



Australian Government  
Australian Transport Safety Bureau

# Ground handling accident involving Cessna 172RG, VH-MKG

Parafield Airport, South Australia | 11 September 2016



Investigation

**ATSB Transport Safety Report**  
Aviation Occurrence Investigation  
AO-2016-115  
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### Addendum

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# Safety summary

## What happened

On 11 September 2016, the pilot of a Cessna 172RG, registered VH-MKG (MKG), was observed moving the aircraft out of a hangar at Parafield Airport. The aircraft was positioned on the apron in front of this hangar. The pilot then hand swung the propeller to start the engine, with no one at the aircraft controls. Following the hand start, the uncontrolled aircraft taxied a short distance before colliding with a parked Piper PA-32 Saratoga. Although not struck directly by the propeller, the pilot was fatally injured either by being struck by the aircraft or in the subsequent fall as the aircraft taxied away. The pilot's dog was unsecured in the aircraft.

## What the ATSB found

The ATSB found that the battery installed in MKG had insufficient charge to start the engine, and that the pilot started the engine by hand swinging the propeller. The aircraft was not adequately secured during the hand start, resulting in fatal injuries to the pilot and damage to another aircraft when it taxied without pilot control.

## Safety message

Hand swinging an aircraft propeller is recognised across the aviation industry as a hazardous procedure. Although hand swinging is permitted under the civil aviation regulations, it should only be undertaken when no other alternatives exist to start the aircraft engine and all necessary precautions have been taken to mitigate the hazards.

Additionally, unrestrained animals in the aircraft cabin have the potential to adversely affect safety during aircraft operations.

### Final position of VH-MKG against the Saratoga



Source: ATSB



## The occurrence

At approximately 1300 Central Standard Time<sup>1</sup> on Sunday 11 September 2016, the owner/pilot (pilot) of a Cessna 172RG aircraft, registered VH-MKG (MKG), arrived at Parafield Airport. MKG was located in a hangar on the aerodrome, where the pilot was employed on a contract basis as a check and ferry pilot and aircraft maintenance engineer.

The ATSB was advised that the pilot had been conducting part of a 100 hour inspection, and other scheduled maintenance, on MKG throughout the weekend. The battery installed in MKG had reportedly been on charge during this maintenance.

At around 1600, witnesses reported seeing the pilot manually reposition MKG outside of the hangar. The aircraft was parked, facing approximately south-west, into the wind. The witnesses observed an initial pull through of the propeller by the pilot, before the pilot returned to the cockpit area for a short time.

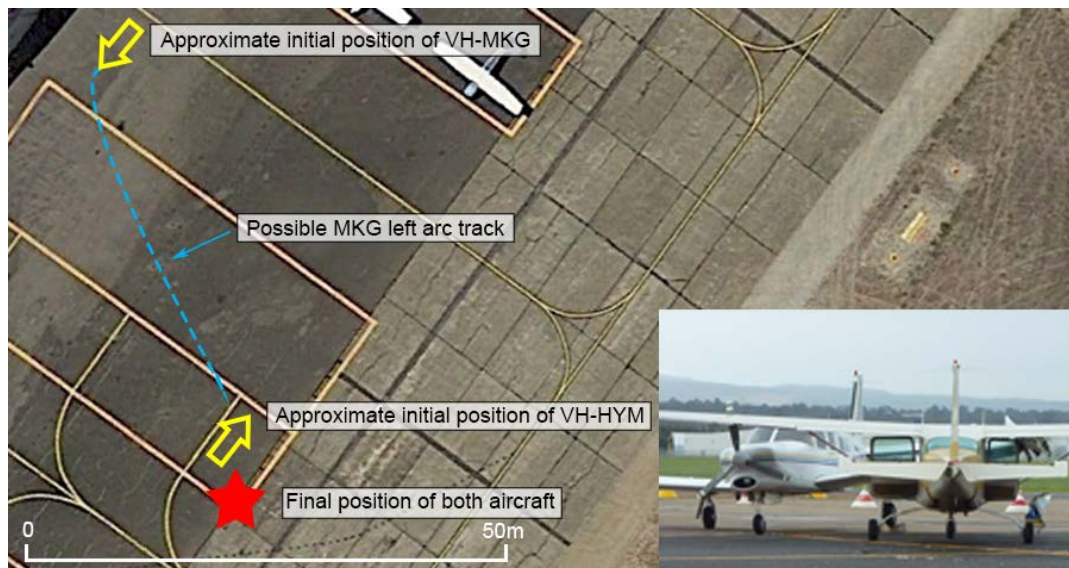
The pilot then returned to the front of the aircraft and hand swung the propeller for a second time, resulting in the aircraft engine starting. MKG then taxied without pilot control, turning approximately 45 degrees on a left arc, before colliding with a Piper PA-32 Saratoga, registered VH-HYM, that was parked on the apron, approximately 35m from MKG.

Throughout the engine start and uncontrolled taxi, the pilot avoided being struck directly by the propeller. However, possibly in an attempt to re-enter the cockpit to regain control of the aircraft, the pilot's fatal injuries likely resulted either from being struck by MKG as it taxied or in the subsequent fall.<sup>2</sup>

The impact of the collision pushed the Saratoga about 10m from its parked location. Both aircraft came to rest approximately parallel to each other, facing in opposite directions, with MKG's propeller embedded in the underside of the Saratoga's left wing. The nose cowl of MKG was also wedged under the Saratoga's wing, lifting its left main wheel clear of the ground.

The pilot's dog was found unrestrained in the aircraft cabin and was removed by emergency responders approximately 90 minutes after the accident.

**Figure 1: The approximate initial and final positions of VH-MKG and VH-HYM, and the approximate track of MKG. Inset shows the final position viewed from behind MKG.**



Source: Google Earth, annotated by ATSB.

<sup>1</sup> Central Standard Time (CST): Coordinated Universal Time (UTC) + 9.5 hours

<sup>2</sup> At the time of publication, the Coroner's report had not been finalised. This report will be updated if there are any significant changes to the preliminary findings

## Starting procedures

The starting procedures for normal operations were contained in the pilot operating handbook (POH) for the Cessna 172RG. It included a checklist of actions to be taken before starting the engine and a starting engine checklist.

In normal operations, the aircraft electrical system was used to start the engine. This required the battery to have sufficient charge to engage the starter motor. Although the battery had been on charge the preceding day while maintenance was undertaken, it was not capable of maintaining sufficient charge to start the engine.

The aircraft was equipped with a ground service port where a ground power unit (GPU) could be connected. The service manual indicated a GPU was intended as a power source for prolonged ground maintenance requiring the use of electrical power. It also indicated, without restricting it to these conditions, that it could be used for cold weather starting. A GPU was available in the hangar where the aircraft was located.

## Hand starting procedures

There were no specific procedures to hand start MKG. Civil Aviation Regulation 231 - *Manipulation of propeller* (CAR 231) permitted the pilot in command to hand swing a propeller to start the engine, provided no assistance was readily available, no passengers were on board the aircraft and adequate provision was made to prevent the aircraft moving forward.

Generic guidance on hand swinging a propeller, published by the Civil Aviation Safety Authority (CASA), the US Federal Aviation Administration (FAA) and various pilot forums, covered topics including:

- deciding to hand start
- positioning the aircraft
- securing the aircraft
- setting the engine controls
- having assistance.

While CAR 231 permitted hand swinging, the guidance available highlighted the increased risk associated with this starting method, and that it should be considered an emergency procedure, used only when absolutely necessary.<sup>3</sup>

The aircraft was positioned appropriately according to the guidance, outside of the hangar, on firm, flat, level ground, with no obstacles directly ahead.

The guidance advised that:

- chocks of an appropriate size and material should be applied to both main wheels
- the aircraft should be tied down adequately, using an appropriate restraint
- the brakes should be set
- the fuel system and engine controls set for a normal start.

CAR 231 requires the person manipulating the propeller to know the correct starting procedure for the aircraft. Additionally, it allows for assistance to be provided by having a qualified person at the controls of the aircraft, if a suitably qualified person is available. The FAA handbook noted that 'the procedure should never be attempted alone.'<sup>4</sup>

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<sup>3</sup> CASA Safety Video - Prop Swinging available at <https://www.youtube.com/CASABriefing>

<sup>4</sup> FAA Airplane Flying Handbook, FAA-H-8083-3A, 2004

## **Securing the aircraft**

### **Wheel Chocks**

A single set of small wooden chocks were located about 15m from the hangar doors, in the approximate area MKG was positioned prior to start-up. The distance between the chocks was consistent with both the nose and main wheels of MKG, with a small gap. It was probable that this gap resulted from forward chock sliding along the ground a short distance as the aircraft rolled over it. A set of aircraft chocks consisting of two aluminium angles connected by a chain were located in the aircraft.

### **Brake system**

The aircraft had a single disc, hydraulically actuated brake on each main landing gear wheel. The brakes were operated by applying pressure to the top of the rudder pedals. When the aircraft was parked, both main wheel brakes were able to be set by using the parking brake. The POH instructed that 'to apply the parking brake, set the brakes with the rudder pedals, pull the handle aft, and rotate it 90° down.' A ratchet spring then holds the park brake in position.

On-site examination of the aircraft brake system established that the park brake was inoperative. The ratchet spring from the park brake handle had fractured, which rendered the park brake system unable to independently remain locked and set. A thorough search of the aircraft cabin did not locate the remainder of the ratchet spring. Examination of the park brake assembly at the ATSB's technical facilities in Canberra was unable to indicate whether the park brake mechanism was operative prior to the accident.

### **Tie down**

A tie down kit was located in the aircraft, but there was no provision for a tie down in the location the aircraft was parked.

### **Throttle control**

The throttle control was of the push-pull type, incorporating a friction lock, which is rotated for the desired friction level. The throttle is open in the fully forward position and closed in the fully aft.

Post-accident inspection of the aircraft controls found the throttle to be at about one third of its possible travel. The friction knob was consistent with no friction on the throttle control.

The measured throttle position was equivalent to a higher setting than the POH engine start checklist position. However, as the friction lock was not set, it could not be determined if this was the same position as when the aircraft propeller was hand swung.

## **Related occurrences**

A review of the ATSB occurrence database identified 39 other reported incidents involving hand starting an aircraft resulting in injuries and substantial damage to property. The database contained all reported occurrences from 1969. The majority of incidents identified inadequate aircraft restraint and excessive throttle settings as factors in the aircraft moving after a hand start. Of these, a number were identified where the aircraft park brake and wheel chocks were used but were not adequate to restrain the aircraft. This included the investigation detailed below.

### **ATSB investigation 199401851**

The pilot attempted to start the engine for the return flight to Darwin, but the starter motor failed to operate. He then applied the handbrake, chocked the nose-wheel and hand-swung the propeller. After several attempts the engine fired then ran at a high RPM speed causing the aircraft to jump over the chock and head towards the airport fence. After unsuccessfully attempting to enter the cabin the pilot tried to grab a main wheel, but missed. He next grabbed at the tailplane but was knocked to the ground. The empty aircraft then ran through the airport fence, across a road and into a ditch, where it came to rest suffering substantial damage.

# Safety analysis

## Starting procedures

Normal operating procedures for the aircraft relied on the battery having sufficient power to start the engine. Evidence gathered during the investigation indicated that the battery was known by the pilot to be unserviceable prior to the accident. It could not be determined why the battery had not been replaced prior to conducting the ground run. Similarly, it was unable to be determined why the available GPU was not used.

The pilot was known to have hand swung aircraft previously, including MKG. The use of either the park brake or wheels chocks, or a combination of both, may have been sufficient to hold the aircraft on previous occasions. However, the aircraft manufacturer indicated that neither the use of chocks nor the park brake were designed to hold the aircraft during an engine start, and were only intended to hold a parked aircraft.

The pilot was hand starting the aircraft unassisted, using only small chocks and without tying down the aircraft, and would therefore have been relying on the park brake being set. If the spring was broken prior to the park brake being set, or broke at the time the brake was set, the pilot would have been alerted to this as the park brake handle would have returned to its initial position. It remains possible that the spring failed between the time the brake was set and the time the engine was started, leaving the pilot unaware that the park brake was not set. This reinforces the recommendations to have a qualified second person at the controls when attempting to hand start.

## Other factors that increased risk

### ***Unrestrained animal***

Civil Aviation Regulation 256A - *Carriage of animals*, allows animals to be transported on aircraft. The regulation requires any animal to be in a container or adequately restrained in order to prevent adversely affecting the safe operation of the aircraft.

While it could not be determined in this instance if the presence of the dog had any impact on the accident, an unrestrained animal in the cockpit or cabin area of an aircraft increased the risk of inadvertent interference with aircraft control settings.

## Findings

From the evidence available, the following findings are made with respect to the ground handling accident involving Cessna 172RG, registered VH-MKG, Parafield Airport, South Australia on 11 September 2016.

These findings should not be read as apportioning blame or liability to any particular organisation or individual.

### Contributing factors

- The aircraft battery had insufficient charge to start the engine, resulting in the pilot starting the engine by hand swinging the propeller.
- The aircraft was not adequately secured during the hand start and had no one at the controls, resulting in fatal injuries to the pilot and damage to another aircraft when it taxied away.

### Other factors that increased risk

- Unrestrained animals in the aircraft cabin can adversely affect safety during aircraft operations.



# General details

## Occurrence details

Date and time:	11 September 2016 – 1600 CST	
Occurrence category:	Accident	
Primary occurrence type:	Ground Operations	
Location:	Parafield Aerodrome	
	Latitude: 34° 47.60' S	Longitude: 138° 37.98' E

## Pilot details

Licence details:	Private Pilot (Aeroplane) Licence, issued Sept 1981
Endorsements:	Manual Propeller Pitch Control; Retractable Undercarriage; Tail Wheel Undercarriage
Ratings:	Single Engine Aeroplane, Multi Engine Aeroplane, Night Visual Flight Rules Multi Engine Aeroplane
Medical certificate:	Class 2, valid to November 2016
Aeronautical experience:	2,155 hours
Last flight review:	December 2015

## Aircraft details

Manufacturer and model:	Cessna Aircraft Company 172RG	
Year of manufacture:	1981	
Registration:	VH-MKG	
Operator:	Private	
Serial number:	172RG0795	
Total Time In Service	6,826.5 hours	
Type of operation:	Private	
Injuries:	Crew – 1 (fatal)	Passengers – 0
Damage:	Minor	

# Sources and submissions

## Sources of information

The sources of information during the investigation included:

- Witnesses
- Maintenance staff
- the Civil Aviation Safety Authority
- Adelaide Airport Limited
- Cessna (Textron Aviation)
- South Australia Police

## References

FAA-H-8083-3A, Airplane flying handbook. (2004). U.S. Dept. of Transportation, Federal Aviation Administration, Flight Standards Service.

Information Manual, Cessna Model 172RG. (1983). Cessna Aircraft Company, Wichita, Kansas USA

## Submissions

Under Part 4, Division 2 (Investigation Reports), Section 26 of the *Transport Safety Investigation Act 2003* (the Act), the Australian Transport Safety Bureau (ATSB) may provide a draft report, on a confidential basis, to any person whom the ATSB considers appropriate. Section 26 (1) (a) of the Act allows a person receiving a draft report to make submissions to the ATSB about the draft report.

A draft of this report was provided to Cessna (Textron Aviation), the Civil Aviation Safety Authority and the United States National Transportation Safety Board.

Submissions were received from the Civil Aviation Safety Authority and the United States National Transportation Safety Board. The submissions were reviewed and where considered appropriate, the text of the report was amended accordingly.

# Australian Transport Safety Bureau

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; 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 operations involving the travelling public.

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.

## Purpose of safety investigations

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

## Developing safety action

Central to the ATSB's investigation of transport safety matters is the early identification of safety issues in the transport environment. The ATSB prefers to encourage the relevant organisation(s) to initiate proactive safety action that addresses safety issues. Nevertheless, the ATSB may use its power to make a formal safety recommendation either during or at the end of an investigation, depending on the level of risk associated with a safety issue and the extent of corrective action undertaken by the relevant organisation.

When safety recommendations are issued, they focus on clearly describing the safety issue of concern, rather than providing instructions or opinions on a preferred method of corrective action. As with equivalent overseas organisations, the ATSB has no power to enforce the implementation of its recommendations. It is a matter for the body to which an ATSB recommendation is directed to assess the costs and benefits of any particular means of addressing a safety issue.

When the ATSB issues a safety recommendation to a person, organisation or agency, they must provide a written response within 90 days. That response must indicate whether they accept the recommendation, any reasons for not accepting part or all of the recommendation, and details of any proposed safety action to give effect to the recommendation.

The ATSB can also issue safety advisory notices suggesting that an organisation or an industry sector consider a safety issue and take action where it believes it appropriate. There is no requirement for a formal response to an advisory notice, although the ATSB will publish any response it receives.

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### Investigation

#### **ATSB Transport Safety Report** Aviation Occurrence Investigation

Ground handling accident involving Cessna 172RG, VH-MKG  
Parafield Airport, South Australia, 11 September 2016

AO-2016-115

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