CIVIL AVIATION AUTHORITY
OF NEW ZEALAND
Te Mana Rererangi Tūmatanui o Aotearoa

SAFETY INVESTIGATION REPORT

CAA OCCURRENCE 19/4241

VAN'S AIRCRAFT INCORPORATED RV-12

ZK-LSV

CONTROLLED FLIGHT INTO TERRAIN

KAKATARAHAE HILL, COROMANDEL RANGE

14 JUNE 2019

ZK-LSV, 2016. Source: CAA aircraft file.

Foreword

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 inquiry. The Civil Aviation Authority (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, of 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 of 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 intervention tools may be required to attain CAA safety objectives.

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Glossary of abbreviations

AMSL	above mean sea level
ADS-B	Automatic Dependent Surveillance - Broadcast
ATSB	Australian Transport Safety Bureau
C	Celsius
CAA	Civil Aviation Authority
CAR	Civil Aviation Rule(s)
CFIT	controlled flight into terrain
E	east
EFIS	electronic flight instrument system
ft	foot or feet
IMC	instrument meteorological conditions
GPS	Global Positioning System
km	kilometre(s)
METAR	meteorological aerodrome report
NZST	New Zealand Standard Time
NM	nautical miles
RCCNZ	Rescue Coordination Centre New Zealand
UTC	Coordinated Universal Time
VFR	visual flight rules
VHF	very high frequency

Data summary

Aircraft type, serial number, and registration:	Van's Aircraft Incorporated RV-12, s/n 12066, ZK-LSV
Number and type of engines:	One, 100 HP Bombardier, Rotax Gmbh 912 ULS 2
Year of manufacture:	2015
Date and time of accident:	14 June 2019, 1127 hours[1]
Location:	Kakatarahae hill, Coromandel Range Latitude[2]: S 36° 53'41.9" Longitude: E 175° 33'34.5"
Type of flight:	Private
Persons on board:	Crew: 1
Injuries:	Crew: 1 fatal
Nature of damage:	Aircraft destroyed
Pilot-in-command's licence:	New Zealand Recreational Pilot Licence (Aeroplane) New Zealand Private Pilot Licence (Aeroplane)
Pilot's age:	78 years
Pilot-in-command's total flying experience:	2287 hours
Information sources:	Civil Aviation Authority field investigation
Investigator in charge:	Mrs S Mandich

[1] All times in this report are NZST (UTC + 12 hours) unless otherwise specified.

[2] World Geodetic System 1984 (WGS-84) coordinates.

Executive summary

At 1941 on 14 June 2019, the CAA was notified by the Rescue Coordination Centre New Zealand (RCCNZ) of a missing aircraft, Van's Aircraft Incorporated RV-12, ZK-LSV. At approximately 1000 hours the following day, the wreckage was located by Land Search and Rescue New Zealand, and the pilot was found deceased.

The Transport Accident Investigation Commission was notified but declined to open an inquiry. A CAA field investigation commenced the following day.

The pilot departed from Whitianga aerodrome on a private flight to Ardmore aerodrome. The purpose of the flight was for the pilot to attend a doctor's appointment at midday in Ardmore township and to drop off a box of aircraft parts to a maintenance facility based at Ardmore aerodrome.

When the pilot failed to return to Whitianga, the RCCNZ was notified and a search initiated. The aircraft wreckage was located on the western slope of Kakatarahae hill, Coromandel Range, approximately seven nautical miles (NM) south-west of Whitianga.

It was determined the accident occurred as a result of controlled flight into terrain (CFIT)[3] in poor weather conditions, below the minima required by visual flight rules (VFR). The New Zealand aviation system relies on people who actively participate in the system to understand and comply with Civil Aviation Rules.

The CAA emphasises the importance of pilots conducting their own self-assessment as to whether they are fit to fly and make decisions accordingly. The CAA has produced information relating to pilot's health, including the 'Are you fit to fly?'[4] poster using 'IMSAFE' which provides guidelines prompting pilots to make the decision whether they are safe to fly or not.

This accident also serves as a timely reminder of the risks associated with reliance on technology for flight into deteriorating weather conditions. A *Vector* Article – "Not drowning in the tech" was published in the Spring 2021 issue. The article aims to raise awareness of the importance of maintaining basic flying skills and understanding the limitations and dangers of reliance on technology.

[3] CFIT is an accident in which an airworthy aircraft, under pilot control, is accidently flown into terrain.

[4] https://www.aviation.govt.nz/assets/publications/posters/im-safe-to-fly.pdf

1. Factual information

1.1 History of the flight

1.1.1 The pilot departed Whitianga aerodrome, in aircraft ZK-LSV, at 1046 heading for Ardmore aerodrome.

1.1.2 The purpose of the flight was for the pilot to attend a doctor's appointment at midday in Ardmore township and to drop off a box of aircraft parts to a maintenance facility based at Ardmore aerodrome.

1.1.3 The flight was to be conducted under VFR.

1.1.4 Flight data retrieved from the aircraft's Automatic Dependent Surveillance-Broadcast (ADS-B) unit showed the aircraft departed Whitianga aerodrome and immediately initiated a climb in a westerly direction, towards the Coromandel Range.

1.1.5 After takeoff, over a period of approximately four minutes and six NM, the aircraft climbed to approximately 3525 feet (ft)[5], travelling in a westerly direction towards Ardmore. Once abeam Kakatarahae Hill, to the north, the pilot initiated a gradual decent.

1.1.6 Near Kawakawa Bay, at approximately 2720 ft, the aircraft turned to the south and flew down the Ness and Wairoa Valleys towards Drury. When the aircraft was in an open plateau, at approximately 1500 ft, just south-west of Hunua township the pilot commenced a reversal turn and then began an ascending turn to track north-east, in the direction of Whitianga. Refer to Figure 1.

1.1.7 The pilot initially climbed to 2700 ft. Data recovered from the electronic flight instrument system (EFIS) showed the pilot engaged the autopilot at 1121 and the altitude bug[6] was set at an altitude of 2400 ft at 1122. The pilot also entered the waypoint for Whitianga aerodrome (NZWT) at 1124. The autopilot remained engaged and the altitude bug set at 2400 ft until the time of impact. Refer to Figure 2.

[5] All heights, unless stated, are referenced above mean sea level (amsl).

[6] While the autopilot is engaged, the altitude bug is used to select an altitude for the autopilot to maintain.

Figure 1: ZK-LSV flight track from ADS-B flight data.

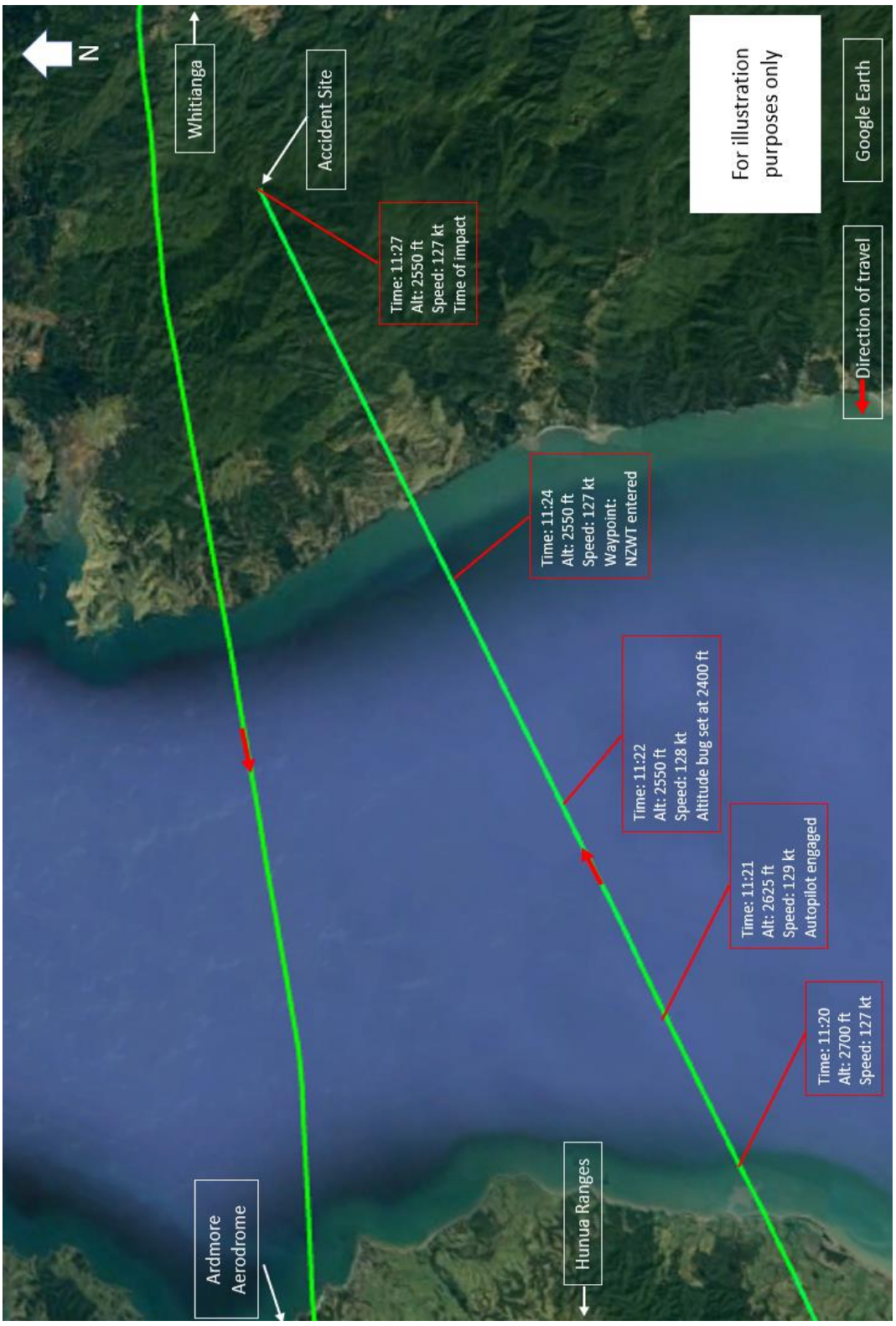

Figure 2: ZK-LSV flight track from ADS-B flight data.

1.1.8 At approximately 1530, when the pilot had not contacted his partner prior to departing Ardmore aerodrome as expected, she went to Whitianga aerodrome.

1.1.9 A friend was mowing the grass at Whitianga aerodrome and at approximately 1600, spoke to the pilot's partner who raised concerns for the pilot's safety.

1.1.10 Contact was made with the Ardmore UNICOM, the Ardmore-based maintenance facility and the pilot's doctor's rooms. All advised they had not seen nor heard from the pilot. Multiple phone calls were made to the pilot's mobile phone, with no response.

1.1.11 At 1619 a call was placed to 111 to advise of the overdue aircraft.

1.1.12 Airways Corporation of New Zealand Limited notified the RCCNZ of the overdue aircraft at 1638, initiating a search for the aircraft.

1.1.13 With assistance from the ADS-B track information the aircraft's last known position was identified. Due to low cloud in the area, a rescue helicopter was unable to access this location. A ground-based search and rescue team was then assembled to gain access.

1.1.14 The search team located the aircraft wreckage at approximately 1000 the following day and the pilot was found deceased.

1.1.15 The accident occurred in daylight, at approximately 1127 on 14 June 2019, seven NM south-west of Whitianga, on the western slope of Kakatarahae hill, Coromandel Range, at a height of approximately 2380 ft. Latitude S 36° 53'41.9, longitude E 175° 33'34.5.

1.2 Injuries to persons

Injuries	*Crew*	*Passengers*	*Other*
Fatal	1	0	0

Table 1: Injuries to persons.

1.3 Damage to aircraft

1.3.1 The aircraft was destroyed.

1.4 Other damage

1.4.1 Nil.

1.5 Personnel information

Flying hours	*All types*	*Relevant Type*
Last 24 hours	0	0
Last 7 days	0.6	0.6
Last 30 days	2.5	2.5
Last 90 days	6.5	6.5
Total hours	2282.6	190.05

Table 2. Pilot flight hours.

1.5.1 The pilot held a valid Recreational Pilot Licence and the appropriate current medical certificate.

1.5.2 The pilot had logged approximately 2282 hours flying time and 190 hours on type in his pilot logbook.

1.5.3 The pilot did not hold an instrument rating and was not permitted to fly in instrument meteorological conditions (IMC).

1.5.4 The pilot's last biennial flight review was completed on 04 June 2019.

1.6 Aircraft information

1.6.1 Van's Aircraft Incorporated RV-12, serial number 12066, was manufactured in 2015 and registered as ZK-LSV, a Special Category – Light Sports Aircraft (LSA), in March 2016. The aircraft was powered by a 100 HP Bombardier Rotax 912 ULS 2 driving a two-bladed Sensenich fixed-pitch composite propeller.

1.6.2 The aircraft is of all-metal construction, capable of carrying two people in a side-by-side arrangement with a maximum all-up weight of 598 kg.

1.6.3 A non-terminating special category – LSA airworthiness certificate was issued pursuant to the CARs. The aircraft instruments and equipment supported day VFR flight only.

1.6.4 A review of airworthiness was carried out on 14 March 2018 and was valid at the time of the accident. No discrepancies or defects were noted.

1.6.5 A review of the aircraft logbooks identified two minor discrepancies. The radio checks were not carried out during the last 24-monthly avionics checks, and there was no record of the annual emergency locator transmitter (ELT) functional checks being carried out. However, there is no evidence to suggest these discrepancies contributed to the accident.

1.6.6 The aircraft was fitted with a Dynon Avionics SV-D1000T Skyview Touch EFIS utilising a single 10.2-inch multi-touch LCD screen, a Dynon SV-GPS-2020 receiver module and ADS-B transponder. The aircraft was also fitted with an autopilot.

1.6.7 The safety investigation did not identify any evidence of mechanical issues which may have contributed to the accident.

1.7 Meteorological information

1.7.1 The CAA's Chief Meteorological Officer was asked to summarise the weather conditions on the day of the accident.

1.7.2 The Graphical Aviation Forecast (GRAFOR), provided by MetService New Zealand for the Auckland, Waikato, and Western Coromandel region for the morning of 14 June 2019 indicated areas of cloud, with bases 1500-2500 ft, and visibility reducing to 10 kilometres (km) in light showers.

1.7.3 Additionally, localised areas of fog were expected, reducing visibility to 500 metres. The fog was forecast to start lifting from 2100Z[7] (0900). Refer to Figure 3.

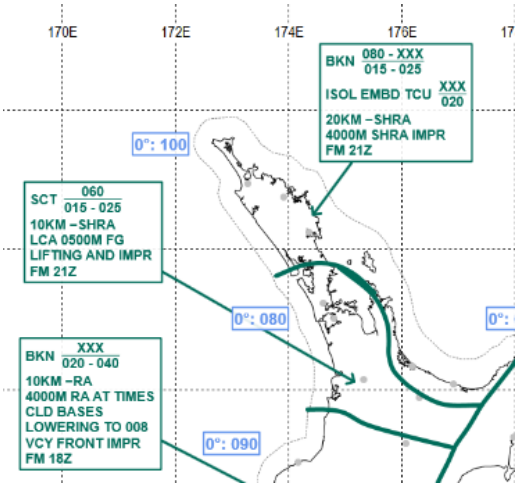

Figure 3: GRAFOR valid SFC-FL100 at 1800Z 13 June 2019.

1.7.4. Observations from Automatic Weather Stations (AWS) in that region on the morning of 14 June showed fog being recorded at Auckland International Airport until 2230Z (1030). Additionally, observations from other AWS indicated the potential for fog or mist conditions at, or near, Ardmore and Whitianga aerodromes due to the high humidity levels recorded. However, humidity levels in Whitianga dropped after 2030Z (0830), meaning fog or mist was unlikely to be present from that time onwards.

1.7.5 In the Whitianga area, the AWS data recorded some precipitation at 2230 and 2300Z 13 June (1030 and 1100 on 14 June). However, the satellite data indicated no significant cloud over Whitianga during the morning and early afternoon and the

[7] UTC is sometimes known as "Zulu time", denoted by the letter Z.

weather radar imagery appears clear for the area at that time. It is likely the recorded precipitation is erroneous data or attributable to dew being recorded in the sensor.

1.7.6 No cloud ceiling, visibility or present weather sensors are installed at the Ardmore or Whitianga aerodromes AWS.

1.7.7 Satellite imagery for the same day showed extensive areas of fog or low cloud in the Auckland, Western Coromandel, and Waikato regions starting to break up towards midday, with areas of cumulus cloud moving across the Coromandel. Refer to Figures 4 and 5.

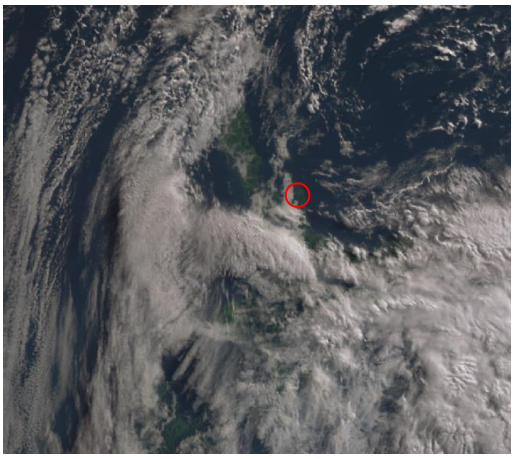

Figure 4: Satellite image at 2120Z 13 June (0920 14 June NZST), red circle indicates wider Whitianga area.

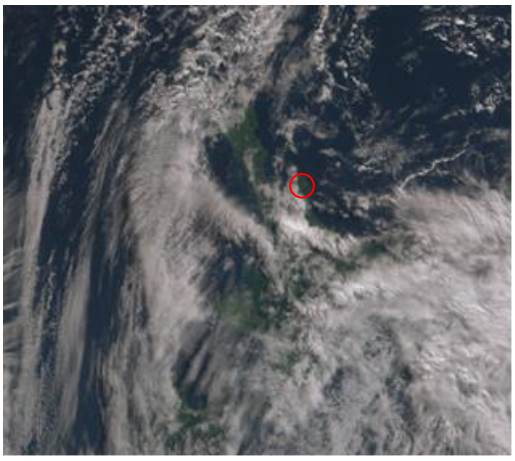

Figure 5: Satellite image at 2330Z 13 June (1130 14 June NZST), red circle indicates wider Whitianga area.

1.7.8 Closed-circuit television (CCTV) footage from Ardmore aerodrome between 1000 and 1130 on the day of the accident confirmed fog was present at Ardmore aerodrome, clearing from approximately 1100. CCTV footage continued to show cloud to the east of the aerodrome until approximately 1129 when the Hunua Ranges started to become visible, with some low cloud still present in the vicinity.

Figure 6: CCTV footage from Ardmore aerodrome Tower East at 0957.

Figure 7: CCTV footage from Ardmore aerodrome Tower East at 1029.

Figure 8: CCTV footage from Ardmore aerodrome Tower East at 1101.

Figure 9: CCTV footage from Ardmore aerodrome Tower East at 1129.

1.7.9 A witness statement confirmed that the weather on the day of the accident was 'beautiful and clear' in Whitianga at the time ZK-LSV departed for Ardmore, with some 'fog rolling over the hills' (Coromandel Range).

1.7.10 Another witness who departed Whitianga aerodrome at approximately 1035 on the day of the accident stated, 'the Coromandel Range was covered in dense clouds that touched the mountains' and the 'cloud was overcast, you couldn't go under it and you would have to go pretty high to get over it'. Refer to Figure 10.

Figure 10: Satellite image at 2230Z 13 June
(1030 hours 14 June NZST), red circle indicates wider Whitianga area.

1.7.11 At approximately 1150, the same witness, flying south passing to the east of Whitianga, advised there was little to no change in the cloud sitting over the Coromandel Range. This is supported by the satellite imagery. Refer to Figure 5.

1.7.12 A MetService NZ forensic meteorologist estimated the cloud top heights, in the vicinity of the Coromandel Range, during the period 1050 and 1130 to be approximately 3400 to 4000 ft.

1.8 Aids to navigation

1.8.1 The aircraft was fitted with a Dynon Avionics SV-D100T Skyview Touch EFIS, a Dynon SV-GPS-2020 receiver and ADS-B.

1.8.2 The Dynon Avionics SV-D100T Skyview Touch display can act as a primary flight display with synthetic vision, an engine-monitoring system, and a moving map in a variety of customisable screen layouts.

1.8.3 The Dynon Avionics SV-D100T Skyview Touch EFIS was not certified[8] and is not permitted to be used as a primary means of navigation reference but can be used as an aid to primary navigation i.e. map and compass.

1.8.4 The Dynon Avionics SV-D100T Skyview Touch has a terrain warning function. However, it could not be determined if the terrain warning function was selected on or serviceable at the time of the accident.

1.8.5 The aircraft had been fitted with ADS-B approximately two weeks prior to the accident. The data from the ADS-B was used to locate the wreckage.

1.8.6 Recovered data also showed the aircraft flew a similar path on previous flights between Whitianga and Ardmore aerodromes. The accident flight initially followed the same path. However, the return portion was from further south than previous flights. Refer to Figure 11.

Figure 11: ZK-LSV ADS-B data of previous flights. Source: edited Google Earth™ image.

8 Certification of equipment occurs when the equipment meets a required design standard of the applicable civil aviation organisation. In the case of LSA, the use of non-certificated equipment is permissible.

1.9 Communications

1.9.1 The aircraft was equipped with a VHF radio.

1.9.2 A phone call was received by the Ardmore UNICOM at approximately 1000 on the day of the accident enquiring about the fog at Ardmore aerodrome. The UNICOM operator advised, "the fog was still thick, and they were unable to see the far side of the airfield."

1.9.3 The UNICOM operator received another call 20 to 30 minutes later, "from the same man asking if there was any improvement and I advised him there was not."

1.9.4 While it cannot be conclusively confirmed the caller was the pilot of ZK-LSV, the man advised that he was in Whitianga and had an appointment to get to in Auckland.

1.9.5 No radio calls from ZK-LSV were recorded by air traffic services.

1.10 Aerodrome information

1.10.1 Not applicable.

1.11 Flight recorders

1.11.1 Data was recovered from the Dynon Avionics SV-D100T Skyview Touch EFIS on board the aircraft and was sent for analysis.

1.11.2 The aircraft was fitted with ADS-B. This information was obtained by RCCNZ and assisted with locating the aircraft wreckage. The safety investigation also used this data to analyse the accident flight path and that of previous flights.

1.12 Wreckage and impact information

1.12.1 The aircraft was located approximately seven NM south-west of Whitianga, on the western slope of the Kakatarahae hill, Coromandel Range, at a height of approximately 2380 ft.

1.12.2 All aircraft components were accounted for on site.

1.12.3 The site examination indicated that the aircraft struck trees in straight and level flight, tracking in a north-easterly direction towards Whitianga.

1.12.4 After the initial impact the aircraft came to rest at the base of a tree. The nose section of the aircraft, including the engine and propeller, had folded under the rest of the fuselage, exposing the cabin.

1.12.5 Although flight control runs were disrupted by the impact, pre-accident control integrity was established as far as possible.

1.13 Medical and pathological information

1.13.1 A CAA senior medical officer (SMO) was asked to review the pilot's medical records and provided a summary.

1.13.2 The post-mortem examination determined the pilot died of injuries sustained in an aircraft collision.

1.13.3 The pilot's medical history showed recent signs of fatigue, high cholesterol, and recent diagnosis of possible Sjogren's syndrome[9]/Systemic Lupus Erythematosus[10] overlap.

1.13.4 Toxicology results showed the pilot had Cyclizine present in his blood. However, the level of the drug was too low to confirm.

1.13.5 Cyclizine is used to treat nausea, vomiting and dizziness associated with motion sickness and vertigo, and can have sedating effects.

1.13.6 The SMO's statement, "too low level to confirm" suggests it is unlikely the drug would have caused significant drowsiness. However, this could not be conclusively discounted.

1.13.7 Apart from Cyclizine, no other drugs or alcohol were present in the blood.

1.13.8 Toxicology results noted the pilot's carbon monoxide saturation was less than five percent. Blood carbon monoxide levels of less than 10 percent are consistent with normal levels observed in the general population.

1.13.9 Witnesses stated the pilot's health had been deteriorating in the 12 months prior to the accident. The pilot became "really tired on recent flights" and "physically at times after the flight, he would struggle to get out of the plane". It was suggested to the pilot, by his peers, that he should fly with one of them as a precaution.

1.14 Fire

1.14.1 Not applicable.

1.15 Survival aspects

1.15.1 Although the pilot was restrained by a lap belt and two shoulder harnesses, the impact forces involved were not survivable.

9 Sjogren's Syndrome – An autoimmune disease occurs when the immune system attacks the body because it confuses it for something foreign. Sjogren's Syndrome primarily affects salivary and lacrimal glands. Common symptoms include dry mouth, dry eyes, dry skin, fatigue, rashes, or joint pain. - https://www.healthline.com/health/sjogren-syndrome

10 Systemic Lupus Erythematosus (SLE) –is another autoimmune condition the symptoms of which include severe fatigue, joint pain, joint swelling, headaches and a rash on the cheeks and nose. https://www.healthline.com/health/systemic-lupus-erythematosus

1.15.2 The aircraft was fitted with an ACK E-04 ELT operating on 121.5 and 406 MHz. No transmissions were recorded from the ELT. During the site inspection it was found the ELT had been ejected from the aircraft during the impact.

1.16 Tests and research

1.16.1 The engine was dismantled and inspected by the manufacturer's (Rotax) local representative, under CAA supervision.

1.16.2 Nothing was found to indicate the engine was not operating at the time of the accident.

1.16.3 The continuation of a VFR flight into IMC is widely regarded as a significant and common factor in many aviation accidents.

1.16.4 A determination to reach your destination, despite changing circumstances, is commonly referred to as 'get-there-itis'. The technical term for this is plan continuation bias – continuing with a plan despite evidence that it is not working[11].

1.16.5 Research conducted by the Australian Transport Safety Bureau (ATSB) shows that, although the dangers of flying VFR into IMC are well-known, pilots still fly into deteriorating weather. An ATSB research investigation report, *General Aviation Pilot Behaviours in the Face of Adverse Weather* concluded that*:*

> *"The chances of a VFR into IMC encounter increased as the flight progressed until they reached a maximum during the final 20 [percent] of the flight distance. This result highlights the danger of pilots 'pressing on' to reach their destination."*

1.16.6 According to a witness, the pilot had previously experienced VFR into IMC encounters and felt relatively comfortable in these conditions.

1.16.7 Fatigue is the general term used to describe physical and/or mental weariness which extends beyond normal tiredness. [12]

1.16.8 The effects of fatigue and people's resilience against those affects can be quite different from one person to the next. The more fatigued you are, the more you might find difficulty in maintaining concentration, in determining the importance of various signals, or in staying awake.[13]

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11 See Vector 2011 Jan Feb (aviation.govt.nz) for more information.

12 https://www.casa.gov.au/sites/default/files/safety-behaviours-human-factor-for-pilots-3-human-performance.pdf

13 https://www.aviation.govt.nz/about-us/covid-19/human-factors-considerations-for-aviation-professionals-after-covid-19-lockdown/

1.17 Organisational and management information

1.17.1 Not applicable.

1.18 Additional information

1.18.1 For VFR flight, a pilot-in-command is required to operate an aircraft in accordance with CAR 91.301 *VFR meteorological minima.*

Flight visibility and distance from cloud is prescribed for the corresponding class of airspace, in the following table and must be adhered to:

Class of airspace		Distance from cloud	Flight visibility
B		Clear of cloud	8 km at or above 10 000 feet AMSL 5 km below 10 000 feet AMSL
C, D, and E		2 km horizontally 1000 feet vertically outside a control zone 500 feet vertically within a control zone	
F and G	Above 3000 feet AMSL or 1000 feet above terrain whichever is the higher	2 km horizontally 1000 feet vertically	
	At or below 3000 feet AMSL or 1000 feet above the terrain whichever is the higher	Clear of cloud and in sight of the surface	5 km

Figure 12: Airspace VFR meteorological minima.

1.18.2 The pilot was operating in Class G airspace and required to have a minimum of 5 km forward visibility, and given his proximity to the terrain, remain clear of cloud and in sight of the surface.

1.19 Useful or effective investigation techniques

1.19.1 Not applicable.

2. Analysis

2.1 The accident occurred as a result of the aircraft flying into terrain during controlled flight in IMC.

2.2 Satellite imagery around the time of the accident shows areas of cumulus cloud moving across the Coromandel, particularly the Coromandel Range. A MetService

NZ forensic meteorologist calculated the cloud tops in the area to be between 3400 and 4000 ft, both at the time of departure and the time of the accident.

2.3 A pilot departing Whitianga aerodrome approximately 10 minutes prior to ZK-LSV stated that dense cloud was covering the Coromandel Range.

2.4 Furthermore, the same witness flying south, passing to the east of Whitianga at approximately 1050, observed little to no change in the cloud formation over the Coromandel Range. This is supported by the satellite imagery. Refer to Figure 5.

2.5 Analysis of the flight data determined that, on departing Whitianga, ZK-LSV climbed to approximately 3525 ft, likely to get over the cloud depicted in the satellite imagery and as described by the witness.

2.6 Due to fog conditions at Ardmore aerodrome the pilot of ZK-LSV was unable to land as planned. Flight track data shows the pilot tracked towards Drury aerodrome. A witness advised that the pilot had previously landed at Drury aerodrome and it is considered likely that he was attempting to do so at this time.

2.7 The pilot then commenced a reversal turn and climbed to track north-east, in the direction of Whitianga. This likely indicates similar conditions existed at Drury aerodrome and thus the pilot was again unable to land.

2.8 The aircraft initially climbed to 2700 ft. Data shows the pilot then descended to 2400 ft. From satellite imagery it would appear the aircraft was likely below cloud at this point.

2.9 Flight data showed that in the six minutes, between 1121 and the impact at 1127, the pilot engaged the autopilot, set an altitude of 2400 ft, entered the waypoint for Whitianga and remained at 127 knots, consistent with normal cruise speed.

2.10 The autopilot remained engaged with the altitude bug set at 2400 ft, at cruise speed, until the time of impact at 1127. This likely indicates the pilot's primary means of navigation had now become the GPS and moving map display on the EFIS, and not VFR procedures.

2.11 Satellite imagery and witness accounts of the weather indicate there was a cloud bank to the west of Whitianga, covering the Coromandel Range. At some point, during the last six minutes of the flight, it is most likely the pilot entered cloud, in contravention of CAR 91.301 *VFR meteorological minima.*

2.12 The pilot had flown between Whitianga and Ardmore regularly for several years. Using previous flight path data, analysis of the terrain shows the highest point to be approximately 1750 ft.

2.13 It is likely that, because the pilot was approaching Whitianga from a position further south than usual, he believed he was sufficiently clear of terrain ahead, when he was not.

2.14 The pilot had been recently diagnosed with two autoimmune disorders prior to the accident, where one of the common symptoms is fatigue. Threats such as fatigue increases the likelihood of errors, leading to degraded situational awareness and

poor decision-making. Pilots need good situational awareness to anticipate, recognise and manage threats as they occur. [14]

2.15 Witnesses stated there had been some concerns relating to the pilot's health in the months leading up to the accident. One witness said the pilot had shown visible signs of fatigue on recent flights, and on at least one occasion, required physical assistance to get out of the aircraft.

2.16 A witness advised that a few weeks prior to the accident, it was suggested the pilot be accompanied by another pilot when flying. Evidence shows this had been the case on previous flights. It is not clear why the pilot was not accompanied on this occasion. It is possible, due to the limited space in the aircraft that, instead of taking a second pilot, the pilot opted to use the room for the box of parts he was taking to the maintenance facility.

2.17 The reason the pilot of ZK-LSV chose to continue into IMC, described as "dense cloud", could not be conclusively determined. Research shows there are many factors that may compel a pilot's decision to 'press on', known as plan continuation bias[15].

2.18 VFR flight into IMC is well-known by pilots to be hazardous. Despite this – and considering the destination (Whitianga) had nearly been reached – the pilot was nearing the highest chance of a VFR into an IMC encounter, according to ATSB research.

2.19 Human factors research has also found that VFR pilots who deliberately entered IMC tended to have experienced the conditions previously and possessed a comparatively greater tolerance of risk. When recounting the event as part of the study, they experienced less anxiety and perceived the risks associated with the transition into instrument conditions as relatively lower than those pilots whose entry into instrument conditions was inadvertent.[16] According to a witness, the pilot had prior to the accident experienced VFR into IMC encounters and felt relatively comfortable in these conditions.

2.20 It is considered likely the inflight diversion placed additional cognitive and physical demands on the pilot, as the flight was longer and the environmental conditions more challenging than expected. These factors likely increased the pilot's fatigue[17] to the point that it affected his situation awareness and decision-making.

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[14] The Civil Aviation Safety Authority of Australia defines a threat as a situation or event with the potential to have a negative effect on flight safety, or any influence that promotes an opportunity for pilot error/s. https://www.casa.gov.au/sites/default/files/safety-behaviours-human-factor-for-pilots-8-threat-error-management.pdf

[15] Continuation bias is a determination to reach your destination despite changing circumstances and evidence that it is not working - commonly referred to as 'get-there-itis'. See Vector 2011 Jan Feb (aviation.govt.nz) for more information.

[16] Mark W. Wiggins, David R. Hunter, David O'Hare, Monica Martinussen. (2012). Characteristics of pilots who report deliberate versus inadvertent visual flight into Instrument Meteorological Conditions. *Safety Science 50*(1), 472–477

[17] Refer to Fatigue risk management | aviation.govt.nz for information relating to fatigue.

2.21 The aircraft has a high level of sophistication with regards to navigation, synthetic terrain, and flight instrument display information available to the pilot. This, coupled with the pilot's familiarity with the route being flown, knowledge of the clear weather conditions in Whitianga and increased fatigue levels, may have led to a reliance on the aircraft technology to navigate through the cloud.

3. Conclusions

3.1 The pilot was appropriately licensed and experienced to carry out the flight.

3.2 Although it could not be conclusively determined, based on his medical concerns and witness observations, the pilot may not have been medically 'fit to fly'.

3.3 The pilot continued into weather conditions which were below the minimum requirements for VFR flight, in non-compliance with CAR 91.301 *VFR meteorological minima*.

3.4 The pilot was not instrument-rated nor was the aircraft equipped for flight into IMC. According to human factors research, having previously experienced IMC encounters likely influenced the pilot's decision to enter cloud.

3.5 Good weather conditions at his destination (home aerodrome) and familiarity with the route being flown may have encouraged the pilot to continue his flight with a reliance on the aircraft's sophisticated technology.

3.6 No pre-accident aircraft defects were found.

3.7 It was determined the accident occurred following controlled flight into terrain in IMC.

3.8 The accident was not survivable.

4. Safety messages

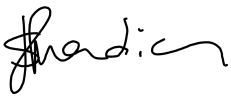
4.1 The CAA emphasises the importance of pilots conducting their own self-assessment as to whether they are fit to fly and make decisions accordingly.

The CAA has produced information relating to pilot's health, including the "Are you fit to fly?" poster using "IMSAFE" which provides guidelines prompting pilots to make the decision whether they are safe to fly or not.

4.2 This accident also serves as a timely reminder of the risks associated with reliance on technology for flight into deteriorating weather conditions.

A *Vector* article – "Not drowning in the tech" was published in the Spring 2021 issue. The article aims to raise awareness of the importance of maintaining basic flying skills and understanding the limitations and dangers of over-reliance on technology.

Report written by:



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