TRANSPORT ACCIDENT INVESTIGATION COMMISSION
TE KOMIHANA TIROTIRO AITUA WAKA

No. 95-020

Robinson R22 Beta

ZK-HDD

18 km North of Karamea

4 December 1995

Abstract

On Monday 4 December 1995 at approximately 2010 hours a shooter fell from a Robinson R22 helicopter, ZK-HDD, during an airborne deer hunting operation 18 km north of Karamea, and sustained fatal injuries. The probable cause of the accident was the opening of the karabiner used on the shooter's harness arrangement, by equipment or clothing, thereby causing him to become unrestrained in the helicopter. The safety issue identified is the need to have a restraint system which incorporates safety features to guard against inadvertent release.

Transport Accident Investigation Commission

Aircraft Accident Report No. 95-020

Aircraft type, serial number and registration:	Robinson R22 Beta, 0855, ZK-HDD
Number and type of engines:	One Lycoming O-320-B2C
Year of manufacture:	1987
Date and time:	4 December 1995, 2010 hours*
Location:	18 km north of Karamea Latitude: 41° 04.5′ S Longitude: 172° 07′ E
Type of flight:	Aerial work, venison recovery
Persons on board:	Crew: 2 (Pilot and Shooter)
Injuries:	Crew: 1 Fatal (Shooter)
Nature of damage:	Nil
Pilot-in-Command's Licence:	Commercial Pilot Licence (Helicopter)
Pilot-in-Command's age:	40
Pilot-in-Command's total flying experience:	203 hours 196 hours on type
Information sources:	Transport Accident Investigation Commission field investigation
Investigator in Charge:	Mr K A Mathews

* All times in this report are in NZDT (UTC + 13 hours)

1. Factual Information

1.1 On Monday 4 December 1995 at 1955 hours ZK-HDD, a Robinson R22, departed from Karamea for an area some 18 km to the north, and four km north of the Kohaihai River mouth. The helicopter was being used for venison recovery work, and on board were the pilot and a shooter. Both cabin doors had been removed and were stored in the helicopter's hangar.

1.2 The pilot said that shortly after they reached the area a deer was spotted, and as they approached the deer it darted into some nearby bush. The pilot manoeuvred the helicopter into a position suitable for shooting, adjacent to the bush, and held the helicopter in a hover waiting for the deer to reappear. The helicopter was hovering above a slip and at a height estimated by the pilot to be "about 7 m".

1.3 During this time the shooter was in the normal shooting position, and seated on the forward edge of his seat. He was partially outside the cabin and was leaning toward the front of the helicopter. A safety harness was around his waist.

1.4 A short time later, at about 2010 hours, the deer bolted out of the bush and the shooter fired a shot at it. The pilot saw the shooter tumble out of the helicopter, in the process.

1.5 The pilot positioned his helicopter in order to locate the shooter, and observed him lying motionless on the slip. The pilot was not able to land and offer any assistance to the shooter, so he flew to a nearby beach where he landed and telephoned his wife, using a cellular telephone. The pilot's wife telephoned the Police and a local helicopter operator, giving them the details of what had happened, and asked for their assistance.

1.6 The pilot went around to the left side of the helicopter and found the left half of the shooter's waist harness hanging outside the helicopter's cabin. It was secured to its normal mount on the helicopter. The right half was also secured to its normal mount and was lying across the shooter's seat. A karabiner, which served as the joining link between the two portions of the harness, was still securely attached to the right half. The karabiner was in the "closed" position.

1.7 The pilot then flew his helicopter to the end of a road where he waited for another helicopter and Police to arrive. The shooter was located by the crew of the other helicopter, but when he was examined he was found to have died from multiple injuries sustained in the fall.

1.8 The weather conditions at the time of the accident were reported by the pilot to have been clear with a light northerly breeze.

1.9 Prior to departure from Karamea on the accident flight the pilot had completed his normal before take-off checks which included "harnesses and hatches". The approved seatbelt assembly was available to the shooter, but the shooter and the pilot had developed the shooter's safety harness (para. 1.13 & 1.14) which he was using at the time. When the pilot looked over at the harness to check it for security he saw that it was positioned around the shooter's waist in the usual way. He could not be certain the harness had been fastened correctly as he could not see the entire connecting assembly, due to equipment around the shooter's waist. However, the pilot said the shooter was very careful and had always fastened his harness properly in the past. The pilot therefore did not doubt the security of the harness around the shooter's waist. Had the left hand portion of the seat harness been left hanging outside the helicopter, or fallen out during flight, the pilot and shooter should have heard it banging on the fuselage. The pilot reported that he did not hear any banging, and the shooter did not indicate to him that he was having any problems with the harness.

1.10 The pilot and shooter had been working on venison recovery work in ZK-HDD for the past two months. The same harness arrangement had been used throughout this period, and the pilot said the shooter was familiar with the helicopter and had not experienced any problems with the harness previously. The pilot had worked with the shooter throughout the day prior to the accident. He said the shooter appeared to be his normal self and in good spirits.

1.11 The shooter's harness arrangement used in ZK-HDD was not the approved standard R22 seatbelt assembly with a metal "lifting flap" buckle and tongue arrangement, but a karabiner waist harness arrangement.

1.12 NZCAR C4, 3.1.1, required that "an approved safety belt or harness shall be installed for each seat of each aeroplane and rotorcraft".

1.13 The shooter's harness arrangement involved the use of a "bent-gate, snap-link" karabiner in place of the "lifting flap" buckle on the right portion of the seat's lap belt, and a metal "figure-of-eight" in place of the tongue on the left side of the seat's lap belt and diagonal harness. The length of the harness was fixed, such that it fitted loosely around the shooter's waist to allow him some freedom of movement. The "bent-gate" was spring loaded to the closed position but was not able to be locked in that position. (See figure 1)

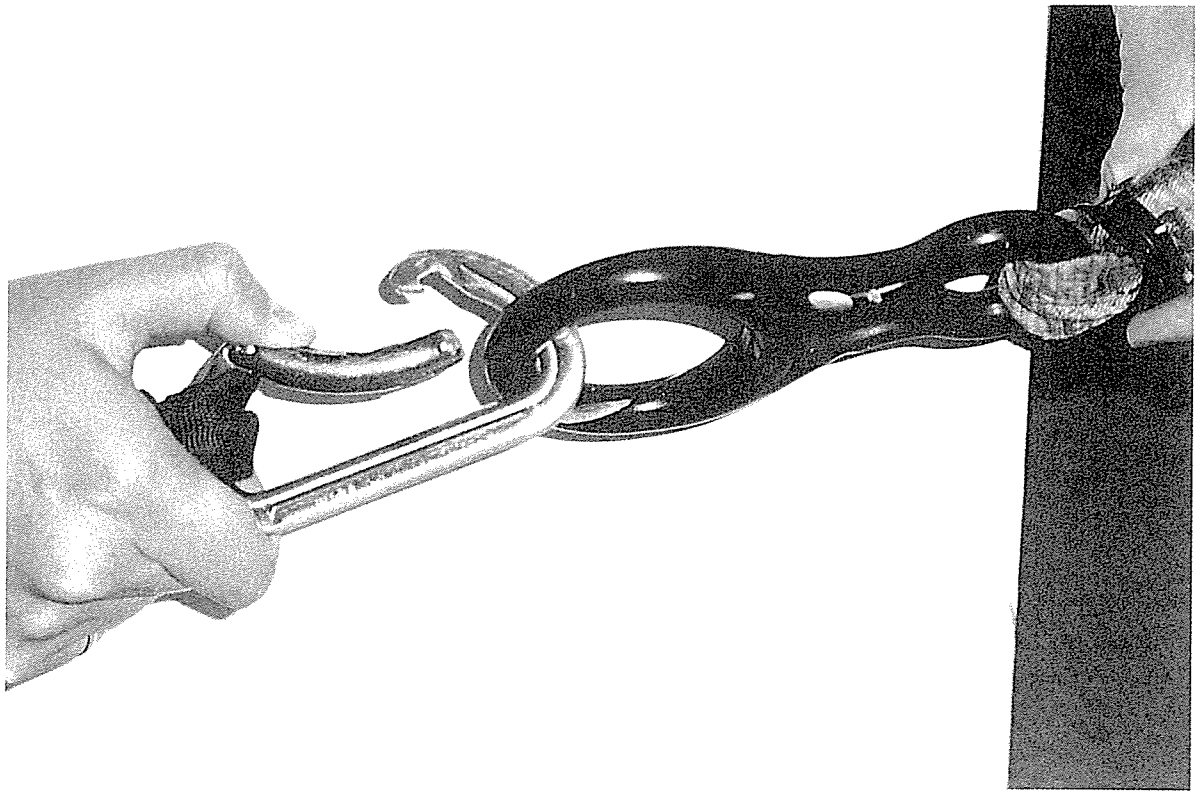

Figure 1
Karabiner and "figure-of-eight"

1.14 Although there were numerous karabiners available with various lockable "snap-links", the pilot said the non-lockable type was preferred, as at times shooters needed to be able to release their harnesses quickly, in order to exit a helicopter rapidly when recovering deer.

1.15 For helicopter venison recovery operations shooters preferred more freedom of body movement than that normally provided for with a standard seatbelt assembly, and a "lifting flap" buckle arrangement presented a potential for inadvertent release. During airborne deer shooting operations accidents had occurred on previous occasions as a result of some item of clothing or equipment "snagging" and lifting the flap on this type of seat belt assembly with serious consequences. (See Aircraft Accident Reports 80-049, 84-073 and 92-008)

1.16 Following the accident in 1984 (No. 84-073) it was recommended to the Civil Aviation Division of the Ministry of Transport that they:

> "Review the adequacy of the restraint systems installed in aerial work helicopters for use of shooters, firstly, to provide security for the individual when shooting and secondly, to enable a person to be restrained firmly when seated in the helicopter."

1.17 The Director of Civil Aviation responded as follows:

> *"Your recommendations have been carefully considered and amendment action to CASO 9, part 2 concerning safety belts and safety harnesses has been initiated. A temporary CAIC-Gen will be issued on 8 December 1986, effective 15 December 1986, advising of the proposed amendment and will seek comment from interested parties.*
>
> *The amendment will contain the following statement:*
>
> *Unless an approved General Purpose Safety Harness is worn in addition to the normal safety belt or harness, each safety belt or safety harness for each seat adjacent to an opened or removed door of a helicopter in flight shall be of a type which cannot be released except by the positive gripping and turning action of a hand. A release mechanism requiring a rotary action of at least 45 degrees for release, and with an unobtrusive control handle unlikely to be moved except by the deliberate action of the wearer would be suitable for the purpose.*
>
> *The standards for the general purpose harness will be prescribed in NZCAR C4. This is also mentioned in the CAIC."*

Nevertheless, at the time of the accident in March 1992 (No. 92-008) the above action had not been carried out.

1.18 Following the investigation of accident No. 92-008 it was recommended to the Director of Civil Aviation, in July 1992, that:

> "The adequacy of the existing restraint systems installed in aerial work helicopters for the use of shooters be considered as a matter of urgency and,
>
> In cooperation and consultation with the aviation industry, appropriate seatbelt modification or other restraint system to provide an appropriate degree of shooter safety during hunting operations be developed and authorised."

1.19 The Director of Civil Aviation responded as follows:

> *"The activity of deer recovery is currently classed as Aerial Work and does not involve the carriage of passengers or goods for hire or reward or any other activity defined under Regulation 131 as Air Transport. There is no requirement for the State to comply with any ICAO standards with respect to deer recovery as it does not involve any international air Navigation and therefore the State is free to set its own Regulations or Requirements.*
>
> *The standard seat restraint that is utilised in the majority of helicopters is designed and constructed to internationally acceptable standards and works extremely well for the purpose for which it was designed. It was however not designed to be used for the purpose of restraining deer shooters.*
>
> *The issue here, is to establish what role the State has to play in the setting and application of standards relating to personal restraint systems for helicopter borne deer shooters. The recommendations of the report indicate that the State should take an active in-depth role in establishing what should be an appropriate degree of shooter safety during hunting operations, although it does not go on to suggest what an appropriate degree of safety is. The previous role of the State regulatory agency was paternal in nature and tended to regulate civil aviation activity in a manner that has since been recognised as over regulatory. Swedavia stated "if individuals wish to fly and will not endanger the lives and property of others, they should be free to do so".*
>
> *We all accept that shooting deer from a helicopter is an activity that presents an extreme risk to both the shooter and the pilot of the helicopter. There have been a multitude of accidents and incidents as a direct result of the high risk involved in deer recovery since the start of this activity in the early seventies. It is probably correct to say that incidents relating to the inadvertent uncoupling of passenger restraints are amongst the minority of incidents that have taken place.*
>
> *Helicopter borne deer shooters are well aware of the risks that they undertake and are driven by the instinct of self preservation in terms of the way they approach their tasks and in what they choose to wear as protective clothing and airborne restraint system. They are also there out of individual choice and, by the very nature of the activity being conducted in remote locations, they do not endanger the lives and property of others.*
>
> *Regulating, through a consultative process, a standard for a deer shooter restraint system is typical of the paternal approach that was applied by the CAD prior to Swedavia. The CA Act 1990 clearly places the responsibility for safe operation upon any person undertaking aviation activities and there is sufficient equipment and information available today for deer shooters to establish appropriate safety restraint devices without requiring the State to undertake this research on their behalf."*

1.20 There was no approved alternative to the helicopter's standard seatbelt assembly, and the shooter's harness arrangement that was installed in the helicopter (albeit without authorisation) was one of a number of "field improvisations" that had been used by various venison recovery operators over the years, in an attempt to eliminate the hazard to shooters presented by the approved standard "lifting flap" seatbelt assembly.

1.21 With the karabiner type of harness arrangement utilised in ZK-HDD, potential exists for the "figure-of-eight" to twist back onto the "snap-link" and force it open, thereby allowing the "figure-of-eight" to slide out of the karabiner. ZK-HDD's harness however did not permit this unless the "snap-link" was bent out of alignment by the "figure-of-eight". The "snap-link"

functioned normally when it was tested and there was no evidence to indicate that it had been bent.

1.22 Further testing of the karabiner did however show it was possible for the "snap-link" to be held in an open position by clothing or equipment, thereby allowing the "figure-of-eight" to release from the karabiner.

1.23 ZK-HDD had a terminating Certificate of Airworthiness which expired on 5 December 1995.

1.24 When the helicopter was issued with a Maintenance Release in September 1995 (valid until September 1996) the approved seat belts were fitted.

1.25 The pilot had qualified for a Commercial Pilot Licence (Helicopter) on 28 September 1995. He had a valid Class 1 Medical Certificate and a Robinson R22 aircraft type rating. At the time of the accident he had flown 203 hours on helicopters and 196 hours on the R22 type.

2. Analysis

2.1 The Commission's most recent recommendation concerning the adequacy of restraint systems for shooters involved in venison recovery operations was made in July 1992. The then Director of Civil Aviation's response to that recommendation indicated that the CAA placed the responsibility for the establishment of appropriate safety restraint during such operations upon the individual shooter.

2.2 The shooter's karabiner type of harness arrangement installed in ZK-HDD was an attempt to overcome the inadequacies of the approved standard "lifting flap" harness, and its potential for inadvertent release with serious consequences.

2.3 The harness assembly installed in the helicopter was technically unapproved. However, as there was no approved alternative to the standard seatbelt arrangement, it was one of various "field improvisations" that had been devised and used during airborne deer hunting operations, in an attempt to eliminate the hazards associated with the approved harness.

2.4 The "snap-link" on the harness's karabiner was not able to be locked in the closed position, and potential therefore existed for it to be opened accidentally. It is probable that the "snap-link" was pushed open by the shooter's equipment or clothing at some point during the accident flight, thereby allowing the "figure-of-eight" to release from the karabiner unbeknown to the shooter. Alternatively, the shooter may not have fastened the karabiner to the "figure-of-eight" correctly prior to the accident flight.

2.5 It is probable that the shooter was not aware he was unrestrained, and as he leaned forward to shoot at the fleeing deer his forward movement was unchecked by the harness. As a result he tumbled out of the cabin door, and fell to his death.

2.6 There are numerous types of karabiner available for different purposes, and many have "snap-links" that lock automatically. Had the shooter used a lockable type, that required the positive gripping and turning action of a hand to unlock it, the potential for an accident of this nature would have been markedly reduced.

3. Findings

3.1 The pilot held a valid Commercial Pilot Licence (Helicopter), Class 1 Medical Certificate and Type Rating for the Robinson R22.

3.2 The shooter and pilot had operated successfully for some two months on airborne deer hunting operations.

3.3 The helicopter's doors had been removed from the helicopter, in accordance with normal practice for airborne deer hunting operations.

3.4 A karabiner type of harness arrangement had been installed in the helicopter as the system of restraint for the left seat occupant, in place of the approved "lifting flap" assembly.

3.5 The approved seat belt assembly was unsuitable for airborne deer hunting operations, as it held potential to be released inadvertently by equipment or clothing, with serious consequences.

3.6 The karabiner harness arrangement was not specifically approved by the Civil Aviation Authority.

3.7 In response to a TAIC Safety Recommendation (Report 92-008), the then Director of Civil Aviation implied that shooters engaged in venison recovery operations were entitled to design their own restraint system.

3.8 The karabiner type of harness arrangement used by the shooter was an attempt to eliminate the hazard provided by the approved "lifting flap" assembly.

3.9 The pilot believed the shooter had fastened the harness assembly before departure and was wearing it during the flight.

3.10 While attempting to shoot a deer, the shooter fell from the helicopter and sustained fatal injuries when he struck the ground.

3.11 The harness's karabiner did not have any form of positive locking for its "snap-link", and potential existed for it to be held open by the shooter's equipment or clothing.

3.12 It is probable that the "snap-link" was held open by the shooter's clothing or equipment, unbeknown to the shooter, thereby allowing the "figure-of-eight" to disconnect from the karabiner.

3.13 It is possible that the shooter did not connect his harness correctly prior to the accident flight.

4. Safety Recommendations

4.1 The Commission is concerned that accidents resulting in serious injury or fatality continue to occur to shooters during airborne deer hunting operations.

While the reluctance of the CAA to engage in research or consultation in terms of specific equipment for a deer shooter restraint system is acknowledged, the Commission nevertheless believes that the development and publication of a standard (e.g. to require the use of karabiners incorporating an automatic locking device, or some other suitable safety feature as already considered desirable from earlier research, see 1.17) would assist materially in the prevention of such accidents.

Accordingly it is recommended to the Director of Civil Aviation that he:

Reconsider the issues involved in regard to the appropriate restraint of airborne deer shooters, with a view to ensuring that the equipment used for their restraint incorporates safety features guarding against inadvertent release. (005/96)

17 April 1996

M F Dunphy
Chief Commissioner

Glossary of Aviation Abbreviations

AD	Airworthiness Directive
ADF	Automatic direction-finding equipment
agl	Above ground level
AI	Attitude indicator
AIC	Aeronautical Information Circular
AIP	Aeronautical Information Publication
amsl	Above mean sea level
AOD	Aft of datum
ASI	Airspeed indicator
ATA	Actual time of arrival
ATC	Air Traffic Control
ATD	Actual time of departure
ATPL (A *or* H)	Airline Transport Pilot Licence (Aeroplane *or* Helicopter)
AUW	All-up weight
°C	Degrees Celsius
CAA	Civil Aviation Authority
CASO	Civil Aviation Safety Order
CFI	Chief Flying Instructor
C of A	Certificate of Airworthiness
C of G (*or* CG)	Centre of gravity
CPL (A *or* H)	Commercial Pilot Licence (Aeroplane *or* Helicopter)
DME	Distance measuring equipment
E	East
ELT	Emergency location transmitter
ERC	Enroute chart
ETA	Estimated time of arrival
ETD	Estimated time of departure
°F	Degrees Fahrenheit
FAA	Federal Aviation Administration (United States)
FL	Flight level
ft	Foot/feet
g	Acceleration due to gravity
GPS	Global Positioning System
h	Hour
HF	High frequency
hPa	Hectopascals
hrs	Hours
IAS	Indicated airspeed
IFR	Instrument Flight Rules
IGE	In ground effect
ILS	Instrument landing system
IMC	Instrument meteorological conditions
in	Inch(es)
ins Hg	Inches of mercury

kg	Kilogram(s)
kHz	Kilohertz
KIAS	Knots indicated airspeed
km	Kilometre(s)
kt	Knot(s)
LAME	Licenced Aircraft Maintenance Engineer
lb	Pounds
LF	Low frequency
LLZ	Localiser
Ltd	Limited
m	Metre(s)
M	Mach number (e.g. M1.2)
°M	Degrees Magnetic
MAANZ	Microlight Aircraft Association of New Zealand
MAP	Manifold absolute pressure (measured in inches of mercury)
MAUW	Maximum all-up weight
METAR	Aviation routine weather report (in aeronautical meteorological code)
MF	Medium frequency
MHz	Megahertz
mm	Millimetre(s)
mph	Miles per hour
N	North
NDB	Non-directional radio beacon
nm	Nautical mile
NOTAM	Notice to Airmen
NTSB	National Transportation Safety Board (United States)
NZAACA	New Zealand Amateur Aircraft Constructors Association
NZDT	New Zealand daylight time (UTC + 13 hours)
NZGA	New Zealand Gliding Association
NZHGPA	New Zealand Hang Gliding and Paragliding Association
NZMS	New Zealand Mapping Service map series number
NZST	New Zealand Standard Time (UTC + 12 hours)
OGE	Out of ground effect
okta	Eighths of sky cloud cover (e.g. 4 oktas = 4/8 of cloud cover)
PAR	Precision approach radar
PIC	Pilot in command
PPL (A *or* H)	Private Pilot Licence (Aeroplane *or* Helicopter)
psi	Pounds per square inch
QFE	An altimeter subscale setting to obtain height above aerodrome
QNH	An altimeter subscale setting to obtain elevation above mean sea level
RNZAC	Royal New Zealand Aero Club
RNZAF	Royal New Zealand Air Force
rpm	revolutions per minute
RTF	Radio telephone or radio telephony

s	Second(s)
S	South
SAR	Search and Rescue
SSR	Secondary surveillance radar
°T	Degrees True
TACAN	Tactical Air Navigation aid
TAF	Aerodrome forecast
TAS	True airspeed
UHF	Ultra high frequency
UTC	Coordinated Universal Time
VASIS	Visual approach slope indicator system
VFG	Visual Flight Guide
VFR	Visual flight rules
VHF	Very high frequency
VMC	Visual meteorological conditions
VOR	VHF omnidirectional radio range
VORTAC	VOR and TACAN combined
VTC	Visual terminal chart
W	West