HeliOffshore
Safety Through Collaboration

Discussion paper on Offshore Helicopter Strategy

1. Introduction

All stakeholders in the Offshore Helicopter Transport Industry benefit from a clear view of where to focus to make the greatest difference to safety performance, what actions or best practice is available to help achieve this, and how well it is working. In addition, the more stakeholders work together to achieve their joint goals, the more that resources can be focused efficiently and momentum can be increased.

In addition, all parties can benefit from an approach which supplements best practice and standards with agreed performance or outcome goals. These goals can cover a number of topics, but crucially, there needs to be a focus on those activities that, when performed well in the frontline, help to prevent accidents. This helps to ensure actions are having the desired effect; and can help foster innovation between and across stakeholder groups to achieve breakthroughs in performance.

2. Purpose

Therefore, the purpose of having stakeholder alignment on the strategy for enhancing safety performance in our industry is to:

2.1. Focus resources in the areas that will make the greatest difference to safety performance.

2.2. Show that the combination of solutions (e.g., design, training, procedures, etc.) achieve the desired operational outcomes; and

2.3. Adopt implementation of solutions which enhance safety performance.

3. Progress so far

Many parties in the Offshore Helicopter Industry have done significant work to determine the strategic priorities for safety. Examples of this include the IOGP strategy, the Norwegian HSS1-3 Studies, the EASA technology study, the Joint Operators Review and IHST priorities. In addition, there have been several reviews of accidents and causal factors, including a recent review by EASA that is further explored in this report. Overall, there are significant areas of agreement and a sound basis for collaboration.

The formation of HeliOffshore, has also created a forum for senior stakeholders in our industry to commit to a resourced programme of activity, specifically aimed at addressing those priorities that will make the greatest difference to safety in the frontline. The mechanisms are being put in place to drive this forward with momentum. While our industry experiences a prolonged downturn, stakeholders remain committed to maintaining a focus on safety, and to do so in the most efficient and joined-up way possible. As a result, the opportunity now is to:

- Underline our commitment to safety;
- Agree key priorities and a high level strategy;
- Work together to deliver it;
- Use data to inform our decisions and demonstrate progress.

4. Purpose of this paper

This paper is being used to create alignment around the approach and the content of an Offshore Helicopter Safety Strategy. The last section includes a set of questions to readers, to help us achieve this. For ease of use, these are also provided below.

This paper is a draft for discussion. Readers are encouraged to consider the following questions:

a. Do you support the overall approach outlined in the paper?

b. What do you think the key priority areas should be?

c. Do you have any comments on the proposed goals?

d. What are the most important actions, in your view, for improving safety in our industry?

e. Do you think we should find ways to measure or judge whether or not our actions are having the desired effect?

f. If yes, do you have a view on what these should be or how they should be developed?

So far, contributions to this paper have been made from several helicopter operators, oil companies, manufacturers and regulators, who are uniting behind this. It also fits nicely with the ICAO Annex 19 concept that each organization, country and region should have a Strategic Safety Plan so that collaboration can be enhanced across the global aviation system. For example, EASA have a regional safety plan that has been fairly well developed for fixed wing, but not so much for Helicopters. In January 2016, a group of senior stakeholders from Oil Companies, State Regulators, Manufacturers and HeliOffshore met with EASA, who are in the process of updating the European Safety Plan section on Offshore Helicopters to align with this paper.

Now is a good time to ensure that our key global aims are included in this paper, so we can use it as a basis for efficiently collaborating on the things that matter most to safety in our industry.

5. Proposed Approach

In order for us to agree a high level strategy, it is proposed we consider the following:

5.1. **Agree overall target–** our vision for the future.

5.2. **Agree high level priority areas –** to optimize use of resources and momentum.

5.3. **Agree high level goals –** to be clear about intended outcomes and foster innovation.

5.4. **Develop performance measures –** to measure or judge if actions are having the desired effect.

5.5. **Identify high potential actions –** areas where it is agreed there is a high potential for safety enhancements or areas where further work to establish this potential is recommended.

5.6. **Document in European Safety Plan and other key Strategies** (e.g., IOGP, HeliOffshore etc.) Encourage link to organizational and State Safety Plans.

5.7. **Implement and track progress –** e.g. completion of actions, extent to which good practice is being implemented, performance/safety data, feedback from frontline.

6. Examples

This section gives a brief description and some examples for each of the steps above.

6.1. **Agree overall target -** Our ultimate aim stems from our deep commitment to the passengers and crews that fly to and from their offshore workplaces each day. We believe that loss of life is not acceptable. We believe that significant progress can be made by closing the gap to fixed wing commercial aircraft safety records. Therefore, our intermediate goal is to ensure that:

6.1.1. *Flying on duty offshore should be at least as safe as flying on the average global commercial airline*

6.2. **Agree high level priority areas –** Use data and expert judgment to agree which areas we should focus on to enhance safety performance. The excerpt from the recent EASA accident report gives a good basis to discuss this (see Appendix 1). For example, system failure, aircraft upset and obstacle conflict have the highest percentage of accidents, so these may be sensible areas to focus on to improve safety.

6.3. **Agree high level goals** – For each high priority area, we should determine: what are we trying to achieve, what would good look like in the future? In this case we propose the following to start a discussion:

A. System Failure
- Early diagnosis and resolution of potential failures , i.e., system(s) prognostic capability.
- Operation with serviceable and suitable safety equipment
- Improve equipment reliability, including fewer single point failures and system(s) redundancy
- Reduce operational impact of system failures
  - effective detection and recovery
  - reduction in the number of land immediately events
  - ensure that controlled ditching at sea is survivable
- Effective progressive maintenance.

B. Aircraft Upset
- Enhance Flight Path Management
- Early identification of deviation from appropriate flight path. E.g. Improved approach fidelity.
- Effective Design, Documentation and Use of Automation
- Enhance support for developments that improve aircraft capability to perform take-offs and landings from elevated heli-decks or runways at or near MGW (Max Gross Weight) in most operational conditions safely, repeatedly and with minimal or no exposure".

C. Controlled Flight into Terrain/Water/Obstacle
- Enhance space to maneuver, reduce obstacles
- Enhance ability to detect and avoid obstacles
- Develop precision terminal approaches

An example of a high level safety performance model for Safe Operations is provided in Figure 1 below. The rows outlined are the ones that, using expert judgement and safety data, are the areas to focus on in order to achieve the greatest safety benefit.

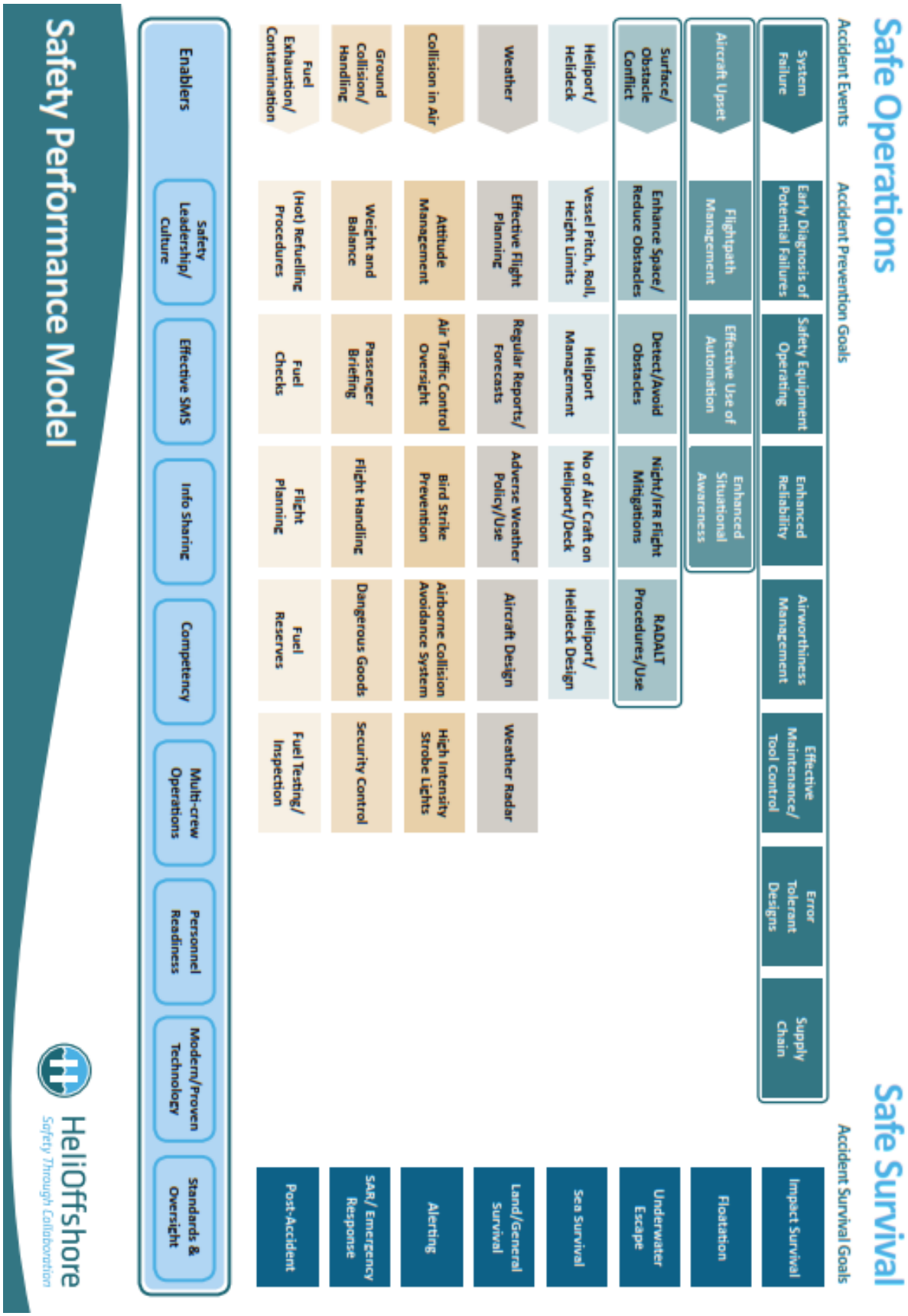


Figure 1. High Level Safety Performance Model Safe Operations

6.4. **Develop Performance Measures** – these are measures of operational tasks or functions and how well they can be accomplished (regardless of what combination of equipment, training, etc. are used). For example, the recently published HeliOffshore HUMS Best Practice Guide, provides some potential measures that would help to determine the goal above "Early detection and resolution of potential failures" (see Appendix 2), and the HeliOffshore Survivability working group has been considering measures for survivability goals like "impact survival" and "underwater escape" (see Appendix 3). The group is asked to consider the proposal that once we agree on the key goals, we should do some work to align around key performance measures for each goal.

Using a framework like this to agree the operational performance we are actually trying to achieve, helps to ensure that we are clear about how we would know if proposed good practice was having the desired effect, and keeps everyone focused on why it matters.

4.5 **Identify high potential actions/solutions –** areas where it is agreed there is a high potential for safety enhancements or areas where further work to establish this potential is recommended. Appendix 4 provides an excerpt from the EHEST Report on *The Potential of Technologies to Mitigate Helicopter Accident Factors. This report was aimed at the wider helicopter community, not just offshore,* but provides some useful information about the most promising technologies for safety improvement.

Priority Area	Potential Actions/Solutions
System Failure	Early Identification of potential failures • Effective use of HUMS • Optimise HUMS design • Mandate/contract for HUMS Enhance System Reliability Reduce single point failures • Mitigate or limit single engine flights • Implement Performance Class 1 equivalent performance Reduce number of land immediately events and maximise time to act • Increase run dry gear box times • Minimise false warnings • Enhanced emergency drills (usability and suitability) Safety Equipment Operating • Operation with serviceable and suitable safety equipment Error preventing/tolerant design Maintenance Training to guard against system failure Continuing Airworthiness enhancements – share data and focus action on top 10 priority list for each type Survivability enhancements • Flight in appropriate conditions with adequate rescue coverage • Improved Certification Standards • Flotation Aids

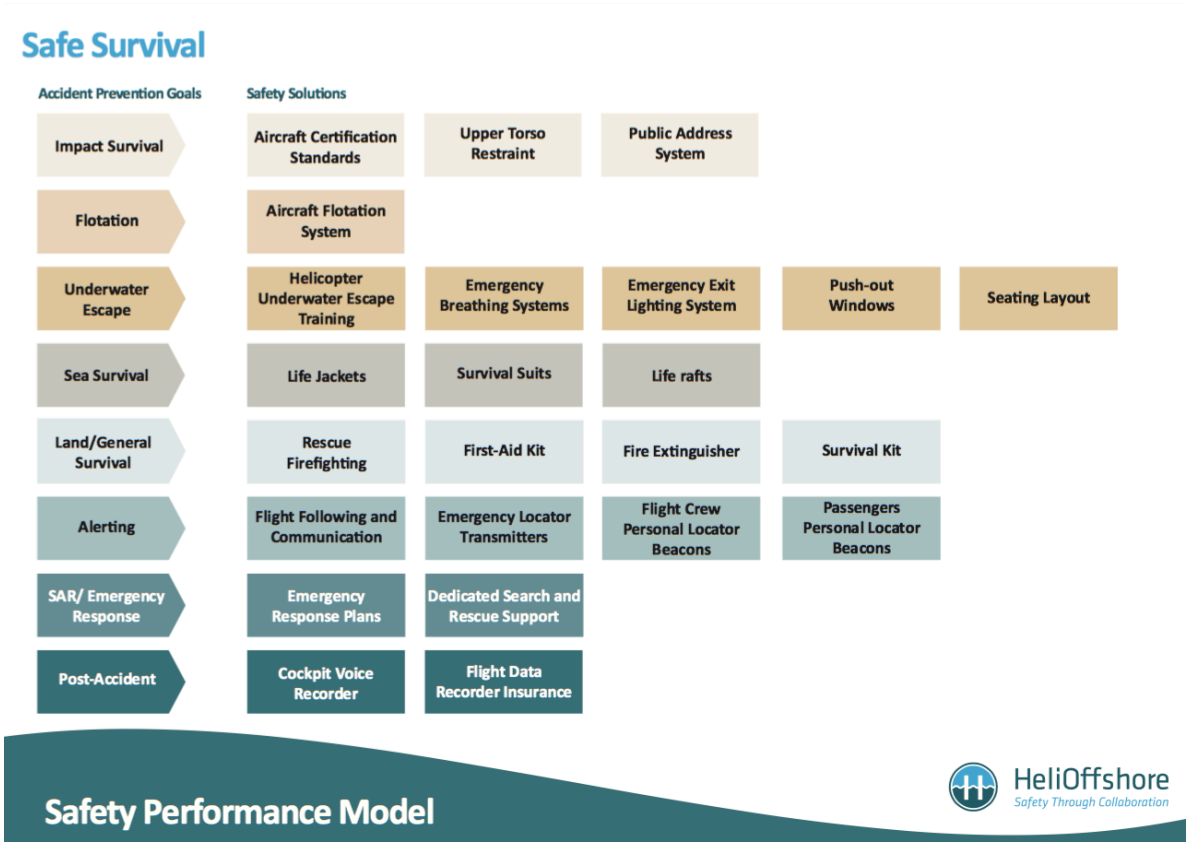
Priority Area	Potential Actions/Solutions
	• Emergency Breathing Systems • Standardised Helicopter Underwater Emergency Training
Aircraft Upset	Effective use of Automation (FCOM, Automation Policy, Training) Equipment/Training to support early identification and resolution of deviations from appropriate flight path Fully Coupled Approaches Sterile Cockpit policy Effective programme of Operational Performance Monitoring (flight and maintenance) such as Flight Data Monitoring (FDM), Line Operational Simulator Audit (LOSA) & Cockpit Video Evidence based training (EBT)
Obstacle Avoidance	Progress the implementation of new HTAWS algorithms that give increased warning time of obstacles Sensors that give warning of drift towards an obstacle Appropriate Helideck Design and Management • Helideck design standards • Helideck personnel competency and assessment • Helideck operator SMS and shared safety reporting • Helideck/Installation emergency response capability Realistic Simulator Training (right visual envelop, cockpit and flight profiles) Mitigate or limit night flights • Encourage the development and use of night, enhanced and synthetic vision systems • Enhance Helideck lighting Effective procedures/training for Radalt and HTAWS use
Common Controls These are actions that will improve our ability to enhance safety across the three areas above	Effective Safety Leadership and Culture Data sharing and lessons learned (especially leading or precursor measures) Competency of operational staff (pilots, maintainers, supervisors, helideck personnel, etc.), including selection, experience, personnel readiness, training and use of evidence based training to ensure capability on the functions discussed above All operators can clearly express their training goals, methods & outcomes. • Use of data to tailor training to operational needs and provide evidence of it's effect (EBT) • Training facility quality • Instructor quality Effective SMS – each organisation should have their own safety strategy that shows their priorities to enhance safety performance, their actions and ways of measuring and evaluating performance (e.g., results in the frontline). This should be linked to this high level strategy where appropriate.

Priority Area	Potential Actions/Solutions
	Enhanced certification standards – e.g. for reliability, crashworthiness and human factors. Consideration of how to deliver safety benefits as quickly and effectively as possible. Use of modern technology with safety and reliability enhancements. Consideration of how to deliver safety benefits as quickly and effectively as possible, both for new types and in service aircraft. Ability to cope with changes in technology and the operating environment (e.g., remotely piloted vehicles).

4.5 **Document in European Safety Plan and other key Strategies** (e.g., IOGP, HeliOffshore etc.) Encourage link to organisational and State Safety Plans. Ensure action owners, timescales, and outcomes are clearly identified.

4.6 **Implement and track progress** – Ultimately we should set implementation goals and timelines for completion of actions, how quickly good practice is adopted, performance/safety outcomes and feedback from the frontline. This can be done industry-wide, regionally and at organizational or team level. Links to the high level plan should be encouraged.

Figure 2 below shows an example of the high level goals for survivability aligned with potential actions or solutions .



7. Summary

This paper is a draft for discussion. Readers are encouraged to consider the following questions:

g. Do you support the overall approach outlined in the paper?

h. What do you think the key priority areas should be?

i. Do you have any comments on the proposed goals?

j. What are the most important actions, in your view, for improving safety in our industry?

k. Do you think we should find ways to measure or judge whether or not our actions are having the desired effect?

l. If yes, do you have a view on what these should be or how they should be developed?

Appendix 1: Excerpts from EASA Report[1]
Offshore Helicopter Risk Portfolio

The following data informs the HeliOffshore Safety Strategy, which is what we have used as the basis to agree which areas we should focus on to enhance safety performance. The following excerpt from the recent EASA accident report gives a good basis for discussion, for example, system failure, aircraft upset and obstacle conflict have the highest percentage of accidents, so we have selected these as justification for our priority areas to focus on to improve safety.

		Key Risk Areas (Outcomes)							
	Outcome Percentage of Fatal Accidents (Last 15 Years)	27.8%	16.7%	13.9%	8.3%	5.6%	0%	0%	0%
	Outcome Percentage of Non-Fatal Accidents (Last 15 Years)	34.4%	8.2%	9%	4.9%	4.9%	4.1%	1.6%	0.8%
Safety Area	Safety Issues	System Failure	Aircraft Upset	Obstacle Conflict	Terrain Conflict	Fire	Abnormal Runway (Landing Area) Contact and Excursions	Airborne Conflict	Incursions and Wrong Deck Landings
Operational	Detection, Recognition and Recovery of Deviation from Normal Operations		•	•	•	•	•	•	•
	Control of the Helicopter Flight Path and Optimal Operational Use of AFCS Capabilities		•	•	•		•	•	•
	Obstacle Clearance			•	•			•	
	Operation in Adverse Weather Conditions		•	•	•		•	•	•
	Fuel management	•	•						
	Flight Planning and Preparation		•	•	•	•	•	•	•
	Ground/ Helideck Operations	•	•	•		•	•		•
	Safe Landing Environment			•		•	•		•
	Helicopter Maintenance	•	•	•	•	•	•	•	•
Technical	Diagnosis of System Failures	•	•			•	•		
	Gearbox and Transmission System Reliability	•	•						
Consequences	Safe Forced Landings	•	•	•	•	•	•	•	•
	Safe Survival and Egress	•	•	•	•	•	•	•	•
Human Factors	Flight Crew Perception and Awareness		•	•	•		•	•	•
	CRM and Communication		•	•	•		•	•	•
	Knowledge and Competency of Individuals	•	•	•	•	•	•	•	•
	Personal Readiness	•	•	•	•	•	•	•	•
	Use of Rules and Procedures	•	•	•	•	•	•	•	•
Organisational	Crew Composition and Management		•	•	•		•	•	•
	SMS Implementation	•	•	•	•	•	•	•	•

Figure 1: Excerpts from EASA Report Offshore Helicopter Risk Portfolio from the last 15 years of global and offshore operations only

[1] *Included with permission from EASA*

To enable an initial consideration of the Key Risk Areas (Outcomes) for the Offshore Helicopter Safety Risk Portfolio, the following chart provides details of the occurrence categories that were assigned to offshore helicopter occurrences.

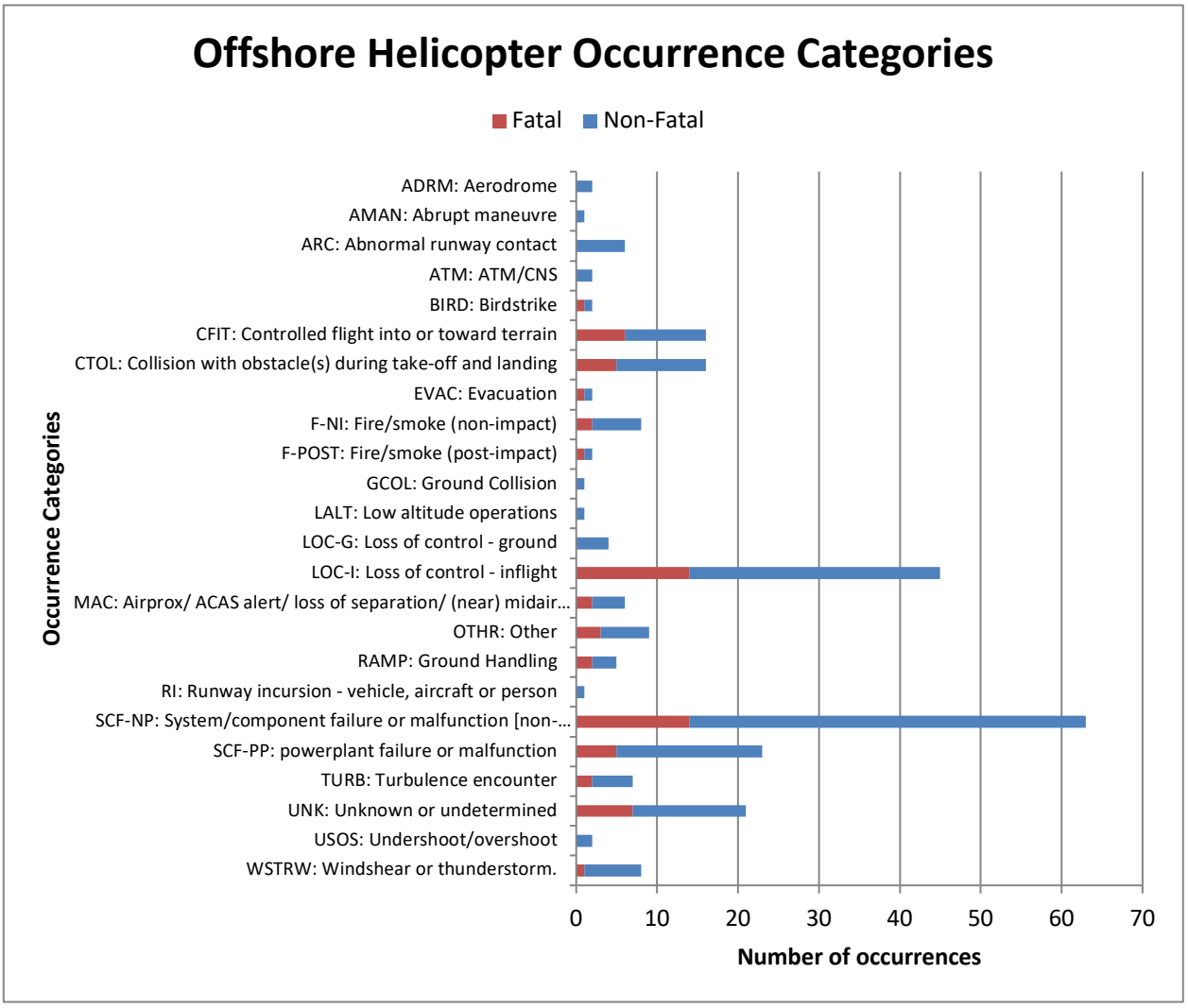


Figure 2: Offshore Helicopter Occurrence Categories from EASA Safety Risk Profile

The four categories with the highest level of fatal accidents are:

1. System/component failures or malfunction
2. Loss of control in-flight
3. Controlled flight into or toward terrain
4. Collision with obstacle(s) during take-off and landing

Appendix 2: Potential HUMS System Performance Reports
Excerpt from HeliOffshore Best Practice Guide

Reports are produced when components are removed from the aircraft and routed to the overhaul shop or OEM/TCH for repair. Collected data is used to validate discrepancies found, or guide in troubleshooting for a root cause of removal. Additionally, this type of information is shared with the OEM/TCH.

1. Operator Maintenance Action Support

The operator should have a procedure in place to compile relevant data on components removed prematurely to assist in subsequent troubleshooting, repair, and improved component reliability.

2. Original Equipment Manufacturer/Overhaul Facility Support

The operator should have a procedure in place to provide timely and relevant data to the OEM/TCH Overhaul facility on HUMS related premature component removals and/or failures, to support root cause analysis efforts. Subsequently, the operator should ensure that the OEM/Overhaul facility provides a detailed component condition report for validation.

3. Defect Trending Reports

Defect trending should be presented to the operator's Management team during periodic review meetings. These reviews should include operational specifics of HUMS status in the day-to-day operation. In addition, current trends are provided to managers during their normal scheduled meetings and distributed at their respective field base location as feedback to HUMS authorized personnel and flight crew. Presentations may include HUMS data analysis results for each aircraft type being monitored and associated system from the previous quarter.

4. Performance Report Content

Example:

- False Alert Rate
- Sensor Failure Rate
- Instrumentation Defect Rate
- Number of Diagnostic Reports/Fault Cases
- HUMS Component Reliability
- Ground Station Software Serviceability
- Usage Exceedance Reports
- Defect Trending

Appendix 3: Potential Survivability Performance Measures

Operational Function	Performance Measure
Impact Survival	Crashworthiness (e.g. Class 1) Blast protection Obstacle Avoidance Fire Prevention
Flotation	Aircraft attitude enhances egress
Evacuation	2/3rds time to safety, avoiding fire
Underwater Escape	2/3rds time to safety, avoiding drowning
Land/Sea Survival	Protection from: • Drowning – time to escape/usable air • Hypothermia – time until rescue • Toxins • Physiological factors • Dehydration – time until rescue
Rescue	Time to locate Time to reach Time to safety

Appendix 4
Excerpt from EHEST Report
The Potential of Technologies to Mitigate Helicopter Accident Factors

The first five technologies are highly promising for three or more Accident/Incident Factors called Standard Problem Statements (SPS's):

1. Enhanced Ground Proximity Warning System / Terrain Awareness and Warning System; mitigating the following 5 SPS's (the number in square brackets denotes the SPS ranking number within the top 20 SPS's):
    - Pilot judgment & actions - Human Factors Pilot's Decision [1]
    - Pilot situation awareness - External Environment Awareness [2]
    - Pilot judgment & actions - Flight Profile [4]
    - Unsafe Acts / Errors – Judgment & Decision-Making Errors [8]
    - Mission Risk – Terrain / Obstacles [10]

2. Digital range image algorithms for flight guidance aids for helicopter low-level flight
    - Pilot situation awareness - External Environment Awareness [2]
    - Pilot judgment & actions - Flight Profile [4]
    - Unsafe Acts / Errors – Judgment & Decision-Making Errors [8]

3. Laser radar obstacle and terrain avoidance system
    - Pilot situation awareness - External Environment Awareness [2]
    - Mission Risk – Terrain / Obstacles [10]
    - Pilot situation awareness – Visibility / Weather [16]

4. Digital Map
    - Pilot situation awareness - External Environment Awareness [2]
    - Pilot judgment & actions - Flight Profile [4]
    - Mission Risk – Terrain / Obstacles [10]

5. Deployable Voice and Flight Data Recorder
    - Part/system failure – Aircraft [5]
    - Maintenance – Performance of Maintenance Duties [18]
    - Regulatory - Accident Prevention [20]

The concept of a technology-safety issues matrix is a powerful tool to prioritise technological solutions from a safety perspective and identify development needs. At a glance the scored results can be interpreted and the effort be focussed on developing the most promising technologies.

The industry is highly recommended to channel their technological development in line with the results of the study. The regulatory side should find ways to improve safety by adopting the technologies.