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Aircraft accident investigation bureau

Final Report No. 1907 by the Aircraft Accident Investigation Bureau

concerning the serious incident (airprox)

between BRT 695, BAe146-200, G-GNTZ

and SWR 1499, A320, HB-IJL

on 2 December 2004

Zurich Airport, on the ground

Bundeshaus Nord, CH-3003 Berne

Final Report

This report has been prepared solely for the purpose of accident/incident prevention. 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.

All times in this report are in UTC format (local time -1h)

Place/date/time	Zurich Airport, 2 December 2004, 19:40 UTC
Aircraft	BRT 695, BAe146-200, G-GNTZ, British Airways City Express
	Zurich (LSZH) – Manchester (EGCC)
	SWR 1499, A320-214, HB-IJL, Swiss International Air Lines
	Prague (LKPR) – Zurich (LSZH)

Crews	BRT 695	CMDR
		FO
	SWR 1499	CMDR
		FO

ATC unit	Control Tower
Air traffic controllers	Aerodrome Controller
	Ground Controller
	Departure Controller
Airspace	D (on the ground)

1. History

1.1 History of the flight

On the evening of Thursday 2 December 2004, SWR 1499, an Airbus 320, was on a scheduled flight from Prague to Zurich. After an instrument landing system (ILS) approach on runway 14, the aircraft landed at 19:37 UTC.

At their request and by agreement with the aerodrome controller (ADC), the crew of SWR 1499 vacated runway 14 at the end of the runway via taxiway H3. They were also instructed to contact apron control after vacating the runway.

After changing frequencies, the crew received an instruction from apron control to taxi via taxiways KILO, BRAVO, JULIET and to hold short of runway 28. They were then informed that they should expect a short delay because of traffic problems on the south side of runway 28. The commander (CMDR) of SWR 1499 stated that at the time he had noticed an aircraft in the take-off position on runway 28.

In the course of the taxiing procedure, SWR 1499 came to a halt short of runway 28 at 19:39:06 UTC according to the radar recording. At 19:39:27 UTC the apron control instructed the crew to switch to the ADC frequency. SWR 1499 confirmed this instruction.

In the meantime, BRT 695, a BAe146, had left stand H88 and was taxiing in accordance with apron control's instructions to the holding point for runway 28. On the way, the frequency change to ADC took place. The flight crew intended to make a scheduled flight from Zurich to Manchester.

On initial contact with the ADC air traffic controller (ADC ATCO), at 19:36:13 UTC the crew of BRT 695 were informed as follows. *"British six nine five tower good evening departure in five minutes"*. Eighty-five seconds later, the ADC ATCO cleared them to taxi to the take-off position on runway 28 (line-up clearance). BRT 695 reached the take-off position at about 19:39:26 UTC.

At 19:39:38 UTC, SWR 1499 again reported to the ADC ATCO: *"tower swiss one four niner niner with you again Juliet holding short of two eight"*. The ADC ATCO then answered at 19:39:42 UTC with the clearance to cross the runway: *"swiss one four nine nine taxiway Juliet cross runway two eight contact apron one two one decimal seven five good-bye"*.

The crew of SWR 1499 confirmed this instruction at 19:39:48 UTC with the words: *"crossing two eight on Juliet on the other side one two one seven five Swiss one four niner niner, gute Nacht"*.

Immediately after the end of this read-back from SWR 1499, the ADC ATCO cleared BRT 695 to take-off from runway 28 at 19:39:53 UTC.

The ADC ATCO stated: *"During the read-back by SWR 1499 a wait-cancelled sounded from the loudspeaker between ADC and GRO (synthetic voice). This didn't make any sense to me, because originally there was a time-release for the departure of BRT 695"*. He continued: ... *"I wanted to know what was going on at DEP and therefore asked GRO to clarify this. GRO gave me no further information. I allowed myself to be diverted by the wait-cancelled"*.

In this incident, the wait/wait-cancelled coordination procedure was applied. The DEP ATCO manually replaced the time-release generated by the TACO by a wait-release, which he then immediately cancelled with a wait-cancelled.

According to statements by the departure controller (DEP ATCO), this wait procedure, followed immediately by wait-cancelled, had previously been a convenient and efficient possibility for him to speed up traffic without disturbing the ADC ATCO by telephone.

He further stated that he had not applied the procedure often and not in series. Until this incident, he had not been aware that when it had been applied there had been difficulties or misunderstandings, otherwise he would not have applied it. However, he has not been applying it since this incident.

The ADC ATCO mentioned that he was experiencing this type of coordination for the first time.

The CMDR of SWR 1499 stated that at the time the first officer (FO) was giving the read-back, the red stop-bar lights were switched off and the green taxiway centreline lights were switched on. He also stated: *"I then started my roll. After the nose of the aircraft had passed the stop bar (the cockpit position was approximately level with the stop bar), I heard ADC clear BRT695 for take off. BRT 695 read it back, switched on the landing lights and started its take-off roll."*

The ADC ATCO stated: *"After the take-off clearance to BRT 695 I first gave a landing clearance to an aircraft approaching runway 14. During the read-back from this crew, I realised that my take-off clearance to BRT 695 was not correct. I realised that I had given a crossing clearance and a take-off clearance at the same time for the same runway. The green taxiway lights also contributed; they had been activated by me as a result of switching off the red stop bar"*.

A little later, at 19:40:07 UTC, the crew of SWR 1499 again reported to the ADC ATCO: *"Tower Swiss one four niner niner we just stop off the runway you confirm?"* The ADC ATCO then instructed the crew in conformation of this: *"One four niner niner hold short of runway two eight hold position"*.

After BRT 695 had continued its take-off procedure and had lifted off from runway 28, the ADC ATCO gave SWR 1499 another clearance at 19:40:42 UTC to cross the runway and contact apron control on frequency 121.750 MHz. At 19:41:10 UTC, the ADC ATCO instructed BRT 695 to switch to departure control. According to information from the BRT 695 flight crew, communicated to the AAIB via the Air Accidents Investigation Branch (AAIB) UK, this crew had not noticed the incident. On this flight, the commander was undergoing line training under the supervision of a training captain.

1.2 Coordination between departure control and aerodrome control

TACO – tower approach communication – is a screen display of “electronic” control strips in the TWR and in the APP. The system is useful to air traffic controllers primarily for handling the traffic for which they are responsible, and secondly for silent coordination of the approach sequence between the approach control sectors and the tower and for silent coordination of the departure sequence between the tower and departure control.

TACO's functionalities also include calculation of the time separation between consecutive departures, based on a standardised matrix. The proposed take-off intervals are displayed in steps of whole minutes (rounded off). The ATCOs are thus able to change the displayed take-off intervals manually.

The matrix in TACO can issue a "wait", depending on the constellation of the departure sequence. This standardised proposal occurs in cases in which the performance of the aircraft flying in front cannot be accurately estimated. In this case the TWR ATCO must wait until the ATCO at departure control clears the "wait" in the TACO display by clicking with the mouse. In the process, an audio "wait cancelled" signal is generated in the tower.

With the wait function, the ATCO at departure control has the possibility of signalling to the ATCO in the tower that take-off clearance must not be given. In this case, an audio "wait" signal sounds in the tower.

In addition, a wait-release can also be entered manually. A wait-release must always be cancelled manually (wait cancelled).

1.3 Weather: according to skyguide

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ATIS ZURICH 02.12.2004 19:39:54 UTC
INFO YANKEE                      LDG RWY 14 ILS APCH. DEP RWY 28
QAM LSZH 1920Z 02.12.2004
030 DEG 6 KT
VIS 4200 M
LIGHT RAIN
CLOUD FEW 3800 FT
+01/+01
QNH 1012 ONE TWO
QFE THR 14 962
QFE THR 16 963
QFE THR 28 962

BECMG VIS 3000 M
NOSIG

TRL 75 DAY 0622 NGT 1618      QNH TICINO 1740Z: 1017 HPA
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2. Analysis

2.1 Air traffic control

After SWR 1499 had landed on runway 14, the aircraft was guided by apron control as far as JULIET taxiway short of runway 28 and handed over to ADC. This corresponded to the usual taxi procedure.

The subsequent rapid chronological sequence under ADC responsibility – clearance to SWR 1499 to cross runway 28 and clearing BRT 695 to take-off from the same runway – is attributable to the fact that the ADC ATCO allowed himself to be diverted by the wait-cancelled message, which surprised him. The ADC ATCO did not consider aborting BRT 695's take-off, because in his assessment SWR 1499 was not on the runway and did not constitute any danger to BRT 695.

At this time the red stop bars were switched off and the green taxiway centreline lights were switched on. SWR 1499 had already started to move and the nose of the aircraft had crossed the stop bar. It was therefore not possible for the ADC ATCO to estimate the exact position of the aircraft with sufficient certainty when SWR 1499 contacted him with the clarifying message (... *"we just stop off the runway, you confirm?"*). It was night-time and it was raining. Based on the SAMAX Radarmonitor, the ADC ATCO could assume, that at least a part of the A320 had already passed the stop bar. BRT 695 had only just started its take-off, so an aborted take-off would have been possible and appropriate.

The instruction to SWR 1499 to cross runway 28 with the simultaneous instruction to switch to the apron control frequency is a current practice in Zurich. According to the wording applied it leaves elbowroom concerning the time to change frequency from tower to apron control. If the flight crew of SWR 1499, according to the used wording in this case, would have obeyed the instruction to change frequency immediately, the risk would have arisen that the ADC ATCO might not have been able to contact them during the crossing manoeuvre and they would not have heard the take-off clearance to BRT 695. The fact that the crew of SWR 1499 were still monitoring the ADC frequency turned out to be a positive factor.

The wait/wait-cancelled procedure applied during this incident by air traffic control was not an official procedure, nor was it part of any training procedure. It was applied only sporadically and by a few ATCOs. It therefore provided an opportunity for misunderstandings, as the present case shows.

2.2 Flight crews

Despite being requested to switch to the apron control frequency, the crew of SWR 1499 continued to monitor the ADC frequency after receiving clearance to cross runway 28.

Thanks to their situational awareness, they were able to monitor the take-off clearance to BRT 695. This then caused them to brake their aircraft abruptly (hard braking) and inform the ADC ATCO accordingly.

The flight crew of BRT 695 did not notice anything concerning the incident.

2.3 ACAS

The ACAS II system is designed for vertical avoiding action in flight and only becomes active when an aircraft is in the air.

3. Conclusions

3.1 Findings

- After landing on runway 14, SWR 1499 was instructed to taxi as far as taxiway JULIET and hold short of runway 28.
- The crew of SWR1499 were informed by apron control of a short delay because of traffic problems on the south side of runway 28.
- The CMDR of SWR 1499 stated that he had noticed an aircraft in the take-off position on runway 28.
- The ADC ATCO instructed SWR 1499 to cross runway 28 and at the same time requested them to change frequency to apron control.
- Immediately after clearing SWR 1499 to cross runway 28, the ADC ATCO cleared BRT 695 for take-off.
- In this incident, the wait/wait-cancelled coordination procedure was applied. This was not a standard coordination procedure and was not part of any training procedure.
- The ADC ATCO stated that he allowed himself to be diverted by the application of the wait/wait-cancelled procedure and that therefore his attention was no longer being applied to runway 28.
- The ADC ATCO did not consider instructing BRT 695 to abort its take-off.
- The flight crew of BRT 695 did not notice the incident.
- At the time of the incident it was night-time and it was raining.
- Thanks to their situational awareness, the flight crew of SWR 1499 noticed BRT 695 starting to take-off and braked hard.
- The crew of SWR 1499 assessed this incident as: "*very high risk of collision*".
- With the clearance to cross runway 28, the red stop bar were switched off and the green taxilines were switched on. SWR 1499 came to a stop with its nose some 3-5 m beyond the stop bar.
- The air traffic controllers and flight crews (as far as is known) were in possession of the necessary licences.

3.2 Cause

The incident is attributable to the fact that air traffic control cleared BRT 695 to take-off on runway 28, even though ATC had shortly before cleared SWR 1499 on taxiway JULIET to cross this runway.

The application of an unauthorised coordination procedure contributed to the incident.

4. Safety recommendation

On 17 January 2005, the Aircraft Accident Investigation Bureau (AAIB) sent a safety recommendation to the Federal Office for Civil Aviation (FOCA). The AAIB recommended to prohibit immediately the application of the non-standard coordination procedure (wait/wait cancelled via TACO, for speeding up the traffic handling), which is neither documented nor instructed. In the meantime, the safety recommendation has been implemented.

Berne, 6 June 2006

Aircraft Accident Investigation Bureau

This report has been prepared solely for the purpose of accident/incident prevention. 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.

**TRANSCRIPT OF TELEPHONY
OR RADIOTELEPHONY COMMUNICATION TAPE-RECORDINGS**

Investigation into the **incident** that occurred on **02.12.2004**

- Subject of transcript: **BRT695 / SWR1499**

- Centre concerned: Swiss Radar Area East

- Designation of unit: Zurich Aerodrome Control

- Frequency / Channel: 118.100 MHz

- Date and period (UTC) covered by attached extract: 02.12.2004
19:33 - 20:00 UTC

- Date of transcript: 9th December 2004

- Name of official in charge of transcription: Claudio DI PALMA

- Certificate by official in charge of transcription:

I hereby certify:

- That the accompanying transcript of the telephony or radiotelephony communication tape-recordings, retained at the present time in the premises of the Analysis Department, has been made, 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.

Zürich, 9th December 2004

Claudio DI PALMA



Abbreviations

<u>Sector</u>	<u>Designation of sector</u>
ADC	- Zurich Aerodrome Control

<u>Aircraft</u>	-	<u>Callsign</u>		<u>Type of acft</u>	<u>Flight rules</u>	<u>ADEP</u>	-	<u>ADES</u>
1499	-	SWR1499	Swiss	A320	IFR	LKPR	-	LSZH
695	-	BRT695	British	B462	IFR	LSZH	-	EGCC
646F	-	SWR646F	Swiss	A320	IFR	LSZH	-	LFPG
564L	-	SWR564L	Swiss	RJ1H	IFR	LSZH	-	LFMN
8866	-	BER8866	Air Berlin	B738	IFR	EDDV	-	LSZH
163H	-	SWR163H	Swiss	A319	IFR	LSZH	-	LIMC
110Y	-	BCY110Y	City-Ireland	B462	IFR	LFPG	-	LSZH
110D	-	SWR110D	Swiss	RJ1H	IFR	LSZH	-	EDDM
275	-	SAA275	Springbok	A342	IFR	LSZH	-	FAJS
432	-	DNM432	Denim	F50	IFR	LIPZ	-	LSZH
49KX	-	SWR49KX	Swiss	A320	IFR	LSGG	-	LSZH

OZEO-dc / 9th December 2004

TRANSCRIPT SHEET

Occurrence: BRT695 / SWR1499 of 02.12.2004



To Col.1	From Col.2	Time Col.3	Communications Col.4	Observations Col.5
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Frequency: 118.100 MHz Zurich Aerodrome Control

ADC	1499	19:33:19	Tower "guete Obig" Swiss one four niner niner established ILS one four	
1499	ADC	:23	Swiss one four nine nine Tower "grüezi" number two	
ADC	1499	:25	One four nine nine	
6 stations in between				
1499	ADC	19:35:25	Swiss one four nine nine wind calm runway one four cleared to land traffic about to vacate	
ADC	1499	:30	Cleared to land äh... one four Swiss one four niner niner is the end available?	
1499	ADC	:34	Affirm	
ADC	1499	:35	Roger we'll take the end thanks	
2 stations in between				
ADC	695	19:36:07	<i>Tower good evening again British six nine five towards äh... the two three hold</i>	
695	ADC	:13	<i>British six nine five Tower good evening departure in five minutes</i>	
ADC	695	:16	<i>Okay</i>	
646F	ADC	:19	Swiss six four six Foxtrot contact Departure good-bye	
ADC	646F	:21	"Ade"	
ADC	564L	:35	Tower "guete Obig" Swiss five six four Lima	
564L	ADC	:39	Swiss five six four Lima Tower "grüezi" departure four four	

TRANSCRIPT SHEET

Occurrence: BRT695 / SWR1499 of 02.12.2004



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>
ADC	564L	19:36:43	Four four	
ADC	8866	:48	"Zürich Tower guten Abend" Air Berlin eight eight six six established ILS one four six miles out	
8866	ADC	:53	"Grüezi" Air Berlin eight eight six six Tower number one	
163H	ADC	:56	Swiss one six three Hotel wind zero one zero degrees three knots runway two eight cleared for take-off	
ADC	163H	19:37:01	Cleared for take-off runway two eight Swiss one six three Hotel	
1499	ADC	:23	Swiss one four nine nine when vacated one two one decimal eight five	
ADC	1499	:27	When vacated one two one eight five äh... Swiss one four nine nine "bis später"	
8866	ADC	:30	Air Berlin eight eight six six wind is calm runway one four cleared to land traffic is about to vacate	
ADC	8866	:35	Cleared to land one four Air Berlin eight eight six six	
695	ADC	:38	<i>British six niner five number two behind the Swiss RJ line up runway two eight</i>	
ADC	695	:42	<i>Okay after the Swiss RJ line up two eight British six nine five</i>	
163H	ADC	:52	Swiss one six three Hotel contact Departure good-bye	
ADC	163H	:55	"Ade" Swiss one six three Hotel	
ADC	110Y	:57	Tower "schönen Abend" City-Ireland one one zero Yankee with you ILS one four six and a half miles	
110Y	ADC	19:38:02	City one one zero Yankee Tower good evening number two	
ADC	110Y	:05	One one zero Yankee	
110D	ADC	:10	Swiss one one zero Delta wind zero three zero degrees three knots runway two eight cleared for take-off	
ADC	110D	:14	Runway two eight cleared take-off Swiss one one zero Delta	

Signature of person
in charge of transcription :

TRANSCRIPT SHEET

Occurrence: BRT695 / SWR1499 of 02.12.2004



To Col.1	From Col.2	Time Col.3	Communications Col.4	Observations Col.5
564L	ADC	19:39:00	Swiss five six four Lima number two now behind RJ line up runway two eight	
ADC	564L	:05	Behind the äh... RJ on the runway line up two eight behind Swiss five six four Lima	
110D	ADC	:10	Swiss one one zero Delta contact Departure good-bye	
ADC	110D	:12	Departure "adieu" one one zero Delta	
8866	ADC	:29	Air Berlin eight eight six six vacate Hotel one	
ADC	8866	:33	Vacating Hotel one Air Berlin eight eight six six	
ADC	1499	:38	Tower Swiss one four niner niner with you again Juliett holding short of two eight	
1499	ADC	:42	Swiss one four nine nine taxiway Juliett cross runway two eight contact Apron one two one decimal seven five good-bye	
ADC	1499	:48	Crossing two eight on Juliett on the other side one two one seven five Swiss one four niner niner "gute Nacht"	
695	ADC	:53	<i>British six nine five wind zero four XXXXX three knots runway two eight cleared for take-off</i>	unintelligible, could be "zero degrees"
ADC	695	:57	<i>Cleared for take-off runway two eight British six nine five bye</i>	
110Y	ADC	19:40:00	City one one zero Yankee wind is calm runway one four cleared to land	
ADC	110Y	:05	Cleared to land one four City one one zero Yankee	
ADC	1499	:07	Äh... Tower Swiss one four nine nine we just stop off the runway you confirm?	
1499	ADC	:12	One four nine nine hold short of runway two eight hold position	
ADC	1499	:14	Holding position Swiss one four niner niner	
ADC	275	:18	Tower Springbok two seven five good evening	
275	ADC	:23	Good evening hold short of runway... hold	

TRANSCRIPT SHEET

Occurrence: BRT695 / SWR1499 of 02.12.2004



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>
ADC	8866	19:40:27	Air Berlin eight eight six six runway vacated Hotel one	
8866	ADC	:30	Air Berlin eight eight six six one two one decimal eight five	
ADC	8866	:32	One two one eight five, eight eight six six	
ADC	275	:35	And Springbok two seven five hold short runway one six	
275	ADC	:38	Affirm Springbok two seven five hold short of runway one six	
ADC	275	:41	Roger	
1499	ADC	:42	Swiss one four nine nine on Juliett cross runway two eight contact Apron one two one seven five	
ADC	1499	:46	Now crossing two eight on the other side one two one seven five äh... Swiss one four nine nine "gute Nacht"	
ADC	432	:51	Tower good evening Denim four three two is äh... fully... two and a half miles final one four	
432	ADC	:56	Denim four three two	
164L	ADC	:58	Swiss one six four Lima hold position I call you back shortly for departure	
ADC	49KX	19:41:04	...er "guete Obig" Swiss four nine Kilo X-Ray ILS one four	
49KX	ADC	:08	"Grüezi" Swiss four nine Kilo X-Ray	
695	ADC	:10	British six nine five to Departure good-day	
ADC	695	:12	Äh... six nine five bye-bye	

- end -



Playback Info

Selected CWP:	CWP-1
CWP data:	Available
Role:	ADC
Speed:	Pause
Mode:	Interactive

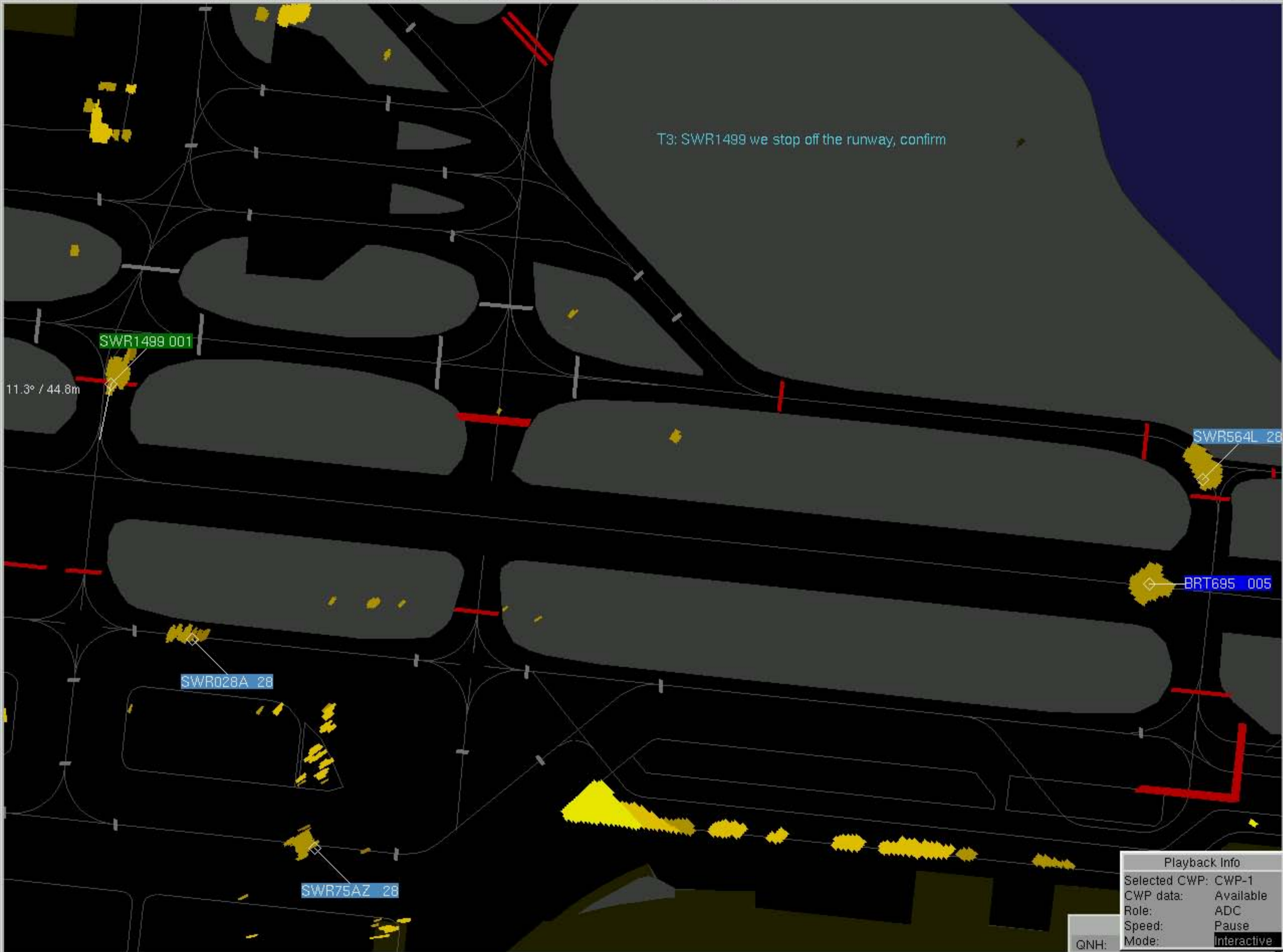
QNH:



Playback Info

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CWP data:	Available
Role:	ADC
Speed:	Pause
Mode:	Interactive

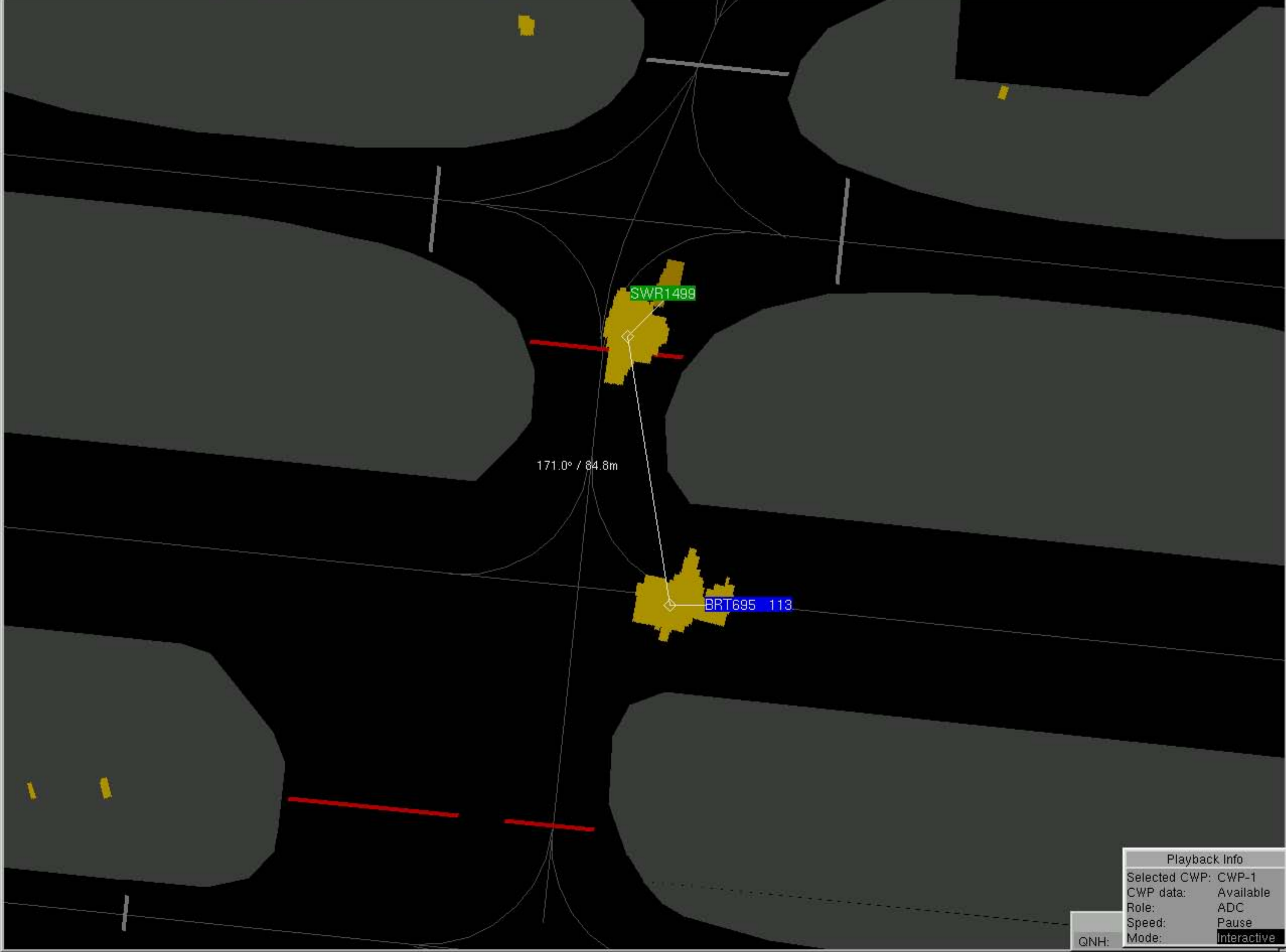
QNH:



Playback Info

Selected CWP:	CWP-1
CWP data:	Available
Role:	ADC
Speed:	Pause
Mode:	Interactive

QNH:



Playback Info

Selected CWP:	CWP-1
CWP data:	Available
Role:	ADC
Speed:	Pause
Mode:	Interactive

QNH: