The purpose of the Dutch Safety Board's work is to prevent future accidents and incidents or to limit their after-effects. It is no part of the Board's remit to try to establish the blame, responsibility or liability attaching to any party. Information gathered during the course of an investigation – including statements given to the Board, information that the Board has compiled, results of technical research and analyses and drafted documents (including the published report) – cannot be used as evidence in criminal, disciplinary or civil law proceedings.

GENERAL INFORMATION

Identification number:	2005134
Classification:	Accident
Date, time[1] of occurrence:	19 September 2005, 07.30 hours
Location of occurrence:	Rotterdam Airport (EHRD)
Aircraft registration:	PH-DYM
Aircraft model:	F-Swearing SA227-AC
Type of aircraft:	Twin-engined passenger aircraft
Type of flight:	Passenger flight
Phase of operation:	Take-off
Damage to aircraft:	Severe
Cockpit crew:	Two
Number of Passengers:	Seventeen
Injuries:	One passenger sustained minor injuries
Other damage:	None
Lighting conditions:	Daylight

SUMMARY

During the take-off, the cockpit crew lost steering control and the aircraft came to a standstill alongside the runway. One passenger sustained minor injuries.

This report is based on interviews with the pilots involved, the transcript from radio transmissions on the Rotterdam tower frequency, flight recorder details, the investigation report from the National Aerospace Laboratory and the weather report from the Royal Dutch Meteorological Office.

[1] All times given in this report are local unless stated otherwise.

FACTUAL INFORMATION

On 19 September 2005, the type F-Swearing SA227-AC aircraft with registration PH-DYM was scheduled to make a charter flight from Rotterdam Airport to Birmingham Airport. Seventeen passengers and two cockpit crew members were on board. The planned departure time was 07.30 hours. The aircraft taxied to the beginning of runway 24 and lined up for take-off. During line-up, the speed levers for the engines were moved from taxi position to flight position. The nose wheel steering fault indicator lit up and the first officer, who was steering the aircraft, responded by saying that he had no nose wheel steering. The captain informed the first officer that he had forgotten to press the switch on the throttles, which activates the nose wheel steering system. The first officer then confirmed that he had nose wheel steering.

With the engines in the low RPM range (taxi position, up to 70% of maximum RPM), the pilot can steer the aircraft using the rudder pedals while taxing. When the engines are operated in the high RPM selection (flight position, between 70% and 100% of the maximum RPM), the switch on the throttles, which activates the nose wheel steering system, must be pressed in during the first part of the take-off roll in order to be able to operate the nose wheel with the rudder pedal. At a speed around 50 knots, the switch which activates the nose wheel steering system is released. The aerodynamic forces of on the rudder are then sufficient to take over the steering from the nose wheel.

Figure 1: PH-DYM shortly after the accident

Once take-off clearance was given by air traffic control, the first officer engaged power and started the take-off roll. He stated that once the nose wheel operating switch had been released, the aircraft almost immediately began moving towards the left hand side of the runway. He tried to use the brakes and the directional rudder, to return the aircraft to the centre of the runway. The aircraft had a speed of between 50 and 60 knots at that point. The crew rejected the take-off but could not prevent the aircraft ending up alongside the runway, on the left hand side.

The captain stated that various forces influence the directional control of an aircraft during the take-off, such as wind, propeller wash, increasing air speed, etc. These forces necessitate steering corrections during the take-off. Only when the nose wheel steering system was disengaged the captain realized something was wrong.

The grass area alongside the runway is lower than the runway and the ground was soft. The left landing gear sank in the soft ground first and, as a result, the aircraft decelerated heavily and the left landing gear broke off almost immediately. The tip of the left wing struck the ground. This caused a ground loop effect and turned the aircraft further left. As a consequence the right landing gear and the nose gear also broke off.
Once the aircraft had come to a standstill, the captain switched off all onboard systems and cut off the fuel supply to the engines. Simultaneously, the first officer was given the task of evacuating the passengers. The passengers were calm and left the aircraft without problems via the left hand door at the front of the aircraft. A moment later, the airport fire service arrived at the location of the accident. One of the passengers was taken to hospital for a check-up; he was able to leave hospital the same morning.
There was severe damage despite the relatively slow speed at which the aircraft left the runway.

INVESTIGATION AND ANALYSIS

The tyre tracks on the runway showed that the aircraft moved towards the left almost from the initiation of the take-off roll. The statements from the crew indicated that they were not able to get the aircraft under control.
The moment at which the crew observed the problem is clearly audible on the cockpit voice recorder; the order to reject the take-off was not given by either pilot.
Both pilots stated that the nose wheel steering fault indicator frequently lights up when switching from the low RPM range to the high RPM range. Cockpit voice recorder data showed that six seconds elapsed between the observation of the problem and leaving the runway. The flight data recorder did not contain any data concerning whether or not the switch had been pressed. The investigation could not establish the speed at which this switch was released.

The National Aerospace Laboratory investigated the effectiveness of the nose wheel steering system of PH-DYM in order to ascertain any defects. The study showed that a hydraulic leak in the nose wheel steering system meant that the system remained active after the nose wheel switch had been released. The system was, therefore, not being steered by commands via the rudder pedals and the leak resulted in an uncontrolled steering command to the left.

It is noteworthy that a leak such as this will always lead to a rotation of the nose wheel. A nose wheel system must be designed as such that the nose wheel will remain in a neutral position or is ‘free’ to move when a defect like this occurs. This will enable pilots to steer the aircraft by varying the brake pressure on the right and left hand landing gear.

The original aircraft manufacturer of this aircraft no longer exists. The type certificate and technical support went over to another company. This company is aware of the problems with the nose wheel steering. It informed all users of this aircraft type about these problems in September 2009 and provided maintenance instructions that would prevent this type of problem from recurring. The main point of this instruction is that the manifold and arming valve must be replaced as an assembly. Replacement of the arming valve without changing the manifold can result in a leakage causing a slow uncommanded turning of the nose wheel.

CONCLUSIONS

This accident was caused by an hydraulic leakage in the nose wheel steering system. The tyre tracks on the runway implied that the steering problem had occurred from the beginning of the take-off. The crew intervened as soon as after the nose wheel switch had been released and the nose wheel steering fault came on but were unable to prevent the aircraft leaving the runway.

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