

National Transportation Safety Board

Office of Aviation Safety

Washington, DC 20594



WPR22FA266

STRUCTURES

June 29, 2023

A. ACCIDENT

Location: Tryon, Nebraska
Date: July 25, 2022
Time: 0839 central daylight time
Airplane: N192MH, Experimental Homebuilt Van's RV-9A

B. STRUCTURES

Group Chair	Clint Crookshanks National Transportation Safety BoardTSB Aurora, CO
Investigator	Laura Abraham National Transportation Safety Board Aurora, CO
Party Coordinator	Rian Johnson Van's Aircraft Aurora, OR

C. SUMMARY

On July 25, 2022, at 0839 central daylight time, an experimental, amateur built Vans RV-9A airplane, N192MH, was destroyed when it was involved in an accident near Tryon, Nebraska. The pilot and student pilot-rated passenger were fatally injured. The airplane was being operated as a Title 14 Code of Federal Regulations Part 91 personal flight.

D. DETAILS OF THE EXAMINATION

The airplane was laid out by the group in a hangar at Beegles Aircraft Services in Greeley, Colorado on June 28, 2023. The fuselage was mostly intact from the nose to the empennage bulkhead. The airplane was inverted when found and there was significant downward crushing along the length of the fuselage. The right horizontal stabilizer and elevator, vertical stabilizer, and rudder were separated from the empennage and recovered in the debris field. The empennage with left horizontal stabilizer and elevator attached was separated from the aft fuselage and recovered in the debris field.

The left wing separated from the airplane about 2-3 feet outboard of the fuselage during the accident and was recovered in the debris field. The upper spar

cap was fractured through the wing attach bolt hole and pulled out of the inboard wing. The rear spar had twisting deformation in a leading edge down direction. The left aileron separated from the wing and both aileron fittings were pulled from the aileron. There was spanwise buckling noted on the upper left wing skin. The flap was fractured near the wing separation point. The inboard half remained attached to the inboard wing and the outboard section separated. The wingtip was separated and fractured into multiple pieces.

The right wing was partially separated about 2 feet outboard of the fuselage and bent down as found. The upper spar cap was cut during recovery to remove the wing. The right flap and aileron remained attached to the wing. The right wingtip was separated and fractured into multiple pieces.

The wing center section that remained attached to the fuselage had obvious downward deformation consistent with negative wing overload.

The vertical stabilizer separated mostly intact from the empennage (Figure 1). The front spar was fractured and deformed aft at the fracture location. The rear spar was pulled from the vertical stabilizer and the vertical stabilizer skins were splayed open. The vertical stabilizer spar had diagonal buckling damage along most of its length. The upper rudder hinge plates were pulled from the spar and the upper half of the spar was deformed and twisted to the right. The rudder was separated and fractured into 5 pieces. The rudder counterweight was separated from the top of the rudder. The upper half of the rudder was mostly intact, but the trailing edge was splayed open. A section of the left center rudder skin was recovered separately, and a section of the right center rudder skin was not recovered. The lower section of rudder remained attached to the vertical stabilizer spar at the center hinge and the trailing edge was splayed open. There was evidence of sealant applied on the rudder trailing edge skins and the trailing edge strip was not recovered. The lower rudder cap was separated.



Figure 1. Separated vertical stabilizer and rudder.

The right horizontal stabilizer was separated and had signatures consistent with downward separation. About $\frac{3}{4}$ of the right elevator remained attached to the right horizontal stabilizer and the trailing edge was splayed open. The inboard portion of the right elevator was separated. The right elevator counterweight was separated and not recovered. The left horizontal stabilizer and elevator remained attached to the empennage. The left elevator counterweight was separated and recovered. The empennage was fractured from the fuselage consistent with twisting counterclockwise as viewed looking forward.

The observed damage was consistent with structural failure initiated by flutter of the rudder and no anomalies were found during examinations of the wreckage.

E. DEFINITION OF FLUTTER

Flutter is an aeroelastic phenomenon that can occur when an airplane's natural mode of structural vibration couples with the aerodynamic forces to produce a rapid periodic motion, oscillation, or vibration. Flutter can be somewhat stable if the natural damping of the structure prevents an increase in the forces and motions. Flutter can become dynamically unstable if the damping is not adequate or speed is increased, resulting in increasing self-excited destructive forces being applied to the structure. Flutter can range from an annoying buzz of a flight control or aerodynamic surface to

a violent destructive failure of the structure in a very short period of time. Due to the high frequency of oscillation, even when flutter is on the verge of becoming catastrophic, it can still be very hard to detect. Aircraft speed, structural stiffness, and mass distribution are three inputs that govern flutter. An increase in airspeed, a reduction in structural stiffness, or a change in mass distribution can increase the susceptibility to flutter.

Submitted by:

Clinton R. Crookshanks
Aerospace Engineer (Structures)