NO. 93-017

BELL 212

ZK-HNO

2NM WEST OF OAONUI

14 NOVEMBER 1993

ABSTRACT

This report relates to the death of two persons who fell while being winched in from the ship "Pacific Ariki", by a hoist installed in Bell 212 helicopter ZK-HNO on 14 November 1993. The ship was at sea 2nm west of Oaonui. The safety issues identified were the effectiveness of the CAA approval of operators and safety audits; the effectiveness of the operator's crew training and supervision; the crew's compliance with instructions; the adequacy of existing instructions on winch operation; the dependence of the hoist design on the integrity of the winch cable; the design of the hoist control circuitry, and the adequacy of inspection techniques to establish the serviceability of the cable.

TRANSPORT ACCIDENT INVESTIGATION COMMISSION

AIRCRAFT ACCIDENT REPORT NO. 93-017

Aircraft Type and Serial Number and Registration:	Bell 212, 31139 ZK-HNO
Number and Type of Engines:	Two Pratt and Whitney PT6T—3B
Year of Manufacture:	1980
Date and Time:	14 November 1993, at 1115 hours*
Location:	On the ship Pacific Ariki 2 nm west of Oaonui Latitude: 37°22'S Longitude: 173°43'E
Type of Flight:	Aerial Work
Persons on Board:	Crew: 2 Passengers: 3
Injuries:	Crew: Nil Passengers: 2 Fatal 1 Nil
Nature of Damage:	Nil
Pilot in Command's Licence:	Commercial Pilot Licence (Helicopter)
Pilot in Command's Age:	55
Pilot in Command's Total Flying Experience:	8948 hours 3432 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 Friday 12 November 1993, a winching exercise was held which involved five Shell Todd Oil Services' (the company) employees as winchmen. A winchman was the person suspended on the hook of the winch cable to recover or otherwise assist persons to be lifted from, or lowered to, the surface by the helicopter's winch.

1.2 This winching was conducted at Helicopters (New Zealand) Ltd's (the operator) Oaonui Base. The exercise entailed three hours flying in total which was completed uneventfully. As the winching was done over land it was referred to as "dry" winching.

1.3 Following the dry winching the rescue hoist (the winch) was removed from the aircraft. It was reinstalled at 1700 hours on Saturday 13 November by one of the operator's engineers who completed a post-installation check with the assistance of one of the operator's pilots. This check was not a required item but duplicated the pilot's standard pre-flight check of the winch. No irregularities were discovered by the check.

1.4 At 0800 hours on Sunday 14 November company participants assembled at the Oaonui Base for a briefing, in preparation for a period of deck winching to be conducted from the company's ship Pacific Ariki.

1.5 The briefing was conducted by the winch crew supervisor and included the viewing of a safety video, a tour of the helicopter and a discussion of winching. Neither of the two pilots involved attended this preliminary briefing. The Senior Pilot was aware of the intended programme and familiar with the topics discussed at the briefing. The pilots stated they attended while the participants were briefed on the detailed procedures for the winching operations but those involved could not recall their presence at the time. This briefing concluded at 0910 hours and the pilots prepared the helicopter for take-off.

1.6 While the pilots were preparing the helicopter, ZK-HNO, the other participants checked their equipment after which the winch crew supervisor briefed the pilots and participants on the proposed programme for the deck winching and the crew for the first sortie donned their equipment.

1.7 ZK-HNO departed from Oaonui at 0925 hours. The first three sorties of approximately 30 minutes each involved a total of 24 winch cycles and were completed without any difficulties.

1.8 The fourth sortie involved an experienced winchman and a substitute "survivor" as the designated person was not available. As ZK-HNO left Oaonui the pilot called the master of the Pacific Ariki by RTF advising him that the aircraft would arrive overhead the ship four minutes later.

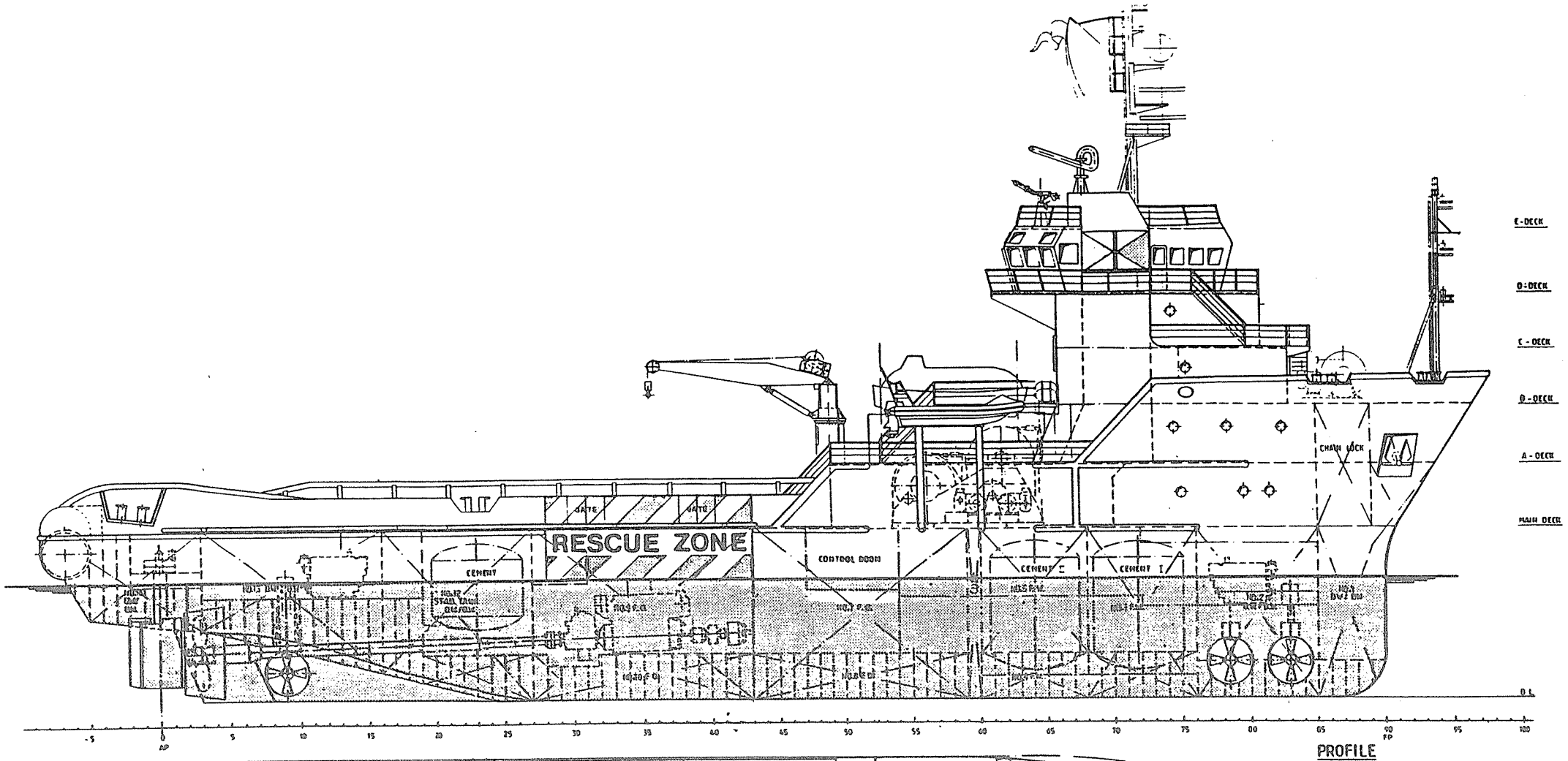
1.9 The Pacific Ariki was stationed some 2 nm off the Taranaki coast, near Oaonui, steaming at 2 knots with the wind 120°/30 knots on its port bow. The sea state was estimated by the first mate as a 1.5 to 2 m swell with a 1.5 m sea. The helicopter pilots estimated the swell as 4 to 5 m.

1.10 On board the helicopter for this fourth sortie were the pilot flying the aircraft, the winch operator (who was also a Bell 212 pilot and the senior base pilot), the winchman, the "survivor" and an observer (who was trained as a winchman).

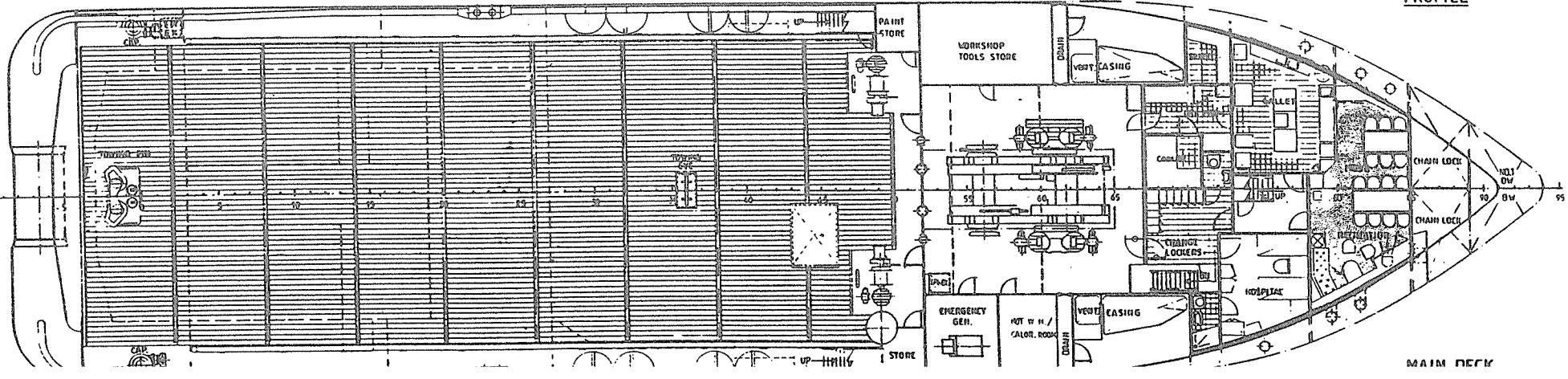
1.11 The first manoeuvre was to lower the winchman and "survivor" to the middle of the deck, some 10 m from the stern of the Pacific Ariki (see Figure 1). Here the "survivor" was unhooked and remained on the deck while the winchman was winched in and the helicopter pilot flew a circuit about the ship.

1.12 The next winch operation was to return the winchman to the ship's deck and to winch him in with a stretcher. The helicopter remained immediately above the ship during this winch cycle. The pilot in command declined to move clear of the ship when told he was clear to do so by the winch operator.

1.13 When the winchman arrived at the helicopter door with the stretcher he was seen to converse briefly with the winch operator. The winch operator stated that the winchman asked him to relay a request to the pilot that he remain "on station" while he went down to uplift the "survivor". The winch operator conveyed this exchange to the pilot as a request to remain over the ship and the pilot agreed.



PROFILE



MAIN DECK

1.14 The winchman was then lowered to the deck of the ship. After he landed on the deck a considerable amount of cable ran out after him. The ship's captain and another witness confirmed that at least 15 m of excess cable coiled on the deck. This amount of cable was in excess of the normal amount paid out on previous occasions to compensate for the rise and fall of the ship as it responded to the local swell. The winch operator stated he paid out some excess cable "to prevent the winchman and "survivor" being whipped off the deck" when he lost sight of the winchman briefly. He believed less cable run out was involved but sufficient for him to advise the pilot, "I may have a runaway" or words to that effect.

1.15 The operator's Offshore Operations Manual specified that if the winch operator was unable to control the cable he was to call "Runaway cable in/out". The aircraft's intercom was live throughout the winching operations. The winch operator was overheard advising the pilot that a "runaway out" had occurred. In response the pilot switched off the "Hoist Pwr" switch (the master switch for the winch). This was in accordance with the operator's instructions. The Offshore Operations Manual was however silent about the next step to be taken. Subsequently the operator's General Manager and the winch manufacturer were both adamant that no further winching should have been attempted. In the event the pilot, who recalled the winch operator's statement as "I may have a runaway", restored power to the winch after obtaining agreement from the winch operator. The winch operator stated that as soon as the power was restored he checked that his pendant was controlling the winch correctly.

1.16 As the winch operator winched in the excess cable the winchman flicked the cable in what seamen on the ship believed was an endeavour to uncoil some half loops which had formed as a result of the random coiling of the excess cable on the deck. During this interlude the "survivor" had hooked on to the winch cable and the winchman had signalled to the winch operator with a "thumbs up" that they were ready to be winched in. The pair were lifted clear of the deck and the winching in commenced. The winch operator did not include the "clearance to move left" in his patter to the pilot during the winching in on which the accident occurred as the pilot had agreed to his request to remain over the ship. The normal procedure was for the pilot to climb the helicopter vertically, until the load was just clear of the deck, before he cleared the winch operator to start "winching in". The observer in the aircraft overheard the normal "patter" for this sequence of events.

1.17 The helicopter pilot maintained the aircraft's station some 50 feet above the ship's deck during the winching in. As the men on the hook neared the helicopter's skids a pause, normally made to ensure the personnel on the hook were clear of the skids and facing the door, did not occur. The winch operator said this was because he could see they were lined up satisfactorily. He continued winching in waiting for a "closed fist" signal from the winchman to indicate the winching in should be stopped. He could not recall receiving such a signal and said that the cable ran to the end of its travel when he endeavoured to stop winching in on his own initiative. The closed fist hand signal was not recognised in the operator's winching procedure and it was incumbent on the winch operator in any event to stop winching in before the hook buffer hit the up limit switch. An open palm hand signal was in the company's manual for "stop" as was a closed fist signal to indicate "steady".

1.18 As the hook reached the end of its travel it hit the up limit switch. This was followed by a "mechanical screech" and some one or two seconds later by a cable break which resulted in the two personnel falling clear of the aircraft.

1.19 The "survivor" and the winchman fell onto the deck brushing the safety rail near the capstan on the ship's starboard quarter and sustained fatal injuries.

1.20 The helicopter pilot advised the Maui A Platform of the accident at 1115 hours with a request for the "rescue helicopter", and both he and the captain of the Pacific Ariki advised Oaonui Base of the event. First aid administered by the ship's crew failed to resuscitate the victims.

1.21 The winch cable was built up by twisting seven stainless steel wires into strands and then twisting 19 of these strands in such a way that the seven central core strands lay twisted in the opposite direction to the exterior 12. This construction ensured that the wires lay flat and each took an approximately uniform load without any tendency to twist.

1.22 The operator's Operation's Manual at page 5/10 paragraph 8 cautioned:

> "Slack in the cable might allow it to become kinked and so dangerously weakened"

1.23 Kinking of this cable could result from it taking a spiral shape as the result of an unnatural twist in the cable (pigtailing). As the half loops which formed in the excess cable from the deck were thrown out before they tightened it is unlikely that any harm would have been done on this occasion.

1.24 There was no evidence of corrosion in any part of the cable. The cable did however show evidence of sacrificial wear in the outer wires of strands in the core and the inner wires of the twelve strands wound around the core throughout its length. This wear (referred to as nicking) obviously reduced the potential strength of the cable. There were some 30 kinks in the cable distributed throughout its length. Five of the most obvious were cut out and subjected to a tensile test. The test established that the degradation in strength due to wear between the wires of adjacent strands in the five samples had in no case reduced the ultimate tensile strength of these samples below the minimum specified in the military specification for such cable (3,330 pounds). However at the site of the failure the abrasion and nicking were much more pronounced.

1.25 The manufacturer had no recorded cases of cable failure, other than from obvious external damage, during the 20 year history of this model of winch and cable combination.

1.26 The winch manufacturer's Operators Manual at page 5-5 issued 15 July 1991 stated:

> "Hoist Cable Assembly.
>
> 3. Monthly, check cable diameter. New cable specification .188 to .194 inch. Wear not to exceed .185 inch. Measurement taken 25, 50, 75 100 feet from Hook Assembly."

1.27 The samples of the failed cable and the other cable in the operator's flight store measured .191 inches as a minimum. The prefailure diameter of the localised section could not be measured but as it was 12 inches from the hook end any out of tolerance reduction in diameter would not have been detected by the routine check.

1.28 There were two pilots involved in the exercise and they had "turn and turn about" flying the aircraft as pilot in command or acting as winch operator.

1.29 Neither of the pilots had received a check by the Civil Aviation Authority, the operator or the contracting company, of their ability to conduct winching operations following their initial training even though this skill was necessary for the aerial work task required by the company.

1.30 The company to which the operator was contracted at the time of this exercise conducted independent audits of the winch operators' and winchmen's performance on a regular basis but their checks did not incorporate an audit of the pilots' compliance with the operator's standard operating procedures (nor were they required to do so). These checks were however taken by the operator as a check of pilot competency on the basis that if the pilot did not respond properly to the winch operator's instructions this would have been noted.

1.31 The pilot flying at the time was experienced in winching operations in which he had been trained by the operator in 1981, but was not aware of the detail of the operator's Offshore Operations Manual on the procedures to be observed during winching. He had not signed or otherwise signified that he had read and understood these instructions neither was he required to do so.

1.32 The pilot acting as winch operator had been specifically instructed in his duties by a pilot instructor experienced in these duties in 1988 but had not been checked as a winch operator since that time. No checks of winch operators were required by CAA or the operator.

1.33 Both pilots were experienced in helicopter operations and on the Bell 212 aircraft type.

1.34 The Lucas Western Gear rescue hoist was designed for tasks such as the deck winching involved on the day of the accident.

1.35 The winch was designed to reduce the speed of winding in, automatically, at two stages; first, at 20 feet from fully in, the winching speed was reduced to 50 per cent of the maximum cable travel speed of 150 feet per minute and again at 2 feet from fully in it was intended to reduce its speed of winding in to 10 per cent of the maximum. When the hook met the up limit bar it triggered two microswitches in sequence each of which was designed to stop the winch winding in by interrupting the power to the winch drum motor. If the winch continued to wind in, at maximum speed, in spite of these features, a clutch system, called an inertia dump, restricted the tension on the cable to less than a third of its ultimate strength and if the current drawn by the motor at any stage exceeded 160 amps a cut out protection was provided. Finally, if these additional features failed the motor of the winch was not

capable of exerting sufficient torque to jeopardise the integrity of a cable which met the required specifications.

1.36 The pendant control was a hand held control box provided for the winch operator which enabled him to control the direction and speed of winching, and to move the winch boom in azimuth. The pilot had independent controls which, if used, overrode those of the winch operator. The effectiveness of this override function was checked before take-off.

1.37 Examination of the winch at the manufacturer's premises established that the winch's circuitry had a short circuit which rendered the winch operator's pendant control and the pilot's independent control ineffective. The circuit fault also deactivated the two speed reductions and the two microswitches intended to stop the motor winching in the cable at the end of its travel. In this situation the only way to stop the winch was for the pilot to switch off the power supply to the winch at the hoist power switch.

1.38 The winch's circuit fault was caused by the failure of two transistors in the control box circuit's power switch/heat sink. The cause of these failures was unknown but an over voltage spike through the circuit at some time when the winch was in operation was one probable cause.

1.39 The winch did have a "down all stop" feature, which was independent of the control box power switch, to stop the last three turns of cable winding off the drum when winching out but no similar independent feature was designed into the "all in" situation.

1.40 Bell Service Instruction No 214.20 in Section III, Maintenance Instructions, Page 3-6, Paragraph 3 stated:

"Inspection Procedures

Periodic Inspection. This inspection shall be performed after each 100 hours airframe time that (the) hoist has been installed, or each 90 days, whichever occurs first.

(1) Run out full length of cable and inspect for broken strands, kinks or interferences."

1.41 The Periodic Inspection was last completed on 16 August 1993 since which time the aircraft had flown 7.8 hours with the winch installed. On that inspection the cable was replaced.

1.42 The operator's Offshore Operations Manual, issued in June 1986, in common with other similar references required on pages 5/11 and 5/17:

"WINCHING IN

b. With the aircraft accurately positioned, the winch operator calls "Up gently". The pilot will climb the aircraft vertically until the load is just clear of the surface. The winch operator must warn the pilot when the cable is about take the weight, and will call "Steady" when the load is clear of the ground.

c. At this point, the operator can start winching in. As he does so, he calls "Clear forward and down", whereupon the pilot will, provided the area is clear, ease the aircraft into a gentle forward descent. The object of this is to avoid having the survivor suspended so far above the surface that damage or injury would be sustained if:-

(1) the cable broke;

(2) the winch ran away out;

(3) the survivor slipped from the strop;

(4) the cable was cut due to aircraft malfunction

The pilot will continue the descent until he receives the call "Go no lower" from the operator. The "survivor" is then winched to the boom."

"DECK WINCHING

PROCEDURE—GENERAL

16.....The winching procedure from the establishment of the hover is standard, except that once the crewman/survivor is lifted clear of the deck and obstructions, the winch operator should direct the aircraft to move left, clear of the vessel. Once clear, a normal lift is completed, with the aircraft moving forward and down over the water while winching in."

1.43 The operator's Offshore Operations Manual on pages 5/18 to 5/20 specified:

"WINCHING : SPECIAL INSTRUCTIONS AND EMERGENCIES

SPECIAL INSTRUCTIONS

3. Up Limit Switch.

If the cable is run up to the stop at speed, it is possible to overstress it. Winch operators are to ensure that they do not permit the cable to run up against the limit stop at full speed.

6. Limitations on Winch Use.

b. Where personnel are to be winched for training purposes they are not normally to be lifted higher than

15 feet above the surface and the aircraft is always to be positioned so that they will fall clear of obstruction in the event of cable failure.

e. All winching is to be carried out without reliance on the up limit switch.

9. Runaway Cable

If the winch runs away in either direction, the operator is immediately to inform the captain using the standard phraseology. The captain will turn off the power."

Note: Unless there was a failure in the winch control circuits, the winch operator could not "permit the cable to run up against the limit stop at full speed". As the automatic speed reduction could not be bypassed the cable's normal speed at that stage was 10% of the full speed.

1.44 Civil Aviation Regulation 76 stipulated, "No operator shall carry out an ..... aerial work operation unless all members of the flight crew have undergone a check at which they have demonstrated their technical knowledge, piloting competence, and ability to execute normal and emergency manoeuvres appropriate to the operation of the aircraft concerned .... (5) In the case of .... an aerial work operation, the check shall be carried out during the period of 12 months prior to the flight". There was no record of either of the pilots involved having demonstrated their ability to conduct winching operations since 1988.

1.45 Civil Aviation Regulation 70 stated:

"70. Persons not to be carried on or in certain parts of aircraft- No person, other than a person required to be carried by these regulations, shall be carried on or in any part of an aircraft where that part is not designed for the accommodation of the crew members or passengers:

Provided that a person may be carried on or in any such part of an aircraft if the Director considers that such carriage is not unsafe and all conditions imposed by the Director in respect of that carriage are complied with."

1.46 The conditions imposed by the Director pursuant to Regulation 70 were detailed in Civil Aviation Safety Order 20 Part 10 : WINCHING, RAPPELLING, AND HUMAN SLING LOADS and included:

"10.2 General conditions

(a) No such operations shall take place except in accordance with the provisions of an approved operations manual.

10.3 Winching

(b) The person to be carried beneath the helicopter shall have been thoroughly briefed by a helicopter crew member."

1.47 The operator was last Approved by the CAA to conduct air transport services carrying passengers and goods for hire or reward and separately to conduct aerial work operations, on 9 July 1993. The aerial work operations in support of offshore oil and mineral exploration, development and recovery, of which the flight involved in this accident was one, were subject to compliance with the operator's Operations Specifications of which the operator's Offshore Operations Manual formed a part. As a CAA Approved operator, Helicopters New Zealand was subject to audit and inspection, both scheduled and unscheduled, by the CAA to ensure that it was complying with the undertakings which entitled it to Approved status.

1.48 The pilots involved in the accident were unaware of the detail of the contents of the operator's Offshore Operations Manual in relation to deck winching. Hence they were relying on their unmonitored experience with winching operations to complete the task rather than complying with the doctrine adopted by the operator, promulgated in its instructions to its pilots and approved by the CAA.

1.49 Had the requirements of the operator's Offshore Operations Manual been observed risk of serious injury or death to personnel being supported by the winch cable would have been minimised. The pilot flying the helicopter at the time of the accident claimed there was no "requirement" or "instruction" for him to move clear of the ship when personnel were being winched in during deck winching. He based this view on the use of the word "should" in the Operations Manual in the context "the winch operator should direct the aircraft to move left, clear of the vessel." He claimed this reduced the status of the sentence from an "instruction" to "guidance".

1.50 While the CAA did not check every aspect of the operator's compliance with approved instructions, the operator had in place a supervisory structure and the status of a Check and Training Organisation which should have ensured that its pilots were complying with standard operating procedures when flying tasks fundamental to the

aerial work for which they were approved and contracted.

1.51 The pilots themselves were experienced in flying generally and in helicopter operations in particular. As professional pilots they knew that the operator had Operating Specifications of which an Offshore Operations Manual formed an essential part with which they must comply. In these circumstances the onus was on the pilots to ensure they were familiar with the operator's standard operating procedure for winching, particularly where the safety of passengers was dependent upon compliance with the approved procedures.

1.52 The design of the winch circuitry was not ideal in that the control circuits did not contain an internal redundant circuit to prevent the cable hook being wound in until the mechanical clutch limited further travel. However the hoist cable was designed to be almost three times stronger than the maximum motor load capacity. The pilot's master electrical switch provided a reliable back up "kill switch" for the hoist. The "inertia dump" provided an additional, mechanical, redundant safeguard to protect the cable and winch motor from overload.

1.53 Difficulty was encountered in establishing the history of the cable in use on the winch as it was not marked other than by the manufacturer's batch number (C60-2). A check of the length of the only other cable, held in store by the operator at Oaonui, indicated that it was the one thought to be in use on the aircraft at the time of the accident. The cable in use at the time was only seven inches short of full length and hence likely to have been one which had been repaired after it was cut accidentally by the cable cutter. It failed at the end opposite to that which had been repaired.

1.54 Prior to this accident:

the CAA had not detected that the operator was not complying with its undertaking to ensure its pilots operated in accord with instructions;

the operator did not conduct effective checks on the capability of its pilots in the winching task basic to the operator's operations;

the pilots did not comply with the operator's standard operating procedures;

the operating procedures did not specifically ban the further use of the winch if a runaway occurred;

the winch circuitry was not designed to bypass a failure in the control circuit when operating in the "winch in" mode, and

the winch cable maintenance procedure did not recognise the potential for localised internal wear of the cable to reduce its strength.

2. FINDINGS

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

2.2 The winch was approved for the assigned task and certified as serviceable.

2.3 The winch cable strength had been degraded by internal abrasion and was not of the required strength, in the locality of the failure, at the time of the accident.

2.4 The operator's Offshore Operation Manual specifically drew attention to the effects of kinking on the strength of the cable.

2.5 The cable had many kinks in its length some of which were in the length, closest to the winch drum, which would not have been used during the exercise on the day of the accident.

2.6 The kinking evident in the cable did not appear to have reduced the tensile strength below the minimum required to meet the military specification for such cable.

2.7 The military specifications tensile strength required for the cable was three times that established as the maximum load which the winch could apply.

2.8 The winch developed a fault in its control circuitry during the exercise which prevented the winch operator's control pendant inputs from producing any

response.

2.9 A "runaway out" may have occurred during the winch out immediately preceding the winch "in" on which the accident occurred.

2.10 The aircraft's crew responded to the runaway in accordance with the operator's instructions.

2.11 The operator's Offshore Operations Manual did not give a clear instruction that the winch should not be used after a runaway.

2.12 The safety of the winch could be improved by a redesign of the circuit to incorporate a feature which interrupted the power supply to the winch drum drive motor when the hook reached the up limit irrespective of the serviceability of the control box.

2.13 The operator had the appropriate approval from CAA to conduct the exercise on which the accident occurred.

2.14 The operator's Offshore Operations Manual included appropriate instructions for avoiding the serious consequences of a cable failure during deck winching.

2.15 The operator did not have in place a reliable system for ensuring that its pilots were aware of the contents of its Offshore Operations Manual.

2.16 The operator was Approved as a Check and Training organisation.

2.17 The operator did not comply with CAA Regulation 76 in so far as an annual check of its pilots' ability to conduct winching operations was concerned.

2.18 The operator did not have a reliable system for tracking the history of the winch cables.

2.19 The pilot in command could be expected to ensure that he was familiar with the contents of CASO 20 part 10 and the operator's Offshore Operations Manual.

2.20 The pilot in command was not familiar with and failed to comply with the instructions promulgated in the operator's Offshore Operations Manual.

2.21 The CAA could be expected during their approval of the operator and subsequent audits to confirm that a reliable system was in place to ensure personnel read and understood the Offshore Operations Manual.

2.22 The CAA failed to confirm that a reliable system was in place to ensure personnel read and understood the Offshore Operations Manual.

2.23 Had the operator's instructions been complied with the consequences of the failure of the winch cable would have been limited to the personnel on the hook falling into the sea from a height of some 15 feet.

2.24 Internal abrasion of the wires in adjacent strands of the cable which caused "nicking" was a normal feature of the cable in the winch used to hoist the participants from the ship's deck.

2.25 The winch manufacturer's inspection procedure specified to detect internal wear of individual wires in the strands comprising the winch cable based on a monthly measurement of the cable diameter at arbitrary distances from the hook end requires to be reviewed.

3. SAFETY RECOMMENDATIONS

3.1 It was recommended to the Director of Civil Aviation that he:

3.1.1 When approving an aircraft operating company, encourage that company to have in place a system to ensure that its employees confirm they have read and understood the operator's Operations Manual. (015/94), and

3.1.2 Require companies engaged in aerial work activities to demonstrate their capability in a different sample of their specialist tasks during consecutive audit inspections (016/94).

3.1.3 Investigate the need for and the feasibility of, introducing a suitable maintenance procedure to detect internal wear of winch cables before the cable's strength was reduced to an unacceptable stage (064/94).

The Director of Civil Aviation responded:

3.1.1 "The Civil Aviation Act 1990, Part II Section 12

subsection (4) states:

'Every participant who holds an aviation document that authorises the provision of a service within the civil aviation system:

(a) Shall, if so required by the rules made under this Act establish and follow a management system that will ensure compliance with the relevant safety standards and the conditions attached to the document; and

(b) Shall provide training and supervision of all employees of the participant who are engaged in doing anything to which the document relates, so as to maintain compliance with the relevant prescribed safety standards and the conditions attached to the document and to promote safety; and

(c) Shall provide sufficient resources to ensure compliance with the relevant prescribed safety standards and the conditions attached to the document.'

With respect to paragraph (a) above, no rules have yet been made under the Act to cover the operation in question, so that reliance in the meantime has to be placed on Civil Aviation Regulation 136 under which the Air Service Certificate was issued. Neither this regulation nor the related Regulation 141 specifically require a system to be in place to ensure personnel read and understand the operations manual. Although it would of course be prudent for an operator to have such a system and the CAA could be expected to encourage the same, there is no regulatory backing for the CAA to insist on it." (015/94)

3.1.2 "The CAA safety audit programmes are designed to sample an operator's documented procedures and confirm conformance. It is not possible or necessary to audit every activity. Rather, areas of concern are routinely addressed, as evidenced by the record of safety occurrences and other audit results. If a particular problem area becomes apparent however, it may be made the objective of a "special purposes" audit and, if confirmed, appropriate measures put in place to resolve the problem". (016/94)

3.2 It was recommended to the Manager of the Lucas Western Gear Company that their:

3.2.1 Cargo winch and rescue hoists be modified so that the control circuitry incorporate a stop switch at the winding in limit which is independent of the control box circuitry (017/94), and

3.2.2 They review with the subcontracting cable suppliers whether there is a need to impose a life or additional inspections on their winch cables to ensure the sacrificial wear between strands does not jeopardise the safety of winch operations (018/94).

The Manager, Quality Assurance of Lucas Aerospace responded:

"3.2.1 Lucas Western has conducted an extensive review of the hoist's mechanical and electrical designs. Lucas Western concluded that a properly operated and maintained hoist provides the user with sufficient margins of safety. However, in light of this recommendation, Lucas Western engineering will consider this feature for future applications (017/94).

3.2.2 In the interest of continued hoist safety, Lucas Western has initiated an investigatory program in conjunction with the cable manufacturers to evaluate methods for inspecting small diameter cables for Internal wear or damage. Any positive conclusions developed will be added as appropriate to the operators manual. Please note the Lucas Western Operations Manual, date 7/15/91, currently calls for daily visual inspection of the cable and monthly measurement of the cable diameter.

3.3 It was recommended to the General Manager of Helicopters (New Zealand) that he:

3.3.1 Ensure each pilot in his company confirm in writing that he/she had read and understood the contents of the company's Operations Manual(s) (011/94), and

3.3.2 Amend the Offshore Operations Manual to detail the measures to be taken after a "runaway" situation occurred with a winch. In particular to stress that the winch not be used again until the fault has been rectified by an aircraft maintenance engineer (012/94), and

3.3.3 Ensure a reliable means is provided of tracking the history of each winch cable in stock (013/94), and

3.3.4 Ensure that helicopter pilots are included in any briefing held about winching exercises or other operations in which they will be involved (014/94).

The General Manager of Helicopters (New Zealand) responded:

3.3.1 "Helicopters (NZ) Ltd has introduced a certification record to be completed and signed by each Company pilot confirming that he/she has read the appropriate Operations Manual and any amendments made thereto (011/94).

3.3.2 Helicopters (NZ) Ltd has added a new para 10 to page 5/20 of the Offshore Operations Manual detailing the procedures to be followed in the event of a winch runaway (012/94).

3.3.3 The Senior Engineer responsible for maintenance of the hoist assembly has suggested the introduction of a component record card similar to that generated for "lifed" or finite items relating to the airframe and engine. In the absence of a serial number on the cable, on will be etched on the end fitting. We endorse this suggestion and it will be implemented (013/94).

3.3.4 This recommendation is difficult to accommodate. In regard to the events that occurred on 14 November 1993, it is a matter of record that both the Pilot and the Winch Operator were present during the practical briefing on winch operations involving Bell 212 ZK-HNO. In regard to all other operations the Pilot is normally the person giving the briefing (014/94).

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