



**Issue No: 02/23**

**The aim of this Safety Matters is to highlight the potential dangers in flight crew using night vision goggles**

**The Isle of Man has issued a Safety Directive that legally prohibits flight crew of aircraft registered in the Isle of Man from utilising night vision goggles during flight, except with the approval of the Isle of Man Aircraft Registry**

For the purposes of the Safety Directive:

- 'flight' means the moment when an aircraft, after the embarkation of its crew for the purpose of taking off, first moves under its own power, until the moment when it next comes to rest after landing;
- 'night vision goggles' (NVG) means a head-mounted, binocular, light intensification appliance that enhances the ability to maintain visual references at night.

Visual reference to the aviator's outside world is essential for safe and effective flight. During night flying, the pilot can improve the out-of-the-windshield view with the use of NVG. However, there are potentially significant safety risks associated with the use of NVG by flight crew, including but not limited to:

- ~ *equipment failure*
- ~ *insufficient flight crew training, skill, experience and currency*
- ~ *flight deck incompatibility*
- ~ *inadequate procedures*

Global aviation accident data has identified fatal accidents of civil aircraft as a result of the risks highlighted above not being appropriately mitigated. Two examples of these are set out overleaf.

# Night Vision Goggles

# BK117-C1, ZK-IMX Controlled Flight into Terrain, Auckland Islands, 22 April 2019

## What happened

The operator was pre-positioning under VFR for a medical evacuation flight that would take place the next day to evacuate a sick crew member from a fishing boat.

The flight was intended to arrive during daylight, but unexpected delays to the departure time resulted in them arriving after dark. The crew donned NVG during the positioning flight to continue under VFR.

The hills and coastline were visible through NVGs, but the pilot believed that the landing area was covered in cloud. The pilot planned an alternative approach to descend in the clear area to below the cloud and then follow the coastline back to the landing area.

The pilot descended and was turning back towards the landing area when the paramedic in the front left-hand seat alerted them to cliffs rising immediately ahead. The pilot reacted, but the helicopter impacted the sea.

The crew were able to escape the helicopter whilst it was partly submerged, suffering only minor injuries.



Wreckage



Looking northwest towards Port Ross

## Why it happened

The pilot misinterpreted the image seen through the NVGs as being cloud covering the landing area when it was very likely to have been fog near the sea surface and downwind of the shore.

The planned descent and approach in the clear area was made using visual reference outside and to the GPS map display. However, the helicopter's descent rate became high as the pilot, relying primarily on visual depth perception, believed the helicopter was further from the surface of the sea than it was.

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When the crew did see an image through the NVGs it was the 20-metre high cliffs several hundred metres ahead and above them. During the manoeuvre to avoid the cliffs, the helicopter impacted the sea.

The operator's exposition for single pilot VFR operations into the Southern Ocean was inadequate at the time to manage the risks associated with such operations.

There were regulatory gaps in the New Zealand Civil Aviation Rules regarding minimum safety requirements for helicopters operating under Part 119 and Part 135 air operator certificates.

**The complete report can be accessed from:** <https://www.taic.org.nz/inquiry/ao-2019-005>

## EC135P3, LN-00Z Controlled Flight into Terrain, Ringsted Denmark, 6 November 2020

### What happened

The aircraft was damaged when it briefly contacted the ground after inadvertent entry into IMC while on approach to a helipad. The helicopter initiated a successful go-around and diverted to a hospital landing site.



Picture no. 1 – Damaged tail bumper



Picture no. 2 – Damaged tail bumper



Picture no. 3 – Removed damaged aft crossbeam compared to new installed.  
The square black rubber plates mounted on the lower aft part of each skid are known as bearpaws.

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En-route to the helipad, the crew (a Technical Crew Member (TCM) and the aircraft commander) observed sporadic fog and fog patches close to the ground towards the south, while weather conditions were clear towards the north.

The TCM went "NVG On" approximately 10 nm from the helipad. When the helicopter passed south of the adjacent city, halos and glare started developing around lights from cars and buildings. The crew noticed increasing ground fog but were fully capable of seeing through the fog and clearly identifying cars, lights, roads and buildings. They felt by no means uncomfortable with the weather conditions. Flight visibility was good and all runway lights, runway surroundings and the main road crossing the final approach track were visible through the ground fog.

On final approach the TCM called out 500, 400 and 300 (ft radio height (RH)) with corresponding airspeeds, while the helicopter crossed the road, and turned onto a left hand base with a GS of 45 kt. During this period, the commander went "NVG On" and everything was perfectly clear in the NVG.

The crew could see the runway lights, the helipad and lights from passing cars unaided. The visibility started decreasing, but compared to previous experiences, it was not unusual, and the crew still felt comfortable with the situation. In their field of view below the NVG, both crew members saw a small group of trees, contours on the ground, and on-ground fog patches below the helicopter.

The commander continued forward, while slowly reducing forward airspeed by lifting the nose of the helicopter. In succession, starting shortly before or about this time, the callouts 200 (RH by the TCM), decision height (auto-generated) and 100 (auto-generated) likely occurred.

Suddenly and without warning, the commander saw only bright light within his NVG. The commander was startled, but noticed a RH indication of 50 ft on his Primary Flight Display and tried to obtain outside visual references by looking below the NVG, but saw only darkness. As the commander initiated a go-around the helicopter contacted the ground in a field 210 m short of the helipad.

### **Why it happened**

Investigation findings related to NVG included:

- The flight crew did not properly identify a threat of low visibility due to fog.
- A decision to perform a shallow approach lowered the vertical distance to any ground fog present below the approach flight path.
- The use of NVG most likely masked decreasing visibility during the final approach.
- Visual illusions likely contributed to a loss of flight crew situational awareness on and an early descent into unseen fog or fog patches on short final.
- Fog or fog patches most likely caused a NVG whiteout below an estimated height of approximately 100 ft and the commander was unable to obtain outside visual reference at 50 ft RH.

The investigation determined that the following causal factors led to this serious incident:

- A less than optimum pre-flight weather briefing.
- An action plan on flying a shallow approach under VFR conditions with low fog and fog patches.
- Difficulties in assessing height and depth while using NVG.
- Loss of situational awareness due to visual illusions.
- NVG whiteout at low altitude.

**The complete report can be accessed from:** <https://en.havarikommissionen.dk/>