

Investigation Report

Identification

Type of Occurrence:	Serious incident
Date:	19 January 2010
Location:	Stuttgart Airport
Aircraft:	Airplane
Manufacturer / Model:	Fairchild Dornier /SA 227 - DC „Metroliner“
Injuries to Persons:	None
Damage:	Minor damage to aircraft
Other Damage:	None
Information Source:	Investigation by BFU
State File Number:	BFU 5X003-10

Factual Information

History of the Flight

At 1717 hrs¹, the aircraft with two pilots on board and coming from Brno, Czech Republic, was on final approach to runway 07 of Stuttgart Airport. After the landing gear lever was actuated, the indications showed green for the nose and left main landing gears and red for the right main landing gear. The crew tried twice to extend and retract the landing gear.

¹ All times local, unless otherwise stated

Because these attempts failed the missed approach procedure was initiated. According to the missed approach procedure the aircraft was vectored toward the extended runway centreline. On the way the crew tried several times to extend and lock the landing gear by use of the emergency procedure. All attempts were futile, the indications for the right main landing gear remained red.

In order to exclude a faulty indication, the crew asked the tower to visually check the landing gear configuration. Therefore the second approach was conducted as a low level flight. The visual check determined that the right main landing gear was not extended. This resulted again in the missed approach procedure. This time the aircraft was guided to an air space north of the airport. In this air space the crew had the space to attempt to unlock the landing gear by flying certain flight manoeuvres in which positive and negative G forces were produced. After nine minutes the attempts were aborted because they had been in vain. The crew declared an emergency and decided to land with the one remaining main landing gear and the nose landing gear. After the landing, as speed had been reduced and the right wing could no longer be kept in the air, the aircraft was steered toward the right and off the runway into the grass so that the right wing could be rested on soft ground. During touchdown the engines were already shut off, the propellers feathered and all electricity shut off.

After the aircraft had come to a complete stop the crew left it by way of the passenger door.

In the morning the crew had taken over the aircraft and flown it to Münster/Osnabrück Airport. The next leg took them to Brno. According to crew statements there were no problems during pre-flight checks.

Personnel Information

The 54-year-old Pilot in Command (PIC) held a Commercial Pilot's License (CPL (A)) issued according to JAR-FCL, German. The license was initially issued on 26 November 1987 by the Luftfahrt-Bundesamt (LBA) and was valid until 20 March 2014. The class 1 medical certificate was valid until 9 March 2010. The PIC had a total flying experience of 15,716 hours with 26,454 landings; of which 11,616 hours with 5,118 landings were on the type in question. His type rating was valid until 31 March 2010.

The 48-year-old co-pilot held a Commercial Pilot's License (CPL (A)) issued according to JAR-FCL, German. The license was issued on 14 August 2000 by the LBA and was valid until 5 September 2014. The class 1 medical certificate was valid until 1 August 2010. The co-pilot had a total flying experience of 6,438 hours with 1,869 landings; of which 6,212 hours with 1,602 landings were on the type in question. Her type rating was valid until 31 August 2010.

On the day of the serious incident, the crew reported for duty at 0810 hrs. A rest period of 36 hours preceded it. Flight time until the occurrence was 5 hours and 20 minutes.

Aircraft Information

The commuter aircraft Fairchild Dornier SA 227-DC is an all-metal low-wing aircraft with a retractable landing gear in nose wheel configuration. The aircraft had the Manufacturer's Serial Number (MSN) DC 805 B and was built in 1991. The maximum take-off mass was 7,484 kg. The aircraft was equipped with two Garrett AiResearch TPE331-12UHR-701 turboprop engines. The engines were fitted with McCauley 4HFR34C652()/()-L106LA-0 propellers.

The aircraft is equipped with three landing gear indications: One for the nose landing gear and two for the main landing gears. When the landing gear is fully extended and locked the indication is green. The red indication means the landing gear is not fully extended or locked.

The last annual inspection was conducted on 8 July 2009. Until the time of the occurrence, the aircraft had flown 25,510 hours and performed 25,928 landings.

On 19 January 2010 a service check was conducted during which the landing gears were lubricated according to the Aircraft Maintenance Manual (AMM).

The emergency checklist described the landing with the extended nose landing gear and one extended main landing gear. Among other things, the propeller should be feathered once the landing is assured so that the wing on which the landing gear cannot be extended can be held in the air as long as possible; in order to control the aircraft's direction brakes and rudder should be used. It was further noted that the aircraft will turn into the direction of the lower hanging wing – the wing where the landing gear is not extended.

Meteorological Information

At the beginning of the occurrence it was night and dark. Visual meteorological conditions prevailed. The wind came from the north with 4 - 5 kt.

Aids to Navigation

For the approach and landing the airport's instrument landing system was used.

Communication

Radio communications were recorded by the air traffic control service. Transcripts of said recording were made available to the BFU.

Aerodrome information

The Stuttgart International Airport is located 1,276 ft above mean sea level and has one runway oriented 07/25. The concrete runway is 3,345 m long and 45 m wide.

Flight Recorders

The aircraft was equipped with an L-3 COM Model F1000, p/n S-703-1000-00, s/n 468 Flight Data Recorder (FDR) and a Fairchild, Model A100, p/n 93-A100-03, s/n 60101 Cockpit Voice Recorder (CVR). The recorders have been made available to the BFU for evaluation purposes.

The read-out determined that the last recorded flight took place on 11 January 2010 from Köln (Colon) to Hof. Thereafter no data was recorded.

Wreckage and Impact Information

After the landing the aircraft had left runway 07 towards the right beyond taxiway F. It came to a complete stop with the aircraft nose 1,374.2 m behind the threshold and 82.7 m right of the extended centre line (see Appendix). The ground next to the runway showed traces of the left main landing gear, the nose landing gear and the right propeller. The aircraft's longitudinal axis pointed towards 100°.

The left main landing gear had dug itself into the earth up to its wheel hub. The nose landing gear was twisted 80° to the right and had penetrated the turf. On the right

side the aircraft rested on the engine nacelle, where the main landing gear is located, and the right outer wing. The landing gear doors of the right main landing gear were partially open (see Appendix). The tyres of the right main landing gear rested on the landing gear doors. The wing tip and the outer area of the right wing were damaged. The tail section had ground contact.

The aircraft was taken to a maintenance hangar and jacked up. The two tension belts which had held up the landing gear during the recovery were opened and removed in the presence of the BFU. As the tension belt was opened, the landing gear slowly moved out of the landing gear bay. After the landing gear was completely extended it was possible to push it manually into the locks. Both landing gear doors were open.

The outer landing gear door of the right main landing gear was dislocated by about 2 cm toward the back. An opening of about 2 cm between the front bay edge and the door appeared when the landing gear doors were pushed closed. In front of the aft hinge the outer skin of the door was slightly rippled.

Level with the aft hinge a dent was worked into the bay edge; the edge itself was rippled. The connection rod between the landing gear door lever and the bellcrank was bent.

The primer on the bay edge was rubbed away in the area of the aft hinge of the inner landing gear door.

The outer wheel of the right main landing gear showed a "Brake plate" (partial melting of the tyre surface) on a length of about 15 cm over the entire tyre tread.

The left hydraulic cylinder of the right main landing gear leaked. In the cockpit the emergency release lever for the landing gear showed "Release". The manual hydraulic pump for the landing gear was locked.

In order to operate the aircraft or the landing gear and conduct further investigations, a ground power unit and an external hydraulic supply unit were connected to the aircraft.

First, the left main landing gear was hydraulically unlocked and moved manually to investigate the kinematic processes of landing gear and doors. It was repeated with the right main landing gear.

Afterwards both main landing gears were slowly hydraulically extended and retracted. During this process the right outer main landing gear door was unhinged. Everything worked perfectly. Then the main landing gears were retracted and emergency released; the function was given.

After these function tests the right main landing gear was manually put in the position in which the indication in the cockpit shows red. This was very likely the position in which it jammed during the approach to Stuttgart. Afterwards the connection between the outer landing gear door and the landing gear lever was reconnected. It was determined that the door slides into the outer edge and gets stuck on a rivet head. The landing gear was retracted hydraulically and locked; the door was closed manually. During the subsequent extension the landing gear remained in the previously simulated position; the same was true for the emergency procedure (refer to the photo in the Appendix).

Fire

There was no fire.

Analysis

The extension and retraction trials conducted by the BFU showed that the right main landing gear could not be extended because the outer landing gear door jammed on the bay edge. The jamming occurred in the area of the aft hinge. The dent and the rippling of the outer skin were caused by the bar of the hinge arm. The traces showed that this had occurred over a longer period of time. On the opposite side the bar had rubbed off the primer.

It is highly likely that the rippling of the outer landing gear door had been present prior to the serious incident.

The cause for the rippling could not be determined.

The electricity for the recorders was shut off and accounts for the missing or not recorded flight data. This occurred during the landing on 11 January 2010 in Hof when the release of the G-switch was triggered and not noticed until the serious incident.

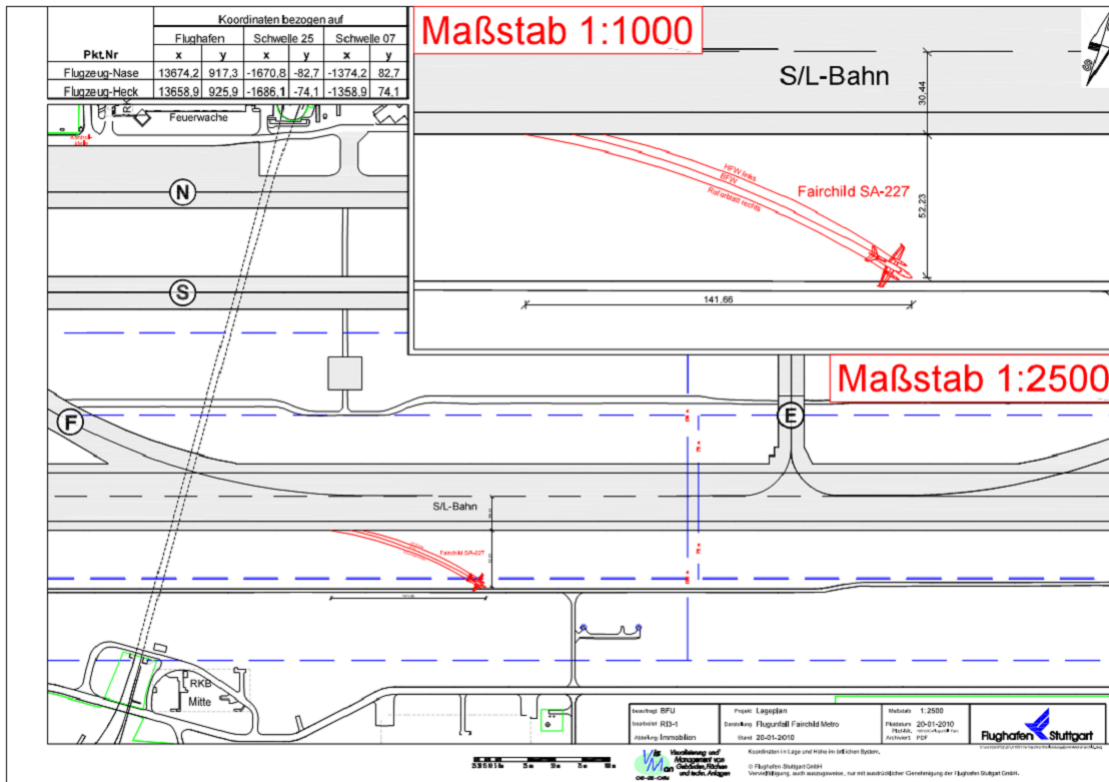
The crew adhered to the emergency checklist.

Conclusions

The non-extension of the main landing gear was caused by the jamming of the outer landing gear door on the bay edge.

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Appendices



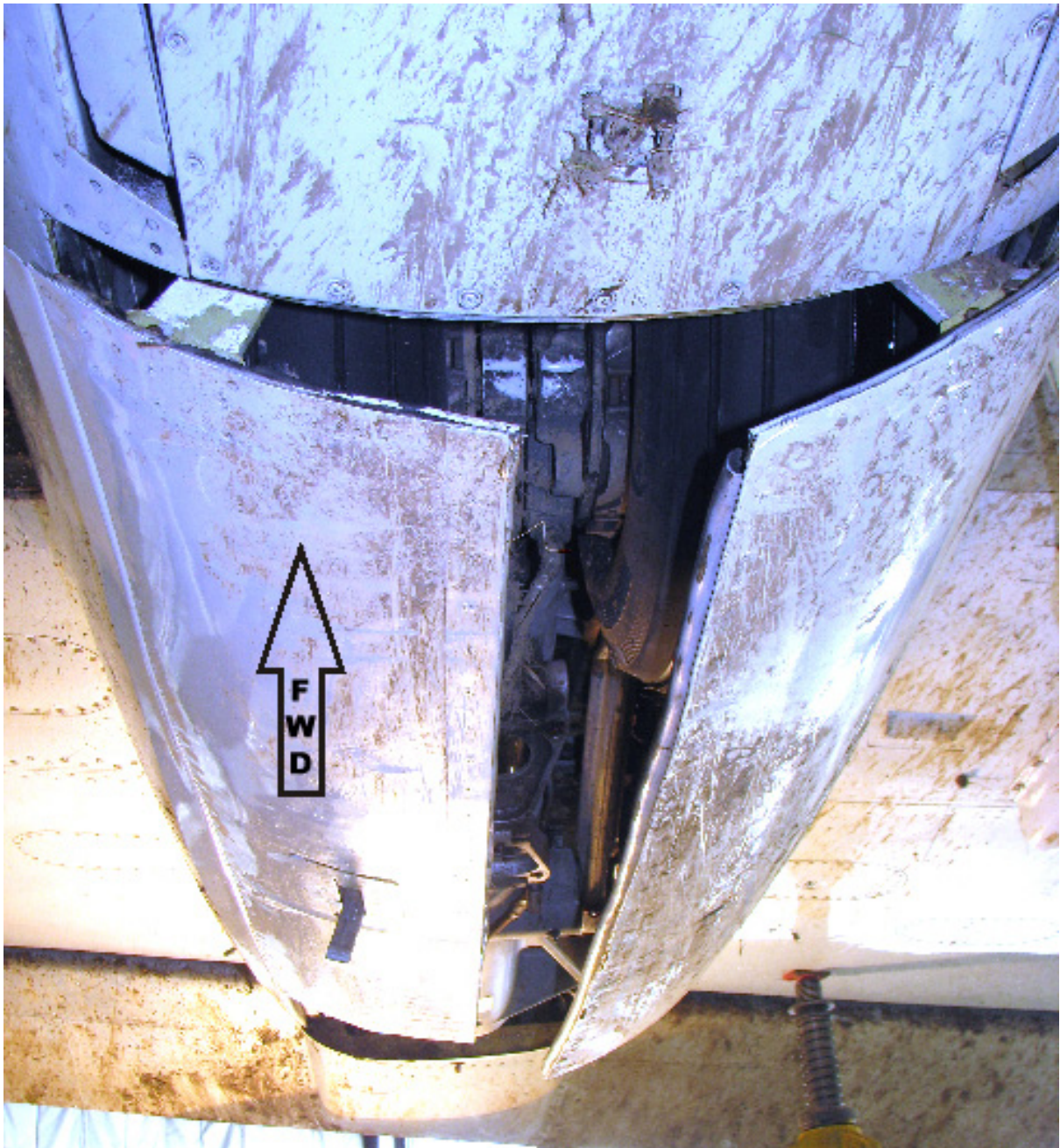
Site plan

Drawing: Stuttgart Airport



Right main landing gear

Photo: BFU



Right main landing gear in the jammed position

Photo: BFU

This investigation was conducted in accordance with the regulation (EU) No. 996/2010 of the European Parliament and of the Council of 20 October 2010 on the investigation and prevention of accidents and incidents in civil aviation and the Federal German Law relating to the investigation of accidents and incidents associated with the operation of civil aircraft (*Flugunfall-Untersuchungs-Gesetz - FIUUG*) of 26 August 1998.

The sole objective of the investigation is to prevent future accidents and incidents. The investigation does not seek to ascertain blame or apportion legal liability for any claims that may arise.

This document is a translation of the German Investigation Report. Although every effort was made for the translation to be accurate, in the event of any discrepancies the original German document is the authentic version.

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