

Final Report

IN-063/2019

Incident involving an AIRBUS A320-214, registration EI-IKL, operated by ALITALIA, and a BOEING B737-8AS, registration EI-ENN, operated by RYANAIR, 58 NM east-southeast (ESE) of the Madrid-Barajas Airport (SPAIN) on 7 September 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.

Notice

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.

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ABBREVIATIONS

| | |
|--------------|--|
| ° ‘ “ | Sexagesimal degrees, minutes and seconds |
| ACAS | Airborne collision avoidance system |
| ACC | Area control center |
| AEMET | Spain’s National Weather Agency |
| AESA | Spain’s National Aviation Safety Agency |
| ATC | Air traffic control |
| ATIS | Automatic terminal information service |
| ATPL (A) | Airline transport pilot license (airplane) |
| CIAIAC | Spain’s Civil Aviation Accident and Incident Investigation Commission |
| CPL (A) | Commercial pilot license (airplane) |
| ENAC | Italian civil aviation authority – Ente Nazionale per l’Aviazione Civile |
| ESE | East-southeast |
| FL | Flight level |
| fpm | Feet per minute |
| ft | Feet |
| h | Hours |
| IAA | Irish Aviation Authority |
| IAF | Initial approach fix |
| ICAO | International Civil Aviation Organization |
| IFR | Instrument flight rules |
| kt | Knots |
| LEMD | ICAO location indicator for the Madrid-Barajas Airport |
| METAR | Meteorological aerodrome report |
| MHz | Megahertz |
| NM | Nautical miles |
| PAC | Conflict alert prediction of the SACTA system |
| QAR | Quick Access recorder |
| QNH | Altimeter sub-scale setting to obtain elevation when on the ground |
| RNN (sector) | Integrated approach sector (REN+ESN) of the Madrid TMA |
| ROD | Rate of descent |
| SACTA | Automated air traffic control system |
| STAR | Standard terminal arrival route |
| STCA | Short-term conflict alert |
| TCAS | Traffic collision avoidance system |
| TMA | Terminal control area |
| UTC | Coordinated universal time |
| VAC | Conflict alert prediction of the SACTA system |
| WNW | West-northwest |

Synopsis

| | | |
|----------------------------------|--|---|
| Operator | Alitalia | Ryanair |
| Aircraft | Airbus A320-214 registration EI-IKL | Boeing 737-8AS registration EI-ENN |
| Persons on board | 158+6, uninjured | 190+6, uninjured |
| Type of operation | Commercial air transport – Scheduled – International – Passenger | Commercial air transport – Scheduled – Domestic – Passenger |
| Phase of operation | On approach – on normal descent | On approach – on normal descent |
| Flight rules | IFR | IFR |
| Date and time of incident | 7 September 2019 at 14:00 ¹ UTC | |
| Site of incident | 58 NM east-southeast (ESE) of the Madrid-Barajas Airport at FL185 | |
| Date of approval | 24 June 2020 | |

Summary of event:

On Saturday, 7 September 2019 at 14:00 UTC, a loss of separation incident occurred involving an Airbus A320-214, registration EI-IKL, operated by Alitalia, flying between the airports of Rome-Fiumicino Airport (Italy) and Madrid-Barajas (Spain), and a Boeing 737-8AS, registration EI-ENN, operated by Ryanair, flying between the airports of Mahón (Balearic Islands, Spain) and Madrid-Barajas.

Both aircraft had been cleared to fly to ASBIN point and had been practically one on top of the other for several minutes, although maintaining an appropriate vertical separation. They were under the control of approach unit sector RNN to the Madrid-Barajas Airport.

The crews of both aircraft breached the instructions received related to their respective rates of descent, which caused both aircraft to approach each other more than prescribed, leading to a loss of separation. Both crews stated that they did not receive TCAS RA in the cockpit and they did not execute evasive maneuvers. Separation was restored through instructions from ATC.

Based on the data obtained from the radar tracks, at the point of closest approach, the two aircraft were 1.4 NM apart horizontally and 300 ft apart vertically at FL185.

¹ All times in this report are in UTC. To calculate local time, add 2 hours to UTC.

After the incident, both aircraft continued on their respective flights. There was no damage of any kind.

The investigation has determined that the loss of separation between the aircraft was due to the failure of both crews to comply with the respective instructions received involving the rates of descent that both aircraft were required to follow.

No safety recommendations are issued.

1. FACTUAL INFORMATION

1.1. History of the flight

On 7 September 2019, an Airbus A320-214 operated by Alitalia, registration EI-IKL, was on a flight, callsign² AZA060, between the airports of Rome-Fiumicino (Italy) and Madrid-Barajas. At the same time, a Boeing 737-8AS, operated by Ryanair, registration EI-ENN, was on a flight, callsign RYR4UX, between the airports of Mahón (Balearic Islands) and Madrid-Barajas.

Both aircraft had been cleared to fly to ASBIN point and had been practically one on top of the other for several minutes, although maintaining an appropriate vertical separation.

However, once they performed their respective descents to their previously cleared ATC altitudes (they were under the control of integrated³ approach sector RNN of the Madrid TMA), they were not made at the cleared rates of descent, resulting in an airprox event between them.

Based on the radar track data obtained, the separation at the point of closest approach was 1.4 NM horizontally and 300 ft vertically at an altitude of about 18500 ft. The incident occurred about 58 NM ESE of the Madrid-Barajas Airport.

Neither crew reported receiving any TCAS warnings in their respective cockpits and neither crew filed a loss of separation report.

After the incident, both aircraft continued on their respective flights. There was no damage of any type.

² In what follows, each aircraft will be identified by its callsign.

³ Sector RNN combined sectors REN and ESN of the Madrid TMA.

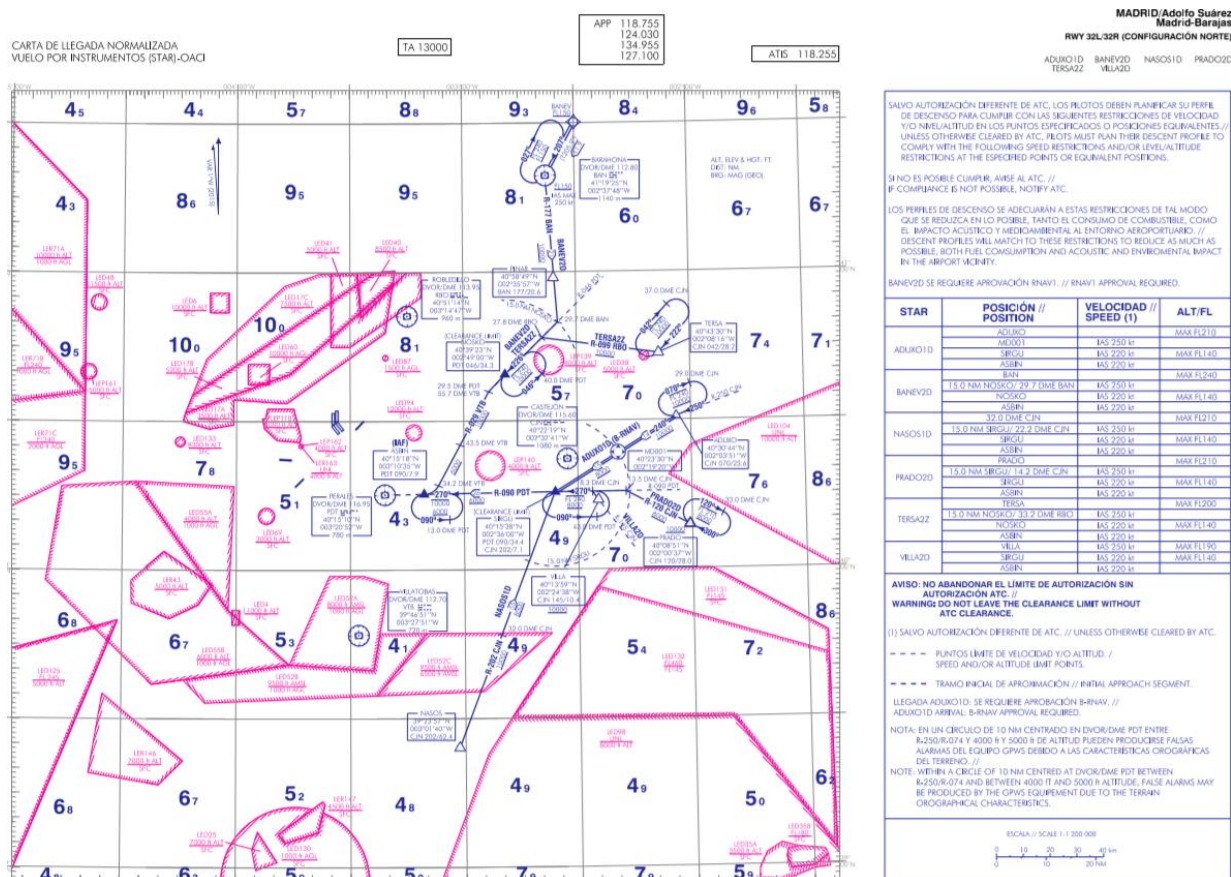


Fig. 1 Detail of chart AD2 – LEMD STAR 4.1 (PRADO2D)

1.2. Injuries to persons

1.2.1. Aircraft AZA060 (EI-IKL)

| Injuries | Crew | Passengers | Total | Other |
|----------|------|------------|-------|-------|
| Fatal | | | | |
| Serious | | | | |
| Minor | | | | |
| None | 6 | 158 | 164 | |
| TOTAL | 6 | 158 | 164 | |

1.2.2. Aircraft RYR4UX (EI-ENN)

| Injuries | Crew | Passengers | Total | Other |
|----------|------|------------|-------|-------|
| Fatal | | | | |
| Serious | | | | |
| Minor | | | | |
| None | 6 | 190 | 196 | |
| TOTAL | 6 | 190 | 196 | |

1.3. Damage to aircraft

The aircraft involved in the incident did not sustain any damage.

1.4. Other damage

None.

1.5. Personnel information

1.5.1. Information on the crew of aircraft AZA060 (EI-IKL)

The aircraft's captain, a 58-year-old Italian national, had an airline transport pilot license for airplanes (ATPL(A)) issued by the Italian civil aviation authority (ENAC), with A320 type and instrument ratings that were valid until 28 February 2020. He also had a class-1 medical certificate that was valid until 28 May 2020. He had a total of 21000 flight hours, of which 7000 had been on the type.

The aircraft's first officer, a 36-year-old Italian national, had an airline transport pilot license for airplanes (ATPL(A)) issued by the Italian civil aviation authority (ENAC), with A320 type and instrument ratings that were valid until 30 June 2020. He also had a class-1 medical certificate that was valid until 8 February 2020. He had a total of 8300 flight hours, of which 7000 had been on the type.

1.5.2. Information on the crew of aircraft RYR4UX (EI-ENN)

The aircraft's captain, a 50-year-old Spanish national, had an airline transport pilot license for airplanes (ATPL(A)) issued by the Irish Aviation Authority (IAA), with Boeing B737-8AS type and instrument ratings that were valid until 30 April 2020. He also had a class-1 medical certificate that was valid until 4 September 2020. He had a total of 14081 flight hours, of which 7980 had been on the type.

The aircraft's first officer, a 40-year-old Irish national, had a commercial pilot license for airplanes (CPL(A)) issued by the Irish Aviation Authority (IAA), with Boeing B737-8AS type and instrument ratings that were valid until 31 December 2020. He also had a class-1 medical certificate that was valid until 13 September 2020. He had a total of 688 flight hours, of which 487 had been on the type.

1.5.3. Information on ATC personnel

There were two individuals at the position that was providing ATC services to the two aircraft in question (sector LEMDESN, combined with LEMDREN into RNN): an executive controller and a planning controller.

The executive controller, a 54-year-old Spanish national, had an air traffic controller license issued by AESA on 15 February 1993. He also had a medical certificate that was valid until 17 July 2020. He had a total experience at the unit of 26 years. He had an approach endorsement for the unit that was valid until 15 March 2020.

The planning controller, a 55-year-old Spanish national, had an air traffic controller license issued by AESA on 10 September 1992. He also had a medical certificate that was valid until 29 November 2019. He had a total experience at the unit of 27 years. He had an approach endorsement for the unit that was valid until 8 June 2020.

1.6. Aircraft information

1.6.1. Information on aircraft AZA060 (EI-IKL)

Aircraft EI-IKL, an Airbus A320-214 with serial number 1489, had a valid certificate of airworthiness that was reviewed on 14 June 2019 by the Italian civil aviation authority (ENAC). The aircraft had 44351 flight hours and 29286 cycles.

1.6.2. Information on aircraft RYR4UX (EI-ENN)

Aircraft EI-ENN, a Boeing B737-8AS with serial number 35036, had a valid certificate of airworthiness that was reviewed on 12 June 2019 by the Irish civil aviation authority (IAA). The aircraft had 27412 flight hours and 13547 cycles.

1.7. Meteorological information

According to the information provided by Spain's National Weather Agency (AEMET), the forecast significant weather maps, confirmed via satellite images, show that at the time and place of the incident, there was no storm activity, convective clouds or reduced visibility, and that the wind at low levels was light.

The METARs for the Madrid-Barajas Airport (58 NM WNW of the incident site) for the times closest to the event were as follows:

METAR LEMD 071300Z 03004KT 9999 FEW040 26/13 Q1019 NOSIG=

METAR LEMD 071330Z 13004KT 9999 FEW040 26/13 Q1019 NOSIG=

METAR LEMD 071400Z 01003KT 300V080 9999 FEW045 27/10 Q1018 NOSIG=

1.8. Aids to navigation

All navigation systems were working correctly.

At 13:56:31, the controller in sector RNN informed RYR4UX that it was identified and instructed it to descend to 6000 ft with QNH 1018. This was correctly readback by the crew of the aircraft.

At this same time, AZA060 was on course to ASBIN point (IAF), descending through FL289 to FL260 at a rate of descent of -506 fpm. RYR4UX was 0.1 NM away, on course to PRADO point and descending through FL249 to 6000 ft at a rate of descent of -2044 fpm.

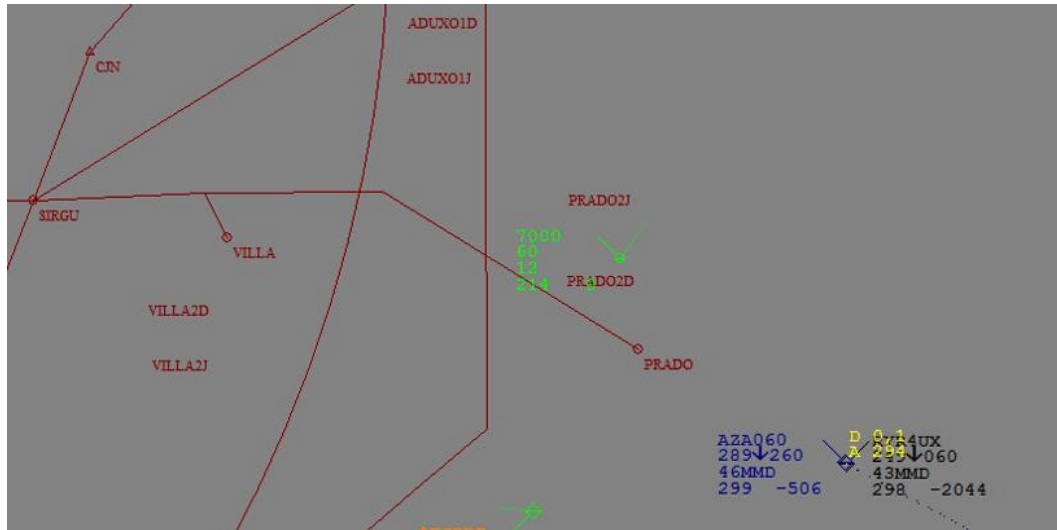


Fig. 3 Palestra image for 13:56:31

At 13:56:56, RYR4UX asked the controller in sector RNN if it was possible to proceed to ASBIN point at high speed. The controller in sector RNN replied in the affirmative and instructed it to fly direct to ASBIN point at high speed, which the crew of the aircraft readback correctly.

At 13:57:36, AZA060 made initial contact with sector RNN in the Madrid ACC and reported it was on course to ASBIN point and descending to FL240.

At the same time, AZA060 was on course to ASBIN point (IAF) at FL262 and descending to FL240 at a rate of descent of -3125 fpm. RYR4UX was 1.0 NM away, on course to the same point at FL229 and descending to 6000 ft at a rate of descent of -1494 fpm.

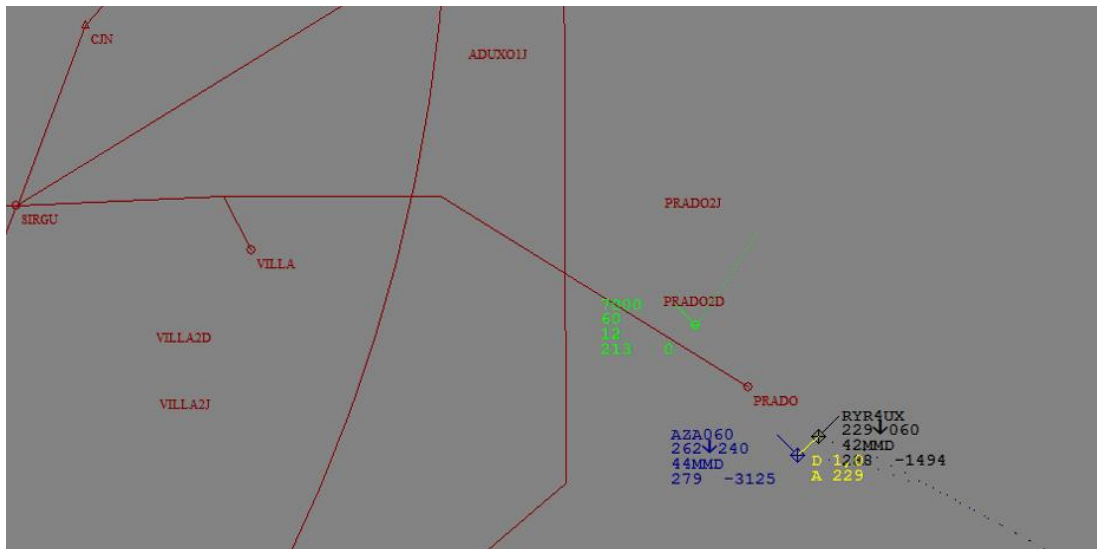


Fig. 4 Palestra image for 13:57:36

At 13:57:40, the controller in sector RNN informed AZA060 that it was identified and instructed it to descend to FL230, which the crew readback correctly.

At 13:58:17, the controller in sector RNN instructed RYR4UX to maintain a rate of descent of -2500 fpm or higher, which the crew readback correctly.

At 13:58:22, AZA060 was on course to ASBIN point (IAF) at FL237 and descending to FL230 at a rate of descent of -3150 fpm. RYR4UX was 1.1 NM away, on course to the same point at FL219 and descending to 6000 ft at a rate of descent of -1313 fpm.

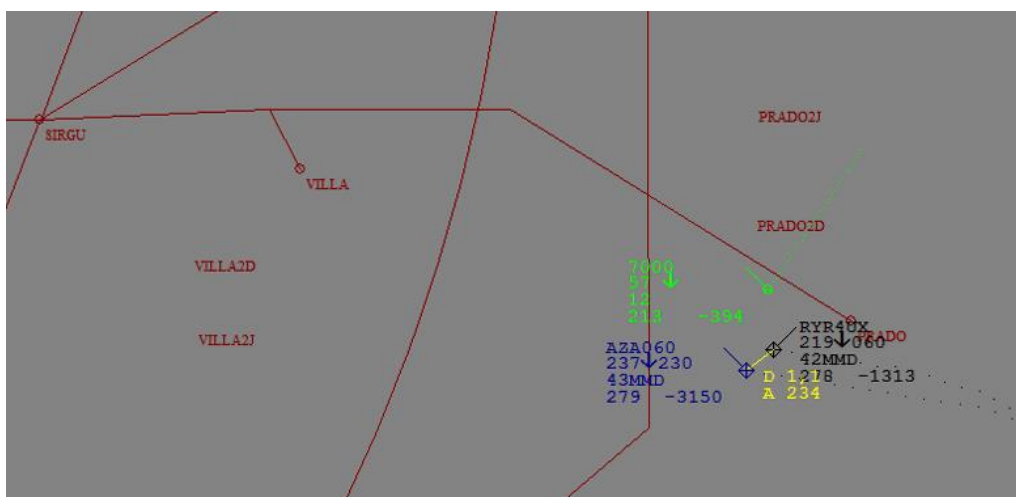


Fig. 5 Palestra image for 13:58:22

At 13:58:27, the controller in sector RNN instructed RYR4UX to follow a rate of descent of -2000 fpm or higher, amending the authorization previously given at 13:58:17, which the crew readback correctly.

At 13:58:28, AZA060 was on course to ASBIN point (IAF) at FL235 and descending to FL230 at a rate of descent of -2925 fpm. RYR4UX was 1.2 NM away, on course to the same point at FL218 and descending to 6000 ft at a rate of descent of -1306 fpm.

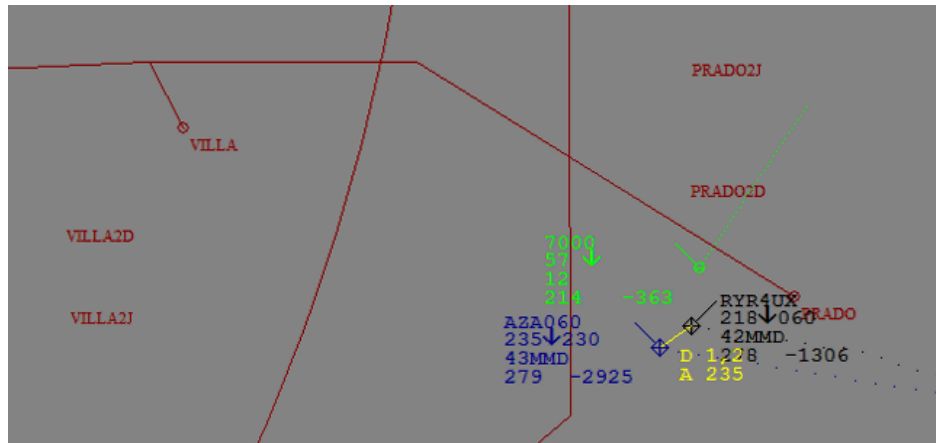


Fig. 6 Palestra image for 13:58:28

At 13:58:33, the controller in sector RNN instructed AZA060 to descend to FL140 and follow a rate of descent of -2000 fpm, which the crew readback correctly.

At the same time, AZA060 was en route to ASBIN point (IAF) at FL234 and descending to FL230 (note that the controller issued the instruction at this time, which is why CFL 140 had not yet been entered on the label) at a rate of descent of -2444 fpm. RYR4UX was 1.2 NM away, en route to the same point at FL217 and descending to 6000 ft at a rate of descent of -1344 fpm.

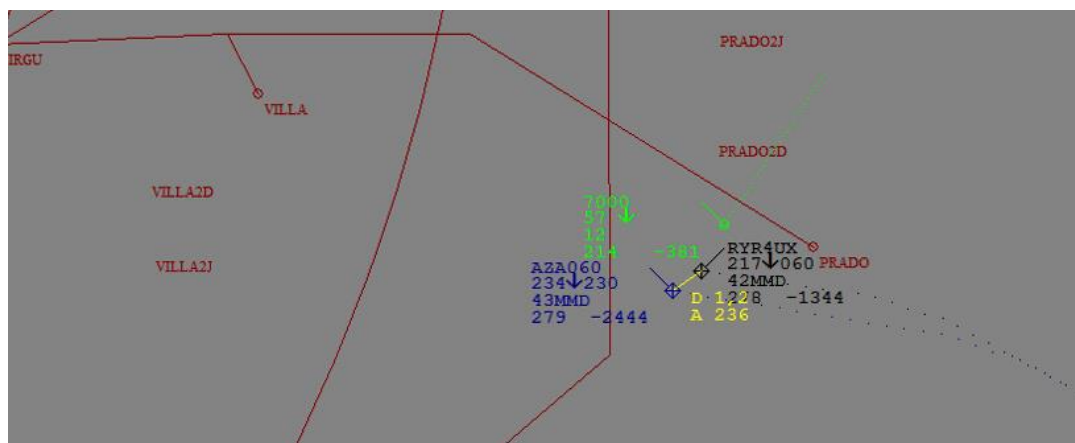


Fig. 7 Palestra image for 13:58:33

At 13:58:39, AZA060 was en route to ASBIN point (IAF) at FL231 and descending to FL140 at a rate of descent of -1744 fpm. RYR4UX was 1.2 NM away, en route to the same point at FL213 and descending to 6000 ft at a rate of descent of -1919 fpm.

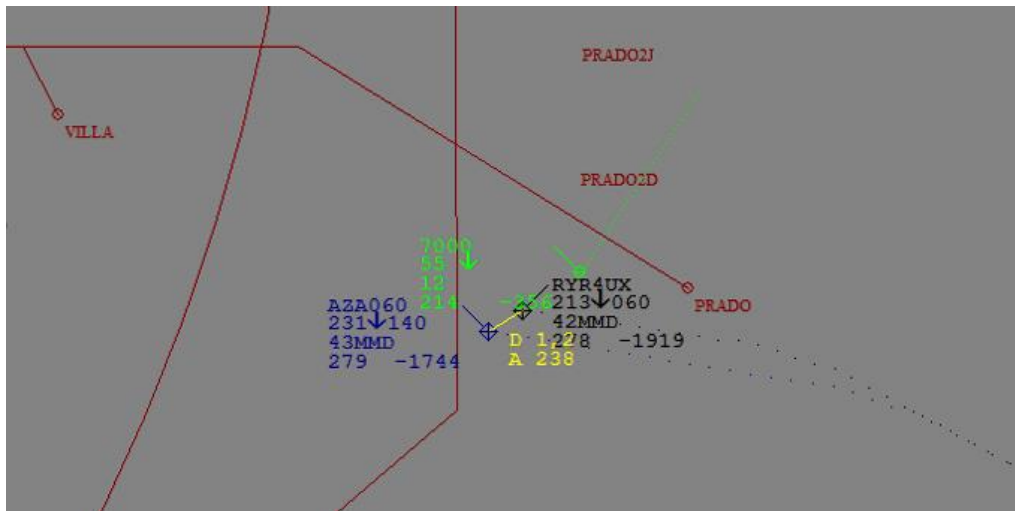


Fig. 8 Palestra image for 13:58:39

At 13:59:19, the controller in sector RNN instructed AZA060 to maintain a high speed. The crew did not reply to this instruction.

At the same time, AZA060 was en route to ASBIN point (IAF) at FL220 and descending to FL140 at a rate of descent of -2144 fpm. RYR4UX was 1.3 NM away, en route to the same point at FL200 and descending to 6000 ft at a rate of descent of -2013 fpm.

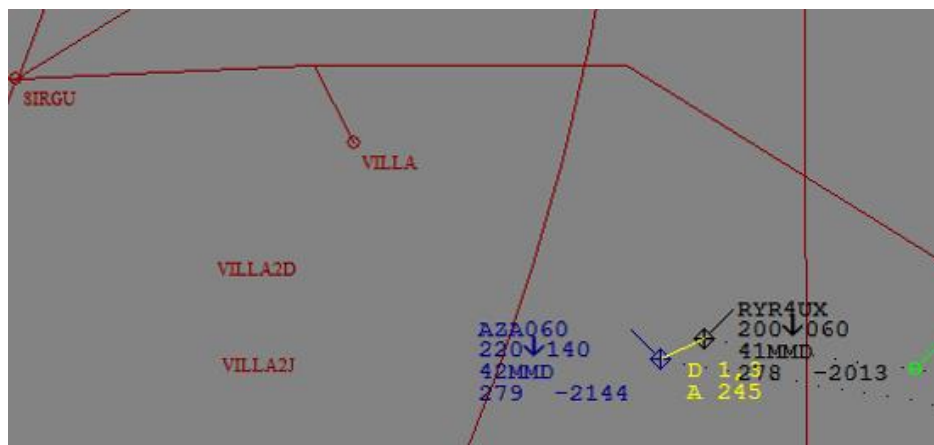


Fig. 9 Palestra image for 13:59:19

At 13:59:27, the controller in sector RNN again instructed AZA060 to maintain a high speed. The crew did not reply to this instruction.

At the same time, AZA060 was en route to ASBIN point (IAF) at FL218 and descending to FL140 at a rate of descent of -2400 fpm. RYR4UX was 1.3 NM away, en route to the same point at FL198 and descending to 6000 ft at a rate of descent of -1994 fpm.

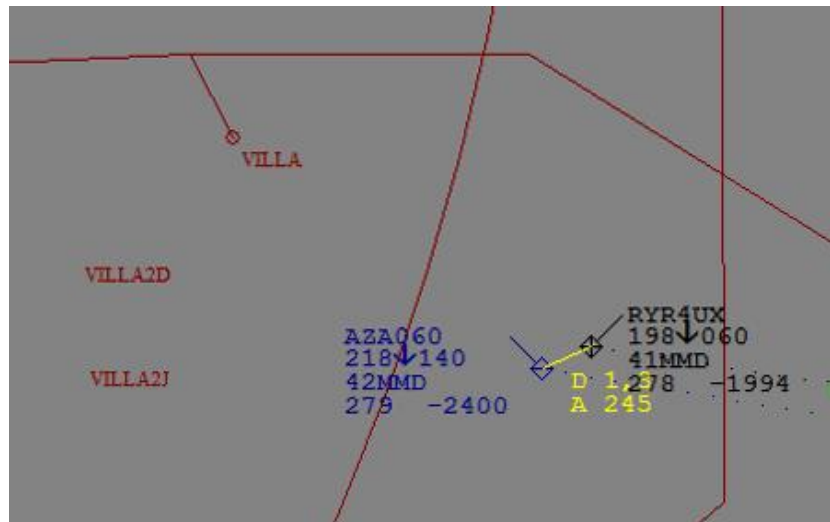


Fig. 10 Palestra image for 13:59:27

At 13:59:33, AZA060 requested that the instruction be repeated.

At the same time, AZA060 was en route to ASBIN point (IAF) at FL215 and descending to FL140 at a rate of descent of -2769 fpm. RYR4UX was 1.3 NM away, en route to the same point at FL196 and descending to 6000 ft at a rate of descent of -2013 fpm.

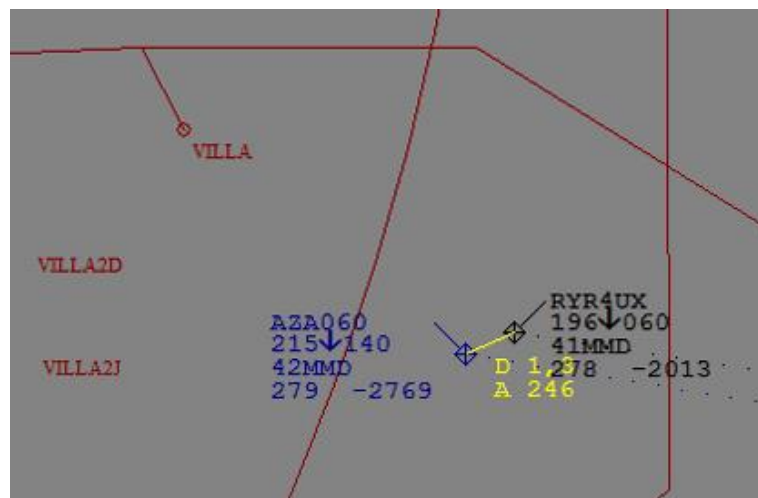


Fig. 11 Palestra image for 13:59:33

At 13:59:35, the controller in sector RNN again instructed AZA060 to maintain a high speed.

At the same time, AZA060 was en route to ASBIN point (IAF) at FL211 and descending to FL140 at a rate of descent of -3313 fpm. RYR4UX was en route to the same point at FL195 and descending to 6000 ft at a rate of descent of -1969 fpm. The two aircraft were 1.3 NM and 1600 ft apart. It was at this time that the STCA-PAC alert was issued.

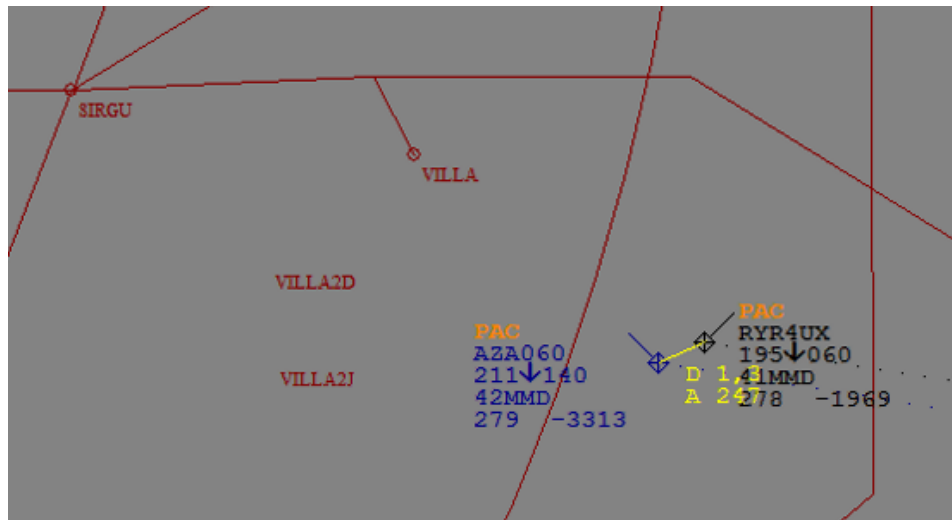


Fig. 12 Palestra image for 13:59:36

At 13:59:37, AZA060 readback "speed... (garbled)".

At 13:59:39, AZA060 was en route to ASBIN point (IAF) at FL207 and descending to FL140 at a rate of descent of -3825 fpm. RYR4UX was en route to the same point at FL193 and descending to 6000 ft at a rate of descent of -1950 fpm. The two aircraft were 1.3 NM and 1400 ft apart.

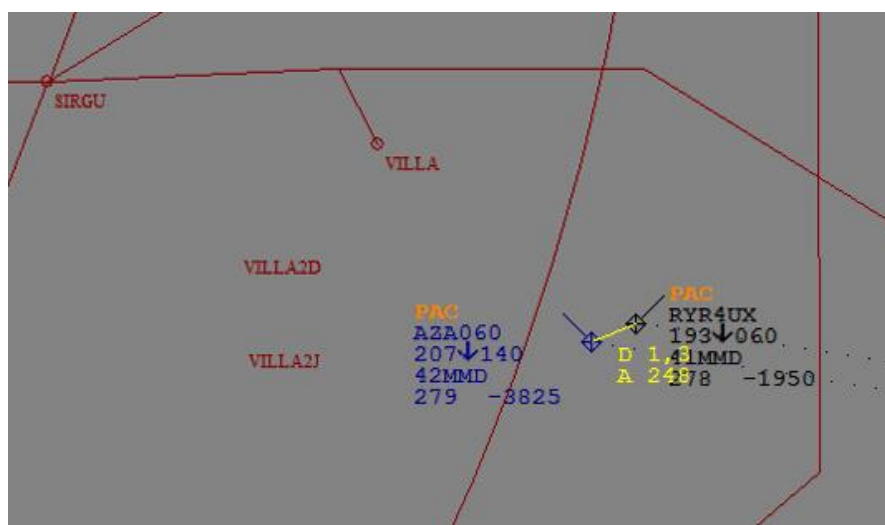


Fig. 13 Palestra image for 13:59:39

At 13:59:55, AZA060 was en route to ASBIN point (IAF) at FL197 and descending to FL140 at a rate of descent of -4281 fpm. RYR4UX was en route to the same point at FL189 and descending to 6000 ft at a rate of descent of -1613 fpm. The two aircraft were 1.3 NM and 800 ft apart. It was at this time that the STCA-VAC alert was issued.

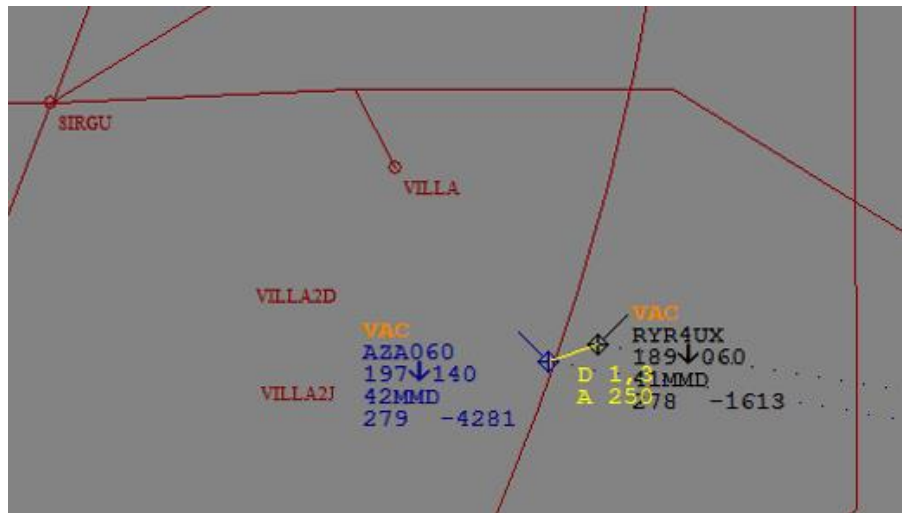


Fig. 14 Palestra image for 13:59:55

At 14:00:12, AZA060 was en route to ASBIN point (IAF) at FL188 and descending to FL140 at a rate of descent of -3656 fpm. RYR4UX was en route to the same point at FL185 and descending to 6000 ft at a rate of descent of -1638 fpm. The two aircraft reached their closest point of approach, 1.4 NM and 300 ft apart. The STCA-VAC alert remained active.

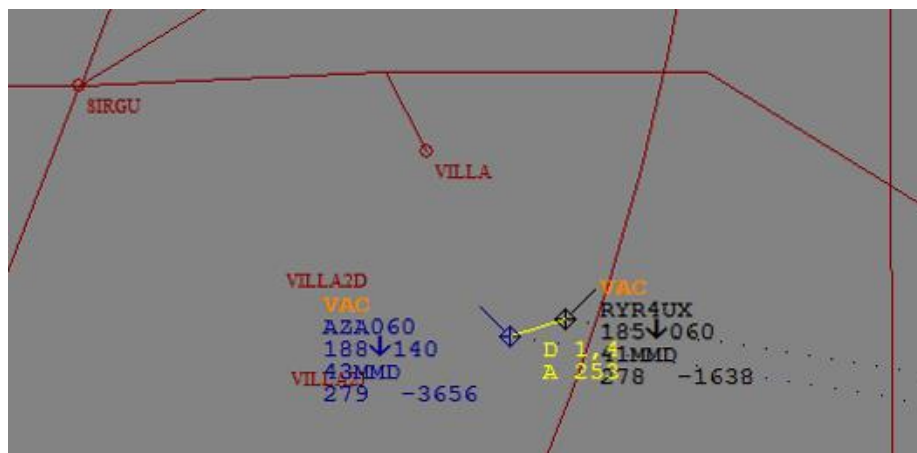


Fig. 15 Palestra image for 14:00:12

At 14:00:15, the controller in sector RNN instructed RYR4UX to maintain a rate of descent of -2000 fpm or higher, which the crew readback correctly.

At 14:00:16, AZA060 was on course to ASBIN point (IAF) at FL186 and descending to FL140 at a rate of descent of -3331 fpm. RYR4UX was en route to the same point at FL183 and descending to 6000 ft at a rate of descent of -1781 fpm. At this time, the aircraft were 1.5 NM and 300 ft apart. The STCA-VAC alert remained active.

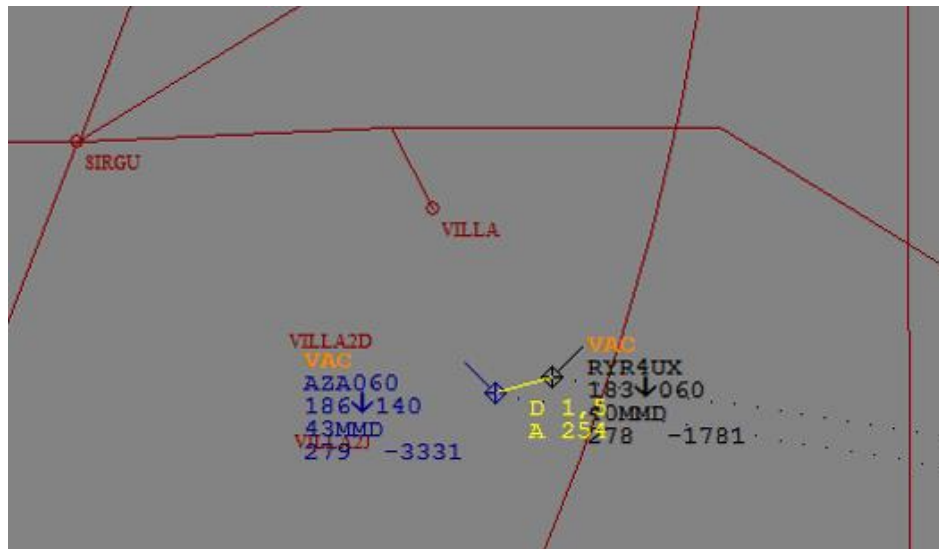


Fig. 16 Palestra image for 14:00:16

At 14:00:23, the controller in sector RNN instructed AZA060 to level off at FL180 upon reaching it.

At 14:00:25, AZA060 was on course to ASBIN point (IAF) at FL182 and descending to FL140 at a rate of descent of -2713 fpm. RYR4UX was en route to the same point at FL180 and descending to 6000 ft at a rate of descent of -2188 fpm. At this time, the aircraft were 1.6 NM and 200 ft apart. The STCA-VAC alert remained active.

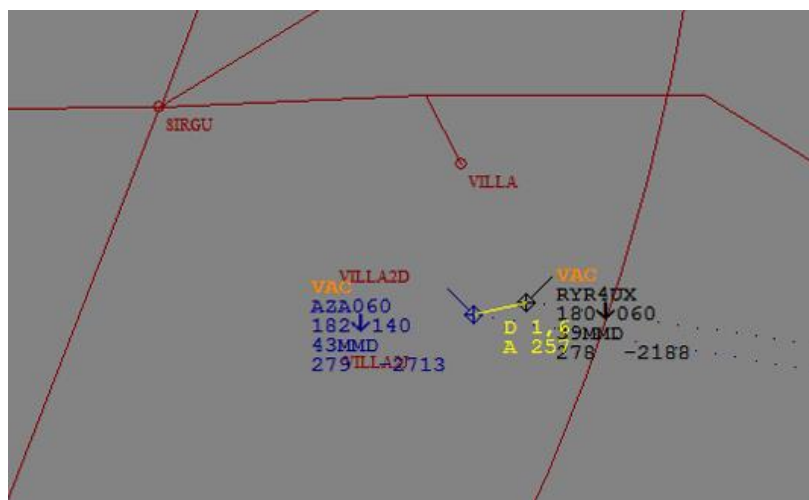


Fig. 17 Palestra image for 14:00:25

At 14:00:27, AZA060 requested confirmation to maintain FL180.

At 14:00:30, the controller in sector RNN answered affirmatively and reiterated that its rate of descent should be -2000 fpm and not higher.

At the same time, AZA060 was en route to ASBIN point (IAF) at FL181 and descending to FL140 at a rate of descent of -2275 fpm. RYR4UX was en route to the same point at FL178

and descending to 6000 ft at a rate of descent of -2144 fpm. At this time, the aircraft were 1.6 NM and 300 ft apart. The STCA-VAC alert remained active.

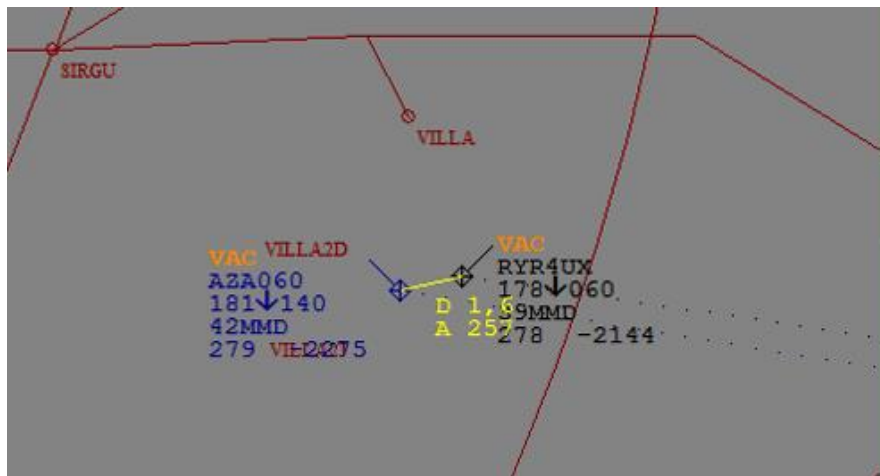


Fig. 18 Palestra image for 14:00:30

At 14:00:35, AZA060 replied “the problem is not easy we are descending below 180 ok, you have to say stop descending at FL180”.

At the same time, AZA060 was en route to ASBIN point (IAF) at FL179 and descending to FL140 (note that the CFL had not been entered yet into the label) at a rate of descent of -2169 fpm. RYR4UX was en route to the same point at FL176 and descending to 6000 ft at a rate of descent of -2156 fpm. At this time, the aircraft were 1.6 NM and 300 ft apart. The STCA-VAC alert remained active.

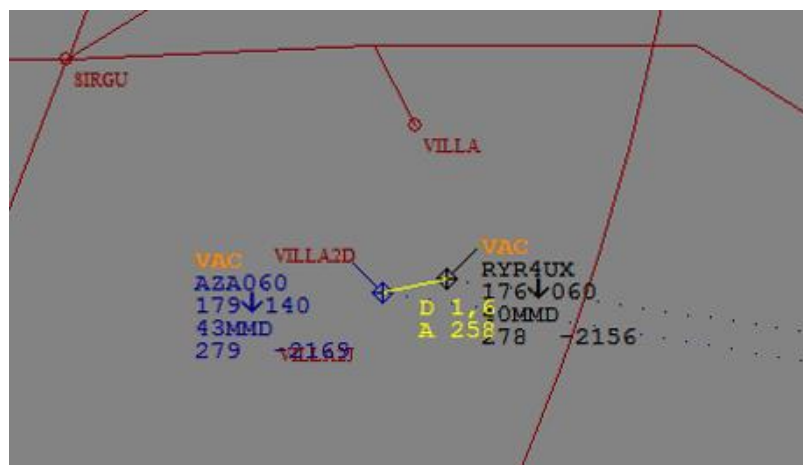


Fig. 19 Palestra image for 14:00:35

At 14:00:44, the controller in sector RNN instructed AZA060 to maintain FL170, which the crew readback correctly.

At 14:00:45, AZA060 was en route to ASBIN point (IAF) at FL177 and descending to FL140 (note that the controller had started issuing the clearance one second earlier, which is why CFL 170 had not yet been entered into the label) at a rate of descent of -1688 fpm. RYR4UX was en route to the same point at FL172 and descending to 6000 ft at a rate of descent of

-2319 fpm. At this time, the aircraft were 1.7 NM and 500 ft apart. The STCA-VAC alert remained active.

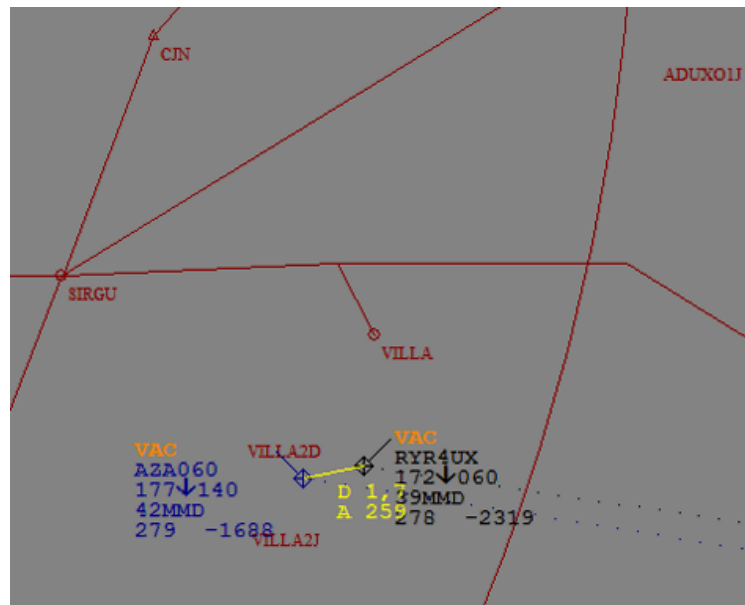


Fig. 20 Palestra image for 14:00:45

At 14:00:53, the controller in sector RNN instructed RJR4UX to maintain 250 kt, which the crew readback correctly.

At 14:01:05, AZA060 was on course to ASBIN point (IAF) and cleared to descend to FL170 (note that CFL 170 had not yet been entered into the label). It began climbing through FL179 at a rate of climb of +575 fpm. RJR4UX was en route to the same point at FL163 and descending to 6000 ft at a rate of descent of -2531 fpm.

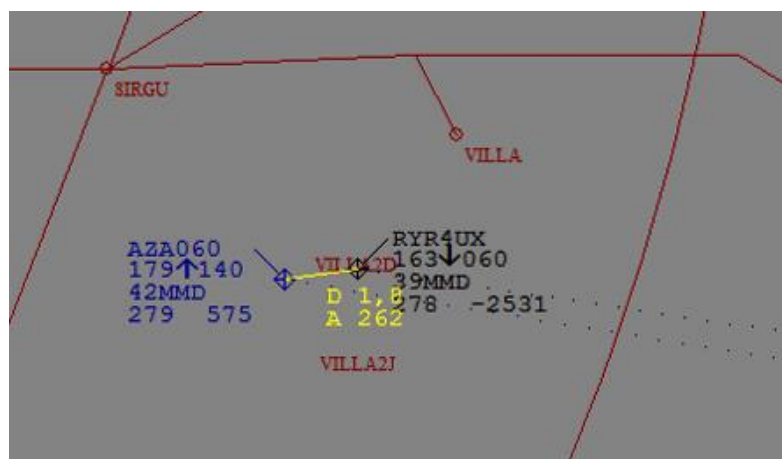


Fig. 21 Palestra image for 14:01:05

At 14:01:10, the controller in sector RNN again instructed AZA060 to maintain FL170, which the crew readback correctly.

At the same time, AZA060 was en route to ASBIN point (IAF) still at FL179 and cleared to descend to FL170 (note that CFL 170 had not been entered yet into the label) at a rate of

climb of +625 fpm. RYR4UX was en route to the same point at FL161 and descending to 6000 ft at a rate of descent of -2506 fpm.

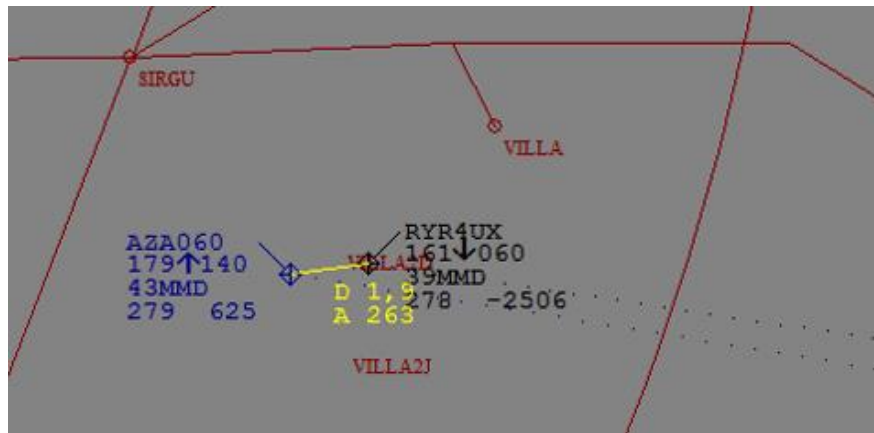


Fig. 22 Palestra image for 14:01:10

At 14:01:22, the controller in sector RNN instructed RYR4UX to maintain a rate of descent of -2000 fpm or higher.

At the same time, AZA060 was en route to ASBIN point (IAF) again descending through FL177 at a zero rate of descent and cleared to descend to FL170 (note that CFL 170 had not yet been entered into the label). RYR4UX was en route to the same point at FL157 and descending to 6000 ft at a rate of descent of -2513 fpm.

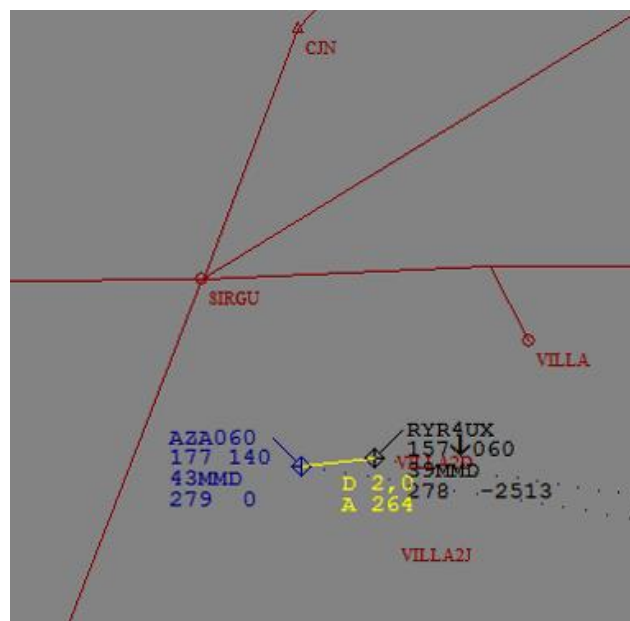


Fig. 23 Palestra image for 14:01:22

At 14:01:27, RYR4UX replied to the controller in sector RNN that they had been instructed to maintain a rate of descent of -2000 fpm or higher and that at that time their rate of descent was -2500 fpm.

At 14:01:33, the controller in sector RNN readback the message from RYR4UX and instructed it to maintain 220 kt, which the crew readback correctly.

At 14:01:54, the controller in sector RNN once again instructed AZA060 to descend to FL140, which the crew readback correctly.

At the same time, AZA060 was on course to ASBIN point (IAF) at FL171 and descending to FL140 at a rate of descent of -1294 fpm. RYR4UX was en route to the same point at FL144 and descending to 6000 ft at a rate of descent of -2763 fpm.

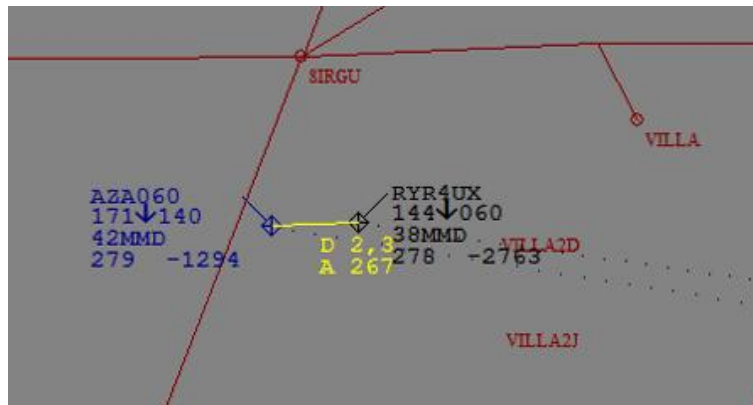


Fig. 24 Palestra image for 14:01:54

At 14:02:11, the controller in sector RNN instructed AZA060, now clear of traffic, to descend to 6000 ft with QNH 1018, which the crew readback correctly.

At 14:02:22, the controller in sector RNN instructed RYR4UX to descend⁵ (without specifying a rate of descent), which the crew readback correctly.

At 14:02:32, the controller in sector RNN asked RYR4UX about its speed. The crew replied “our current speed 290 kt reducing to 220 kt now, it’s a little bit hard to slow down”.

At 14:02:33, AZA060 was en route to ASBIN point (IAF) at FL164 and descending to 6000 ft at a rate of descent of -1463 fpm. RYR4UX was en route to the same point at FL130 and descending to 6000 ft at a rate of descent of -2156 fpm.

⁵ It had previously been cleared to descend to 6000 ft at 13:56:31.

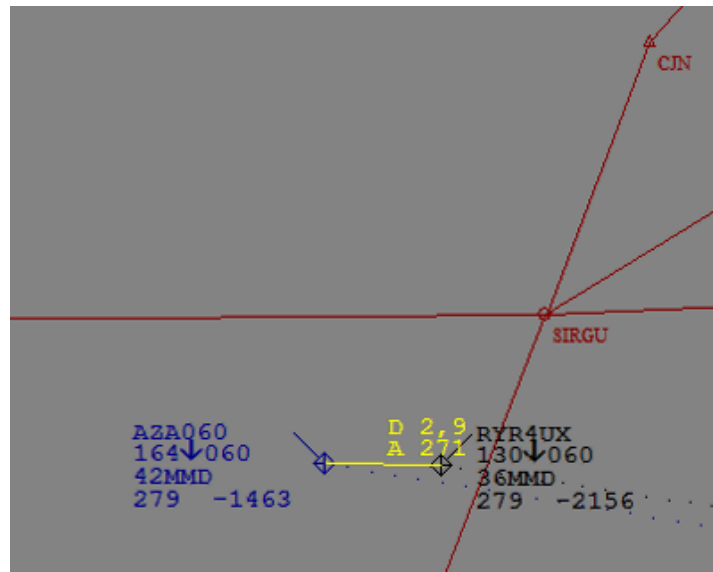


Fig. 25 Palestra image for 14:02:33

At 14:02:40, the controller in sector RNN readback receipt of the message at 14:02:32 from RYR4UX, and instructed it to turn right heading 340°, which the crew readback correctly.

At 14:03:37, the controller in sector RNN instructed RYR4UX to turn left direct to ASBIN point, which the crew readback correctly.

At 14:03:59, the controller in sector RNN instructed AZA060 to maintain 220 kt, which the crew readback correctly.

At 14:04:40, the controller in sector RNN transferred AZA060 to 127,1 MHz, which the crew readback correctly.

At 14:06:37, the controller in sector RNN transferred RYR4UX to 127,1 MHz, which the crew readback correctly.

The data recorded by Palestra were used to compile a graph displaying the rates of descent of both aircraft during the incident, as shown below⁶.

De los datos registrados en Palestra, se muestra a continuación una gráfica en la que se representan los regímenes de descenso de ambas aeronaves durante el incidente.

⁶ The graph was compiled by ENAIRE

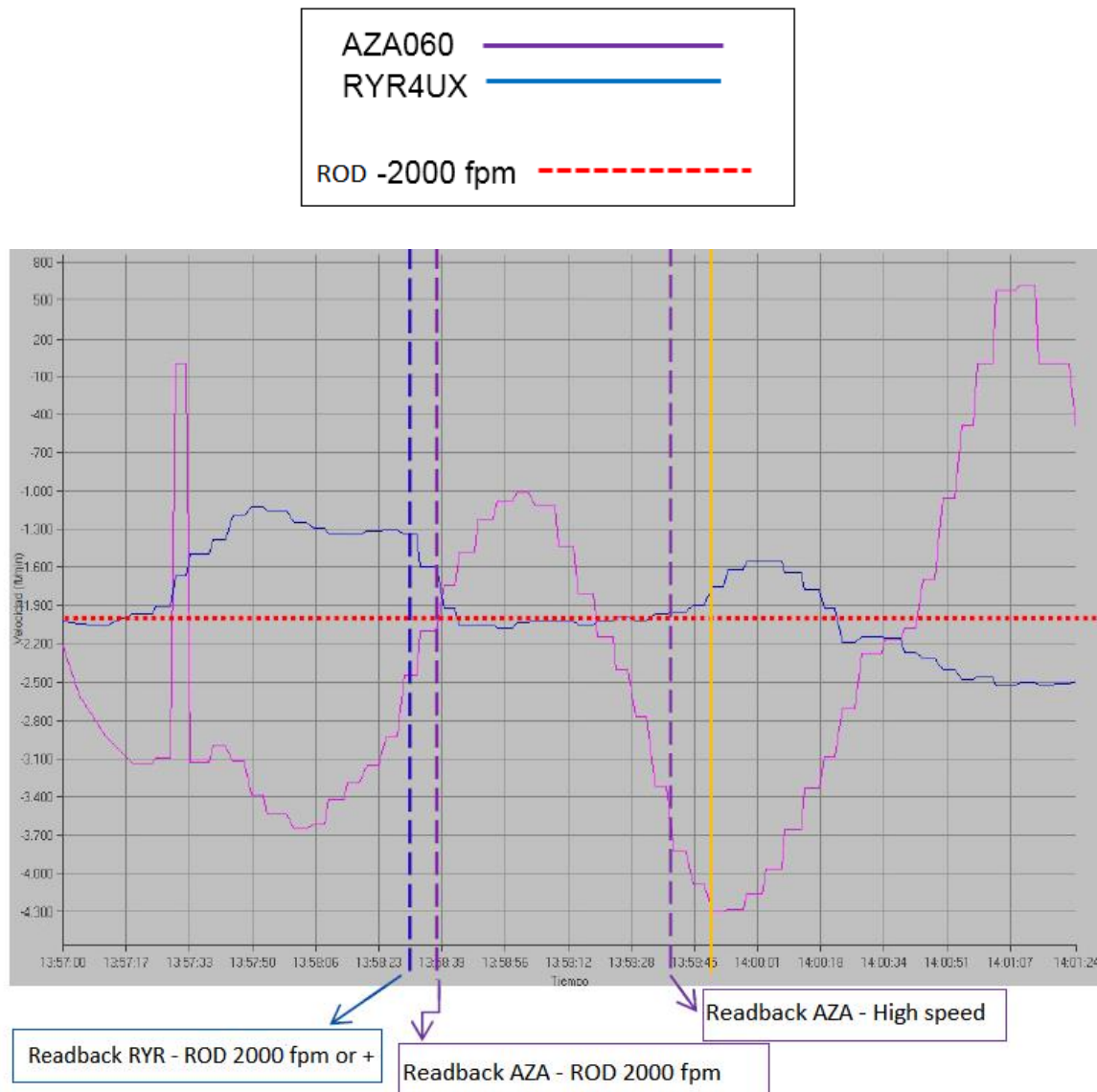


Fig. 26 Graph of rates of descent (ROD) of the two aircraft between 13:57:00 and 14:01:24

The graph shows that the rates of descent instructed by the controller, and readback by the crews, were not adhered to satisfactorily by the crews.

1.10. Aerodrome information

Not applicable.

1.11. Flight recorders

The flight recorders from the aircraft were not available since by the time the investigation was started, the recorders no longer contained the data from the incident flight.

However, the flight parameters recorded in their respective QARs were available, as were the voice recordings from the control center, along with the radar tracks. All of this information was analyzed and the relevant content presented in the previous section.

1.12. Wreckage and impact information

Not applicable.

1.13. Medical and pathological information

Not applicable.

1.14. Fire

None.

1.15. Survival aspects

Not applicable.

1.16. Tests and research

The CIAIAC commenced its investigation into this incident on the same day it became aware of it, which was 23 December 2019. Both airlines were contacted in order to interview their crews. This endeavor yielded very little information, since neither crew received TCAS warnings, and as a result they did not write a safety report. Moreover, given the time that had elapsed, the crews were unable to remember much. The findings are provided below.

1.16.1. Statement from the captain of AZA060 (EI-IKL)

Nothing of significance occurred on the flight in question. Nothing else to add.

1.16.2. Statement from the captain of aircraft RYR4UX (EI-ENN)

Recalled practically nothing from that flight, nor were they asked by ATC to report the event.

1.16.3. Statement from the first officer of RYR4UX (EI-ENN)

After nearly four months after the event, he could not recall the exact details of the flight. He can assure that they did not have a TCAS warning or any comments from ATC related to the event, so they did not report it. In light of the information he knows now about the event, he thinks they might have misunderstood an ATC instruction or that the pilot may have been distracted, which resulted in ATC's instruction not being carried out at the time.

1.16.4. Statement from the executive controller in sector RNN

The information below was taken from the report written by the executive controller after the incident:

Aircraft RYR4UX did not maintain the requested rate of descent of -2000 fpm or higher. This caused a loss of separation, since being aware that the traffic ahead of it at a higher level was also going to the same destination (LEMD), it increased its speed upon entering the Madrid TMA in order to hamper (sic) its descent. He added that he supposed that the instruction to maintain a given rate of descent was recorded in the tapes, but that this instruction was not complied with.

1.16.5. Statement from the planning controller in sector RNN

The information below was taken from the report written by the planning controller after the incident:

The executive controller assigned a specific rate of descent to each aircraft at different altitudes, RYR4UX descending to 6000 ft and AZA060 descending to FL140. Neither aircraft complied with the rate of descent restriction, which led to the loss of separation.

1.16.6. Information on duty and rest periods

It was the executive controller's third consecutive duty day following a four-day rest period. As regards the shift on the day of the incident, he was on the afternoon shift and RNN was the first sector he worked. He had been working as the executive controller in sector LEMDRNN since 13:07 UTC, and stayed at that post until 14:13 UTC. After a required break, he went on to relieve the planning controller in that same sector.

It was the planning controller's fourth consecutive duty day following a twelve-day rest or vacation period. As regards the shift on the day of the incident, he was on the afternoon shift and RNN was the first sector he worked. He had been working as the planning controller in sector LEMDRNN since 13:01 UTC, and stayed at that post until 14:12 UTC. After he was relieved, he took over as executive controller in that same sector.

1.17. Organizational and management information

Not applicable.

1.18. Additional information

ENAIRE, the air navigation service provider, conducted an internal investigation of the event, as a result of which it proposed the following actions in order to improve safety:

- 1) Send the findings from its internal investigation into the incident to both airlines (Alitalia and Ryanair)
- 2) Send the findings from its internal investigation into the incident to the controllers involved

1.19. Useful or effective investigation techniques

Not applicable.

2. ANALYSIS

2.1. General

On 7 September 2019, an Airbus A320-214 operated by Alitalia, registration EI-IKL, was on a flight, callsign AZA060, between the airports of Rome-Fiumicino (Italy) and Madrid-Barajas. At the same time, a Boeing 737-8AS, operated by Ryanair, registration EI-ENN, was on a flight, callsign RYR4UX, between the airports of Mahón (Balearic Islands) and Madrid-Barajas.

Both aircraft had been cleared to fly to ASBIN point and had been practically one on top of the other for several minutes, although maintaining an appropriate vertical separation.

The crews of both aircraft had valid licenses and medical certificates.

Both aircraft were airworthy and their documentation was valid.

Both the executive and planning controllers in the sector had valid licenses, unit endorsements and medical certificates.

Their activities prior to the incident flight were within the norm.

The weather during the incident flight was not limiting and did not have any adverse effects on the flight.

2.2. Conflict generation and resolution

Both aircraft were in sector RNN, with AZA060 flying to ASBIN point (IAF) and RYR4UX to PRADO point. Initially, AZA060 was above RYR4UX, and both of them were descending, although their vertical separation was sufficient. RYR4UX was instructed to descend to 6000 ft as it was descending through FL289, and was then cleared to proceed to ASBIN point at a high speed.

AZA060 was then instructed to descend to FL230 as it was descending through FL260.

At 13:58:27, the controller in sector RNN instructed RYR4UX to follow a rate of descent of -2000 fpm or higher, and immediately afterward instructed AZA060 to descend to FL140 and follow a rate of descent of -2000 fpm. Both crews readback correctly. One second later, the aircraft were separated by 1.2 NM horizontally and 1700 ft vertically.

At 13:59:19, the controller in sector RNN instructed AZA060 to maintain a high speed, but its crew did not readback. As a result, the controller repeated the instruction eight seconds later, again receiving no reply. The images obtained from Palestra show that this aircraft started to increase its rate of descent above the authorized -2000 fpm, and at 13:59:27, its rate of descent was -2400 fpm.

At 13:59:33, AZA060 requested that the instruction be repeated. At that time, its rate of descent was -2769 fpm and the aircraft were separated by 1.3 NM and 1900 ft. Two seconds later, the controller again instructed it to maintain a high speed. At that time, the rate of descent of AZA060 was -3313 fpm and of RYR4UX was -1969 fpm. Three seconds later, at 13:59:36, the STCA-PAC alert was activated.

At 13:59:39, the situation was no better: AZA060 was descending at -3825 fpm and RYR4UX at -1950 fpm, and the aircraft were 1.3 NM and 1400 ft apart.

At 13:59:55, the prescribed separation was lost as the aircraft were 1.3 NM and 800 ft apart, resulting in the STCA-VAC alert activation. The rate of descent of AZA060 was -4281 fpm (its cleared rate of descent was -2000 fpm), and the rate of descent of RYR4UX was -1613 fpm (it had been cleared to maintain a rate of -2000 fpm or higher).

The controller had instructed the higher aircraft to maintain a rate of descent of -2000 fpm, and to more than -2000 fpm to the lower aircraft. Neither aircraft observed these limits, which resulted in a gradual reduction of the vertical separation between them. Both instructions are deemed correct, but the controller's monitoring of the crews to enforce them cannot be considered correct, and this oversight failure led to the loss of separation.

It is similarly deemed incorrect for the controller not to have issued a more forceful instruction (such as diverting one aircraft from its course or halting the descent of the higher aircraft) in order to limit the loss of separation and speed up the adequate separation recovery, in light of the little success that the instructions pertaining to the rates of descent were having. At 13:59:36, the STCA-PAC alert was activated. The controller did not intervene until 39 seconds later (at 14:00:15, before the point of closest approach was reached).

At 14:00:12, according to the radar data, the minimum separation between the aircraft – 1.4 NM and 300 ft – occurred as AZA060 was crossing FL188 at -3656 fpm and RYR4UX was crossing FL185 at -1638 fpm.

At 14:00:15, the controller reminded RYR4UX to follow a rate of descent of -2000 fpm or higher. The distance between the two aircraft was 1.5 NM and 300 ft, RYR4UX was descending at -1781 fpm and AZA060 at -3331 fpm.

The controller in sector RNN later instructed AZA060 to maintain FL180 as the aircraft was nearing this altitude, and so its crew requested confirmation. The controller again instructed the crew to maintain FL180, reiterating that they were to maintain a rate of -2000 fpm and not higher. The crew stated that they were below said level, and they were instructed to descend to FL170.

Later, the controller instructed RYR4UX to maintain 250 kt and he reminded AZA060 to maintain FL170, since it had climbed to FL179.

At 14:01:22, the controller informed RYR4UX that it had been instructed to maintain a rate of descent of -2000 fpm or higher, to which the crew replied that its rate of descent was now -2500 fpm.

Finally, the controller in sector RNN readback the message from RYR4UX and instructed it to maintain 220 kt, and AZA060 to descend to FL140 and subsequently to 6000 ft.

Neither crew reported receiving any advisories in their respective TCAS, and neither crew filed a report detailing this loss of separation. They had been unaware of the airprox until they were asked by the CIAIAC to provide information on the incident.

Both aircraft continued their respective approaches and completed their flights uneventfully.

2.3. Relevant facts

The following facts are deemed as relevant and decisive in leading to the loss of separation between the two aircraft:

- 1) RYR4UX was instructed to follow a rate of descent of -2000 fpm or higher in order to establish a difference in vertical speed with respect to the other aircraft involved in the incident, but it did not follow this instruction.
- 2) By contrast, AZA060 was instructed to follow a rate of descent of -2000 fpm, which it failed to do for approximately 1 minute 20 seconds, on occasion exceeding this assigned rate by more than double.

3. CONCLUSIONS

3.1. Findings

- Aircraft EI-IKL (callsign AZA060) had been cleared to fly to ASBIN point.
- Aircraft EI-ENN (callsign RYR4UX) had been cleared to fly to ASBIN point.
- AZA060 was above RYR4UX, practically over it, and had been for several minutes, although they had maintained an appropriate vertical separation.
- The crews of both aircraft had valid licenses and medical certificates for the flight.
- Both aircraft were airworthy and their documentation was valid.
- The weather during the incident flight was not limiting and had no adverse effects on the flight.
- Both the executive and planning controller in sector RNN had valid licenses, unit endorsements and medical certificates.
- Their activities prior to the incident flight are also deemed acceptable.
- At 13:58:27, the controller in sector RNN instructed RYR4UX to descend at a minimum rate of -2000 fpm, which the crew correctly readback.
- At 13:58:33, the controller in sector RNN instructed AZA060 to descend at -2000 fpm, which the crew correctly readback.
- Neither crew observed the instructions received regarding the rates of descent assigned to them.
- At 13:59:35, the controller in sector RNN again instructed AZA060 to maintain a high speed.
- At 13:59:36, AZA060 was descending at a rate of -3313 fpm, and RYR4UX at -1969 fpm. The distance between the aircraft was 1.3 NM and 1600 ft, and both were en route to ASBIN point. At this time, the STCA-PAC alert was activated.
- At 13:59:39, AZA060 was descending at a rate of -3825 fpm, and RYR4UX at -1950 fpm. The distance between the aircraft was 1.3 NM and 1400 ft, and both were en route to ASBIN point.
- At 13:59:55, AZA060 was descending at a rate of -4181 fpm, and RYR4UX at -1613 fpm. The distance between the aircraft was 1.3 NM and 800 ft, and both were en route to ASBIN point. At this time, the STCA-VAC alert was activated.
- At 14:00:12, the aircraft reached their closest point of approach: 1.4 NM and 300 ft. The STCA-VAC alert remained active. AZA060 was descending through FL188 for FL140 at a rate of -3656 fpm, and RYR4UX was descending through FL185 for 6000 ft at -1638 fpm. Both aircraft were en route to ASBIN point.
- From 13:59:35 until 14:00:12, the controller in sector RNN did not communicate with either aircraft, which were not adhering to the specified rates of descent as the vertical distance between the aircraft decreased.
- At 14:00:15, the controller in sector RNN instructed RYR4UX to follow a rate of descent of -2000 fpm or higher.
- At 14:00:23, the controller in sector RNN instructed AZA060 to level off at FL180 upon reaching it (it already had, so the instruction was amended to FL170).
- At 14:01:54, AZA060 was descending through FL171 for FL140 at a rate of -1294 fpm, and RYR4UX was descending through FL144 to 6000 ft at -2763 fpm. The distance between the aircraft was 2.3 NM and 2700 ft, and both were en route to ASBIN point.

- Neither crew reported receiving an advisory in their respective TCAS, and neither crew filed a report on the loss of separation.
- The aircraft continued their respective flights uneventfully after the incident.
- As a result of its own safety report, the air navigation service provider agreed to issue the findings of its internal investigation into the incident to both airlines (Alitalia and Ryanair) and to the controllers involved.

3.2. Causes/Contributing factors

The loss of separation between the two aircraft was due to the failure of both crews to comply with the respective instructions received involving the rates of descent that both aircraft were required to follow.

Contributing to this is the fact that the controller in sector RNN:

- did not actively monitor and enforce the instructions that both crews had received related to their rates of descent, and
- did not provide a more forceful instruction (such as diverting one of the two aircraft from its heading or leveling off the higher aircraft), given the lack of results provided by the instructions involving the rates of descent.

4. SAFETY RECOMMENDATIONS

None.