



Dedicated to innovation in aerospace

**The potential of technologies to improve safety of
future rotorcraft operations**

European Safety Promotion Network Rotorcraft (ESPN-R)
Laurent Declerck - 8th of November 2022

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Rotorcraft Department





ESPN-R & NLR

ESPN-R Coordinators:

- **NLR** – Joost Vreeken
- **Airbus** – Bernd Osswald
- **EASA** – Michel Masson

NLR activities within ESPN-R

- National accidents/incidents data gathering (EHSAT analysis team)
- Rotorcraft safety workshops (continued in EPAS)
- Lead Safety Technology working group

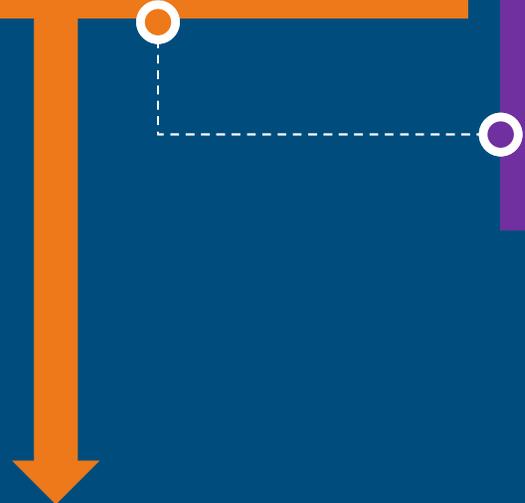




Common Safety Issues



Safety Technologies





EASA Rotorcraft Safety Roadmap

GOALS:

- 50% safety improvement by 2028
- Focus on light rotorcraft and small operators

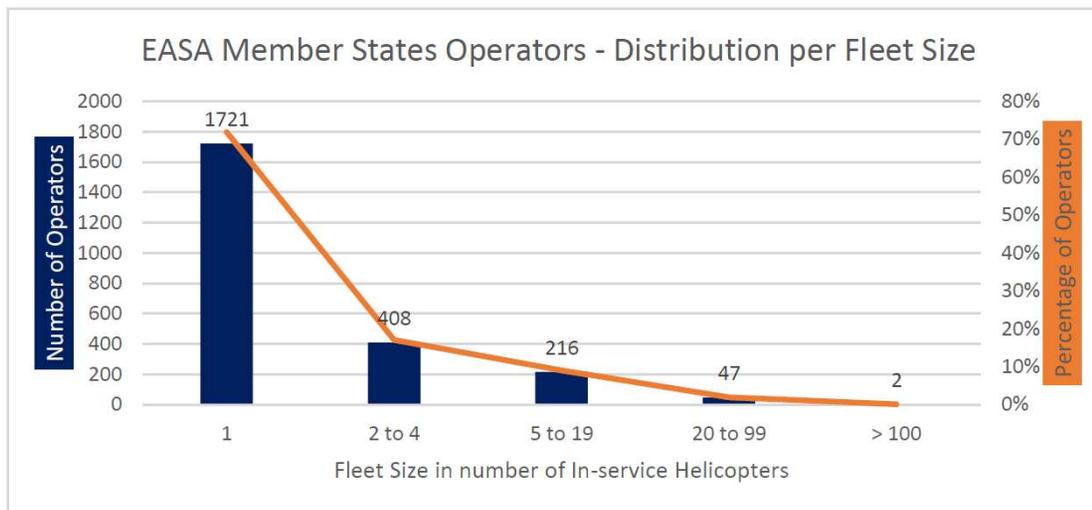
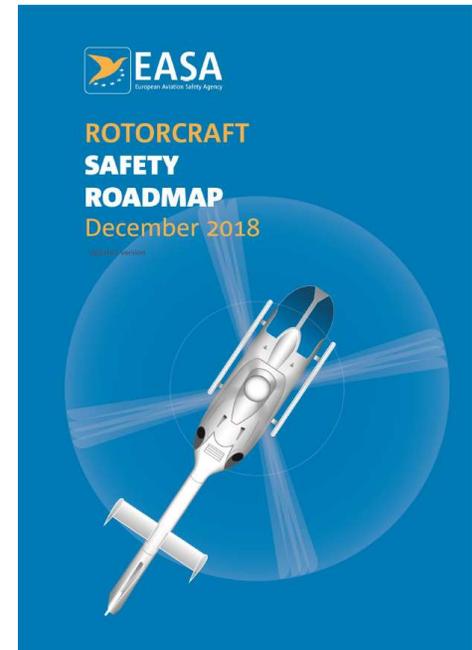


Figure: Distribution of EASA MS Operators by fleet size of In-service Helicopters. Source: FlightGlobal (aka Ascend)



Small operators: “It’s a fragmented community, which is very much concerned with the day-to-day business, similar in many ways to the General Aviation community”. – EASA Rotorcraft Safety Roadmap



Targeting Light Rotorcraft and Small Operators

- Light rotorcraft types: R22, R44, H125 ...
- Operations: leisure flights and special operations (aerial work in agriculture, training flights...)

Accidents 2008-2017:

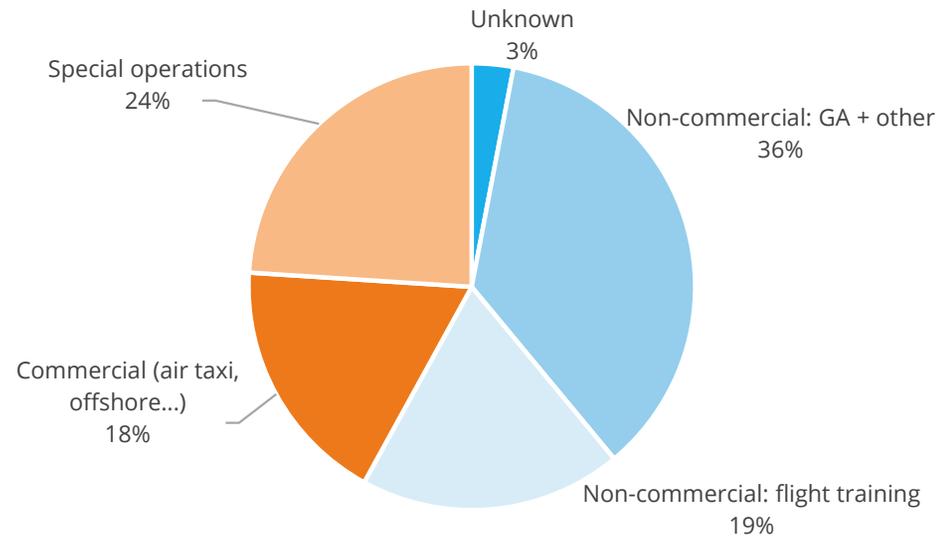


Figure: Accidents Reported to the Agency 2008 - 2017 by Type of Operation (Source FlightGlobal (aka Ascend) database)



Common Safety Issues

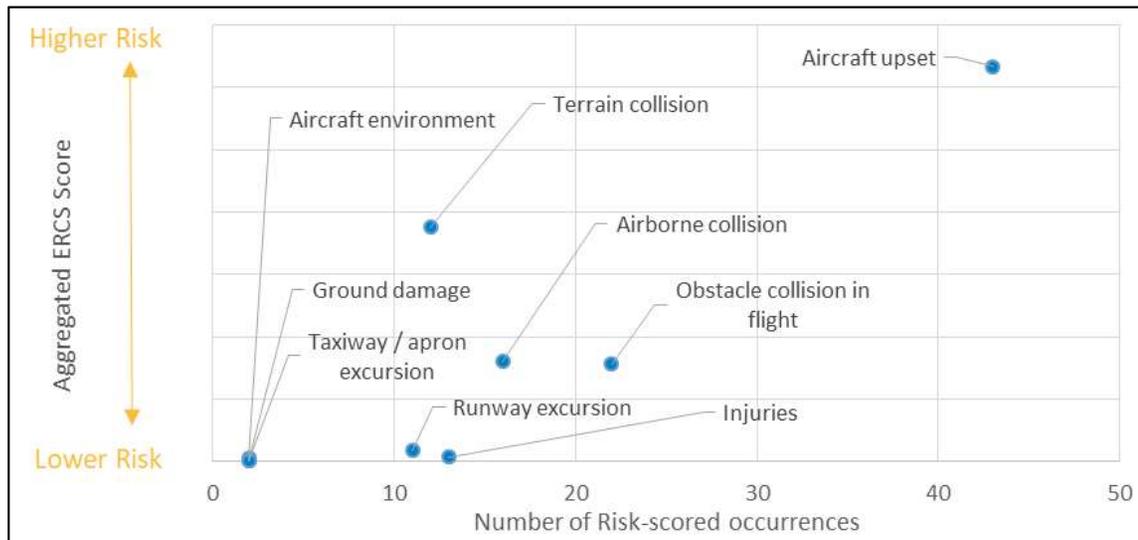


Figure: EASA Rotorcraft Safety Statistics

➔ General common safety issues = **KNOWN**

Safety issues per operation type

Helicopter specialised ops (Part SPO) – Safety issues

- Perception and Situational Awareness
- Helicopter Obstacle See and Avoid
- Flight Path Management
- System Reliability
- Development and Application of Rules and Procedures
- Adverse Weather
- Experience, Training and Competence of Individuals
- Handling of Technical Failures
- Operations in Degraded Visual Environments
- Decision Making and Planning

Helicopter non-Commercial ops (GA) – Safety issues

- Perception and Situational Awareness
- Flight Path Management
- System Reliability
- Experience, Training and Competence of Individuals
- Decision Making and Planning
- Flight Planning and Preparation
- Helicopter Obstacle See and Avoid
- Operations in Degraded Visual Environments
- Human Performance

Source: EASA Rotorcraft Safety Statistics



Common Safety Issues



Safety Technologies

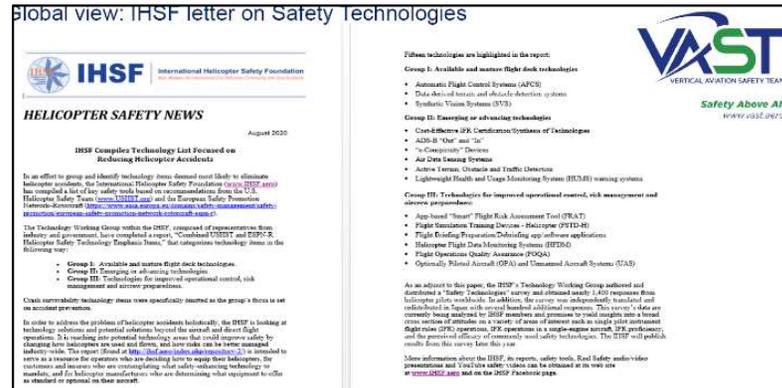
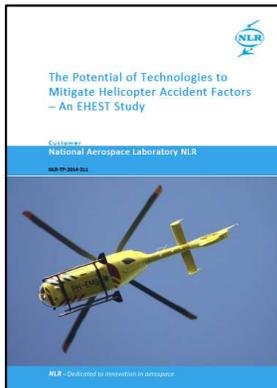




Safety Technologies

Technology to directly or indirectly prevent accidents or increase survivability

- NLR - The Potential of Technologies to Mitigate Helicopter Accident Factors (2014 & 2018)
- IHSF Compiles Technology List Focused on Reducing Helicopter Accidents (2020)





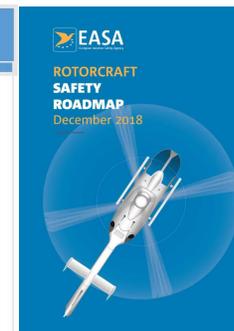
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Link EASA Rotorcraft Safety Roadmap:

Net Safety Benefit
<p>Objective: New Technologies for forward fit and retrofit</p> <p>Objectives:</p> <ul style="list-style-type: none">• EASA to establish a policy on the net safety benefit approach and to facilitate the introduction of new technology (in coordination with the GA Roadmap),• Define the process to identify the systems and equipment providing safety benefits <p>Timeline:</p> <ul style="list-style-type: none">• As part of RMT.0727 “Part 21 — simple and proportionate rules for GA” introduce the requirements.





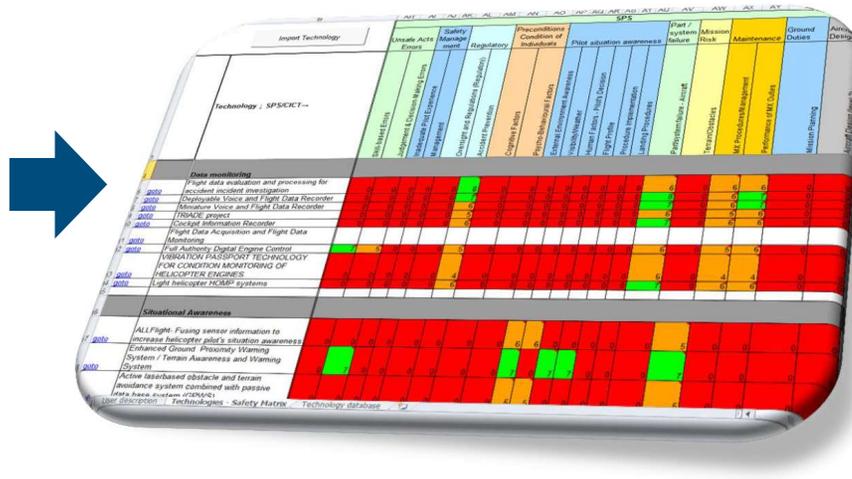
Safety Technologies – NLR Research

Identify ‘highly promising’ technologies to improve rotorcraft safety: initial study 2014 – update 2018

List of common safety issues

Rank	SPS Level 1	SPS Level 2	Number of occurrences
1	Pilot judgment & actions	Human Factors Pilot's Decision	64
2	Pilot situation awareness	External Environment Awareness	38
3	Ground Duties	Mission Planning	35
4	Pilot judgment & actions	Flight Profile	31
5	Part/system failure	Aircraft	30
6	Unsafe Acts / Errors	Skill-based Errors	29
7	Safety Management	Inadequate Pilot Experience	28
8	Unsafe Acts / Errors	Judgment & Decision-Making Errors	27
9	Pilot judgment & actions	Procedure Implementation	26
10	Mission Risk	Terrain / Obstacles	26
11	Pilot judgment & actions	Landing Procedures	25
12	Safety Management	Management	23
13	Maintenance	Maintenance Procedures / Management	23
14	Regulatory	Oversight and Regulations	23
15	Preconditions: Condition of Individuals	Cognitive Factors	22
16	Pilot situation awareness	Visibility / Weather	20
17	Aircraft Design	Aircraft Design	19
18	Maintenance	Performance of Maintenance Duties	19
19	Preconditions: Condition of Individuals	Psycho-Behavioural Factors	19
20	Regulatory	Accident Prevention	18
Total number of occurrences			545

Technology rating matrix



Study output

List of highly promising safety technologies

List of common safety issues without 'mitigating' safety technology

= Technology focused



Common Safety Issues



Safety Technologies



✓ clear link



? Link to be established
More awareness needed



Operational Scenarios



Common Safety Issues



Safety Technologies

✓ clear link

? Link to be established
More awareness needed



Operational Scenarios – Data Gathering

Survey – small rotorcraft operators: info about day-to-day operations

ESPN-R Survey Questions - DRAFT



Current operations:

- Definition of current operations (type of mission, location...)
- Current fleet information
- Safety issues, challenges, concerns of current operations
- Are you aware of the link between your operations, common safety issues and safety technologies?

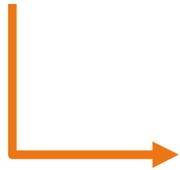
Future operations

- Expected changes in operations (coming from future business demands or changes of external factors..)
- Future fleet information
- Safety issues, challenges, concerns of future operations



Operational Scenarios – Data Gathering

Survey – small rotorcraft operators: info about day-to-day operations



From survey results:

1. Define operational scenarios from results
2. Define operational scenarios such that operators can easily relate
3. Present a clear link between the operational scenario, the safety issues and technologies



Operational Scenarios



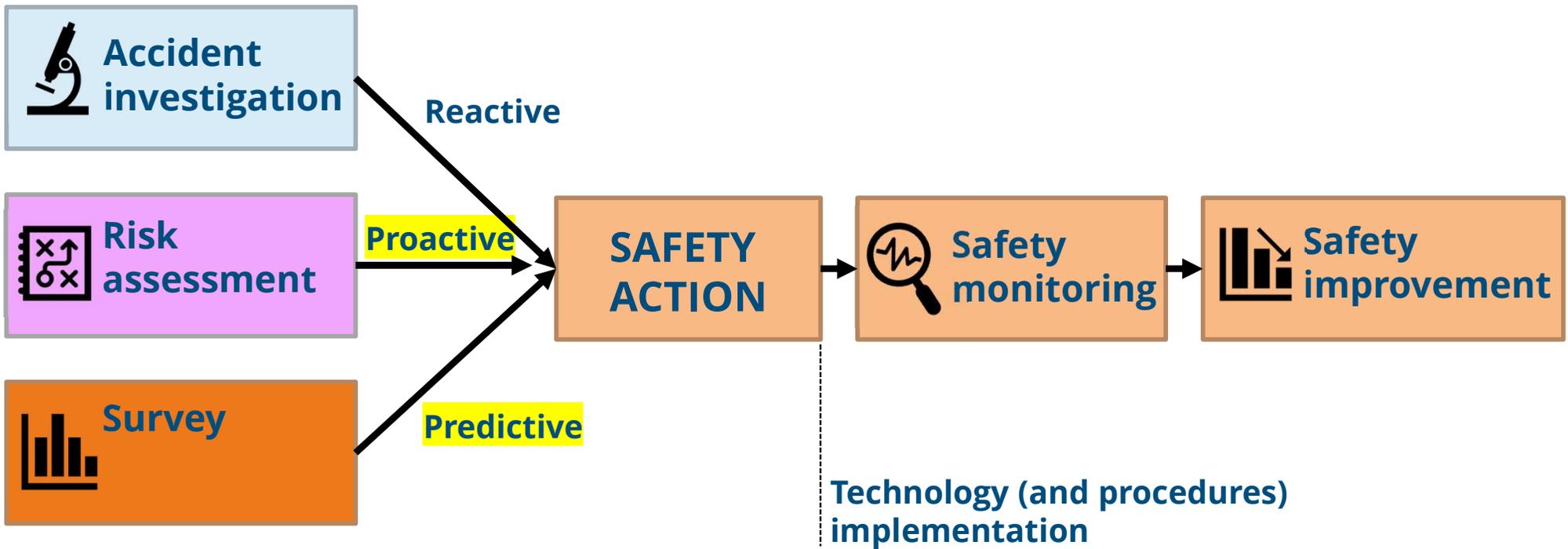
Common Safety Issues



Safety Technologies



Safety Actions – Technology Implementation





Operational Scenarios



Common Safety Issues



Safety Technologies



Operational Scenarios



Common Safety Issues



Safety Technologies

Example case:

Operation: Agricultural aerial work

Rotorcraft: Single piston engine helicopter, agricultural specific equipment installed

Operator: fleet of 4 single piston engine helicopters, 2 different helicopter types, operator also offers flight training and aerial photography

Safety Issue A: Helicopter obstacle see and avoid (ex: power lines, trees...)

Safety Issue B: Development and application of rules and procedures: operation and mission-systems specific considerations

Safety Issue C: Perception and situational awareness (ex: sun glare)

Tech. D: Wire strike protection system (wire cutters)

Safety equipment improvement I

Tech. E: Flight briefing, preparation, debrief app/software

Safety equipment improvement II

Tech. F: Data-derived terrain and obstacle detection systems

Safety equipment improvement III



Link Operations, Safety Issues and Technology

Project goal: Establish a clear link between rotorcraft (future) operations, safety issues and safety technologies to motivate the implementation of these safety technologies

OUTPUT

1. Safety technology advise to operators – direct link between operations and technologies creates an incentive to implement safety systems
2. Direct link showing the impact of safety technologies on daily operations towards policy makers and businesses developing safety equipment
3. Identify the need for future technology development



Distribute study results through workshops and online platform



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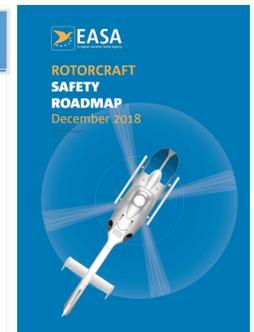
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Rotorcraft Safety Rating

Objectives: Incentivise Safety by introducing an industry-led Rotorcraft Safety rating scheme.

Actions:

- Enable Operator and Customer to make informed decisions based on the safety performance of the product.
- Make a comparative review of the Schemes available in other industries. Define an initial concept with the intended objectives and framework.
- Progress the concept definition and engage with European Manufacturers. Identify the technologies granting safety benefits.
- Finalise a proposal for the introduction of a Rotorcraft Safety rating scheme to be presented to the wider industry. (Presentation at R.COM and Paper)



Special Projects-
Safety Ratings Working Group



Way Forward

- Engage with small rotorcraft operators:
 - Ask for input to set up an effective survey
 - Communicate project goals and benefits for the operators
- Promote survey and project goals within the rotorcraft community





Dedicated to innovation in aerospace

Fully engaged

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