

The Dutch Safety Board

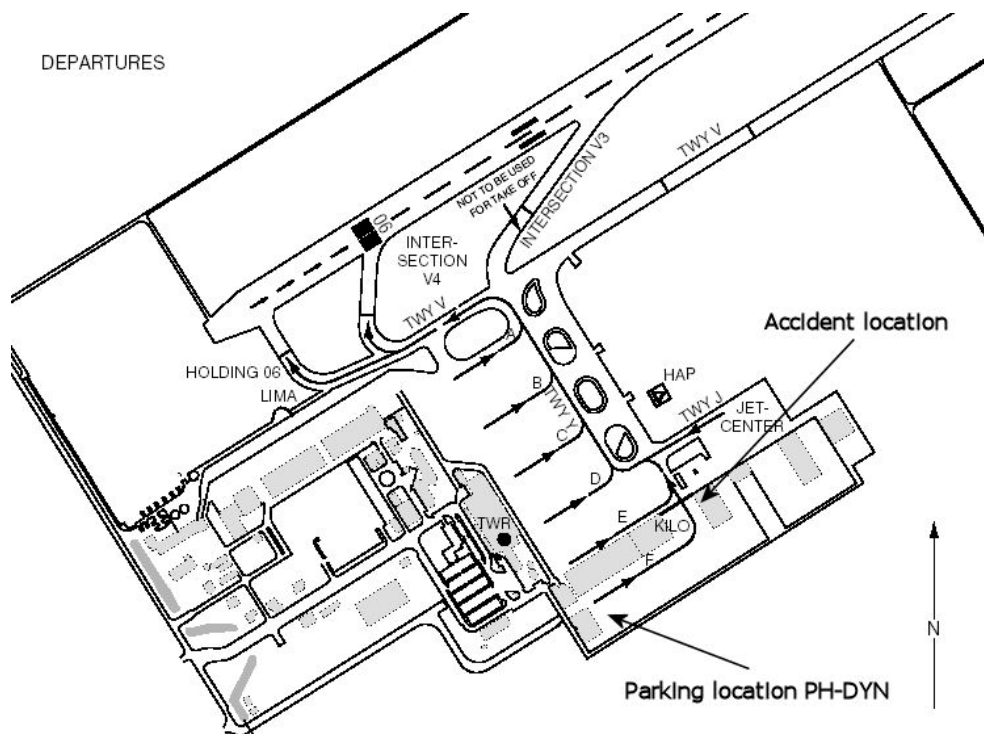
Occurrence #:	2004003	Classification:	Accident
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FACTUAL INFORMATION

Date of the occurrence:	12-01-2004	POB flight crew:	2
Place of occurrence:	Rotterdam Airport	Flight experience captain:	Circa 4000 hours of which circa 1300 hours on type
Aircraft registration:	PH-DYN	POB passengers:	6
Aircraft model:	Cessna 550 Citation II	Injuries:	3 passengers with neck complaints
Type of aircraft:	Twin-engine business jet	Lighting conditions:	Daylight
Type of flight:	Commercial flight		
Phase of operation:	Taxiing		
Damage to aircraft:	Severely damaged		

The flight and the occurrence

The Cessna 550 Citation II is a business aircraft with two jet engines. On board of the PH-DYN were two pilots and six passengers. Purpose was a commercial flight from Rotterdam (NL) to Strassbourg (F). The captain was pilot flying en was sitting in the left-hand seat. The aircraft was parked at the "F-apron" and the flight crew had received permission from air traffic control (ATC) to taxi to runway 24. The platform was damp after recent rain/drizzle conditions that same day. After performing the "before taxi checklist" the PH-DYN started to move. First a right-hand turn was made to intercept the yellow marker line on the "F-apron". At the end of the "F-apron" the pilot used nosewheel steering to make a left-hand turn. To make the turn sharper and keep the nose wheel on the marker line the pilot was forced to use the left-hand wheel brake. When a gentle pressure on the brake pedal did not give the desired result he declared that he pushed the brake pedal to the maximum limit. The deceleration was minimal whereupon he asked the co-pilot to assist braking. This had no result whereupon the aircraft made the turn too wide and the right-hand wing came in contact with the post of a hangar door. The aircraft levered to the right after which the nose ran through a hangar door and the aircraft came to rest. All occupants left the aircraft. Three passengers suffered from neck complaints. The aircraft was severely damaged. During this occurrence the emergency brake system has not been used.





The PH-DYN after the accident

Investigation & Analysis

Technical investigation

During a test shortly after the accident the nose wheel steering and brakes proved to function normally. Pressure and quantity of the hydraulic fluid were in order. In consultation with Cessna in the United States the technical investigation focused on components of the brake system. A total of 16 components of the brake and antiskid system were sent to the United States for testing and inspection at the different manufacturers under supervision of officials of the National Transportation Safety Board (NTSB) and Federal Aviation Administration (FAA). The final conclusion of the investigation was that in none of the components failures were found that could explain the accident.

Operational investigation

According to the "taxi checklist" in the aircraft operating manual used by the operator, testing of the brakes is the first item to be performed. The procedure of the operator involved was to perform the brake test as soon as the aircraft starts to move, the remaining "taxi checklist"-items have to be performed at marker KILO, just after vacating the "F-apron". The reason for this is that the "F-platform" generally is full with parked aircraft as a result of which taxiing must be done cautiously. Hereby it is necessary that both pilots look outside. According to the operator concerned, performing a checklist increases the risk that the aircraft collides with an obstacle by inattention. The crew could not recall if an initial brake test was actually performed in this event.

Brake system

The PH-DYN is equipped with a switchable antiskid brake system which prevents skidding of the main wheels during braking. The antiskid protection operates at speeds above 12 knots, at lower speeds the system is disengaged automatically. Roughly the system consists of an electronic control box and a wheel speed transducer and power brake on each wheel. The moment that a wheel threatens to skid the brake pressure on the concerning wheel is reduced as a result of which complete blockage will be prevented.

Besides an antiskid switch there is also an annunciator light in the cockpit (ANTISKID INOP). The light is illuminated when the antiskid switch is in the OFF position or when the electronic control box detects a fault in the incoming signals. In ANTISKID INOP mode the brakes continue to function normally including power-assist yet without antiskid protection. One item on the "before taxi" checklist is a check if the antiskid annunciator light is off.

At the left-hand side of the instrument panel is a lever to activate the emergency brake system. According to the taxi checklist of the operator the emergency brake system should be used if during taxiing the brake pedal cannot be pushed in or when the aircraft does not respond to a brake input. After the accident the emergency brake system was checked. No failures to the system were found and it was concluded that the system was not used in the present case.

Other occurrence

An occurrence in 1998 in the United States with a Cessna Citation has similarities with the event in Rotterdam. During the rollout after landing on a short runway the brakes (temporary) did not work whereupon the aircraft overran the runway. At first instance no defects were found in the brake system

and antiskid system. Only after a month an electrical short was detected in the wiring of one of the speed transducers. This electrical short was not present permanently as a result of which it was not detected earlier. The NTSB came to the conclusion that the brake problems were caused by this electrical short.

Analysis

From the recorded sounds on the cockpit voice recorder (CVR) it turned out that there were 47 seconds between the moment of starting to move and the collision. The average taxi speed calculated from the number of seconds and the covered distance was approximately 10 knots. From taxi tests with an identical aircraft it turned out that 10 knots is a speed whereby a ninety degrees turn can be made without the use of brakes. Because the calculated 10 knots is an average speed it can be assumed that the speed at making the turn was slightly higher and joint use of nosewheel steering and left-hand brake was necessary. It is unknown if the antiskid system was active in this event (the antiskid system is activated above 12 knots).

A cause for the breakdown of the brake system was not found, the tested components were within the specifications. The following scenarios were considered:

Antiskid inoperative

According to the aircraft manufacturer it is possible that the friction of the platform was diminished by rain that had fallen earlier. Coupled with a diminished weight on the inboard (left-hand) wheel due to the left turn it could have resulted in a locked left-hand wheel. Since the braking action of a locked wheel is less than that of a wheel that begins to slip but is still rotating, a change in turning radius could be explained;

Antiskid operative

When the signal of the left-hand speed transducer is lost temporary, the electronic control box will react to that by reducing the brake pressure on the concerning wheel. When the signal fault is of short duration the annunciator light in the cockpit will not extinguish. Also the pilot will notice nothing unusual in the pedal pressure.

Why the emergency brake system was not activated is not known. Possibly the time was too short for that. Also the location of the handle could have played a part (the pilot needs to lean forward to activate the emergency brake).

Although it could not be determined if the initial brake test was actually performed, the Dutch Safety Board will emphasize that testing of the brakes should be performed at the moment the aircraft starts to move. An early performed brake test as required by the aircraft operating manual could possibly reveal a problem immediately and consequently at a much lower speed. This offers pilots more opportunity to activate the emergency brake system.

Note: This report has been published in English and Dutch language. If there are differences in interpretation the Dutch txt prevails.