



## More than just VFR into IMC

Decision making and data analysis in accident investigation

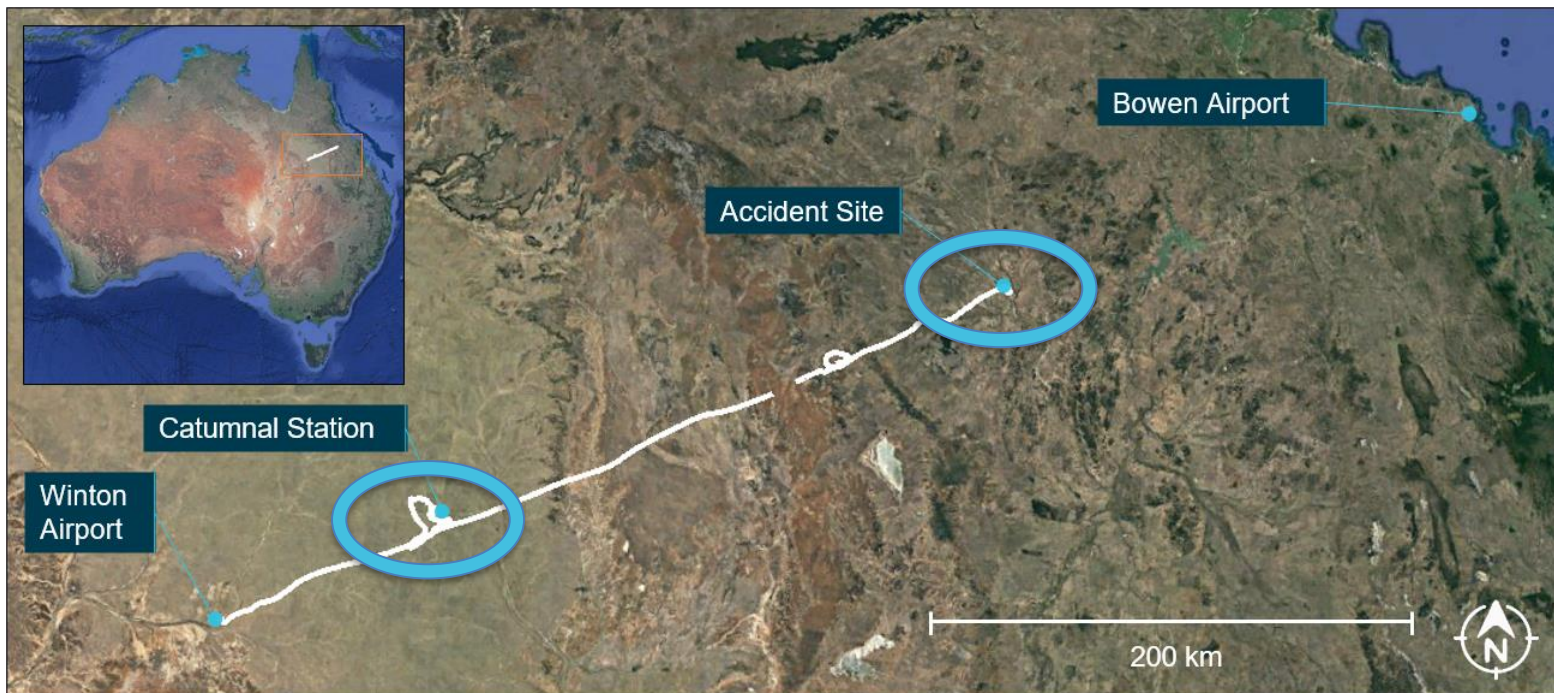
**AO-2021-017 – In-flight  
breakup involving Van’s  
Aircraft RV-7A,  
registered VH-XWI**

90 km south of Charter  
Towers, QLD, 23 April 2021.





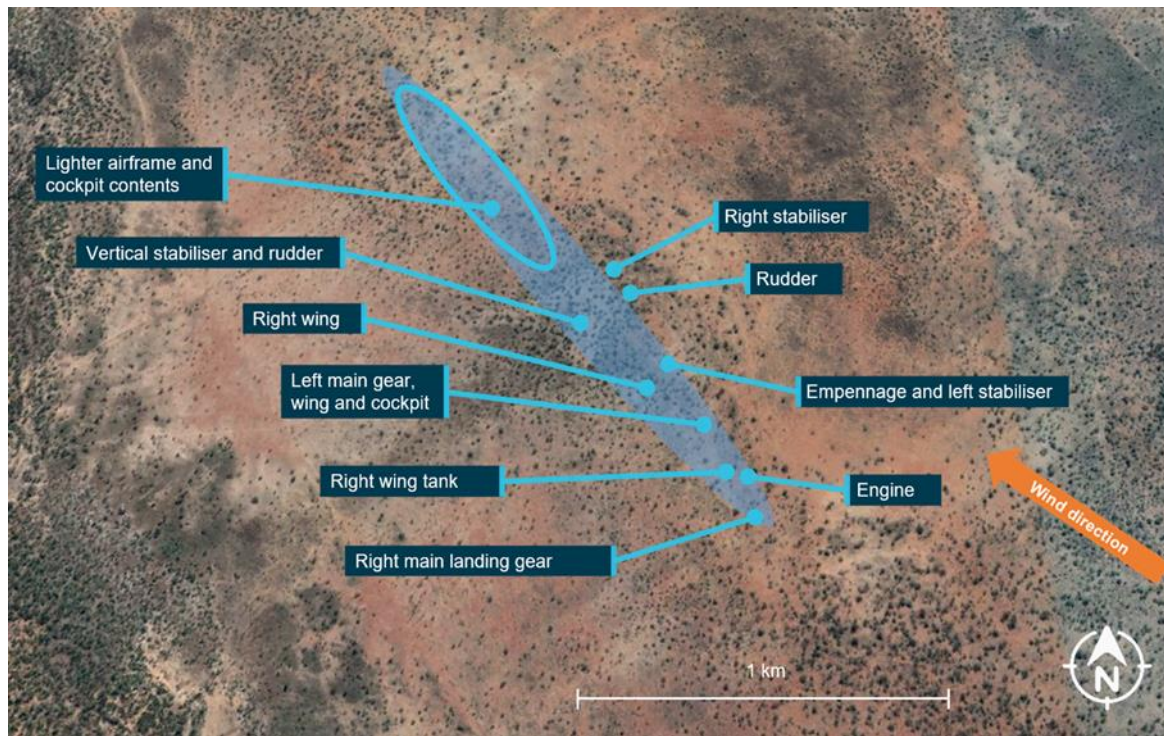
On 23 April 2021, a Van's Aircraft RV-7A, registered VH-XWI, was being operated on a private flight from Winton to Bowen, Queensland



## Access difficulties

- Recent rain, swollen rivers
- Delayed team arrival onsite
- Required team to be airlifted in
- Remote area considerations

In-flight break-up scatter pattern



# Airframe in-flight break-up signatures



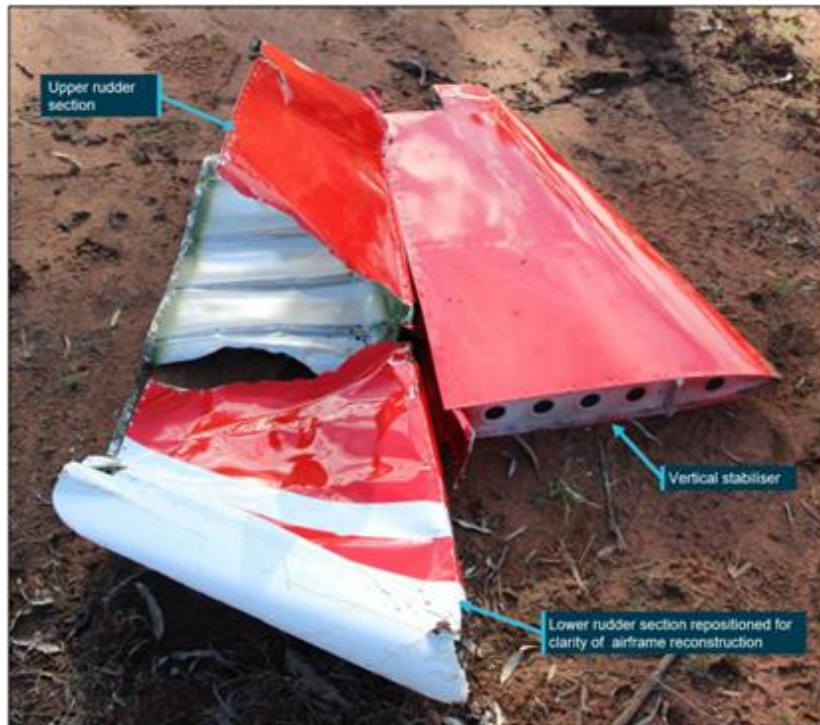
Engine, propeller and nosewheel assembly

Left wing and cockpit

Ground softened after recent rain

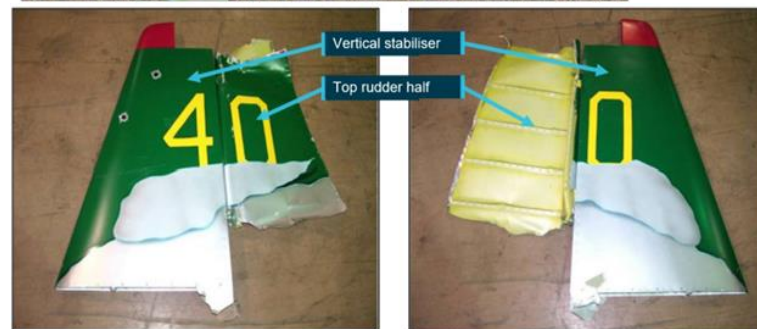
Right wing main spar

Two previous accidents involving Van's RV-7/A variants involved in in-flight break-ups involving high rates of descent and exceedance of Vne, these demonstrated similar airframe failure modes to that of VH-XWI.



ZK-DVS

C-GNDY



## Types of in-flight data and its limitations

- Dynon Skyview HDX
  - Recorded 100 flight parameters
  - Most parameters updated 16 times per sec (16Hz)
  - But down sampled data after 10mins to 1 time per sec (1Hz)
  - Missing the last 90 seconds of data before break-up.



**TRK042→GPS <AP> VS -500→ALT**

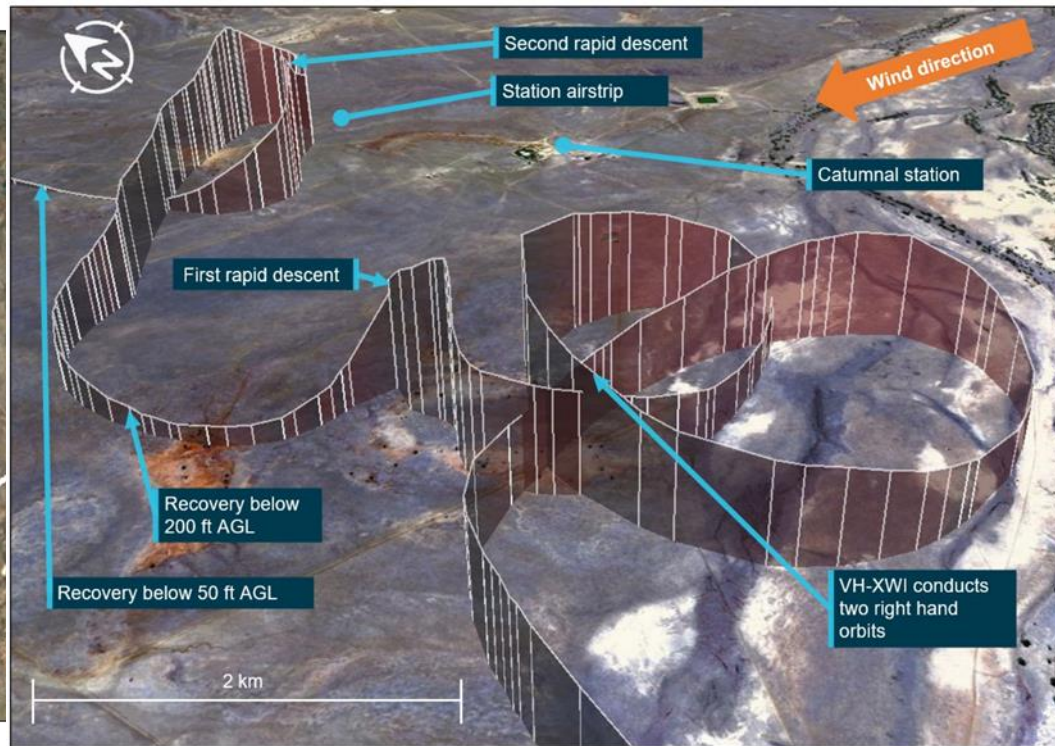
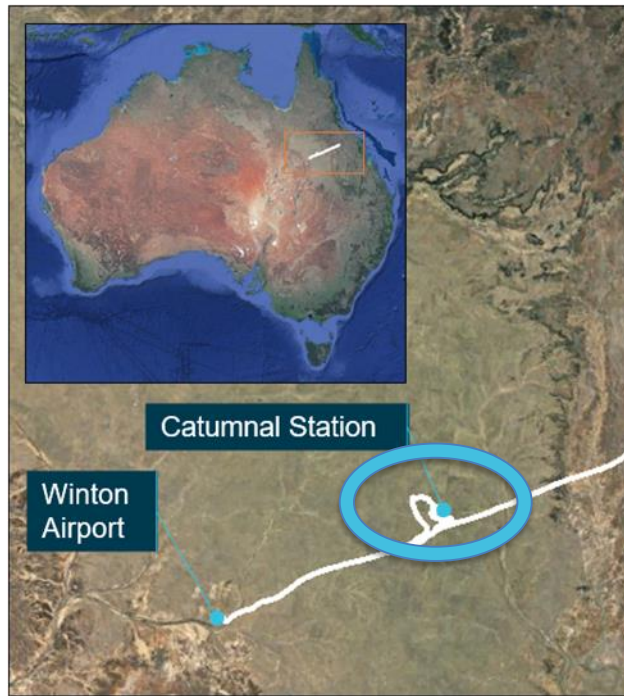
Autopilot top bar status indicator

Dynon Skyview primary flight display

Dynon engine and airframe flight display



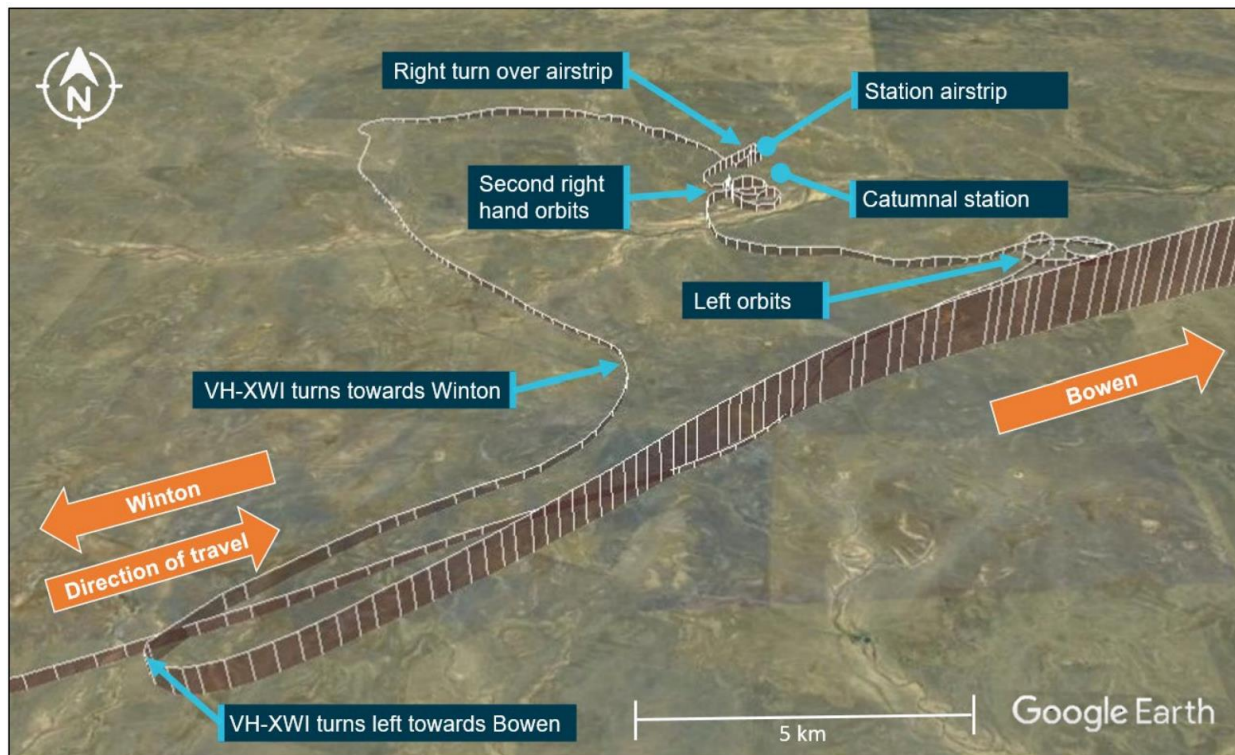
OzRunways  
Electronic Flight Bag





VH-XWI recovered at low level from the stalls overhead the station, then navigated at low level back to its original track and turned towards Winton

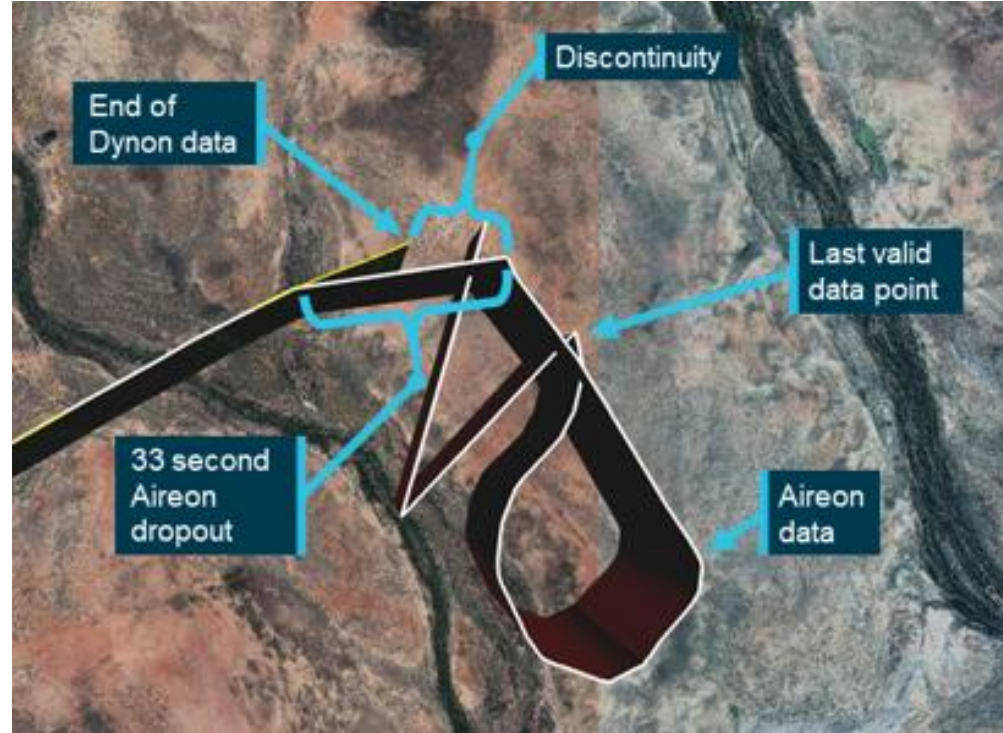
However, at 0838, about 11 km after turning towards Winton, the aircraft conducted a left climbing turn then re-commenced a track towards Bowen and climbed to about 10,500 ft AMSL.







- Initial data plots between Dynon and Aireon data had continuity gaps and unreliable data points
- This still did not give us visibility of the final in-flight break up sequence
- Seemingly exhausting the available data, the cause appeared inconclusive
- Communication with the aircraft kit manufacturer now became a priority to understand common airframe failure modes



**VAN'S AIRCRAFT**  
TOTAL PERFORMANCE

Through contact with our NTSB counterparts, we contacted VANs for information and history on in-flight breakups

VANs were incredibly helpful and had been monitoring these accidents and was working on ways to prevent them

After providing information under section 62 of the TSI Act, they identified that:

This is the sixth in-flight flutter event of a RV-7 or RV-7A. In all cases the last recorded airspeed KTAS was at or above the margin required by FAR23 of 220 KTAS.

The never exceed speed ( $V_{NE}$ ) for the RV-7A is 200 KTAS. Operation over this speed cannot guarantee structural integrity.

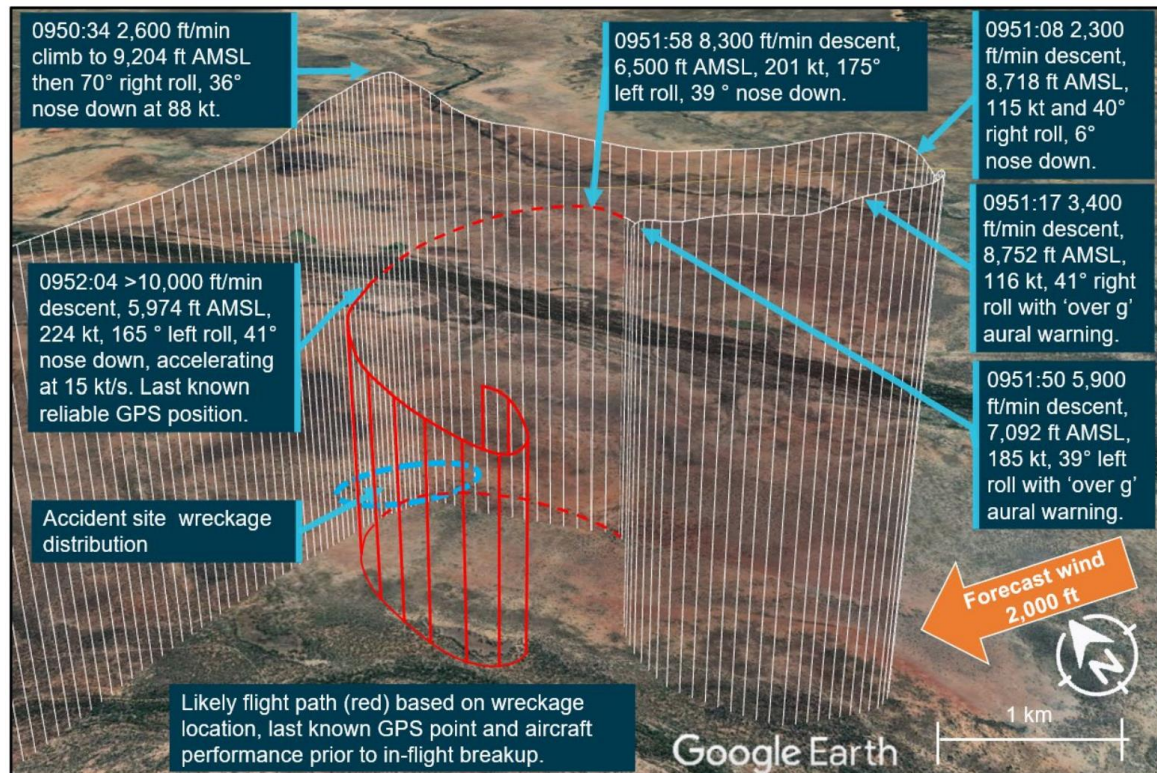




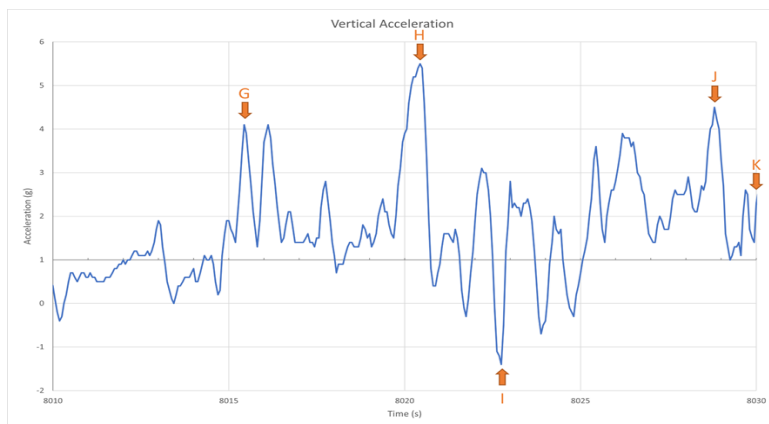
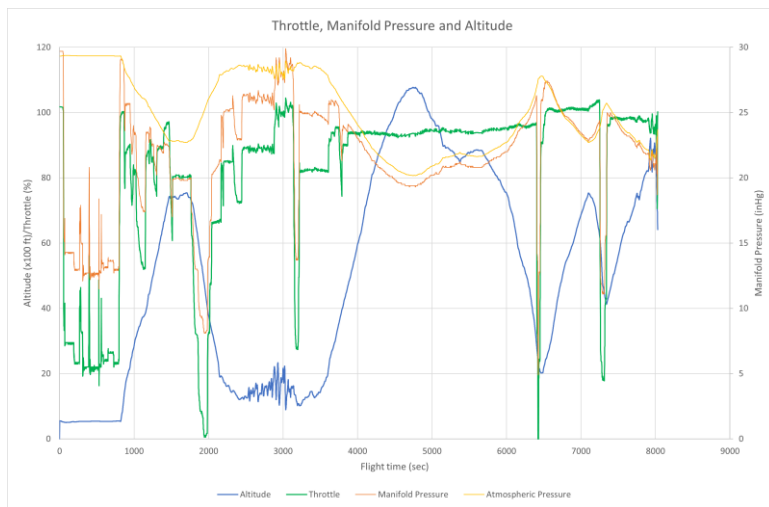
The last 90 seconds of flight was originally not accounted for, due to likely power disruption during the in-flight break-up

Subsequent data recovery found an additional 70.5 seconds and assisted us in identifying the final stages of flight.

So how was this done?



- Review of the raw data download was conducted
- Previous data was extracted using a Windows based system
- An additional download was conducted using a Linux based system
- Additional analysis was undertaken on the final flight performance.



# Analysis focused on



PILOT EXPERIENCE  
AND OTHER  
CHARACTERISTICS



FLIGHT INTO NON-  
VISUAL CONDITIONS



IN-FLIGHT DECISION  
MAKING



IN-FLIGHT BREAK-UP

## Contributing factors

- The pilot departed for the flight from Winton to Bowen, Queensland, knowing that the weather conditions en route were unlikely to be suitable for flight under the visual flight rules (VFR).
- The pilot likely entered weather conditions not suitable for flight in visual meteorological conditions, leading to spatial disorientation and loss of aircraft control.
- The aircraft's airspeed exceeded  $V_{ne}$  (never exceed speed or maximum airframe speed), leading to rudder flutter, airframe structural failures, and subsequent in-flight break-up.

## Other factors that increased risk

- Earlier in the flight, the pilot entered a degraded visual environment over Catumnal Station, most likely resulting in spatial disorientation. This resulted in a loss of control, stall, and subsequent low-level recovery.
- Although the pilot turned back to Winton after the near collision with terrain at Catumnal Station, the pilot then resumed the flight towards Bowen and degrading weather conditions.

## Other findings

- There were no operational reasons for the pilot to continue the flight to Bowen, and the pilot probably had a self-imposed motivation or pressure to continue the flight.



Further information can be found on this and many more accidents at [www.atsb.gov.au](http://www.atsb.gov.au)



**Thank you**

**Any Questions**

**VFR into IMC and In-  
flight break-up  
involving Van's  
Aircraft RV7A,  
VH-XWI**

