

Loss of control during approach to land

ZK-JRX Van's Aircraft Incorporated RV-4

Raglan estuary

17 December 2018



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Executive summary

At 1530 hours New Zealand Daylight Time¹ on 17 December 2018, the Civil Aviation Authority (CAA) received notification from the Rescue Coordination Centre that ZK-JRX, a Van's Aircraft Incorporated RV-4 (Van's RV-4) had crashed in the estuary to the south of Raglan township. The pilot and passenger were fatally injured.

On the day of the accident, the pilot intended to fly with a passenger from Motueka aerodrome to North Shore aerodrome north of Auckland.

Following departure from Motueka aerodrome, a brief refuelling stop was completed at Whanganui aerodrome. ZK-JRX was next witnessed to be approaching Raglan aerodrome.

The aircraft was seen to begin a turn to the left and then roll rapidly before descending at a high rate. The aircraft did not recover from the descent and struck the mud flats in the estuary immediately south of the township.

The CAA safety investigation determined that the aircraft had departed controlled flight during a turn while approaching to land. The aircraft entered a spin to the left, with insufficient height available for the pilot to effect a recovery prior to the aircraft striking the mud flats.

Although first responders were quickly on scene, the accident forces were not survivable.

The pilot of ZK-JRX did not hold the required licence to permit him to fly the aircraft while carrying a passenger. He also did not hold the required aircraft type rating for the Van's RV-4.

Safety messages

The pilot-in-command must hold the required licence or certificate to carry passengers

To carry passengers, the pilot-in-command of an aircraft must hold the appropriate class of licence or certificate to comply with Civil Aviation Rules. This is to ensure that the pilot-in-command has received the required training for them to have the skills and knowledge to fly safely.

Pilots require an aircraft type rating

An aircraft type rating is required to be completed and signed off by a flight instructor prior to a pilot acting as pilot-in-command and carrying passengers. This ensures the pilot-in-command is competent to safely handle the aircraft throughout the flight envelope, for normal and emergency procedures, and within the required parameters established by the aircraft manufacturer.

¹ New Zealand Daylight Time is GMT + 13 hours

Incident timeline

June 2017 The pilot purchased ZK-JRX, then gifted it to his son who holds a private pilot licence. The aircraft was registered in the son's name.

Between 02 November and 16 December 2018, approximately 11 hours flight time was recorded in the aircraft's technical log by the pilot. However, there were no records in the pilot's logbook for any flights having been carried out in ZK-JRX.

17 December 2018 (day of the accident):

- 1200 hours (est) ZK-JRX, flown by the pilot, lands at Motueka aerodrome after departing from a private airstrip located in the upper Wairau Valley.
- 1220 hours (est) ZK-JRX departs Motueka aerodrome with the passenger. The pilot was taking the passenger to view his yacht which was for sale in Auckland.
- 1325 hours (act) ZK-JRX lands at Whanganui aerodrome where 34.7 litres of avgas were uplifted.
- 1417 hours (act) ZK-JRX takes off from Whanganui aerodrome bound for North Shore aerodrome.
- 1516 hours (act) The pilot of ZK-JRX makes a radio call to Raglan Traffic stating: 'Raglan Traffic Juliet Romeo Xray five to the south tracking to join'.
- 1518 hours (act) Witnesses observe ZK-JRX approaching Raglan aerodrome, enter a spin and descend, striking the mud flats.

Incident maps, plans, and photographs



Figure 1: ZK-JRX (Photo source NZ Civil Aircraft)



Figure 2: Accident location (Image source Google Earth)



Figure 3: Accident site (CAA photograph)



Figure 4: Aircraft wreckage (CAA photograph)

Findings and conclusions from the investigation

As a result of the CAA safety investigation, a number of findings and conclusions were determined relevant to the pilot and aircraft. These are listed below and then described in more detail:

- | | |
|-----------------------|---|
| Human factors | <ul style="list-style-type: none">• The pilot did not hold a licence to fly the aircraft• The pilot held certificates to fly microlight aircraft and gliders• There was no record of the pilot having received any dual flight instruction in ZK-JRX• The pilot did not hold the required medical certificate or declaration to fly ZK-JRX• Toxicology results showed that the pilot had been taking the medication Nevirapine• The pilot would have been taken by surprise when the aircraft stalled• The accident forces exceeded the range for human survivability |
| Equipment factors | <ul style="list-style-type: none">• ZK-JRX was an amateur built aircraft, requiring a minimum of a recreational pilot licence to fly it• No defects were found which could have affected the airworthiness of the aircraft• The estimated weight and centre of gravity position of the aircraft at the time of the accident exceeded the limits for the Van's RV-4• With an aft centre of gravity, the Van's RV-4 is sensitive to elevator nose up pitch inputs |
| Environmental factors | <ul style="list-style-type: none">• The weather conditions were not a contributing factor in this accident |

Human factors

The pilot did not hold a licence to fly the aircraft

The Civil Aviation Act 1990 and Civil Aviation Rules, require that to fly an aircraft type such as ZK-JRX and to carry passengers, the pilot-in-command is required to hold an aviation licence. This is issued by the Civil Aviation Authority under Part 61 *Pilot Licences and Ratings*. The pilot held no such licence and was therefore contravening the Civil Aviation Act 1990 and Civil Aviation Rules.

The pilot held certificates to fly microlight aircraft and gliders

At the time of the accident, the 64 year old pilot held a microlight pilot certificate and glider pilot certificate with a current medical validation for both.

The pilot started flying training in 1987 and at the time of the accident, he had accrued approximately 228.9 hours as recorded in his pilot logbook². Most of the flights had been carried out in microlight aircraft. The pilot's microlight biennial flight review was due in April 2018, but there was no record of this having been completed.

No record of dual flight instruction to enable him to fly the aircraft

When the pilot purchased ZK-JRX in June 2017, a 20 minute demonstration flight was carried out with the previous owner, who held a flight instructor rating. Enquires made during the safety investigation, could not locate any further evidence that the pilot had enlisted the services of a flying instructor to enable him to obtain an aircraft type rating, as required by Civil Aviation Rules Part 61 Subpart B *Aircraft Type Ratings*.

Although the pilot's logbook did not contain any recorded flight time for ZK-JRX, entries in the aircraft technical log, indicate that the pilot had flown ZK-JRX for approximately 11 hours during the month prior to the accident. The pilot's partner, also indicated that she had been on a number of flights with the pilot in the past. However, no specific records could be found to support this.

The pilot did not hold the required medical certificate to fly the aircraft

The medical validation the pilot held would not meet the requirements of the Civil Aviation Rules to enable him to fly ZK-JRX. The pilot was required by Civil Aviation Rules Part 61 *Pilot Licences and Ratings*, to hold a medical certificate or declaration appropriate for the class of licence required to fly ZK-JRX while carrying a passenger. Therefore, the pilot was not complying with Part 61 *Pilot Licences and Ratings*.

Toxicology results indicated the pilot was taking Nevirapine

Toxicology testing carried out on the pilot found that he had been taking the prescription drug Nevirapine. This is a prescription medication and may have some significant side effects.

A CAA senior medical officer was consulted on the effects that Nevirapine may have on a pilot's performance during flight. He stated: *"Nevirapine, marketed under the trade name Viramune among others. It has a number of possible side effects, the commonest being: diarrhea (15-20%), Rash (15-20 percent), Headache (11 percent), Neutropenia (10-11 percent), Fever (8-11 percent). Nevirapine use is not seen as being of aeromedical significance following an adequate trial period free of any reaction"*

The pilot's partner also advised that as far as she was aware, the pilot did not suffer any adverse effects from the medication. Based on this, the safety investigation concluded that although the pilot had been taking the medication Nevirapine, this was considered not to be a causal factor in the accident.

The pilot would have been taken by surprise when the aircraft stalled

The sudden and unexpected departure from controlled flight would have taken the pilot by surprise as he would not have been expecting it to occur.

Cognitive responses to surprise include confusion and loss of situational awareness, and may involve the inability to remember current operating procedures or techniques³.

² Flight time is approximate only as no flights were recorded in the pilot's logbook after 18 December 2016.

³ Refer: [EASA Startle Effect Management Research Project](#)

The effect of surprise may have resulted in the pilot taking the incorrect action when the aircraft stalled and entered the spin. When taken by surprise, the most likely response from the pilot when the aircraft rolled further to the left than expected, would have been to use opposite aileron (roll control input) in an attempt to level the wings. In this situation, the incorrect aileron input would exacerbate the aircraft's tendency to enter into a spin.

Due to the low altitude of the aircraft when it stalled and entered the spin, and not having been adequately trained on the aircraft, the pilot had no chance to recover the situation prior to the aircraft striking the mud flats.

Equipment factors

ZK-JRX was an amateur built aircraft

ZK-JRX was an amateur built Van's RV-4 originally constructed in the USA in 1987, then exported to New Zealand in 2003. The aircraft was issued with a special category certificate of airworthiness by the CAA. Therefore, a minimum of a recreational pilot licence was required to be held by the pilot-in-command when carrying a passenger.

Post-accident examination of the aircraft found no defects

Examination of the aircraft during the safety investigation did not find any defects which may have contributed to the accident. The aircraft was maintained to the required standards and there were no outstanding defects which may have affected the safety of the flight.

It was not possible to determine how much fuel was contained in the aircraft's fuel tanks when the accident occurred, due to disruption of the tanks and loss of any remaining fuel. First responders reported a strong fuel smell at the accident site. During examination of the aircraft, fuel (avgas) was found in the fuel lines leading to the engine. It's considered unlikely the pilot had encountered a loss of engine power due to fuel starvation or exhaustion.

The aircraft was observed to be approaching Raglan aerodrome

The aircraft was seen by several witnesses on the ground to be approaching Raglan aerodrome. The pilot's final intended destination after departing Whanganui aerodrome was North Shore aerodrome, north of Auckland. The reason for landing at Raglan aerodrome could not be determined. However, Raglan is a popular aerodrome with pilots' to take a break during their flight.

Approximately two minutes before the accident, a radio transmission was recorded from the pilot of ZK-JRX stating that the aircraft was joining Raglan. There was nothing in the radio call to indicate there were any problems.

Witnesses observed the aircraft roll and descend at a high rate

The aircraft was observed by several witnesses, including another pilot, approaching and turning towards Raglan aerodrome when it rapidly rolled to the left and descended at a high rate. The aircraft then struck the mud flats in an approximate 40 degree nose down attitude, with rotation to the left. The impact signatures are consistent with the aircraft being in a spin to the left when it struck the mud flats.

The aircraft was overweight and the centre of gravity position exceeded the aft limit

During the safety investigation, the aircraft's all up weight and centre of gravity position were calculated. At the time of the accident, the aircraft was a minimum of 47 pounds over the 1500 pound maximum allowable weight for flight⁴. Based on this weight and the loading of the aircraft, the centre of gravity was calculated to be rearward of the maximum aft limit.

Aircraft performance when overweight and out of centre of gravity limitations

The aircraft being overweight and the centre of gravity position rearward of the aft limit, can adversely affect the performance and handling characteristics of the aircraft.

Following discussions with the previous owner of ZK-JRX and other pilots familiar with flying the aircraft type, it's apparent the aircraft becomes sensitive in pitch when loaded at an aft centre of gravity position. The elevator control forces in nose-up pitch become light, making it easier for the pilot to over pitch and stall the aircraft, especially at low airspeeds. With the aircraft also being overweight, this will increase the stall speed making the aircraft more susceptible to stalling at lower airspeeds such as during the approach to land.

Environmental factors

Weather conditions were good for the intended flight

Observers on the ground at Raglan reported that there was very little cloud present and a steady south-westerly breeze existed at the time of the accident.

Weather is not considered to be a factor in the accident.

Recommended actions

There are no recommended actions as a result of this accident. The CAA safety investigation considers the Civil Aviation Rules currently in force are appropriate.

The New Zealand aviation system relies on people who actively participate in the system to understand and comply with Civil Aviation Rules. The pilot involved in this accident did not comply with a number of those rules and this resulted in his death, and the death of his passenger.

⁴ The amount of fuel contained in the aircraft's fuel tanks at the time of the accident could not be accurately determined due to the rupturing of the fuel tanks and subsequent loss of all fuel. It was calculated that the minimum quantity of fuel required to meet legal requirements for the flight from Raglan to North Shore aerodrome would have been 50 litres. This quantity of fuel was used to calculate the weight and balance of the aircraft at the time of the accident.

Accident data summary

Aircraft make and model, registration, serial number and total hours:	Van's Aircraft Incorporated RV-4, ZK-JRX, S/N 1320, 950 hours (approx) total time
Year of manufacture:	Amateur built 1987 in USA
Engine make and model, and type of engine:	1 Lycoming O-360 A3A 180 Horsepower engine
Propeller:	Catto Composite 2B
Last inspection:	Annual/100 hour 21 December 2017
Accident date and time:	17 December 2018, 1518 NZDT
Location:	Raglan estuary Latitude: S 37° 48' 28" Longitude: E 174° 52' 40"
Altitude:	Sea level
Type of flight:	Private
Persons on board:	Crew: 1 (fatal) Passenger: 1 (fatal)
Nature of damage:	Aircraft destroyed
Pilot's licence/certificate:	Advanced microlight pilot certificate Glider pilot certificate
Pilot's age:	64 years
Pilot's total flying experience:	Total: 230 hours (approx) On type: Unable to accurately determine. 11 hours recorded in the aircraft technical log, most likely flown by the pilot.
Information sources:	Civil Aviation Authority safety investigation
Investigator in charge:	Mr CP Grounsell

About the CAA

New Zealand's legislative mandate to investigate an accident or incident is prescribed in the Transport Accident Investigation Commission Act 1990 (the TAIC Act) and Civil Aviation Act 1990 (the CA Act).

Following notification of an accident or incident, TAIC may conduct an investigation. CAA may also investigate subject to Section 72B(2)(d) of the CA Act which prescribes the following:

72B Functions of Authority

(2) The Authority has the following functions:

- (d) To investigate and review civil aviation accidents and incidents in its capacity as the responsible safety and security authority, subject to the limitations set out in [section 14\(3\)](#) of the [Transport Accident Investigation Commission Act 1990](#)

The purpose of a CAA safety investigation is to determine the circumstances and identify contributory factors to an accident or incident with the purpose of minimising or reducing the risk, to an acceptable level, of a similar occurrence arising in the future. The safety investigation does not seek to ascribe responsibility to any person but to establish the contributory factors to the accident or incident, based on the balance of probability.

A CAA safety investigation seeks to provide the Director of Civil Aviation with the information required to assess which, if any, risk-based regulatory intervention tools may be required to attain CAA safety objectives.

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