

Final Report of the Aircraft Accident Investigation Bureau

concerning the incident (Airprox)

between SAA274 and SWR265

on 21 November 2001

at EKRIT Holding

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 use of the masculine shall be deemed to include both the masculine and feminine genders.

PLACE/DATE/TIME	EKRI Holding (3.5 NM S/E EKRI) 21 November 2001 05:01 UTC	
AIRCRAFT	1. SAA274	Boeing 747-300 (B743) ZS-SAT South African Airways Johannesburg – Zurich
	2. SWR265	Boeing (Douglas) MD-11 (MD-11) Swissair HB-IWQ Lagos – Zurich
ATC UNIT		Zurich Approach Control
AIR TRAFFIC CONTROLLER	APW	Zurich Arrival West Sector
AIRSPACE	C	

HISTORY

On Wednesday 21 November 2001, SAA274 was on a scheduled flight from Johannesburg to Zurich. At 04:45:09 UTC, the First Officer, who was pilot non flying (PNF), made contact with the air traffic control officer (ATCO) at Zurich Arrival West (APW), on frequency 118.000 MHz. The latter instructed the cockpitcrew of SAA274, who was on RNAV STAR KELIP 3E, to descend to FL130. In addition, after reaching EKRIT holding, the cockpitcrew should expect to wait there until 05:00 UTC, in order subsequently to carry out an approach to runway 16 under radar control. The First Officer of SAA274 acknowledged this instruction correctly.

At 04:56:30 UTC, SAA274, which had in the meantime reached FL130, flew into the EKRIT holding pattern. It was on its first loop approximately 6NM south-west of EKRIT heading east/north-east, when at 04:59:28 the cockpitcrew was instructed by the ATCO to fly heading 050°, to descend to FL100, to increase speed from 180kt to 210kt and to commence the approach to runway 16. The ATCO then allowed the cockpitcrew to further increase speed to 220kt, since he intended to allow SAA274 to be the first aircraft to land.

At 05:00:22 UTC, SAA274 passed through FL133 in a shallow climb, the ATCO, who was receiving a Short Term Conflict Alert (STCA-Alert) on his radar monitor, intervened with the following words: "SAA274, confirm, you're in a descent?" The response of SAA 274 was: "Okay, 274 is descending".

Fifteen seconds later, the minimum separation between SAA274 and SWR265 fell below the required minimum.

On that day, SWR265 was on a scheduled flight from Lagos to Zurich. The aircraft was flying on RNAV STAR BERSU 3E.

At 04:54:43 UTC the First Officer, who was pilot non flying (PNF), made contact with Zurich Arrival West (APW) and stated he was descending through FL180 to FL140 and that he was aware of the current aerodrome weather with the code letter "TANGO". The ATCO answered the pilot of SWR265 by confirming that he had identified the aircraft on his radar monitor.

At 05:00:33 UTC, shortly before SAA274 intersected the flight path of SWR265, which at that time was about 4NM south-east of EKRIT, the pilot of SWR265 indicated that he would carry out a "TCAS climb".

At 05:00:37 UTC SAA274 crossed the flight path of SWR265 ahead of the latter; the two aircraft approached each other to a lateral distance of 0.3NM and a vertical difference of 600ft.

FINDINGS

- At the time of the incident, both SAA274 and SWR265 were in radio contact with Zurich Arrival West Sector on frequency 118.000 MHz.
- Both aircraft were flying according to instrument flight rules (IFR).
- SAA274 was at FL130 in the EKRIT holding pattern.
- SWR265 was at FL140 and was flying in from BASKI on a heading towards EKRIT.
- SAA274 and SWR265 were in Class "C" airspace.
- The CMD of SAA274 was pilot flying (PF) and the First Officer pilot non flying (PNF).
- The CMD of SWR265 was pilot flying and the First Officer pilot non flying.
- The pilots of SAA274 received both an Airborne Collision Avoidance System – Traffic Advisory (ACAS-TA) and a Resolution Advisory (ACAS-RA).

- The pilots of SWR265 also received an ACAS-TA and an ACAS-RA.
- Although it was still dark, Visual Meteorological Conditions (VMC) applied.
- The pilots of SAA274 had visual contact with SWR265.
- The pilots of SWR265 observed the position lights of SAA274 even before the ACAS alarms.
- The CMD of SWR265 assessed the risk of collision as not very high in view of the fact that they always had visual contact with SAA274.
- Neither SAA274 nor SWR265 received traffic information from the ATCO.
- The autopilot of SAA274 ZS-SAT was the "SPZ-1 / Honeywell Triple Channel" model.
- Set up Auto flight panel SAA274 in EKRIT holding pattern:

Autopilot in command	A
NAV Mode Switch	HDG
Speed Mode Switch	OFF
ALT Mode Switch	ALT SEL
FLT Mode Annun Panel	ALT SEL GREEN
Auto Throttle Speed Sel	180kt
Auto Throttle Mode Select	SPEED
- At 04:59:28 UTC, the ATCO issued the following instruction to SAA274:
 "SAA274, fly heading 050, descent flight level one hundred, speed two ten, landing runway 16".
 According to information from the CMD of SAA274 the following set-up was initiated on the Auto flight panel:
 - Turned HDG bug onto 050°
 - Dialled 10 000 into ALT SEL Window
 - Selected V/S on Speed Mode Selector
 - Selected V/S –500 on Vertical Speed Switch
 - Checked ALT Sel armed
 - Dialled 210kt into Auto Throttle Speed Selector

ANALYSIS

The pilots of SAA274 flew their aircraft to the EKRIT intersection a few minutes before 05:00 UTC and were instructed by the ATCO to fly into the EKRIT holding pattern. Only at 05:00 UTC was the ATCO allowed to issue the instruction to leave the holding pattern and commence an approach to runway 16. The ATCO expected SWR265, which was approaching the EKRIT intersection from the south-east, to be above this waypoint at almost exactly 05:00 UTC.

At 04:59:28, SAA274, which had just completed a left turn and was again flying in an east/north-easterly direction, was assigned radar heading 050° by the ATCO in order to vector it to the instrument landing system (ILS) for runway 16. At the same time he instructed the pilot to descend to FL100 and to increase speed first from 180kt to 210kt and later to 220kt. The ATCO's intention was to vector SAA274 to the ILS runway 16 ahead of SWR265. The result of this concept was that the two aircraft, which had the correct standard vertical separation of 1000ft, would cross each other a few miles south-east of EKRIT.

The sequence of operations which the pilots of SAA274 used to make the various entries in the Auto flight panel could not be definitively verified after the event. The autopilot was probably confronted with executing several commands within a short time.

It must be assumed that the autoflight system computer was briefly overloaded because it had to process too many informations at the same time.

The type SPZ-1 / Honeywell Triple Channel autopilot is an analogue autopilot which can quickly become overloaded if it is operated inappropriately. This allows the conclusion that the auto throttle was temporarily no longer issuing entirely accurate instructions to the engines during the additional entry (acceleration to 210kt). The CMD of SAA274 reported that the engine power at the beginning was Maximum Continuous Thrust (MCT). The resulting "pitch-up-moment" could clearly not be trimmed sufficiently quickly by the autopilot, leading to the unnoticed shallow climb.

However, even a autopilot of older manufacture such as the type SPZ-1 / Honeywell Triple Channel must be able to handle such situations, given appropriate operation (step-by-step entries).

In the initial moments, the pilots of SAA274 had not realised that their aircraft was beginning to climb slightly. However, when they passed through FL133, they were made aware of the situation by the ATCO via the radio message "SAA274, confirm, you're in a descent?" At the same time, after they had already detected the problem by virtue of an ACAS-TA, the pilots received an ACAS-RA because of the approaching SWR265. According to his own statements, the CMD was directing his attention to his ACAS equipment and the First Officer was observing the intruder. However, both pilots needed a brief moment to realise that their aircraft was not descending but was in a shallow climb.

The CMD (pilot flying) then immediately switched off the autopilot and initiated a manual descent. The B747 then began to descend again from an altitude of FL134.

At that time, the pilots of SWR265 had already established visual contact with SAA274 and had already received an ACAS-TA. When SAA274 passed through FL133 and was made aware of the situation by the ATCO, SWR265 was still approximately 1.3NM away from SAA274 at the 2 o'clock position.

This was the point at which SWR265 received an ACAS-RA with the instruction to climb. At 05:00:33 UTC the First Officer informed ATC: "SWR265, TCAS climb".

SWR265 then climbed to FL148.

A few seconds later the two aircraft crossed. This remedied the situation between the two aircraft and the remainder of the approach continued without incident.

CAUSE

The incident is very probably attributable to following points:

1. Inappropriate inputs into the autopilot by the cockpitcrew.
2. Missing closed loop between the cockpitcrew.

Transcript of Original Tape Recording

Subject **Airprox SAA274 of November 21, 2001**

Call Signs	274	→	SAA274	→	Springbok (South African Airways)
	265	→	SWR265	→	Swissair
	135	→	SWR135	→	Swissair
	APW	→	Zurich Arrival West Sector		

Frequency Zurich Arrival West Sector / APW 118.000 MHz

The signer certifies the completeness of the present transcript

skyguide
Flugsicherungsbetrieb Zürich

ZZD
i.V. ZC/cb

sig. Nicky Scherrer
i.V. Bettina Comte

From	To	Time UTC	Communication	Observation/various
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274	APW	04:45:09	Zurich Arrival, SAA274, good morning	
APW	274	:13	good morning, SAA274, you're identified, cleared flight level 130, expect to join the holding until on the hour and then, it will be Radar vectoring for the ILS approach runway 16	
274	APW	:27	okay, we're cleared level 130, expect into the hold, on the hour vectors for 16, SAA274	
APW	274	:34	correct	

3 aircraft in between (twin frequency, only controller readable)

265	APW	:54:43	„Züri, grüezi wohl“, SWR265, level 180, descending level 140, M D eleven with Tango	
APW	265	:51	SWR265, you're identified	
265	APW	:54	thank you	
135	APW	:59:00	„Züri Arrival, guete Morge“, SWR135, level 190, descending 150 to EKRI and hold, ATIS „Züri“ information Victor	
APW	135	:10	SWR135, you're identified, until further proceed on the standard routing flight level 150, might be a short delay, then it might be landing on runway 16	
135	APW	:21	okay, standard routing for 16, SWR135	
APW	274	:28	SAA274, fly heading 050, descend flight level one hundred, speed two ten, landing runway 16	
274	APW	:35	down to level one zero zero and heading 050, SAA274	
APW	274	:40	that's correct; what is your current speed?	
274	APW	:43	one eight zero knots	
APW	274	:45	okay, increase to two twenty	
274	APW	:48	two twenty knots now, SAA274	
APW	274	05:00:22	SAA274, confirm, you're in a descent?	
274	APW	:29	okay, 274 is descending	
265	APW	:33	SWR265, TCAS climb	
APW	265	:37	265, climb approved	

From	To	Time UTC	Communication	Observation/various
APW	274	:40	SAA274, your Mode charlie is climbing, confirm, you are in a descent?	
274	APW	05:00:45	we are in a descent, we do...thousand one hundred feet	
APW	274	:48	and your current altitude?	
274	APW	:50	through level 129 now	
APW	274	:52	*....	*controller clicks on mike

- end of incident -

additional questions:

APW	274	05:01:35	and SAA274, would you confirm, as I gave you the descent clearance, the aircraft did not start a climb but started a descent?	
274	APW	:45	it was a slight climb and then we started a descent	
APW	274	:49	well, according the Mode charlie, we had an indication of 134, so, did you overshoot your level by four hundred feet?	
274	APW	:58	oh, not, not, it, it, may be a hundred feet, and then it started a descent	
APW	274	:02:05	okay	
265	APW	:10	and the SWR265, we had an indication six hundred feet separation to the Springbok	
APW	265	:17	„ja“, that's also, ---, I gave him the descent clearance, the Mode charlie indication started a slow climb and I also had an indication of 134, as I confirmed, that he was descending; would you file a TCAS report on this?	
265	APW	:32	yes, SWR265, affirm	
APW	265	:35	okay, I'll do the same, then	

- end -

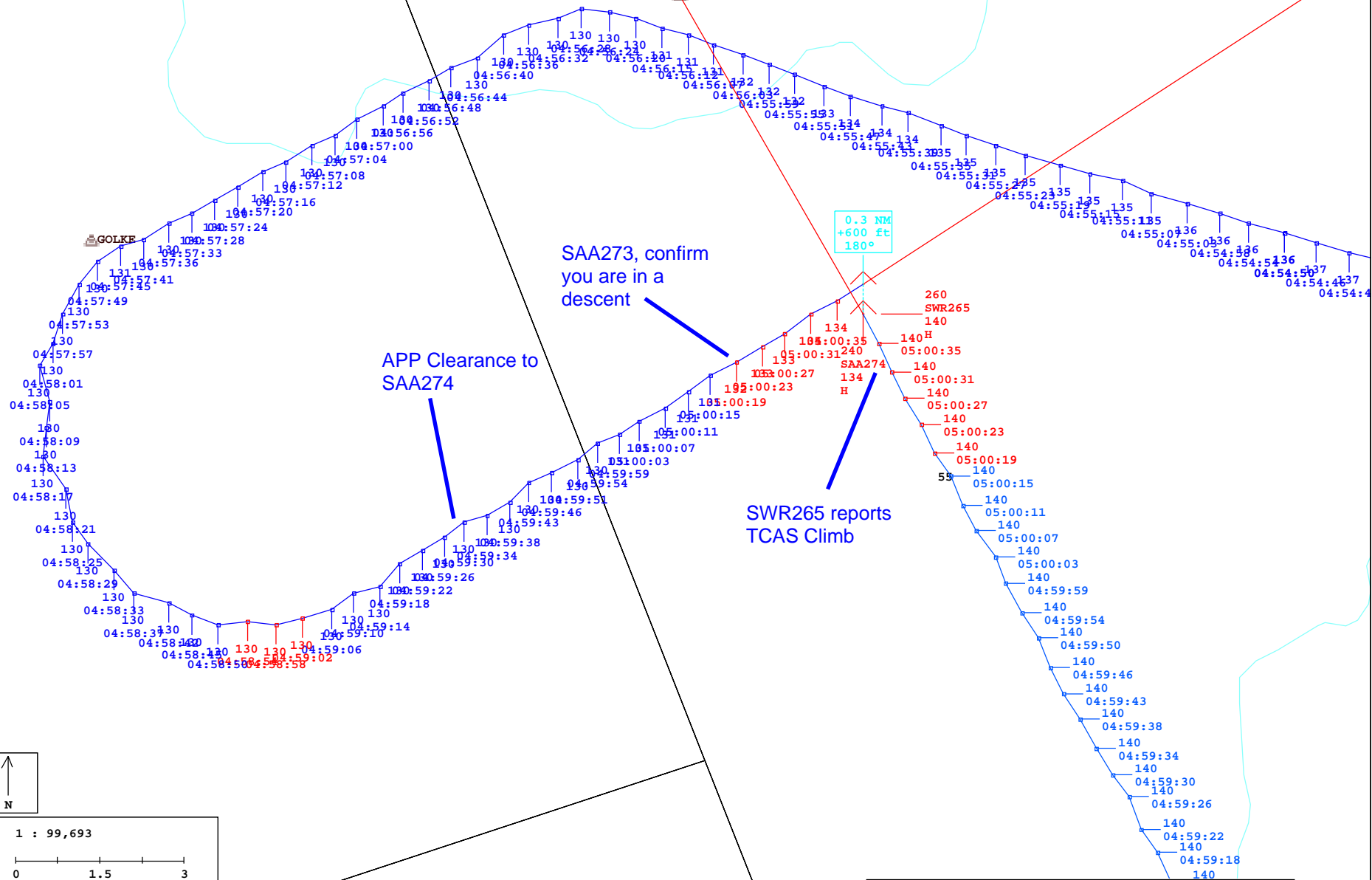
Src
APP

Analysis: TCAS SAA274 of november 21, 2001 Time [UTC]: 21.11.2001 05:00:41



EKRIT

GOLKE

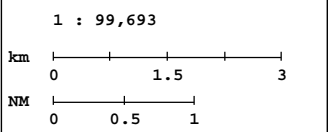


SAA273, confirm you are in a descent

APP Clearance to SAA274

SWR265 reports TCAS Climb

0.3 NM
+600 ft
180°



Name: Bettina Comte sg-zc/cb Eval Date: 28.11.2001