



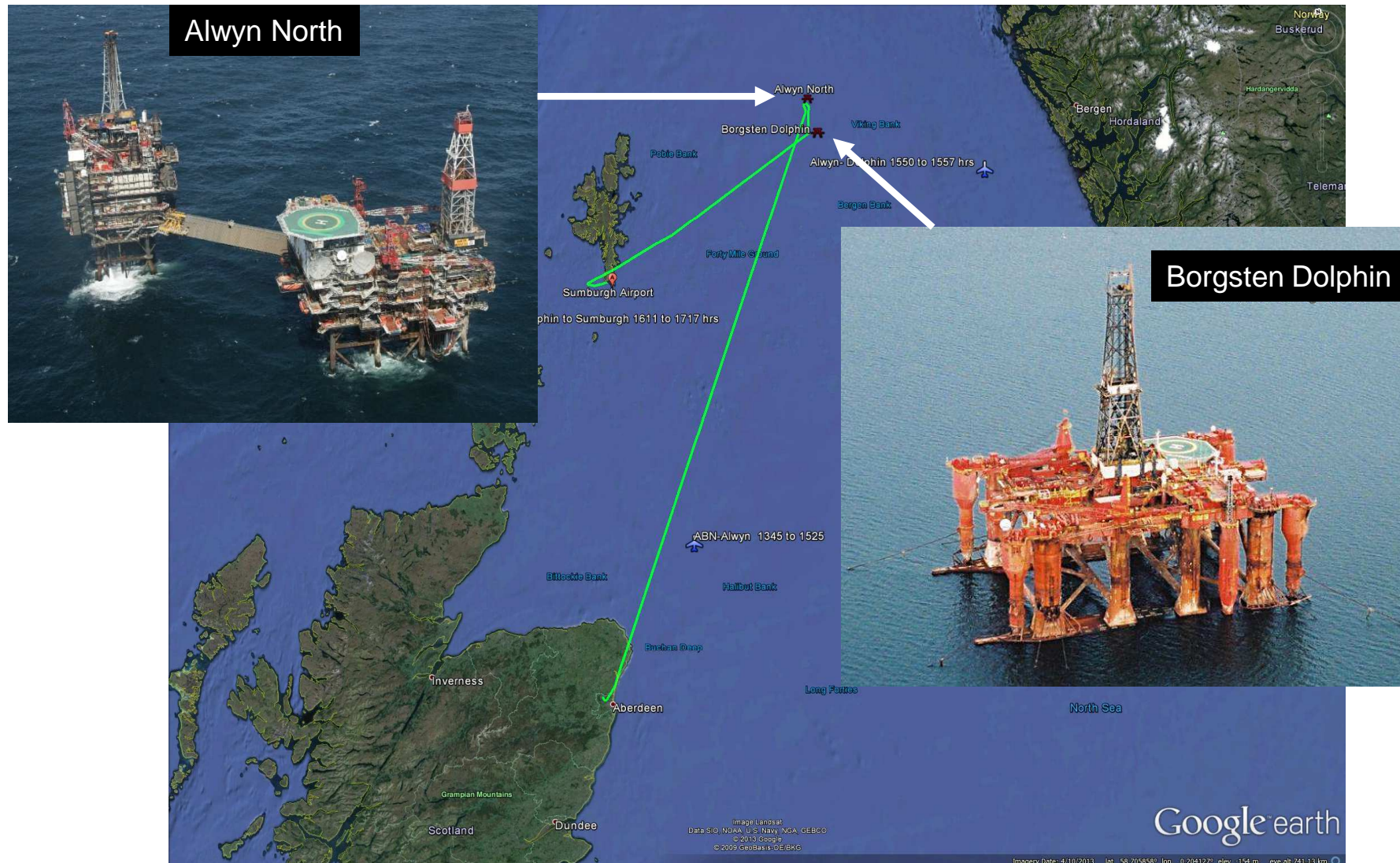
Case Study: Super Puma G-WNSB Richard Ross, UK AAIB

- Accident description
- AAIB investigation
- Safety Recommendations
- Noteworthy issues

Accident Description

- Offshore passenger transport flight
 - Aberdeen Airport to Alwyn North (oil rig)
 - To Borgsten Dolphin (semi-submersible drilling vessel)
 - To Sumburgh to refuel
 - Return to Aberdeen
 - 16 passengers/2 crew on accident sector
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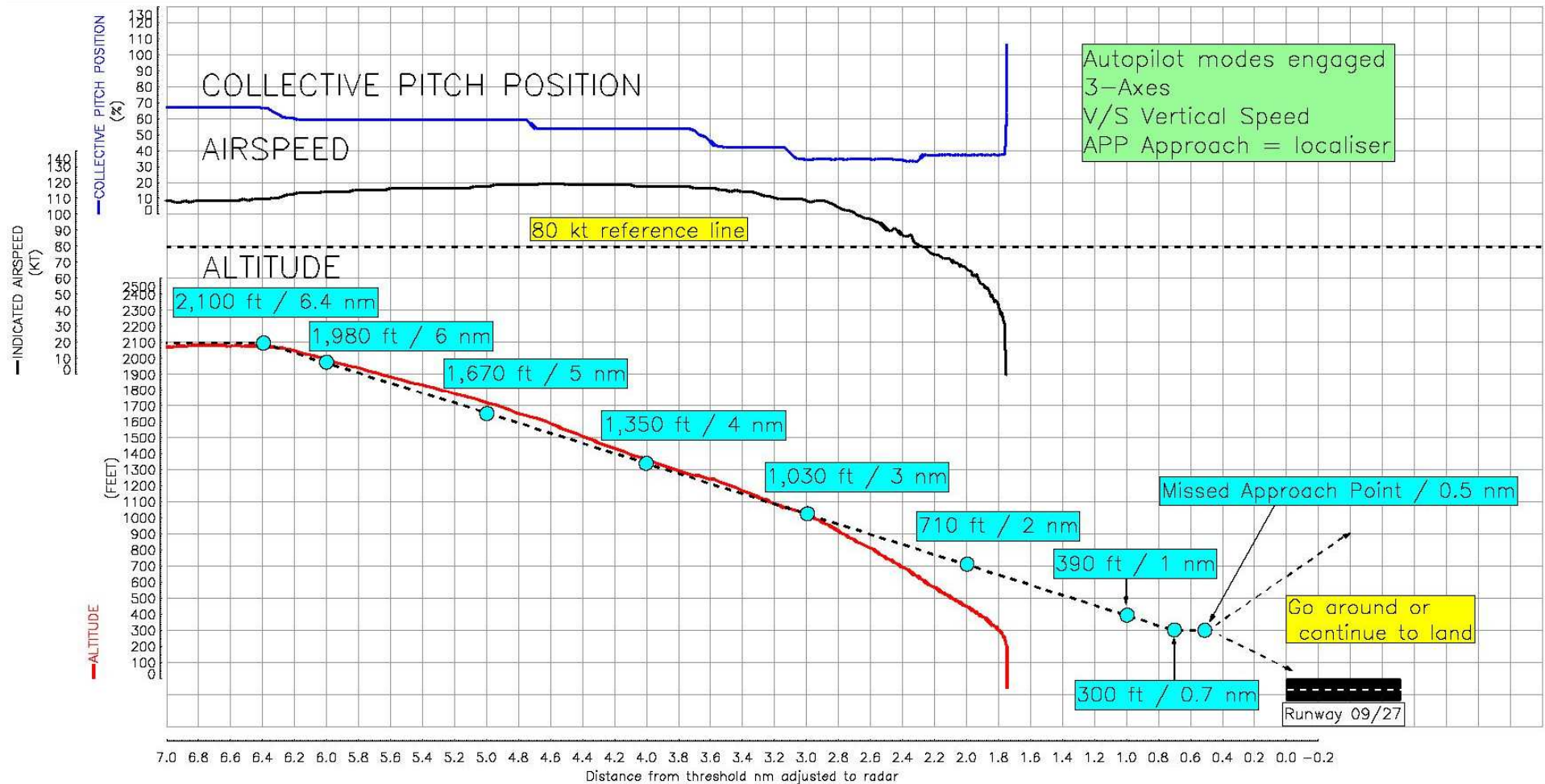
History of the flight (cont.)



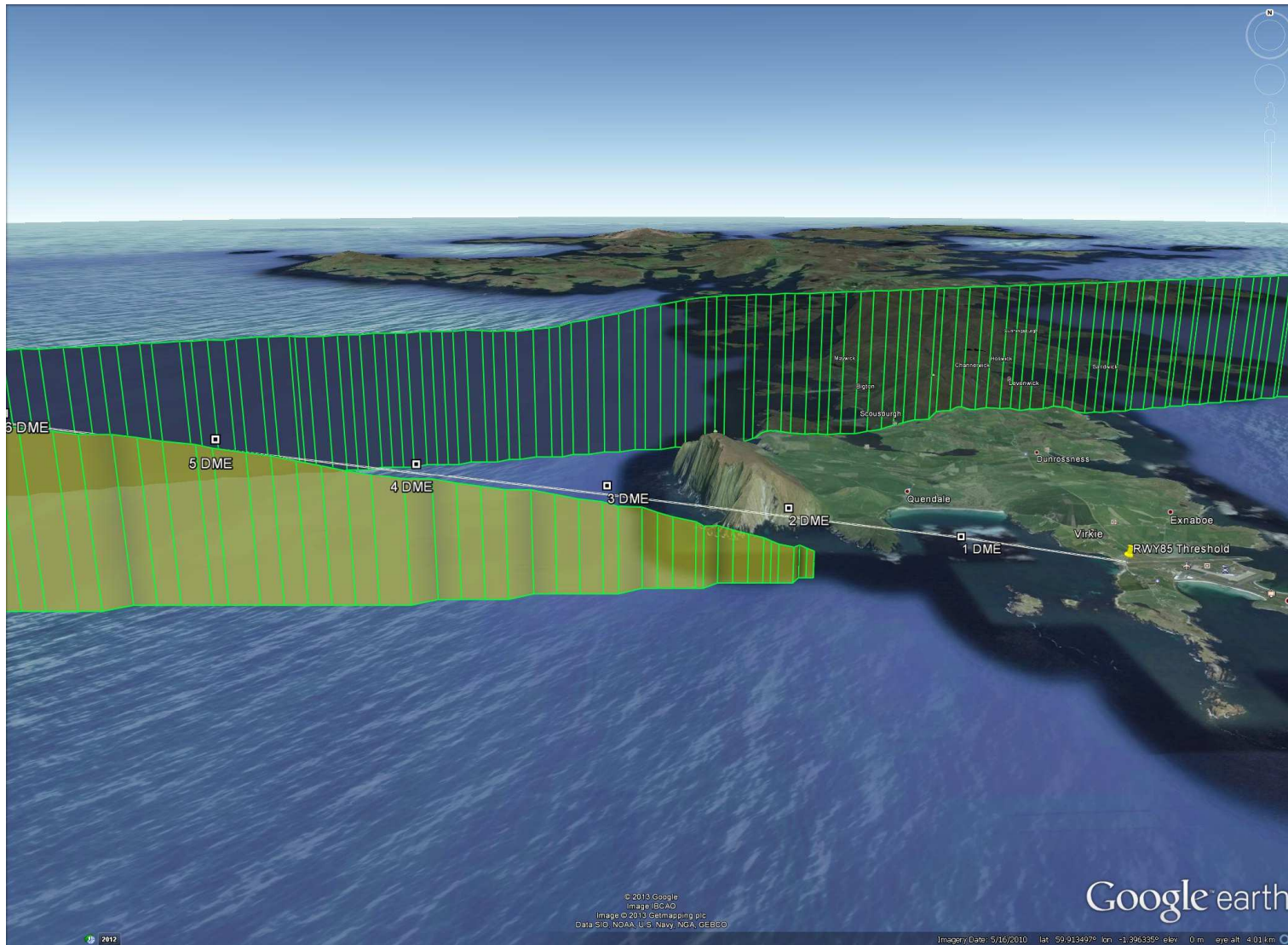
- Cloud at Sumburgh lower than forecast (300 ft), but still above minima
- Non-precision (Localiser/DME) approach flown to Sumburgh Runway 09 in IMC (MDA 300 ft)
- Approach flown in cloud
- Commander - Pilot Flying/Co-pilot - Pilot Monitoring
- Autopilot in 3-axes mode with Vertical Speed mode (PF must use the collective to control airspeed)

- Approach vertical profile good until 3 nm DME
- PF's collective control input insufficient to maintain 80 kt
- Airspeed decayed to below 35 kt, unobserved by crew
- High rate of descent
- Commander's attempt to recover unsuccessful
- Helicopter impacted sea and rolled over immediately
- 4 fatalities, 14 survivors (including 2 crew)

Approach Vertical Profile



Radar Data



Post-Impact



- Flight instruments were not monitored effectively during latter stage of the approach, allowing the helicopter to enter a critically low energy state, from which recovery was not possible
 - Visual references were not acquired by MDA, but no effective action taken to level the helicopter, as required by the operator's SOP
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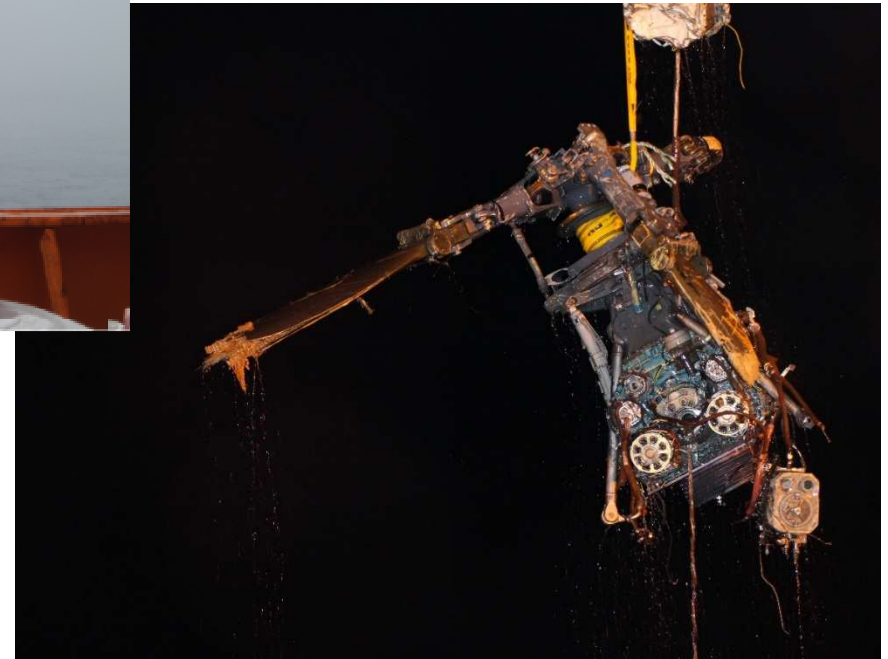
- Operator's SOP for this type of approach not clearly defined
 - Operator's SOPs did not make best use of automation
 - Decision to fly 3-axes with V/S mode decelerating approach required closer monitoring of the instruments
 - Despite poorer than forecast weather, the commander had not altered his expectation of being able to land at Sumburgh
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AAIB Investigation

- Engineering aspects
- Operational factors
- Flight Data
- Survivability
- Improved technology

Engineering Aspects







- Recovery operation on shoreline very hazardous!
 - CVFDR beacon signal blocked by terrain
 - Key items recovered: main rotor head, tail rotor, engines, gearboxes, CVFDR
 - No pre-accident technical issues were identified...
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Final Wreckage Location



Operational Factors

- PF did not monitor flight instruments effectively
 - Why?
 - Crew had a limited recollection of the events
 - Two independent HF studies commissioned to understand the human factors issues
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- CHC Operations Manual allowed 3-axes or 4-axes approaches
 - No FCOM available from manufacturer
 - Experience gradient between pilots
 - Non-standard phraseology used by the crew
 - Lack of clarity in Commander's approach briefing
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- CHC Operations Manual amended: only 4-axes non-precision approaches; approach speed to be pre-briefed
 - FCOMs being developed (Airbus Helicopters, Sikorsky)
 - 'HeliOffshore' industry association formed
 - CAA CAP 1145 safety study: introduction of offshore helicopter operational restrictions
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Flight Data

AAIB analysis of CHC flight data:

- Commander's operating history not unusual compared to other pilots on the AS332 L2
- No evidence he had previously continued an approach below minima
- No evidence of a trend of AS332 L2 pilots flying at low airspeeds in IMC
- CHC pilots used 3-axes with V/S rather than 4-axes for non-precision approaches

- FDM carried out voluntarily by offshore helicopter operators
- Helicopter FDM not mandatory (will be from Jan 2019)
- Limited regulatory guidance/support for helicopter FDM
- Helicopter FDM lags behind fixed wing programmes
- Difficult to verify compliance with SOPs

Survivability

- No warning of impact with the sea
 - Helicopter rapidly filled with water & became inverted
 - Disorientation
 - No chance to take a breath before impact
 - Limited time to escape
 - Hybrid rebreathers ineffective in water impact case
 - Difficulty pushing out cabin windows
 - Problems deploying liferafts from inverted helicopter
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- Daylight
 - 'Warm' sea temperature (+10 deg C)
 - Co-pilot armed the floats prior to impact
 - Several cabin windows on left side blown in
 - Sea state favourable
 - SAR helicopters quickly on scene
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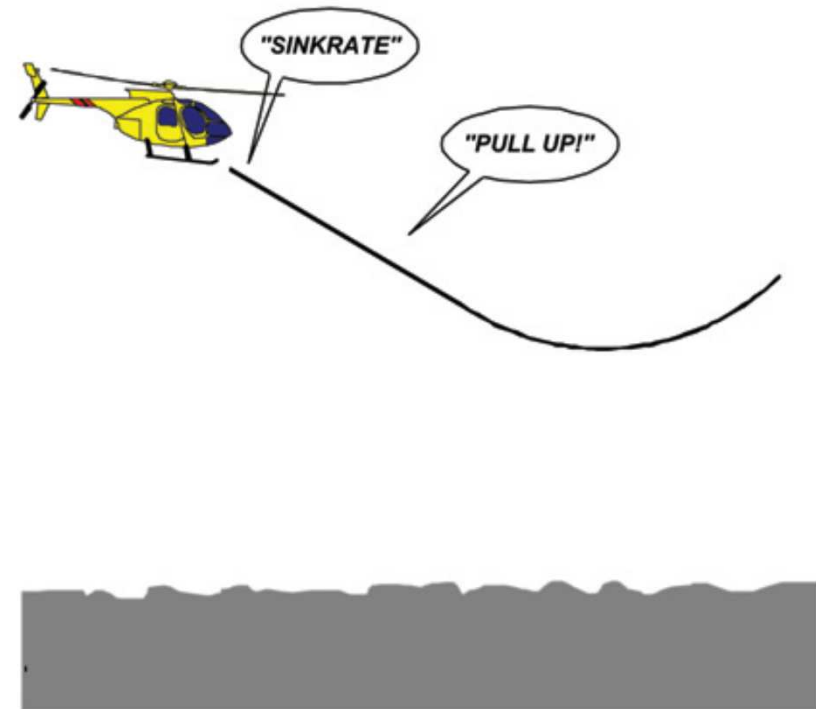
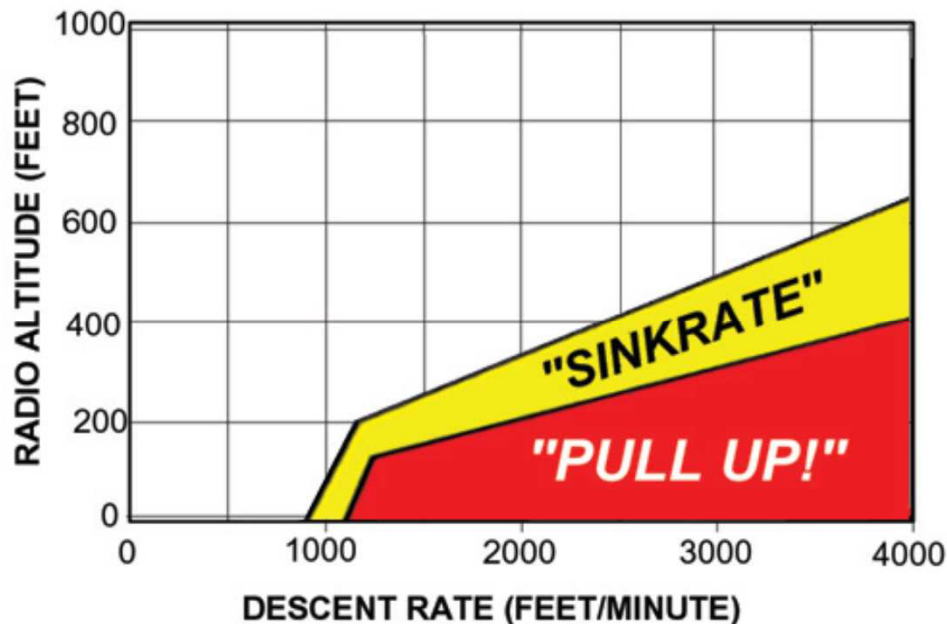
- New regulations proposed by EASA in 2016
- UK CAA North Sea Safety Review: CAP 1145

11 AAIB Safety Recommendations to improve survivability including:

- Side-floating capability for helicopters
 - Standardisation of exit size, opening mechanisms and cabin layout
 - Compressed air Emergency Breathing System
 - Automatic helicopter float activation
 - Liferaft deployment from any helicopter attitude
 - EASA-approved evacuation training
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Improved Technology

Terrain Awareness Warning System (TAWS) provides audible and visual warnings of an impending collision with land, sea or obstacle





- Analysis showed that the current TAWS would not have prevented the accident
- Work is ongoing, headed by UK CAA, to establish improvements to helicopter TAWS
- Enhanced TAWS envelope (engine torque & airspeed) would give sufficient warning to prevent this accident
- The EASA requires TAWS to be fitted to helicopters manufactured after 31 December 2018

- EASA issued 3 tenders (in 2008 & 2012) for a project to demonstrate the feasibility/safety benefit of a helicopter low airspeed warning system
- No tenders were received; but:
- Airbus Helicopters has completed trials with a low airspeed warning system

- 26 AAIB Safety Recommendations, covering:
 - Operational Standards
 - Search and Rescue
 - Flight Data Monitoring
 - Technical Standards
 - Survivability

- Operators voluntarily grounded AS332 L2 fleet
- Great pressure from the manufacturer on AAIB
- Loss of industry confidence in AS332 L2: Facebook page: '*Destroy the Super Puma...*'
- Scottish judicial investigation is ongoing...
- Court order issued for release of CVFDR data
- Discussion with EASA about implications of mandating cockpit image recorders

Questions?

