A Risk Management Approach to Helicopter Night Offshore Operations

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Gerry Gibb – Safety Wise Solutions

Aim

Through review of night offshore helicopter accidents:

- Identify lessons that should have been learned
- Recommend measures for accident prevention
- Recommend measures for accident mitigation
- Review new or emerging technology

Engage Industry to provide uniform approach to improve risk management night offshore applications

Background

Night Offshore Medical Evacuation

Night Offshore Passenger Transfer

Background

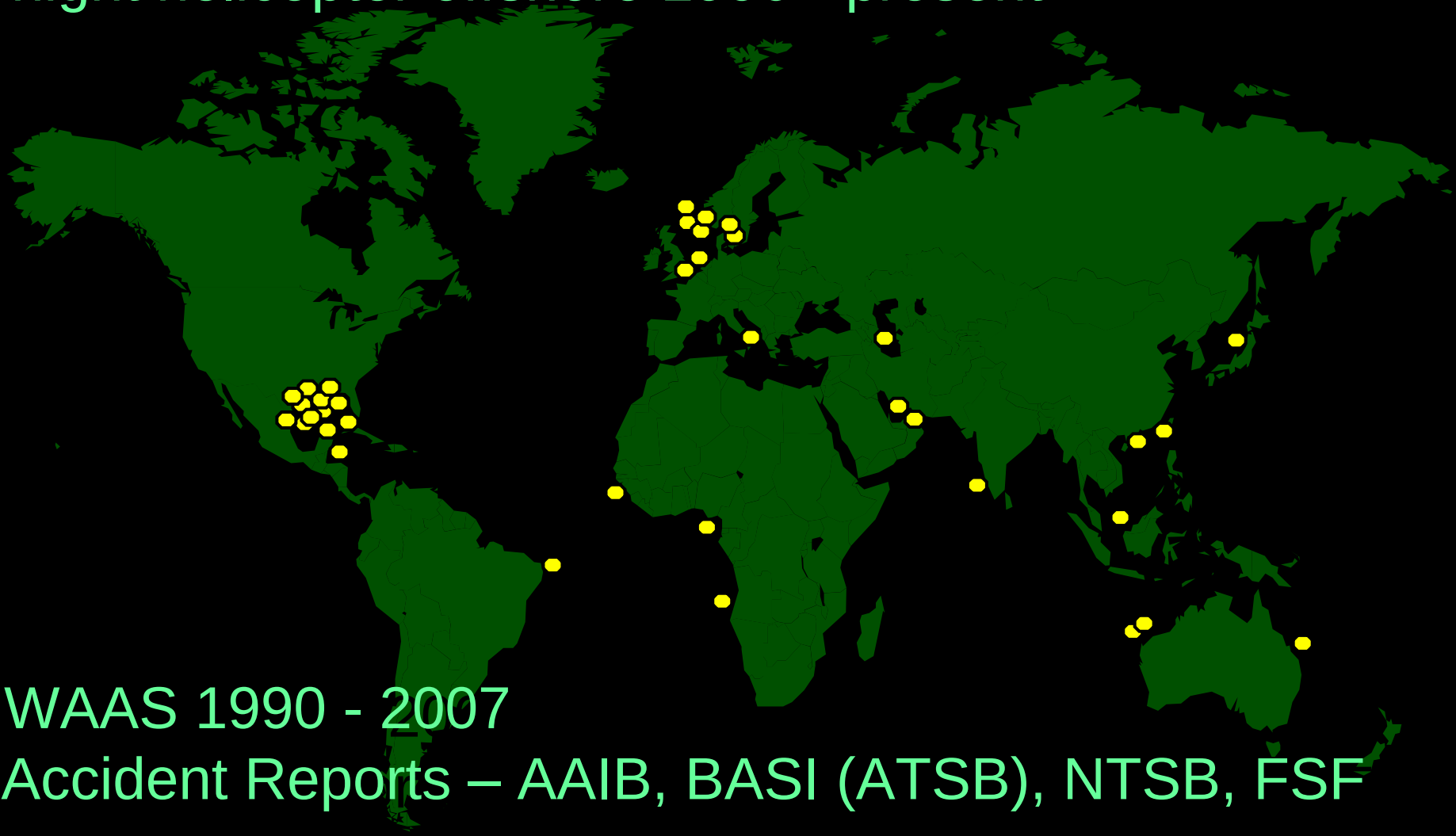
Night Offshore Medical Evacuation

Night Offshore Passenger Transfer

Night Offshore Accidents

Terms of Reference

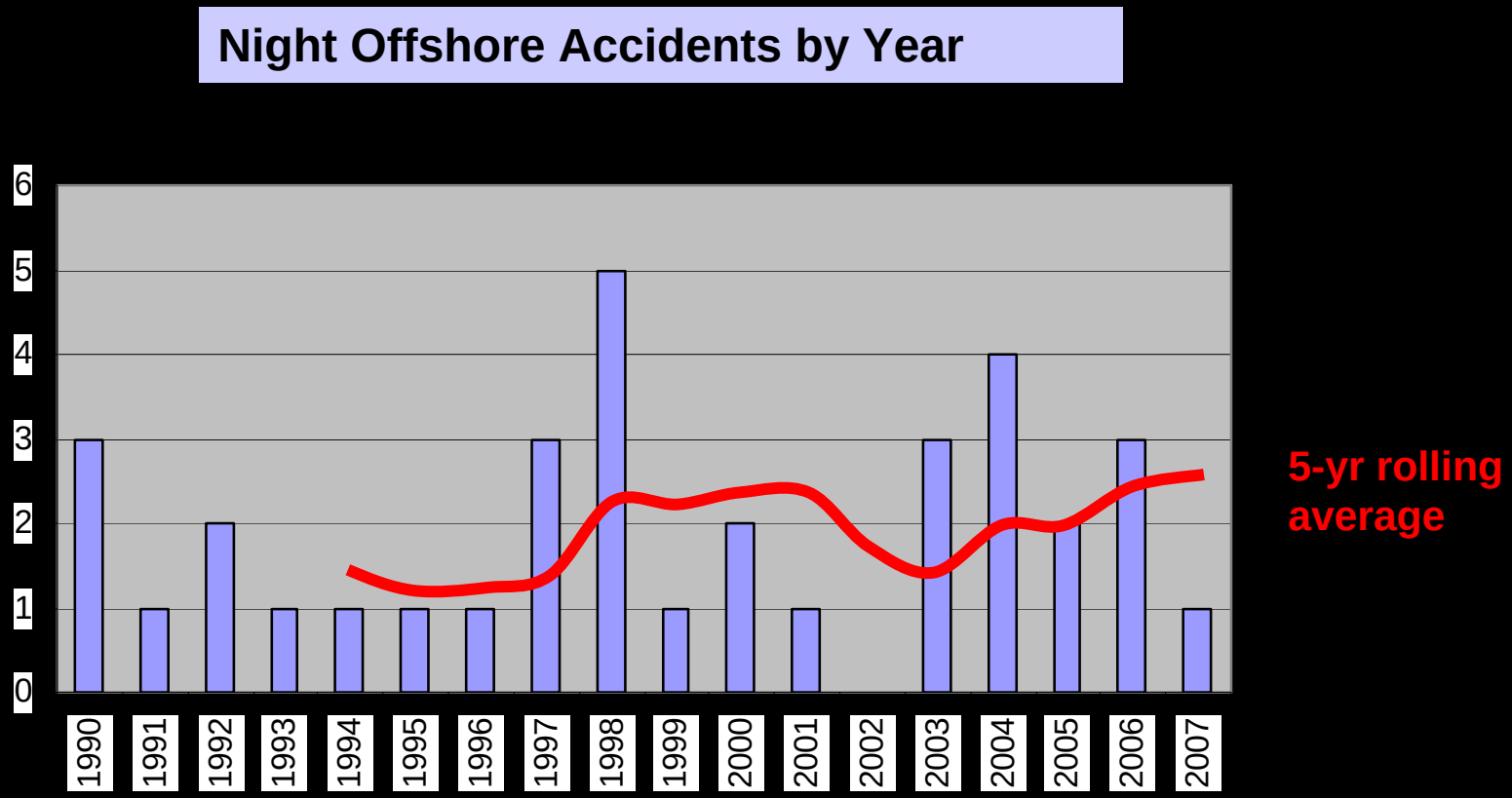
Review of all (documented) accidents associated with night helicopter offshore 1990 - present



WAAS 1990 - 2007

Accident Reports – AAIB, BASI (ATSB), NTSB, FSF

Data Summary



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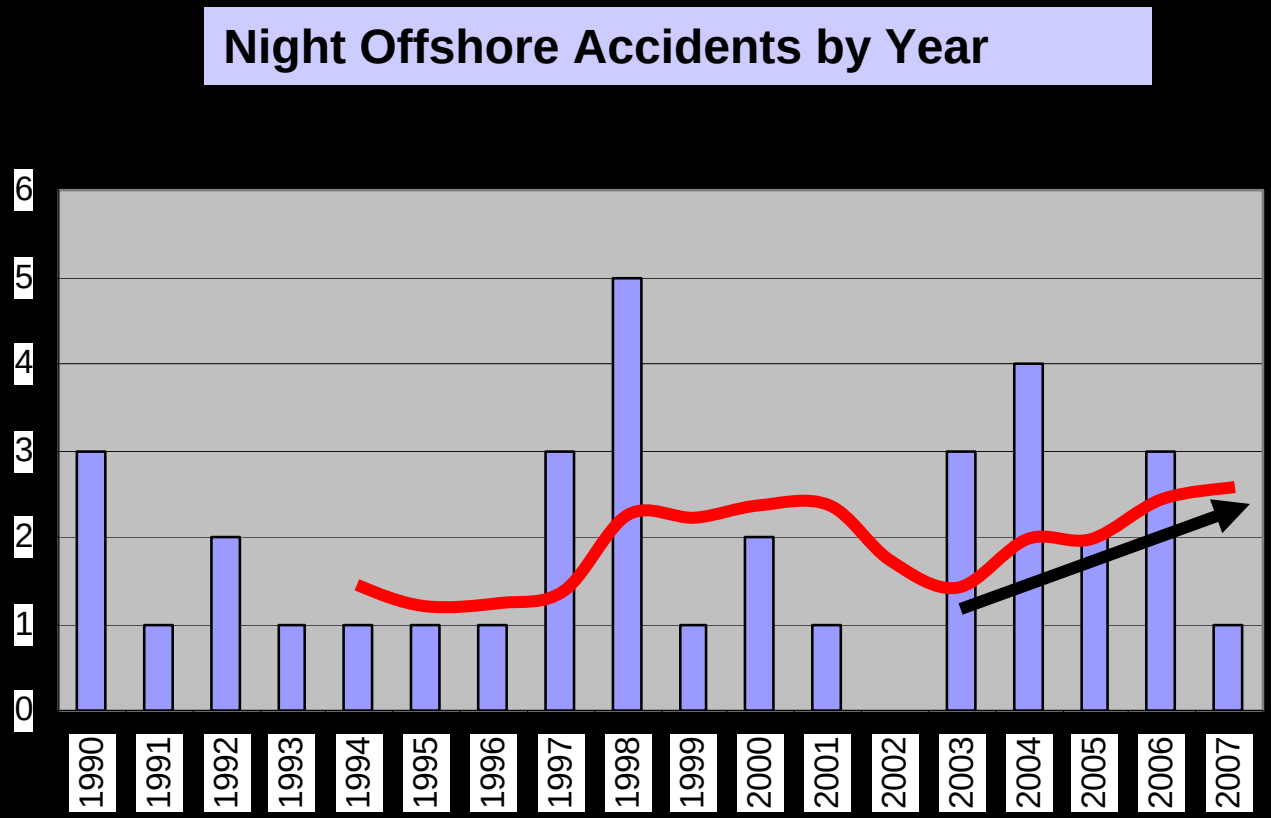
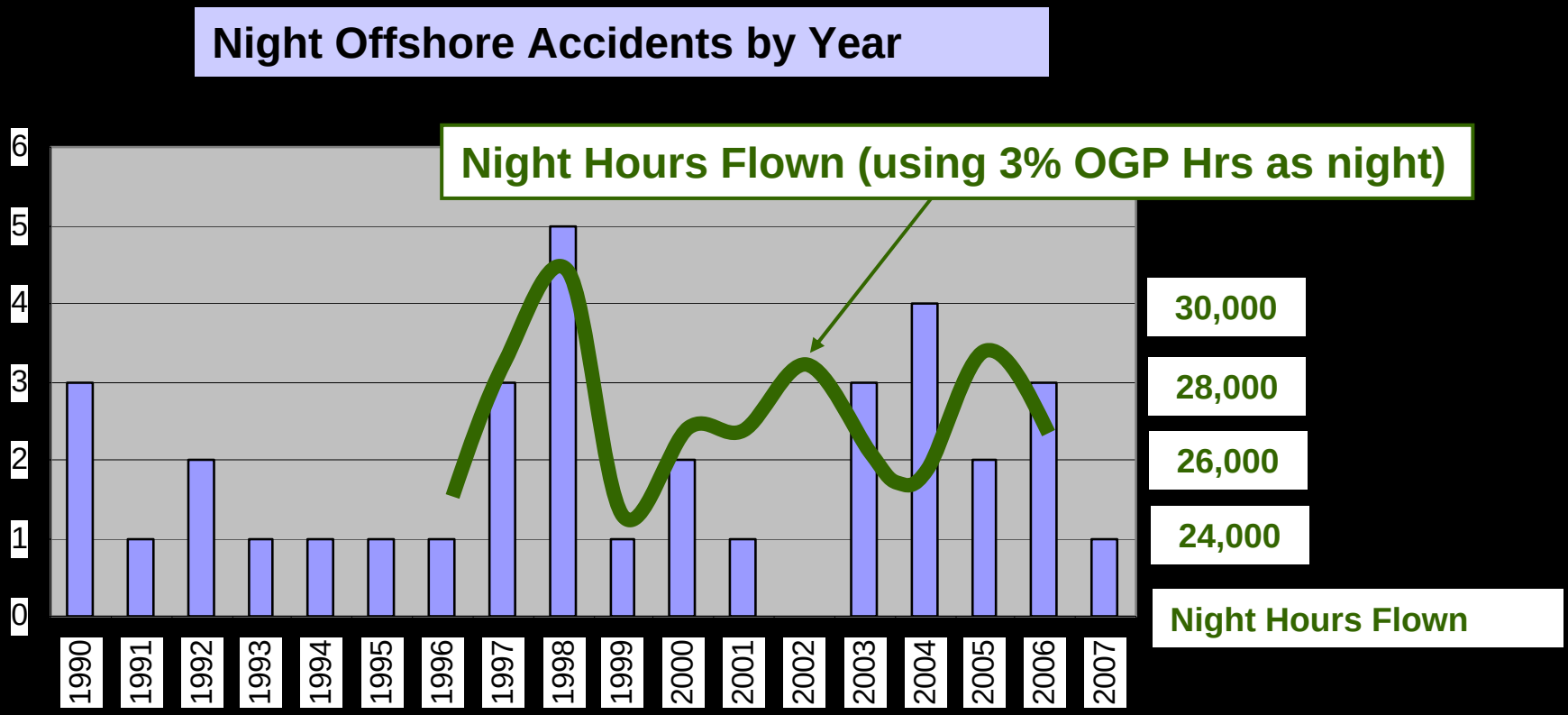


5-yr rolling average

Highest in 2007 with a positive gradient

Data Summary



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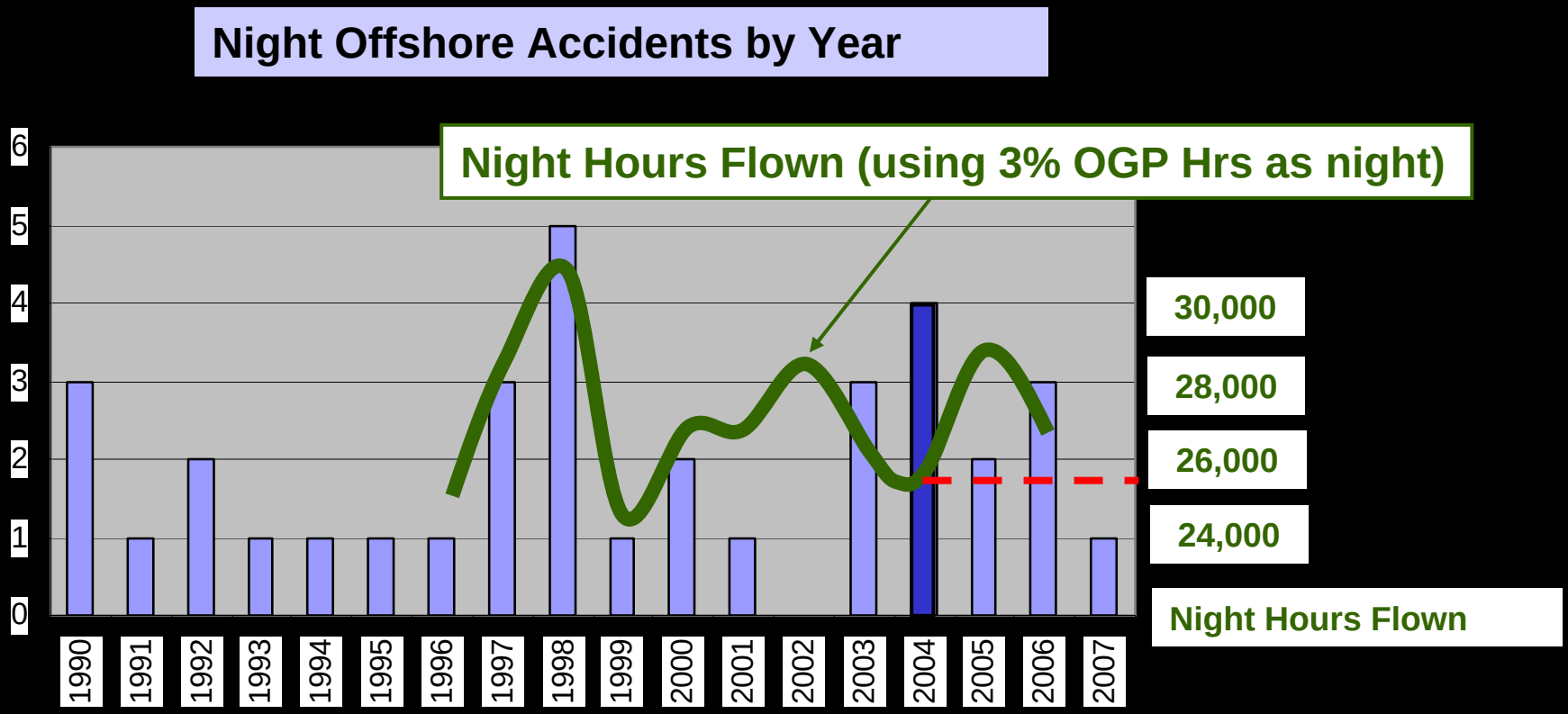
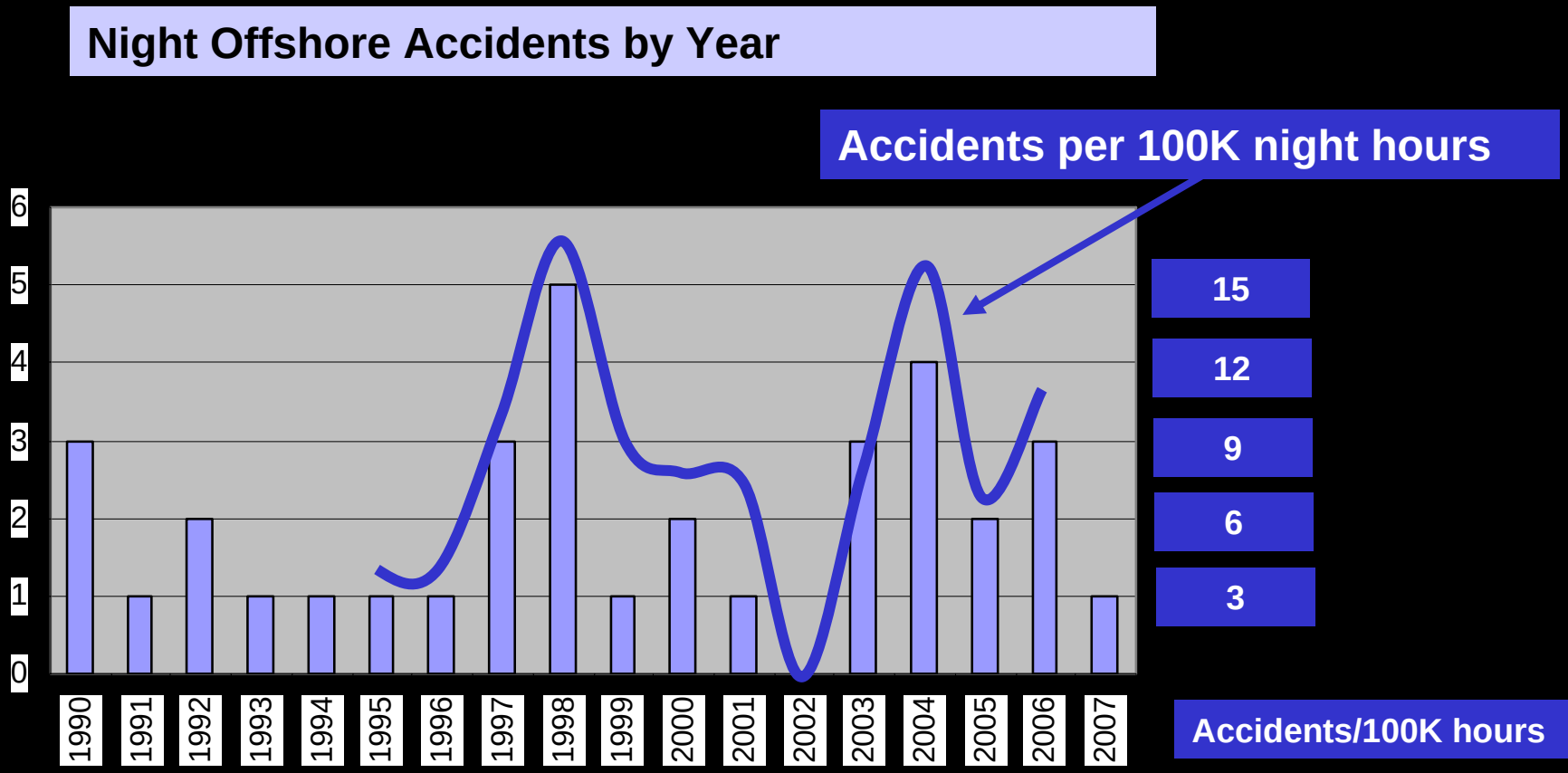


4 accidents in 2004: 25,800 hours flown → 15.5 accidents/100K night hours

Data Summary



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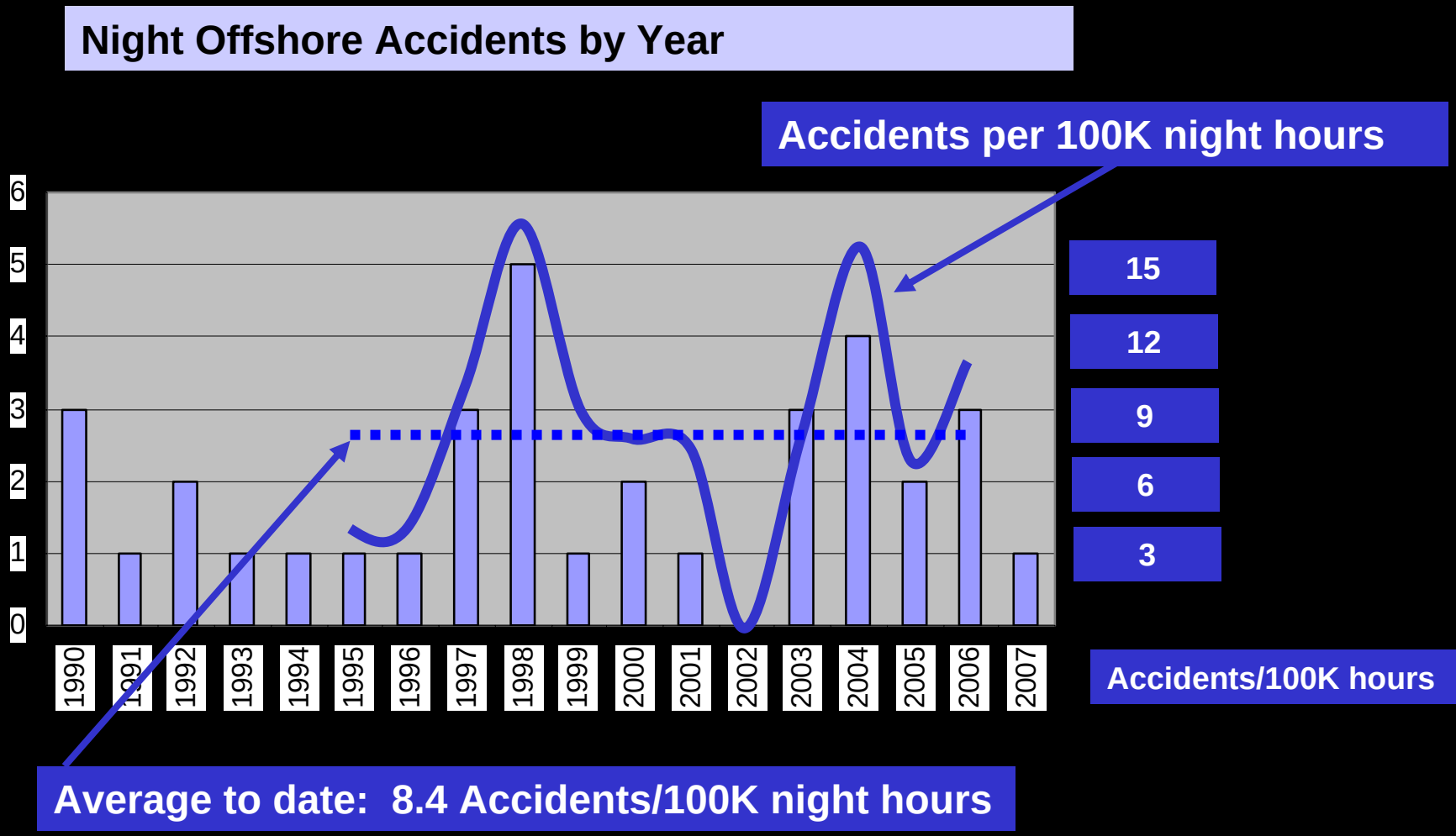

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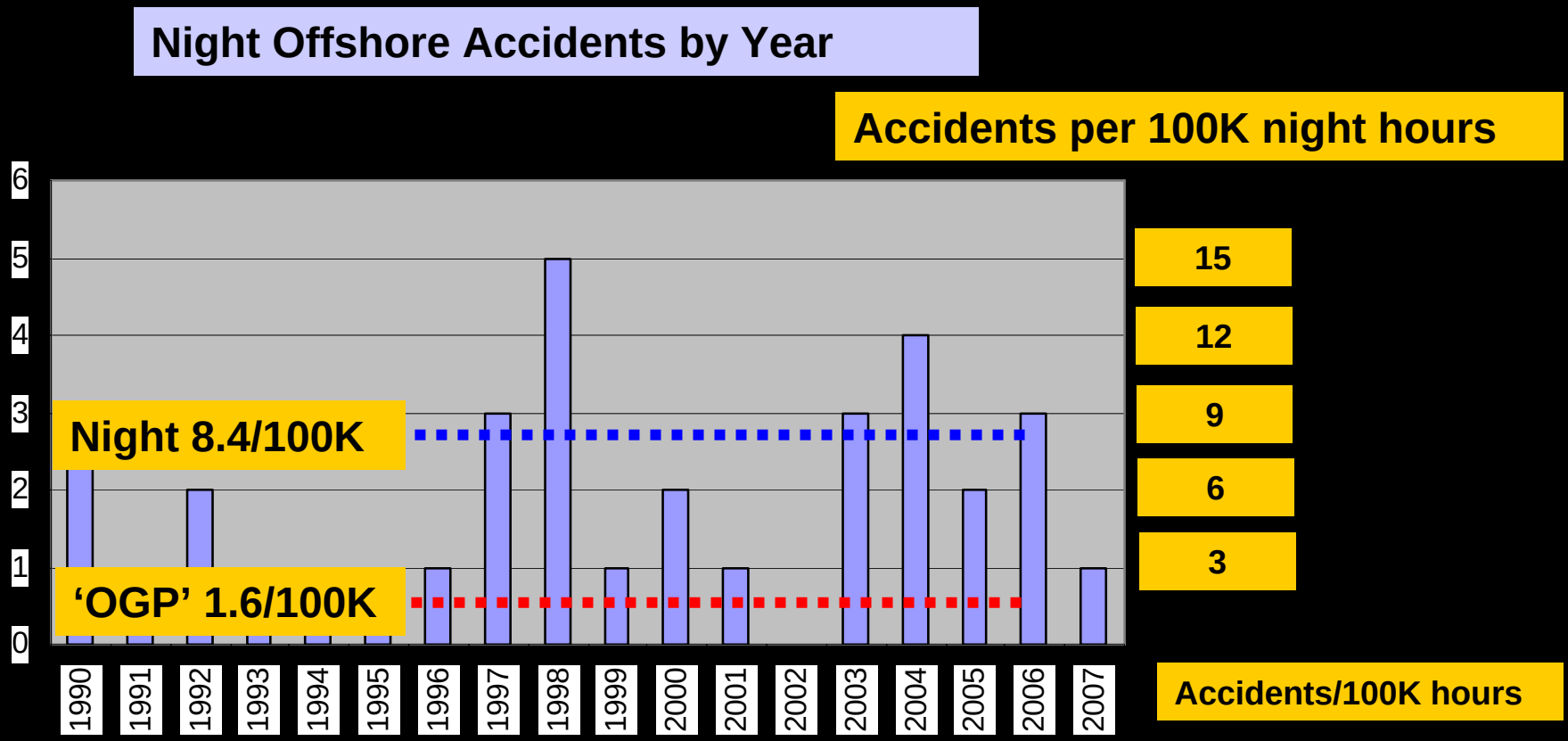

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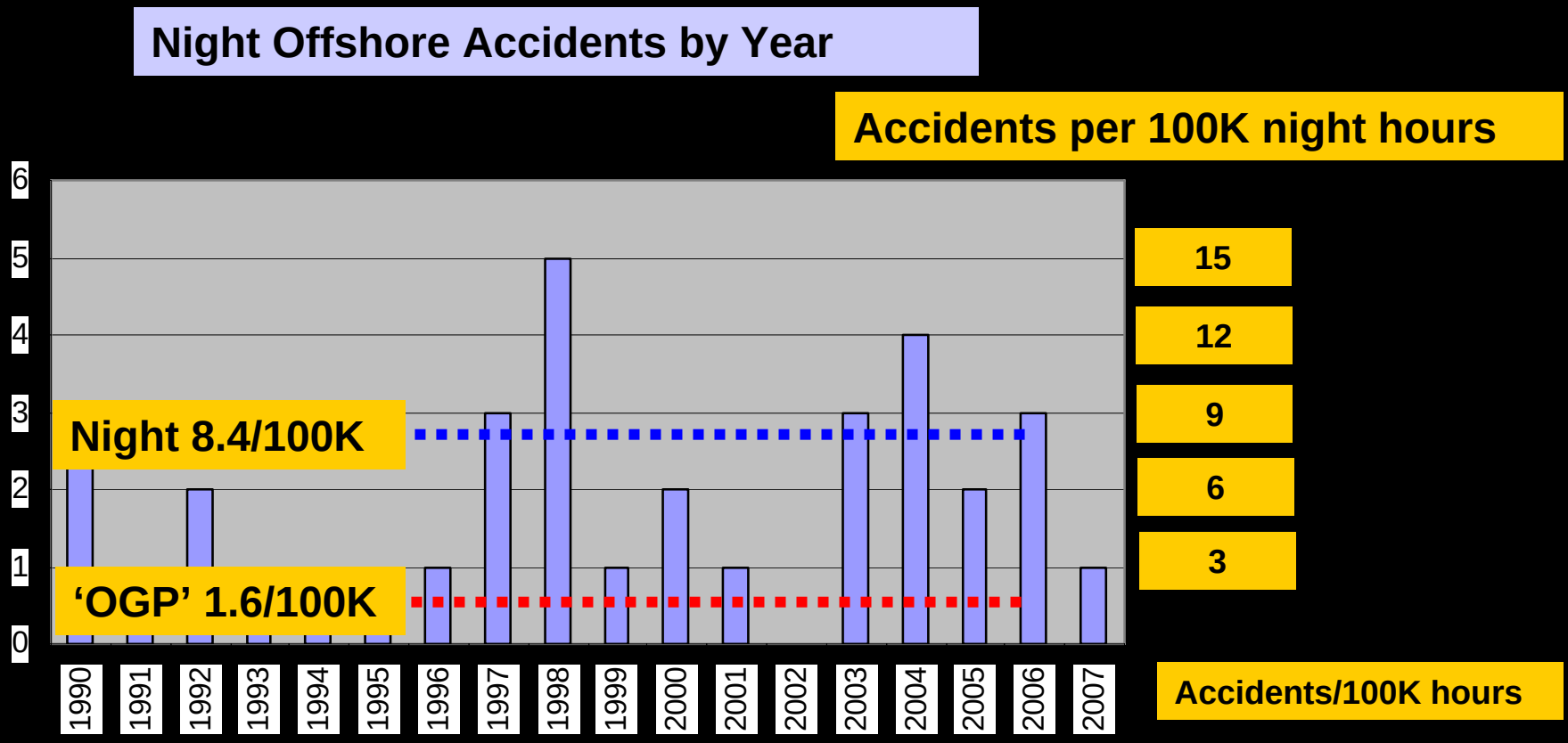


Disproportionately more night accidents/100K hours by factor of >5

Why the Focus?

Reality:

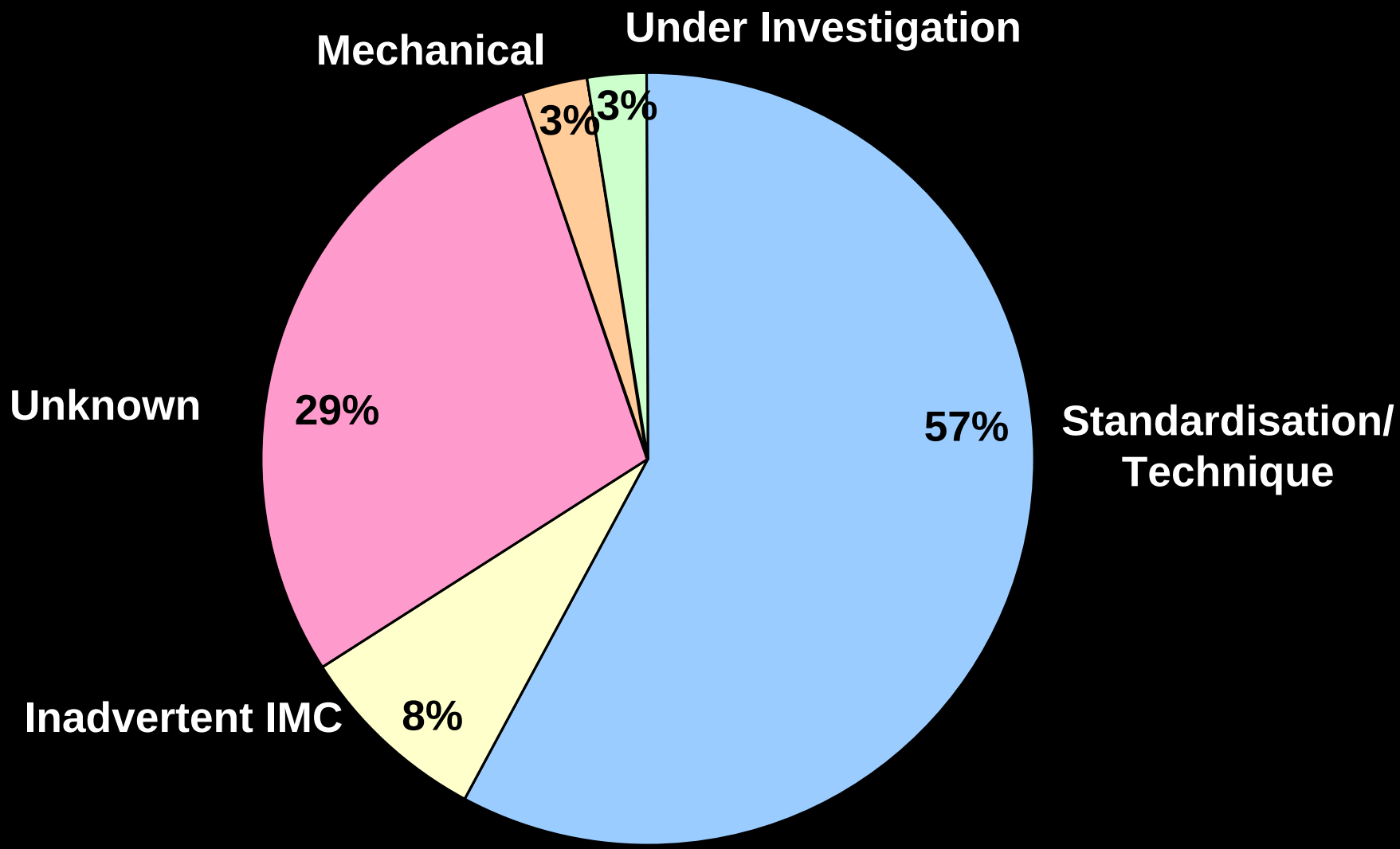
- *Industry is aiming to reduce accidents by 80% by 2016*
- *The Night offshore accident rate and trend has to be addressed if this target is to be met.*

Outlook:

- *We have all of the information we need to effect change*
- *The five-year average fatal accident rate/100K hours can begin to be reduced this year**
- *The five-year average fatal accident rate/100K hours can be reduced to zero by 2016**

*..... if we make one or two changes

Root Cause Analysis



Inadvertent IMC – what went wrong

All aircraft were conducting visual operations in a night IFR environment and went IMC

- All flown VFR to destination

- All involved single pilot

- No apparent use of missed approach procedures

- No IVSI, radalt, audio alerts (AVAD)

Inadvertent IMC – how to improve

1. Accept **‘Night VFR Offshore’** as an oxymoron and a misnomer

FAR 135.207 VFR Helicopter Surface Reference Requirements:

No person may operate a helicopter under VFR unless that person has visual surface reference or, at night, visual surface light reference, sufficient to safely control the helicopter.

No moon, no stars = no horizon = IFR
A single light source does not provide an horizon

Inadvertent IMC – how to improve

1. Understand ‘Night VFR Offshore’ is a misnomer

2. Operate with two instrument qualified crew

3. Operate in accordance with IFR procedures

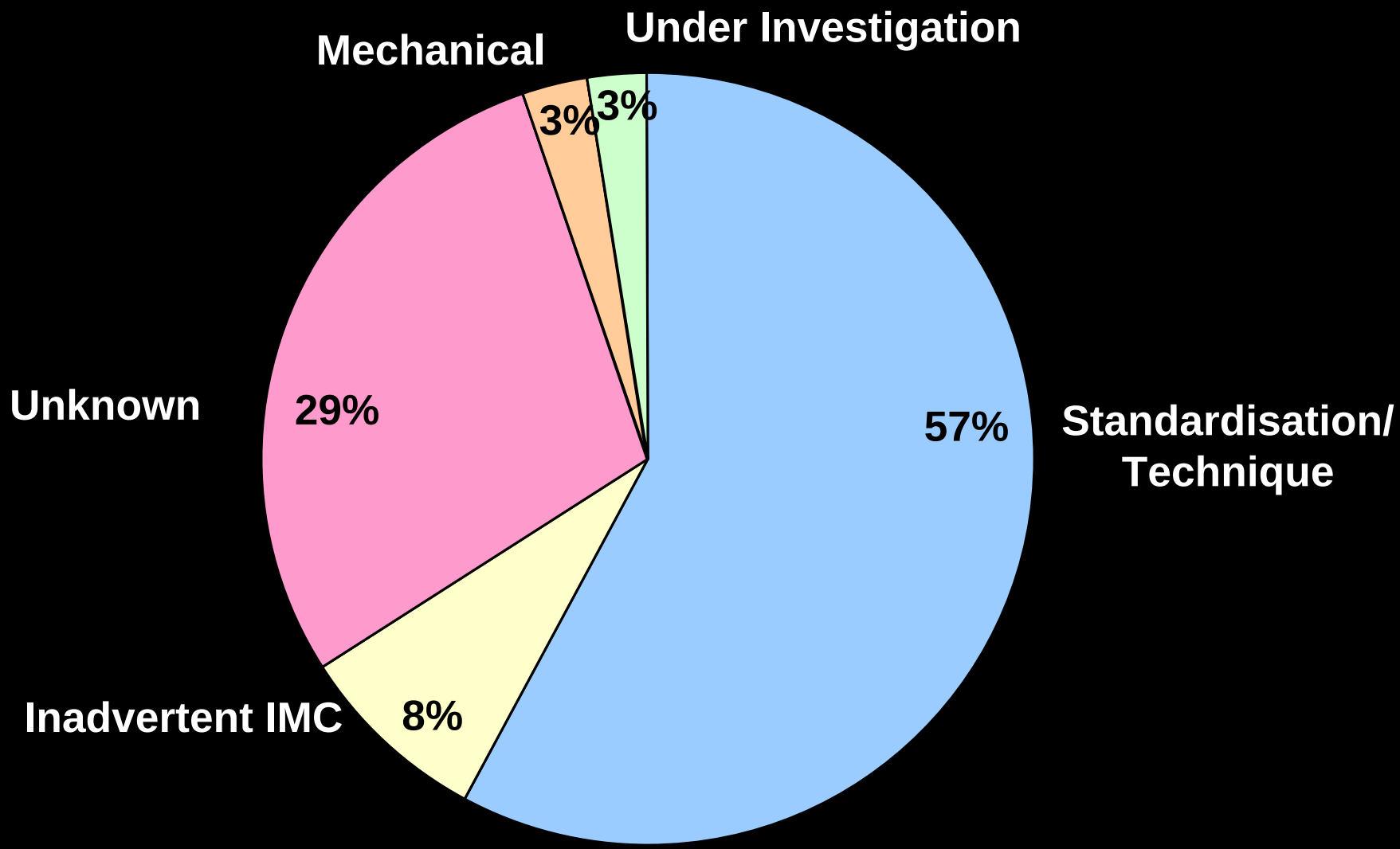
3. Operate IFR equipped aircraft

- IVSI’s, Radalts, AVAD, Stabilisation equipment (AFCS, Autopilot)

4. Use of Standard Operating Procedures

- discussed further

Root Cause Analysis



Standardisation / Technique – what went wrong

Lack of situational awareness in the air

Transfer from IFR to VFR and back to IFR contributing factor. Spatial disorientation, no horizon, lack of visual cues - without disciplined procedural processes to fall back on.

Standardisation / Technique – what went wrong

Lack of positional awareness in the air

Transfer from IFR to VFR and back to IFR contributing factor. Spatial disorientation, no horizon, lack of visual cues - without disciplined procedural process to fall back on.

Poor handling / incorrect profile flown

Poor or incorrect handling by the aircrew. Inadequate use of automation and instrumentation. Incorrect profile – too steep, too slow, too shallow.

Standardisation / Technique – what went wrong

Lack of positional awareness in the air ('SA')

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Omission of action / inappropriate action by flight crew member

Failure to correctly follow procedures

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Omission of action / inappropriate action by flight crew member

Failure to correctly follow procedures

Poor crew coordination

Failure in monitoring/challenging

Standardisation / Technique – how to improve

Fixed Wing Community - Learning #1

Disciplined Adherence to Stabilised Approaches

Understanding factors contributing to non-stabilised approaches and have an appreciation of elements of a stabilised approach and corresponding tolerances.

Use of the Go-Around for an non-stabilised approach.

Standardisation / Technique – how to improve

Fixed Wing Community - Learning #1

Example of how Fixed Wing view stabilised approach

1. The aircraft is on the correct flight path
2. Small changes in heading/pitch to maintain correct flight path
3. Aircraft speed control (FW use of Vref + 20 indicative of tolerances)
4. Aircraft in correct landing configuration
5. Sink rate < 1000fpm unless special briefing completed
6. Power setting appropriate for approach configuration
7. All briefings and checklists have been completed
8. Approach tolerances complied with and wings level 300’AGL
9. Unique approach, or abnormal conditions, have been specially briefed

Standardisation / Technique – how to improve

Fixed Wing Community - Learning #1

Disciplined Adherence to Stabilised Approaches

If not stabilised, executing the Go-Around is GOOD!

Standardisation / Technique – how to improve

Disciplined Adherence to Stabilised Approaches

Nine (9) elements of a stabilised approach. Understanding factors contributing to non-stabilised approaches. Knowledge of tolerances defining stabilised approach. Use of the Go-Around for an non-stabilised approach.

Crew Coordination and Procedures

Standard industry calls, briefings and procedures for offshore night approach.

Standard industry criteria for when visual approach can be commenced.

Standardisation / Technique – how to improve

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Standard industry criteria for when visual approach can be commenced.

Hover to Forward flight – offshore

Go-around (Missed Approach) – offshore

Loss of Airspeed - offshore

Document procedures that define crew responsibilities and expectations for transition from the visual to sole reference using instruments and coordinated crew concept.

Standardisation / Technique – how to improve

Disciplined adherence to stabilised approaches

Document procedures for transition from the hover to forward flight from visual reference to sole reference using instruments and coordinated crew concept

Crew Coordination and Procedures

Document procedures that define crew responsibilities and expectations for transition from the visual to sole reference using instruments and a coordinated crew concept.

Training

3 offshore take-off and landings every 90-days

Standardisation / Technique – how to improve

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Procedural training (use of simulators, LOFT)

Standardisation / Technique – how to improve

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3 offshore take-off and landings every 90-days

+

Procedural training (use of simulators, LOFT)

+

Helicopter Operations Monitoring Program

Accident Prevention Summary (Part 1)

Operate as if in an IFR environment

Two IFR qualified pilots

IFR capable aircraft – IVSI, Radalt, AVAD, AFCS

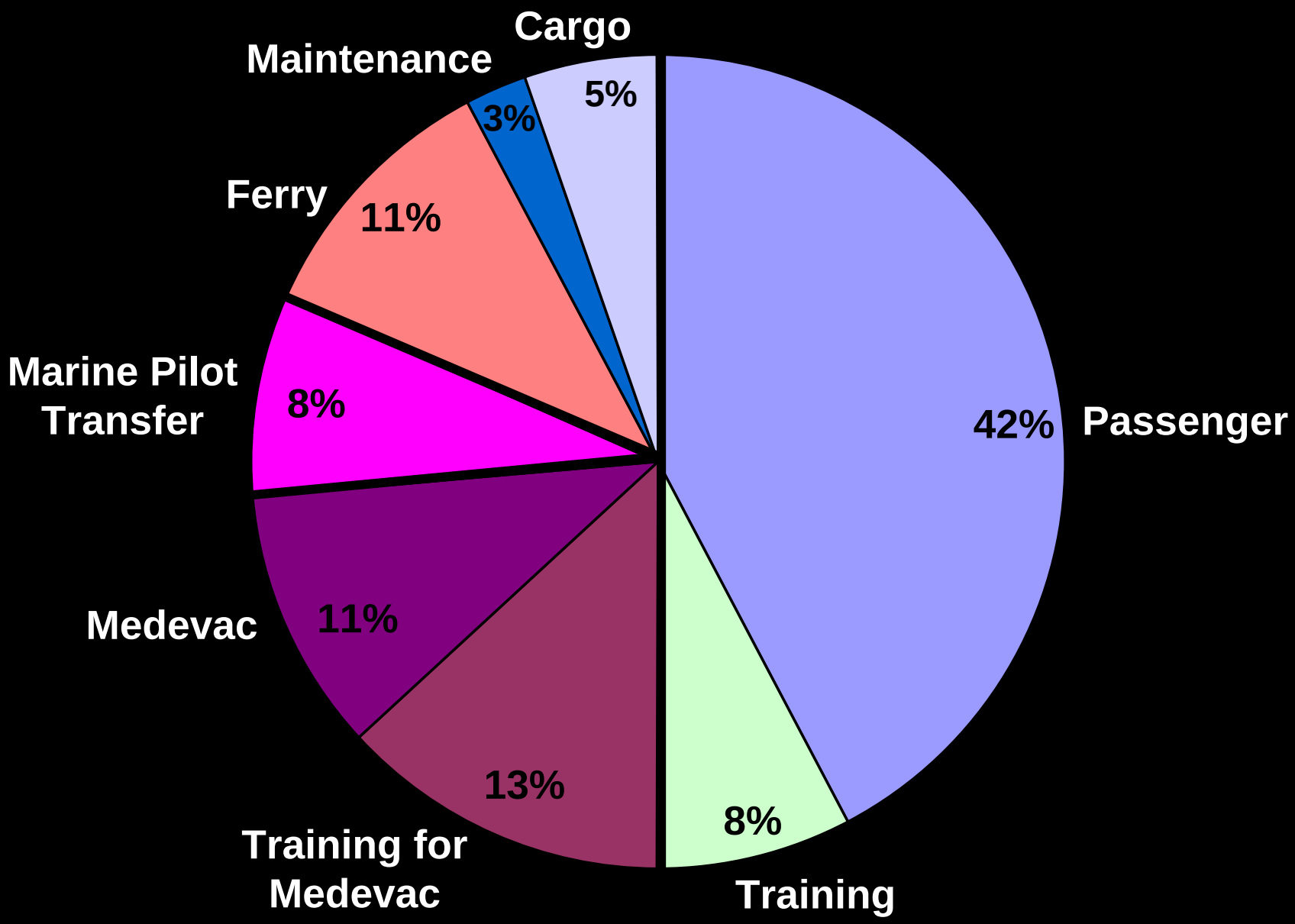
Comprehensive SOP's – Stabilised Approach

Comprehensive SOP's – Instrument to Visual

Crew trained regularly

HOMP

Accident by Role: 1990 - 2007

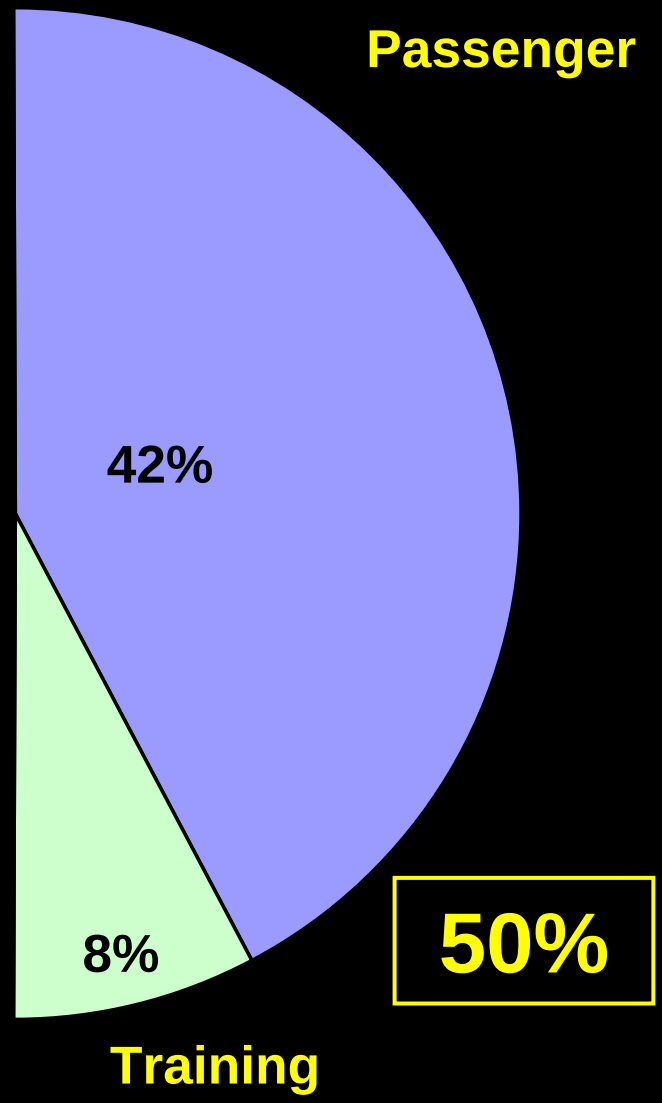


Accident Prevention – Passenger Role

Base Assumption from root cause analysis:

- Dual IFR qualified pilot
- IFR operation
- 2 x IVSI, 2 x radalts, AVAD, AFCS

- Twin turbine
- TAWS, EGPWS
- Adverse Weather Policy
- Experience & recency – aircrew
- Procedures and Training



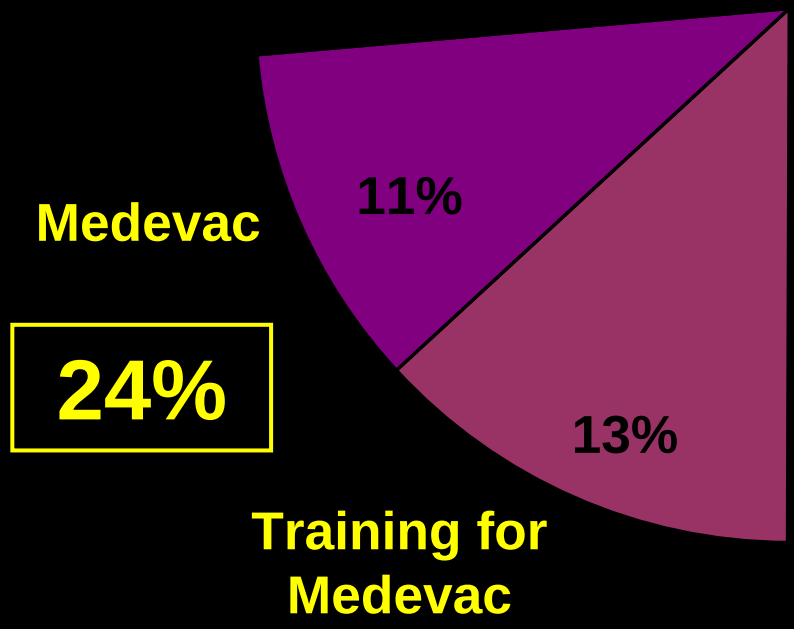
Accident Prevention – Base Case

Base Assumption:	Accident Prevention Base Case:
- Twin turbine	TAWS, EGPWS
- Dual IFR Pilot	Adverse Weather Policy
- IFR operation	Experience & Recency
- IVSI, Radalt, AFCS	Procedures and Training

Accident Prevention – Offshore Medevac

Base Assumption:	Accident Prevention Base Case:
- Twin turbine	TAWS, EGPWS
- Dual IFR Pilot	Adverse Weather Policy
- IFR operation	Experience & Recency
- IVSI, Radalt, AFCS	Procedures and Training

+



- Risk Assessment

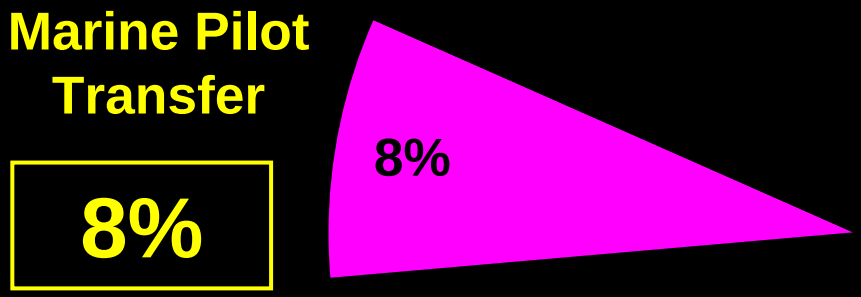
Involve client organisation, aircraft operator and Company medical and aviation expertise.

- Company Guidelines

Based on Risk Assessment develop guidance with call-out protocol and high level management endorsement. Night medevac for life threatening situations only.

Accident Prevention – Marine Pilot Transfer

‘Night Visual Flight Rules (VFR) Offshore’ is a misnomer and an oxymoron

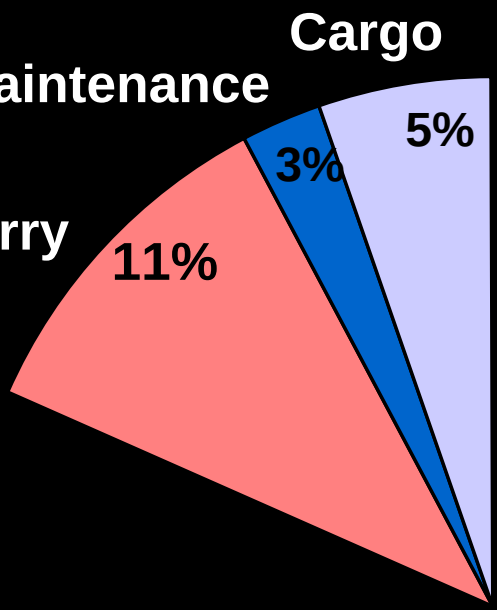


Dark night, no horizon, offshore = IFR environment

MPT should be considered no different than the offshore passenger role

Accident Prevention - Non-Passenger

19%



3 Standardisation / Technique

1 Inadvertent IMC

3 Unknown

No maintenance flights at night

No cargo flights at night

No ferry/re-positioning at night

Accident Prevention Summary (Part 2)

Operate as if in an IFR environment

Two IFR qualified and regularly trained pilots

IFR capable aircraft – IVSI, Radalt, AVAD

Trained using comprehensive SOP's – Stabilised Approach

Trained using comprehensive SOP's – Instrument to Visual

HOMP

Twin turbine

TAWS, EGPWS

Adverse Weather Policy

Experience and recency

Aircrew procedures and training

Medevac Policy in place for life threatening situations only

No maintenance flights, cargo or ferry flights at night

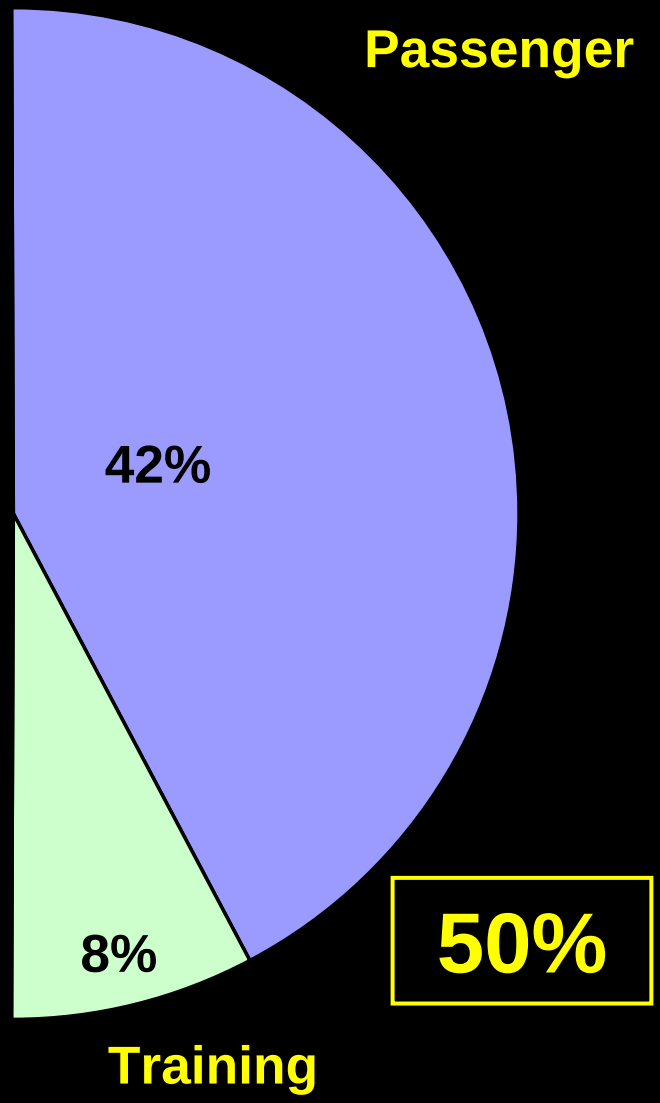
Marine Pilot Transfer be treated the same as night offshore passenger flights

Accident reports tell us majority of accidents would not have occurred if these controls and error traps were in place and effective

Accident Mitigation

Base Assumption:	Accident Prevention:
- Twin turbine	TAWS, EGPWS
- Dual Pilot	Adverse Weather Policy
- IFR operation	Experience & Recency
- IVSI, 2 x radalts	Procedures and Training

- HUET, HEELS, Survival Suits A/R



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Base Assumption:	Accident Prevention:
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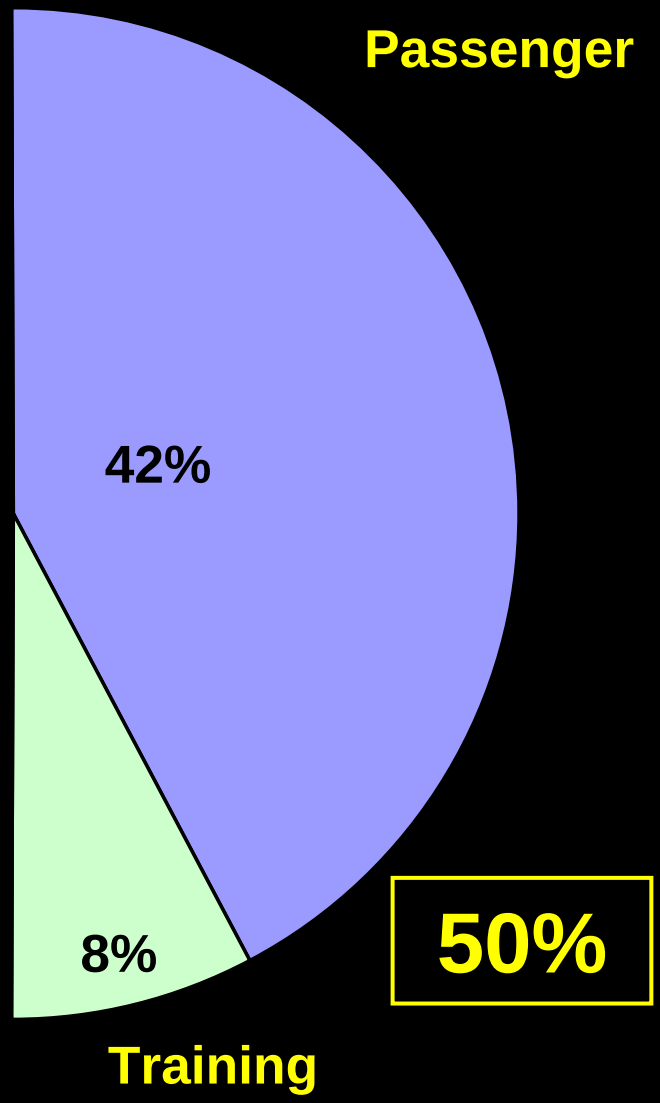
- IVSI, 2 x radalts	Procedures and Training

- HUET, HEELS, Survival Suits

- Automatic Float Inflation



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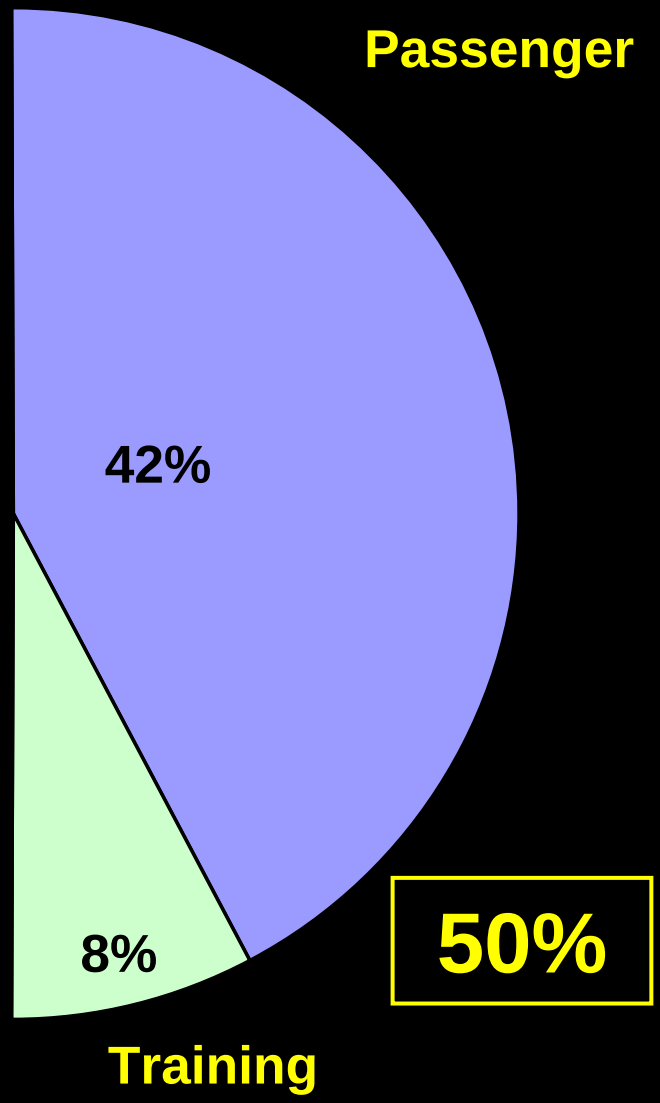
- HUET, HEELS, Survival Suits
- Automatic Float Inflation
- **External Liferafts**



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- HUET, HEELS, Survival Suits
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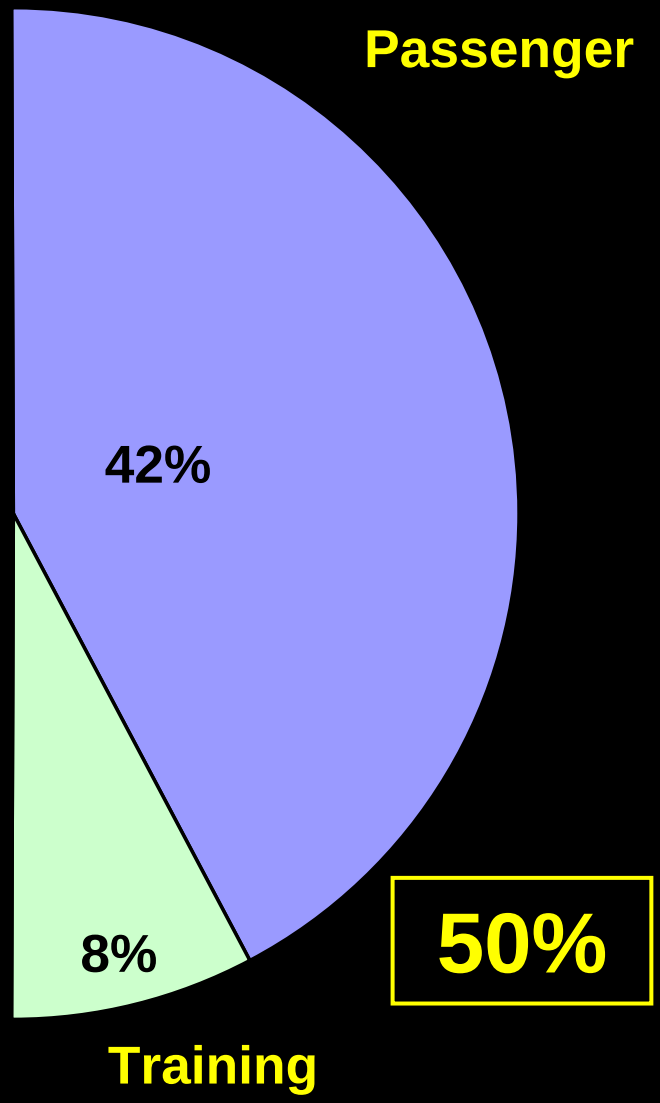
- External Liferafts
- **Adverse Weather Policy**



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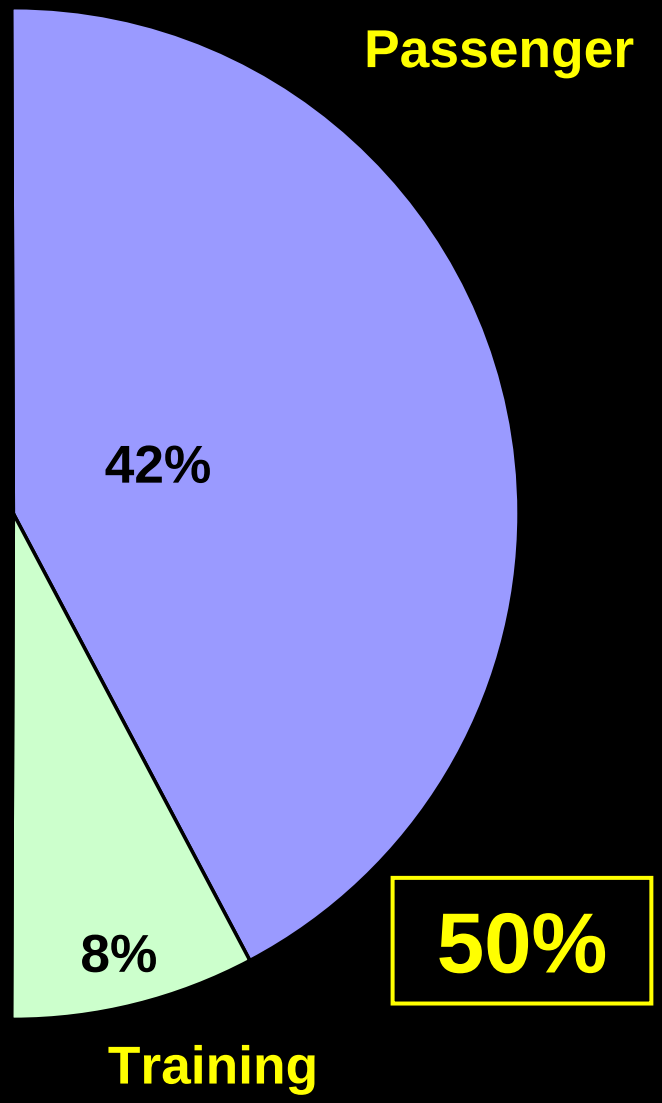
- IVSI, 2 x radalts	Procedures and Training

- HUET, HEELS, Survival Suits
- Automatic Float Inflation
- External Liferafts
- Adverse Weather Policy
- **SAR Review**



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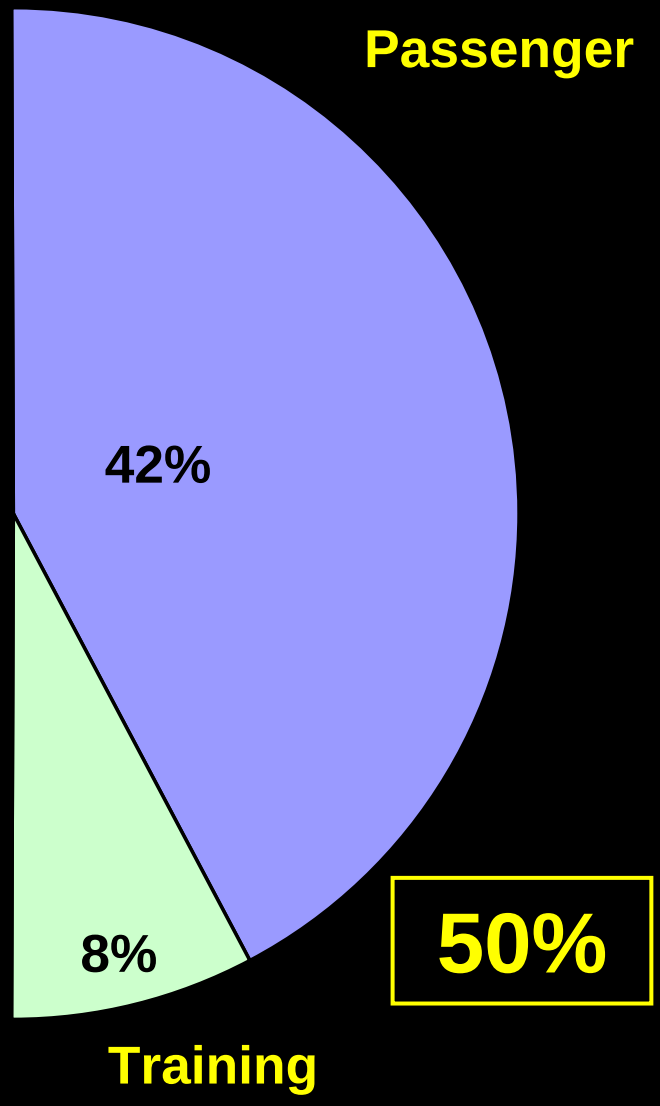
- IFR operation	Experience & Recency
- IVSI, 2 x radalts	Procedures and Training

- HUET, HEELS, Survival Suits
- Automatic Float Inflation
- External Liferafts
- Adverse Weather Policy
- SAR Review
- **Satellite Flight Following**



Accident Prevention and Mitigation Summary

Operate as if in an IFR environment

Two IFR qualified pilots, trained regularly

IFR capable aircraft – IVSI, Radalt, AVAD

Comprehensive SOP's – Stabilised Approach

Comprehensive SOP's – Instrument to Visual

HOMP

Twin turbine

TAWS, EGPWS

Adverse Weather Policy

Experience and recency

Aircrew procedures and training

HUET, HEELS, Survival Suits A/R

Automatic float inflation

External liferafts

Adverse Weather Policy

SAR capability

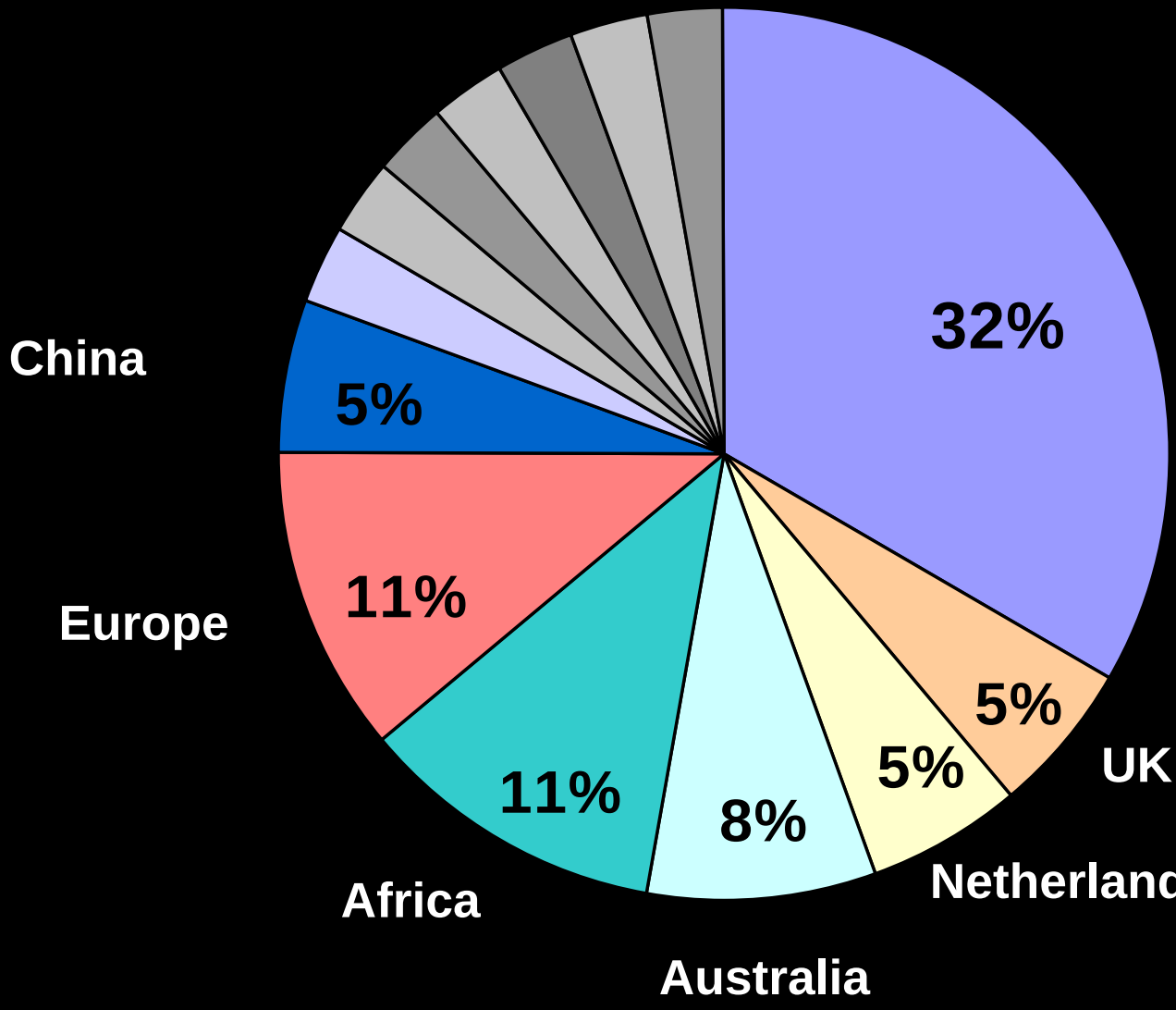
Satellite flight following

Medevac Policy in place for life threatening situations only

No maintenance flights, cargo or ferry flights at night

Marine Pilot Transfer be treated the same as night offshore passenger flights

Accidents by Location: 1990 - 2007



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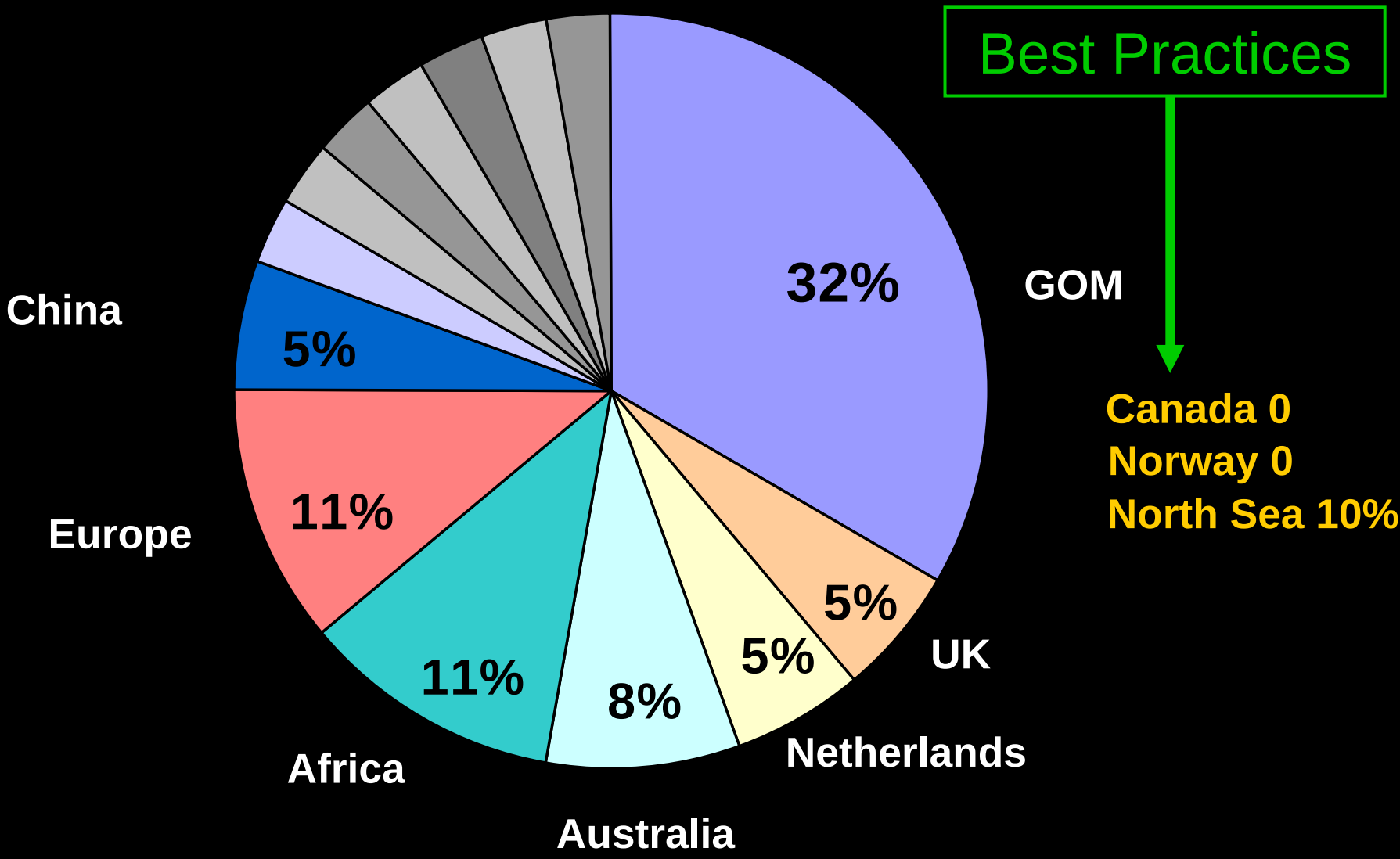

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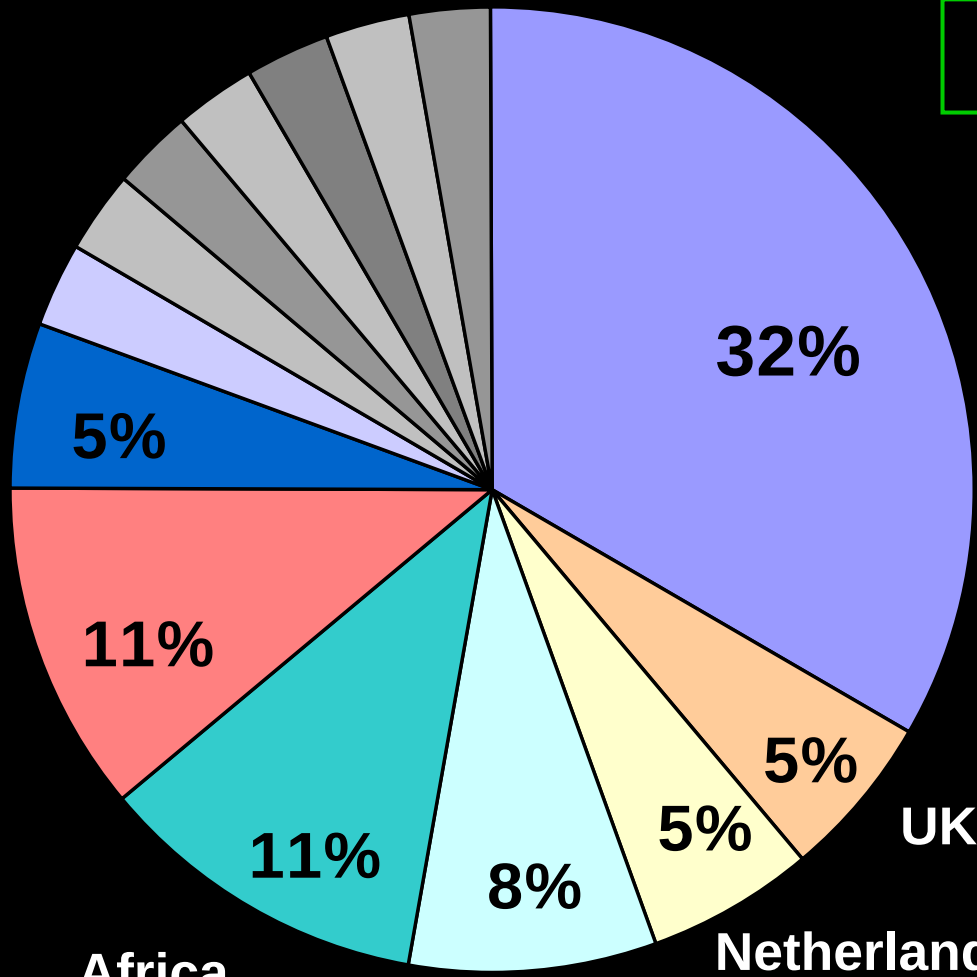


Best Practices

Canada 0
Norway 0
North Sea 10%

20

Available technology to be pursued

Enhanced Vision Systems (EVS)

Operational in fixed wing

Synthetic Vision

Flying in a helicopter today

Platform Visual Landing Systems

Recommended in accident reports and ICAO documents

Helideck Lighting Systems

Thames Alpha Phase Two trials

Technology – Enhanced Vision Systems

Technology – Synthetic Vision

Technology - Visual Landing Systems

ICAO Heliport Manual 3rd Edition 1995

"A single unit indicator, known as the Helicopter Approach Path Indicator (HAPI) should be installed at an elevated heliport or helideck where there is the need to provide approach slope guidance visually...."

"The HAPI system is closely associated with the safety of helicopter operations...."

Australian BASI Report B/915/1020 SA330J 12/5/1991

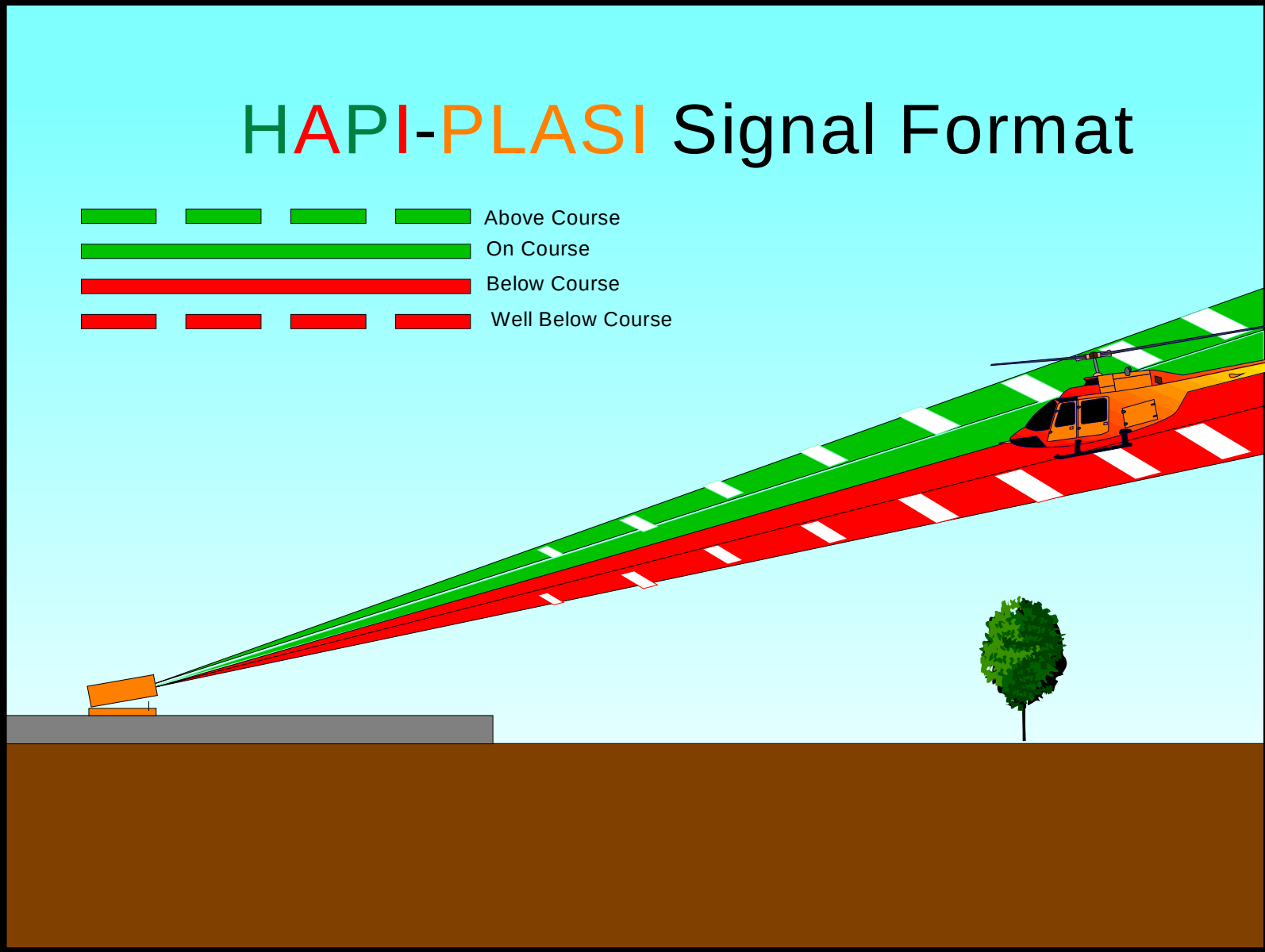
Install visual aid for night offshore approaches to offshore platforms

PLASI-2000

HELICOPTER
PULSE LIGHT APPROACH SLOPE INDICATORS

INCREASING OFF SHORE
HELIDECK SAFETY

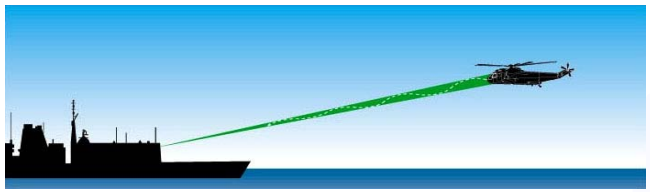
Technology - Visual Landing Systems



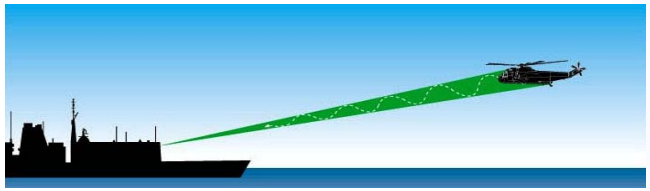
Technology Visual Landing Systems

HELIVAS

Stabilised Glide Slope Indicator (SGSI)



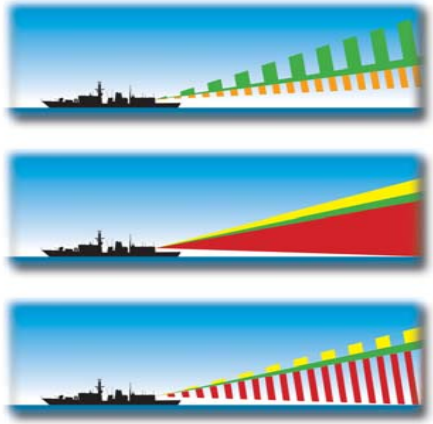
1º wide command sector provides optimum guidance without being over restrictive



2 º wide command sector allows high rates of decent to build up before corrective signal is observed.

2 º is to compensate for poor stabilisation

BEAM GEOMETRY



- The Red Sector should not hit the sea and high approach sector should not allow a high rate of decent to build up
- NVG sector frequencies 0.7Hz upper, 3.9Hz lower, command sector steady
- Colour transition between sectors < 3arc minutes, 1.8m @ 2km

www.agiltd.co.uk

Technology - Helipad Lighting Systems

OGP Approach to Night Offshore Operations

Reaffirmation of current ‘base case’

1) Two pilot, twin engine IFR operation, IVSI, 2 radalts, AVAD, autopilot
2) 3 offshore deck landings every 90-days or suitable equivalent
3) TAWS/EGPWS, HUET and Adverse Weather Policy

Accident Prevention - Mandate

6) Pilot experience – Captains 25 hours night offshore
7) Focus on offshore night training syllabus of Operators
8) Develop localised Medevac Guidance based on RA and with appropriate senior management endorsement
9) HOMP

- Instrument to Visual
- Stabilised Approaches
- Documented procedures

Accident Mitigation – Mandate

10) HEEL, Automatic float inflation, External life-rafts
11) SAR review and RA
12) Satellite flight following

Pursuit of New Technology

13) Enhanced Vision, synthetic vision
14) Helideck visual approach indicators and helipad lighting – pursue trials

OGP Consideration

Safety Monitoring – Low Workload (and should diminish)

1) Continue to track night offshore accidents. Using sub-group approach reach consensus on additional subjective analysis associated with causal factors.

Procedural – Medium Workload

2) Work with operators (Bristow, CHC, Cougar, PHI *et al*) + industry (EHOC, HSAC) to assist industry in producing guidance paper on standardised night offshore procedures and training syllabus.

Technology – Medium Workload

3) Work with OEM's to impart necessity for external life-raft, automatic floatation, emergency exit lighting to be an offshore standard.
4) Work with OEM and operators on progressing vision technology and GPI's

Trial – Medium workload by OGP ASC to coordinate and sponsor

5) Fixed and floating GPI procedures for industry

6) Procedural commonality for industry

Risk Based Approach

How can we use this data in a meaningful way?

Educate non aviation management

Conduct Risk assessment

Develop industry wide risk assessment ‘tool-kit’

Scenarios based on all data reviewed

Prevention and Mitigation based on accident reports

What would that tool-kit look like?

Night Flight Risk Assessment

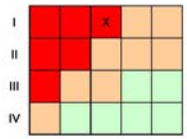
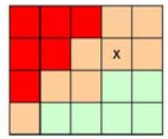
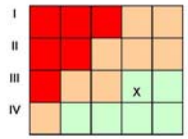
SAFETYWISE

HELICOPTER NIGHT OFFSORE OPERATIONS
RISK ASSESSMENT

Example Process and Worksheets

Night Offshore Helicopter Operations
Risk Assessment - Process

Risk Scenario Worksheet No. 9 (X) Health or Safety

Risk Rating Before any Risk Reduction Steps	Residual Risk after Implementing Immediate Actions	Risk Rating After Risk Reduction Steps
		

Hazard Event	Weather	
Risk Scenario Description	Night medical evacuation called out in marginal weather conditions. Not willing to question need for medevac, retrieval crew dispatched and enters unseen fog patch as descent goes slightly below standard glide path whilst on visual approach to platform. Pilot flying becomes momentarily disorientated and continues to try and fly the aircraft using visual procedures but does not arrest the rate of descent and the aircraft flies into the water at high speed.	
Potential Causes	➢ Lack of adequate weather forecasting ➢ Mission fixation overwhelming risk assessment of activity ➢ Lack of surrounding visual reference leading to disorientation ➢ Lack of understanding of issues associated with night visual illusions ➢ Deficiency in the interpretation of visual and instrument information by PF ➢ Deficiency in monitoring and challenging by PNF ➢ Lack of understanding requirements of a stabilised approach and the need to go-around if unstabilised ➢	
Consequences	➢ Potential fatalities - inability for aircraft to survive impact ➢ Potential fatalities - inability to egress ➢ Potential fatalities - inability for SAR to respond	
Existing Safeguards	➢ Night training - three offshore landings and take-off every 90-days	
Risk Ratings (Before mitigation)	Timeframe considered: 10 years **Likelihood:** C	**Consequences:** Health and Safety I
Basis for Risk Rating:	**Likelihood:** Category C based on OGP accident rate of 8.6 accidents per 100K flight hours. More than five times greater than day/night average of 1.6 accidents per 100K hours. Six fatal accidents and 19 fatalities associated with non-life threatening medevacs since 1990. **Consequences:** Consequences based on controlled flight into water at high speeds, personnel immersed in sea for extended periods.	
Near-term Risk Reduction Recommendations	➢ Two crew operations meeting OGP minimum experience requirements ➢ Adverse Weather policy ➢ Automatic Weather Operating Station (AWOS) ➢ Company guidance issued associated with night medevac for life threatening situations only	
Risk Ratings After Near-term Actions	Timeframe considered 3 months **Likelihood:** D	**Consequences:** Health and Safety II

Thank you

Any Questions ?

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