center
ACP	Area control procedural rating
ACS	Area control surveillance rating
ADI	Area control instrument rating
ADS-B	Automatic dependent surveillance – broadcast
ADV	Aerodrome control visual rating
AESA	Spain’s National Aviation Safety Agency
AGL	Above ground level
AIP	Aeronautical information publication
AIR	Air control endorsement
AMSL	Above mean sea level
APP	Approach control
APS	Approach control surveillance rating
ARP	Aerodrome reference point
ATC	Air traffic control
ATCO	Air traffic controller
ATIS	Automated terminal information service
ATPL	Airline transport pilot license
ATS	Air traffic service
ATZ	Aerodrome traffic zone
CAA	Civil Aviation Authority of the United Kingdom
CECOA	Airport coordination center
CTR	Control zone
DME	Distance-measuring equipment
E	Entry point for the Reus Airport CTR
FAENT	Annual Fund for Adapting to Regulatory and Technological Trends
FL	Flight level
ft	Feet
GMC	Ground movement control endorsement
GMS	Ground movement surveillance endorsement
GPS	Global positioning system
h	Hours
HGT	Height above
hPa	Hectopascals
IAF	Initial approach fix
ICAO	International Civil Aviation Organization
IFR	Instrument flight rules
ILS	Instrument landing system

IR	Instrument rating
Km	Kilometers
Kt	Knots
LEGE	ICAO code for the Girona-Costa Brava Airport
LELL	ICAO code for the Sabadell Airport
LERS	ICAO code for the Reus Airport
LV	Low visibility
m	Meters
METAR	Meteorological aerodrome report
MLAT	Multilateration
N	Entry point for the Reus Airport CTR
NDB	Non-directional beacon
NM	Nautical miles
NOTAM	Notice distributed by means of telecommunication containing information concerning the establishment, condition or change in any aeronautical facility, service, procedure or hazard, the timely knowledge of which is essential to personnel concerned with flight operations
OCN	Oceanic control endorsement
OJTI	On-the-job training instructor
OM	Operations manual
PAR	Precision approach radar
PSR	Primary surveillance radar
QNH	Altimeter sub-scale setting to obtain elevation when on the ground
RAD	Aerodrome radar control endorsement
RCA	Spain’s AirTraffic Regulation
RES	Designator of the DME/VOR at the Reus Airport
RUS	Designator of the NDB at the Reus Airport
S	Entry point for the Reus Airport CTR
SFC	Surface
SRA	Surveillance radar approach
SSR	Secondary surveillance radar
TCAS RA	Traffic collision avoidance system – Resolution advisory
TCL	Terminal control endorsement
TMA	Terminal control área
TWR	Aerodrome control tower
UTC	Coordinated universal time
VFR	Visual flight rules
VLA	Designator of the DVOR/DME
VOR	VHF omni-directional bearing
W	Entry point for the Reus Airport CTR

Synopsis

Aircraft 1:

Owner:	Genesis Ireland Aviation Trading 3 Ltd
Operator:	Jet2.com LTD
Aircraft:	Boeing 737-86N, registration G-GDFS
Persons on board:	6 crew and 186 passengers, uninjured
Type of flight:	Commercial Air Transport - Scheduled - International - Passenger
Phase of flight:	Approach - Missed approach
Type of operation:	IFR

Aircraft 2:

Owner:	Aero Link Air Services
Operator:	Aero Link Air Services
Aircraft:	Diamond DA20-C1, registration EC-KMH
Persons on board:	1 crew, uninjured
Type of flight:	General Aviation - Training - Solo
Phase of flight:	Approach - Other
Type of operation:	VFR

Date and time of incident:	12 May 2019 at 10:38[1]
Site of incident:	Point E in the Reus Airport CTR
Date of approval:	**26 February 2020**

Summary of event:

On Sunday, 12 May 2019, a Boeing 737-86N aircraft, registration G-GDFS, inbound from Manchester, was on approach to the Reus Airport. It had missed its previous landing maneuver and, at the time of the incident, it was on the outbound leg at 3800 ft in preparation to make a new ILS Y approach to runway 25. (The instrument approach chart published in the AIP states that the outbound leg should be flown descending from an altitude of 5000 ft to 3800 ft at DME mile 13 on the ILS. On the outbound leg, DME mile 13 on the ILS practically coincides with reporting point E).

The Diamond DA20-C1, registration EC-KMH, was preparing to enter the Reus Airport CTR via reporting point E. The visual approach chart published in the AIP states that arrivals via point E of the CTR must be made at a maximum altitude of 2000 ft; however, this aircraft had been instructed by the controller to maintain 3,500 ft or higher due to an aerobatic air show over Tarragona. At the time of the incident, the aircraft was flying at 3,800 ft.

[1] All times in this report are local. To obtain UTC, subtract 2 hours from local time.

The controller in the Reus control tower was receiving on-the-job instruction and was being supervised by the instructor controller. The instructor controller decided to set up the control tower radar to show only the Reus ATZ airspace since the Unit Training Plan states that the approach control service provided is procedural.

Neither the controller under instruction nor the instructor was aware of the potential conflict. The flight paths of both aircraft converged and G-GDFS received a TCAS RA, as a result of which it executed an avoidance maneuver that cleared the conflict.

The minimum horizontal distance between the two aircraft was 0.6 NM, and the vertical distance 200 ft.

There were no injuries and the aircraft were not damaged.

The investigation has determined that this incident occurred because the controller under instruction and the instructor controller lost situational awareness of the traffic under their control.

The following factors contributed to the incident:

- Providing an inadequate clearance to the visual traffic EC-KMH, in terms of the altitude to maintain, as the lower clearance limit (3500 ft) conflicted with the ILS approach maneuver cleared to aircraft G -GDFS
- Not using the surveillance radar.
- The placement of the strips in the holder, as well as the use of various fixes (runway, pattern, approach), differed from those normally used by the instructor controller.
- AESA's assignment, in coordination with ENAIRE, of an area very close to the Reus Airport for exhibition flights.

1. FACTUAL INFORMATION

1.1. History of the flight

On Sunday, 12 May 2019, a Boeing 737-86N aircraft, registration G-GDFS, inbound from Manchester, was on approach to the Reus Airport. It had missed its previous landing maneuver and, at the time of the incident, it was on the outbound leg at 3800 ft in preparation to make a new ILS Y approach to runway 25. (The instrument approach chart published in the AIP states that the outbound leg should be flown descending from an altitude of 5000 ft to 3800 ft at DME mile 13 on the ILS. On the outbound leg, DME mile 13 on the ILS practically coincides with reporting point E).

The Diamond DA20-C1, registration EC-KMH, was preparing to enter the Reus Airport CTR via reporting point E. The visual approach chart published in the AIP states that arrivals via point E of the CTR must be made at a maximum altitude of 2000 ft; however, this aircraft had been instructed by the controller to maintain 3,500 ft or higher due to an aerobatic show over Tarragona.

The NOTAM[2] that had been issued warning of these aerobatic flights was as follows:

(*D1432/19 NOTAMN*
Q) LECB/QWBLW/IV/M /W /000/033/4107N00116E002
A) LECB
B)1905101400
C)1905121400
D)10-11 1400-1700, 12 0800-1400
E) AEROBATICS WI 02NM RADIUS OF 410642N 0011535E TARRAGONA/PLAYA DEL MIRACLE
F) SFC G)03300FT AMSL)

The NOTAM states that aerobatic flights were in progress within a radius of 2 NM of Playa del Miracle in Tarragona, from the SFC to an altitude of 3300 ft. On the day of the incident, the flights were scheduled between 8 UTC (10 local) and 14 UTC (16 local).

At the time of the incident, the Diamond DA20-C1 aircraft, registration EC-KMH, was flying at 3,800 ft.

The controller in the Reus control tower was receiving on-the-job instruction and was being supervised by the instructor controller. The Unit Training Plan states that the approach control service provided is procedural, meaning that even though the control tower has a radar, at the time of the incident, it was set up to show only the Reus ATZ airspace.

[2] • During the comment phase, the operator of the G-GDFS aircraft indicated that this NOTAM was not among the information given to the crew prior to departure. Therefore, the aircraft crew was not aware of this situation.

Neither the controller under instruction nor the instructor was aware of the potential conflict. The flight paths of both aircraft converged and G-GDFS received a TCAS RA, as a result of which it executed an avoidance maneuver that cleared the conflict.

The minimum horizontal distance between the two aircraft was 0.6 NM, and the vertical distance 200 ft.

1.2. Injuries to persons

Aircraft 1

Injuries	Crew	Passengers	Total in the aircraft	Other
Fatal				
Serious				
Minor				Not applicable
None	6[3]	186	192	Not applicable
TOTAL	6	186	192	

Aircraft 2

Injuries	Crew	Passengers	Total in the aircraft	Other
Fatal				
Serious				
Minor				Not applicable
None	1		1	Not applicable
TOTAL	1		1	

1.3. Damage to aircraft

The aircraft did not sustain any damage.

1.4. Other damage

There was no other damage of any kind.

1.5. Personnel information

Information on the crew of G-GDFS

[3] 2 flight crew and 4 cabin crew

The pilot, a 50-year-old British national, had an airline transport pilot license (ATPL(A)) issued on 5 July 2012 by the United Kingdom's Civil Aviation Authority, and B737 300-900/IR/LV ratings, which were valid until 29 February 2020.

The pilot had a class-1 medical certificate that was valid until 7 February 2020.

The copilot, a 28-year-old British national, had an airline transport pilot license (ATPL(A)) issued on 20 April 2016 by the United Kingdom's Civil Aviation Authority, and B737 300-900/IR ratings, which were valid until 30 April 2020.

The copilot had a class-1 medical certificate that was valid until 20 September 2019.

Information on the crew of EC-KMH

The student pilot, a 20-year-old Iranian national, had, among others, a class-2 medical certificate that was valid until 4 October 2023.

The student pilot had a total of 72 flight hours, of which 45:42 h had been flying solo.

On the day of the incident, the student pilot was doing a triangular cross-country flight between the following airports:

1. He took off from the Sabadell Airport (LELL) at 10:00 and landed at Reus Airport (LERS) at 11:00.
2. He then took off from LERS and, at 12:39, landed at the Girona-Costa Brava (LEGE) Airport at 14:45.
3. Finally, he took off from LEGE at 15:00 and landed at LELL at 16:00.

Information on the controller under instruction in the control tower at the Reus Airport

The controller who was receiving on-the-job instruction, a 23-year-old Spanish national, had a student air traffic controller license, issued on 30 May 2018.

After the incident, on 6 June 2019, he received his air traffic controller license with the following ratings: ADV, ADI (with AIR, GMC, TWR, GMS and RAD endorsements), APP, APS (with PAR, SRA and TCL endorsements), ACP (with OCN endorsement) and ACS (with TCL and OCN endorsements). For the LERS unit, he had an APP and ADI/TWR/RAD endorsements, expiring on 25 May 2020.

He had a class-3 medical certificate that is valid until 23 January 2021.

Information on the instructor controller in the control tower at the Reus Airport

The instructor controller, a 42-year-old Spanish national, had a license, with an initial issue date of 4 May 2011, with the following ratings: ADV, ADI (with AIR, GMC, TWR, GMS and RAD endorsements), APP, APS (with PAR, SRA and TCL endorsements), ACP (with OCN

endorsement) and ACS (with TCL and OCN endorsements). For the LERS unit, he had an APP and ADI/TWR/RAD endorsements, expiring on 3 May 2020. He also had an on-the-job training endorsement, expiring on 19 April 2021.

He had a class-3 medical certificate that was valid until 3 July 2019.

1.6. Aircraft information

Information on the aircraft with registration G-GDFS

The Boeing 737-86N aircraft, registration G-GDFS and serial number 32243, was registered in the CAA's aircraft registry on 9 May 2014.

It had a certificate of airworthiness, issued by the CAA, and an airworthiness review certificate, valid through 28 April 2020.

Information on the aircraft with registration EC-KMH

The Diamond DA20-C1, registration EC-KMH and serial number C0217, was built in 2003 and registered in AESA's aircraft registry on 17 March 2008. The aircraft was outfitted with two General Electric CF34-8C5 engines.

It had a certificate of airworthiness, issued by AESA, and an airworthiness review certificate, valid through 11 December 2019.

1.7. Meteorological information

The 08:30 UTC (10:30 local) METAR for the Reus Airport was as follows:

METAR LERS 120830Z 25011KT 210V290 CAVOK 19/05 Q1024=

- Variable wind from 210º to 290º at 11 knots.
- Good visibility on the surface.
- Temperature of 19º C and dew point of 5º C.
- QNH of 1024 hPa.

1.8. Aids to navigation

The radar tracks of the aircraft at various times during the incident are shown for analysis.

At 10:32:26, G-GDFS, whose callsign was EXS929, after missing its approach due to not being stabilized, was on the outbound leg to try a new ILS Y approach based on the RUS NDB. The instrument approach chart published in the AIP specifies that the outbound leg is to be flown descending from an altitude of 5000 ft to 3800 ft by DME mile 13 on the ILS; however, the aircraft was flying at an altitude of 4000 ft, as it had been cleared to do so by the air traffic controller.

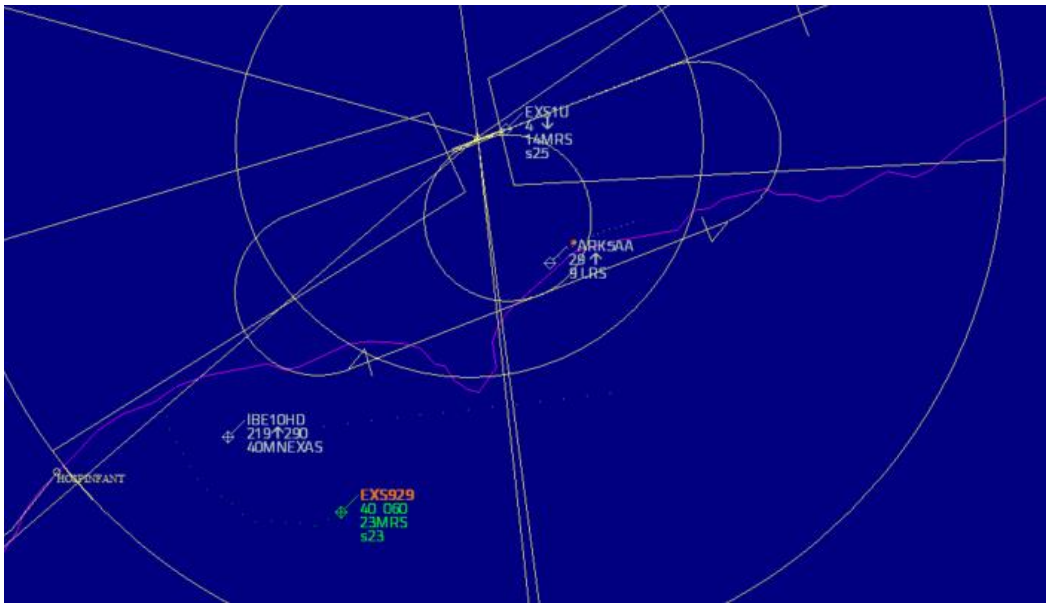


Illustration 1: Position of G-GDFS at 10:32:26

At 10:34:40, EC-KMH, whose callsign was ARK1AK, was preparing to enter the Reus Airport CTR via reporting point E. At that time, it was at an altitude of 3100 ft. This aircraft had been instructed by the controller to maintain 3,500 ft or higher due to an aerobatic show that was taking place over Tarragona.

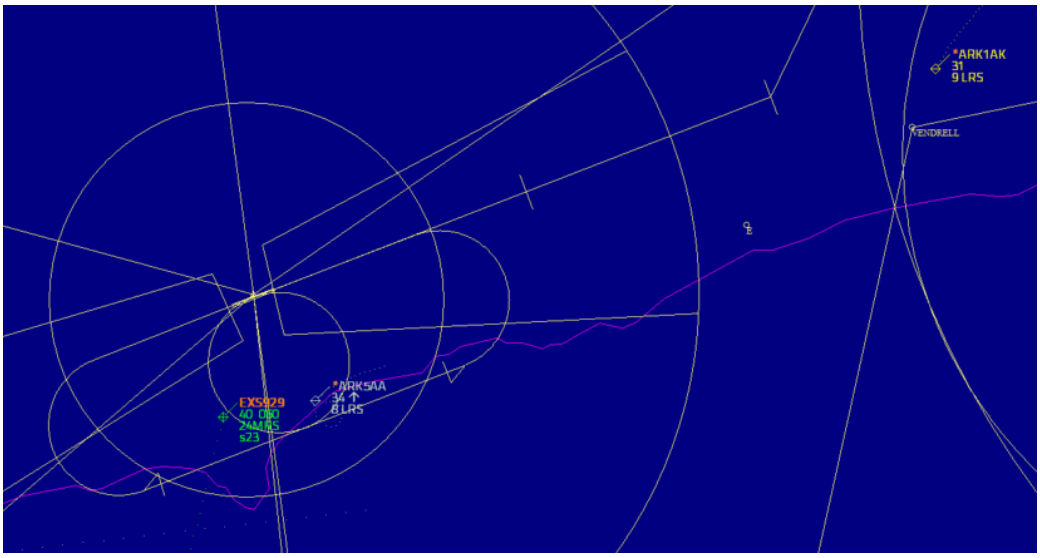


Illustration 2: Position of the aircraft at 10:34:40

At 10:37:41, G-GDFS was on the outbound leg, approaching mile 13 on the ILS DME at an altitude of 3800 ft, and EC-KMH was near reporting point E in the CTR at an altitude of 3600 ft. (On the outbound leg, mile 13 on the ILS DME practically coincides with reporting point E). At this time, the two aircraft were separated by 2.2 nautical miles horizontally and 200 ft vertically.

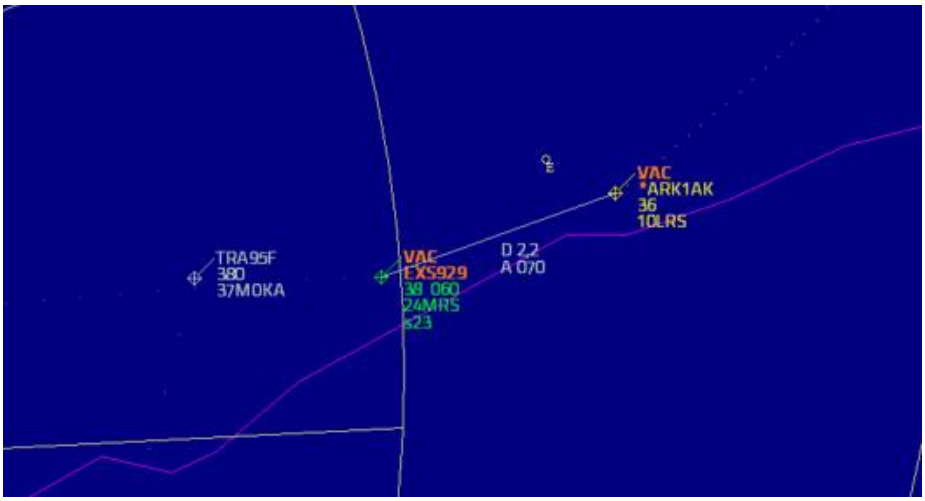


Illustration 3: Position of the aircraft at 10:37:41

The minimum separation between the aircraft occurred at 10:38:05, after which G-GDFS began to climb and separate from EC-KMH after receiving a TCAS resolution advisory.

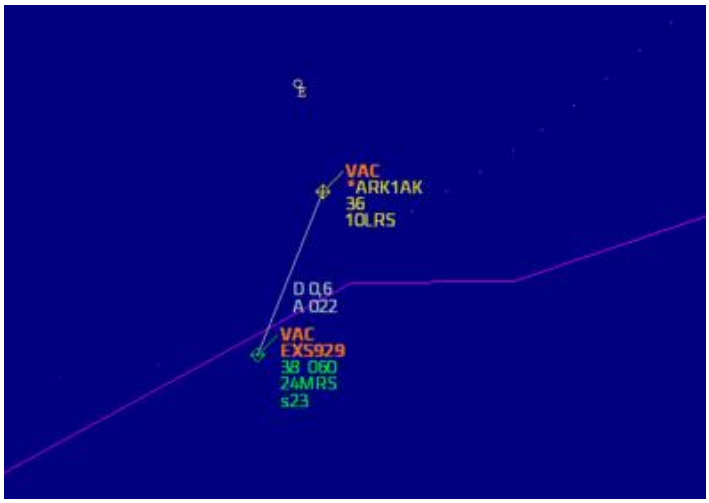


Illustration 4: Position of the aircraft at 10:38:05

1.9. Communications

In order to analyze the incident, the communications between the controller in the control tower at the Reus Airport and the crews of the aircraft involved in the incident are summarized below.

At 10:28:24, G-GDFS, callsign EXS929, reported that it was going around as it was over the runway 25 threshold. The controller in the control tower at the Reus Airport cleared it to proceed to RES at an altitude of 4000 ft.

At 10:29:26, the controller in the control tower at the Reus Airport informed the controller in sector T4 that the traffic had missed its approach and asked not be transferred any other traffic.

At 10:30:10, the controller in the control tower asked the traffic the reason for the missed approach, and the crew replied that it was not stabilized.

Later, at 10:32:28, the crew informed the controller that they were maintaining 4000 ft and proceeding to RES. They also requested to fly the ILS Y approach for the RUS NDB, which was authorized by the controller.

At 10:33:58, EC-KMH, with callsign ARK1AK, informed the controller in the control tower at the Reus Airport that it was proceeding to point E at 3000 ft to land at the airport. The controller informed the pilot that runway 25 was in use, provided the weather conditions, cleared him to fly along the coastline and asked to be notified when the aircraft was over Tarragona. He also instructed the pilot to maintain 3,500 ft or higher due to an aerobatic air show in the area of Tarragona.

At 10:35:48, the controller in the control tower at the Reus Airport informed the controller in sector T4 of the change to the ILS approach instruction for EXS929, stating that the traffic was flying the Y approach and would fly outbound for 13 miles and exit the airport CTR. He also informed him that after this traffic, he could transfer him additional aircraft.

At 10:37:24, the controller in the control tower informed the crew of EXS929, as well as a Ryanair on the ground, of a change to the QNH, which was now 1023.

A few seconds later, at 10:37:40, the crew of EXS929 reported that it had traffic some 200 ft below. The controller instructed them to stand by.

At 10:37:52, the crew of EXS929 informed the controller that they had initiated an avoidance maneuver.

At 10:37:56, the controller in the control tower instructed ARK1AK to descend to 2000 ft or lower. He then informed the other traffic, EXS929, of this instruction, which replied by stating that they had had to perform a TCAS avoidance maneuver, that they were at an altitude of 4200 ft and returning to their assigned flight level.

1.10. Aerodrome information

The Reus Airport, ICAO code LERS, is 3 km E of the city of Reus. It is at an elevation of 71 meters and it has one asphalt runway, 07/25, which is 2459 m long and 45 m wide.

At the time of the incident, aircraft were landing on runway 25.

1.11. Flight recorders

Aircraft EC-KMH did not have a flight recorder, as it is not required for this type of aircraft. However, aircraft G-GDFS did have a flight recorder installed.

By the time the CIAIAC opened its investigation, the data from the flight recorder on G-GDFS were no longer available, so the Commission requested the QAR (Quick Access Recorder), an analysis of which revealed the following[4]:

The crew made the following communications with the air traffic control service:

1 – At **10:37:25**, they informed the controller of traffic some 200 ft below them.

2 – At **10:37:36**, they informed the controller that they had initiated an avoidance maneuver, at which time the aircraft starts to climb.

3 – The controller informed the aircraft of the instruction given to the other aircraft, to which the crew replied at **10:37:58**, stating that they had had to perform a TCAS avoidance maneuver, that they were at an altitude of 4200 ft and returning to the assigned flight level. They were not in fact at that altitude, but they were close.

The QAR also recorded the TCAS (Traffic Alert and Collision Avoidance system) warnings: At 10:37:30, with the aircraft at an altitude of 3,504 ft, it received a TCAS warning that instructed the crew to down: “Down Advisory Corrective” until 10:37:34, and then the value “Up Advisory Corrective” until 10:37:46.

All of the above indicates that for 4 s, the crew were initially instructed to descend, followed by a climb advisory.

For the duration of the advisories, the aircraft stayed on a course of 084º, and its indicated airspeed, which was 219 kt, began to increase.

1.12. Wreckage and impact information

Not applicable.

1.13. Medical and pathological information

There were no indications that the actions of the crews or the air controllers in the control tower at the Reus Airport were affected by physiological factors or that they were incapacitated.

1.14. Fire

There was no fire in the aircraft or in the surroundings.

1.15. Survival aspects

[4] There is a slight mismatch between the time reference of the communications recorded by ENAIRE and that calculated by the CIAIAC to reference the QAR data. The CIAIAC has relied on communications and radar tracks provided by ENAIRE and the time crew clicks to communicate with air traffic controllers.

Not applicable.

1.16. Tests and research

Statement from the crew of aircraft G-GDFS

They were flying the standard missed approach for the Reus Airport at the altitude authorized by ATC, 4000 ft. They had been cleared to fly the ILS Y approach to runway 25.

As they were on the outbound leg, they saw a nearby aircraft flying directly toward them, some 200 ft lower. They notified ATC of a potential conflict. Since the approach control service is provided without radar, they think that ATC was not aware of this other traffic. They also thought that the pilots of this other airplane may have been following a route different from that instructed by ATC.

They received a resolution advisory from TCAS, followed by a descend instruction, which they immediately executed. After starting the descend, the TCAS reversed the instruction to a climb. They climbed to approximately 4400 ft until the conflict cleared, after which they again descended to their assigned flight level.

Through the window, they saw the other traffic pass underneath on an opposite heading. It had approached to within 200 ft vertically and 1 to 2 miles horizontally. Several passengers reported the presence of the nearby aircraft to the cabin crew.

They informed ATC, which stated that they would report the incident.

Statement from the student pilot in aircraft EC-KMH

He estimated that he reached reporting point “E” inbound to the Reus CTR at about 10:37, to make the approach and complete landing.

He acknowledged the instructions provided by the Reus controller during the first call upon reaching reporting point “E”: continue along the coast, maintain 3000 ft due to the presence of aerobatic flights over Tarragona. The controller also instructed him to call again once he was over the city of Tarragona.

He had not yet reached Tarragona when he noticed a Jet2 airplane on his same course, crossing his path ahead of him from right to left, climbing out toward the sea. At the same time, the Reus controller instructed him to “change course to the right and continue along the coastline”, which he did.

Upon reaching the city of Tarragona, the controller told him to “hold over Tarragona and circle to the right”. He circled 2 or 3 times over the city, after which the Reus controller told him to “continue toward Salou and circle left there”. After circling once, he was instructed to “join the right downwind leg for runway 25” from Salou. A short time later, before reaching Reus, the controller instructed him to fly toward the city of Alcover and hold there.

As he was flying to Alcover, north of the airport, he received new instructions to again join the right downwind leg for runway 25. While in the downwind leg, approximately over the industrial area called Constantí, he was cleared to land on runway 25.

Statement from the instructor of the pilot in aircraft EC-KMH

The student reported at 09:00 to prepare a triangular cross-country flight that involved taking off from Sabadell, flying to the Reus Airport with a full landing, and then flying to the Girona Airport with a full landing and returning to the departure point in Sabadell.

At 10:00, the student pilot commenced the flight and then took off en route to Reus.

After that point, the instructor could not say if the student flew the planned route correctly or when he entered the Reus CTR, since the aircraft does not have a GPS tracking system or the like to provide an instantaneous position indication on a map.

At the end of the flight, at 16:00 after returning from LEGE, during the debriefing, the student pilot told the instructor that:

- There was a lot of air traffic at LERS, and that because of this he was instructed to fly holding patterns at several points near the airport. He did not identify any situations involving near misses with another aircraft, and

- After landing at LELL, upon completing his mission, the Sabadell controller told him that a controller in Barcelona had tried to contact him several times but that he did not answer. The student informed the instructor that he did not hear any calls from Barcelona at any point.

Statement from the controller under instruction in the control tower at the Reus Airport.

Runway 25 was in use. There were a lot of birds in the area and several bird strikes had been reported throughout the morning. There was also a reserved area over Tarragona up to 3300 ft for aerobatic flights.

The aircraft with callsign EXS929 was instructed to hold at VLA at 6000 ft until the preceding traffic was in sight, since it was a conventional approach. It was then instructed to make the ILS Z approach and asked to report when it left 6000 ft (for use by following aircraft) and 10 NM on final.

He contacted the visual traffic with callsign ARK5AA reaching reporting point E and instructed it to proceed along the coastline to Tarragona (where they are usually incorporated into the pattern), maintaining 3500 ft or higher due to the reserved area. This clearance and altitude would not interfere with ILS approaches from the VLA IAF. It was a training flight, the student pilot was flying solo and his low experience when it came to acknowledging and carrying out clearances was evident.

The preceding traffic landed and vacated the runway, so the aircraft with callsign EXS929 was cleared to land.

The traffic with callsign ARK5AA reached Tarragona at 3500 ft, which is when EXS929 missed its approach.

He confirmed to the traffic with callsign EXS929 that the authorized limit altitude at point RES was 4,000 ft. He also confirmed that the traffic following it in the ILS Z approach, EXS1U, was leaving 4000 ft. He asked about the reason for the missed approach, since the large presence of birds made him suspect it could have been a bird strike, in which case the runway would have to be checked. The traffic reported that the reason had been an excessively long landing. He then cleared EXS1U to land and coordinated with the sector T4 controller to accept no other traffic.

The traffic with callsign ARK5AA was instructed, through the control tower, to join the left downwind leg for runway 25 and circle. The traffic continued circling over Tarragona and, after several communications confirming the clearance, since it was not doing as instructed, he saw it descend over the reserved area. It was instructed to maintain 3500 ft or higher so as not to enter the area.

The traffic with callsign EXS929 requested to make the ILS Y approach, but it was cleared for the ILS Z approach, since the ILS Y approach exited the CTR airspace and flew an outbound leg of 13 NM instead of 9 NM. After acknowledging correctly, he insisted in requesting the ILS Y approach due to previous problems attempting the ILS Z approach. Since it had missed the first approach, it was eventually cleared to make the ILS Y approach.

He contacted the visual traffic with callsign ARK1AK, which was also a student pilot flying solo, as it reached entry point E and gave it the same instructions as traffic ARK5AA.

He coordinated the ILS Y approach of the aircraft with callsign EXS929 with the sector T4 controller, since it would be leaving the Reus CTR airspace.

The traffic with callsign EXS929 reported a TCAS RA, although the controller thought that the crew had reported a TCAS TA and that the crew were requesting information on the visual traffic. At that point, he noticed the conflict between EXS929 and ARK1AK. He immediately instructed the visual traffic to descend to 2000 ft or lower (altitude that it would have been instructed to maintain if not for the reserved area over Tarragona) to avoid the conflict.

The aircraft with callsign EXS929 reported that it had had to execute an avoidance maneuver and that it was clear of the traffic. It continued the approach and landed.

The conflict was not anticipated on the auxiliary radar display, since it was set up from 0 to 3000 ft out to a radius of 5 NM. This configuration allowed controllers to see radar data on traffic in the airspace of the Reus ATZ. The displays were being used in this manner due to the interpretation of the instructor and other ATCOs at the unit of the emails they had been

exchanging for several weeks with their superiors and the Regulatory Department, in which they asked about the use of the surveillance radar service at LERS. The information received, in the opinion of certain ATCOs, did not clarify the use of the radar at an APP unit. As a result, the approach was purely conventional, without surveillance.

The conflict was not identified or anticipated due to the high workload. Since LERS is a single-controller unit that provides both control tower and approach services, the controller is required to multitask, and these tasks are often unrelated to operations, such as: creating and editing flight plans, providing weather information (no ATIS), checking supervisory emails, answering the two telephones in the tower and coordinating with CECOA to assign or change stands. This hampers the development of a basic situational awareness in conventional approaches.

Statement from the instructor controller in the control tower at the Reus Airport.

High workload due to various simultaneous situations: restricted area over Tarragona due to an air show, missed approach by the aircraft with callsign EXS929, student pilots flying solo in VFR conditions (the aircraft with callsigns ARK5AA and ARK1AK) and the workload from IFR aircraft.

After the missed approach of the aircraft with callsign EXS929 at 10:28, it was instructed to fly the standard missed approach at 4000 ft, and then to make the ILS Z approach. EXS929 requested to fly the ILS Y approach, which it was cleared to do after coordinating with LECB T4, since it was possible that it would exit the Reus CTR airspace.

In the meantime, the traffic with callsign ARK1AK was flying from point E to Salou and was instructed to climb to 3500 ft to avoid the area reserved for the air show.

Due to the workload, neither the student controller nor he noticed that ARK1AK would interfere with the approach of EXS929.

The traffic with callsign EXS929 received a TCAS resolution advisory, after which it resumed the approach and landed without further incident at 10:45.

No traffic information was provided, as is required for airspace D.

In his opinion, a contributing factor in this event was not having surveillance radar beyond the Reus ATZ airspace that could have provided visual information that the aircraft were in conflict. He also noted that with the scheduled reduction of the Reus CTR airspace, the controllers in the control tower would be unaware of this type of traffic along the coastline, which could result in additional incidents like this one.

During the internal analysis into the incident conducted by ENAIRE, this controller mentioned the fact that the controller under instruction placed the strips in the holder differently from how he usually placed them. His use of the various fixes (runway, pattern, approach) was also different.

1.17. Organizational and management information

Not applicable.

1.18. Additional information

Internal report prepared by ENAIRE

After analyzing this incident, ENAIRE wrote an internal report and took the following measures to improve operational safety::

1. Monitor the operational practices of the ATCO in terms of providing conventional approach services by observing activities involving services selected at random for one month.
2. Evaluate the need to have standardized procedures or best practices for using the flight progress strip holder in the unit's Operations Manual
3. Publish a "Procedure for using the ATS surveillance systems in the Reus CTR" in the LERS Operations Manual and in the AIP, which can be used as a support tool for the conventional control procedures that are used there
4. Include this incident in the specific annual training for this unit.
5. Require the ATCOs collaboration to develop a best practices guide for the unit on using the radar in conventional approaches and for supervising OJTI sessions.
6. Share the causal factors with the instructor controller.

ILS Z instrument approach chart for runway 25

The ILS Z instrument approach chart for runway 25 published in the AIP is shown below. It specifies that after a missed approach, aircraft must:

- climb direct to 750 ft,
- turn left to follow RES R-234 to 7 NM on the RES DME,
- turn left to 177º to 4,000 ft,
- turn left direct to RES VOR/DME to join holding pattern.

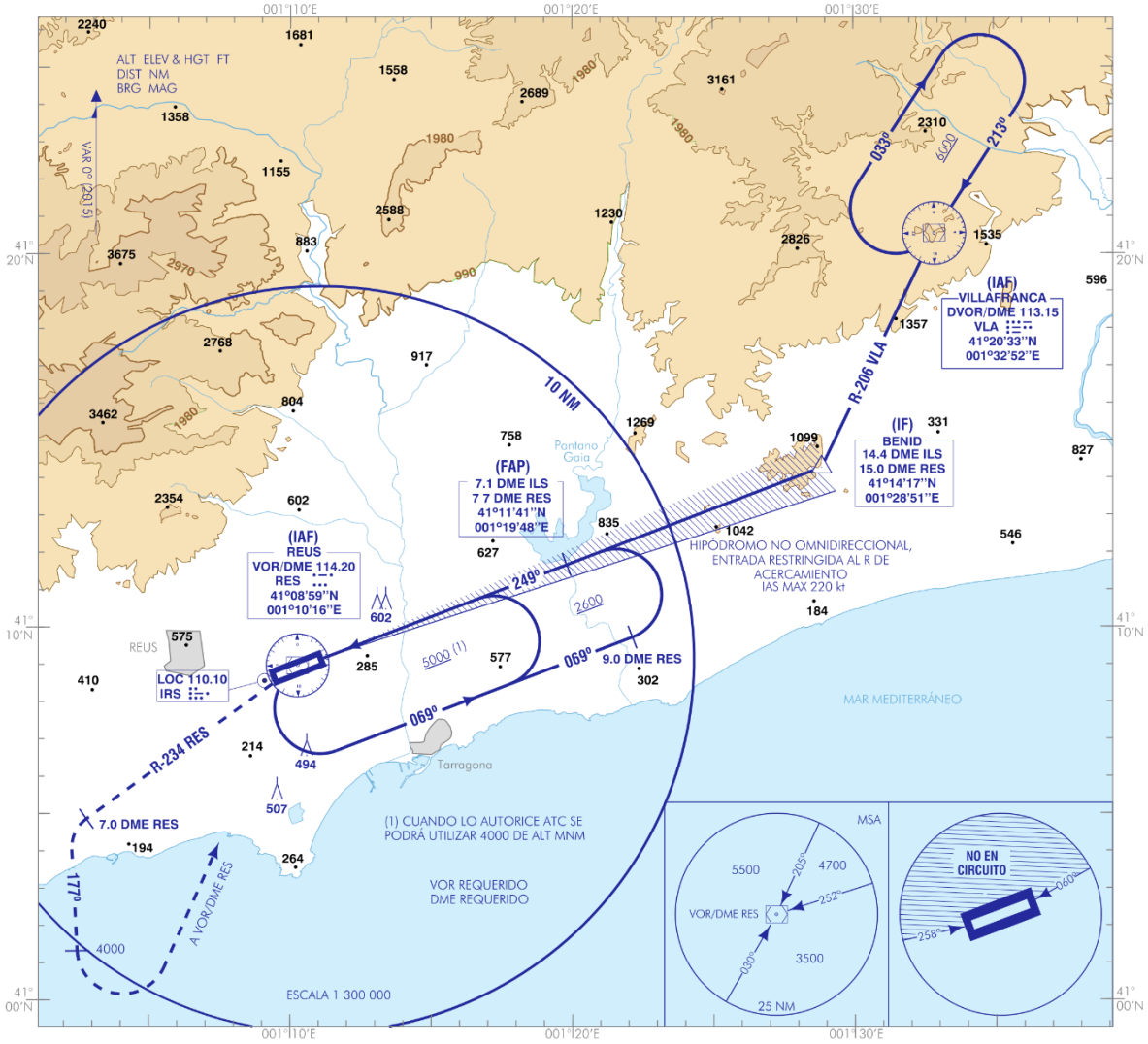
As the chart shows, the outbound leg is inside the Reus CTR airspace and extends out to 9 NM from the RES DME. Aircraft have to descend to 2600 ft.

CARTA DE APROXIMACIÓN
POR INSTRUMENTOS OACI

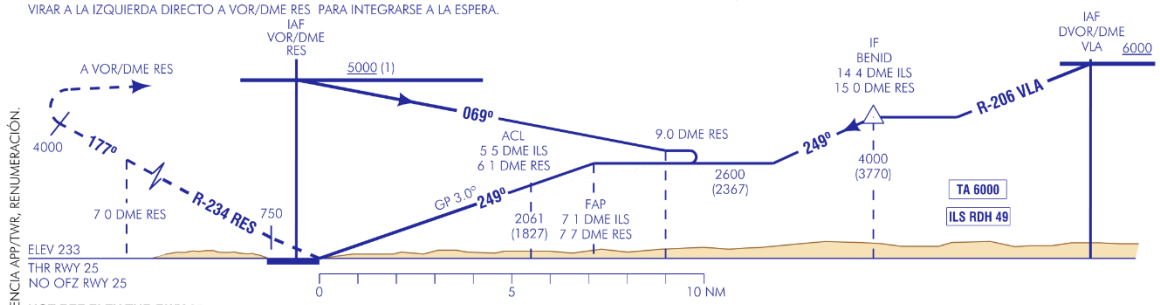
ELEV AD
233

APP	128 875
TWR	128 875
GMC	121 700

REUS
ILS Z
RWY 25



FRUSTRADA: SUBIR DIRECTO A 750 ft. VIRAR A LA IZQUIERDA PARA SEGUIR R- 234 RES HASTA 7 0 DME RES VIRAR A LA IZQUIERDA A RUMBO 177° HASTA ALCANZAR 4000 ft.
VIRAR A LA IZQUIERDA DIRECTO A VOR/DME RES PARA INTEGRARSE A LA ESPERA.



CAMBIOS: FRECUENCIA APP/TWR, RENUMERACIÓN.

HGT REF ELEV THR RWY 25

OCA/H		A	B	C	D
STA	CAT I	420 (187)	430 (197)	440 (207)	450 (217)
En circuito (H) sobre 233		850 (620)	890 (660)	1050 (820)	1080 (850)

GS	kt	80	100	120	140	160	180
FAP-THR: 7.1 NM	min:s	5 21	4 17	3 34	3 03	2 41	2 23
FAF MAPT·	min:s						
ROD: 5 2 %	ft/min	425	531	637	743	849	955

ALT/HGT DME (ILS) FNA

13 DME	12 DME	11 DME	10 DME	9 DME	8 DME	7 DME	6 DME	5 DME	4 DME	3 DME	2 DME	1 DME
						2560 (2330)	2230 (2000)	1900 (1670)	1580 (1340)	1250 (1020)	930 (690)	610 (370)

ILS Y instrument approach chart for runway 25

Also provided is the ILS Y approach chart for runway 25, which specifies the following after a missed approach:

- climb direct to 850 ft,
- turn left on magnetic heading 207º RUS and climb to 3000 ft,
- turn left direct to RUS NDB, climb to 5000 ft to join holding pattern.

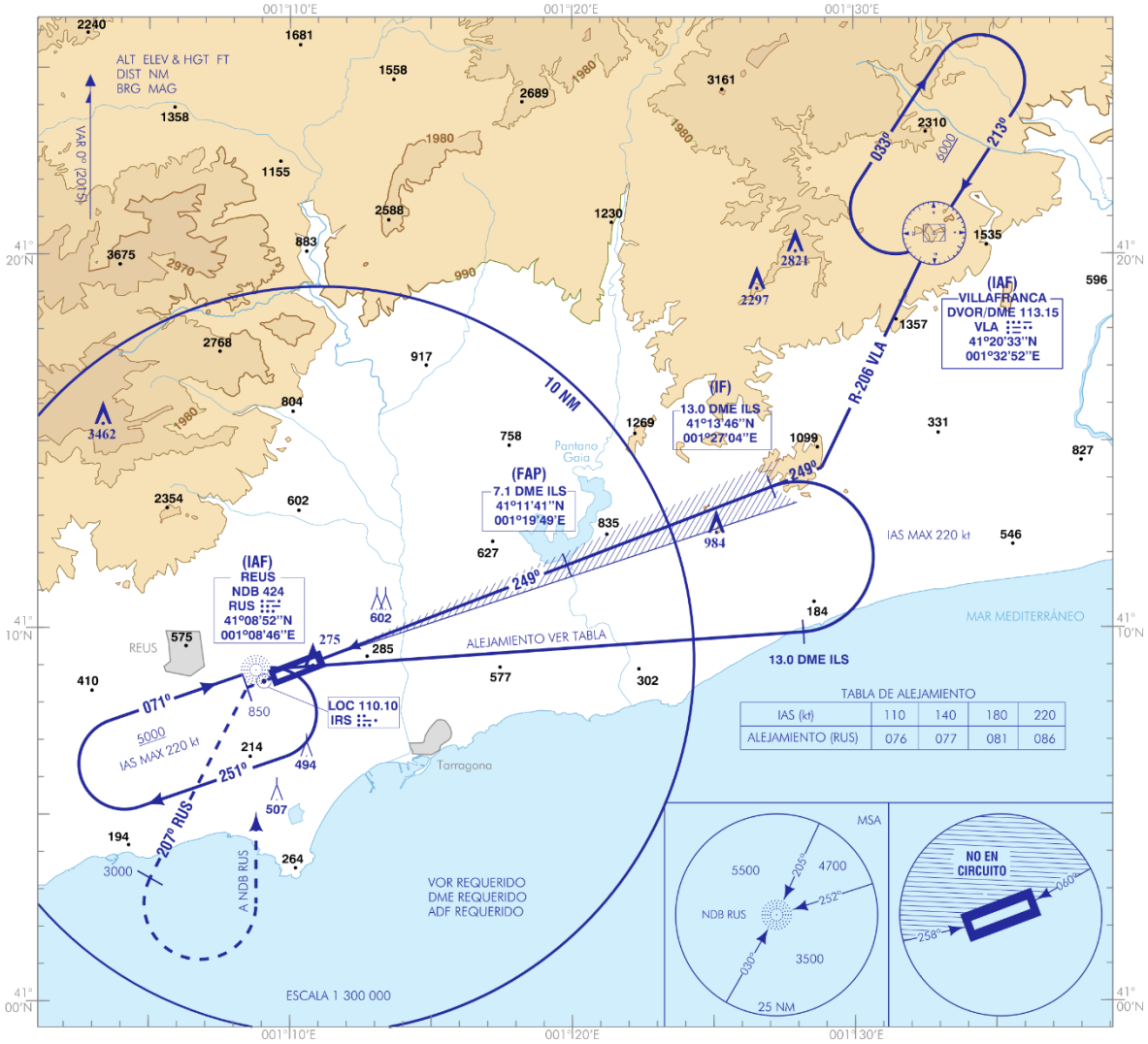
As the chart shows, part of the outbound leg is outside the Reus CTR airspace, extending out to 13.0 NM from the ILS DME. Aircraft have to descend to 3800 ft. The outbound leg ends in the vicinity of VFR reporting point E (Roda de Bará) for entering the Reus CTR.

CARTA DE APROXIMACIÓN POR INSTRUMENTOS OACI

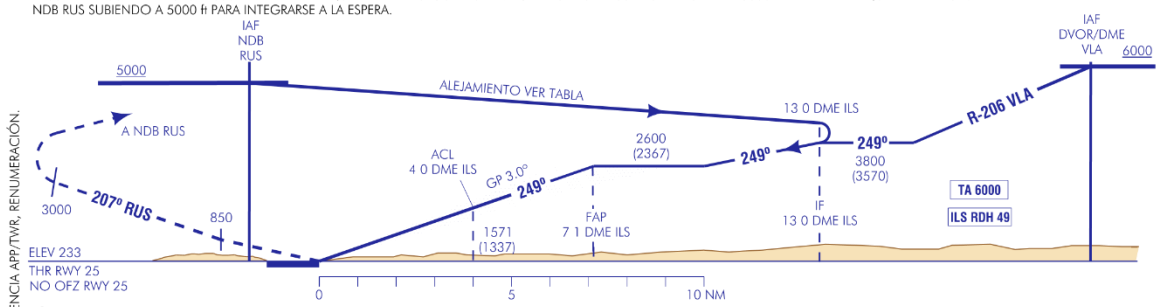
ELEV AD 233

APP	128 875
TWR	128 875
GMC	121 700

REUS ILS Y RWY 25



FRUSTRADA: SUBIR DIRECTO A 850 ft. VIRAR A LA IZQUIERDA PARA SEGUIR RUTA MAGNÉTICA 207° RUS HASTA ALCANZAR 3000 ft. VIRAR A LA IZQUIERDA DIRECTO A NDB RUS SUBIENDO A 5000 ft PARA INTEGRARSE A LA ESPERA.



CAMBIOS: FRECUENCIA APP/TWR, RENUMERACIÓN.

HGT REF ELEV THR RWY 25

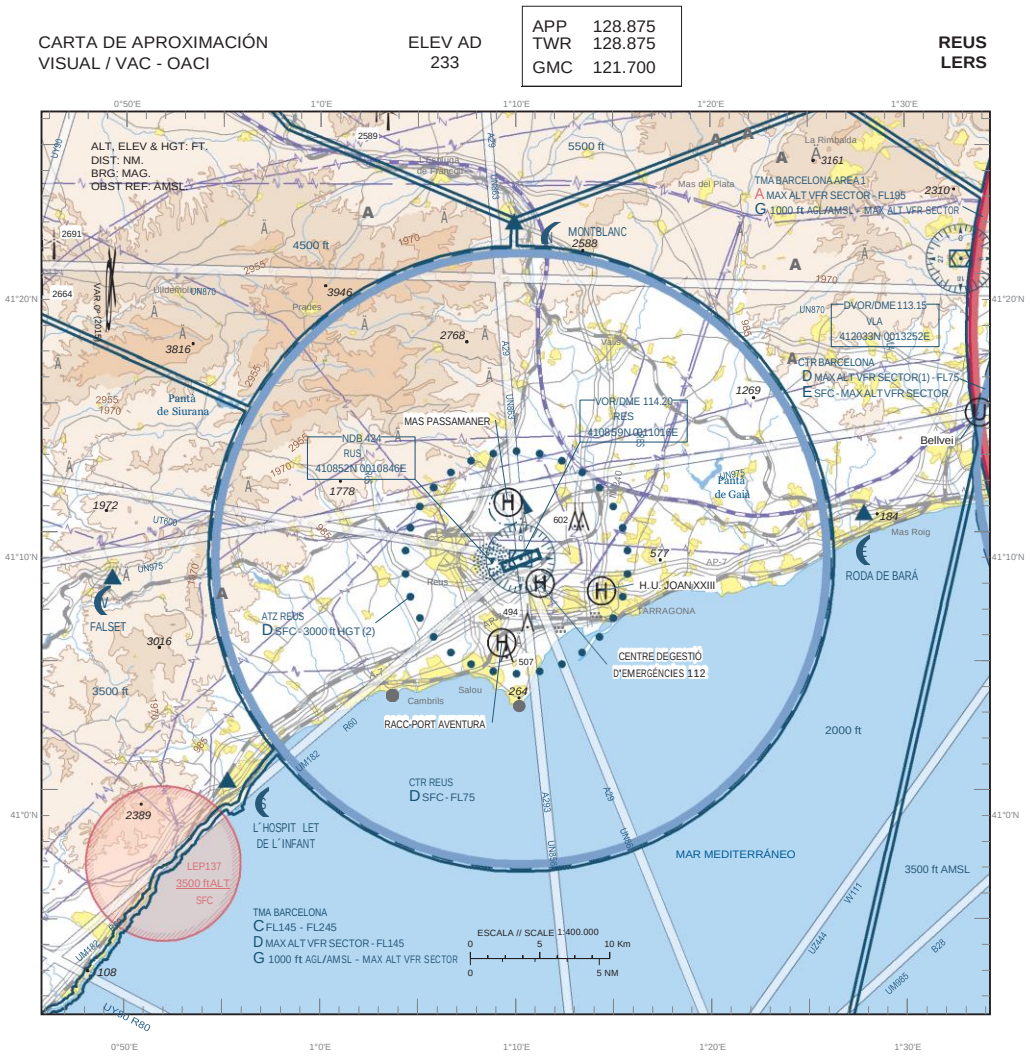
OCA/H		A	B	C	D
STA	CAT I	420 (187)	430 (197)	440 (207)	450 (217)
En circuito (H) sobre 233		850 (620)	890 (660)	1050 (820)	1080 (850)

GS	kt	80	100	120	140	160	180
FAP-THR: 7.1 NM	min:s	5 21	4 17	3 34	3 03	2 41	2 23
FAF MAPT·	min:s						
ROD: 5 2 %	ft/min	425	531	637	743	849	955

ALT/HGT DME (ILS) FNA												
13 DME	12 DME	11 DME	10 DME	9 DME	8 DME	7 DME	6 DME	5 DME	4 DME	3 DME	2 DME	1 DME
						2560 (2330)	2230 (2000)	1900 (1670)	1580 (1340)	1250 (1020)	930 (690)	610 (370)

Visual approach chart for the Reus Airport

Below is the visual approach chart for the Reus Airport published in the AIP:



This chart shows that when arriving, pilots will establish radio contact with APP at least 5 minutes before reaching the VFR reporting points. Circling will take place over points N (Montblanc), S (L'Hospitalet de L'Infant) and W (Falset) at an altitude of 3000 ft AMSL, and over point E (Roda de Bará) at a maximum altitude of 2000 ft AMSL. Pilots will also request clearance from Reus APP to enter the CTR. If applicable, they will be cleared from the VFR hold point to join, as directly as possible, the aerodrome traffic pattern, and given instructions to land.

Control service provided by the control tower at the Reus Airport

The control tower in the Reus Airport provides aerodrome control services and approach control services for the following airspaces:

- In the Reus CTR airspace, which is a circle with a 12-NM radius centered at the RES VOR/DME whose vertical limits span from SFC to FL75, it provides approach control services, and
- In the Reus ATZ, which is a circle with a radius of 8 km (or horizontal visibility, whichever is lower) centered at the ARP whose vertical limits span from SFC to 3000 ft HGT or to the elevation of the cloud ceiling, whichever is lower, it provides aerodrome control services.

1. Aerodrome control service

The provision of the aerodrome control service in the Reus ATZ airspace relies on a radar display system.

As published in the AIP, ATS surveillance systems may be used at the Reus Airport when providing aerodrome control services to carry out the following functions:

a) Monitor the flight paths of aircraft on final approach;
b) Monitor the flight paths of other aircraft in the vicinity of the aerodrome;
c) Ensure separation, laid out in RCA-4.6.7.3, between successive departing aircraft; and
d) Provide navigation assistance to VFR flights.

2. Approach control service

The approach control service provided by the control tower at the Reus Airport in the Reus CTR airspace is conventional, meaning it is procedureal. The service is provided in the Reus CTR airspace and in an airspace delegated by the Barcelona TMA (highlighted in green in the chart below) up to FL75. Reus also delegates to the Barcelona TMA a semicircular segment (highlighted in yellow) between FL75 and 5500 ft AMSL.

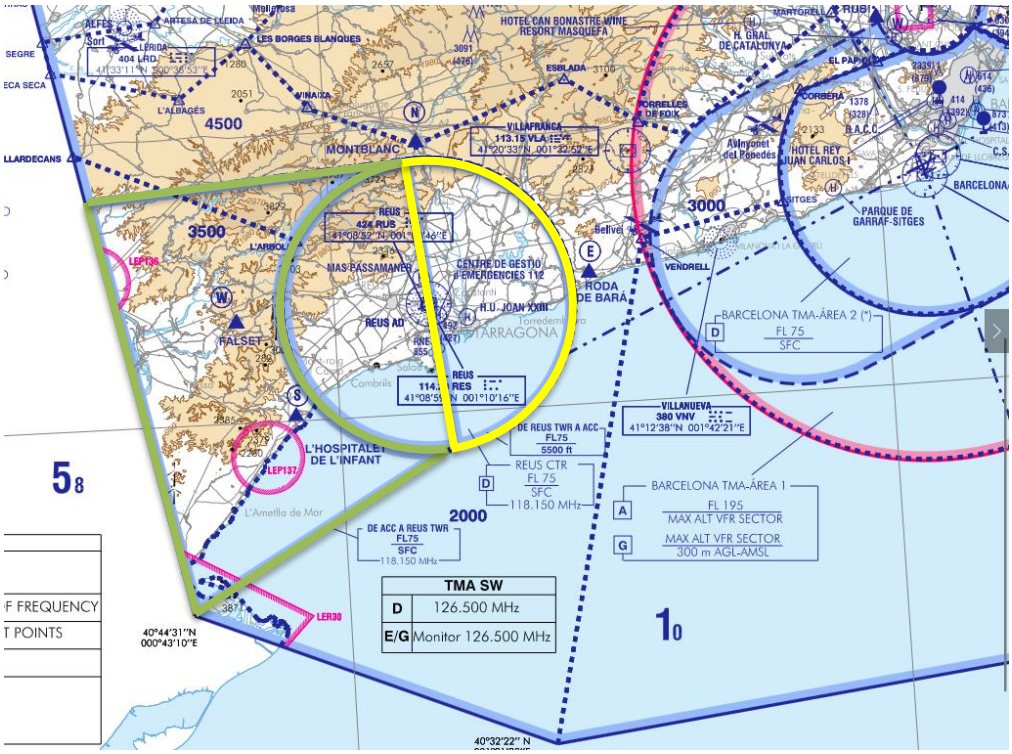


Illustration 5: Airspace where approach control services are provided

ENAIRE stated that, at the time of this incident, there was no specific report[5] on the radar coverage at Reus, although there was a report on the coverage of the Barcelona TMA, which spans the airspace that falls under the responsibility of the control tower at the Reus Airport. According to this ENAIRE report, the radar at BEGAS provides full coverage above "about" 5000 ft in the Reus CTR airspace.

At the time of the incident, although the radar system beyond ATZ airspace was available, it was zoomed in and spanned only a circle with an 8-km radius, and the altitude filter was set to 3000 ft, meaning only the Reus ATZ airspace was being monitored.

Regulation on the use of ATS surveillance systems

Spain's Air Traffic Regulation states:

- *"4.6.1.12. The provision of ATS surveillance services shall be limited to specified areas of coverage and shall be subject to such other limitations as have been specified by the appropriate ATS authority. Adequate information on the operating methods shall be published in aeronautical information publications (AIP), as well as operating practices and/or equipment limitations having direct effect on the operation of air traffic services.*

[5] • Currently, there is a specific report that will be published and it will probably be in force on the date of publication of this final CIAIAC report.

Note – The AIP shall provide information on the area or areas where PSR, SSR, ADS-B and MLAT systems are used, as well on ATS surveillance services and procedures."

- *"4.6.6.7.2. When the control of an identified aircraft is to be transferred to a control sector that will provide the aircraft with procedural separation, the transferring controller shall ensure that appropriate procedural separation is established between that aircraft and any other controlled aircraft before the transfer is effected."*

- *"4.6.7.1.1. The information provided by ATS surveillance systems and presented on a situation display may be used to perform the following functions in the provision of air traffic control service:*

  …..

  h) When applicable, maintain a watch on the progress of air traffic in order to provide a procedural controller with:

  1. *Improved position information regarding aircraft under control;*
  2. *Supplementary information regarding other traffic; and*
  3. *Information regarding any significant deviations by aircraft from the terms of their respective air traffic control clearances, including their cleared routes as well as levels, when appropriate.*

- *"4.6.7.3.2. When control of an identified aircraft is to be transferred to a control sector that will provide the aircraft with procedural separation, such separation shall be established by the transferring controller before the aircraft reaches the limits of the transferring controller's area of responsibility, or before the aircraft leaves the relevant area of surveillance coverage."*

Therefore, although in Reus the approach control service provided is procedural, it does not imply that the ATS surveillance system available in the unit cannot be used in accordance with the provisions of section 4.6.7.1. 1, letter h) of the Air Traffic Regulation

1.19. Useful or effective investigation techniques

No special investigation techniques were used.

2. ANALYSIS

2.1. Analysis of the area assigned for acrobatic air show

According to the published NOTAM, there was an aerobatic air show over Miracle beach in Tarragona, taking place in the airspace from the SFC to 3300 ft within a radius of 2 NM from said beach. In the days before the incident, 10 and 11 May, these aerobatic flights had taken place between 14:00 UTS and 17:00 UTC; however, on the day of the incident, the flights had taken place in the morning/early afternoon, from 08:00 UTC until 14:00 UTC.

Shown in green on the visual approach chart for the Reus Airport is the outline of the airspace that was used for this aerobatic air show.

As the chart shows, a small part of this airspace was within the Reus ATZ, and was thus monitored on radar by the air traffic controllers; however, the majority of this area was inside the Reus CTR, and the controllers were not aware of the aircraft in this area:

Although the aerobatic flight exhibition was coordinated between AESA and ENAIRE's Department of Operational Coordination, following the usual procedure, and after which AESA published a Resolution regarding the aeronautical compliance required by these exhibits, it is considered that the evaluation of the safety risks was not adequate. The publication of a NOTAM advising of the exhibition of acrobatic flights in front of the Miracle beach in Tarragona is not a sufficient safety measure and therefore a safety recommendation will be made to ENAIRE so that it establishes more safety measures when assign aerobatic flight areas near airfields. It should also be noted that, during the comment phase, the operator of the G-GDFS aircraft indicated that this NOTAM was not among the information given to the crew prior to departure. Therefore, the aircraft crew was not aware of this situation.

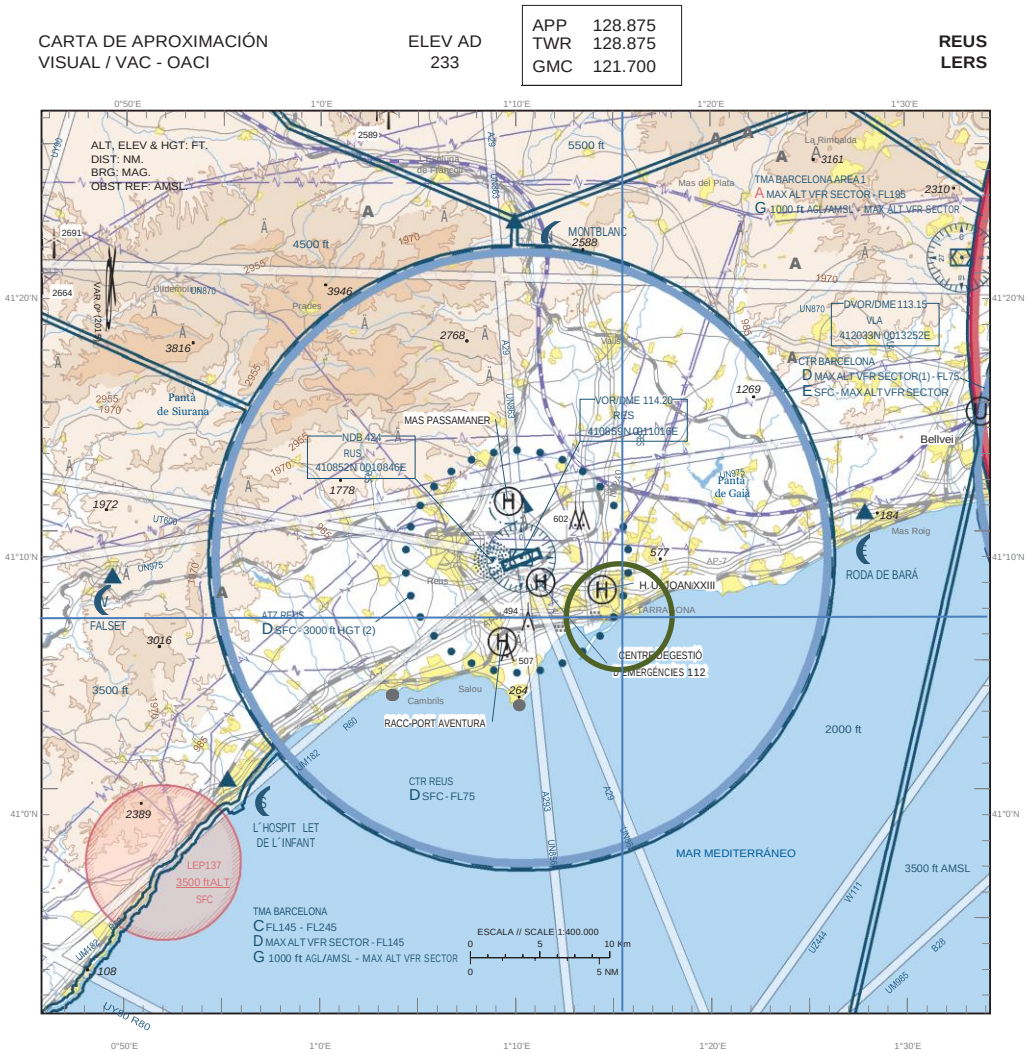


Illustration 6: Close-up of the airspace where the air show was taking place (in green)

2.2. Analysis of the maneuver performed by aircraft G-GDFS

Initially, the controller in the control tower at the Reus Airport instructed G-GDFS to make the ILS Z approach to runway 25. The standard ILS Z approach states that on a missed approach, aircraft must descend to 2600 ft on the outbound leg. If this clearance had not been modified at the request of the flight crew, the aircraft would have entered the airspace reserved for the aerobatic flights on the outbound segment. Neither the controller under instruction nor the instructor controller was aware of this potential conflict.

The aircraft was subsequently cleared to once more make the ILS Y approach to runway 25. This approach specifies that on a missed approach, aircraft must descend from 5000 ft to 3800 ft on the outbound leg, which maintained a buffer of 500 ft from the aerobatic flights, which were taking place below 3300 ft. But the outbound leg for the ILS Y approach to runway 25 ends at mile 13, practically over reporting point E to enter the Reus CTR. Again, neither the controller under instruction nor the instructor controller was aware of potential conflicts with aircraft entering the Reus CTR via point E.

2.3. Analysis of the maneuver performed by aircraft EC-KMH

Aircraft EC-KMH was instructed to maintain an altitude of 3500 ft or higher. The controller in the control tower at the Reus Airport instructed the aircraft to fly above the minimum altitude of 2000 ft specified in the visual approach chart published in the AIP for aircraft entering the airport's CTR via point E. He did so to ensure a separation of at least 200 ft with the aircraft taking part in the aerobatic air show. However, the controller did not limit the maximum altitude at which it could fly, and at the time of the incident, the aircraft was at an altitude of 3600 ft.

Again, neither the controller under instruction nor the instructor controller realized that the clearance to maintain an altitude of 3500 ft or higher could give rise to potential conflicts with other traffic.

2.4. Analysis of the controller's actions when the conflict was identified

The conflict was not identified by the controller under instruction or by the instructor controller, neither of whom reacted to it. In fact, before the conflict, no traffic information was provided to either of the two aircraft involved in this incident.

When the aircraft with callsign EXS929 informed him that there was an aircraft 200 ft below, the controller replied to stand by. In other words, the controller lacked the situational awareness needed to give the traffic an effective response.

Sixteen seconds later, when the crew of EXS929 told him they had started an avoidance maneuver, the controller instructed the other aircraft to descend to an altitude of 2000 ft, infringing the area reserved for the acrobatic air show that reached up to 3,300 feet, and informed EXS929 of the instruction given to the latter.

Although this instruction by the controller did not conflict with the TCAS resolution advisories, he did not follow the procedure established by ENAIRE for these situations, which calls for radio silence from ATC until the TCAS itself clears the conflict. Therefore, given the gravity of this event, it is recommended that ENAIRE provide refresher training to controllers at the unit on the procedure to follow in the event of a TCAS RA.

2.5. Analysis on the use of radar to provide the approach control service

The use of ATS surveillance systems is regulated by Spain's Air Traffic Regulation. This regulation states that the limitations specified by the air traffic service provider, ENAIRE in this case, involving the use of ATS surveillance systems must be published in the AIP. In the AIP, ENAIRE has published that the radar is used to provide the aerodrome control service, but has not published anything regarding its use to provide the approach control service. On the other hand, the regulation states in a different section that, when applicable, the information provided by ATS surveillance systems can be used to aid the procedural controller.

The controllers in the Reus control tower had doubts about the use of radar to provide the approach control service. ENAIRE indicated, during the investigation of this incident, that its Regulatory Department had clarified prior to the incident the possibility of using the ATS surveillance system for the procedural controller (according to point 4.6.7.1.1. Letter h) of the Air Circulation Regulations). However, adequate information had not been published in the AIP on the methods and practices of use as established by the Air Traffic Regulations in section 4.6.1.12, the actual coverage studies had not been completed in the CTR and it was not updated the Operational Manual and, consequently, the training associated with these operating procedures.

Regarding the radar coverage, according to ENAIRE, at the time of the incident, spanned the airspace in the Reus CTR above "about" 5000 ft. There was therefore no technical impediment to using it to aid the procedural controller in the CTR airspace with radar coverage.

However, since the air traffic controllers in the Reus controller tower had persistent doubts about whether its use was appropriate to provide the approach control service, they did not use it voluntarily beyond the ATZ airspace over the course of the incident.

Moreover, as the Unit Training Plan itself emphasizes that the approach service is provided without ATS surveillance systems, and the controllers are trained on using procedures to control approaches, they concluded that , since the controller in the control tower was under instruction, and the ATS services are based on conventional control procedures, its use was not adequate in training despite the provisions of the regulations.

Therefore, the voluntary decision not to use the radar (since it was configured with an altitude filter to 3000 ft that only covered the ATZ airspace) is not deemed to constitute a violation of ENAIRE's procedures.

A safety recommendation is discarded since ENAIRE has clarified in the AIP the use of radar to provide the approach control service.

2.6. Analysis of the lack of instructor controller's lack of situational awareness

The instructor controller did not identify the conflict between the two aircraft, nor was he able to keep the controller under instruction from issuing an instruction that could have conflicted with the TCAS resolution advisory.

The instructor controller did not correct certain instructions from the controller under instruction that could have resulted in conflicts, such as:

- the clearance to fly the ILS Z approach to runway 25, which entailed entering the airspace where the aerobatic air show was taking place, or
- the clearance to an aircraft to fly at an unspecified altitude, or
- the clearance to again fly the ILS Y approach to runway 25, which entailed flying away to practically entry point E to the Reus CTR.

The reason for the instructor controller's lack of situational awareness could not be determined. It is possible that the location of the flight progress strips in the holder prevented him from identifying a potential conflict between the aircraft.

It would be appropriate for ENAIRE to establish standardized procedures on how to place the fixes at the work station so as to ensure that all the controllers place the flight progress strips in the holder in the same way.

3. CONCLUSIONS

3.1. Findings

- The crews of both aircraft had valid licenses and medical certificates.
- The controller under instruction and the instructor controller in the Reus control tower had valid licenses and ratings.
- The documentation of both aircraft was valid and they were airworthy.
- The weather conditions were not limiting for the type of flight.
- The controller in the Reus control tower had set up the radar surveillance system to cover only the airspace in the ATZ.
- At the time of the incident, the approach control service was only providing procedural approaches.
- The controller in the control tower at the Reus Airport cleared the visual traffic, the aircraft with registration EC-KMH, to maintain an undefined altitude of 3500 ft or higher; that is, above the maximum altitude of 2000 ft specified in the visual approach chart published in the AIP.
- The other traffic, the aircraft with registration G-GDFS, was cleared to make the ILS Y approach to runway 25, the outbound leg for which ends in the vicinity of entry point E to the Reus CTR.
- The controller in the control tower did not provide any traffic information to either of the two aircraft involved in this incident.
- The controller in the control tower did not follow the operating procedure in the event of a TCAS RA, and gave an instruction to the visual traffic that could have conflicted with the instruction given by the TCAS to the instrument traffic.

3.2. Causes/Contributing factors

The investigation has determined that this incident occurred because the controller under instruction and the instructor controller lost situational awareness of the traffic under their control.

The following factors contributed to the incident:

- Providing an inadequate clearance to the visual traffic EC-KMH, in terms of the altitude to maintain, as the lower clearance limit (3500 ft) conflicted with the ILS approach maneuver cleared to aircraft G -GDFS
- Not using the surveillance radar.

- The placement of the strips in the holder, as well as the use of various fixes (runway, pattern, approach), differed from those normally used by the instructor controller.
- AESA's assignment, in coordination with ENAIRE, of an area very close to the Reus Airport for exhibition flights..

4. SAFETY RECOMMENDATIONS

The measures taken by ENAIRE to prevent incidents of this type from happening again are deemed to be satisfactory. However, there is a need to issue the following safety recommendation since the controller in the control tower did not adhere to the operating procedure in the event of a TCAS RA, since once a crew report starting the avoidance maneuver, the procedure calls for radio silence from ATC until the conflict clears in the TCAS. Therefore, by providing an instruction to the visual traffic (aircraft EC-KMH), the controller could have contradicted the instructions provided by the TCAS:

REC 01/20. It is recommended that ENAIRE provide refresher training to controllers at the unit on the procedure to follow in the event of a TCAS RA.

The publication of a NOTAM informing of the aerobatic flight show over Miracle beach in Tarragona is deemed to be an insufficient operational safety measure, and therefore:

REC 02/20. It is recommended that ENAIRE establish more safety measures when aerobatic flights are near an aerodrome.

The cause of the controllers' lack of situational awareness could not be determined. It is possible that the location of the flight progress strips in the holder prevented him from identifying a potential conflict between the aircraft. As a result:

REC 03/20 It is recommended that ENAIRE establish standard procedures on how to place fixes at the work station so as to ensure that all the controllers place the flight progress strips in the holder in the same way.