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Australian Transport Safety Bureau

Runway excursion involving a Saab 340B, VH-ZRL

Taree Airport, New South Wales, 22 February 2013

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Addendum

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Runway excursion involving a Saab 340B, VH-ZRL

What happened

Propeller blade damage

Source: Aircraft operator

On the evening of 22 February 2013, the crew of a Regional Express Saab 340B aircraft, registered VH-ZRL, were preparing for a scheduled passenger service from Sydney to Taree, New South Wales. The first officer (FO) was designated as the pilot flying.

Due to the inclement weather forecast at Taree and the surrounding area, the crew selected an alternate airport and elected to carry additional fuel in case conditions precluded a landing at Taree. The crew also determined that they would conduct a runway 22 area navigation global navigation satellite system (RNAV (GNSS)) approach at Taree.

At about 1815 Eastern Daylight-saving Time,[1] the flight departed Sydney with 34 passengers on board.

While enroute, the crew reported that the aircraft was in instrument meteorological conditions (IMC)[2] and heavy rain was experienced. Air traffic control provided regular updates on the weather conditions, which indicated a crosswind from the south-east would be expected at Taree.

When about 80 NM from Taree, the crew contacted the operator's ground agent at Taree, who provided updated information from the airport's automatic weather station (AWS). The crew determined that a 20 kt left crosswind would be expected for the landing. They also assessed that the braking action would be 'medium'[3] and that the conditions were acceptable for landing.

Prior to commencing the approach, the crew conducted a briefing and reviewed the missed approach procedure. During the approach, the crew continued to monitor the weather conditions. The crosswind was initially observed as 50 kts when at about 6,000 ft, although it decreased as the aircraft descended. To compensate for the crosswind, the aircraft was offset into wind.

At about 700-800 ft above ground level (AGL), the crew became visual with the runway. The crew assessed the approach and determined that it was suitable for landing. At that time, the crew reported that the wind was fluctuating and light rain was experienced.

At about 100 ft, the FO noted that the wind vector on the captain's horizontal situation indicator (HSI) display was showing a 17 kt crosswind.

During the landing flare, the FO applied right rudder and rolled the aircraft slightly to the left to align with the runway centreline. At about 1904, the aircraft touched down close to, or on the centreline. Immediately after, the crew reported that the aircraft was subjected to a wind gust, which caused the left wing to lift slightly and the aircraft to weathercock to the left, into wind. Reverse thrust had been selected after touchdown.

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1 Eastern Daylight-saving Time (EDT) was Coordinated Universal Time (UTC) + 11 hours.

2 Weather conditions that require pilots to fly primarily by reference to instruments, and therefore under instrument flight rules (IFR), rather than by outside visual references. Typically, this means flying in cloud or limited visibility.

3 The operator's flight crew operations manual (FCOM), provided guidance on the level of braking action to be expected during landing, taking into account the maximum crosswind component. 'Medium' braking action meant that the 'aircraft will use all of the scheduled distance and directional control may be impaired. The achievement of satisfactory performance requires precision and accurate control of speed.' The maximum allowable crosswind component for 'medium' braking action was 20 kt.

The aircraft veered left toward the runway edge and the captain assumed control of the aircraft. He applied right rudder, but the aircraft did not respond. As the aircraft's airspeed decreased, the captain also applied right brake, with no effect. He then simultaneously commenced nose wheel steering using the tiller. The nose wheel began to judder as it had been turned right, but the aircraft continued straight ahead. As the captain believed that the nose wheel steering was ineffective, he elected to apply asymmetric thrust by reducing the amount of reverse thrust on the left engine and increasing reverse thrust on the right engine. The aircraft commenced moving to the right.

The crew were unable to determine how far left the aircraft had veered due to the water spray from the application of reverse thrust, but believed the aircraft had not departed the runway. The aircraft slowed and was taxied to the parking area. By the time the aircraft was shut down and the passengers had disembarked, strong winds and heavy rain were experienced.

Using a torch, the FO then conducted a post flight inspection, which included examining the left landing gear and propellers. At the same time, refuelling of the aircraft commenced and the captain was completing paperwork. After finishing the post-flight inspection, the FO advised the captain that nil damage was found.

In preparation for the next flight to Grafton, the captain commenced an external inspection of the aircraft using a torch.[4] At that time, the captain reported that it was raining heavily. He examined the left landing gear and reported that no mud or grass was observed. As he continued toward the left propeller, he was interrupted by the refueller. The captain then went back into the cockpit with the refueller and was further distracted by the company's ground handling agent. As a result, the captain did not get the opportunity to inspect the left propeller blades.

At that time, the captain decided to conduct a runway inspection to determine if the runway was contaminated and requested the ground handling agent drive him out to the runway to conduct the inspection. He also took the opportunity to see if there was any evidence of the aircraft having departed the runway. Nil evidence of markings or damage was noted to indicate that the aircraft had departed the runway.

The captain reported that there was a substantial amount of standing water on the runway and estimated that the crosswind was about 30 kt. The flight to Grafton was subsequently cancelled due to the weather conditions at Taree.

The next day the flight to Grafton was conducted, with the required external inspections of the aircraft conducted by the FO. The aircraft then returned to Sydney, at which time maintenance personnel conducted an inspection of the aircraft and observed damage to the left propeller blades. All four blades had sustained stone damage predominantly on the back (reverse) of the blades (Figure 1). Individual blade damage repairs may have been carried out with the blades remaining in place; however, the four blades were all replaced in order to allow effective repair processes to be completed.

[4] Company procedures did not require the captain to conduct a post/pre-flight inspection. The FO was responsible for conducting these inspections.

Figure 1: Propeller blade damage

Source: Aircraft operator

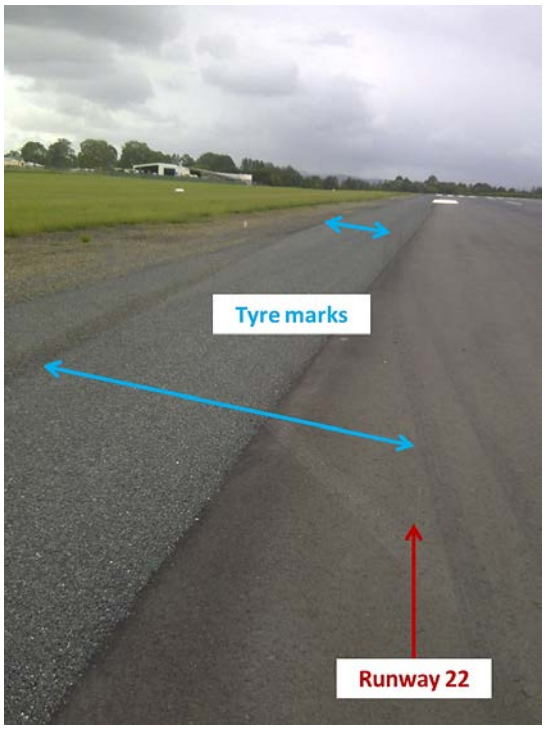
Runway inspection

Runway 04/22 at Taree consisted of a 30 m wide runway with a 3-4m wide soil and gravel shoulder either side (Figure 2). A subsequent runway inspection during daylight hours determined that the aircraft had veered onto the runway shoulder (Figure 3).

Figure 2: Runway surface

Source: Aircraft operator

Figure 3: Tyre marks on runway 22



Source: Aircraft operator

Meteorological information

Aerodrome special weather reports (SPECI)[5]

The Bureau of Meteorology (BoM) automatic weather station (AWS) located at Taree generated aerodrome weather reports. The following SPECI reports were issued:

- At 1900: indicated that the wind was 160° (True) at 16 kt; broken cloud[6] at 1,000 ft and 1,400 ft above ground level (AGL), and overcast cloud at 2,500 ft; 0.8 mm of rain had fallen in the last 10 minutes and 29.2 mm had fallen since 0900.
- At 1912: indicated that the wind was 160° (True) at 16 kt gusting to 26 kt; broken cloud at 1,000 ft and overcast cloud at 1,600 ft; 0.2 mm of rain had fallen in the last 10 minutes and 29.6 mm had fallen since 0900.

The BoM subsequently provided the Australian Transport Safety Bureau (ATSB) with one-minute interval data recorded by the AWS. At 1904, that data indicated the wind was from 159° at 18 kt gusting to 26 kt.

Recorded information

The aircraft was fitted with a flight data recorder (FDR) and following the incident, the data was downloaded and provided to the ATSB. The recorded data (Figure 4) showed that, during final approach, the aircraft's heading was less than the published runway heading, indicating that the aircraft was experiencing a crosswind from the left. When at about 800 ft, the calculated crosswind component was about 30 kts and decreased to about 13 kt when at about 100 ft.[7] At 1904:08, just prior to touchdown, the aircraft rolled left by about 8°and right rudder was applied. The aircraft rolled back to the wings level position.

As the aircraft touched down the weight on wheels parameter changed state several times before indicating the aircraft was firmly on the ground. The recorded lateral acceleration indicated that the aircraft was subjected to a side loading toward the left at touchdown.

After touchdown, reverse thrust was selected. As the aircraft's airspeed reduced through about 65 kt, the heading began to swing to the left. Right rudder was applied and the aircraft then turned toward the right at 1904:29, at an airspeed of 25 kt. The recorded lateral acceleration indicated that the aircraft was subjected to a side loading during the turn and rolled to about 2.5° left wing down. The rate of turn reduced, coincident with the left engine torque being reduced (a reduction in reverse thrust) to a lower value than the right engine torque.

After 1904:38, the rate of turn increased, but the lateral acceleration and roll attitude decreased. The right turn stopped at 1904:41 and with an airspeed of 21 kt, a left turn began. The left turn continued until 1905:06 when a heading of 213° was established and maintained until 1905:18 when a right turn onto the taxiway was commenced.

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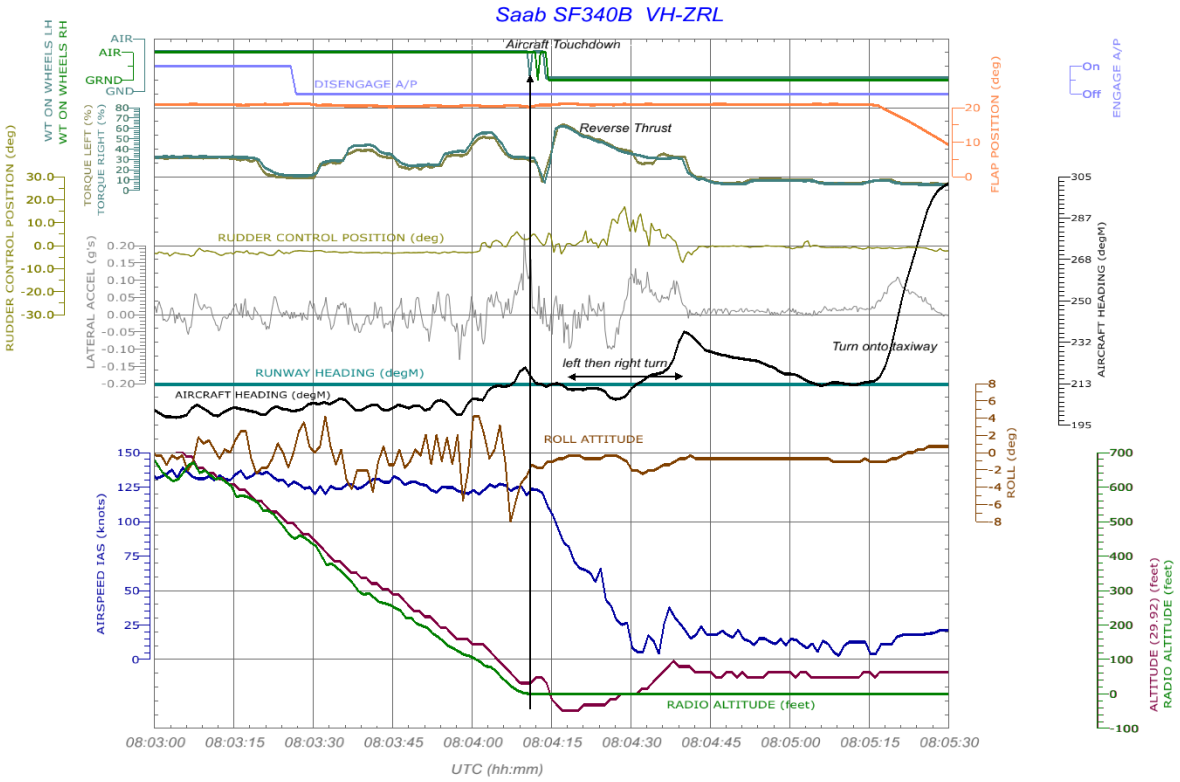
5 A special weather report used to identify when conditions are below specific levels of visibility and cloud base; when certain weather phenomena are present; and when temperature, pressure or wind change by defined amounts.

6 Cloud cover is normally reported using expressions that denote the extent of the cover. The expression few indicates that up to a quarter of the sky was covered, scattered indicates that cloud was covering between a quarter and a half of the sky. Broken indicates that more than half to almost all the sky was covered, while overcast means all the sky was covered.

7 A value for the crosswind component experienced during the approach was derived by calculation using the recorded airspeed and the difference between the recorded aircraft heading and the published runway heading.

Figure 4: Summary of flight data



Source: Australian Transport Safety Bureau

Pilot comments (captain)

The captain provided the following comments regarding the incident:

- The approach was stabilised and the aircraft landed within the touchdown zone.
- If faced with a similar situation in the future, he would likely not continue to use reverse thrust, but rather, apply forward engine power until the aircraft deviation had been corrected and then re-apply reverse thrust.
- A tactile inspection of the left propeller blades may have identified the damage, however, given the poor weather conditions on the night, the damage would not have been easy to observe.
- His additional external inspection of the aircraft had been interrupted. In hindsight, he should have asked the persons to wait until the inspection had been completed.

Pilot comments (first officer)

The first officer provided the following comments regarding the incident:

- The apron was floodlit on the terminal side. The aircraft had been parked parallel to the terminal, with the left side parked away from the lights. The first officer was required to use a torch to conduct his external inspection. At the time, it was very dark and raining heavily.
- He had conducted a thorough visual inspection of the left landing gear and top surface of the left propeller blades. When conducting his inspection, he stood facing the propellers and turned the blades in an anti-clockwise direction. This was suitable for sighting the front surface of the blades, but not the reverse side. He had also conducted a tactile inspection of the leading edge of the blades. He had got out of the habit of inspecting the surface of the reverse side of the blades and consequently did not see the damage.
- When looking at the blades afterwards with the engineers, he could not recall observing damage that he would have considered a huge amount of damage.

- If he had sighted the damage on the night, he would have sought the captain's advice.
- The propeller damage had no effect on the aircraft's performance; with no vibrations, sounds or abnormal indications noted.
- At the time of landing, the runway was not contaminated with water.

Safety message

Weather can behave in an unpredictable manner, particularly when unfavourable conditions exist. While this incident highlights the adverse effects weather can have on aircraft operations, it also emphasises the impact of complacency and interruptions/distractions.

The FO commented that, in his opinion, when conducting a considerable number of flights within a short period of time, it was easy to become complacent when having to conduct a pre-flight and post-flight inspection for each flight. Complacency, the feeling of satisfaction or contentment with what is happening, may occur from a pilot's overconfidence in performing a task that has been previously conducted numerous times, without incident. This may result in a pilot inadvertently overlooking important information or responding to a situation inappropriately. The best defence against complacency is for pilots to remain vigilant and alert, and be mindful that even the most routine tasks must be conducted with care and concentration.[8]

Furthermore, when conducting an inspection, it is important for pilots to be aware of what constitutes propeller damage so that appropriate action can be taken.

An interruption/distraction can cause the crew to feel rushed and be confronted with competing tasks. The crew must then complete one task before performing another, which may result in poor results in one or more of the completed tasks. This may leave uncertainties unresolved, the omission of actions, and failing to detect and correct resulting abnormal conditions. Acknowledging that some distractions cannot be avoided, but others can be minimised or eliminated is the first step in developing preventative strategies and lines-of-defence. The Flight Safety Foundation suggests that after interruptions/distractions have been recognised and identified, the next priority is to re-establish situation awareness by conducting the following:[9]

- *Identify:* What was I doing?
- *Ask:* Where was I distracted?
- *Decide/act:* What decision or action shall I take to get 'back on track'?

General details

Occurrence details

Date and time:	22 February 2013 – 1904 EDT	
Occurrence category:	Serious incident	
Primary occurrence type:	Runway excursion	
Location:	Taree Airport, New South Wales	
	Latitude: 31° 53.32' S	Longitude: 152° 30.83' E

[8] www.skybrary.aero/index.php/Discipline_(OGHFA_BN)
[9] www.flightsafety.org/files/alar_bn2-4-distractions.pdf

Aircraft details

Manufacturer and model:	Saab Aircraft Company 340B	
Registration:	VH-ZRL	
Operator:	Regional Express	
Serial number:	340B-398	
Type of operation:	Air transport – low capacity	
Persons on board:	Crew – 3	Passengers – 34
Injuries:	Crew – Nil	Passengers – Nil
Damage:	Minor	

About the ATSB

The Australian Transport Safety Bureau (ATSB) is an independent Commonwealth Government statutory agency. The ATSB is governed by a Commission and is entirely separate from transport regulators, policy makers and service providers. The ATSB's function is to improve safety and public confidence in the aviation, marine and rail modes of transport through excellence in: independent investigation of transport accidents and other safety occurrences; safety data recording, analysis and research; and fostering safety awareness, knowledge and action.

The ATSB is responsible for investigating accidents and other transport safety matters involving civil aviation, marine and rail operations in Australia that fall within Commonwealth jurisdiction, as well as participating in overseas investigations involving Australian registered aircraft and ships. A primary concern is the safety of commercial transport, with particular regard to fare-paying passenger operations.

The ATSB performs its functions in accordance with the provisions of the *Transport Safety Investigation Act 2003* and Regulations and, where applicable, relevant international agreements.

The object of a safety investigation is to identify and reduce safety-related risk. ATSB investigations determine and communicate the safety factors related to the transport safety matter being investigated.

It is not a function of the ATSB to apportion blame or determine liability. At the same time, an investigation report must include factual material of sufficient weight to support the analysis and findings. At all times the ATSB endeavours to balance the use of material that could imply adverse comment with the need to properly explain what happened, and why, in a fair and unbiased manner.

About this report

Decisions regarding whether to conduct an investigation, and the scope of an investigation, are based on many factors, including the level of safety benefit likely to be obtained from an investigation. For this occurrence, a limited-scope, fact-gathering investigation was conducted in order to produce a short summary report, and allow for greater industry awareness of potential safety issues and possible safety actions.