

Final Report

EX007-0/00

Factual Information

Kind of occurrence:	Serious incident
Date:	18. December 2000
Location:	Dresden Airport
Aircraft:	Transport category aeroplane
Manufacturer/type:	Saab AB / Saab 2000
Injuries to persons:	no injuries
Material damage:	Aeroplane slightly damaged
Other damage:	airport installations

History of the flight

The crew was to conduct a scheduled flight from Dresden to Zürich (Switzerland). 4 crew members and 18 passengers were aboard the aeroplane.

At 20:14 hrs the crew received the take-off clearance from the air traffic control unit (Tower); indicated wind was 200° and 3 kt. The weather was good and there were no obstructions of visibility in the dark night. The runway was dry.

During the take-off run, the crew heard unusual noises. They interpreted the noises as a bursting tyre of the nose wheel and initiated an aborted take-off. The aeroplane came to stop on the runway. Due to the destruction of both tyres of the nose wheel the aeroplane could not be taxied off the runway. As a result the runway had to be closed until 22:08 hrs for further flight operations.

Investigation

Two persons in charge of the airport were employed to secure the clues. The flight data recorder (DFDR) and the cockpit voice recorder (CVR) were removed and sent to Braunschweig in order to be analysed.

Dresden Airport has a concrete runway of 2,508 m length and 80 m width. Its true bearing is 041° / 221°. The runway area which can be used for take-offs and landings is reduced over the whole runway length to a width of 51 m because of ground markings and lights.

The aerodrome chart in the AIP Germany Part AD 2 (aerodromes), EDDC 2-5 dated 13 August 1998 only shows the usable runway of 51 m width. The chart does not show the concrete strips of 14.50 m width each to the left and to the right of the runway.

The runway lighting between the threshold and the end consists of white elevated edge lights and white surface centre line lights over the full length of the runway. The edge lights have a 360° omnidirectional characteristic and are installed at a distance of 14.50 m from the left and the right edge of the concrete runway. The spacing between the individual lights is 60 m. In the areas of the taxiways to and from the runway the lights are surface lights, in order to ensure unobstructed taxiing. The spacing between the white surface centre line lights is 30 m. The lighting is visible in the take-off and landing direction and is only faintly visible from the side (at an angle of 90°). In addition the runway has a reflecting white centre line and edge line marking.

Taxiway E used by the crew to reach runway 22 is equipped with green centre line lights and in the junction area between taxiway H and taxiway E with blue edge lights. The centre line lighting serves as a

taxiing guide line and leads to the centre line of runway 22. The spacing between the lights is 30 m and in turns 15 m. The green and the blue lights are switched together from the tower.

In addition taxiway E is fitted with a yellow centre line marking. The yellow marking leads as well as the green centre line lighting to the runway centre line when the runway is joined. In the area of the white threshold marking, however, the guide line is interrupted over a length of appr. 30 m.

During the analysis of the traces on site it was found that the aeroplane had started its take-off run on the left-hand runway edge lighting and that until it stopped it had destroyed a total of 8 lights over a length of 1.345 m. The lights are numbered on the left side consecutively from the beginning of the runway lighting. Lights no. 7 through no. 12 and no. 24 had been destroyed by the nose wheel, light no. 8 had been destroyed by the left main landing gear.

There were no usable traces on the runway between the alignment of the aeroplane in the take-off position and the first light (no. 7) which was destroyed after 360 m. Appr. in the area of light no. 18, a well-marked wavy line left by the nose wheel tyres, which had been destroyed by the collision with the lights, was starting on the runway to the right of the lighting. The maximum lateral distance to the lighting was 3 m.

The aeroplane was inspected by the operator, who found two destroyed nose wheel tyres and rims, damage to both left main landing gear tyres and to the leading edges of both wings (boots) between the power plants and the fuselage as well as several marks left by the debris of the edge lights on the propellers and the landing gear doors.

Appr. 10 s after the start of the take-off run the CVR recorded 4 noises in a short quick sequence which were to be assigned to the collision of the nose wheel with the lamps of the left edge lighting. Having registered these noises and the subsequent vibration of the aeroplane the crew initiated an aborted take-off.

From the CVR recordings it is to be concluded that the working atmosphere in the cockpit was calm and relaxed.

All technical parameters of the aeroplane recorded by the DFDR were in the allowable range from the moment the power plants were started until the aborted take-off was initiated and the power plants were shut off.

The recorded heading in the take-off position was 219.3°. Up to the initiation of the aborted take-off, the DFDR recorded variations up to 2° to the right. Just at

the moment when the aborted take-off was initiated a heading of 221.2° was recorded. Afterwards there were variations in heading of $\pm 3^\circ$. The aeroplane came to a stop after a total distance of 1,705 m and with a heading of 217.3°.

During the take-off run there were only minor changes in the recorded rudder and rudder pedal position. Only following the aborted take-off major rudder deflections in both directions were recorded. For this it is to be considered that during the take off until a speed of 80 kt is reached the lateral direction is to be controlled manually (by means of a hand wheel).

A graphic prepared on the basis of the DFDR parameters taxiing speed and heading and showing the turning from taxiway E onto the runway indicated that close to the left edge lighting the aeroplane had left the green centre line lighting leading to the centre line of runway 22 and aligned parallel to the centre line lighting for take-off.

After a waiting time of 106 s in the take-off position (scheduled departure time slot was 20:13 hrs) the take-off run was started on the runway edge lighting. During the take-off run the nose wheel collided with the edge lighting. Following this collision the crew aborted the take-off. Nothing in the recording of the DFDR indicates that the crew had tried to clear the runway edge lighting by changing the direction.

The aborted take-off was initiated appr. 20 s after take-off power had been set. The speed was 102 kt and the distance travelled on the runway was 510 m (see attachment).

In a written statement dated 08 January 2001, the pilot in command (PIC) declared after having been informed about the evaluation of the DFDR recording and the analysis of the traces found at the incident site that he considered it to be established that he had started the take-off run with the aeroplane on the left runway edge lighting.

On 09 January and on 31 July 2001 two staff members of the BFU conducted follow-up investigations at Dresden airport.

According to the statement made by the tower controllers the lighting switched on at the time of the occurrence included taxiway and runway edge lighting as well as the centre line lighting. A statement concerning the intensity selected was no longer possible. A documentation for the switching conditions of the lighting does not exist and is not required.

The site of the occurrence was visited with day light and during a dark night under weather conditions similar to those at the time of the occurrence. The assessment was made at ground level height and from the eye level height (2.95 m) of a Saab 2000 crew.

This assessment resulted in the following findings:

- At night the green surface lights of taxiway E lead to the runway centre line lighting without any interruption and are continuously visible during taxiing until they become covered by the aeroplane fuselage nose.
- At night the taxiing direction is clearly indicated by the green centre line lighting.
- The yellow centre line marking of taxiway E is perceivable at night only with a strong visual fixation. The marking omitted in the area of the junction with the runway (appr. 30 m) was difficult to perceive. This omission is bridged by three green lights of the centre line lighting.
- From the position from which the take-off run of the Saab 2000 was started the following lights were to be seen:
 - in forward direction a chain of white lights
 - to the left at an angle up to 45° four red lights of PAPI (precision approach path indicator) and the blue edge lights of taxiway D.
 - to the right at an angle up to 45° a chain of white lights (centre line lighting) and additionally at the beginning the last two green surface lights of taxiway E as well as behind of and in parallel to them a further chain of white lights (right edge lighting)
 - to the right at an angle of 45° to 90° white lights (centre line lighting) with low intensity and a chain of white lights (right edge lighting)
- No findings were made which could explain the confusion of the lights of the runway centre line lighting with the lights of the runway edge lighting.

The crew held the required licences and rating for the Saab 2000.

The PIC had a total flight experience of 3569 hours, 1241 hours of which on the Saab 2000. The copilot had a flight experience of 1800 hours, 1555 hours of which on the incident type.

The crew knew the airport from several approaches and departures by day as well as at night. On this day it was the second flight cycle (Zürich-Dresden Zürich).

Analysis

According to the technical findings made by the operator it is to be assumed that the incident had not been caused by a technical defect of the aeroplane.

At the time of the take-off the meteorological conditions were good. There were no obstructions of visibility.

During taxiing to runway 22 the crew never was under stress or pressure.

The lighting and markings at Dresden airport complied with the standards and recommended practices of ICAO Annex 14.

All necessary lighting of runway 22 and the taxiways had been switched on.

At night, the green surface lights of taxiway E lead to the centre line lighting of runway 22 without any interruption.

At night the taxiing direction is clearly indicated by the green centre line lighting.

At night the edge lighting and the centre line lighting are the only reference to determine the aeroplane position on the runway. When starting the take-off run the crew should have noticed that they had no runway edge lighting on the left in their visual field.

Based on the evaluation of the traces on the ground, the analysis of the DFDR recordings and the statement made by the PIC the position of the aeroplane prior to the start of the take-off run was on the extended line of the left edge lighting of runway 22.

The fact that the first lamps of the lighting had not been damaged can only be the result of the alignment on the runway - at the beginning the nose wheel was left of the lighting.

No findings were made which could explain the confusion of the lights of the runway centre line lighting with the lights of the runway edge lighting.

A possible explanation for the fact that the centre line lighting had been left when joining the runway could be a head down position of the crew when doing the line-up check list.

Conclusions

The incident happened because the pilot in command confused the centre line lighting of runway 22 with the left runway edge lighting. This confusion had not been noticed by the copilot.

Safety Recommendation

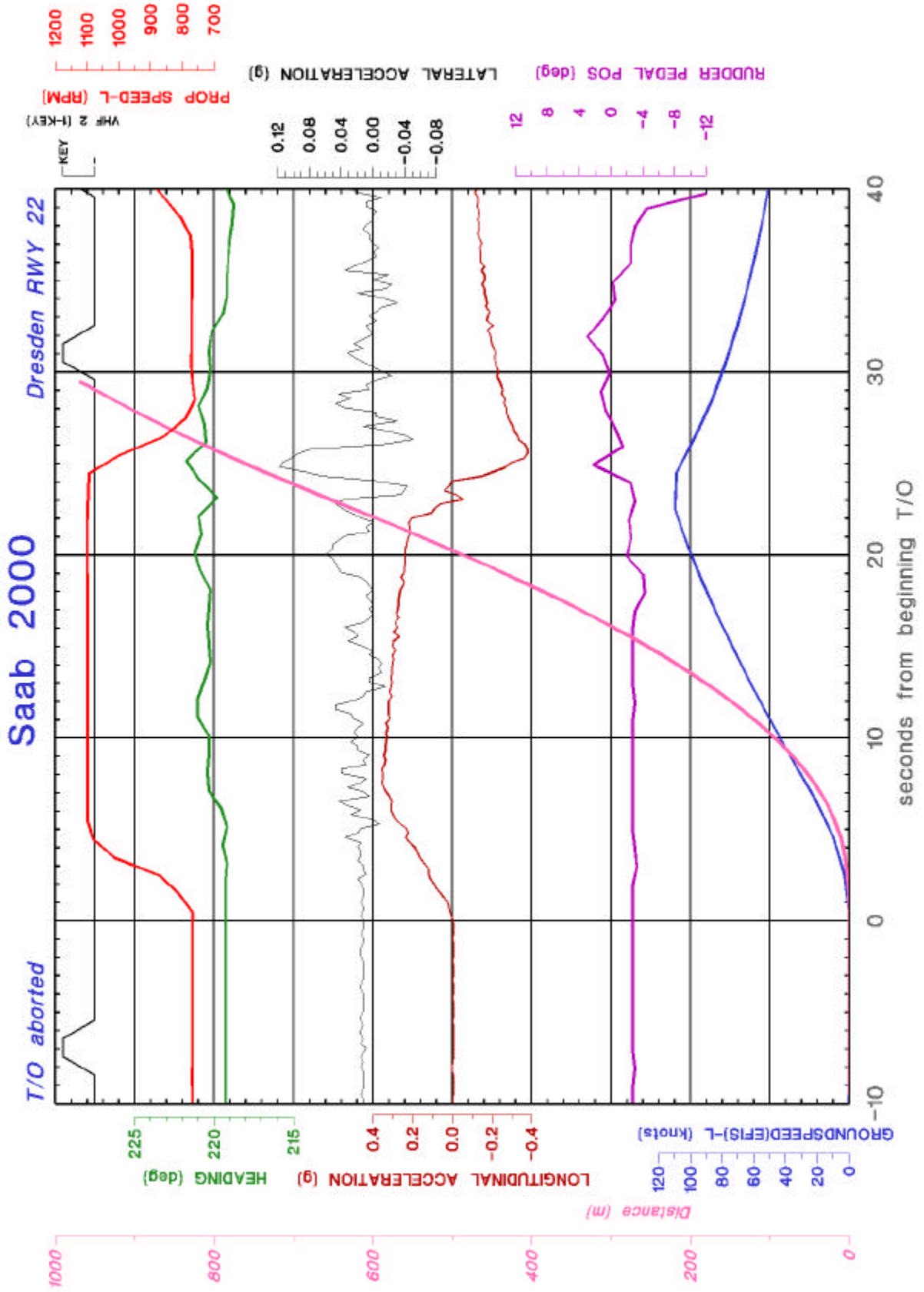
The result of the investigations has prompted the BFU to issue the following safety recommendation:

05/2001 The fleet commander should review the crew resource management (CRM) for its efficiency within the fleet.

Investigator-in-charge	Krupper
Flight Recorders	Thiel
air traffic control, airport	Peters
field investigation	Ahrens, Kühn

Encl(s):

Excerpt from the flight data recordings (take-off phase)



BFU-Flight Recorders

Revised: October 01, 2001