



Final Report of the Aircraft Accident Investigation Bureau

concerning the incident (Airprox)

between TAP5327 and CRX3554

on 1 December 2001

on the ground, Zurich Airport

According to art. 22 – 24 of the Ordinance relating to the Investigation of Aircraft Accidents and Serious Incidents (VFU), the investigation report dated December 13, 2002 of the Aircraft Accident Investigation Bureau was submitted for examination by the Federal Aircraft Accident Review Board (Review Board). The Review Board declared the investigation report as the final report.

FINAL REPORT

AIR TRAFFIC INCIDENT REPORT (ATIR)

AIRPROX (NEAR COLLISION)

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

The masculine form of names also applies analogously to the feminine form

PLACE/ DATE/TIME On the ground, Zurich airport, 1 December 2001
12:08 UTC

AIRCRAFT TAP5327, Airbus A319, CS-TTM, TAP Air Portugal
Zurich – Lisbon

CRX3554, Saab 2000, (SB20), HB – IYG, Crossair
Zurich - Munich

ATC UNIT Aerodrome Control Zurich

AIR TRAFFIC CONTROLLERS GRO (Ground Controller)

ADC (Aerodrome Controller)

Apron South (Apron Controller)

HISTORY

As cleared by the apron controller, TAP5327 taxied from gate B37 along taxiway Echo (E) in the direction of the taxiway E/runway 28 intersection. When given clearance to taxi, TAP5327 was also instructed to stop before Runway 28. As the aircraft approached runway 28, it was informed by the apron controller that it was "number two" behind a Swissair Airbus 330. This Swissair aircraft was originally docked at gate A43 and taxied via "Inner" and taxiway E likewise in the direction of the taxiway E/runway 28 intersection. It was planned for these two aircraft to take off from runway 16 and they therefore had to cross runway 28 on their way there.

Up to this point, the Portuguese aircraft had correctly confirmed all the clearances by the apron controller. When TAP5327 was approximately in the region between the taxiway intersections E7 and E6, it was instructed by the apron controller to change to the "Zurich Ground" (GND) frequency. This contact with GND was established without delay and, at this initial contact, the ground controller again instructed TAP5327 to stop before runway 28. This clearance was also correctly confirmed by the crew of TAP5327.

Shortly after this and independently of one another, both a second apron controller and the ground controller observed that TAP5327 was about to taxi past the red stop bar before runway 28 and subsequently approach the runway shoulder.

The apron controller assumed that "Zurich Ground" had the situation under control, particularly after she found, slightly later, that TAP5327 had come to rest at the edge of the runway.

For her part, the ground controller immediately, by means of a loud shout, warned the aerodrome controller (ADC) to her right of the obvious intention of TAP5327 to cross. Immediately after this, she found out that the aircraft had come to rest at the runway shoulder.

Shortly before this, the aerodrome controller had given a Saab 2000 of Crossair (CRX3554) clearance to take off. He analysed the dangerous situation arising and came to the conclusion that, because of the advanced take-off run of the Crossair aircraft, aborting the take-off was no longer feasible. This aircraft was approximately in line with taxiway J and in the process of initiating the rotation in order to take off. In consequence, the aerodrome controller permitted CRX3554 to continue the take-off procedure.

TAP5327 finally came to rest, according to unanimous controller statements, with the aircraft nose approximately in line with the runway shoulder.

Although the commander of the Crossair aircraft taking off was aware of the TAP approaching taxiway E during the take-off run, he assumed that this aircraft would stop before runway 28. It was only after take-off that the crew became aware, on the basis of information from air traffic control, of the dangerous situation which had just unfolded. The air traffic control subsequently submitted an ATIR.

FINDINGS

- The incident took place on the ground at the intersection between taxiway E and runway 28.
- Until just before the critical situation, TAP5327 was in radio contact with apron control (Zurich Apron). At the time of the critical approach to Runway 28, it had already made radio contact with ground control (Zurich Ground); a first exchange of information took place.
- CRX3554 was in continuous contact with aerodrome control (Zurich Tower).
- At 12:02:35, TAP5327 obtained clearance from Apron for engine start-up and push back from gate B37.
- At 12:05:20, TAP5327 requested clearance to taxi; this was provided immediately as follows: "TAP5327 taxi via Echo hold short RWY 28". This clearance was correctly confirmed by the crew.
- At 12:06:10, Apron informed TAP5327, the taxiing sequence to be followed as follows: "TAP5327 for your information, you are number two behind the Swissair Airbus 330". This report was confirmed as follows: "Behind Airbus 330 of Swissair, TAP5327".
- At 12:06:55, Apron instructed the TAP to change to the Zurich Ground frequency: "TAP5327, contact Ground 121,9 bye bye". The crew correctly confirmed the change of frequency. At this time, the Portuguese aircraft, according to unanimous statements from the apron controller and the aerodrome controller, was approximately 250 m from the taxiway E/runway 26 stop bars.
- At 12:07:03, the stop bars at the taxiway E/runway 28 intersection were switched on, according to the automatic recording equipment, after they had been previously switched off because of two Swissair Airbus aircraft crossing runway 28.
- At 12:07:10, the Air Portugal aircraft reported to Zurich Ground with: "Zurich Ground, good morning, TAP5327" and immediately obtained the reply: "TAP5327, hold short of RWY 28". The crew confirmed the instruction correctly with: "Holding short RWY 28, TAP5327".
- At 12:07:28, the aerodrome controller cleared CRX3554 for take-off, which had previously been waiting in the take-off position.
- At 12:08:35, the stop bars mentioned were switched off after the ground controller had, shortly before, given TAP5327 clearance to cross runway 28.
- According to the written statement by the commander of TAP5327, the latter was involved in a difference of opinion with his F/O as they approached runway 28 on taxiway E. This difference of opinion involved the question of which of them had to set the next frequency on the second communications set. According to his statement, this discussion led to a lack of concentration. When he had taxied past the stop bars, however, he became aware of his error and immediately brought the aircraft to a halt. According to his statement, they were more than 15 m from the runway shoulder when their aircraft came to rest.
- According to unanimous statements from the apron controller and the aerodrome controller, TAP5327 taxied at the normal, usual speed.

All times indicated in the report follow the UTC format (local time -1)

- Weather: INFO ZULU, LSZH 2250Z
Wind variable, 2 knots
Ground visibility 20 KM
Clouds: 1-2/8 at 400FT/GND, 5-7/8 at 2200FT/GND
5-7/8 at 5000FT/GND
Temperature 10 °C, Dewpoint 8 °C
QNH 1020 hPa
No significant change
- The involved apron controller and air traffic controllers and the two Crossair pilots were in possession of the necessary valid licenses. According to the statement of the Air Portugal TAP, the two pilots of TAP5327 were also in possession of the necessary valid licenses.

ANALYSIS

The organisation of the ground control of aircraft and vehicles at Zurich airport

At Zurich airport, the control of aircraft and vehicles on the apron, on the taxiways to the south of runway 28 and to the east of runway 16, on certain taxiway sections to the north of runway 28 in the region of the new Dock Midfield and in the region of the "Romeo" and "Romeo 8" taxiways and of the "Whiskey" gates is the responsibility of the airport management (UNIQUE Airport Zurich). This service is provided under the radio call sign "Zurich Apron". The precise delimitation of the area of responsibility of APRON relative to that of skyguide, who is responsible for air traffic control, may be seen from the AIP map LSZH AD 2.24.3-1.

From this, skyguide is exclusively responsible for, in particular, the provision of clearance for crossing runways. skyguide usually provides this service under the radio call signal "Zurich Ground".

The two services, "Zurich Apron" and "Zurich Ground", are accommodated in spatially separated operating centers and are provided by apron controllers and air traffic controllers, who are not mutually exchangeable.

The question arises as to whether it is expedient to have this spatial separation between two services who have similar duties that complement one another and who must co-ordinate intensively.

Apron control and ground control / phraseology

The phraseology used by the apron controller and air traffic controller for directing aircraft on the ground plays a decisive role for the safety of the taxiing traffic. Equally important is the correct confirmation (read-back) of the taxiing instructions by the crews and, if appropriate, the correction of erroneous confirmations by the apron controller and air traffic controller.

Approximately 12 cases of runway incursions occurred at Zurich airport in the course of the year 2001. In some of these cases, incorrect interpretation by the pilots of taxiing instructions from the apron controller played a decisive role.

As a consequence of these frequent runway incursions, UNIQUE has incorporated some improvements regarding taxiway markings and changes with respect to the phraseology to be used.

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Further improvements are possible and, as a consequence of the present case, should be initiated soon.

The phraseology used in the present case by the apron controller to the Air Portugal aircraft TAP5327 "FOR YOUR INFORMATION, YOU ARE NUMBER TWO BEHIND THE SWISSAIR AIRBUS 330" could have been misleading. This phraseology could lead to the pilots thinking that they could - as "number two behind ..." - likewise cross the runway located in front of them and follow the aircraft taxiing in front of them. This danger becomes greater if the aircraft taxiing in front is permitted to cross the runway without stopping.

The use of this deviant phraseology is not, however, the cause of the present incident, which may be seen from the written statement of the commander of TAP5327, on the one hand, and, on the other hand, from the following dialogue of the commander with Zurich Ground. In the course of this, Zurich Ground once again expressly instructed TAP5327: "TAP5327, HOLD SHORT OF RWY 28". This instruction was confirmed by TAP5327 in the correct manner.

In all these considerations, it should not be forgotten that the continuous and uninterrupted observation of a taxiing aircraft cannot be expected from either the apron controller or the air traffic controller for capacity reasons. In the final analysis, it is the responsibility of the pilots to follow taxiing instructions obtained in the correct manner.

The instructions of the air traffic controllers were correct and expedient and their reactions to the conditions were correspondingly good.

The aids available for the control of aircraft and vehicles on the ground

For visual control on the ground, taxiways are equipped with the usual taxiway centre lines and markings together with transverse red stop bars, which can be switched on and off, before the runways. In the case of the taxiway E/runway 28 intersection, the warning "RWY AHEAD" is painted on the ground in the foreground in large, exaggerated letters in white on a red background. The taxiway E/runway 28 and taxiway J/runway 28 intersections are additionally equipped in the foreground with two runway guard lights – "WigWag".

Although this marking standard exceeds the requirements of the current Surface Movement Guidance and Control Systems (SMGCS), an **Advanced** Surface Guidance and Control System (A-SMGCS) would, in order to ensure the maximum possible safety under all conditions, be necessary at the Zurich-Kloten airport due to its traffic volume, the layout of the airport and the dominant weather conditions. An essential element of such an A-SMGCS is a runway incursion warning aid. Such an aid would not, in fact, have completely prevented the present incident but it would have drawn attention to the danger of conflict earlier.

skyguide, together with UNIQUE, plans to install such a system under the name **Swiss Airport Movement Area Control System (SAMAX)** with the implementation of a first step in the course of the summer of 2002.

The installation of a SAMAX is also planned for Geneva airport.

The taxiway markings

The taxiway markings at Zurich-Kloten airport are designed in such a way that a single taxiway marking, "Taxiway Echo", leads from the gates on fingerdocks A and B and from the hangar area to before runway 16. This could give the pilots the impr

ession that, when given clearance phraseology such as: "TAP5327 TAXI VIA ECHO ...", they had been given clearance to taxi to before runway 16 even though this clearance, in each case, also contains the clear addition: "HOLD SHORT OF RWY 28".

It may therefore be recommended that a change to the taxiway markings be considered and in such a way that through taxiways to the north of runway 28 carry a taxiway marking different from those to the south of runway 28. The creation of new markings for clearance limits before runway 28 can be considered as a supplement, for example: "TAP5327 TAXI TO POSITION **X-RAY** VIA ECHO".

CAUSE

The incident may be attributed to a momentary inattention of the cockpit crew of TAP5327. As a result the aircraft had taxied past the taxiway E/runway 28 stop bars and approached the runway shoulder in a dangerous manner. This took place in spite of the fact that the stop bars were switched to red and in disregard of the express instructions of both the apron controller and the air traffic controller to stop before runway 28.

SAFETY RECOMMENDATION NR. 288

The Federal Office for Civil Aviation should examine whether a change to the taxiway markings in such a way that through taxiways to the north of runway 28 carry a taxiway marking different from those to the south of runway 28 could be expedient. Additionally more systematic safety might be achieved by the creation of clearance limiting points before the runway to be crossed.

SAFETY RECOMMENDATION NR. 289

The Federal Office for Civil Aviation should initiate that phraseology usages such as "... YOU ARE NUMBER TWO BEHIND..." or "... FOLLOW BEHIND..." when issuing taxiing instructions, sequencing instructions or traffic informations on the manoeuvring area are no longer used.

SAFETY RECOMMENDATION NR. 290

The Federal Office for Civil Aviation should examine whether Apron should repeat the "HOLD SHORT OF RUNWAY..." instruction to aircraft taxiing for take off at the same time when they are sent over to a ATC unit of skyguide.

Berne, 13 December 2002

Aircraft Accident Investigation Bureau

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Transcript of Original Tape Recording

Subject **AIRPROX TAP5327 of December 1, 2001**

Call Signs 5327 → TAP5327 Air Portugal
 3554 → CRX3554 Crossair

Abbreviations ADC → Aerodrome Controller
 GRO → Ground Controller

Frequencies Zurich Tower 118,1 MHz
 Zurich Ground 121,9 MHz

The signer certifies the completeness of the present transcript

skyguide
Flugsicherungsbetrieb Zürich

ZZY

sig. Franz Fischbach

5327 GRO 12:07:10 Zurich ground, good morning, TAP 5327
GRO 5327 :15 TAP5327, hold short of runway 28
5327 GRO :19 Holding short runway 28, TAP5327

1 aircraft in between

GRO 5327 :08:05 TAP5327?
5327 GRO :07 Holding short, 5327
GRO 5327 :10 TAP5327, cross now runway 28
5327 GRO :14 Crossing runway 28, TAP5327
GRO 5327 :24 TAP5327 you should have stopped at the red bar, we'll file a
internal report
5327 GRO :31 5327, thank you
GRO 5327 :09:07 TAP5327, contact apron 12185
5327 GRO :10 Apron 12185, TAP5327, thank you, bye bye

3554 ADC 12:02:20 Zurich Tower, CRX3554, "Grüezi", holding point 28, in sequence
ADC 3554 :26 "Grüezi", CRX3554, behind Adria regional jet, line up runway 28,
departure time zero seven
3554 ADC :31 Roger, behind Adria, Crossair "ääh", line up runway 28, CRX3554

19 aircraft in between

ADC 3554 :07:28 CRX3554, wind calm, cleared for take-off runway 28
3554 ADC :33 Cleared for take-off runway 28, CRX3554

1 aircraft in between

ADC 3554 :08:45 CRX3554?
3554 ADC :48 Departure, CRX3554
ADC 3554 :50 Negative, remain shortly on this frequency
3554 ADC :53 Okay, CRX3554
ADC 3554 :55 "Ähm", I don't know if you noticed the Air Portugal crossed the red
stop bar at taxiway Echo
3554 ADC :09:02 Negative, "äh ja", we remarked this, CRX3554

ADC 3554 12:09:06 Just for your information, we file an internal report on that
3554 ADC :10 Roger, CRX3554

2 aircraft in between

ADC 3554 :51 CRX3554, turn left to Zurich East
3554 ADC :54 Left to Zurich East, CRX3554
ADC 3554 :56 And contact departure, "adieu"
3554 ADC :58 Departure, "schöne Tag", CRX3554
ADC 3554 :10:00 "Merci glichfalls"

- end -