Transportation Safety Board of Canada

Bureau de la sécurité des transports du Canada

AVIATION INVESTIGATION REPORT
A08O0168

LOSS OF CONTROL AND COLLISION WITH TERRAIN

VAN'S RV-3B C-GJIF
LAKE SIMCOE REGIONAL AIRPORT
BARRIE-ORILLIA, ONTARIO
06 JULY 2008

Canada

The Transportation Safety Board of Canada (TSB) investigated this occurrence for the purpose of advancing transportation safety. It is not the function of the Board to assign fault or determine civil or criminal liability.

Aviation Investigation Report

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Summary

On 06 July 2008, the privately operated Van's RV-3B aeroplane (registration C-GJIF, serial number 11340) was being flown on a pleasure flight from the Lake Simcoe Regional Airport in Barrie-Orillia, Ontario to the vicinity of Tobermory, Ontario and returning. On return to the Lake Simcoe Regional Airport, the aircraft joined a left-hand circuit to land on Runway 28. At 1020 eastern daylight time, the aircraft touched down and bounced two or three times. After the last bounce, the aircraft climbed steeply, then descended rapidly, and impacted on the grass about 20 feet left of the southern edge of the runway, approximately 2000 feet from the threshold. There was a post-impact fire. The pilot was fatally injured and the aircraft was destroyed.

Ce rapport est également disponible en français.

Other Factual Information

The occurrence flight was the second flight of the day. The flight originated at the Ottawa/Carp Airport, Ontario at about 0645 [1] and was flown under visual flight rules to the Lake Simcoe Regional Airport in Barrie-Orillia, Ontario, arriving at approximately 0800. The aircraft was refuelled and took off at about 0845 for the flight to Tobermory. Three radio transmissions were recorded by London Radio: the first when C-GJIF transited the Wiarton area en route to Tobermory, the second when it approached the Tobermory area, and the third when it transited the Wiarton area returning to the Lake Simcoe Regional Airport.

A primary radar target corresponding to C-GJIF was tracked by the NAV CANADA radar at Toronto, the nearest air traffic control radar, between the vicinity of the Lake Simcoe Regional Airport and about 40 nautical miles (nm) west on both the outbound and return legs of the flight. The remainder of the flight was below the floor of radar coverage. According to the aircraft journey logbook, the transponder had been removed for maintenance; therefore, no secondary returns were recorded. There was no regulatory requirement to carry a transponder in the airspace used by the aircraft.

The weather recorded by the Lake Simcoe Regional Airport automated weather observation system (AWOS) at 1025 was as follows: sky condition clear, visibility 10 statute miles (sm), temperature 24°C, dew point 14°C, wind 160°True (T) at 3 knots, altimeter setting 30.07 inches of mercury, and density altitude of 2100 feet. Similar weather existed along the route of the flight. The weather was suitable for the flight and is not considered a factor in the accident.

The aircraft joined mid-downwind for a left-hand circuit to Runway 28, an asphalt runway 5000 feet long by 100 feet wide. Normal radio calls were made but the pilot did not state whether he intended a full-stop landing or a touch-and-go. During the final segment, the aircraft approached the runway threshold in a near-level attitude. The aircraft touched down approximately 1000 feet down the runway; the attitude remained flat and there was no apparent flare. The aircraft bounced to an estimated height of 15 feet, touched down a second time in a more nose-up attitude—approximately the three-point attitude. It bounced a second and possibly a third time. After the final bounce, the aircraft was slow (i.e., low-energy state) and was in a steep nose-up attitude. The engine power increased. At the top of the bounce, which may have been as high as 50 to 75 feet, the nose dropped sharply. As the aircraft descended, the nose came up while the aircraft continued to descend. The aircraft struck the ground in a near-flat, wings-level attitude heading 30 to 40° left of runway heading. A fire began within a few seconds after the impact.

Airfield personnel and others at the field responded and were on scene in little more than one minute and attempted to control the fire using handheld extinguishers. They found the canopy in the closed and locked position and the pilot unresponsive in the cockpit. The intensity of the fire prevented them from gaining access to the cockpit. Individual volunteer firefighters arrived within minutes and used additional handheld extinguishers to suppress the fire. The fire was not extinguished until the fire truck arrived on scene approximately 10 minutes after the accident.

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[1] All times are eastern daylight times (Coordinated Universal Time minus four hours).

Examination of the wreckage indicated that the main landing gear failed aft on impact, resulting in the right main landing gear penetrating the fuel tank in the leading edge of the right wing, allowing fuel to leak. The fuel ignited, likely as a result of contact with the hot engine exhaust stack. The cockpit area and the inboard section of the right wing were consumed by the fire. Control cabling outside the cockpit area was found intact and the controls were found free of restriction. The elevator trim tab was found slightly trailing-edge up (corresponding to aeroplane nose down). The left wing was intact and the corresponding fuel tank was approximately half full of fuel. Nothing was found to indicate that the aircraft experienced a mechanical failure prior to the accident.

The Van's RV-3B aeroplane is a single-seat, single-engine, low-wing, all-metal monoplane fitted with conventional (i.e., tail wheel) landing gear as illustrated in Figure 1. The aeroplane, which had been built by the pilot from plans and kits, had been issued a special certificate of airworthiness as an amateur-built aircraft under the provision of section 507.03 of the *Canadian Aviation Regulations* (CARs). Examination of the aircraft log books and construction records indicate that it was properly built, certified, and maintained. Surviving structure indicated good workmanship. Information from the manufacturer indicated that the nature of the landing gear failure was indicative of a high rate of descent at impact and that there was no history of this type of failure when landing within design limits.

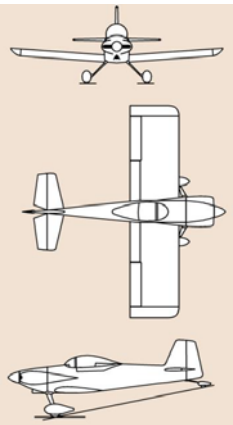

Figure 1. Van's RV-3B general arrangement

The pilot held a private pilot license, which he received in 1997, and was certified and qualified for the flight in accordance with existing regulations. His initial experience was in tricycle-gear aeroplanes. His experience in conventional landing gear aircraft, from entries in his logbook, is shown in Table 1.

Date	Experience	Flights/Hours [2]
July 2000	Tail dragger checkout – dual instruction in Champion 7ECA	2 / 3
July 2001	Dual instruction in Champion 7ECA including 3-point landings	2 / 4
December 2002	Dual instruction in Piper PA-18 including 3-point landings	2 / 2
September 2003	Dual instruction in Van's RV-9 by factory-endorsed instructor	1 / 1
December 2003 to February 2004	Tail wheel endorsement – dual instruction in the United States in Piper PA-18 and Aviat A1B aeroplane	15 / 17
September 2004	Dual instruction in Van's RV-7 by factory-endorsed instructor	1 / 1
September 2005	Dual instruction in Van's RV-7 by factory-endorsed instructor	1 / 1
May 2006	Factory RV tail wheel checkout in Van's RV-7 by factory-endorsed instructor [3]	6 / 9
24 June 2006	Pilot's first flight in Van's RV-3B, also maiden flight of C-GJIF	
June 2006 to July 2008	Experience in C-GJIF	80 / 122

Table 1. Pilot logbook entries

Prior to the date of the accident, the pilot had accumulated 453 hours of total flying time, of which 122 hours had been in the accident aircraft. During the previous thirty days, he had flown 17 hours, all in the accident aircraft. He flew approximately 3 additional hours on the day of the occurrence. No information was available as to his activity/rest schedule during the two days before the accident.

The pilot usually employed a three-point landing technique, but recently had experimented with the wheel landing technique. The wheel landing technique requires touching down in a level attitude on the main wheels and, as the wheels touch, checking forward on the elevator control to keep the main wheels firmly on the runway until speed decreases and the tail touches down as elevator control diminishes. [4] There was no specific entry for wheel landing training in the pilot's log book; however, such entries are not required and wheel landings are usually performed as part of tail wheel endorsements.

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2 All flights/hours do not include the day of the accident.

3 The manufacturer, Van's Aircraft Inc., has developed a transition training program that is intended to assist qualified pilots to transition to RV series airplanes. The company identifies several qualified flight instructors who offer this program. The instruction is provided in two-place RV aeroplanes that have flying characteristics similar to single-place RV aeroplanes.

4 Transport Canada, TP 975E, *Flight Instructor Guide – Aeroplane*, revised 09/2004.

The pilot was found in the cockpit of the aircraft with the restraint harness and canopy still secured. The post-mortem examination found no evidence of pre-existing medical disease that would have contributed to pilot incapacitation. There was evidence of significant force at impact that could cause unconsciousness or a decreased level of consciousness. As a result, the pilot was insensible to the situation and was not able to extricate himself from the aircraft before succumbing to smoke inhalation. There were no other significant medical findings and no drugs or alcohol were detected. The cause of death was found to be the post-crash fire, including smoke inhalation and carbon monoxide poisoning. Absent the fire, the crash was survivable.

The aircraft was equipped with an emergency locator transmitter (ELT) mounted behind the cockpit. The ELT was found severely damaged by fire and heat. There were no reported ELT transmissions at the time of the accident and the Joint Rescue Coordination Centre (JRCC) in Trenton indicated that no ELT signals were detected by the search-and-rescue satellite system. It could not be determined whether the ELT functioned, even momentarily, before it was destroyed in the post-crash fire.

The RV-3 type was designed in the late 1960s. About 250 of these aircraft have been built worldwide; fourteen are registered in Canada. Transportation Safety Board (TSB) records show four other accidents and one incident in Canada involving this aircraft type:

- 1978 - Wing structural failure in flight.
- 1982 - Collision with a truck on the ground.
- 1992 - Fast approach; porpoise after touchdown; lost directional control; went off the side of the runway and overturned.
- 1996 – Landed heavily and bounced; during the go-around, the aileron controls jammed; aeroplane rolled and struck the ground.
- 2008 - Gusty cross-wind landing—aircraft bounced, stalled, and went off the side of the runway; minor damage only.

Guidance material was reviewed regarding three-point and wheel landing techniques for conventional-gear aeroplanes. The bounced landing is characterized by the Federal Aviation Administration as a pilot-induced oscillation that occurs after an aeroplane touches down in a nose-low attitude with excess speed. [5] Touchdown on the main wheels creates a nose-up pitching moment which, if not controlled, produces a greater pitch attitude, higher angle of attack, and greater lift. As a result, the aircraft lifts-off and climbs. Pilot reaction to reduce the pitch angle is to push forward on the control stick or yoke, which reinforces the effect of the aircraft's natural stability and results in the aircraft landing a second time with a higher rate of descent and a greater tendency to bounce than the first landing, as illustrated in Figure 2.

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[5] United States Federal Aviation Agency, Pamphlet P-8740-48, *On Landings Part 1*, 1995.

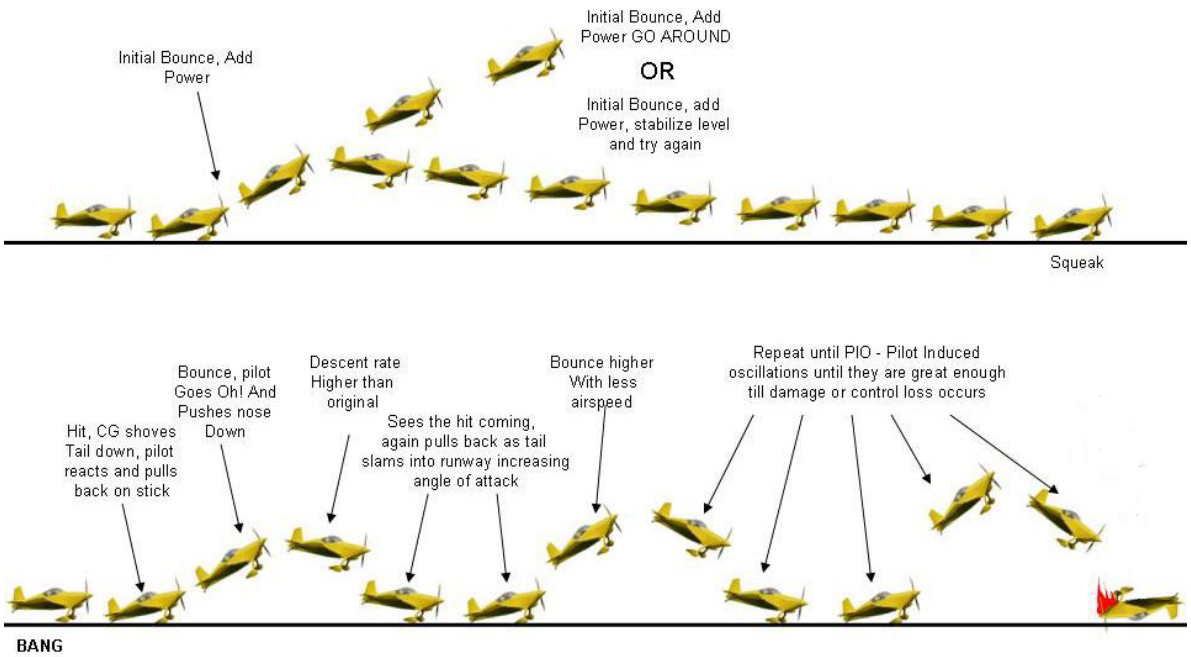

Figure 2. Bounced landing in a conventional-gear aeroplane
(Adapted with permission from George McQueen)

The Experimental Aircraft Association indicates that there are three options for a pilot after the aeroplane bounces: [6]

- Apply power and go around;
- If there is sufficient runway, apply power and level the aeroplane after the first bounce, then reduce power and re-establish in the flare as airspeed reduces in order to achieve an acceptable landing; or
- Allow the bounce to continue with a risk of damage.

6 Experimental Aircraft Association, Reach for the Sky Learn to Fly Article 11/08, *Bad Landings*.

Analysis

With no indication of mechanical failure or pilot incapacitation prior to the accident, the investigation focussed on the landing technique employed by the pilot and his response to the bounce after the first touchdown. The aircraft attitude on approach and the slightly nose-down longitudinal trim position found in the wreckage indicate a higher-than-normal approach speed, consistent with an intended wheel landing. Although the pilot was less experienced in wheel landings than conventional ones, there was nothing to indicate that he did not have the skill to perform one properly.

After the aircraft bounced on the first touchdown, the absence of a positive power application indicates that the pilot attempted to continue the landing using the existing speed of the aircraft. However, he unintentionally entered a pilot-induced oscillation (PIO), resulting in a more severe second and possibly third bounce. The eventual addition of power following the last bounce was likely an attempt to go around but the aircraft was in too low an energy state for the pilot to effect a recovery and avoid an impact that was beyond the design limit of the landing gear. Essentially, the attempted go around was too late to be successful; however, the investigation was unable to determine exactly why it was not initiated sooner. As a result of the high rate of descent on impact, the landing gear collapsed, rupturing the fuel tank and allowing fuel to leak and be ignited by the hot exhaust stack. Although the impact was survivable, it incapacitated the pilot, preventing him from escaping the cockpit before succumbing to smoke inhalation.

Findings as to Causes and Contributing Factors

1. The aircraft approached and likely touched down at a higher-than-normal speed, causing it to bounce on touchdown.

2. The pilot attempted to continue the landing without adequate correction for the bounce, leading to the aircraft bouncing again and then impacting the ground at a rate of descent that exceeded the design limit of the landing gear. As a result, the landing gear failed, a fuel tank ruptured, and a post-impact fire ensued.

3. The crash was survivable but the pilot, incapacitated by the severity of the impact, was unable to escape the cockpit and succumbed to smoke inhalation as a result of the post-impact fire.

Other Findings

1. The intensity of the post-impact fire prevented responders from reaching the cockpit to free the pilot.

2. The emergency locator transmitter (ELT) was rendered inoperative by the post-impact fire and heat damage.

This report concludes the Transportation Safety Board's investigation into this occurrence. Consequently, the Board authorized the release of this report on 06 October 2009.