Transport Accident Investigation Commission

Final report
Tuhinga whakamutunga

Aviation inquiry AO-2025-003
Bell Textron Canada Limited 206L-3 helicopter, ZK-IGD
Loss of control – ground
4.5 NM west of Whakatāne
27 July 2025

May 2026

The Transport Accident Investigation Commission
Te Kōmihana Tirotiro Aituā Waka

No repeat accidents – ever!

"The principal purpose of the Commission shall be 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."

Transport Accident Investigation Commission Act 1990, s4 Purpose

The Transport Accident Investigation Commission is an independent Crown entity and standing commission of inquiry. We investigate selected maritime, aviation and rail accidents and incidents that occur in New Zealand or involve New Zealand-registered aircraft or vessels.

Our investigations are for the purpose of avoiding similar accidents and incidents in the future. We determine and analyse contributing factors, explain circumstances and causes, identify safety issues, and make recommendations to improve safety. Our findings cannot be used to pursue criminal, civil, or regulatory action.

At the end of every inquiry, we share all relevant knowledge in a final report. We use our information and insight to influence others in the transport sector to improve safety, nationally and internationally.

Commissioners

Chief Commissioner	David Clarke
Deputy Chief Commissioner	Stephen Davies Howard
Commissioner	Paula Rose, QSO
Commissioner	Bernadette Roka Arapere (until 6 November 2025)

Key Commission personnel

Chief Executive	Martin Sawyers
Chief Investigator of Accidents	Louise Cook
Investigator-in-Charge for this inquiry	Hamish Johnstone
Commission General Counsel	Sid Wellik

Notes about Commission reports
Kōrero tāpiri ki ngā pūrongo o te Kōmihana

Citations and referencing

The citations section of this report lists public documents. Documents unavailable to the public (that is, not discoverable under the Official Information Act 1982) are referenced in footnotes. Information derived from interviews during the Commission's inquiry into the occurrence is used without attribution.

Photographs, diagrams, pictures

The Commission owns the photographs, diagrams and pictures in this report unless otherwise specified.

Time, altitude, distance and speed

Times referred to in this report are stated in the applicable local time, being either New Zealand Standard Time (NZST), which is Universal Time Coordinated (UTC) + 12 hours or New Zealand Daylight Time (NZDT), which is UTC + 13 hours. In New Zealand, in accordance with exceptions to the International System of Units and with the Aeronautical Information Publication (AIP) Gen 2.1, altitudes, elevations and heights are measured in feet. In this report these parameters are therefore only expressed in feet (ft) without a metric equivalent. Navigational distances are stated in nautical miles, vertical speed in feet per minute, and horizontal speed in knots (being nautical miles per hour).

Verbal probability expressions

For clarity, the Commission uses standardised terminology where possible.

One example of this standardisation is the terminology used to describe the degree of probability (or likelihood) that an event happened, or a condition existed in support of a hypothesis. The Commission has adopted this terminology from the Intergovernmental Panel on Climate Change and Australian Transport Safety Bureau models. The Commission chose these models because of their simplicity, usability, and international use. The Commission considers these models reflect its functions. These functions include making findings and issuing recommendations based on a wide range of evidence, whether or not that evidence would be admissible in a court of law.

Terminology	Likelihood	Equivalent terms
Virtually certain	> 99% probability of occurrence	Almost certain
Very likely	> 90% probability	Highly likely, very probable
Likely	> 66% probability	Probable
About as likely as not	33% to 66% probability	More or less likely
Unlikely	< 33% probability	Improbable
Very unlikely	< 10% probability	Highly unlikely
Exceptionally unlikely	< 1% probability	

Figure 1: Bell Textron Canada Limited 206L-3 Longranger, ZK-IGD
(Credit: Nathan Cox, Jetphotos (January 2022))

Figure 2: Location of accident
(Credit: Land Information New Zealand Toitū Te Whenua)

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Tuhinga whakarāpopoto

What happened

1.1. On 27 July 2025, the owner/pilot of a Bell Textron Canada Limited 206L-3 Longranger helicopter (the helicopter) was taking off from their property near Whakatāne to fly back to Ardmore aerodrome, where the helicopter was usually based. The pilot regularly flew between Ardmore aerodrome and the property. On board were the pilot and two family members.

1.2. As the pilot applied left cyclic[1] to move the helicopter away from a nearby low retaining wall, the helicopter rolled to the left. The main rotor blades struck the concrete to the left-hand side of the fuselage. A main rotor blade passed through the tail boom, and the main fuselage came to rest on its left-hand side, facing 180 degrees from its initial position, all within a few seconds.

1.3. The pilot suffered a head injury and was rendered unconscious for about five minutes. The pilot and both passengers were taken to hospital for treatment.

Why it happened

1.4. The nose attitude[2] of the helicopter was slightly higher than normally experienced during takeoff, **very likely** giving the pilot the impression that the helicopter was higher off the ground than it was.

1.5. It is **virtually certain** that the rear of the left skid was still in contact with the ground as the helicopter started to move left. There was sufficient friction between the rear of the left skid and the concrete to cause the helicopter to roll around the point of contact. The pilot attempted to counter the roll by lowering the collective[3]; this was not successful and the helicopter continued to roll onto its left side, in a condition known as dynamic rollover.

1.6. Dynamic rollover is a critical phenomenon in helicopter operations, where the helicopter can roll uncontrollably around a pivot point,[4] often leading to an accident if not corrected early.

What we can learn

1.7. Owing to the dangers of dynamic rollover, it is important when manoeuvring a helicopter close to the ground that the pilot ensures there is no contact between the landing gear and the ground before attempting to move the helicopter sideways or backwards.

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[1] The cyclic control is held in the pilot's right hand and adjusts the pitch of each rotor blade individually during its rotation to direct the helicopter forward, backward, or laterally.

[2] The angle of the helicopter's nose relative to the horizon, indicating whether the nose is pitched up, level or down.

[3] The collective is the control in the pilot's left hand that adjusts the pitch of all the main rotor blades simultaneously, allowing the pilot to adjust the height of the helicopter.

[4] A fixed point around which an object rotates or balances.

1.8. All helicopter movements close to the ground need to be slow and controlled in order to recognise any unusual or unexpected movements and to apply the appropriate corrective action in a timely manner.

Who may benefit

1.9. All helicopter pilots and maintenance organisations may benefit from this report.

2 Factual information
Pārongo pono

Narrative

2.1. At about 1514 on 27 July 2025, the owner/pilot (the pilot) of ZK-IGD, a Bell Textron Canada Limited (Bell) 206L-3 Longranger helicopter (the helicopter) was taking off from their property near Whakatāne to fly back to Ardmore aerodrome, where the helicopter was normally based. On board were the pilot and two family members who regularly flew between Ardmore aerodrome and the property.

2.2. The pilot advised Commission investigators that they did their usual pre-flight[5] inspection of the helicopter alone to avoid distractions, then the passengers boarded the helicopter. The pilot did a final walk-around to check the helicopter, including checking that all doors were closed securely and that the passengers' seatbelts were properly fastened, before strapping themself in. The pilot and passengers all stated that this was the normal routine.

2.3. The pilot reported that there was nothing eventful or out of the ordinary in the starting sequence and checks.

2.4. The pilot reported that after completing their after-start and pre-takeoff checks, the intention was to take off into a 2–3 feet (ft) hover and then move the helicopter to the left a short distance, away from the small retaining wall and gently sloping ground on the right of the helicopter (*see* Figure 3). They then planned to move the helicopter backwards into a clear space and turn into the wind before climbing above obstacles and transitioning to forward flight.

Figure 3: ZK-IGD parking spot from a previous visit
(Credit: Owner of ZK-IGD)

2.5. The initial portion of the takeoff was considered normal by all on board. The pilot recalled that once in the hover the helicopter was in a slightly higher nose attitude

[5] Checking the condition and airworthiness of the helicopter.

than they normally experienced, though not to a degree that would raise concerns for them. They thought this was because of the light tailwind they were experiencing.

2.6. As the helicopter started to move left away from the retaining wall, it began rolling to the left (*see* Figure 4). The main rotors struck the concrete ground, destroying the blades and causing the helicopter to shake violently and the tail to separate.

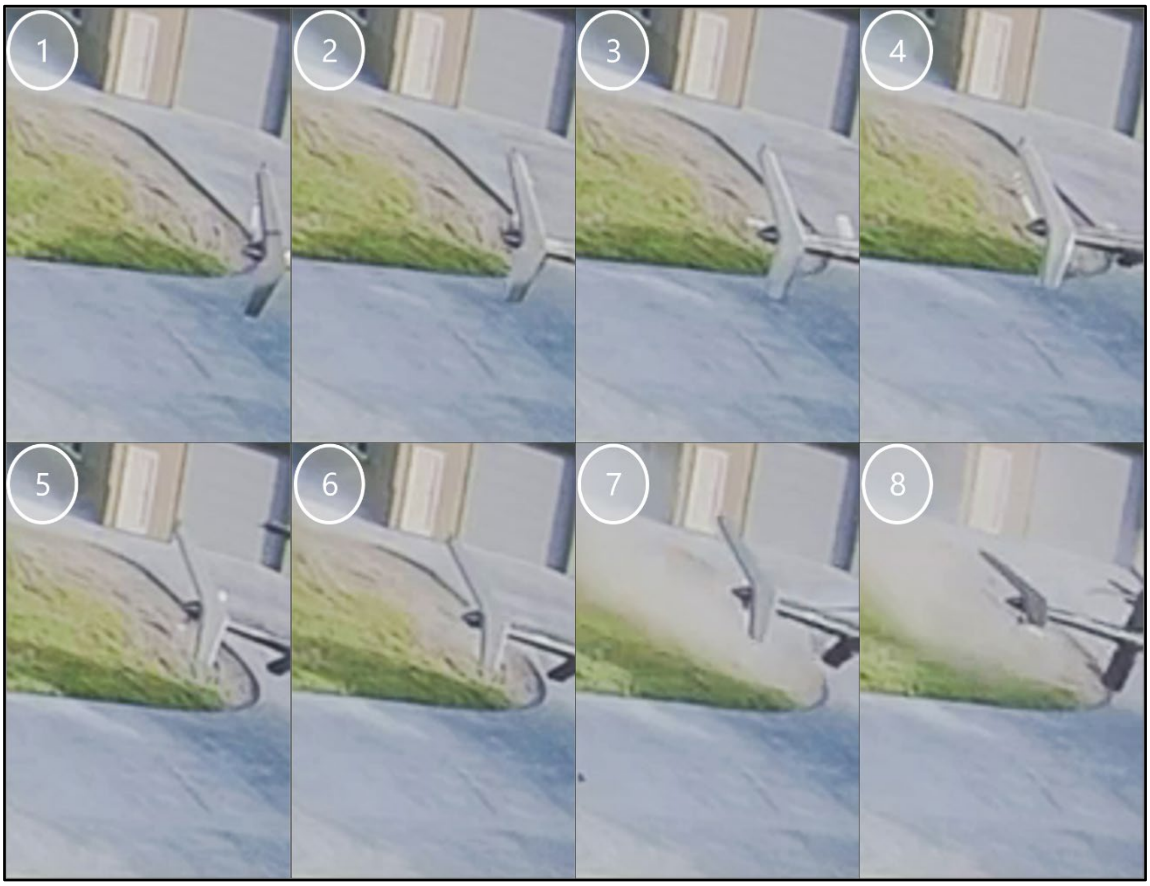

Figure 4: Sequence of rollover from CCTV footage

(Credit: Owner of ZK-IGD)

2.7. After the helicopter stopped moving, the passengers extricated themselves and then, with the help of a neighbour, they pulled the unconscious pilot out of the helicopter. The pilot lost consciousness for about five minutes as a result of the accident, was kept in hospital overnight for observation and discharged the next day. The two passengers sustained minor injuries and were not admitted to hospital.

2.8. Neither the pilot nor passengers recalled shutting off the helicopter engine; however, neither they nor other witnesses recalled the engine running after the occupants had evacuated the helicopter.

Personnel information

2.9. The pilot had held a Private Pilot Licence (Helicopter) (PPL(H)) since March 2008 and had accrued about 611 total flying hours including 99 hours on the B206L-3 type of helicopter.

2.10. The pilot began helicopter training in 2006, having previously accrued 55 hours' training in aeroplanes in 1990 to 1991. Initial helicopter training was conducted in a Robinson R22. The pilot purchased a Bell 206B Jetranger (B206B) in September 2015, for personal use. After completing conversion training, they accumulated 361 hours on the B206B before purchasing ZK-IGD in November 2021.

2.11. The pilot completed a biennial flight review in December 2024, and their pilot's logbook showed that at the time of the accident they had flown 4.7 hours in the preceding 90 days, including multiple flights. The pilot met the currency requirements to exercise the privileges of their PPL(H) licence.

2.12. The pilot reported being well rested at the time of the accident, and that they were in good health and fit to fly.

Pilot medical

2.13. The pilot held a valid and current DL9[6] medical certificate. There was no evidence that the accident was the result of a medical event or pre-existing condition.

Aircraft information

2.14. ZK-IGD was a Bell Textron Canada Limited Helicopters 206L-3 helicopter, serial number 51221, manufactured in 1987. It was powered by a single Rolls-Royce 250-C30P turboshaft engine.

2.15. The helicopter was imported into New Zealand in 2021 and issued with a non-terminating certificate of airworthiness in the standard category on 4 August 2021. The helicopter was to be maintained in accordance with the manufacturer's maintenance instructions.

2.16. Commission investigators reviewed the maintenance records, which showed that there were helicopter components that were overdue for maintenance action (*see* paragraph 3.10). The helicopter was booked in for maintenance on 1 August 2025, which was the week after the accident. Part of that maintenance was for those overdue components.

2.17. The Bell 206L-3 is a 7-seater helicopter with a maximum permissible weight of 4150 pounds (lb) (1882 kilograms (kg)). The basic weight of ZK-IGD was recorded as 2505.8 lb (1136.6 kg). Using the known weights and positions of the three occupants and the measured fuel load, the helicopter was calculated to be within its weight and balance limits at the time of the accident. The fuel was drained and measured at the scene. The check of the fuel for water and impurities identified no contamination.

Meteorological information

2.18. The METAR AUTO[7] for Whakatāne aerodrome[8] issued at 1530 was:

- wind from 060 degrees true at 6 knots (kt)
- visibility 20 kilometres
- cloud broken at 4200 feet

[6] From 5 April 2021, Private Pilot Licence holders were able to exercise a wide range of licence privileges on a current medical certificate issued in accordance with clause 44(1) of the Land Transport (Driver Licensing) Rule 1999. That is applicable for a class 2, 3, 4 or 5 driver licence with passenger endorsement, known as a DL9 driver licence medical certificate (*see* Civil Aviation Rules Part 61.35(a)(1)(ia)).

[7] Aerodrome routine meteorological report provided from an automatic weather station.

[8] 4.5 nautical miles (NM) east of the accident site.

- temperature 14°C and dew point 8°C
- atmospheric pressure at sea level 1030 hectopascals (hPa)

2.19. A local pilot who arrived at the scene soon after the accident told investigators that they estimated the wind at the time was light at about 4–5 kt, from the east. It was a generally clear day.

Recorded data

2.20. The helicopter was fitted with a Garmin aera 760 GPS navigation system that recorded its flights. Data points from the accident flight were analysed as part of the investigation. Owing to the short timeframe and relative lack of distance covered, the data did not assist the investigation into the accident flight. It did provide independent corroboration of the flight times recorded in the pilot's logbook.

Flight recorders

2.21. The helicopter was not fitted with a flight data recorder or a cockpit voice recorder and was not required to be.

Other data sources

2.22. The pilot provided closed-circuit television (CCTV) footage from a nearby building with partial coverage of the accident site.

2.23. Mobile phone records were checked for possible relevance to pilot distraction. There were no calls or messages to or from the pilot in the period leading up to or during the accident.

Table 1: Timeline from other data sources

Time	Event
1514:53[9]	helicopter begins moving to the left and begins to roll
1514:56	tail of the helicopter lifts slightly
1514:57	main rotor blades strike the ground
1516	111 emergency call made
1527	emergency services arrive

Site and wreckage information

2.24. The accident occurred on a flat concrete pad, with slightly raised terrain nearby. Some trees were located behind low retaining walls to the right of the helicopter during takeoff and there was a large shed to the left.

[9] 1514 and 53 seconds.

2.25. The main rotor blades disintegrated during the accident sequence with only the root of each blade remaining connected to the main rotor hub,[10] which in turn was still connected to the mast (*see* Figure 5). The remaining parts of the blades were found spread across the accident site.

Figure 5: Top of helicopter and remains of the main rotor blades

2.26. The helicopter's mast was bent through about 90°, although still attached to the transmission[11] (*see* Figure 6).

Figure 6: Main rotor mast bend

[10] Attachment point for the main rotor blades.

[11] Transfers power from the engine to the main rotor, tail rotor and other accessories during normal flight conditions.

2.27. Strike marks on the right-hand side of the main cabin, next to the unoccupied rear-facing seat position, were consistent with a main rotor striking the cabin and then travelling across the top of the helicopter cabin and through the control linkages,[12] where the hydraulics are located (*see* Figure 7).

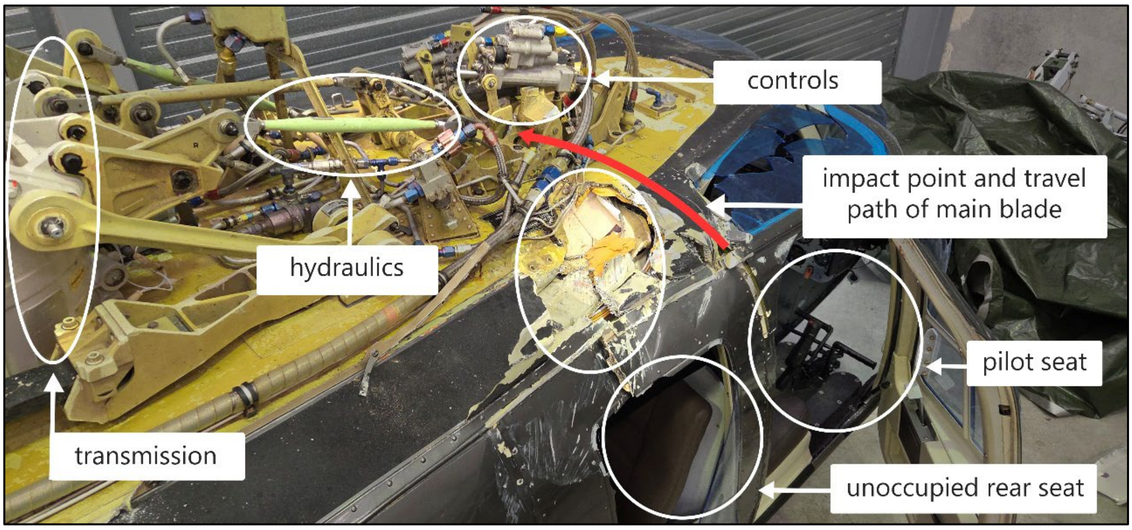

Figure 7: Top of the cabin and controls

2.28. Evidence marks on the concrete include a divot,[13] consistent with the location of the end of the main rotor blade when it first struck the ground (*see* Figure 8). A small hole in the retaining wall, in line with the concrete strike marks, is consistent with a blade-tip weight penetration.

2.29. There were several paint marks consistent with various parts of the helicopter. Of note are the yellow and orange paint marks in the approximate position of the left skid during the accident sequence (*see* Figure 3, Figure 8 and Figure 9).

Figure 8: Blade impact marks

[12] Used to control the helicopter attitude and direction of travel.
[13] A small indentation, gouge or disturbance caused by an impact.

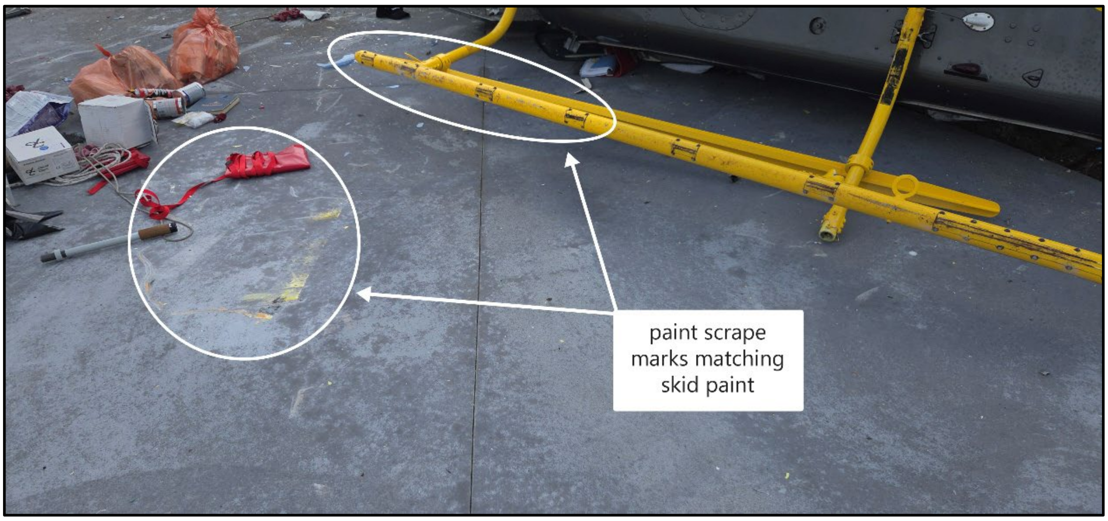

Figure 9: Skid paint marks

2.30. The left-rear cross-tube was bent inwards (*see* Figure 10), consistent with heavy side loading during the accident sequence. The paint on the outer section of the left rear skid was missing, through the outer yellow layer and an underlying orange layer, showing the bare metal below (*see* Figure 11).

2.31. There was no fire before, during or after the accident sequence, and the fuel tank remained intact.

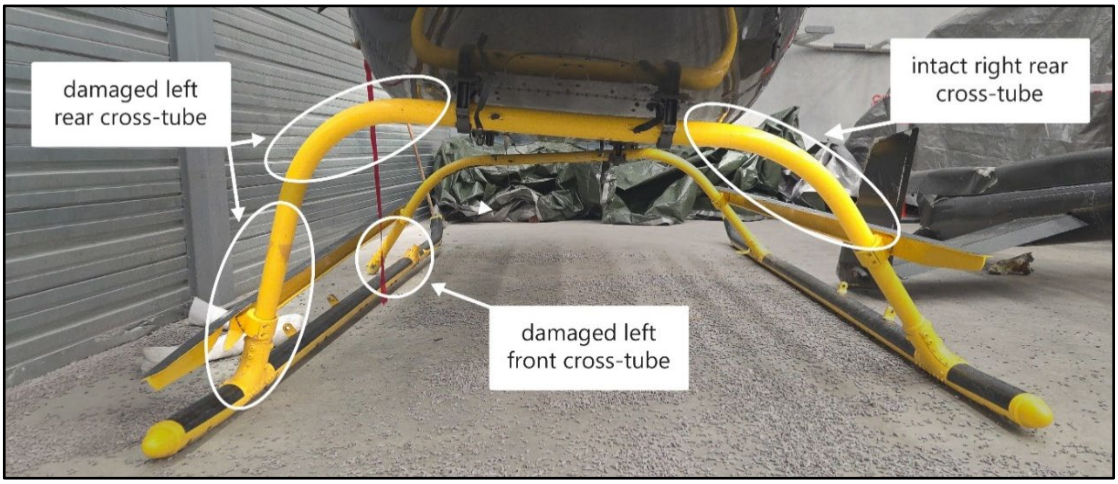

Figure 10: Rear cross-tubes

Figure 11: Outer left rear skid, showing two layers of paint missing

Survival aspects

2.32. The helicopter was fitted with an emergency locator transmitter (ELT) designed to activate in a heavy impact. The ELT activated and automatically notified the Rescue Coordination Centre New Zealand (RCCNZ) at 1517. The RCCNZ then called emergency services to attend; the emergency services arrived at the accident scene about 10 minutes later.

2.33. The rear passenger was wearing a three-point lap and sash style seatbelt. The front passenger and pilot both had four-point harnesses that remained secure throughout the accident sequence. Both passengers received minor bruising. The main cabin remained intact during the accident sequence, protecting the occupants as it was designed to do.

2.34. During the accident sequence, the pilot’s head contacted the aircraft cabin roof, resulting in loss of consciousness and bleeding. The pilot was not wearing a flight helmet; nor were they required to do so.

3 Analysis
Tātaritanga

Introduction

3.1. Helicopter pilots are taught to lift from the 'skids light'[14] condition to a low hover before going to normal hover height to preclude dynamic rollover[15] (Civil Aviation Safety Authority Australia, 2012).

3.2. This means that the helicopter should lift slowly into a low hover for the pilot to check controllability, and to assess the attitude of the helicopter when hovering. A check of the engine and flight instruments is also undertaken to ensure that there is sufficient power available to continue, noting that the power required increases as the hover height increases. If any of these factors are not suitable, the pilot can land the helicopter and reassess before committing to further flight.

3.3. If the helicopter aligns with the anticipated take-off characteristics, it is standard practice to lift to a normal hover height, as appropriate to the type of helicopter, before manoeuvring in the hover.

3.4. The following section analyses the circumstances surrounding the event to identify factors that increased the likelihood of the event occurring or increased the severity of its outcome.

What happened

3.5. The position of the helicopter at the time of takeoff, combined with the direction of the wind and the local topography, meant that the relative wind was almost a direct tailwind.

3.6. The pilot's plan was to take off into a 2–3 ft hover, then move left, away from the low wall they were parked next to, and then move backwards into a clearer space before turning into the wind and climbing vertically above the surrounding trees and flying away. The pilot later reported a nose-high attitude on takeoff, **very likely** the result of needing to counter the effect of the tailwind. This meant that as power was applied, the front of the skids would have left the ground first and the rear of the skids would have remained lower.

3.7. With the nose higher than usual it is **very likely** that the pilot had the impression that the helicopter was higher off the ground than it was. As the pilot input cyclic control to move the helicopter to the left, it is **virtually certain** that the heel of the left skid was still in contact with the concrete. Paint scrape marks on the concrete show that there was enough friction between the skid and the concrete to prevent the skid from moving at the same rate as the rest of the helicopter. As a result, the helicopter began to roll to the left because of the horizontal component of the thrust from the main rotor.

[14] When the pilot raises the collective just enough for the landing skids to lose full contact with the ground without actually completing a full takeoff or hover.

[15] Dynamic rollover is discussed in paragraph 3.17 onwards.

3.8. This phenomenon, known as dynamic rollover, is discussed in paragraph 3.17 onwards.

Why did the helicopter roll over on takeoff?

Pilot medical event

3.9. There was no evidence that the accident was the result of a medical event or medical condition.

Helicopter maintenance

3.10. Examination of the helicopter and engine logbooks identified some discrepancies in component life limits and maintenance requirements. However, the components in question remained intact during the accident sequence and were not causal to the accident.

3.11. While the airworthiness of the helicopter did not contribute to the accident, aircraft operators should be aware of their responsibilities. Civil Aviation Rules (CARs) Part 91.603(a)(1) states that the operator of an aircraft must ensure that the aircraft is maintained in an airworthy condition.

Mechanical failures

3.12. Examination of the engine confirmed it was operating at high power at the time the main rotor blades struck the concrete. The damage to the main rotor and tail rotor blades confirm they were also rotating at high speed at the time of impact.

3.13. External damage to the engine and engine mounts sustained during the accident was **virtually certain** to have caused the engine to shut down during the accident sequence. This is consistent with witness reports that the engine had stopped when the passengers evacuated.

3.14. Examination of the flight controls showed that they had retained continuity and function until damaged during the accident. The controls had been assisted by hydraulics up to the point of impact.

3.15. When interviewed, the pilot said that the helicopter was performing normally and there were no aural or visual warnings leading up to the accident.

3.16. Based on the following evidence, it was **exceptionally unlikely** that a mechanical failure contributed to this accident.

Dynamic rollover

3.17. Dynamic rollover is a well-known phenomenon and is taught to all helicopter pilots early in their training.

The United States Federal Aviation Administration (FAA) Helicopter Flying Handbook provides this description of dynamic rollover:

> A helicopter is susceptible to a lateral rolling tendency, called dynamic rollover, when it is in contact with the surface during takeoffs or landings. For dynamic rollover to occur, some factor must first cause the helicopter to roll or pivot around a skid or landing gear wheel, until its critical rollover angle is reached. The angle at which dynamic rollover occurs will vary based on helicopter type. Then, beyond this point, main rotor thrust continues the roll and recovery is

> impossible. After this angle is achieved, the cyclic does not have sufficient range of control to eliminate the thrust component and convert it to lift. If the critical rollover angle is exceeded, the helicopter rolls on its side regardless of the cyclic corrections made. (United States Department of Transportation Federal Aviation Administration, 2019)

3.18. The recovery technique for dynamic rollover is to lower the collective before reaching the critical angle, which is between 5° and 8°, depending on the helicopter design. Often, the natural instinct for pilots when rolling left is to apply opposite direction cyclic input; however, unless it is applied before the helicopter reaches the critical angle, it will not be sufficient by itself to recover the helicopter. (*See* Appendix 1 for the full FAA Helicopter Flying Handbook guidance on dynamic rollover).

3.19. When interviewed, the pilot said that they attempted to correct the roll to the left by lowering the collective. CCTV footage captured from the nearby house supports the pilot's recollection. However, by the time the pilot had recognised and attempted to recover from the roll, the critical angle had already been passed, and the main rotor blades then made contact with the ground.

3.20. It is **virtually certain** that the helicopter was beyond the critical angle when the pilot lowered the collective while attempting to recover the helicopter, preventing the successful execution of the recovery technique.

Factors affecting safety

Flight helmets

3.21. The pilot was not wearing a flight helmet. This was not unusual, as most private, and some commercial, helicopter pilots do not routinely wear flying helmets, especially when carrying passengers, and there is no requirement to do so.

3.22. The benefits of wearing an appropriate flight helmet are well documented, especially for pilots during accidents and incidents, when they need to maintain awareness and act quickly. Unlike the passengers, the pilot is unable to protect their head during an accident, as their hands are occupied on the flight controls trying to maintain, or regain, control of the helicopter. Flight crew head protection can increase safety for all occupants. A pilot's head injury can compromise their ability to control the aircraft, safely shut down the aircraft once on the ground and assist with evacuation.

3.23. In Commission report AO-2018-005 on the engine control malfunction and forced landing of MD Helicopters 600N, ZK-ILD, the Commission made a recommendation (005/21). to the Director of Civil Aviation to promote education awareness of the benefit of aircraft pilots and occupants wearing appropriate helmets when practicable and when operational conditions indicate a potential benefit (Transport Accident Investigation Commission, 2021). Ongoing education on the benefits of wearing helmets would continue to improve transport safety.

> Helmets provide protection to the head and assist in combatting two different types of emergency; protection from a penetrating bird strike and protection during a crash event (Flight Safety Foundation, 2024, p. 199).

Flight data and cockpit video recorders

3.24. The helicopter was not fitted with a flight data recorder or a cockpit voice recorder; nor was it required to be. Although voluntary in this type of aircraft, the use of cockpit video recorders can aid transport safety investigations in the event of an accident. They can also be useful tools for training and pilot feedback for normal operations.

4 Findings
Ngā kitenga

4.1. The pilot was appropriately qualified, trained and capable of performing the flight.

4.2. As part of its inquiry, the Commission determined that this accident was not the result of a mechanical failure, distraction, or medical condition or event.

4.3. The nose-high attitude was **very likely** the result of the pilot needing to counter the effect of the tailwind.

4.4. The nose attitude of the helicopter was slightly higher than the pilot normally experienced during takeoff, **very likely** giving the pilot the impression that the helicopter was higher off the ground than it was.

4.5. It is **virtually certain** that the rear of the left skid was still in contact with the ground as the helicopter started to move left, and there was sufficient friction between the rear of the left skid and the concrete to cause the helicopter to roll around the point of contact, in a condition known as dynamic rollover.

4.6. It is **virtually certain** that the helicopter was beyond the critical angle when the pilot lowered the collective while attempting to recover the helicopter, preventing the successful execution of the recovery technique.

4.7. External damage to the engine and engine mounts sustained during the accident was **virtually certain** to have caused the engine to shut down during the accident sequence.

5 Safety issues and remedial action
Ngā take haumaru me ngā mahi whakatika

General

5.1. Safety issues are an output from the Commission's analysis. They may not always relate to factors directly contributing to the accident or incident. They typically describe a system problem that has the potential to adversely affect future transport safety.

5.2. Safety issues may be addressed by safety actions taken by a participant; otherwise the Commission may issue a recommendation to address the issue.

5.3. No new safety issues were identified.

6 Recommendations
Ngā tūtohutanga

General

6.1. The Commission issues recommendations to address safety issues found in its investigations. Recommendations may be addressed to organisations or people, and can relate to safety issues found within an organisation or within the wider transport system that have the potential to contribute to future transport accidents and incidents.

6.2. In the interests of transport safety, it is important that recommendations are implemented without delay to help prevent similar accidents or incidents occurring in the future.

6.3. No new recommendations were issued.

7 Other safety lessons
Ngā akoranga matua

7.1. Pilots need to be aware of the wind conditions and how this will affect the performance of the helicopter, including in light and benign conditions when the performance of the helicopter can be affected in subtle but significant ways.

7.2. All pilots and private owners need to be vigilant with the maintenance requirements of their aircraft.

7.3. Flight helmets protect occupants' heads during accidents and reduce the likelihood and severity of head injuries that may prevent the pilot from taking action to reduce the severity of the accident. Flight crew head protection can increase safety for all occupants. A pilot's head injury can compromise their ability to control the aircraft or safely shut down the aircraft once on the ground and assist with evacuation.

7.4. Civil Aviation Rules define the minimum levels of safety required. Pilots must determine their own safety requirements relative to their operations and consider the use of appropriate helmets for themselves and occupants.

7.5. On 27 May 2021, the Commission recommended that the Director of Civil Aviation promote education awareness of the benefit of aircraft pilots and occupants wearing appropriate helmets when practicable and when operational conditions indicate a potential benefit.

7.6. Cockpit video recorders can be useful tools for training and pilot feedback during routine operations. They can also provide valuable information for transport safety investigations to assist with determining the circumstances and causes of accidents and incidents, to avoid similar occurrences in the future.

7.7. Aircraft operators are responsible for ensuring that their aircraft are maintained in an airworthy condition.

8 Data summary
Whakarāpopoto raraunga

Aircraft particulars

Aircraft registration:	ZK-IGD
Type and serial number:	Bell Textron Canada Limited 206L-3 Longranger, serial number 51221
Number and type of engines:	one; Rolls-Royce 250-C30P turboshaft engine
Year of manufacture:	1987
Operator:	private
Type of flight:	private
Persons on board:	three

Crew particulars

Pilot's licence:	Private Pilot Licence (Helicopter)
Pilot's age:	68
Pilot's total flying experience:	611 hours total, 556 on helicopters (including 99 on type) and 55 on fixed-wing aircraft

Date and time	27 July 2025, 1514
Location	4.5 NM west of Whakatāne latitude: 37° 53.8´ south longitude: 176° 49.4´ east
Injuries	three minor injuries (including one loss of consciousness)
Damage	Helicopter destroyed

9 Conduct of the inquiry
Te whakahaere i te pakirehua

9.1. At 1619 on 27 July 2025, the CAA notified the Commission of the occurrence. The Commission subsequently opened an inquiry under section 13(1) of the Transport Accident Investigation Commission Act 1990 and appointed an Investigator-in-Charge.

9.2. A protection order was issued covering the wreckage and surrounding areas. The property owner provided CCTV footage.

9.3. At 1210 on 28 July 2025, two Commission investigators arrived at the accident site 4.5 NM west of Whakatāne. Investigators conducted a site examination and recording on 28 and 29 July 2025.

9.4. On 29 July 2025, the helicopter wreckage was removed from the accident site and transported to the Commission's technical facility in Wellington for further detailed examination.

9.5. On 30 July 2025, Commission investigators interviewed the pilot and both passengers.

9.6. On 31 July 2025, Commission investigators visited the maintenance organisation that provided the maintenance of the helicopter and gathered the relevant maintenance records.

9.7. On 29 October 2025, the Commission approved a draft report for circulation to three interested parties for their comment.

9.8. One interested party provided a detailed submission and two interested parties replied that they had no comment. Any changes as a result of the submission have been included in the final report.

9.9. On 25 March 2026, the Commission approved the final report for publication.

Abbreviations
Whakapotonga

CAA	Civil Aviation Authority of New Zealand
CCTV	closed-circuit television
DL9	medical certificate for driver licence
ELT	emergency locator transmitter
FAA	United States Federal Aviation Administration
ft	foot
kg	kilogram
kt	knot
lb	pound
m	metre
NM	nautical mile
NZST	New Zealand Standard Time
PPL(H)	Private Pilot Licence (Helicopter)
RCCNZ	Rescue Coordination Centre New Zealand

Glossary
Kuputaka

collective	one of the flight controls used by a helicopter pilot to ‘collectively’ adjust the pitch angle of all main rotor blades at the same time to alter the amount of thrust/lift being produced
cyclic	one of the flight controls used by a helicopter pilot to control the main rotor in order to move the helicopter forward, backward and laterally
dynamic rollover	uncontrolled lateral rolling tendency when a helicopter is in contact with the ground with only one skid or wheel
knot	a measurement of speed, in nautical miles per hour, equivalent to 1.85 kilometres per hour
nose attitude	angle of the helicopter’s nose relative to the horizon, indicating whether the nose is pitched up, level, or down
pivot point	fixed point around which an object rotates or balances

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Ngā tohutoru

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Appendix 1 Excerpt from FAA Helicopter Flying Handbook – Dynamic Rollover

blade, which reduces lift, and increase on the retreating blade, which increases lift. At some point as the forward speed increases, the low blade speed on the retreating blade, and its high AOA cause a stall and loss of lift.

Retreating blade stall is a factor in limiting a helicopter's never-exceed speed (V_{NE}) and its development can be felt by a low frequency vibration, pitching up of the nose, and a roll in the direction of the retreating blade. High weight, low rotor rpm, high density altitude, turbulence and/or steep, abrupt turns are all conducive to retreating blade stall at high forward airspeeds. As altitude is increased, higher blade angles are required to maintain lift at a given airspeed. Thus, retreating blade stall is encountered at a lower forward airspeed at altitude. Most manufacturers publish charts and graphs showing a V_{NE} decrease with altitude.

When recovering from a retreating blade stall condition caused by high airspeed, moving the cyclic aft only worsens the stall as aft cyclic produces a flare effect, thus increasing the AOA. Pushing forward on the cyclic also deepens the stall as the AOA on the retreating blade is increased. While the first step in a proper recovery is usually to reduce collective, RBS should be evaluated in light of the relevant factors discussed in the previous paragraph and addressed accordingly. For example, if a pilot at high weight and high DA is about to conduct a high reconnaissance prior to a confined area operation where rolling into a steep turn causes onset of RBS, the recovery is to roll out of the turn. If the cause is low rotor rpm, then increase the rpm.

Common Errors

1. Failure to recognize the combination of contributing factors leading to retreating blade stall.
2. Failure to compute V_{NE} limits for altitudes to be flown.

Ground Resonance

Helicopters with articulating rotors (usually designs with three or more main rotor blades) are subject to ground resonance, a destructive vibration phenomenon that occurs at certain rotor speeds when the helicopter is on the ground. Ground resonance is a mechanical design issue that results from the helicopter's airframe having a natural frequency that can be intensified by an out-of-balance rotor. The unbalanced rotor disk vibrates at the same frequency (or multiple thereof) of the airframe's resonant frequency, and the harmonic oscillation increases because the engine is adding power to the system, increasing the magnitude (amplitude) of the vibrations until the structure or structures fail. This condition can cause a helicopter to self-destruct in a matter of seconds.

Hard contact with the ground on one corner (and usually with wheel-type landing gear) can send a shockwave to the main rotor head, resulting in the blades of a three-blade rotor disk moving from their normal 120° relationship to each other. This movement occurs along the drag hinge and could result in something like 122°, 122°, and 116° between blades. *[Figure 11-4]* When another part of the landing gear strikes the surface, the unbalanced condition could be further aggravated.

If the rpm is low, the only corrective action to stop ground resonance is to close the throttle immediately and fully lower the collective to place the blades in low pitch. If the rpm is in the normal operating range, fly the helicopter off the ground, and allow the blades to rephase themselves automatically. Then, make a normal touchdown. If a pilot lifts off and allows the helicopter to firmly re-contact the surface before the blades are realigned, a second shock could move the blades again and aggravate the already unbalanced condition. This could lead to a violent, uncontrollable oscillation.

This situation does not occur in rigid or semi-rigid rotor disks because there is no drag hinge. In addition, skid-type landing gear is not as prone to ground resonance as wheel-type landing gear, since the rubber tires' resonant frequency typically can match that of the spinning rotor, unlike the condition of a rigid landing gear.

Dynamic Rollover

A helicopter is susceptible to a lateral rolling tendency, called dynamic rollover, when it is in contact with the surface

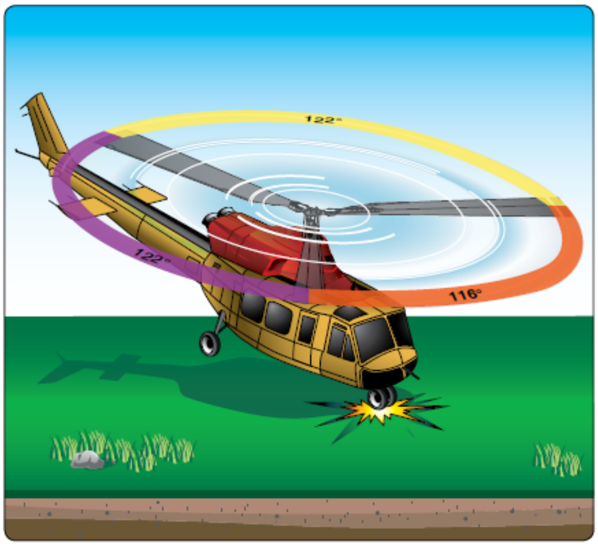

Figure 11-4. *Ground resonance.*

during takeoffs or landings. For dynamic rollover to occur, some factor must first cause the helicopter to roll or pivot around a skid or landing gear wheel, until its critical rollover angle is reached. The angle at which dynamic rollover occurs will vary based on helicopter type. Then, beyond this point, main rotor thrust continues the roll and recovery is impossible. After this angle is achieved, the cyclic does not have sufficient range of control to eliminate the thrust component and convert it to lift. If the critical rollover angle is exceeded, the helicopter rolls on its side regardless of the cyclic corrections made.

Dynamic rollover begins when the helicopter starts to pivot laterally around its skid or wheel. For dynamic rollover to occur the following three factors must be present:

1. A rolling moment
2. A pivot point other than the helicopter's normal CG
3. Thrust greater than weight

This can occur for a variety of reasons, including the failure to remove a tie down or skid-securing device, or if the skid or wheel contacts a fixed object while hovering sideward, or if the gear is stuck in ice, soft asphalt, or mud. Dynamic rollover may also occur if you use an improper landing or takeoff technique or while performing slope operations. Whatever the cause, dynamic rollover is possible if not using the proper corrective technique.

Once started, dynamic rollover cannot be stopped by application of opposite cyclic control alone. For example, the right skid contacts an object and becomes the pivot point while the helicopter starts rolling to the right. Even with full left cyclic applied, the main rotor thrust vector and its moment follows the aircraft as it continues rolling to the right. Quickly reducing collective pitch is the most effective way to stop dynamic rollover from developing. Dynamic rollover can occur with any type of landing gear and all types of rotor disks.

It is important to remember rotor blades have a limited range of movement. If the tilt or roll of the helicopter exceeds that range (5–8°), the controls (cyclic) can no longer command a vertical lift component and the thrust or lift becomes a lateral force that rolls the helicopter over. When limited rotor blade movement is coupled with the fact that most of a helicopter's weight is high in the airframe, another element of risk is added to an already slightly unstable center of gravity. Pilots must remember that in order to remove thrust, the collective must be lowered as this is the only recovery technique available.

Critical Conditions

Certain conditions reduce the critical rollover angle, thus increasing the possibility for dynamic rollover and reducing the chance for recovery. The rate of rolling motion is also a consideration because, as the roll rate increases, there is a reduction of the critical rollover angle at which recovery is still possible. Other critical conditions include operating at high gross weights with thrust (lift) approximately equal to the weight.

Refer to *Figure 11-5*. The following conditions are most critical for helicopters with counterclockwise rotor rotation:

1. Right side skid or landing wheel down, since translating tendency adds to the rollover force.
2. Right lateral center of gravity (CG).
3. Crosswinds from the left.
4. Left yaw inputs.

For helicopters with clockwise rotor rotation, the opposite conditions would be true.

Cyclic Trim

When maneuvering with one skid or wheel on the ground, care must be taken to keep the helicopter cyclic control carefully adjusted. For example, if a slow takeoff is attempted and the cyclic is not positioned and adjusted to account for translating tendency, the critical recovery angle may be exceeded in less than two seconds. Control can be maintained if the pilot maintains proper cyclic position and does not allow the helicopter's roll and pitch rates to become too great. Fly the helicopter into the air smoothly while keeping movements of pitch, roll, and yaw small; do not allow any abrupt cyclic pressures.

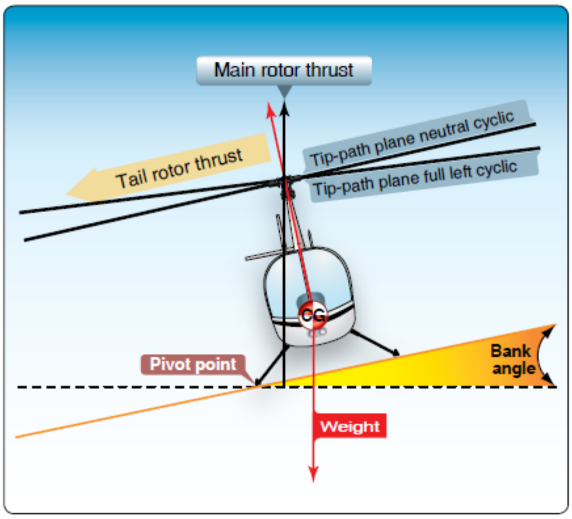

Figure 11-5. *Forces acting on a helicopter with right skid on the ground.*

Normal Takeoffs and Landings

Dynamic rollover is possible even during normal takeoffs and landings on relatively level ground, if one wheel or skid is on the ground and thrust (lift) is approximately equal to the weight of the helicopter. If the takeoff or landing is not performed properly, a roll rate could develop around the wheel or skid that is on the ground. When taking off or landing, perform the maneuver smoothly and carefully adjust the cyclic so that no pitch or roll movement rates build up, especially the roll rate. If the bank angle starts to increase to an angle of approximately 5–8°, and full corrective cyclic does not reduce the angle, the collective should be reduced to diminish the unstable rolling condition. Excessive bank angles can also be caused by landing gear caught in a tie down strap, or a tie down strap still attached to one side of the helicopter. Lateral loading imbalance (usually outside published limits) is another contributing factor.

Slope Takeoffs and Landings

During slope operations, excessive application of cyclic control into the slope, together with excessive collective pitch control, can result in the downslope skid or landing wheel rising sufficiently to exceed lateral cyclic control limits, and an upslope rolling motion can occur. *[Figure 11-6]*

When performing slope takeoff and landing maneuvers, follow the published procedures and keep the roll rates small. Slowly raise the downslope skid or wheel to bring the helicopter level, and then lift off. During landing, first touch down on the upslope skid or wheel, then slowly lower the downslope skid or wheel using combined movements of cyclic and collective. If the helicopter rolls approximately 5–8° to the upslope side, decrease collective to correct the bank angle and return to level attitude, then start the landing procedure again.

Use of Collective

The collective is more effective in controlling the rolling motion than lateral cyclic, because it reduces the main rotor thrust (lift). A smooth, moderate collective reduction, at a rate of less than approximately full up to full down in two seconds, may be adequate to stop the rolling motion. Take care, therefore, not to dump collective at an excessively high rate, as this may cause a main rotor blade to strike the fuselage. Additionally, if the helicopter is on a slope and the roll starts toward the upslope side, reducing collective too fast may create a high roll rate in the opposite direction. When the upslope skid or wheel hits the ground, the dynamics of the motion can cause the helicopter to bounce off the upslope skid or wheel, and the inertia can cause the helicopter to roll about the downslope ground contact point and over on its side. *[Figure 11-7]*

Under normal conditions on a slope, the collective should not be pulled suddenly to get airborne because a large and abrupt rolling moment in the opposite direction could occur. Excessive application of collective can result in the upslope skid or wheel rising sufficiently to exceed lateral cyclic control limits. This movement may be uncontrollable. If the helicopter develops a roll rate with one skid or wheel on the ground, the helicopter can roll over on its side.

Precautions

To help avoid dynamic rollover:

1. Always practice hovering autorotations into the wind, and be wary when the wind is gusty or greater than 10 knots.
2. Use extreme caution when hovering close to fences, sprinklers, bushes, runway/taxi lights, tiedown cables, deck nets, or other obstacles that could catch a skid or wheel. Aircraft parked on hot asphalt overnight might find the landing gear sunk in and stuck as the ramp cooled during the evening.

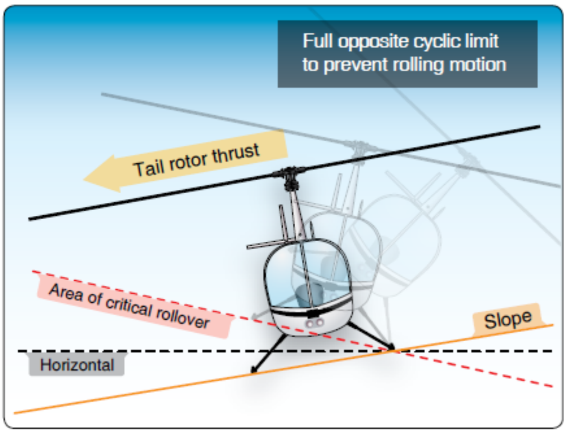

Figure 11-6. *Upslope rolling motion.*

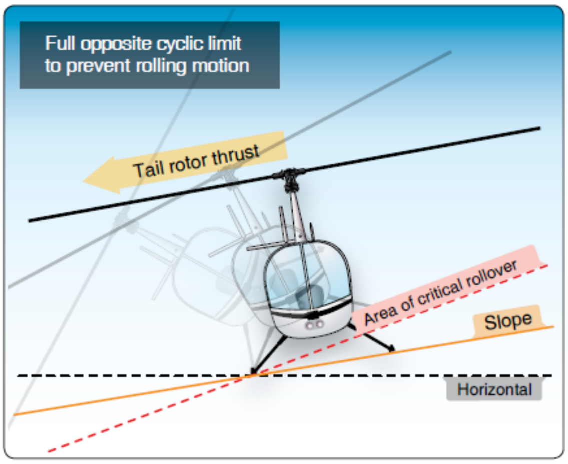

Figure 11-7. *Downslope rolling motion.*

3. Always use a two-step lift-off. Pull in just enough collective pitch control to be light on the skids or landing wheels and feel for equilibrium, then gently lift the helicopter into the air. 4. Hover high enough to have adequate skid or landing wheel clearance from any obstacles when practicing hovering maneuvers close to the ground, especially when practicing sideways or rearward flight.

5. Remember that when the wind is coming from the upslope direction, less lateral cyclic control is available.

6. Avoid tailwind conditions when conducting slope operations.

7. Remember that less lateral cyclic control is available due to the translating tendency of the tail rotor when the left skid or landing wheel is upslope. (This is true for counterclockwise rotor disks.)

8. Keep in mind that the lateral cyclic requirement changes when passengers or cargo are loaded or unloaded.

9. Be aware that if the helicopter utilizes interconnecting fuel lines that allow fuel to automatically transfer from one side of the helicopter to the other, the gravitational flow of fuel to the downslope tank could change the CG, resulting in a different amount of cyclic control application to obtain the same lateral result.

10. Do not allow the cyclic limits to be reached. If the cyclic control limit is reached, further lowering of the collective may cause mast bumping. If this occurs, return to a hover and select a landing point with a lesser degree of slope.

11. During a takeoff from a slope, begin by leveling the main rotor disk with the horizon or very slightly into the slope to ensure vertical lift and only enough lateral thrust to prevent sliding on the slope. If the upslope skid or wheel starts to leave the ground before the downslope skid or wheel, smoothly and gently lower the collective and check to see if the downslope skid or wheel is caught on something. Under these conditions, vertical ascent is the only acceptable method of lift-off.

12. Be aware that dynamic rollover can be experienced during flight operations on a floating platform if the platform is pitching/rolling while attempting to land or takeoff. Generally, the pilot operating on floating platforms (barges, ships, etc.) observes a cycle of seven during which the waves increase and then decrease to a minimum. It is that time of minimum wave motion that the pilot needs to use for the moment of landing or takeoff on floating platforms. Pilots operating from floating platforms should also exercise great caution concerning cranes, masts, nearby boats (tugs) and nets.

Low-G Conditions and Mast Bumping

"G" is an abbreviation for acceleration due to the earth's gravity. A person standing on the ground or sitting in an aircraft in level flight is experiencing one G. An aircraft in a tight, banked turn with the pilot being pressed into the seat is experiencing more than one G or high-G conditions. A person beginning a downward ride in an elevator or riding down a steep track on a roller coaster is experiencing less than one G or low-G conditions. The best way for a pilot to recognize low G is a weightless feeling similar to the start of a downward elevator ride.

Helicopters rely on positive G to provide much or all of their response to pilot control inputs. The pilot uses the cyclic to tilt the rotor disk, and, at one G, the rotor is producing thrust equal to aircraft weight. The tilting of the thrust vector provides a moment about the center of gravity to pitch or roll the fuselage. In a low-G condition, the thrust and consequently the control authority are greatly reduced.

Although their control ability is reduced, multi-bladed (three or more blades) helicopters can generate some moment about the fuselage independent of thrust due to the rotor hub design with the blade attachment offset from the center of rotation. However, helicopters with two-bladed teetering rotors rely entirely on the tilt of the thrust vector for control. Therefore, low-G conditions can be catastrophic for two-bladed helicopters.

At lower speeds, such as initiation of a takeoff from hover or the traditional recovery from vortex ring state, forward cyclic maneuvers do not cause low G and are safe to perform. However, an abrupt forward cyclic input or pushover in a two-bladed helicopter can be dangerous and must be avoided, particularly at higher speeds. During a pushover from moderate or high airspeed, as the helicopter noses over, it enters a low-G condition. Thrust is reduced, and the pilot has lost control of fuselage attitude but may not immediately realize it. Tail rotor thrust or other aerodynamic factors will often induce a roll. The pilot still has control of the rotor disk, and may instinctively try to correct the roll, but the fuselage does not respond due to the lack of thrust. If the fuselage is rolling right, and the pilot puts in left cyclic to correct, the combination of fuselage angle to the right and rotor disk angle to the left becomes quite large and may exceed the clearances built into the rotor hub. This results in the hub contacting the rotor mast, which is known as mast bumping. *[Figure 11-8]* Low-G mast bumping has been the cause of numerous military and civilian fatal accidents. It was initially encountered during nap-of-the-earth flying, a very low-altitude tactical flight technique used by the military where

Kōwhaiwhai - Māori scroll designs

TAIC commissioned its four kōwhaiwhai, Māori scroll designs, from artist Sandy Rodgers (Ngāti Raukawa, Tūwharetoa, MacDougal). Sandy began from thinking of the Commission as a vehicle or vessel for seeking knowledge to understand transport accident tragedies and how to avoid them. A 'waka whai mārama' (i te ara haumaru) is 'a vessel/vehicle in pursuit of understanding'. Waka is a metaphor for the Commission. Mārama (from 'te ao mārama' – the world of light) is for the separation of Rangitāne (Sky Father) and Papatūānuku (Earth Mother) by their son Tāne Māhuta (god of man, forests and everything dwelling within), which brought light and thus awareness to the world. 'Te ara' is 'the path' and 'haumaru' is 'safe' or 'risk free'.

Corporate: Te Ara Haumaru - the safe and risk free path

The eye motif looks to the future, watching the path for obstructions. The encased double koru is the mother and child, symbolising protection, safety and guidance. The triple koru represents the three kete of knowledge that Tāne Māhuta collected from the highest of the heavens to pass their wisdom to humanity. The continual wave is the perpetual line of influence. The succession of humps represents the individual inquiries.

Sandy acknowledges Tāne Māhuta in the creation of this Kōwhaiwhai.

Aviation: Ngā hau e whā - the four winds

To Sandy, 'Ngā hau e whā' (the four winds), commonly used in Te Reo Māori to refer to people coming together from across Aotearoa, was also redolent of the aviation environment. The design represents the sky, cloud, and wind. There is a manu (bird) form representing the aircraft that move through Aotearoa's 'long white cloud'. The letter 'A' is present, standing for a 'Aviation'.

Sandy acknowledges Ranginui (Sky father) and Tāwhirimātea (God of wind) in the creation of this Kōwhaiwhai.

Maritime: Ara wai - waterways

The sections of waves flowing across the design represent the many different 'ara wai' (waterways) that ships sail across. The 'V' shape is a ship's prow and its wake. The letter 'M' is present, standing for 'Maritime.

Sandy acknowledges Tangaroa (God of the sea) in the creation of this Kōwhaiwhai.

Rail: rerewhenua - flowing across the land

The design represents the fluid movement of trains across Aotearoa. 'Rere' is to flow or fly. 'Whenua' is the land. The koru forms represent the earth, land and flora that trains pass over and through. The letter 'R' is present, standing for 'Rail'.

Sandy acknowledges Papatūānuku (Earth Mother) and Tāne Mahuta (God of man and forests and everything that dwells within) in the creation of this Kōwhaiwhai.

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