Helicopter Frost Protection

The Hughes 300 lifted off at approximately 0615 local time, with the pilot and a passenger on board, for a photographic sortie to capture the sunrise over local vineyards. At 0630, witnesses saw the helicopter descend in the dark, and crash. The helicopter's engine had failed at around 500 feet agl. This left the pilot in the dangerous position of having to attempt an autorotation at night, onto undulating terrain. The pilot attempted to use whatever rotor rpm the engine would produce, hoping that the situation would improve. Inevitably, the rotor rpm could not be sustained, and the helicopter impacted the ground in an uncontrolled state. The pilot sustained severe spinal injuries, and the passenger was killed.

The fact that the pilot could not see the ground had a very profound influence on the outcome of the emergency. The pilot probably did the best he could in that situation, but one can only surmise how the same situation might have been handled if the flight had commenced just 10 minutes later, at dawn.

This accident illustrates that night flying operations can be dangerous. Helicopter frost protection work is no exception, but the risks can be reduced by careful consideration and planning.

The Rules

Last year, a letter regarding helicopter frost protection operations was posted to many New Zealand helicopter pilots. This letter outlined the regulatory requirements for pilot night proficiency, and the required aircraft equipment for night VFR (rule 91.511 *Night VFR instruments and equipment*). Excerpts from this letter are reprinted in this article for the benefit of pilots who did not receive the letter, and who intend to conduct frost protection operations this year.

This year, the CAA General Aviation Group's Rotary Unit will again be monitoring frost protection operations around the country.

The Pilot

If it is an operation for 'hire or reward', the pilot must hold a Helicopter Commercial Pilot Licence (CPL H). The pilot is required to have local night privileges (within 25 NM) certified in their logbook by an A- or B-category instructor. If passengers are to be carried, then night currency is also required – three takeoffs, translational circuits, and three landings in the previous three months.

If it is required to transit more than 5 NM from a lighted heliport or aerodrome (not recommended for frost work), one hour of instrument flight time is required in the previous three months.

Local night privileges training requirements include:

- 10 hours night flying in helicopters, including 5 hours dual.
- 10 takeoffs, translational circuits, and landings, solo.
- 2 hours of dual instrument flight time in helicopters.

See Civil Aviation Rule Part 61 *Pilot Licences and Ratings*.

Care must be taken to ensure that pilots do not exceed their Part 135 flight and duty times. It may be possible for pilots to be stood down from their normal duties, in preparation for frost protection work.

The operator is responsible for ensuring that pilots, flying frost protection operations within a control zone, are familiar with the required procedures. This includes having copies of *AIP New Zealand Vol 4*, (or the relevant plates), charts, NOTAMs and current meteorological information. A serviceable torch for each crew member is also required.

The Aircraft

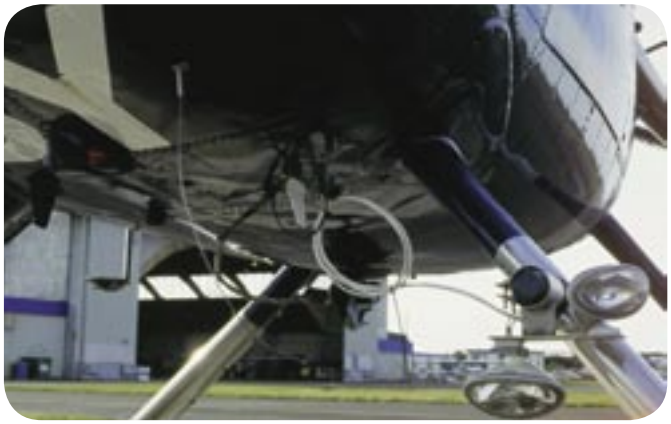
Additional night instruments and equipment are required. These include:

- a turn and slip indicator.
- position lights.
- an anti-collision light.

All of the required instruments are to be serviceable and illuminated.

When flying in controlled airspace, ensure the aircraft has a serviceable transponder, and ALT is selected.

It is advisable to remove the hook mirror to reduce the possibility of reflection from the landing light, as this will degrade night vision. Installation of additional lighting, as a back-up, must be



Additional lighting on a Hughes 369.

an approved modification in accordance with acceptable technical data (CAR Part 21 *Certification of Products and Parts*). For more information, contact the Aircraft Certification Unit at the CAA.

The Operation

If passengers, who are not crew members (refer to Civil Aviation Rules, Part 1 *Definitions*), are carried on the helicopter, the operation becomes an Air Operation, and this requires the operator to hold a Part 119/135 Air Operators Certificate.

Considerations

Before the Frost Season

Ideally, the grower and the helicopter operator should meet before the frost season starts. This assists the operator to identify potential hazards, and a hazard plan can be formulated.

The chosen landing site should be well lit and clear of obstacles. This includes the arrival and departure flight paths. Obtain a thorough briefing on the nature and location of all significant obstacles – it may be prudent to carry out a reconnaissance with the owner, in daylight, to achieve this.

Some obstacles to watch for include:

- television and radio aerials.
- power poles and lines.
- electric fence power supply wires.
- buildings and tall trees.

The landing and fuelling area should be on site, as this minimises ferry times and reduces noise pollution for the neighbours. The area should be secure from animals and from the general public. If intending to store fuel for the season, ensure it is kept safe from water contamination, and that it is in a suitable container. Fuel should be stored in a tanker, or a drum, and **not** in a plastic container. Care should be taken to correctly identify the type and quality of the fuel – fuel does go stale.

Portable fuel tanker.

One person, on site, should be appointed responsible for all activities around the helicopter and helipad. Also – ensure the vineyard owner is thoroughly briefed on safety around helicopters.

Discuss the callout procedure. It is useful for this to include the communications required on the night, including the method of notifying the pilot. The pilot and support crew should, preferably, be accommodated on site. This saves time in responding to the frost alarm. It also helps to ensure the pilot is well rested for the operation. The onsite accommodation should be comfortable, as there is nothing worse than being cold, hungry, and not being able to sleep, while waiting for the phone to ring!

Allow sufficient time to fly the helicopter to the site before ECT.

Emergency Callout

An operator may receive an emergency callout when frost conditions are forecast. The operator should have a written procedure for handling the situation, taking into account the daylight time remaining, pilot fatigue, and the following day's commitments. Sufficient time should be allowed for positioning the helicopter before Evening Civil Twilight (ECT), and to receive a briefing from the grower. Ideally, have the vineyard owner fax instructions, and a map of the area, before the operation begins. Avoid the temptation to travel at night, to assist in the 'emergency' situation. Do not be tempted to compromise your personal or company minimums, in the interest of what someone else considers to be an 'emergency'.

On the Night

After arriving on site, review the hazard plan and operational requirements with the grower. This review should be undertaken with other helicopter pilots involved in the operation, so that radio frequencies can be coordinated.

When the frost alarm has been raised, avoid being rushed by a stressed grower. It is important to allow 15 minutes for dark adaptation. This time can be

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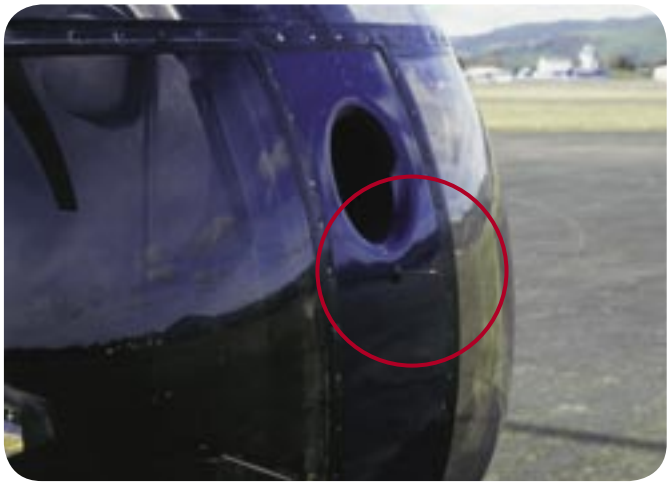
used efficiently to establish the maximum flight time available for the fuel that is carried (including the reserve), undertaking a final fuel drain, and checking the helicopter for clear ice. It may be handy to have a ground power pack nearby, to assist in starting the helicopter.

After startup, check that the outside air temperature gauge is operational. Ensure that all condensation on the outside and the inside of the bubble has dried off. Some helicopter types require a considerable period of time before the heater becomes effective, and this needs to be factored into the time before lift-off, otherwise visibility will be impaired.

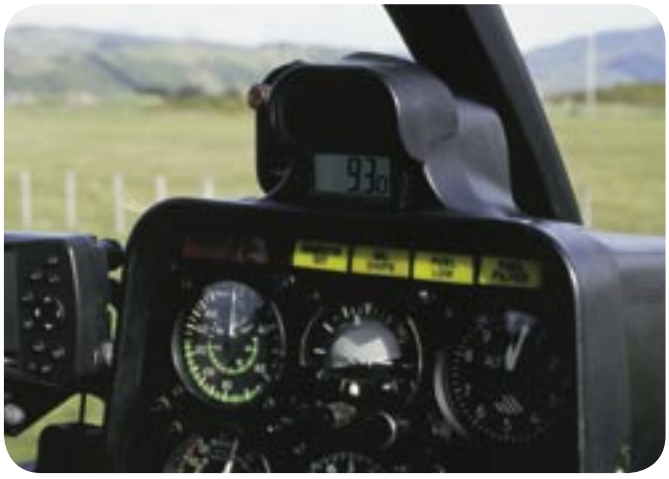
Each flight at night is different. Be aware of the visual illusions that can occur. In particular, judgement of distance is more difficult at night than by day. During daylight, the pilot estimates distance by comparing the sizes of nearby and distant objects. At night, this is rarely possible, with the only visible objects being 'points' of light. Only the brightness of these points of light can be used as a cue for judging distance. This is why, on very clear nights, lights will often seem closer than they really are, and on nights when the atmospheric visibility is low they will seem further away.

Flying at night is easier if there is a full moon; visibility is better, making observation of other helicopters, and hazards easier. If there is no moon, or the moon becomes briefly obscured by cloud, then awareness of your surroundings is more difficult.

Make sure you are able to communicate with other helicopters operating in the vicinity, and with the grower, throughout the operation. This will ensure safety and efficiency. If sharing the same block with other helicopters, a good lookout is important.



A temperature probe (circled), linked to a digital temperature display inside the cockpit.



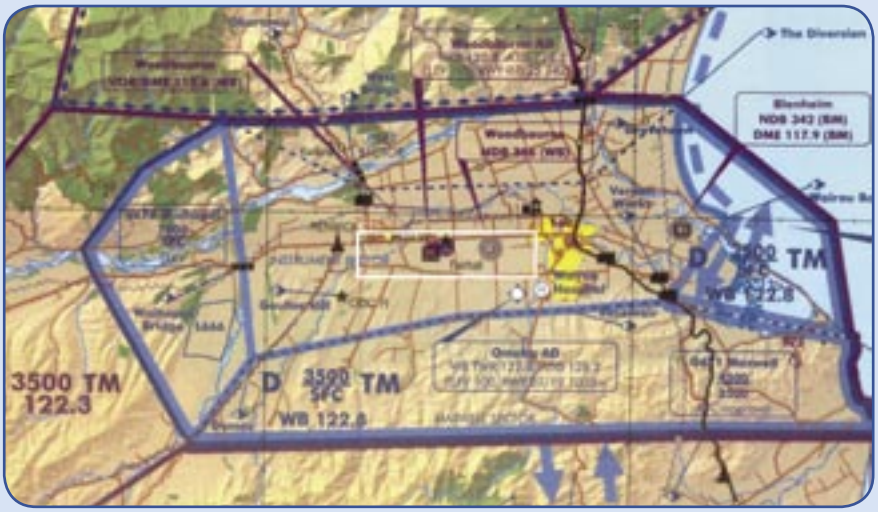
Frost Protection Operations at Blenheim

The Blenheim area has a large number of vineyards, and during the frost season it can be extremely busy, with over 30 helicopters operating at night. Last year, Woodbourne Tower reported problems with the seasonal influx of helicopters entering controlled airspace at ECT without prior warning. This presented difficulties for the duty controllers, and a number of airspace occurrences were filed.

This year, in order to facilitate smooth coordination of helicopter traffic, give Woodbourne Tower as much notice of your expected arrival as possible. Telephone and enter a flight detail, with the expected arrival time, and destination. Ensure you have the appropriate aerodrome charts, a current VNC, and that you are familiar with the procedures for operating inside the control zone (including the reporting points). Remember, the aircraft must have a serviceable transponder, with ALT selected.

When the frost operation starts, Woodbourne Tower will usually be off watch (check the latest AIP supplement for hours of service), and the airspace is uncontrolled. Caution is required, if operating near Woodbourne aerodrome, as at various times during the night, aircraft may be arriving via the instrument approach. If possible, maintain a listening watch on 122.8 MHz, and avoid operating near the final approach path.

For noise abatement, avoid overflying the built-up areas. This is particularly important if flying to Omaka to refuel. Good airmanship is required around the Omaka fuel facility, as it can be extremely busy.



When flying in the white boxed area, when the Tower is off watch, be aware of arriving or departing aircraft at Woodbourne. ***Monitor 122.8 MHz.***

Use the radio to assist with separation – this will also help your concentration.

The nature of the frost protection operation will depend on the height of the inversion layer. The inversion layer is distinguished by a 'warmer layer of air' above which the temperature increases with height. Typically it is between 50 and 150 feet agl. Flying below the inversion layer is not efficient, because the helicopter will not be down-washing the warmer air onto the crop. To identify the height of the inversion layer, the helicopter needs to be fitted with an outside air temperature probe, linked to a digital back-lit display. The pilot can then vary the altitude of the helicopter accordingly.

The efficiency of down-washing the warmer air onto the crop depends on many factors – such as the height, speed, and weight of the helicopter. These factors need to be considered along with the safety of the operation. Consequently, in the event of an engine failure, it may be impossible to make a safe landing. It is important to have the ground, and any obstacles, in sight at all times.

The pilot should have a planned procedure, in the event of inadvertently entering IMC, or of suddenly losing visual contact with the ground. Such a procedure needs to be planned in advance.

Fatigue is an important consideration. The pilot needs to have adequate rest, in suitable on site accommodation, before flying in the early hours of the morning.

Noise Abatement Procedures

The CAA does receive complaints from the public regarding night helicopter frost protection operations carried out around the country's vineyards and orchards. The number of complaints can be reduced by having the helicopter in position before nightfall. This minimises over-flight of built-up areas at unsociable hours. The landing site, and refuelling point, should be on or near the property of the owner, to eliminate ferry flights over built-up areas.

Conclusion

Night flying needs to be treated with the utmost care and respect. The risk involved in frost protection operations can be reduced by positioning the helicopter during the daylight hours, receiving a thorough briefing from the grower, and ensuring that the pilot and the helicopter are suitably qualified and equipped for night flying. ■

Safety Videos

Here is a list of safety videos made available by CAA. See our web site (www.caa.govt.nz) for a synopsis of each title by clicking on "Safety Information – Videos". Note the instructions on how to borrow or purchase.

Civil Aviation Authority of New Zealand

Safety Video Series

Title	*Length*	*Year released*
Airframe Icing	26 min	2003
Airspace and the VFR Pilot	45 min	1992
Apron Safety	19 min	2003
Collision Avoidance	21 min	1993
Decisions, Decisions	30 min	1996
Drugs and Flying	14 min	1995
ELTs and SAR	17 min	2004
Fatal Impressions	5 min	1995
Fit to Fly?	23 min	1995
Fuel Management	38 min	2002
It's Alright if You Know What You Are Doing – Mountain Flying	32 min	1997
Light Twins	23 min	2001
Marine Survival	42 min	2003
Mark 1 Eyeball	24 min	1993
Mind that Prop/Rotor!	11 min	1994
Momentum and Drag	21 min	1998
Mountain Survival	24 min	2000
On the Ground	21 min	1994
Passenger Briefing	20 min	1992
Radar and the Pilot	20 min	1990
Rotary Tales	10 min	1999
Situational Awareness	15 min	2002
Survival	19 min	2000
Survival – First Aid	26 min	2001
The Final Filter	16 min	1998
To the Rescue	24 min	1996
We're Only Human	21 min	1998
Weight and Balance – Getting it Right	28 min	2000
Wirestrike	15 min	1987
You're On Your Own	15 min	1999

Other titles

All of Us (security awareness)	22 min	2003
Working With Helicopters	8 min	1996★

★re-release date

Civil Aviation Safety Authority, Australia

The Gentle Touch (Making a safe approach and landing)	27 min
Keep it Going (Airworthiness and maintenance)	24 min
Going Too Far (VFR weather decisions)	26 min
Going Ag – Grow (Agricultural operations)	19 min
Going Down (Handling emergencies)	30 min

Outside Productions

These may be borrowed, but not purchased, from CAA.

Mountain Flying (produced by High Country Productions, R D 2, Darfield)	66 min	2000

The CAANZ programmes have been produced over a period of years using three formats, Low-band, SVHS and Betacam. Programmes are being progressively replaced, and it is the intention to eventually offer all programmes in Betacam. While the technical quality of some of the earlier videos may not be up to the standard of commercial programmes, the value lies in the safety messages.

To Borrow: The tapes may be borrowed, free of charge. Contact CAA Librarian by fax (0–4–569 2024), phone (0–4–560 9400) or letter (Civil Aviation Authority, PO Box 31–441, Lower Hutt, Attention Librarian). **There is a high demand for the videos, so please return a borrowed video no later than one week after receiving it.**

To Purchase (except Outside Productions): Obtain direct from Dove Video, PO Box 7413, Sydenham, Christchurch. Email dovevideo@yahoo.com. Enclose: **$10 for each title** ordered; plus **$10 for each tape** and box (maximum of 4 hours per tape); plus a **$5 handling fee** for each order. All prices include GST, packaging and domestic postage. Make cheques payable to "Dove Video".