CIVIL AVIATION AUTHORITY
OF NEW ZEALAND

**AIRCRAFT ACCIDENT REPORT**

**OCCURRENCE NUMBER 10/885**

**CESSNA U206G**

**ZK-SKT**

**COLLISION WITH VEHICLE**

**MARSDEN POINT**

**12 MARCH 2010**


Photo used with permission of George Canciani.

# FOREWORD

As a signatory to the Convention on International Civil Aviation 1944 ("the Chicago Convention") New Zealand has international obligations in respect of the investigation of accidents and incidents. Pursuant to Articles 26 and 37 of the Chicago Convention, the International Civil Aviation Organisation ("ICAO") issued Annex 13 to the Convention setting out International Standards and Recommended Practices in respect of the investigation of aircraft accidents and incidents.

New Zealand's international obligations are reflected in the Civil Aviation Act 1990 ("the Act") and the Transport Accident Investigation Commission Act 1990 ("the TAIC Act").

Section 72B(2)(d) and (e) of the Civil Aviation Act 1990 Act also provides:

> **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:
>
> (e) To notify the Transport Accident Investigation Commission in accordance with section 27 of this Act of accidents and incidents notified to the Authority:

Following notification to the Transport Accident Investigation Commission ("the Commission") of any accident or incident which is notified to the Authority, an investigation may be conducted by the Commission in accordance with the TAIC Act. CAA may also investigate subject to the requirements of the TAIC Act.

The purpose of an investigation by the Commission is to determine the circumstances and causes of accidents and incidents with a view to avoiding similar occurrences in the future, rather than to ascribe blame to any person.

CAA however investigates aviation accidents and incidents for a range of purposes under the Act. Investigations are primarily conducted for the purpose of preventing future accidents by determining the contributing factors or causes and then implementing appropriate preventive measures - in other words to restore safety margins to provide an acceptable level of risk. The focus of CAA safety investigations is therefore to establish the causes of the accident on the balance of probability.

Accident investigations do not always identify one dominant or 'proximate' cause. Often, an aviation accident is the last event in a chain of several events or factors, each of which may contribute to a greater or lesser degree, to the final outcome.

CAA investigations may also inform other regulatory-safety decision making or enforcement action by the Director.

In the case of a fatal aviation accident, the final CAA investigation report will generally be highly relevant to an inquiry, and in some circumstances, an inquest, conducted by a Coroner. CAA investigations are not however done for, or on behalf of, a Coroner.

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**Glossary of Abbreviations used in this report**

| | |
|---|---|
| C | Celsius |
| CAA | Civil Aviation Authority |
| CAR | Civil Aviation Rule(s) |
| ELT | emergency locator transmitter |
| E | east |
| ft | feet |
| hPa | hectopascal(s) |
| km | kilometre(s) |
| MHz | megahertz |
| nm | nautical mile(s) |
| NZDT | New Zealand Daylight Time |
| NZ | New Zealand |
| QNH | barometric pressure (referenced to sea level) |
| RPM | revolutions per minute |
| RCCNZ | Rescue Coordination Centre of New Zealand. |
| S | south |
| TAIC | Transport Accident Investigation Commission |
| TAF | Terminal Aerodrome Forecast |
| UTC | Universal Coordinated Time |
| VFR | Visual Flight Rules |

CIVIL AVIATION AUTHORITY OF NEW ZEALAND

# AIRCRAFT ACCIDENT REPORT

## OCCURRENCE No 08/2220

| | |
|---|---|
| **Aircraft type, serial number and registration:** | Cessna U206G, S/N U20606609, ZK-SKT |
| **Number and type of engines:** | One, Continental IO-520-ECF |
| **Year of manufacture:** | 1982 |
| **Date and time:** | 12 March 2010, 1557 hours[1] (approximately) |
| **Location:** | Private Airstrip, Marsden Cove<br>Latitude[2]: S 35° 50.39'<br>Longitude: E 174° 27.78' |
| **Type of flight:** | Private |
| **Persons on board:** | Crew: 1 |
| **Injuries:** | Crew: 1 fatal |
| **Nature of damage:** | Aircraft destroyed |
| **Pilot-in-command's licence:** | NZ Private Pilot Licence (Aeroplane) |
| **Pilot-in-command's age:** | 27 |
| **Pilot-in-command's total flying experience:** | 186 flight hours approximately[3] |
| **Information sources:** | Civil Aviation Authority field investigation |
| **Investigator in Charge:** | Mr S.J. Walker |

[1] All times in this report are NZDT.

[2] World Geodetic System (WGS 84) co-ordinates.

[3] See paragraph 1.5.1 for further detail.

## Synopsis

The RCCNZ was notified at 1557 hours on 12 March 2010 that an aircraft had crashed into a paddock close to Marsden Cove Marina. The pilot was found at the accident site fatally injured. The CAA and the TAIC were notified shortly thereafter. The TAIC declined to investigate. A CAA field investigation was commenced later that day.

## 1. Factual information

### 1.1 History of the flight

1.1.1 The pilot of the aircraft was the Project Manager of the Marsden Cove Marina development and had been visiting the building site on business during the afternoon of the day of the accident. At approximately 1530 hours he returned to the aircraft, which was parked on private land close to the Marina, to prepare for the return flight to the North Shore Aerodrome, his home base.

1.1.2 At approximately 1550 hours the pilot was performing pre-takeoff checks. The Site Manager, who had given the pilot a lift to the aircraft in the company van, noticed that there was a large vehicle operating on the track in the vicinity of the end of the paddock used for aircraft operations. The Site Manager signalled to the pilot not to takeoff and then directed the tanker away from the track. Once the tanker had cleared the area the Site Manager parked the van to watch the takeoff. The van was parked facing the aircraft at a distance of approximately 450 metres from where the takeoff roll commenced, (see Figure 3 for further detail).

1.1.3 The Site Manager, seated in the van with his son, saw the aircraft takeoff normally, but noticed that it did not continue to climb. The aircraft flew parallel with the ground towards him at eye level and was seen to build speed with “no change in the sound of the engine”, which appeared to him to be at full takeoff power. The aircraft continued to follow the track in front of him, close to the ground, and on reaching the van it “pulled hard and banked”, whereby the right wingtip struck the right hand corner of the van.

1.1.4 The aircraft, although badly damaged, remained airborne, striking an earth bank before arriving at the main impact point 65 metres beyond the van, in a paddock adjacent to the track, where it was consumed by an intense fire.

1.1.5 The first persons to arrive at the scene used a mobile water tanker in an attempt to extinguish the fire and found that the pilot had not survived the accident.

1.1.6 The accident occurred at approximately 1550 hours, close to Marsden Cove Marina, at sea level, Latitude S 35° 50.39', Longitude E 174° 27.78'.

## 1.2 Injuries to persons

| *Injuries* | *Crew* | *Passengers* | *Other* |
|---|---|---|---|
| Fatal | 1 | 0 | 0 |
| Serious | 0 | 0 | 0 |
| Minor/None | 0 | 0 | 2 |

**Table 1: Injuries incurred from the accident.**

## 1.3 Damage to aircraft

1.3.1 The aircraft was destroyed.

## 1.4 Other damage

1.4.1 The van incurred moderate damage, in the form of a shattered windscreen and side windows and impact marks on the bonnet and roof pillar.

## 1.5 Personnel information

1.5.1 The pilot, aged 27, held a Private Pilot Licence (Aeroplane), issued on 5 May 2008. He held a current Class II Medical Certificate appropriate for his licence. Up to his last logbook entry on 19 June 2009 he had recorded a total flying time of 135.7 hours of which 74.1 hours were recorded as pilot-in-command.

1.5.2 The pilot completed a Cessna U206G type rating on 8 August 2008 and had recorded approximately 40 hours on type.

1.5.3 A record of hours flown by the pilot since his last logbook entry was not located, however it was estimated from the maintenance logbooks to be approximately 50 hours.

1.5.4 It was reported that the pilot was in good health and good spirits on the day of the accident.

1.5.5 In April 2008, when the pilot applied to the CAA for a Private Pilot Licence (Aeroplane), it was noted that he had had a number of traffic infringements which had resulted in a suspension of his Driver Licence for three months, commencing in January 2005. As there was no further record of any driving offences being committed since 2005, the pilot was assessed by the CAA as meeting the fit and proper person criteria for holding a Private Pilot Licence (Aeroplane). During this safety investigation it was found that, subsequent to the issue of his Private Pilot Licence (Aeroplane), the pilot was involved in two further traffic offences which were recorded by the Ministry of Justice.

## 1.6 Aircraft information

1.6.1 Cessna U206G, ZK-SKT, was first registered in New Zealand in March 2004 after being imported from Bolivia. It was issued a Non-Terminating Standard Category Airworthiness Certificate in August 2004.

1.6.2 The aircraft had a current Annual Review of Airworthiness and the last maintenance inspection had been conducted on 16 February 2010. Other than the replacement of a defective alternator, no significant deficiencies were detected during the inspection.

1.6.3 At the last 100 hour inspection the airframe total time since new was recorded in the Airframe Logbook as 4255 hours. The Engine Logbook also detailed that the engine had completed 2826.83 hours since new and 1124.50 hours since overhaul.

1.6.4 The Site Manager had flown with the pilot from Masterton to North Shore Aerodrome earlier that morning. He commented that he thought that the aircraft was performing well and that there was "nothing wrong with it", except for an intermittent door micro switch, which required that the door be opened to reset the micro switch prior to extending the flaps.

1.6.5 The aircraft fuel tanks were topped up prior to the flight from North Shore Aerodrome to Marsden Cove.

### 1.7 Meteorological information

1.7.1 On the day of the accident southwesterly winds prevailed, which may have led to mechanical turbulence, particularly around the take-off area, due to its geographical location and topography.

1.7.2 The Terminal Aerodrome Forecast for Whangarei Aerodrome, issued at 1356 hours on the day of the accident, forecast surface winds from 220 degrees[4] at 18 knots, 30km visibility, the possibility of light rain and broken cloud at 5000 feet. The QNH was forecast to be 1014 hPa to a maximum of 1023 hPa. Later in the day the wind was forecast to change to 230 degrees at eight knots.

1.7.3 The Meteorological Aviation Report for Whangarei Aerodrome, issued at 1600 hours on the day of the accident, recorded the wind from 230 degrees at 17 knots, varying between 190 degrees and 250 degrees, 20km visibility, scattered cloud at 4000 feet, broken cloud at 6000 feet, with a temperature of 21 degrees C and a QNH of 1017 hPa.

1.7.4 Prior to the flight, the pilot remarked to the Site Manager that in these conditions the aircraft should take off rapidly and climb steeply.

### 1.8 Aids to navigation

1.8.1 Not applicable.

### 1.9 Communications

1.9.1 No communications were reported as being received from the aircraft.

### 1.10 Aerodrome information

1.10.1 Not applicable.

[4] Expressed in degrees from True North

## 1.11 Flight recorders

1.11.1 Not applicable.

## 1.12 Wreckage and impact information

1.12.1 The accident sequence involved a series of impacts. The initial point of impact was where the right wingtip collided with the windscreen, bonnet and right hand roof pillar of the van.

1.12.2 The second point of impact was where the right wing struck the earth bank at approximately 46 metres beyond the van. The third and final point of impact was the main impact with the ground, approximately 65 metres beyond the van, where the aircraft came to rest inverted.

1.12.3 Both of the wings, the engine and the propeller had separated from the fuselage during the impact sequence. The centre fuselage had been consumed by an intense fire (see Figure 1).


**Figure 1: Main Wreckage.**

**Note – the van parked in the top right of the picture.**

1.12.4 A section of the right wing was located on the track, six metres from the van. It consisted of the outboard end of the wing, a portion of wing spar and the complete

right aileron still attached by its outboard hinge (see Figure 2). Information about the aircraft attitude and the magnitude of the aileron deflection at the instant the wingtip struck the van was captured by deformation of the wing structure and paint transfer.

1.12.5 The propeller, with its adaptor flange still attached, had sheared in torsion from the crankshaft, and was located within the area of the main wreckage. The propeller blades exhibited significant bending deformation.

1.12.6 The engine mounts had failed during the impact sequence and the engine had come to rest 11 metres beyond the main wreckage. It was evident that the exhaust manifolds had suffered ductile deformation from impact damage while at operating temperature. A scrub fire had consumed a patch of vegetation downwind from the engine.

**Figure 2: Damage to Right Wing tip and Aileron.**

1.12.7 The outboard section of the right flap was severely crushed and had been forced into the wing trailing edge in what appeared to be slightly short of the fully retracted position.

1.12.8 Pre-accident flight control integrity was established as far as possible at the accident site.

1.12.9 The fuel selector was found with the 'LEFT' tank selected.

1.12.10 The elevator trim surface was found set out of neutral by approximately ten degrees (in the normal position for take-off).

1.12.11 An aircraft-mounted 406 MHz ELT was fitted, and was still transmitting intermittently, even after suffering significant damage caused by the impact and the fire.

1.12.12 The right wingtip, engine, and propeller were recovered to a secure maintenance facility for a more detailed inspection, during which the pre-accident integrity of the engine and propeller was established.

### 1.13 Medical and pathological information

1.13.1 The Post-Mortem examination report revealed that the pilot died of extensive burns.

### 1.14 Fire

1.14.1 A significant and intense fire consumed the centre fuselage. The fire was fuel fed once the wing tanks had ruptured and the fuel vapours had probably been ignited by the hot engine exhaust or disruption of the electrical system.

### 1.15 Survival aspects

1.15.1 Approximately 15 minutes after the accident had occurred the RCCNZ received an 'unlocated alert' for the 406 MHz ELT that corresponded with ZK-SKT. However the position was recorded as 400 nm away from Marsden Cove. RCCNZ reported that the satellite SARSAT S12 had only received three datapoints from the ELT during that pass, which was not sufficient for the system to calculate an accurate position. This limitation, combined with the fact the satellite may have detected the signal at a low angle, may have resulted in the large position discrepancy. The ELT had been significantly damaged in the impact and fire and it appeared to be intermittently transmitting, severely limiting the information available to determine an exact location.

1.15.2 The accident was not survivable.

### 1.16 Tests and research

1.16.1 Nil.

### 1.17 Organisational and management information

1.17.1 Nil.

### 1.18 Additional information

1.18.1 The takeoff weight of ZK-SKT was estimated to be 2645 pounds. From the Pilot's Operating Handbook for the aircraft it was calculated that a ground roll of around 178 metres would have been required for the takeoff.

1.18.2 In respect of vertical obstacle clearance, it was calculated that, an obstacle on the take-off path 302 metres from the commencement of the takeoff would be cleared by 50 feet vertically. This was then used to determine that the aircraft should have cleared the van by at least 105 feet vertically.

1.18.3 Civil Aviation Rule Part 91 prescribes the rules relating to general operating and flight, in part which states as follows:

***91.201 Safety of aircraft***

*A pilot-in-command of an aircraft must—*

*(2) during the flight, ensure the safe operation of the aircraft and the safety of its occupants;*

i.e. it is the pilot's responsibility to manage the aircraft in a manner that is safe and does not cause unnecessary risk.

### 1.19 Useful or effective investigation techniques

1.19.1 Nil.

## 2. Analysis

2.1 The separation of a large section of the right wing and right aileron from the aircraft reflected the severity of the collision with the van. It was established that the aircraft still had significant forward airspeed at the time that it arrived at the main impact site.

2.2 The investigation determined that the engine was producing high power at the time the propeller struck the ground, evidenced by the torsional shearing of the crankshaft at the propeller adaptor flange, ingestion of debris into the intake and combustion chambers, ductile deformation of the exhaust manifold, destruction of the engine mounts and significant deformation of the propeller blades.

2.3 When correlated with the damage to the van, the damage to the wingtip revealed that the aircraft attitude, in relation to the ground at the time of the collision, was approximately 20 to 25 degrees nose up with 20 degrees of right bank. The right aileron was deflected upward from the neutral position by approximately 20 degrees. The aileron deflection indicated that the pilot was commanding a right roll, resulting in a banked turn toward the van when the impact occurred.

2.4 It was calculated that, with approximately 20 degrees of right bank, based upon the height of the impact marks on the van, the aircraft was between three and six feet above the ground at the time it struck the van. At this height the lowering of the right wing due to the banked attitude of the aircraft contributed to the striking of the van with the outer section of the right wing. It is possible that the pilot did not fully appreciate the affect that roll to the right would have on wingtip clearance.

2.5 The right roll command was considered to be an intentional manoeuvre, due to the angle of bank and magnitude of aileron deflection at the time of the collision.

Additionally, the direction of the roll input was opposite to that which would have been required to correct for the wind conditions reported on the day.

2.6 The evidence that the aircraft did not follow the normal climb profile from takeoff, but instead flew for 270 metres at low level and increasing airspeed, suggested that the pilot was in control of the aircraft.

2.7 Flight at increasing airspeed, at low level, would have demanded the pilot's full concentration. Little margin for error existed. A misjudgement while performing this manoeuvre resulted in a high speed collision. It is likely that a visual illusion known as 'blossom effect'[5] was a factor in the misjudgement. Additionally, the increasing airspeed would have contributed to the misjudgement of the rate of closure with the van.

2.8 The loss of the section of right wing and right aileron resulted in immediate and severe loss of lift on the right wing. The aircraft was uncontrollable from that point with no possibility of recovery.

## 3. Conclusions

3.1 The pilot was appropriately licensed and rated for the flight.

3.2 The aircraft was in an airworthy condition prior to the accident and there was no evidence to suggest that mechanical failure contributed to the accident.

3.3 There is no evidence to suggest that the pilot did not have control of the aircraft during the takeoff, or was in any way incapacitated at that time. The flight path of the aircraft suggests there was a conscious and deliberate decision by the pilot not to follow the normal climb profile after takeoff and to fly towards the van at low level.

3.4 It is unknown why the pilot did not follow the normal climb profile after takeoff. As the occupants of the van were known to the pilot it is reasonable to believe that the pilot may have flown the aircraft towards the van at low level, in order to perform a low pass or 'fly by' over the van. Such low flying would have been unnecessary and deemed to be 'at risk behaviour'.

3.5 During a rolling pull-up manoeuvre the aircraft collided with the van. This collision was probably caused by the pilot misjudging his clearance from the van due to the combination of 'blossom effect' and the lowering of the right wing in the banked turn.

3.6 There was no evidence to suggest that environmental factors contributed to this accident.

[5] 'Blossom effect' is a visual illusion which, in aviation terms, causes misinterpretation of rate of closure between the pilot of an aircraft and another aircraft, or object, appearing small until it is too late to avoid.

3.7 The predominant cause of the accident appears to have been a conscious decision by the pilot to operate the aircraft in an unsafe manner leading to an error or a series of errors.

## 4. Safety Actions

4.1 Publication of this report will serve to highlight possible consequences of 'at risk behaviour' in aviation.

4.2 The CAA is undertaking a safety review (safety action number 11A890) to assess its processes for establishing a person's eligibility to hold a Pilot Licence in relation to known risk taking behaviour.

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Authorised by:

Peter Kirker
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11 Jan 2011

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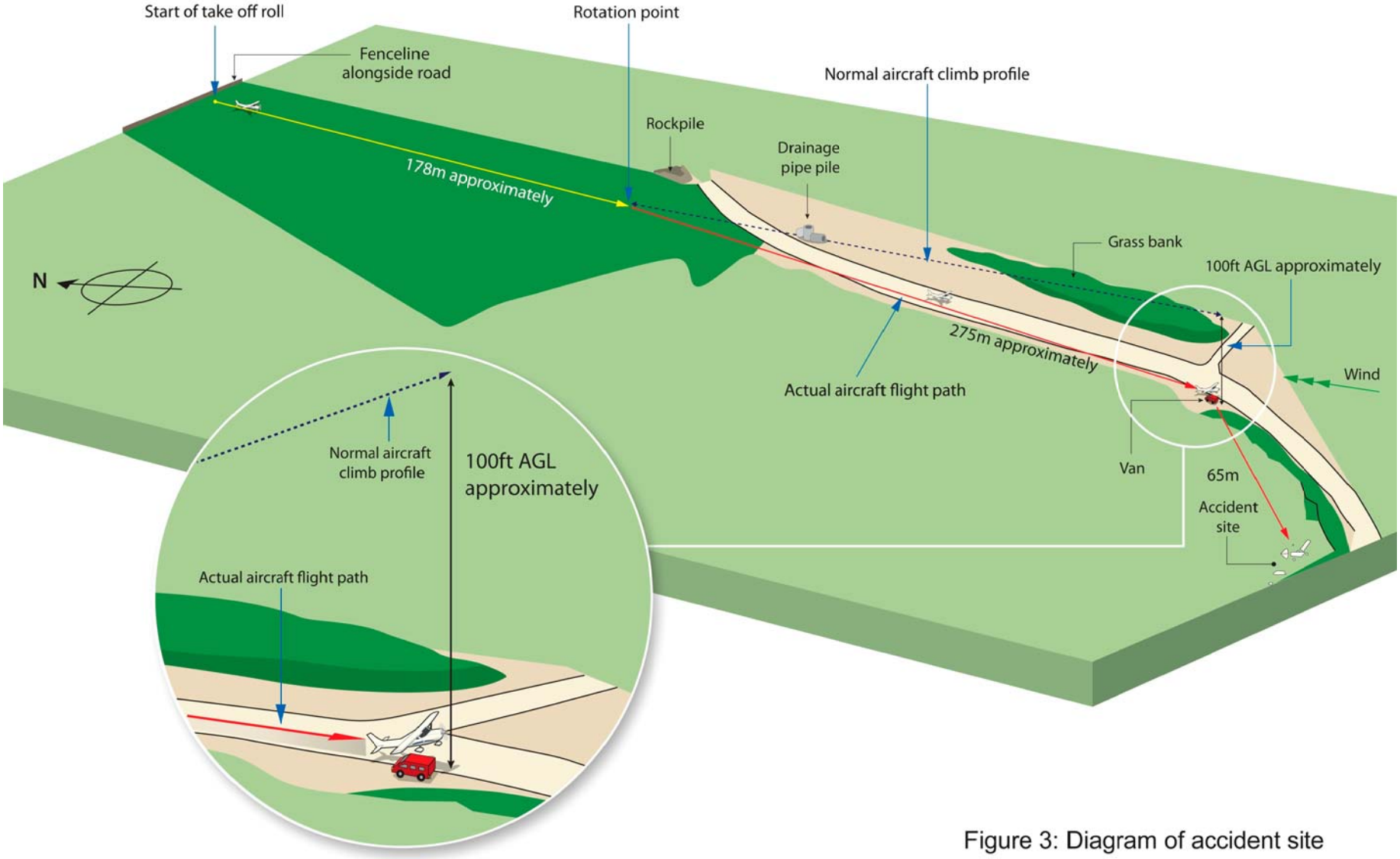


Figure 3: Diagram of accident site