

ACCIDENT

Aircraft Type and Registration:	Vans RV-8A, G-HCCF	
No & Type of Engines:	1 Lycoming IO-360-A1B6 piston engine	
Year of Manufacture:	2014 (Serial no: PFA 303-13790)	
Date & Time (UTC):	21 February 2018 at 1400 hrs	
Location:	Old Sarum Airfield, Wiltshire	
Type of Flight:	Private	
Persons on Board:	Crew - 1	Passengers - 1
Injuries:	Crew - None	Passengers - None
Nature of Damage:	Extensive	
Commander's Licence:	Private Pilot's Licence	
Commander's Age:	59 years	
Commander's Flying Experience:	4,310 hours (of which 37 were on type) Last 90 days - 6 hours Last 28 days - 6 hours	
Information Source:	Aircraft Accident Report Form submitted by the pilot	

Synopsis

Following a bounced landing, the aircraft's nose landing gear dug into soft grass, the propeller made ground contact and the aircraft inverted.

History of the flight

The aircraft was being flown from the rear seat and the owner, who possesses a Private Pilot's Licence (PPL) with a lapsed rating for Single Engine Piston (SEP) aircraft, was a passenger in the front seat. Mainwheel braking is facilitated using toe pedals, but these are only fitted in the front cockpit.

Following a local flight, the pilot completed two satisfactory 'short field' landings on the grass Runway 06 with 'full flap' set, and with braking applied by the passenger at the pilot's request. Because brake pedals are available only in the front cockpit, the aircraft has a placard which states it is only to be flown solo from the front seat.

A third approach was flown, for another 'short field' landing, and the aircraft touched down on a part of the runway close to the threshold that felt "bumpy" and had an uphill gradient. The aircraft bounced and both occupants believed that only the mainwheels had touched, but subsequent examination of the ground markings indicated the nosewheel had also made firm contact (Figure 1). This was substantiated by a witness, who described the third landing as heavier than the first two, and who believed the aircraft was in a relatively flat attitude when it bounced.

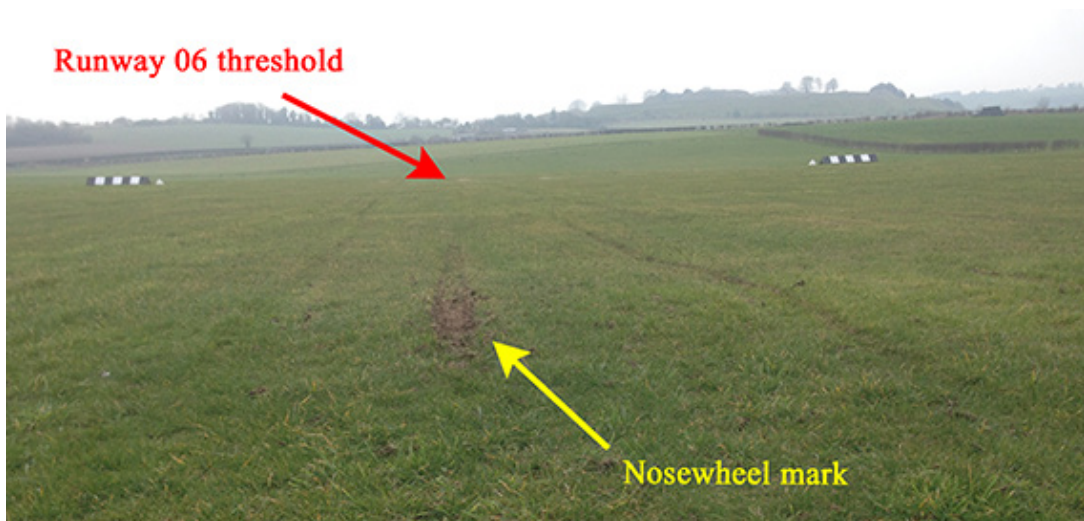


Figure 1

View of initial ground marks; the aircraft having touched down moving towards the camera position and then bounced

After the bounce, when the aircraft touched down again, the pilot asked the passenger to apply the brakes “more firmly” than he had during the previous landings. The aircraft ran straight and slowed quickly, but the nose dropped and, although the pilot moved the control stick fully aft, the propeller made ground contact. According to the passenger, the aircraft then “flipped over quite slowly” and came to rest inverted, with the canopy broken into several pieces (Figure 2).



Figure 2

G-HCCF inverted and with a line attached in preparation for righting

The pilot stated that the fuel and electrics were switched OFF immediately and then he released his seat belt, although he later wished he had kept his belt fastened for longer, because he had to support his own body weight and clear pieces of the canopy while he

was upside down. Several bystanders approached the aircraft and, in response to the pilot's shouted instructions, they raised one of the wings. This allowed the passenger and the pilot to crawl out through the broken canopy.

The airfield authority noted that Runway 06 is generally regarded as smooth but with an undulation, or bump, close to the threshold. At the time of the accident the surface had drained well, following a period of rain, but was assessed as soft.

Aircraft occupants' comments

After examining the ground marks and damage, the passenger, who was also the aircraft's constructor and owner, observed that the nose landing gear had bent rearwards as a result of "digging in" to the soft ground during the landing; there was significant damage to the nose landing gear fork unit. The pilot commented, that prior to the aircraft inverting, there was no jolt and no noise was heard that could have warned him the nose landing gear was sustaining damage.

Following the accident, the pilot commented that he ought to have flown the aircraft from the front seat, so that he had access to all the controls. He had previously held a flight instructor's rating for SEP aircraft and, prior to this qualification lapsing, he had trained the passenger/owner on his aircraft, with the passenger/owner occupying the front seat. Consequently, the pilot felt comfortable flying the aircraft from the rear seat and relying on the passenger/owner to operate the wheelbrakes when requested. The passenger/owner had logged 40 hours flying in G-HCCF and was awaiting a proficiency check to renew his SEP rating.

In retrospect, the pilot and the passenger/owner both assessed that it had not been appropriate to attempt 'short field' landings on the, uphill section of Runway 06, where there is a surface undulation, especially in view of the soft condition of the grass surface.

Previous AAIB investigations

The AAIB has investigated several UK accidents during which the nose landing gear of a Vans RV series aircraft has bent back or collapsed and this is the sixth such accident which has resulted in the aircraft inverting.

A report in AAIB Bulletin 3/2017, concerning G-RPRV, listed 13 previous accidents but did not mention G-XSAM, a Vans RV-9A which suffered a nose landing gear collapse at Old Sarum and was reported in AAIB Bulletin 2/2016. The report concerning G-RPRV noted that the Light Aircraft Association (LAA) Type Acceptance Data Sheet (TADS) for the Vans RV-9A includes the following statement:

'Problems have been experienced with the RV-9A noseleg, especially when operating off grass, with instances of the nosewheel bending back and the strut digging into the ground, causing a rapid stop and further damage. In order to avoid this risk, it is important to maintain the correct nosewheel tyre pressure, and to trim the spat to ensure generous clearance between the tyre and the

wheel aperture in the spat (circa half an inch). It is also important to maintain suitable preload on the nosewheel axle bearings, torquing up the axle nut gently as required in the absence of a conventional spacer between the bearings. It is also important to land the aircraft on the mainwheels first and hold the nosewheel off the ground during the initial part of the landing roll, rather than landing on all three wheels together which encourages wheelbarrowing and overloading the nosewheel.'

A similar statement is included in the TADS for other Vans types with nosewheels, but is not included in the TADS for the RV-8A, so the LAA has now decided to review the RV-8A document.

Following publication of the report concerning G-RPRV, two further accidents have been reported; G-ELVN (AAIB Bulletin 11/2017) and G-CCVS (AAIB Bulletin 1/2018). The report concerning G-CCVS mentions an 'Anti Splat' kit which can be fitted to the nose landing gear; G-HCCF had such a kit fitted.

National Transportation Safety Board (NTSB) study

The United States NTSB studied 18 landing accidents and one incident to Vans series aircraft that inverted during landing¹. The study's summary stated:

'Once the [nose landing gear] strut and fork have contacted the ground, the strut will bend aft. The aft loading from the dragging fork and the spring-back reaction of the strut produces an overturning moment and lifting action that may result in the airplane overturning without any additional forces acting on the airplane. The aerodynamic load on the horizontal stabilizer may prevent the airplane from overturning while the airspeed is greater than some critical yet presumably low airspeed. ... At low airspeeds, the aerodynamic loads on the horizontal stabilizer lessen to the point that the tail can now start to rise allowing the airplane to rotate about the nose gear and become inverted.'

The study concluded that there was sufficient strength in the nose landing gear leg, and in all these cases the nose landing gear leg forks made contact with the ground.

LAA comment

The LAA noted that occupants of G-HCCF were aided in their escape because the aircraft's canopy had broken. However, in other accidents, such as that involving G-RPRV, pilots used an axe, or other tool, to break the canopy and facilitate their escape. The LAA commented that it will consider the case for requiring, or promoting, the carriage of an appropriate tool in certain aircraft.

Footnote

¹ See http://www.porcupinetech.com/rvproj/docs/ntsb_rv_study_ANC05LA123.pdf