Civil Aviation Authority

# UK CAA Review of Offshore Helicopter Operations

## 8th EASA Rotorcraft Symposium

David Howson, 3-4 December 2014

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- Prevention of Accidents
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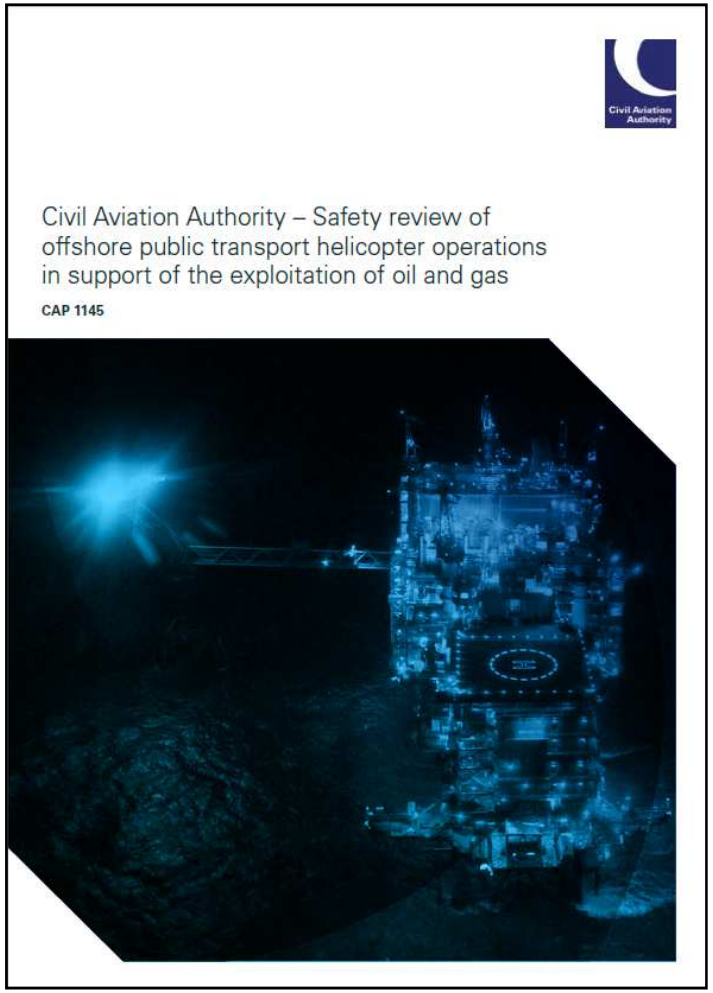
# Introduction

- Safety review of offshore public transport helicopter operations in support of the exploitation of oil and gas commissioned by CAA Board.
- All stakeholders consulted.
- Subject to peer review by ‘challenge team’.
- Conducted in conjunction with CAA Norway and EASA.
- Published as CAP 1145 in February 2014.
- Contains 32 actions (for CAA) and 29 recommendations (to other organisations).
- Joint industry Offshore Helicopter Safety Action Group (OHSAG) established to monitor and progress actions and recommendations.



# Accident Analysis

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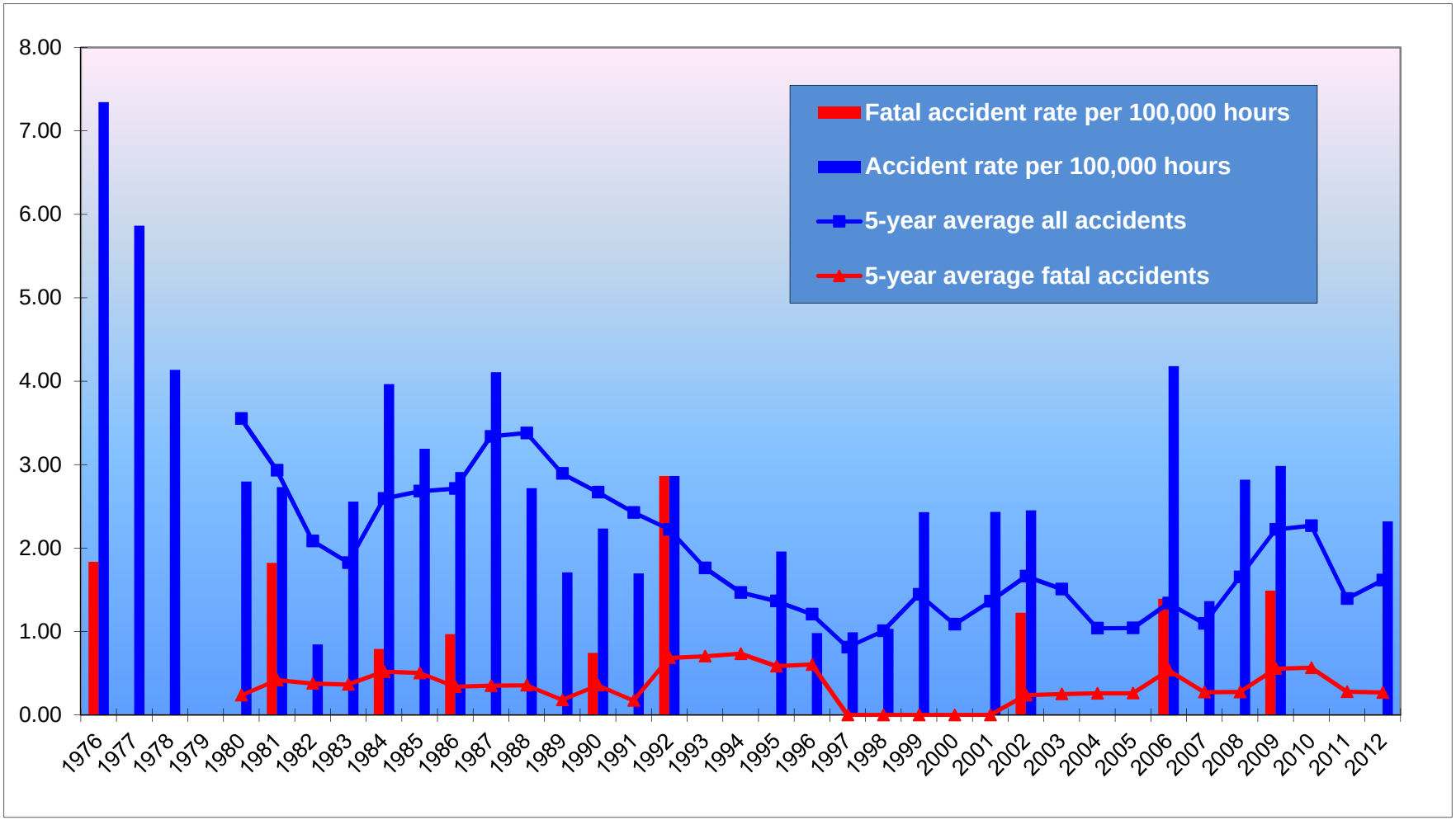
# Overall Statistics 1976 - 2012

- All accidents:
  - 72 accidents,
  - approx. 2 per year,
  - 2.1 per 100,000 flight hours.

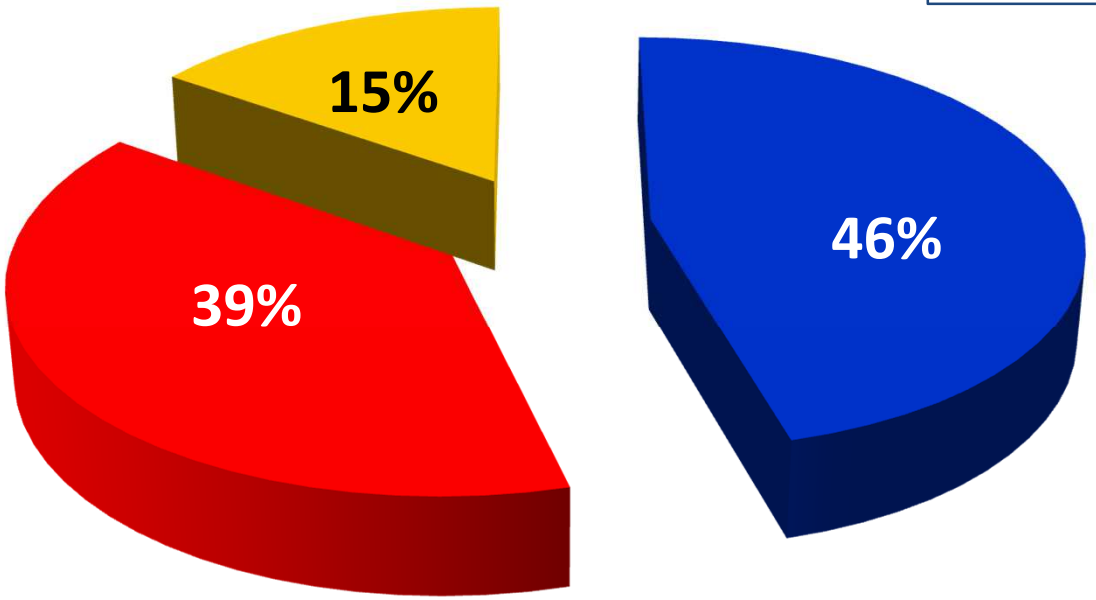
- Fatal accidents:
  - 12 fatal accidents (124 fatalities),
  - 0.32 per year or approx. one every 3 years,
  - 0.36 per 100,000 flight hours.

# Chronology of Reportable Accidents – Rate per 100,000 Flight Hours



# Breakdown of Accidents by Category 1976 – 2012 (72 accidents)

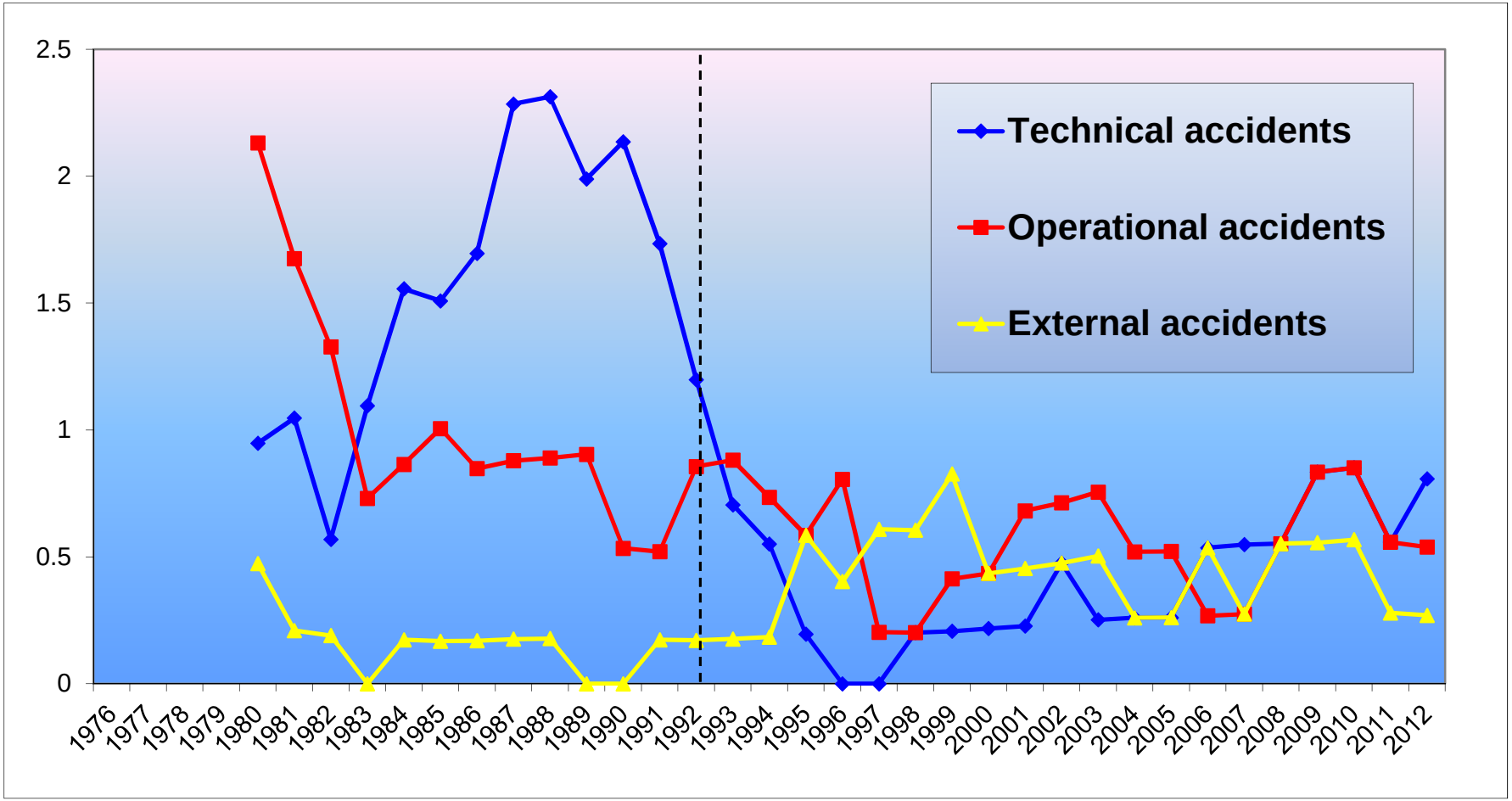
Coded using CAST/ICAO Common Taxonomy Team (CICTT) scheme.



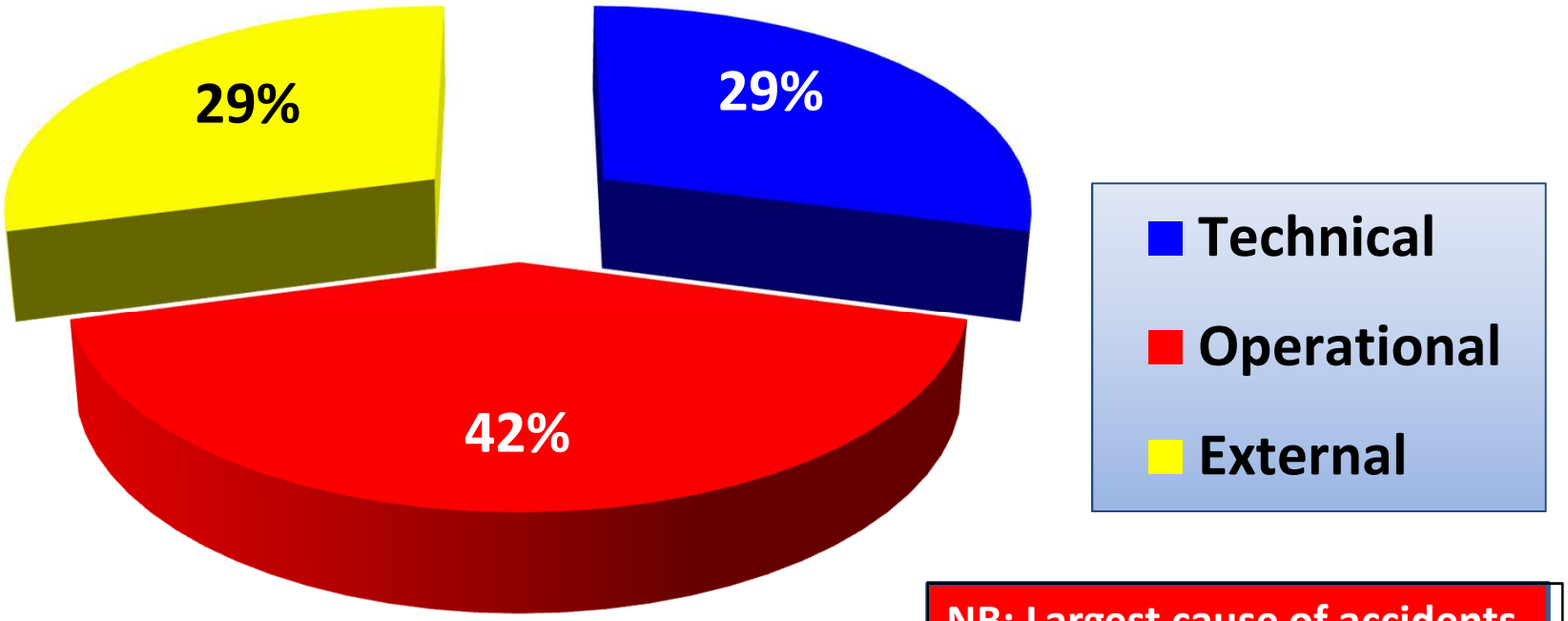

- Technical
- Operational
- External

NB: Largest cause of accidents is technical (46%).

# Chronology of Accidents by Category – Rate per 100,000 Flight Hours



# Breakdown of Accidents by Category 1992 – 2012 (24 accidents)




**NB: Largest cause of accidents is operational (42%).**

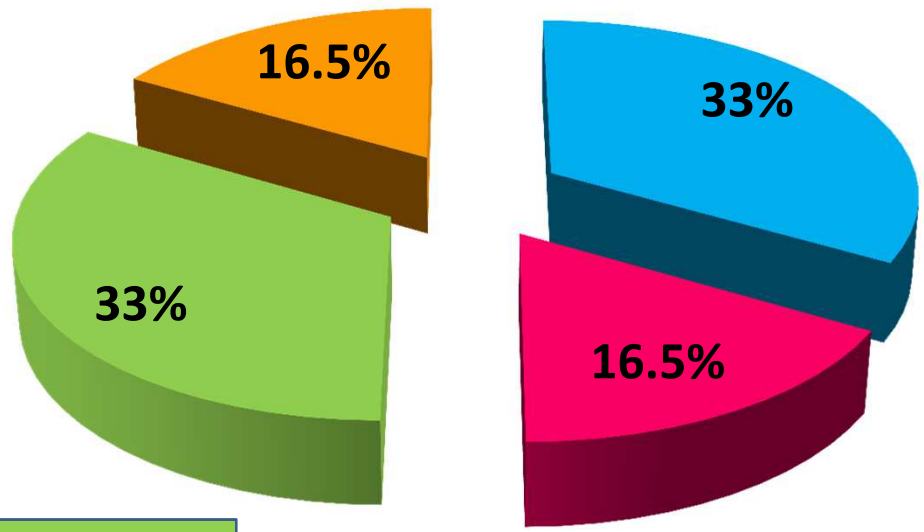
# Breakdown of Accident Categories 1992 – 2012 (24 accidents)

- Operational accidents:
  - 10/24 or 42% of total
  - most (7/10 or 70%) due to pilot error.
- Technical accidents:
  - 7/24 or 29% of total
  - most (6/7 or 86%) due to rotor and transmission failures.
  - many (4/7 or 57%) rooted in design/certification issues.
- External accidents:
  - 7/24 or 29% of total
  - most (5/7 or 71%) due to lightning strikes.

# Fatal Accidents 1992 – 2012 (6/24 or 25%)

G-BLUN, Morecambe Bay 2006 (CFIT)

• G-BJVX, Leman A 2002 (main rotor)
• G-REDL, Peterhead 2009 (MRGB)




- System/component failure - non-powerplant (SCF-NP)
- Loss of control - in flight (LOC-I)
- Ground handling (RAMP)
- Controlled flight into terrain (CFIT)

• G-BOND, DSV Mayo 1992 (HLO fatality)
• G-BLEZ, Viking B 1992 (HLO fatality)

G-TIGH, Cormorant A 1992 (loss of control)

# Conclusions from Accident Analysis

- The last 20 years (1992 to 2012) of offshore operations are representative of current operations.
- The accident rate is relatively stable at 1.14 per year or 1.37 per 100,000 flight hours or 0.65 per 100,000 sectors.
- The fatal accident rate over this period is 0.29 per year or 0.33 per 100,000 flight hours or 0.16 per 100,000 sectors.
- The main causal factors of reportable accidents are (in order):

  1st Operational – pilot error.

  =2nd Technical – rotor and transmission failures.

  =2nd External – lightning strikes.
- Fatal accidents follow a similar pattern except that there have been no External cause fatal accidents.

# Accident Prevention

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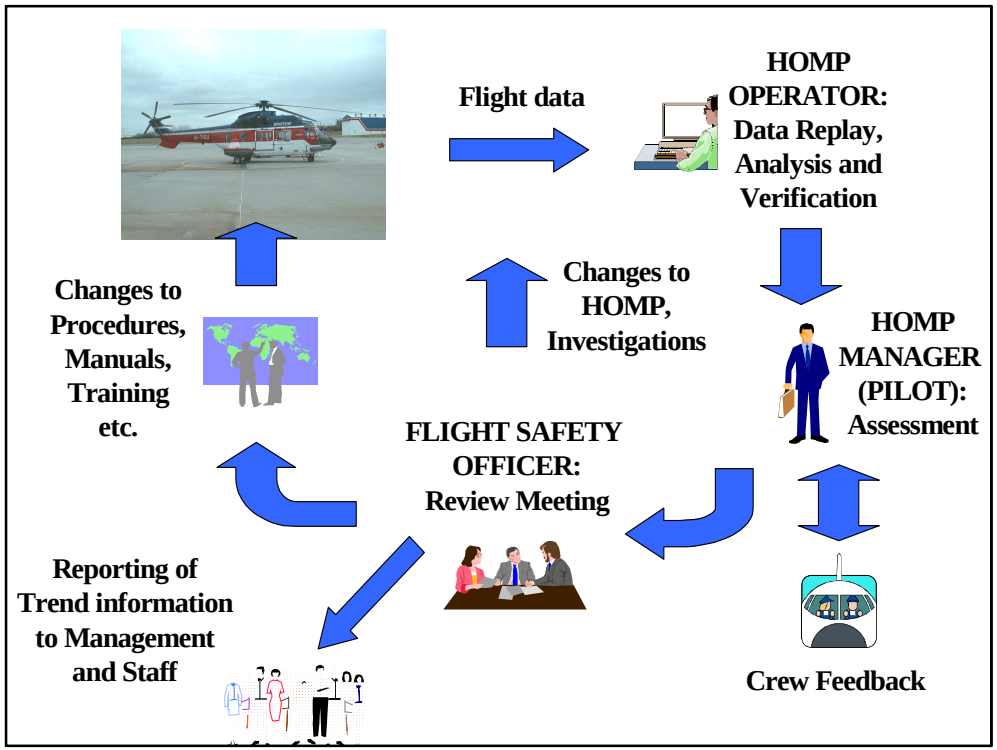
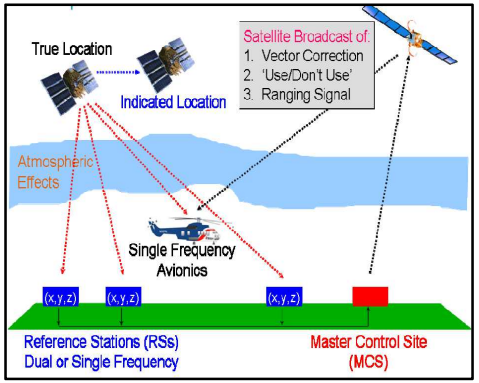
# Operational Accidents

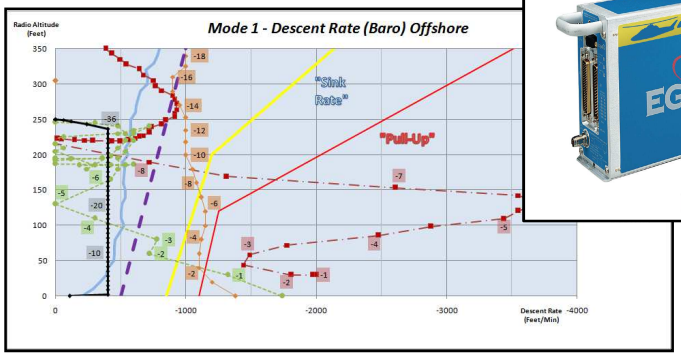
- Biggest issue is pilot error (70%).
- Main tool for addressing pilot error is Flight Data Monitoring (HFDM).
  - Need to improve HFDM performance at offshore helicopter operators via new helicopter sub-group of CAA-run FDM User Group forum.



# Operational Accidents

- Current research will also deliver significant improvements once completed and implemented:
  - operations to moving decks,
  - improved helideck lighting,
  - GPS-guided approaches,
  - improved HTAWS.
- Together these address 6/10 operational accidents, including all 4 fatal operational accidents.



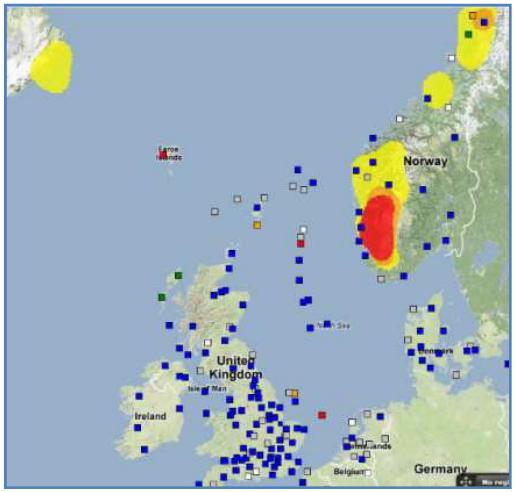


# Technical Accidents

- Biggest issues are rotor and transmission failures (86%).
- Prevention of failures:
  - Need to investigate causes of technical failures, e.g. maintenance vs design.
- Mitigation of failures:
  - Results of research on transmission HUMS improvements (Advanced Anomaly Detection – AAD, see CAA Paper 2011/01) being implemented on AW139, S92 and EC225.
  - CAA research on extending HUMS to rotors completed (see CAA Paper 2012/01) and fed into AgustaWestland Rotorcraft Technology Validation Programme (RTVP).
  - CAA participating in RTVP which includes significant work on rotor HUMS.

# External Accidents

- Biggest cause is lightning strikes (71%).
  - Immediate safety risk presented by lightning strikes, e.g. AS332L G-TIGK, 1995.
  - Secondary safety risk due to undetected damage from lightning strikes, e.g. S-76 G-BJVX, 2002.
  - Cost of lightning strikes – up to $4M per strike.
- Best approach is to avoid being struck.
  - Triggered lightning strike forecasting tool on UK Met Office OHWeb weather service developed and implemented.
  - System will be overseen during winter 2014/15.
  - Further refinements/enhancements under consideration.



# Accident Mitigation

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# The Issue

- Most offshore flying is over water.
- Entirely foreseeable that helicopters will have to make emergency landings on water or may crash into the sea.
- UK North Sea 1976 to 2012:
  - 12 ditchings and 8 ‘survivable’ water impacts (7 non-survivable water impacts).
  - 38 fatalities, most due to drowning.
  - Main factor is escape from a capsized and/or sinking helicopter which is rapidly filling with water.

# The Solution

- Significant research (started in 1980's post HARP – CAP 491) completed and reported (summarised in CAA Paper 2005/06).
- Incorporation into EASA rules and advisory material in progress via EASA Rule Making Task RMT.0120.
- Some measures (e.g. auto float inflation) already voluntarily implemented by industry.
- Will 'encourage' industry to accelerate introduction/ retrofit of measures – CAP 1145 Recommendation R5.

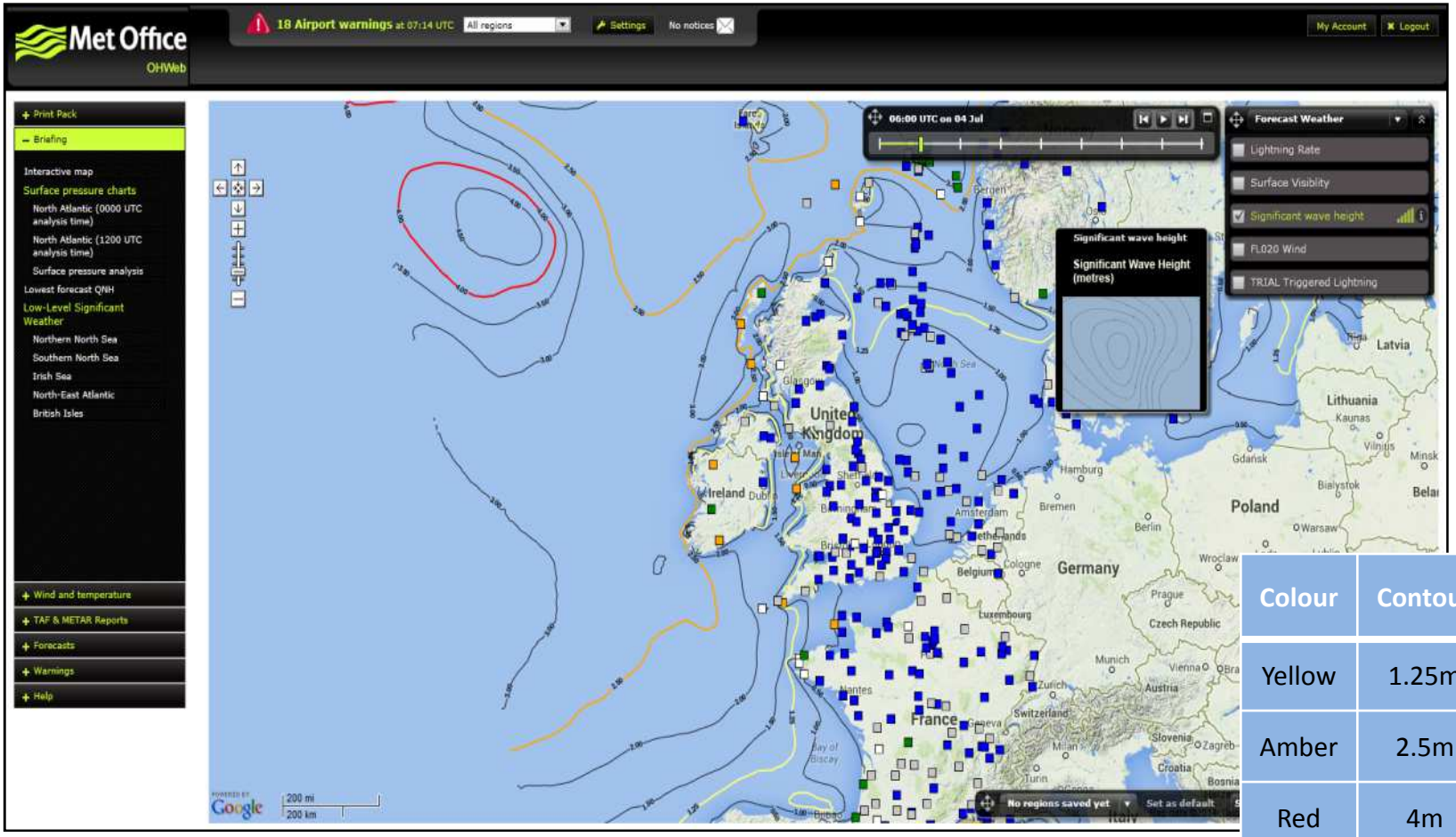
# Interim Measures

- CAP 1145 Actions designed to provide near term mitigation pending implementation of new rules under EASA RMT.0120:
  - Action A5 – overall sea state 6 operational limit (rescue);
  - Action A6 – limiting operations to certificated helicopter ditching capability;
  - Action A7 – arming of emergency flotation systems (EFS);
  - Action A8 – restricting passengers to seats immediately adjacent to authorised underwater escape exits unless EBS implemented;
  - Action A9 – requiring the size of underwater escape exits to be compatible with passenger body size;
  - Action A10 – mandate of CAP 1034 Cat A EBS or side floating EFS scheme.
- Mandates applied via Operational Directive under CAA Safety Directive SD-2014/001 & 002 issued in accordance with Article 15 of the ANO 2009.

# Action A5

*With effect from 01 June 2014, the CAA will prohibit helicopter operators from conducting offshore flights, except in response to an offshore emergency, if the sea state at the offshore location that the helicopter is operating to/from exceeds sea state 6 in order to ensure a good prospect of recovery of survivors.*

- Limit revised from sea state 6 to 6m significant wave height (SWH) :
  - Sea state definition 'archaic' and indeterminate; marine industry uses SWH.
  - 6m SWH is equivalent to upper end of sea state 6 (WMO table).
- Limit revised to apply to the whole journey, not just at the destination:
  - Original limit assumed information available only from wave buoys at offshore locations.

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| Colour | Contour | Sea State |
|---|---|---|
| Yellow | 1.25m | 3 |
| Amber | 2.5m | 4 |
| Red | 4m | 5 |
| Purple | 6m | 6 |

- UK Met Office OHWeb forecasting to be used :
  - Model-based forecasts validated for accuracy over several decades.
  - To be used for planning and at departure decision stage only, i.e. updates while en-route not required.

# Action A6

*With effect from 01 September 2014, the CAA will prohibit helicopter operators from conducting offshore flights, except in response to an offshore emergency, if the sea state at the offshore location that the helicopter is operating to/from exceeds the certificated ditching performance of the helicopter.*

- Limit revised to apply to the whole journey, not just at the destination per Action A5.
- Sea keeping performance claimed by OEMs accepted:
  - Not ideal as likely to be based on regular wave testing.
  - Being addressed by EASA RMT.0120.
- EASA Airworthiness Directives issued covering helicopters manufactured in the EU and non-EU helicopters operating in the EU.

# Action A7

*With effect from 01 June 2014, the CAA will require helicopter operators to amend their operational procedures to ensure that Emergency Floatation Systems are armed for all overwater departures and arrivals.*

- Significant proportion of EFS ‘failures’ in survivable water impacts due to EFS being either not armed or not activated.
- EFS only armed on approach to and departure from offshore locations.
- EFS was not armed on G-WNSB approach to Sumburgh – armed at last minute thanks to quick thinking/action by co-pilot.
- EASA RMT.0120 considering automatic arming/disarming.

# Action A8

*With effect from 01 June 2014, the CAA will prohibit the occupation of passenger seats not adjacent to push-out window emergency exits during offshore helicopter operations, except in response to an offshore emergency, unless the consequences of capsize are mitigated by at least one of the following:*

*a) all passengers are wearing Emergency Breathing Systems that meet*
*Category 'A' of the specification detailed in CAP 1034 in order to increase underwater survival time;*
*b) fitment of the side-floating helicopter scheme in order to remove the time pressure to escape.*

- Required to address mismatch between escape time and underwater survival time (without suitable EBS).
- Target date revised to 01 September following representations from oil & gas industry.

- CAA required to authorise underwater escape exits under JAR OPS 3.837(a)(4) & (6).
- Modified (from CAP 562 Leaflet 44-30) guidance adopted based on research performed by RAF IAM (Report No.528) and University of Loughborough Report on body size for the Joint Aviation Authorities (JAA) in 2001:
  - Key parameter is shoulder width.
  - Diagonal of exit aperture needs to be > shoulder width.
  - 99th percentile shoulder width for Britain/Europe = 22.2”.
  - Therefore minimum diagonal diameter of the underwater escape exit required is 22”. This dimension is to be taken between the corner radii.
  - Existing minimum width of 14” retained.
  - An underwater escape exit may be considered large enough for two passengers to exit simultaneously provided that it is at least 28” wide and 19.5” high.
- All exits authorised except:
  - Sikorsky S76 front and rear windows (too narrow – addressed by modified seating config.).
  - Airbus Helicopters AS332L (Tiger) rear windows (too narrow – addressed by removing from UK operations).

S76
11.7”
13.3”

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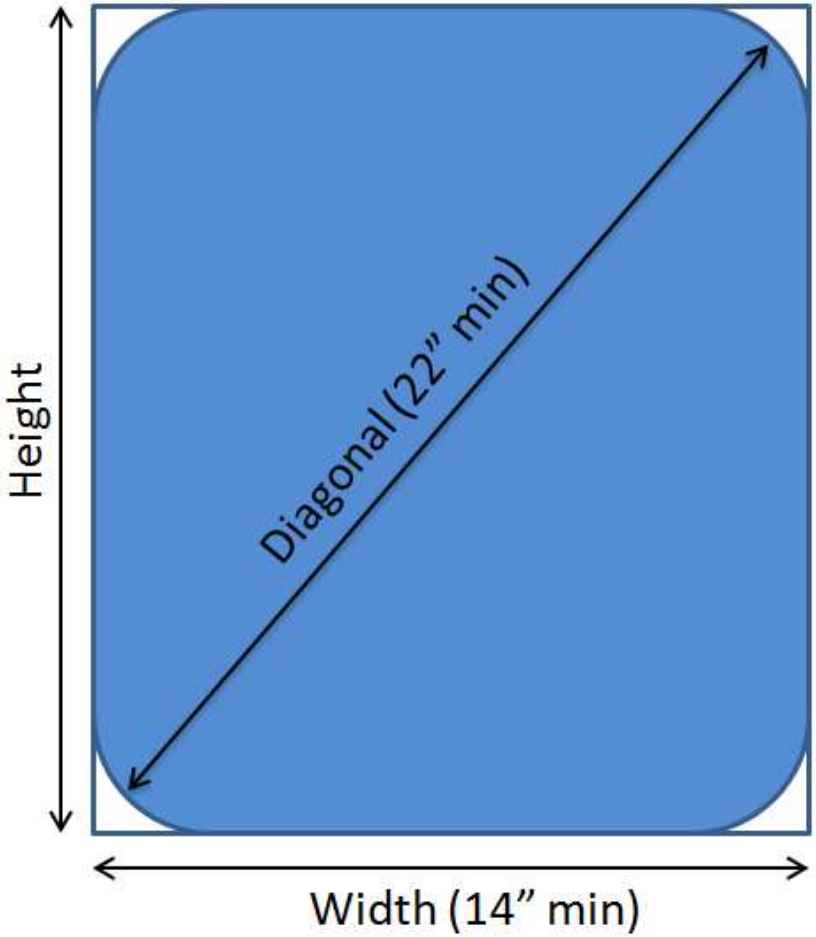
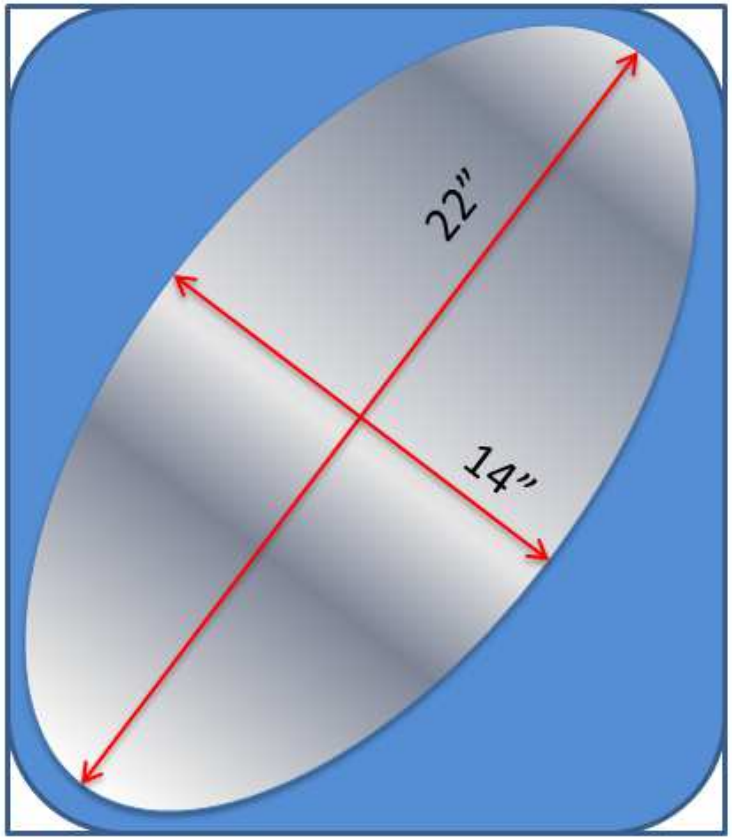
# Action A9

*With effect from 01 April 2015, the CAA will prohibit helicopter operators from carrying passengers on offshore flights, except in response to an offshore emergency, whose body size, including required safety and survival equipment, is incompatible with push-out window emergency exit size.*

- Principles of Action A8 applied, but refined as follows:
  - RGU workforce survey data confirmed minimum width of 14” relating to maximum chest depth to be appropriate (approx. 99%ile).
  - RGU workforce survey data established minimum diagonal of 22” suitable for approx. 90% of passengers.
  - Ellipse test (22” x 14”) to be applied to non-rectangular exits and partially obstructed exits (e.g. by seat backs).




**Unobstructed Regular Exit**



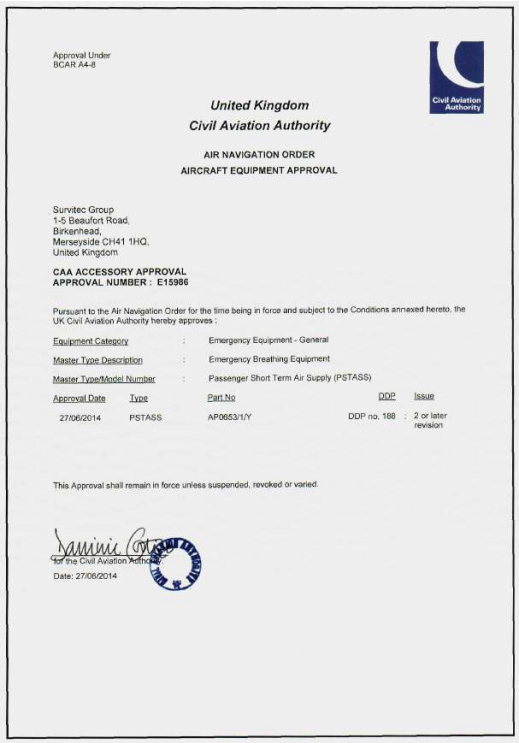

**Partially Obstructed and/or Irregular Exit**

- All exits expected to comply except Airbus Helicopters AS332L2 non-Type IV exits (diagonal <22” ):
  - Diagonal meets 22” minimum with rubber seal removed.
  - Airbus Helicopters working to demonstrate that rubber seal will detach on operation of exit.
  - Alternative solution to brief pax to remove rubber seal prior to egress.
- Industry will measure workforce and classify those with max chest depth >14” or shoulder width > 22” as ‘extra broad’ (XBR):
  - Classification added to Vantage card.
  - XBR pax allocated to seats with direct access to Type IV (26” x 19”, diagonal 27”) or larger exit.
  - Expecting approx. 10% of workforce to be XBR.
- All helicopters have at least 30% seats suitable for XBR.
- Visual confirmation of correct seating via coloured/patterned arm bands and matching seat covers/head rests.

# Action A10

*With effect from 01 April 2016, the CAA will prohibit helicopter operators from conducting offshore helicopter operations, except in response to an offshore emergency, unless all occupants wear Emergency Breathing Systems that meet Category 'A' of the specification detailed in CAP 1034 in order to increase underwater survival time. This restriction will not apply when the helicopter is equipped with the side-floating helicopter scheme.*

- Target date brought forward to 01 January 2015 for passengers only.
- EASA announced approval of the Mk50 lifejacket with the Cat 'A' EBS fitted on 8 July 2014.
- Survitec passenger Cat. 'A' EBS approved by CAA on 10 July 2014.



Approval Under
BCAR A4-8

*United Kingdom*
*Civil Aviation Authority*

AIR NAVIGATION ORDER
AIRCRAFT EQUIPMENT APPROVAL

Survitec Group
1-5 Beaufort Road,
Birkenhead,
Merseyside CH41 1HQ,
United Kingdom

**CAA ACCESSORY APPROVAL**
**APPROVAL NUMBER : E15986**

Pursuant to the Air Navigation Order for the time being in force and subject to the Conditions annexed hereto, the UK Civil Aviation Authority hereby approves :

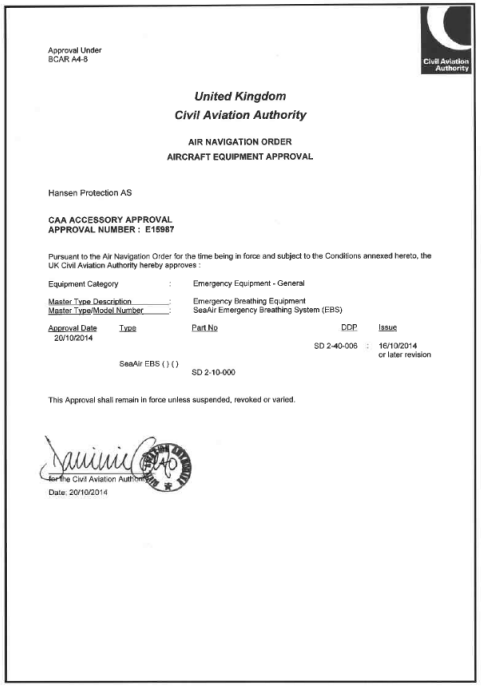
| | | |
|---|---|---|
| Equipment Category | : | Emergency Equipment - General |
| Master Type Description | : | Emergency Breathing Equipment |
| Master Type/Model Number | : | Passenger Short Term Air Supply (PSTASS) |

| Approval Date | Type | Part No | DDP | Issue |
|---|---|---|---|---|
| 27/06/2014 | PSTASS | AP0653/1/Y | DDP no. 188 : | 2 or later revision |

This Approval shall remain in force unless suspended, revoked or varied.

for the Civil Aviation Authority
Date: 27/06/2014

- Step Change in Safety EBS Working Group worked to deploy the new lifejacket and EBS from mid-August and achieved full coverage by 01 September 2014 four months ahead of revised target.
- 59,965 people trained (dry training only) between July and 18 September 2014.
- Flight crew version of Survitec Cat ‘A’ EBS under development.



Approval Under
BCAR A4-8

Civil Aviation Authority

*United Kingdom*
*Civil Aviation Authority*

AIR NAVIGATION ORDER
AIRCRAFT EQUIPMENT APPROVAL

Hansen Protection AS

CAA ACCESSORY APPROVAL
APPROVAL NUMBER : E15987

Pursuant to the Air Navigation Order for the time being in force and subject to the Conditions annexed hereto, the UK Civil Aviation Authority hereby approves :

| | | |
|---|---|---|
| Equipment Category | : | Emergency Equipment - General |
| Master Type Description | : | Emergency Breathing Equipment |
| Master Type/Model Number | : | SeaAir Emergency Breathing System (EBS) |

| Approval Date | Type | Part No | DDP | Issue |
|---|---|---|---|---|
| 20/10/2014 | SeaAir EBS ( ) ( ) | SD 2-10-000 | SD 2-40-006 | 16/10/2014 or later revision |

This Approval shall remain in force unless suspended, revoked or varied.

For the Civil Aviation Authority
Date: 20/10/2014

- Second CAP 1034 Cat ‘A’ EBS produced by Hansen Protection certificated by CAA.
- Integrated with SeaAir suit and lifejacket used with SeaWind and ETSO suits.
- Certification of third system (Viking) in progress.

Thank you for your attention…

# Any questions?