



Final Report of the Aircraft Accident Investigation Bureau

concerning the incident (Airprox)

between SWR 422 and AXX 032

on 28th December 2000

1.5 NM W KLO

AIRCRAFT ACCIDENT INVESTIGATION BUREAU

FINAL REPORT
AIR TRAFFIC INCIDENT REPORT (ATIR)
AIRPROX (NEAR COLLISION)

THIS REPORT HAS BEEN PREPARED FOR THE PURPOSE OF ACCIDENT/INCIDENT PREVENTION. THE LEGAL
ASSESSMENT OF ACCIDENT/INCIDENT CAUSES AND CIRCUMSTANCES IS NO CONCERN OF THE PRESENT
INVESTIGATION
(ART. 24 OF THE AIR NAVIGATION LAW)

PLACE/DATE/TIME 1.5 NM W KLO, 28 December 2000, 09:22 UTC

AIRCRAFT SWR 422, Airbus A320, HB-IJB, Swissair
Zurich - Oslo

AXX 032, Boeing (Douglas) MD81, Z3-ARB,
Avioimpex
Skopje - Zurich

ATC UNIT Aerodrome Control Zurich

**AIR TRAFFIC
CONTROLLERS** ADC (Aerodrome Controller)
APE (Approach Controller East)

AIRSPACE D

HISTORY

Arriving from its home base of Skopje, AXX032 was under radar vectoring while approaching Runway 14 in Zurich. Initially, the approach progressed normally and routinely. Approximately 11 NM to the east of the extrapolated centre line of Runway 14, the responsible approach controller for AXX032 instructed a reduction in speed to 210 knots. Approximately three minutes later, this air traffic controller instructed AXX032 to change its heading to 220°. Somewhat later, he instructed a fresh heading change to 160° with simultaneous clearance for an ILS (instrument landing system) approach to Runway 14. The instruction for this change in heading occurred so late that AXX032 overshot the localizer and for the time being, was unable to follow it. During this same flight phase - instead of switching the instrument landing system to the DFGS (Digital Flight Guidance System) – the co-pilot, as PF (Pilot Flying), unintentionally manipulated this equipment incorrectly. The result was that AXX032 initially maintained the heading of 160°.

It was only due to an intervention by the CMD that the ILS was switched to the autopilot. At this time, AXX032 was already about 1 NM to the west of the localizer and was continuing to fly on a heading of about 160°. The air traffic controller now enquired of AXX032 "Are you established?" and instructed the aircraft to turn immediately to the left in order to align with the localizer. Seconds later, the air traffic controller offered AXX032 to initiate a new approach. The crew initially refused and were then given clearance to descend to 3500 FT. At a distance of approximately 4.5 NM from the touchdown point of Runway 14 – AXX032 was then in the process of returning to the localizer – the air traffic controller again enquired whether AXX032 could continue the approach. AXX032 replied in the affirmative and was then handed over, by the approach controller, to the ADC (Aerodrome Controller) responsible for the airport traffic.

Twenty seconds later, during its first call on this channel, AXX032 reported that it would initiate a missed approach. At this time, the Macedonian aircraft had overshot the localizer by up to 0.3 NM to the east and was again approaching it. The aerodrome controller now immediately instructed AXX032 to stop the climb at 3500 FT. This limitation to the climb became necessary in order to achieve rapidly vertical separation from an airbus A320 of Swissair (SWR490) which had recently taken off from Runway 16. Although AXX032 confirmed this clearance for 3500 FT, it nevertheless climbed soon afterwards through the allocated altitude. From the indication on his bright display (monitor which represents a radar image), the aerodrome controller recognised this continuing climb of AXX032 to, in the meantime, 4000 FT. Because SWR490, which had previously taken off, was continuing its climb as normal, the air traffic controller could now give clearance for this 4000 FT also to AXX032. At this time, AXX032 had again overshot the localizer and was now approximately 0.2 NM to the west of it. This lateral deviation relative to the localizer was to increase to approximately 0.7 NM in the subsequent 30 seconds.

In the meantime, the aerodrome controller had also recognised that the Avioimpex aircraft's great deviation to the west might cause a further separation problem with another Swissair aircraft (SWR422) which had taken off shortly before from Runway 28. He therefore instructed a left turn for AXX032 to the heading 020° in order to separate the flight paths of these two aircraft as rapidly as possible. In addition, he initially instructed SW422 to stop its climb at 4000 FT with the intention

of giving AXX032 clearance to climb further without delay - in order to ensure vertical separation also. At this time, AXX032 was at 3900 FT and SW422 was at approximately 3100 FT and climbing. The pilots of SWW422, however, immediately reported that they had received a TCAS alarm and would descend to 3000 FT. The aerodrome controller immediately informed them that AXX032 would cross behind them. There was therefore no longer any danger of collision. AXX032, however, subsequently continued the climb without clearance up to 4700 FT and was up to 1 NM to the right of the runway centre line.

The two aircraft AXX032 and SWR422 approached to within a distance of 1.0 NM laterally and 400 FT vertically. The incident took place in IMC (instrument meteorological conditions).

FINDINGS

- Both aircraft were flying in controlled airspace class D.
- Both aircraft were flying according to IFR (instrument flight rules) and were in continuous radio contact with the responsible air traffic control units. At the beginning of the incident, AXX032 was controlled by the approach controller east and later by the aerodrome controller and SW422 was continuously under the control of the aerodrome controller.
- At 09:14:48, the APE (approach controller east) had AXX032 turn to the left to a heading of 250°.
- At 09:15:24, the APE had AXX reduce speed to 210 knots. At this time, AXX 032 was approximately 11 NM to the east of the extrapolated centre line of Runway 14.
- AT 09:18:13, the APE had AXX032 turn to a heading of 220°. AXX032 was now approximately 3.3 NM to the east of the localizer.
- At 09:18:50, the APE had AXX032 turn to a heading of 160° and, at the same time, gave it clearance for an ILS approach to Runway 14. AXX032 was still approximately 1 NM to the east of the localizer.
- At 09:19:15, the APE instructed AXX032 to maintain a speed of 200 KT. At this time, AXX032 had just overshot the localizer and was 10 NM from the touchdown point of Runway 14.
- At 09:19:47, the APE enquired of AXX032: "AXX032, are you established?" The latter replied: "We are receiving the ILS now, turning back", whereupon the APE gave the instruction: "AXX032 turn left to establish!"
- At 09:20:05, the APE offered AXX032 the opportunity of initiating a new approach. The pilots refused this offer and then received clearance to descend to 3500 FT.
- At 09:20:43, the APE communicated with the Macedonian aircraft as follows: "AXX032, you're four miles from touch down, confirm, you can make it?" They replied: "Ah, we got it, the ILS, AXX032". The APE then handed over the aircraft

to the aerodrome controller (ADC). At this time, AXX032 was in the process of returning to the localizer.

- 30 seconds later, at 09:21:20, AXX032 reported for the first time to the aerodrome controller - with the information that they were initiating a missed approach procedure. The aircraft had previously overshoot the localizer by approximately 0.3 NM to the east but was now approaching it again. The aircraft flew through approximately 3100 FT and was climbing. It was immediately instructed by the aerodrome controller to stop the climb at 3500 FT.
- At 09:21:38, the aerodrome controller gave AXX032 clearance for an altitude of 4000 FT and subsequently had it turn to the left to a heading of 020°. At this time, the MD80 of Avioimpex had already reached 4000 FT. It had again overshoot the localizer, was located approximately 0.2 NM to the west of the runway centre line and was moving further away from it.
- At 09:21:55, the ADC instructed SWR422, which had previously taken off from Runway 28, to stop its climb at 4000 FT. The Swissair aircraft, however, immediately reported that they had received a TCAS alarm about an intruder (AXX032) 700 FT above them and therefore wished to descend to 3000 FT. At this time, AXX032 was still flying on a heading of approximately 150° and was approximately 0.7 NM to the west of the threshold of Runway 14.
- Shortly afterwards, the aerodrome controller was able to inform SWR422 that this intruder would cross behind them. The danger of collision was therefore averted.
- In what followed, AXX032 continued to climb without clearance to 4700 FT.
- The crew of AXX032 had correctly confirmed all the instructions of the ATC (Air Traffic Control).
- In his written statement, the CMD of AXX032 asserted that the co-pilot, as Pilot Flying, had undertaken an erroneous manipulation of the autopilot which resulted in the ILS not being immediately switched to the autopilot. Later, when they again approached the localiser with the ILS coupled, the autopilot had automatically switched off without preliminary warning.
- The two air traffic controllers at the APE and ADC workplaces were authorised to exercise the corresponding functions.
- The two pilots of SWR422 had valid licences.
- The two pilots of the Avioimpex aircraft were, according to written comment from this airline, authorised to carry out the corresponding functions.
- The take-off direction of Runway 28 has an angle of 41° to the reciprocal value of the approach direction of Runway 14.
- The "Zurich Final" approach sector was not occupied at the time of the incident and up to 09:45 UTC.

- The amount of traffic at the time of the incident was, according to the statement by the APE, "increasing, with a rather high frequency loading on the sector".
- Weather: Information PAPA, LSZH 0920
 Wind calm
 Ground visibility 4000 M
 Mist
 Clouds: 1-2/8 at 400 FT/GND, 3-4/8 at 800 FT/GND
 5-7/8 at 1200 FT/GND
 Temperature 4 °C, dewpoint 4 °C
 QNH 998 hPa
 TEMPO ground visibility 5000 M.

Wind at 4000-5000 FT in the Zurich approach sector: 270°/20 KT

ANALYSIS

Airmanship

AXX032: The unsuccessful approach and subsequent inaccurate missed approach by the Macedonian aircraft appears to have been due to an accumulation of various elements. There was, firstly, an incorrect manipulation of the autopilot by the co-pilot with the result that, after overshooting the localizer, the aircraft initially continued with the last heading of 160° instructed by the air traffic controller before, due to the intervention of the CMD, the ILS was switched to the autopilot, whereupon the aircraft again approached the localizer with a heading which was now 120° (according to written information from the CMD). At this point, the autopilot obviously switched off again without any preliminary warning and this again caused the aircraft to overshoot the localizer towards the east. It then had to be manually controlled by the co-pilot. During the missed approach, now instructed in good time by the CMD, the co-pilot did not succeed in stabilising the aircraft on the runway centre line. Instead, the MD80 overshot the localizer once again towards the west and soon after this, started to climb beyond 4000 FT to 4700 FT, disregarding a contrary clearance. The CMD asserts that the aircraft continued to climb at a relatively high rate and therefore exceeded the cleared altitude of 4000 FT even before the co-pilot could reconnect the autopilot and input the corresponding flight parameters (level and heading). This also explained why AXX032 was late in complying with the instructed left turn to a heading of 020°.

Overall, there appears to be a clear lack of training on the part of the co-pilot of AXX032. The CMD did indeed instruct the missed approach in good time after recognising the unstabilised approach, which was outside the tolerances. An earlier intervention, or coaching of the F/O, might still have made successful the approach.

SWR422: According to his statement, the CMD of the Swissair aircraft had perceived the intruder (AXX032) on the TCAS (Traffic Collision Avoidance System). It approached in a very unstable manner from varying directions. It was approximately 700 FT above his own aircraft. Instead of undertaking a further steep climb in accordance with the TCAS-RA, or to stabilise the climb at 4000 FT in accordance with the clearance by the air traffic control, they preferred to flatten the climb and descend slightly until the danger was past.

The reaction of the Swissair crew appears to have been expedient and professional.

Air traffic control

Approach controller: The tactic of the approach controller consisted in preparing AXX032 with a first heading instruction of 220° (starting from 250°) for the intercept with the localizer in order to then guide AXX032 in a second step and at a relatively acute angle of 020° onto the localizer. This tactic has the advantage that it permits a very exact positioning of the radar-guided aircraft to the localizer. At high traffic densities, this facilitates the attainment of a high approach frequency. On the other hand, the method implies an increased expenditure of effort in terms of radio telephony communications and very precise work in order not to miss the correct moment for turning into the intercept heading.

In the present case, the approach controller permitted AXX032 to turn too late onto the heading of 160° intended for intercepting the localizer. The relatively high speed of 210 KN instructed by APE made things additionally difficult. Under these circumstances, overshooting the localizer was unavoidable and could have been foreseen. It would have been useful for the APE to have indicated this impending overshoot to the pilots, along the lines of "taking you through the localizer"; distance information would also have been useful at this point, particularly since the Macedonian aircraft, manufactured in 1981, was not equipped with modern FMS (flight management system) equipment, which provides the pilot with detailed information on the actual position.

Again, the question from the APE: "Are you established?", when AXX032 was approximately 1 NM from the localizer, was not very helpful. Instead of this, active support to the crew, along the lines of: "AXX032, you are 1 NM right of the localiser, turn left heading 120° to return to the localizer" would have been more useful.

Despite these small inadequacies of the approach control, the Avioimpex crew should have been able to fly the missed approach procedure reasonably accurately. These inadequacies are therefore of, at most, marginal importance as a cause of the incident.

The traffic volume between 09:15 and 09:45 UTC amounted to some 26 movements per hour. This is an amount which could really be handled satisfactorily, given the configuration of the approach control at the time of the incident (two approach controllers but no final controller).

Aerodrome controller: In this difficult situation, in which he had to ensure separation between AXX032 and two other aircraft in instrument meteorological conditions, the aerodrome controller reacted expediently and rapidly.

The runway layout in Zurich

In Part 4, "Approach control services", in their document 4444-RAC/501 – "Rules of the air and air traffic services" – ICAO recommends, under the heading "Separation of departing aircraft from arriving aircraft", that take-offs should be spaced based on time relative to arrivals (when different runways are used). The requirements with respect to the spacing in time are higher when the departure direction is less than 45° from the reciprocal value of the approach direction. In this case, no departures

are permitted within 5 minutes of an arrival. The two runways, 28 and 14, in question here, are angled at 41°. ICAO also specifies that the responsible authorities can establish different regulations. There is no information available suggesting that the responsible Swiss authorities have issued regulations for the present case which differ from the ICAO recommendation. In practice, Runway 14 (for arrivals) and 28 (for departures) are operated simultaneously even in the case of instrument meteorological conditions (IMC).

In any event, the incident would not have occurred if the ICAO recommendations had been followed.

CAUSE

The incident may be attributed to the following:

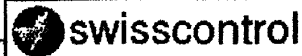
- The Pilot Flying of AXX032 flew the missed approach manoeuvre to Runway 14 very inaccurately and, in consequence, arrived 1 NM to the right of the runway centre line.
- The departure of SWR422 was not spaced in time relative to the arrival of AXX032.

SAFETY RECOMMENDATION

Expedient regulations for spacing departures relative to arrivals should be established by the responsible authorities on the basis of the ICAO recommendations.

Berne, 22 February 2002

Aircraft Accident Investigation Bureau



Analysis: atir axx032 of december 28, 2000 Time [UTC]: 28.12.2000 09:22:34

APE: "AXX032, reduce to 210 knots."

SXC
APP

SWR3581
a49
200 S

30

a50 09:16:06
a47 09:16:26
a44 09:16:46
a40 09:17:06
a40 09:17:46
a40 09:18:07
a40 09:18:27
a40 09:18:47
a40 09:19:08

APE: "AXX032, turn left heading 220."

APE: "AXX032, left heading 160, cleared ILS 14."

APE: "AXX032, maintain speed two hundred."

09:19:28
a39
09:19:28
09:19:28
a40
09:20:08

APE: "AXX032, are you established?"

032: "We are receiving the ILS now, turning back."

APE: "AXX 032, turn left to establish."

032: "Left to establish, AXX032."

APE: "AXX032, would you like a new approach?"

032: "Negative, ah, negative."

CRX875
a35
300 M
a37 09:20:29
a35 09:20:49
a31 09:21:09
a35 09:21:30
a39 09:21:59

ADALIK

ZH500

ZH801

ZH502

30

BRAG

ZH800

SWR422
a35
160 11

SWR120
a35
270 L

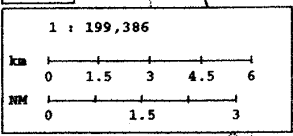
H LK3447
a19 160 M
120 L

SWR490
a50 057
09:22:09 11
a14
a46
a43
a41

SWR3624
a14
a46
a43
a41

09:22:12
09:22:05
09:21:56
a399:21:48

09:22:40
09:22:24 11



ZH825

Name: nicky scherrer sc-zzd Eval Date: 05.01.2001



Analysis: atir axx032 of december 28, 2000 Time [UTC]: 28.12.2000 09:22:09

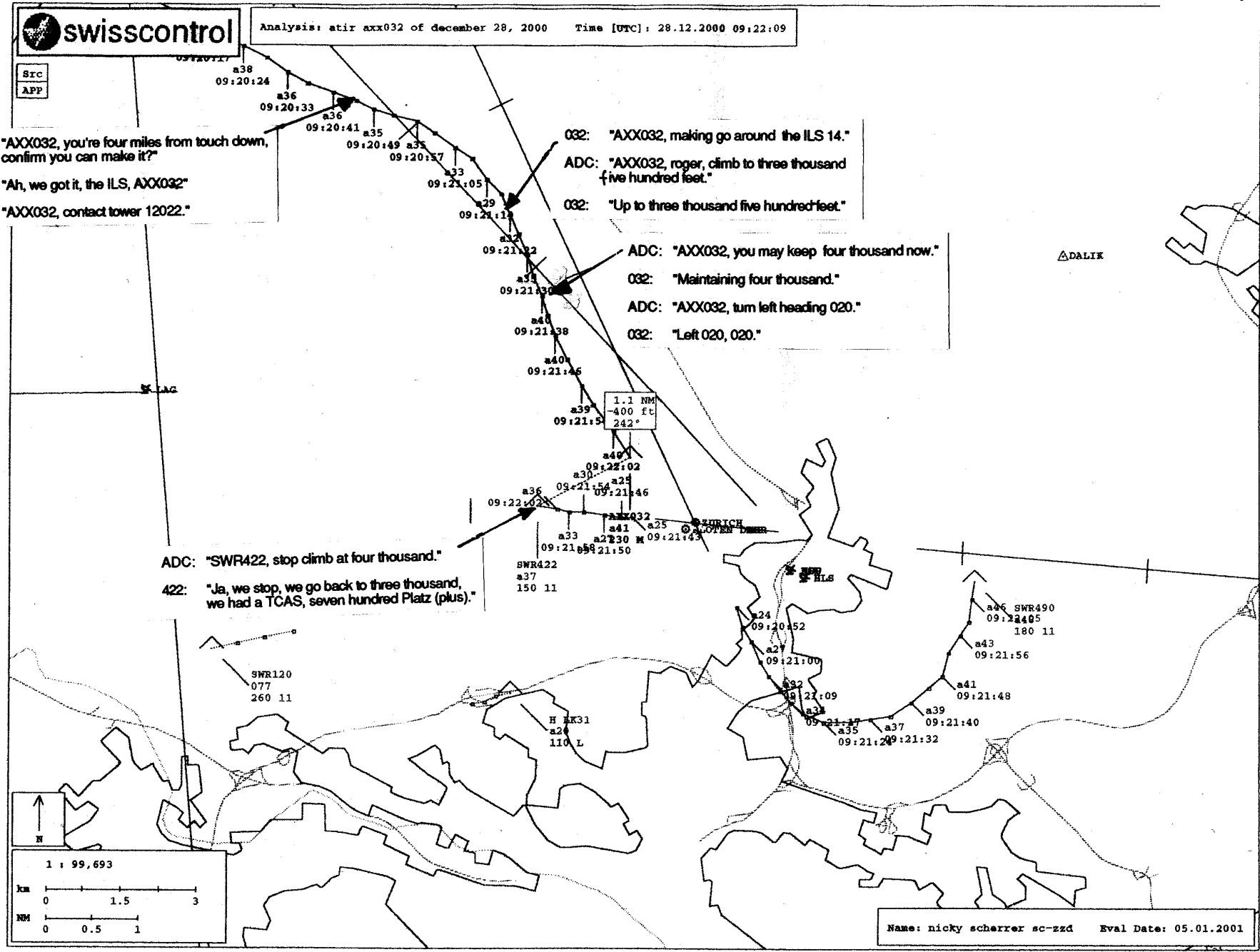
Src
APP

APE: "AXX032, you're four miles from touch down, confirm you can make it?"
032: "Ah, we got it, the ILS, AXX032"
APE: "AXX032, contact tower 12022."

032: "AXX032, making go around the ILS 14."
ADC: "AXX032, roger, climb to three thousand five hundred feet."
032: "Up to three thousand five hundred feet."

ADC: "AXX032, you may keep four thousand now."
032: "Maintaining four thousand."
ADC: "AXX032, turn left heading 020."
032: "Left 020, 020."

ADC: "SWR422, stop climb at four thousand."
422: "Ja, we stop, we go back to three thousand, we had a TCAS, seven hundred Platz (plus)."



Name: nicky scherrer sc-zzd Eval Date: 05.01.2001

**skyguide**Flugsicherungsbetrieb Zürich
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Transcript of Original Tape Recording

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Subject **ATIR AXX032 of december 28, 2000**

Abbreviations and Call Signs	032	→	AXX032	→	Impex (Avioimpex, Macedonia)
	422	→	SWR422	→	Swissair
	APE	→	Zurich APP East		
	ADC	→	Zurich TWR / ADC		

Frequency Zurich Arrival East / APE 120,750 MHz
Zurich Tower ADC / ADC 120,225 MHz (Twinfrequency with 118,000 MHz)

The signer certifies the completeness and correctness of the present transcript.

skyguide

Flugsicherungsbetrieb Zürich


Nicky Scherrer

From	To	Time UTC	Communications	Observations
APE	032	09:14:48	AXX032, turn left heading 250, descend to four thousand feet	
032	APE	:53	Left 250, down to four thousand feet, AXX032	
APE	032	:15:24	AXX032, reduce to 210 knots	
032	APE	:28	Reducing 210 knots, AXX032	
APE	032	:18:13	AXX032, turn left heading 220	
032	APE	:16	Left heading 220, AXX032	
APE	032	:50	AXX032, left heading 160, cleared ILS 14	
032	APE	:55	Left heading 160, cleared ILS 14, AXX032	
APE	032	:19:15	AXX032, maintain speed two hundred	
032	APE	:21	Speed two hundred knots, AXX032	
APE	032	:47	AXX032, are you established?	
032	APE	:50	We are receiving the ILS now, turning back	
APE	032	:52	AXX032, turn left to establish	
032	APE	:55	Left to establish, AXX032	
APE	032	:20:05	AXX032, would you like a new approach?	
032	APE	:07	Negative, ah, negative	
APE	032	:09	AXX032, descend three thousand five hundred feet	
032	APE	:13	Down three thousand five hundred feet	
APE	032	:43	AXX032, you're four miles from touchdown, confirm, you can make it?	
032	APE	:48	Ah, we got it, the ILS, AXX032	
APE	032	:52	AXX032, contact tower 12022	
032	APE	:55	20, 20, 22, bye	

120,22 (and 118,0 as twinfrequency)

From	To	Time UTC	Communications	Observations
ADC	422	09:20:41	SWR422, wind calm, cleared take-off runway 28	
422	ADC	:45	Cleared take-off 28, SWR422	
032	ADC	:21:20	AXX032, making go around the ILS 14	
ADC	032	:24	AXX32, roger, climb to three thousand five hundred feet	
032	ADC	:28	Up to three thousand five hundred feet	
ADC	032	:38	AXX32, you may keep four thousand now	
032	ADC	:41	Maintaining four thousand	
ADC	032	:45	AXX032, turn left heading 020	
032	ADC	:50	Left 020, 020	
ADC	422	:55	SWR422, stop climb at four thousand	
032	ADC	:22:00	That's four thousand AXX032	
ADC	422	:05	SWR422, stop climb at four thousand	
422	ADC	:06	Ja, we stop, we go back to three thousand, we had a TCAS „seven hundred Platz“*	* this sentence is only readable on 118,1
ADC	422	:08	Yes, it,s just crossing behind you	
422	ADC	:13	Roger	
032	ADC	:14	Okay, returning back to four thousand	
ADC	032	:17	...*, AXX32	* unreadable
ADC	032	:22	AXX32, maintain four thousand feet , please	
ADC	032	:25	AXX32, maintain four thousand feet	
032	ADC	:28	Returning back to four thousand, now four thousand five hundred descending	
ADC	032	:31	Thank you, AXX32, turn left heading 020	
032	ADC	:35	Left 020	
ADC	422	:38	SWR422, climb to flight level 80	
422	ADC	:42	We got the level 80, SWR422	
ADC	422	:45	correct	
ADC	422	:52	SWR422, contact departure, „adieu“	
422	ADC	:54	„Adieu“, we have to file a report about this TCAS, SWR422	
ADC	422	:57	Okay, „merci“	

- end -

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Transcript of Original Tape Recording

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Subject **ATIR AXX032 of december 28, 2000**

Abbreviations 032 → AXX032 → Avioimpex
and Call Signs APE → Zurich Arrival East

Frequency Zurich Arrival East / APE 120,75 MHz

The signer certifies the completeness and correctness of the present transcript.

Skyguide (formerly swisscontrol)
Flugsicherungsbetrieb Zürich



Nicky Scherrer

From	To	Time UTC	Communications	Observations
APE	032	09:29:45	AXX032?	
032	032	:46	Go ahead	
APE	032	:47	How come, you didn't look on the localizer on the first approach? Do you have any navigational problems, or operations normal?	
032	APE	:50	Operation normal	
APE	032	:52	Okay, thank you	

- end -

Amendment to transcript:
ATIR AXX032 of december 28, 2000