# Final Report

# CESSNA 172, REGISTRATION 9V-BOQ
# RUNWAY EXCURSION AT SELETAR AIRPORT

## 27 September 2019

AIB/AAI/CAS.184

Transport Safety Investigation Bureau
Ministry of Transport
Singapore

8 July 2020

***The Transport Safety Investigation Bureau of Singapore***

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## GLOSSARY OF ABBREVIATIONS

| | |
|---|---|
| ARFF | Airport Rescue Fire Fighting |
| ATC | Air Traffic Control |
| CCTV | Closed-circuit television |
| LT | Local Time |

## SYNOPSIS

On 27 September 2019, at about 1650LT, a Cessna 172 aircraft veered off the runway after landing on Runway 03 at Seletar Airport, Singapore. The pilot managed to steer the aircraft back onto the runway. There was no injury or damage to the aircraft or aerodrome installation.

The Transport Safety Investigation Bureau classified this occurrence as a serious incident.

## AIRCRAFT DETAILS

| | | |
|---|---|---|
| Aircraft type | : | Cessna 172 |
| Operator | : | Seletar Flying Club |
| Aircraft registration | : | 9V-BOQ |
| Numbers and type of engines | : | 1 x Lycoming O-320-D2J |
| Date and time of incident | : | 27 September 2019, about 1650LT |
| Location of occurrence | : | Seletar Airport, Singapore |
| Type of flight | : | Training |
| Persons on board | : | 1 |

## 1 FACTUAL INFORMATION

All times used in this report are Singapore Local Time (LT) unless otherwise stated. Singapore Local Time is eight hours ahead of Coordinated Universal Time (UTC).

### 1.1 History of the flight

1.1.1 On 27 September 2019, a Cessna 172 was flown by a student pilot performing a solo flight for circuit training[1] over Seletar Airport, Singapore. The flight commenced at about 1600LT. The runway in use was Runway 03.

1.1.2 During the solo flight, there was a crosswind from the right (i.e. from the east) during the aircraft's approach to Runway 03. The pilot corrected for the crosswind during the approaches without difficulty.

1.1.3 After conducting three circuits, the pilot noticed that it started to drizzle and decided to land on the fourth circuit. According to the air traffic control (ATC), the runway was dry during the landing.

1.1.4 For the fourth and last circuit, just prior to touchdown, the pilot experienced what he described as a slight wind shear. In response, the pilot increased the engine power slightly to ensure that he was able to maintain the required approach speed.

1.1.5 The pilot recalled that just after the aircraft's main wheels had touched down at about 1650LT, he encountered a gust of wind, which he felt was from the left of Runway 03, resulting in a change of the aircraft's heading towards the right and the aircraft veering to the right. The pilot said he applied brakes, left aileron and left rudder input to try to keep the aircraft on the runway. However, the aircraft continued to veer to the right.

1.1.6 As the aircraft was approaching the runway edge, the pilot felt that he was not able to fully control the aircraft and was fearful that his control inputs to try to keep the aircraft on the runway could be too excessive, which could result in the aircraft's right wingtip contacting the ground. The aircraft eventually veered off the runway onto the grass area. When the aircraft had slowed down sufficiently, the pilot regained control of the aircraft and steered the aircraft back onto the runway.

[1] Circuit training consists of the pilot carrying out multiple take-offs and landings without coming to a stop during the landing roll.

1.1.7 The aircraft came to a stop on the runway and the Airport Rescue Fire Fighting Service (ARFF) was activated by the ATC. The pilot shut down the engine and exited the aircraft before the ARFF arrived (see **Figure 1**).

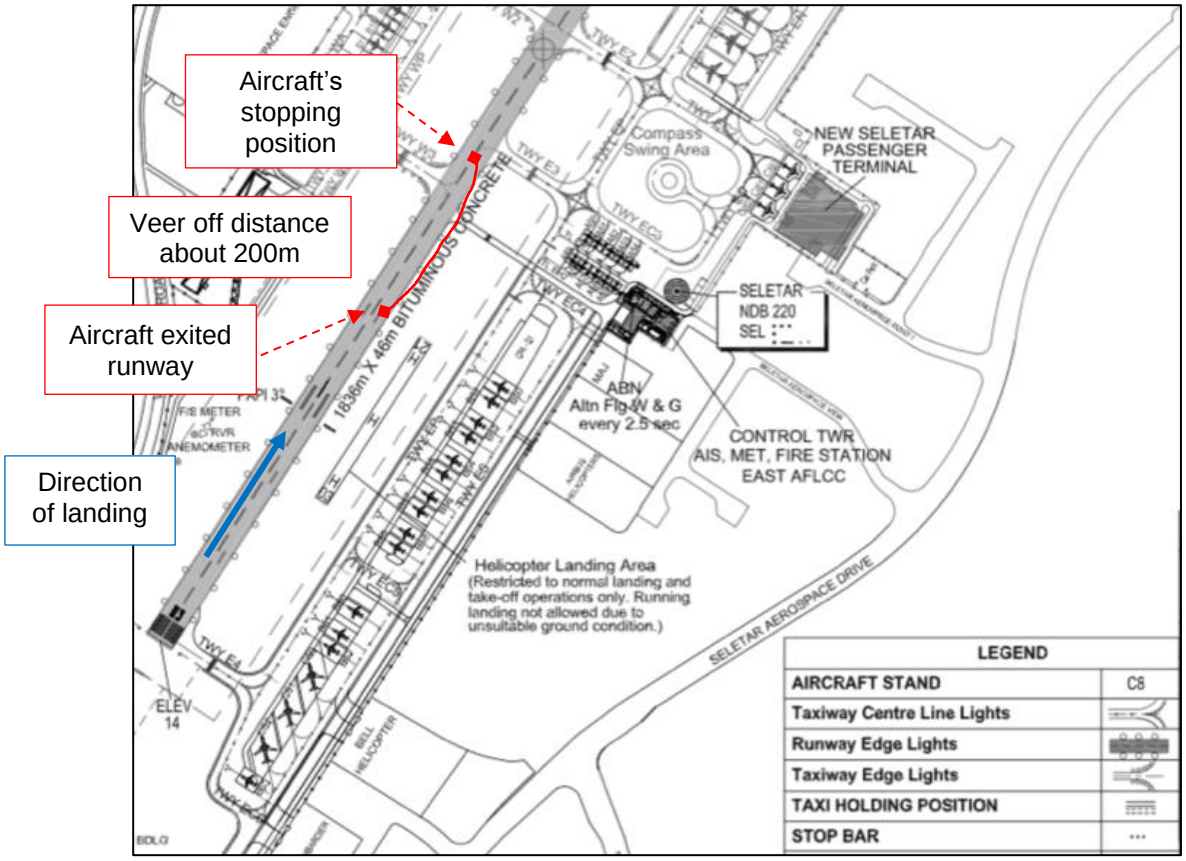


Figure 1: Aircraft ground path and stopping position

1.2 Injuries to persons

1.2.1 There was no injury to any persons.

1.3 Damage to aircraft

1.3.1 There was no damage to the aircraft.

1.4 Other damage

1.4.1 There was no other damage.

## 1.5 Personnel information

### 1.5.1 Pilot-in-Command (PIC)

| | |
|---|---|
| Gender | Male |
| Age | 39 |
| Licence | Student Pilot Licence (Aeroplane) |
| Issuing Authority | Civil Aviation Authority of Singapore |
| Licence validity | 31 January 2024 |
| Medical certificate | Class TWO Medical Certificate<br>Restriction: Nil |
| Total flying experience | 48.5 hours |
| Total hours on type | 48.5 hours |
| Flying in last 24 hours | Nil |
| Flying in last 7 days | 3 hours |
| Flying in last 28 days | 4.5 hours |
| Flying in last 90 days | 15.1 hours |

## 1.6 Meteorological information

1.6.1 According to the Meteorological Service, between 1630LT and 1700LT, the wind speeds were between 4.2 and 10.4 knots and the wind direction varied between 85 and 141 degrees. Between 1648LT and 1651LT, around the time of the incident, the wind speeds were between 5.5 and 7 knots and the wind direction varied between 110 and 126 degrees. Weather radar images showed light showers over the Seletar Airport between 1640LT and 1700LT.

1.6.2 The weather information received by the pilot from Seletar Tower, just prior to incident landing was surface wind from 120 degrees at six knots.

1.6.3 The crosswinds were within the aircraft's handling capability.

1.6.4 There was no record of detected wind shear at the time of incident.

## 1.7 Recorded data

1.7.1 There was no flight recorder installed on this aircraft, nor was a flight recorder required to be installed.

1.7.2 The video footage from the aerodrome operator's closed-circuit television (CCTV) cameras facing the runway was made available to the investigation

team. The motion of the aircraft during the runway excursion was captured in the video footage.

## 1.8 Medical and pathological information

1.8.1 The pilot underwent a medical examination following the incident. There was no evidence of any medical or toxicological factor that could have affected the performance of the pilot.

## 1.9 Tests

1.9.1 The rudder and aileron control systems were examined following the occurrence. No anomaly was found.

## 2 ANALYSIS

The investigation team looked into the following:

(a) Decision to continue with landing

(b) Control of aircraft

### 2.1 Consideration to continue with landing

2.1.1 Wind shear involves unpredictable wind speed and direction changes that can affect the safe handling of an aircraft. It is a general practice to discontinue a landing and perform a go-around when a wind shear is detected.

2.1.2 According to the pilot, he experienced a slight wind shear close to touchdown and decided to continue with the landing. Had he executed a go-around, he would have avoided the gust of wind at the time of the aircraft's touchdown.

2.1.3 This incident should remind pilots of the need to go-around when a wind shear is detected either by the pilot, the onboard aircraft systems or the meteorological equipment installed at the aerodrome.

### 2.2 Control of aircraft

2.2.1 The pilot recalled that just after the aircraft's main wheels had touched down at about 1650LT, he encountered a gust of wind, which he described as coming from the left, that resulted in a change of the aircraft's heading towards the right and the aircraft's veering to the right. The pilot said he applied brakes, left aileron and left rudder input to try to keep the aircraft on the runway. However, the aircraft continued to veer to the right. Had the wind come from the left of Runway 03, the pilot's control input would have brought the aircraft to the left of the runway.

2.2.2 The investigation team analysed the motion of the aircraft based on the meteorological data which indicated that the wind direction during the incident was from the right of the runway. The gust of wind reportedly encountered by the pilot could have been a momentary increase in strength of the crosswind from the right[2] of the aircraft. This would have resulted in the weather vaning[3] of

[2] The aircraft yawing right might have resulted in the pilot's perception that the gust of wind was from the left.

[3] The weather vane effect was a result of the aircraft having more side surface area towards the rear. Thus, the crosswind force acting on the rear of the aircraft was greater than the force acting on the forward part of the aircraft and the force differential caused the aircraft to pivot about a vertical axis through the aircraft's centre of gravity, towards the direction of the wind (in this case, to the right).

the aircraft and the aircraft yawing right, which was consistent with the pilot's account. With the application of left aileron by the pilot, the aircraft could have rolled to the left which would present a risk of the left wing of the aircraft contacting the runway surface. The investigation team was not able to reconcile the pilot's concern over the right wingtip coming into contact with the runway surface arising from a left aileron input.

2.2.3 The investigation team was unable to verify the nature and amount of control inputs by the pilot during the landing, due to the lack of flight recorder data. The exact sequence of events leading to the aircraft veering off the runway could not be ascertained.

2.2.4 Nonetheless, an appropriate response when the aircraft heading is not aligned with the runway centreline during touchdown, would be to apply the rudder in the opposite direction. Once directional control has been regained, the brakes should then be applied to decelerate the aircraft.

## 3 CONCLUSIONS

3.1 The pilot detected a slight wind shear condition just prior to the aircraft touching down. The pilot decided to continue with the landing instead of performing a go-around.

3.2 When the aircraft was veering to the right after touchdown, the pilot limited the amount of force he used on the controls to steer the aircraft to keep it on the runway, for fear that the aircraft might tip over. He opted to let the aircraft drift into the grass area and then to steer the aircraft back onto the runway after the aircraft had slowed down sufficiently.

3.3 Post-incident tests did not reveal any anomaly with the aircraft's control systems. Owing to the lack of flight recorder data, the investigation team was unable to ascertain nature and amount of control inputs by the pilot and what bearing, if any, they had on the aircraft veering off.

## 4 SAFETY ACTIONS

4.1 Arising from this incident, the operator of the aircraft initiated the following safety actions:

a) The lessons learnt from this incident were shared with all members of the flying club at a safety forum. The safety forum highlighted the best practices of aircraft control and go-around decisions.

b) The sole instructor pilot of the flying club revised his instruction syllabus to enhance training in the following areas:

- Aircraft control on ground after landing
- Use of rudder in phases of training

c) The student pilot was given three hours of flight training on crosswind techniques and circuit training under the supervision of the instructor pilot. He resumed solo training after having completed the additional training satisfactorily. Subsequently, the student pilot completed the flight handling test conducted by the Civil Aviation Authority of Singapore and obtained his Private Pilot Licence.

## 5 SAFETY RECOMMENDATION

*A safety recommendation is for the purpose of preventive action and shall in no case create a presumption of blame or liability.*

5.1 In view of the safety actions undertaken by the operator of the aircraft, the investigation team did not have any safety recommendation to propose.