NO. 94-008

HUGHES 369D

ZK-HHG

MOHAKA

14 MARCH 1994

ABSTRACT

This report relates to the collision with two 11,000 volt electric power conductors by a Hughes 369 D helicopter on 14 March 1994 at Mohaka near Wairoa. The safety issues identified were the need for detailed preparation before engaging in low level air transport operations, the permissive operation of low level air transport operations and the marking of long spans of wires above wide valleys.

TRANSPORT ACCIDENT INVESTIGATION COMMISSION

AIRCRAFT ACCIDENT REPORT NO. 94-008

Aircraft Type, Serial Number and Registration:	Hughes 369D,1160030D, ZK-HHG
Year of Manufacture:	1977
Date and Time:	14 March 1994, 1000 hours*
Location:	Mohaka, near Wairoa Latitude: 39° 05.5'S Longitude: 177° 10.5'E
Type of Flight:	Air Transport
Persons on Board:	Crew: 1 Passengers: 2
Injuries:	Crew: Nil Passengers: Nil
Nature of Damage:	Substantial
Pilot in Command's Licence:	CPL (H)
Pilot in Command's Age:	38
Pilot in Command's Total Flying Experience:	11,000 hours approximately 3,400 hours on type.
Information Source:	Transport Accident Investigation Commission field investigation
Investigator in Charge:	R Chippindale

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

1. NARRATIVE

1.1 On 14 March 1994 The aircraft operator had been engaged to carry out an aerial filming task in the Mohaka River valley area. At 0945 hours the pilot arrived at Mohaka with one cameraman and one film director on board. The helicopter was landed, adjacent to the vineyard which was the subject to be filmed, and the left rear door was removed.

1.2 The cameraman was positioned in the back left seat and secured by a seat belt and an independent safety harness so that he could film looking out to the aircraft's left. The director was seated, near to the pilot, in the right front seat.

1.3 The helicopter took off at 0950 hours and flew a reconnaissance of the area for five minutes to ensure the area was clear of obstructions.

1.4 The task involved filming two blocks of grape vines at different levels in the valley. This was completed without incident.

1.5 The film director then requested the pilot to fly one additional run over the lower of the two blocks. As the aircraft was being positioned for this last run it collided with two power conductors of an 800 m span across the valley in which the blocks were situated.

1.6 At the time of the collision the pilot recalled the aircraft as being in a shallow climb at an estimated 35 KIAS.

1.7 Immediately following the impact the pilot decreased power and established that he could still control the helicopter. While establishing this he found the aircraft was attached to one conductor which itself was still attached to a pole. The pilot reduced the helicopter's speed and turned towards the left, the side on which the conductor was attached. The aircraft had developed a severe vibration and the engine was running hotter than normal.

1.8 The pilot descended the aircraft and progressively reduced the engine power so that for the last 30 feet of the descent the throttle was closed.

1.9 Just before touchdown the cameraman advised the pilot that the conductor was wrapped around his legs and he was trapped.

1.10 As soon as the aircraft touched down the pilot "switched everything off". He then told his passengers to wait until the rotors had stopped turning. When the rotors stopped the pilot helped to extricate the cameraman. Everyone was clear of the aircraft at 1015 hours and at that time the pilot advised a passing aircraft of the situation by an RTF "Pan" call.

1.11 There was no wire cutter fitted to the helicopter but the operator was negotiating the purchase of a suitable model of cutter at the time of the accident.

1.12 One of the aircraft's main rotor blades had sustained substantial damage during the collision, which involved the loss of a significant section aft of its main spar. The conductors also tore small areas of the aircraft's skin.

1.13 The power line with which the aircraft collided was marked on the map in the aircraft which the pilot studied during his preparation for the task. There were similar spans of power lines across the river nearby which were not marked on the maps normally used by aerial work operators and the pilot mistook one of these for the one which was marked on the map.

1.14 None of the spans of conductors which crossed the river was marked in any way to attract the attention of pilots. The manager of the property had not been contacted prior to the flight for a briefing on local wire hazards in the vicinity.

1.15 Each of the conductors was of three strands of 12 gauge galvanised steel wire with an overall outside diameter of 5 mm. The 800 m span involved was strung, between hardwood posts, some 85 m (280 feet) above the valley floor.

1.16 The span was at right angles to the power line's general direction along the river bank.

1.17 The collision occurred at approximately 1000 hours. Both conductors snapped as did the hardwood pole on the western river bank. The bank rose 260 feet vertically from the river valley floor.

1.18 None of the helicopter's occupants was injured in the accident.

1.19 The accident resulted in the interruption of the electric power supply to the surrounding district for nine hours.

1.20 Although the flight on which the accident took place was not considered by CAA to be aerial work, the operator's Air Service Certificate included air transport and aerial work.

1.21 CASO 20 Part 9 gave the Director of Civil Aviation's approval for helicopters to be used for low level operations providing the following conditions were met:

"The operations shall be conducted under visual meteorological conditions

The helicopter shall not remain below the prescribed minimum heights for any period longer than that necessary to complete the operation

No persons other than those essential to the operation, shall be carried in the helicopter and the pilot in command shall ensure that all persons carried are properly briefed

The operations shall be conducted in such a way that there is no unnecessary danger to persons or property."

1.22 In a response to a Safety Recommendation made as a result of a fatal accident involving an air transport operation in 1985 the Civil Aviation Division of the Ministry of Transport had stated that it did not consider the marking of such long spans of conductors to be necessary. The explanation at that time was that aircraft should not be operated at less than 500 feet above the highest ground or obstruction within a 2000 foot radius of the aircraft. If this restriction was observed then there were no power lines which would penetrate the airspace available to the aircraft.

1.23 This accident cast some doubt upon these views. As the aircraft was operating for hire and reward and the aerial photographs were not for sale by the operator the flight was not within the definition of aerial work and was thus an air transport operation.

1.24 As with the accident which prompted the earlier recommendation the conductors with which the aircraft collided were of a small overall diameter and in a long uninterrupted span. Due to their small diameter and colour they were difficult to see. In this case they did not run in same line as the poles carrying the conductors, on each side of the river.

1.25 While the span was marked on the aeronautical map carried by the pilot at least one other similar span in the vicinity was not.

1.26 ICAO Annex 14 Volume 1 paragraphs 6.1.10 and 6.1.11; and 6.2.7 to 2.2.10; and 6.3.1 to 6.3.4 define the following standards and recommended practices applicable to all ICAO Signatories:

"6.1.10 Recommendation.—Overhead wires, cables etc., crossing a river, valley or highway should be marked and their supporting towers marked and lighted if an aeronautical study indicates that the wires or cables would constitute a hazard to aircraft, except that the marking of the supporting towers may be omitted when they are lighted by high-intensity obstacle lights by day."

"6.1.11 Recommendation.—When it has been determined that an overhead wire, cable, etc., needs to be marked but it is not practicable to install markers on the wire, cable, etc., then high-intensity obstacle lights should be provided on their supporting towers."

"Use of Markers

6.2.7 Markers displayed on or adjacent to objects shall be located in conspicuous positions so as to retain the general definition of the object, and shall be recognisable in clear weather from a distance of at least 1000 m for an object to be viewed from the air and 300 m for an object to be viewed from the ground in all directions in which an aircraft is likely to approach the object. The shape of markers shall be distinctive to the extent necessary to ensure that they are not mistaken for markers employed to convey other information, and they shall be such that the hazard presented by the object they mark is not increased.

6.2.8 Recommendation.—A marker displayed on an overhead wire, cable, etc., should be spherical and have a diameter of not less than 60 cm.

6.2.9 Recommendation.—The spacing between two consecutive markers or between a marker and a supporting tower should be appropriate to the diameter of the marker, but in no case should the spacing exceed:

a) 30 m where the marker diameter is 60 cm progressively increasing with the diameter of the marker to

b) 35 m where the marker diameter is 80 cm and further progressively increasing to a maximum of

c) 40 m where the marker diameter is of at least 130 cm.

Where multiple wires, cables, etc., are involved, a marker should be located not lower than the level of the highest wire at the point marked.

6.2.10 Recommendation.—A marker should be of one colour. When installed, white and red, or white and orange markers should be displayed alternately. The colour selected should contrast with the background against which it will be seen."

6.3 Lighting of objects

Use of obstacle lights

6.3.1 The presence of objects which must be lighted shall be indicated by low-, medium-, or high intensity obstacle lights, or a combination of such lights.

Note.—High intensity obstacle lights are intended for day use as well as night use. Care is needed to ensure that these lights do not create disconcerting dazzle. ....

6.3.4 Recommendation.—High-intensity obstacle lights should be used to indicate the presence of:

a) an object if its height exceeds 150 m; or

b) a tower supporting overhead wires, cables, etc., where:

— an aeronautical study indicates such lights to be essential for recognition of the presence of wires, cables, etc., by day: or

— it has not been found practicable to install markers on the wires, cables, etc.

1.27 It is probable that no "aeronautical survey" had been conducted on the conductors in question. Nevertheless, as this accident demonstrated, such spans can cause a hazard to legitimate air transport operations and such spans are common throughout the country.

2. FINDINGS

2.1 The aircraft was airworthy and suitable for the planned task.

2.2 The pilot held the necessary qualifications for the task.

2.3 The pilot's preparation for the low level flight did not include a comprehensive study of the information available to him on known wire hazards.

2.4 The operator was authorised to fly below 500 feet agl for this air transport operation.

2.5 ICAO provided standards for the marking of long spans of conductors across river valleys should they be determined to require marking by an "aeronautical survey".

2.6 It was unlikely that an aeronautical survey of the conductors involved in this accident or others in the area had been conducted.

2.7 The electric power conductors were not marked to attract the pilot's attention nor were they required to be.

3. SAFETY RECOMMENDATIONS

3.1 As a result of this accident it was recommended to the Director of Civil Aviation that;

He review the present provision in CASO 20 Part 9 with a view to requiring operators to obtain specific permission for air transport operations at low level irrespective of whether or not they are planned over populous areas (053/94);

He consider assembling a team to conduct an aeronautical review such as that referred to in ICAO Annex 14 with each of the electric power distribution authorities, to ascertain which if any spans incorporated in their power distribution lines constitute sufficient hazard to aircraft to warrant the marking recommended by ICAO (054/94);

If any spans are identified as being of sufficient potential hazard to aviation to warrant marking them he require them to be so marked as soon as practicable (055/94).

The Director of Civil Aviation responded that:

"The first is not compatible with the CAA's "stand-back" approach to safety regulation, as advocated by Swedavia-Mcgregor and provided for in the 1990 Civil Aviation Act.

The resources involved for the second would, in our opinion, be beyond those available to the organisations likely to be required to participate.

We consider that it would be more appropriate to require pilots to conduct a survey of the area prior to operating at low levels in order to note the location of potential hazards."

4. OBSERVATION

4.1 The CAA have prepared comprehensive publicity material on the hazards of the various types of wires to low flying aircraft.

4.2 Aerial work operators consistently operate in the presence of such hazards but the number of accidents resulting from a collision with such hazards is still not acceptable.

4.3 That an experienced aerial work operator collided with electric power conductors on an air transport flight indicates there is still room for improvement in alerting pilots to the hazards of long spans of virtually invisible wires.

4.4 While pilots cannot and must not rely on wires to be physically marked or depicted on their maps, marking of the more hazardous wires has the potential to reduce the risk.

24 August 1994

M F Dunphy
Chief Commissioner

ABBREVIATIONS COMMONLY USED IN TAIC REPORTS

AD	Airworthiness Directive
ADF	Automatic direction-finding equipment
agl	Above ground level
AI	Attitude indicator
AIC	Aeronautical Information Circular
AIP	Aeronatical Information Publication
amsl	Above mean sea level
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	Celsius
CAA	Civil Aviation Authority
CASO	Civil Aviation Safety Order
CFI	Chief Flying Instructor
CPL (A or H)	Commercial Pilot Licence (Aeroplane or Helicopter)
DME	Distance measuring equipment
E	East
ELT	Emergency location transmitter
ERC	En route chart
ETA	Estimated time of arrival
ETD	Estimated time of departure
F	Fahrenheit
FAA	Federal Aviation Administration (United States)
FL	Flight level
g	Acceleration due to gravity
GPS	Global Positioning System
HF	High frequency
hPa	Hectopascals
IAS	Indicated airspeed
IGE	In ground effect
IFR	Instrument Flight Rules
ILS	Instrument landing system
IMC	Instrument meteorological conditions
ins Hg	Inches of mercury
kHz	Kilohertz
KIAS	Knots indicated airspeed
kt	Knot(s)
LF	Low frequency
LLZ	Localiser
M	Mach number (e.g. M1.2)
M	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
mph	Miles per hour
N	North
NDB	Non-directional radio beacon
NOTAM	Notice to Airmen
nm	Nautical mile
NZAACA	New Zealand Amateur Aircraft Constructors Association
NZGA	New Zealand Gliding Association
NZHGPA	New Zealand Hang Gliding and Paragliding Association
NZMS	New Zealand Mapping Service map series number
NZDT	New Zealand daylight time (UTC + 13 hours)
NZST	New Zealand standard time (UTC + 12 hours)
NTSB	National Transportation Safety Board (United States)
OGE	Out of ground effect
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	South
SAR	Search and Rescue
SSR	Secondary surveillance radar
T	True
TACAN	Tactical Air Navigation aid
TAF	Terminal 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