

Final Report of the Aircraft Accident Investigation Bureau

concerning the incident (Airprox)

between AZA622 and NTL6300

on 2 March 2002

18 NM NNW Aosta

Bundeshaus Nord, CH-3003 Berne

FINAL REPORT

AIR TRAFFIC INCIDENT REPORT (ATIR)

AIRPROX (NEAR-MISS)

This report serves exclusively to prevent accidents. The legal assessment of accident/incident causes and circumstances is no concern of the incident investigation. (Art. 24 of the Air Navigation Law). The masculine form is used in this report regardless of gender for reasons of data protection.

PLACE/DATE/TIME	18 NM NNW AOSTA, 2 March 2002, 10:30 UTC
AIRCRAFT	AZA622, MD11, Boeing, I-DUPE, Alitalia Milan Malpensa to Los Angeles NTL6300, B737, Boeing, TC-ANH, Air Anatolia Amsterdam to Antalya
ATC UNIT	Area Control Centre (ACC)
CONTROLLER	MOLUS3 Radar Controller Planning

AIRSPACE

С

HISTORY

On Saturday 2 March 2002 at 10:17:46 UTC, an Anatolia company aircraft type B737-400, NTL6300, a scheduled flight from Amsterdam to Antalia, made contact on the MOLUS3 sector frequency 126.05 MHz at flight level 290. The radar controller identified it and about four minutes later cleared it directly towards SARONNO VOR.

In the opposite direction, an aircraft type MD11 of the Alitalia company, AZA622, a commercial flight from Milan to Los Angeles, made contact on frequency 126.05 MHz, climbing towards flight level 260. The radar controller identified it and cleared it to flight level 280. A little later, he informed the pilot that he could continue his climb in one minute and informed him that he would be crossing opposing traffic, 1000 feet below him, from left to right, currently at a lateral separation of 7 NM, direction 11 o'clock.

At 10:28:06, the pilot of flight NTL6300 announced that he had just crossed traffic behind him, 500 metres on his left. The radar controller replied to him that he thought it was a mode C radar error, as the aircraft had been cleared to flight level 280.

Flight AZA622 was cleared to climb to flight level 300. The pilot announced that one minute earlier, his TCAS (Traffic alert and collision avoidance system) had issued an RA (Resolution Advisory) and that he had crossed traffic on his left. The radar controller reminded him that he had been cleared to flight level 280 and asked the pilot if he had exceeded this level. The pilot of flight AZA622 answered that he was currently passing flight level 285 and that he had followed the instructions of his TCAS "Climb" and then "Descend". The radar controller asked the pilot to confirm that he had continued his climb following an RA from his TCAS despite the fact that he had indicated traffic 1000 feet higher. The pilot answered "yes", that at that time, he had not seen the traffic, but only the RA from his TCAS.

The pilot of flight NTL6300 stated that he was going to submit a report.

The radar controller stated to the pilot of flight AZA622 that he was going to submit a report and asked him to change frequency to 132.315 MHz.

At 10:31:05, the radar controller informed the pilot of flight NTL6300 that he was going to submit a report and asked him to contact Milan on frequency 127.45 MHz.

FINDINGS

- The incident took place 18 NM NNW of AOSTA, in class C controlled airspace, at flight level 285, within the area of jurisdiction of the Geneva ACC (Area Control Center).
- Instrument flight rules were in force.
- At the time of the incident, flights AZA622 and NTL6300 were in contact with and under radar control of Sector MOLUS3 on frequency 126.05 MHz.
- The route of flight AZA622 was AOSTA-MOLUS-DJL.
- The route of flight NTL6300 was MOROK-GVA-SRN.
- The radar controller as well as the planning controller possessed a valid licence.
- Radio communications between the pilots of flights AZA622, NTL6300 and the radar controller were in English.
- The MD11, flight AZA622, as well as the B737, flight NTL6300, was equipped with a TCAS II version 7.

- Flight conditions were VMC (Visual Meteorological Conditions)
- At 10:27:47, separation between the two aircraft was an altitude difference of 900 feet and a lateral separation of 3.9 NM and the STCA (Short Time Conflict Alert of sector MOLUS3) did not indicate a proximity alert to the radar controller.
- At 10:27:59, the AZA flight reached flight level 285.
- At 10:27:59, flight AZA622 and flight NTL6300 crossed 18 NM NNW of AOSTA with a minimum altitude difference of 500 feet, a lateral separation of 1 NM and a closing speed of 753 kt.
- At 10:27:59, the STCA of sector MOLUS3 indicated a proximity alert to the radar controller.
- The TCAS of flight NTL6300 issued a TA (Traffic Advisory) "TRAFFIC, TRAFFIC" followed by an RA (Resolution Advisory) "CLIMB, CLIMB".
- The pilot of flight NTL6300 had flight AZA622 in sight and did not follow the instructions of his TCAS.
- At 10:28:23, flight AZA622 was at flight level 278.
- Five members of the crew were present in the cockpit of flight AZA622. The 4 pilots forming the standard crew for this rotation, plus an examining pilot performing an annual line check of the pilot in the left seat at Alitalia all technical crew must take their seats in the cockpit below an altitude of 10,000 feet, or preferably until cruising altitude has been reached.
- Analysis of various documents and recordings shows that the incident took place in the following sequence:
 - 10:27:20 Traffic information to AZA622 from the radar controller.
 - 22 Beginning of the "abnormal" increase in the rate of climb.
 - 29 Traffic advisory (TA) with voice alert "TRAFFIC, TRAFFIC".
 - 33 End of the "abnormal increase in the rate of climb".
 - 38 Corrective resolution advisory (RA) with voice alert "ADJUST VERTICAL SPEED, ADJUST".
 - 43 Disengaging of the automatic pilot.
 - 54 Corrective resolution advisory (RA) with voice alert "DESCEND, DESCEND".
 - 59 Closest point of convergence.
 - 10:28:08 Announcement of end of conflict "CLEAR OF CONFLICT".
 - 27 Engaging of the automatic pilot.
- According to the TCAS data recording provided by the Alitalia airline company, a corrective resolution advisory (RA) with audible alarm "ADJUST VERTICAL SPEED, ADJUST" was triggered.
- According to the report of the crew of flight AZA622, the 5 people present in the cockpit heard the TA advisory "TRAFFIC, TRAFFIC" followed by the RA "DESCEND, DESCEND".
 Only the pilot flying heard "CLIMB, CLIMB" and acted accordingly.

- Analysis of the recorded TCAS data of flight AZA622 made it possible to establish the following facts:
- Despite the information from the radar controller concerning traffic flying 1000 feet higher, the MD11's rate of climb was not reduced; on the contrary, it increased from 1184 feet/minute to 1688 feet/minute over a period of 12 seconds. The automatic pilot was disengaged, flight level 280 was passed and the rate of climb during this manoeuvre reached a maximum value of 2872 feet/minute.
- Flight AZA622 climbed to flight level 285 and following the RA resolution advisory "DESCEND, DESCEND" descended again to flight level 278.

Weather: Geneva 10:20

Wind: 070° 2 kt Visibility: 10 KM Cloud: few 500 FT, broken 3000 FT, overcast 9000 FT Temperature: + 03°C QNH 1011 hectopascals NOSIG (no significant change).

Winds at altitude FL 300 230° 105 kt.

ANALYSIS

Aspects relating to air traffic control

On Saturday 2 March 2002 at 10:17:46 UTC, the pilot of flight NTL6300 made contact on the sector MOLUS3 frequency 126.05 MHz at flight level 290. The radar controller identified it and four minutes later cleared it to fly directly towards SARONNO VOR.

At 10:25:43, in the opposite direction, the pilot of flight AZA622 destination Los Angeles made contact on frequency 126.05 MHz, climbing towards flight level 260. The radar controller identified it and cleared it to climb to flight level 280.

At 10:27:20, in order to inform the pilot of flight AZA622 that he would receive a higher level in a few seconds, the radar controller informed him of the opposing traffic flight NTL6300 at flight level 290, from left to right, at a lateral separation of 7 NM, direction 11 o'clock.

At 10:27:47, separation between flight AZA622 and flight NTL6300 was an altitude difference of 900 feet and a lateral separation of 3.9 NM, i.e. below the minima, though the sector MOLUS3 STCA had not yet alerted the radar controller.

At 10:27:59, 12 seconds later, the STCA first indicated a proximity alert to the radar controller. Actually, the two aircraft crossed at this time with an altitude difference of 500 feet and a lateral separation of 1 NM. Given the rapidity of the event, the STCA alert only alerted the radar controller very late.

At 10:28:06, the pilot of flight NTL6300 complained that traffic was passing behind him, 500 metres to his left.

At 10:28:16 the radar controller replied to him that in his opinion the alert was due to a mode C radar error, as the aircraft he had just crossed had only been cleared to flight level 280.

At 10:28:23, flight AZA622 was at flight level 278.

At 10:28:28, flight AZA622 was cleared to continue its climb to flight level 300. It was at this time that the pilot complained that he had crossed traffic on his left and that his TCAS had issued an RA "*We had a resolution advisory, Alitalia six two two, one minute ago, on the left traffic.*" The radar controller reminded him that he had been cleared only to flight level 280 and asked him if he had climbed higher than this level. The pilot answered that he had followed the instructions of his TCAS: "*We had a resolution advisory at... red, and for climb, immediately, for us, and after to descend. I leave heu, I left two eight zero initially, until at two eight five I see in Victor Mike the other traffic coming on opposite direction, and I leave the..., the altitude to, to, to go down.*" He confirmed that he had climbed to flight level 285, that he was in VMC, that he had seen the opposing traffic and that he had descended again.

At 10:29:05, the pilot of flight NTL6300 informed the controller that he was going to submit a report.

At 10:30:35, the radar controller informed the pilot of flight AZA622 that he was going to submit a report and asked him to contact Geneva on frequency 132.315 MHz.

At 10:31:05, the radar controller informed the pilot of flight NTL6300 that a report would be submitted on the incident and asked him to contact Milan on frequency 127.45 MHz.

Operational aspects relating to the control of aircraft

The conflict took place on the occasion of a geographically close convergence of two aircraft, the vertical separation of which was expected to be 1000 feet. Despite traffic information issued for the attention of the Italian pilots, the airprox (near miss) occurred and from then onward the question of the satisfactory operation of the onboard collision avoidance systems is posed; this is the first reason which justified the analysis of the MD11's TCAS, integrating its data into the other available sources of information which complement it. The study then aimed to determine and examine the elements which led and contributed to the evolution of the incident: influences of the different types of displays and TCAS alerts, special features of the traffic avoidance procedures.

The TCAS recording data were processed "directly" as far as the flight parameters were concerned (pressure altitudes, speeds, rates of climb/descent, etc.), the resolution advisories and the engagement status of the automatic pilots. By combining some of these data with those originating from other sources of information, it was possible to draw up the two graphs "TA/RA horizontal tau" and "TA/RA vertical tau" for the period corresponding to the critical phase of the conflict, as well to determine the closest point of convergence.

Analysis of the results made it possible to decipher the abnormal increase in the rate of climb of the Italian aircraft and to give a plausible explanation for this. By using it with the other available data, it was possible to determine the time at which the traffic advisory (TA) was issued and thus to integrate it in the causal chain which led to the "near miss". The information relating to the resolution advisories was processed in the same way and made it possible to check the collision avoidance logic generated at the time of the coordination of the two onboard collision avoidance systems.

A systematic approach to the TCAS displays and voice alerts showed that the ergonomics of the MD11 are not optimal in this respect: the way in which information is transmitted to pilots may lead to erroneous interpretations; the dissociation of the visual information slows down all the information transfer processes. As for the traffic avoidance procedures, for both of the companies involved these deal only with the general aspect of collision avoidance, without being adapted to the specific features of the TCAS instrumentation.

They define poorly the tasks of the PF and PNF for each type of traffic and resolution advisory. At the more general level of the compatibility of onboard collision avoidance systems with air traffic control, it is apparent that automatic pilots are not adapted to CAS logic. Consequently, if cockpit crews do not ensure that they reduce the rates of climb/descent in the last 1000 feet prior to a cleared flight level, in conditions where traffic is in close proximity the onboard collision avoidance systems do not distinguish between normal level acquisition and a potential high conflict situation.

Comparison of the crew behaviour reports with the results of the data processing analysis indicates that the near miss was caused by erroneous behaviour of the pilots when confronted with the TCAS alerts: traffic avoidance procedures which were not designed around a cockpit crew coordination system led to a situation of confusion, leading to misinterpretations and non-compliance with resolution advisories.

CAUSE

The incident is due to the erroneous behaviour of the crew of flight AZA622 and to the absence of a reaction from the crew of flight NTL6300 when confronted with the respective alerts from their TCAS.

Berne, 18 July 2005

Aircraft Accident Investigation Bureau

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TRANSCRIPT OF TELEPHONY

OR RADIOTELEPHONY COMMUNICATIONS TAPE-RECORDING

Investigation into the incident that occurred on 2 March 2002

- Subject of transcript:	Alitalia 622
- Centre concerned:	Geneva
- Designation of unit:	ACC
- Frequency:	126.05 MHz
- Date and period covered by attached extract:	2 March 2002 10:17 - 10:31 UTC
- Date of transcript:	13 March 2002
 Name of official in charge of transcription service: 	Monica Simonet

- Certificate by official in charge of Analysis Department:

I hereby certify:

- That the accompanying transcript of the telephony or radiotelephony communication tape-recording, retained at the present time in the premises of Analysis Department, has been made under my supervision.
- That it was examined and checked by me.
- That no changes have been made to the entries in columns 2, 3 and 4, which contain only clearly understood indications in their original form.

Geneva, 13 March 2002

M. Simonet

U. River



Abbreviations

ACC	-	Geneva Area Control Centre					
6300	-	Anatolia 6300	B734	IFR flight	EHAM	-	LTAI
681	-	Crossair 681	SB20	IFR flight	LEBL	-	LFSB
CFC	-	CSDFC	F2TH	IFR flight	EHRD	-	LFMD
1115	-	Air France 1115	A320	IFR flight	LIMC	-	LFPG
704	-	Tunisair 704	A319	IFR flight	DTTJ	-	LSGG
67L	-	Shamrock 67L	B735	IFR flight	EIDW	-	LIML
201	-	Littoral 201 XH	CRJ1	IFR flight	LFMN	-	LFST
4512	-	Iberia 4512	A320	IFR flight	LEBL	-	EDDF
2501	-	Eurofly 2501	B763	IFR flight	MUHA	-	LIMC
622	-	Alitalia 622	MD11	IFR flight	LIMC	-	KLAX

GED/ 17/06/2004

To <u>Col.1</u>	From <u>Col.2</u>	Time <u>Col.3</u>	Communications Col.4	Observations <u>Col.5</u>
Freque	ncy 126.05	MHz: Gene	va Area Control Centre, Sector MOLUS 3	
ACC	6300	10:17:46	Geneva bonjour, Anatolia six three double zero, maintain two niner zero, proceeding XXXXX.	probably: "Geneva"
6300	ACC	53	Bonjour heu six three zero zero, identified.	
ACC	6300	58	XXXXX.	probably: "Merci"
681	ACC	59	Crossair six eight one descend now to flight level two seven zero.	
ACC	681	10:18:03	Two seven zero, Crossair six eight one.	
681	ACC	05	Roger, for lower contact Geneva, one two eight niner, good day.	
ACC	681	09	One two eight niner, good day.	
CFC	ACC	34	Charlie Fox Charlie continue descent to flight level two nine zero.	
ACC	CFC	39	Descend to flight level two ????? zero, Charlie Foxtrot Charlie.	unreadable
CFC	ACC	42	Roger, be at two nine zero latest VEVAR.	
ACC	CFC	46	Heu to be level at two nine zero, VEVAR.	
ACC	1115	53	Genève bonjour, Air France onze quinze.	
1115	ACC	57	Bonjour Air France onze quinze, identifié, montez au niveau trois cents, initial.	
ACC	1115	10:19:03	Montons vers le niveau trois cents, trois zéro zéro, Air France onze quinze.	
704	ACC	13	Tunisair sept cent quatre, vous appelez Genève, cent vingt-cinq cinquante-cinq, au revoir.	
ACC	704	18	Vingt-cinq cinquante-cinq, au revoir.	
1115	ACC	53	Air France onze quinze réautorisé niveau trois cent trente.	
ACC	1115	58	Autorisé trois trente, trois trois zéro, Air France onze quinze.	
67L	ACC	10:20:26	Shamrock six seven Lima contact Milan, one two five two seven, good day.	
ACC	67L	10:20:32	One two five two seven, Shamrock six seven Lima, good day.	



To <u>Col.1</u>	From <u>Col.2</u>	Time <u>Col.3</u>	Communications <u>Col.4</u>	Observations <u>Col.5</u>
ACC	201	56	Radar bonjour, Littoral deux cent un X-ray Hotel, approchant le deux huit zéro, vers MOLUS.	
201	ACC	12:21:01	Bonjour Littoral X-ray Hotel, maintenez l'niveau deux cent quatre-vingts en atteignant.	
ACC	201	06	On maintient deux huit zéro atteignant, X-ray Hotel.	
ACC	4512	09	Control, Iberia four five one two, good morning.	
4512	ACC	12	Bonjour Iberia four five one two, identified. Proceed IRMAR KINES - DITON, level three zero zero, three hundred.	
ACC	4512	22	IRMAR KINES - DITON, Iberia four five one two.	
CFC	ACC	36	Charlie Fox Charlie contact Marseilles, one two five six five, good day.	
ACC	CFC	41	Marseilles, one two five six five, Charlie Fox Charlie, au revoir.	
6300	ACC	47	Anatolia six three zero zero proceed now to Saronno, direct.	
ACC	6300	51	Direct to Saronno, Anatolia six three zero zero.	
1115	ACC	10:22:12	Air France onze quinze réautorisé niveau trois cents initialement. Heu j'vous rappelle pour plus haut.	
???	???	18	XXXXX.	noise of microphone
ACC	1115	20	Okay, nous maintenons trois cents heu initial, Air France onze quinze.	
1115	ACC	54	Air France onze quinze maintenant réautorisé niveau trois cent vingt, qui sera votre niveau final.	
ACC	1115	10:23:01	Eh bien nous montons vers trois vingt, niveau final, Air France onze quinze.	another controller takes over from here
1115	ACC	10:24:19	Air France onze quinze contactez Genève, cent vingt-quatre zéro trois.	
ACC	1115	23	Genève, cent vingt-quatre zéro trois, Air France onze quinze, au revoir Monsieur.	
ACC	2501	10:24:30	Genève Control, Eurofly two five zero one.	
2501	ACC	35	Siriofly two five zero one bonjour, identified, cleared direct to Torino, level two seven zero.	



To <u>Col.1</u>	From <u>Col.2</u>	Time <u>Col.3</u>	Communications <u>Col.4</u>	Observations <u>Col.5</u>
ACC	2501	41	Eurofly two five zero one direct Torino, two seven zero.	
ACC	2501	10:25:24	Eh, Eurofly two five zero one, ready for descent any time.	
2501	ACC	30	Siriofly two five zero one, stand by short.	
ACC	2501	34	Stand by.	
ACC	622	43	Genève, Alitalia six two two bonjour, climbing level two six zero.	
622	ACC	47	Bonjour Alitalia six two two, identified, climb level two eight zero.	
ACC	622	50	Up to level two eight zero, Alitalia six two two, merci.	
4512	ACC	10:26:06	Iberia four five one two cleared direct to BERSU.	
ACC	4512	12	Say again for Iberia four five one two?	
4512	ACC	15	Heu disregard, you're on the turn to DITON now, confirm ?	
ACC	4512	18	Affirmative, you said KINES - DITON.	
4512	ACC	20	Roger, proceed to DITON.	
ACC	4512	23	Direct DITON, Iberia four five one two, thank you.	
2501	ACC	50	Siriofly two five zero one for descent contact Milano, one two five two seven.	
ACC	2501	55	One two five two seven, thank you, good day Sir.	
2501	ACC	57	Bye-bye.	
622	ACC	10:27:20	Alitalia six two two higher for you in one minute, your crossing traffic one thousand feet above, from left to right, seven miles, at your eleven o'clock.	
ACC	622	29	Alitalia six two two thank you very much.	
ACC	6300	10:28:00	XXXXX, Anatolia six three zero zero.	probably: "Genève"
6300	ACC	04	Anatolia six three zero zero, go ahead.	
ACC	6300	06	As you know, this time traffic is pa, passing behind heu, heu five hundred meters, near ?????, left side.	unreadable



To <u>Col.1</u>	From <u>Col.2</u>	Time <u>Col.3</u>	Communications <u>Col.4</u>	Observations Col.5
6300	ACC	16	Heu yes, I believe it's just a mode C error. The aircraft was cleared to two eight zero.	
ACC	6300	22	Roger, heu climbing at two eighty-five, and crossing on our left side, Alitalia.	
622	ACC	28	Alitalia six two two climb now level three zero zero.	
ACC	622	31	Up level three zero zero.	
ACC	622	36	We had a resolution advisory, Alitalia six two two, one minute ago, on the left traffic.	
622	ACC	42	Yes, you were cleared to level two eight zero, and… did you burst your level ?	
ACC	622	49	We are passing now two eight five We left… the level to… follow the advisory.	
622	ACC	57	Yes, you were cleared level two eight zero, prior to that advisory, confirm ?	
ACC	???	10:29:08	?????	noise, unreadable
ACC	6300	12	Heu Alitalia passed XXXXX us, Anatolia said that, passed us at two eighty-five, heu, heu, before, one minute ago.	could be: "until"
6300	ACC	22	Yea, okay, heu, we'll check into that, thank you.	
ACC	6300	25	Yes, very near, for your information I'll make a report.	
6300	ACC	31	Yes, yes.	
ACC	622	33	Control, Alitalia six two two ?	
622	ACC	34	Go ahead, six two two.	
ACC	622	10:29:36	We had a resolution advisory at red, and for climb, immediately, for us, and after to descend. I leave heu, I left two eight zero initially, until at two eight five I <u>see</u> in Viktor Mike the other traffic coming on opposite direction, and I leave the, the altitude to, to, to go down.	pilot spells "opposite" with an Italian accent
622	ACC	10:30:04	Okay, I understand that you climbed <u>because</u> of the traffic resolution alert. Is that correct ?	
ACC	622	10	Correct Sir.	



Page no.5 Date: 2.MAR.2002

TRANSCRIPT SHEET

To <u>Col.1</u>	From <u>Col.2</u>	Time <u>Col.3</u>	Communications <u>Col.4</u>	Observations <u>Col.5</u>
622	ACC	11	Okay, just prior to that you were to, you were not to two eight zero. I was advising you: eleven o'clock traffic one thousand feet above, and you were to climb shortly after that. Did you copy that ?	
ACC	622	23	Yes, but I'd not see before the heu the traffic heu, heu coming in the opposite direction; and I see only the resolution advisory, before.	pilot spells "opposite" with an Italian accent
622	ACC	35	Okay, in any case, we will file a report on that… situation.	
ACC	622	41	Okay.	
622	ACC	53	And Alitalia six two two continue with Geneva, one three two three one five.	
ACC	622	58	One three two three one five, confirm ?	
622	ACC	10:31:01	Affirm.	
ACC	622	02	Bye.	
6300	ACC	05	Anatolia six three zero zero, check that a report will be made. You can contact Milano, one two seven four five.	
ACC	6300	13	One two seven four five, Anatolia six three double zero. Confirm, I think the aircraft, Ali, Alitalia six two two ?	
6300	ACC	22	That is correct.	
ACC	6300	23	Thank you.	
ACC	6300	27	Say again frequency one two seven four five ?	
6300	ACC	10:31:29	Affirm, with Milan.	
ACC	6300	30	Yea.	

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Signature of person in charge:





