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Anticipating Future Safety Issues

28-30 November 2023

Objectives of this session

- Inform
  - About developments on the challenges for aviation operations (focused on helicopter operations)
- Reflect
  - About future developments
  - About the related (new) safety risks

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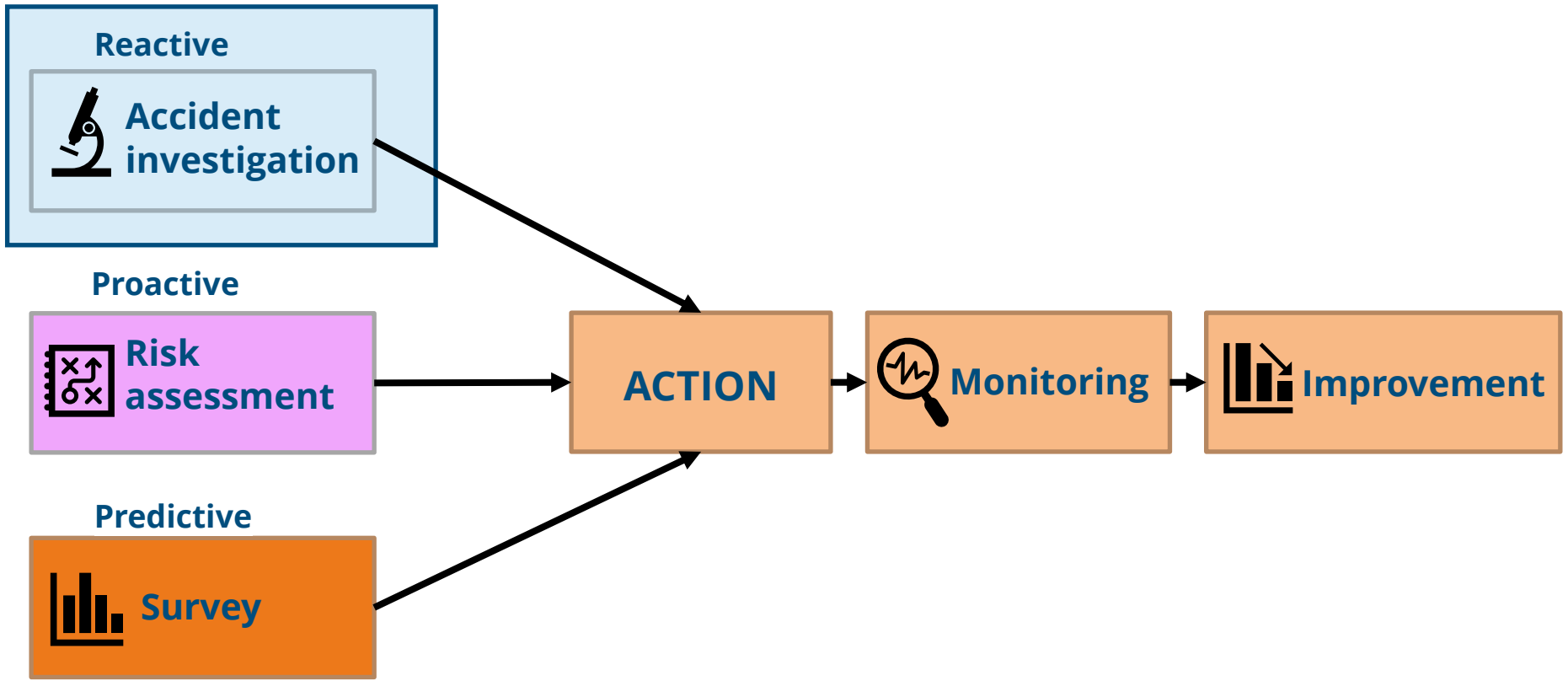
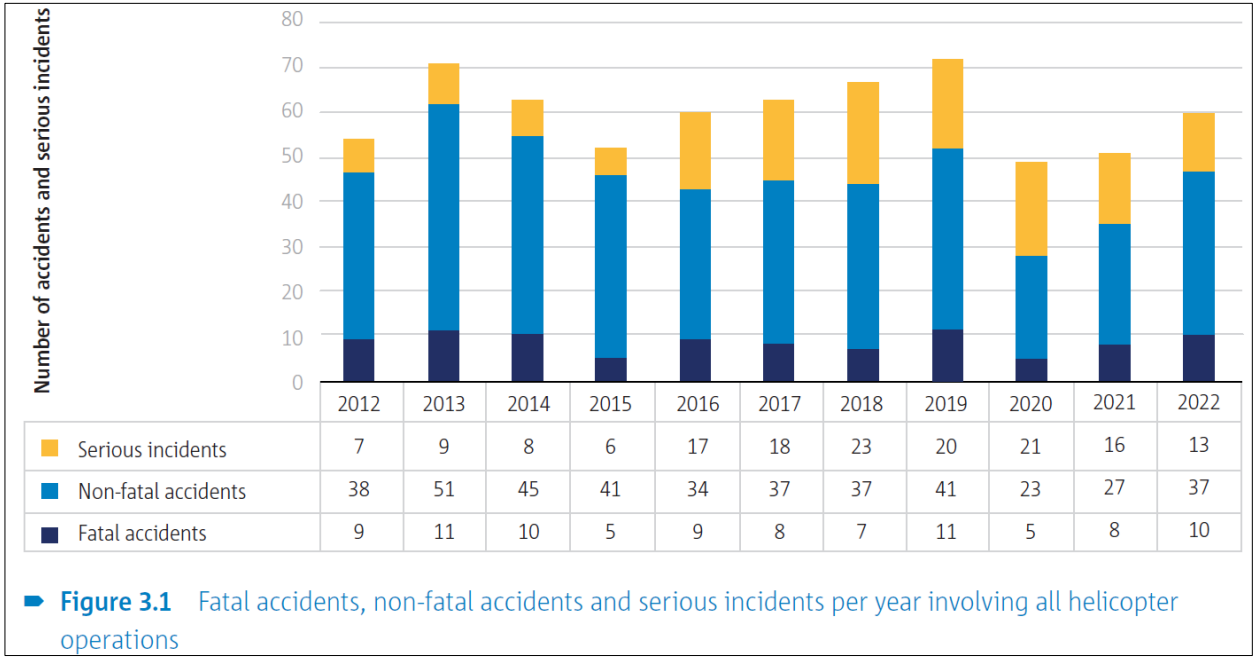
(How) does technology help me?

Inform & Reflect

Safety Actions – Technology Implementation



Current safety risks are known



	2012	2013	2014	2015	2016	2017	2018	2019	2020	2021	2022
Serious incidents	7	9	8	6	17	18	23	20	21	16	13
Non-fatal accidents	38	51	45	41	34	37	37	41	23	27	37
Fatal accidents	9	11	10	5	9	8	7	11	5	8	10

Figure 3.1 Fatal accidents, non-fatal accidents and serious incidents per year involving all helicopter operations

Figure: EASA Annual Safety Review 2023

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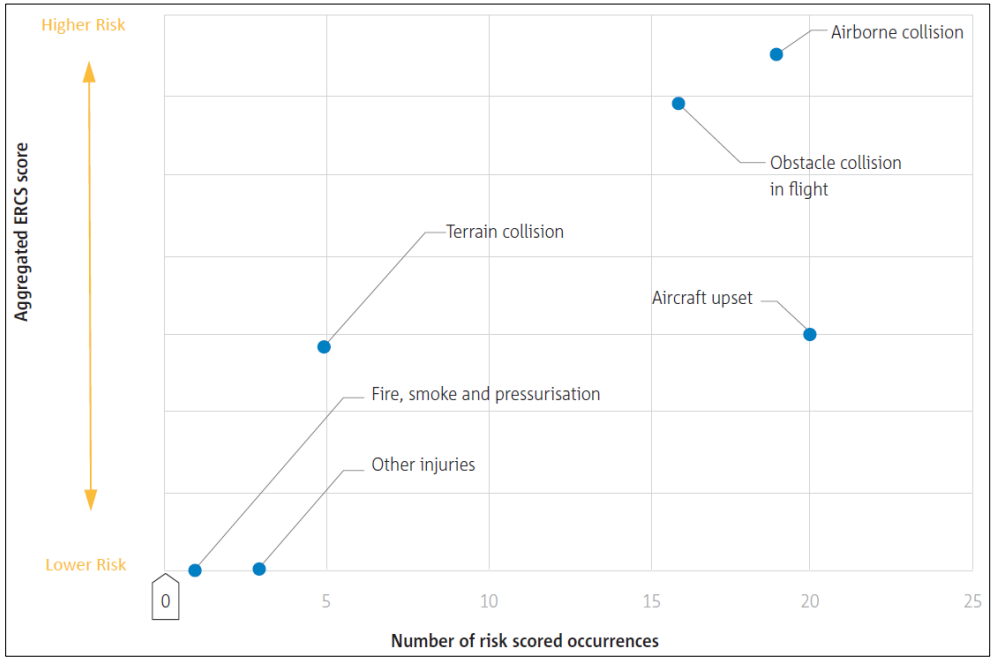
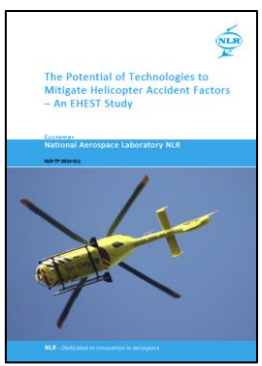


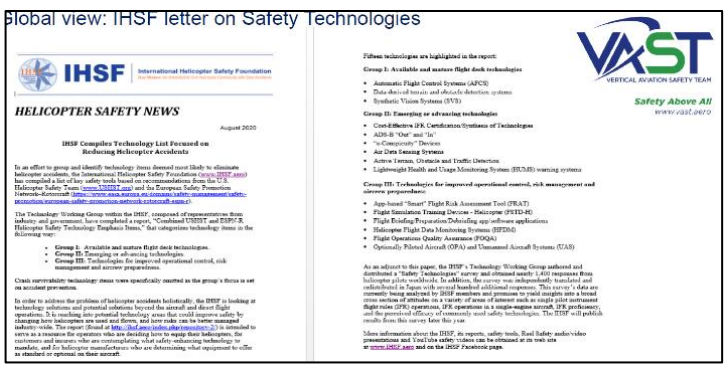
Figure: EASA Annual Safety Review 2022

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)




Global view: IHSF letter on Safety Technologies

IHSF International Helicopter Safety Foundation

HELICOPTER SAFETY NEWS

August 2020

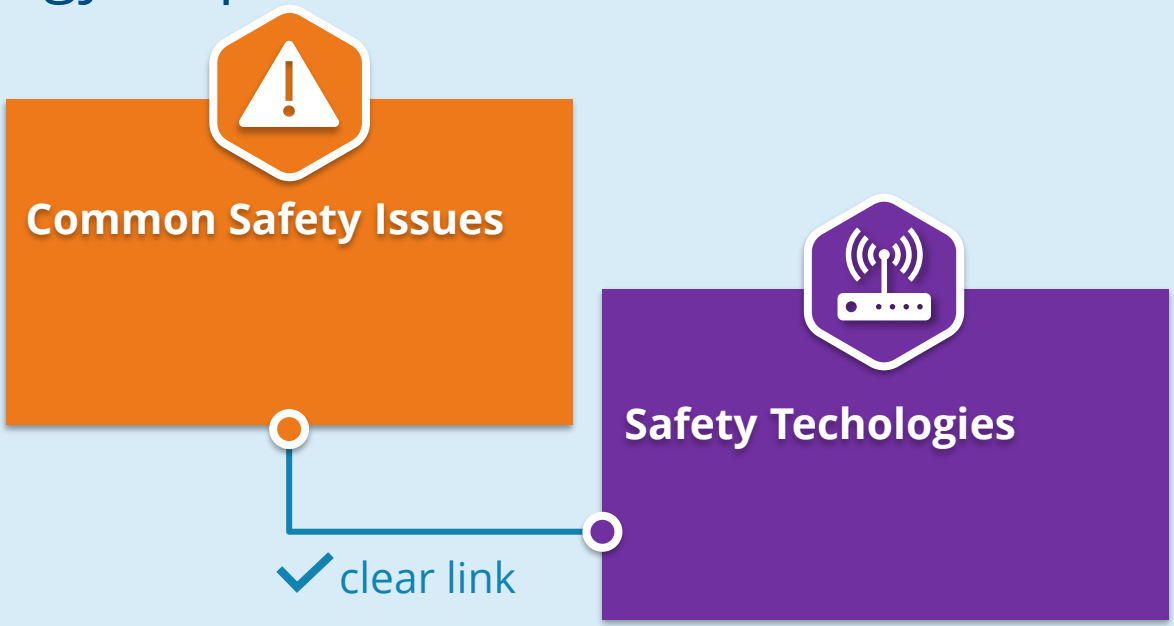
IHSF Compiles Technology List Focused on Reducing Helicopter Accidents

VAST VERTICAL AVIATION SAFETY TEAM

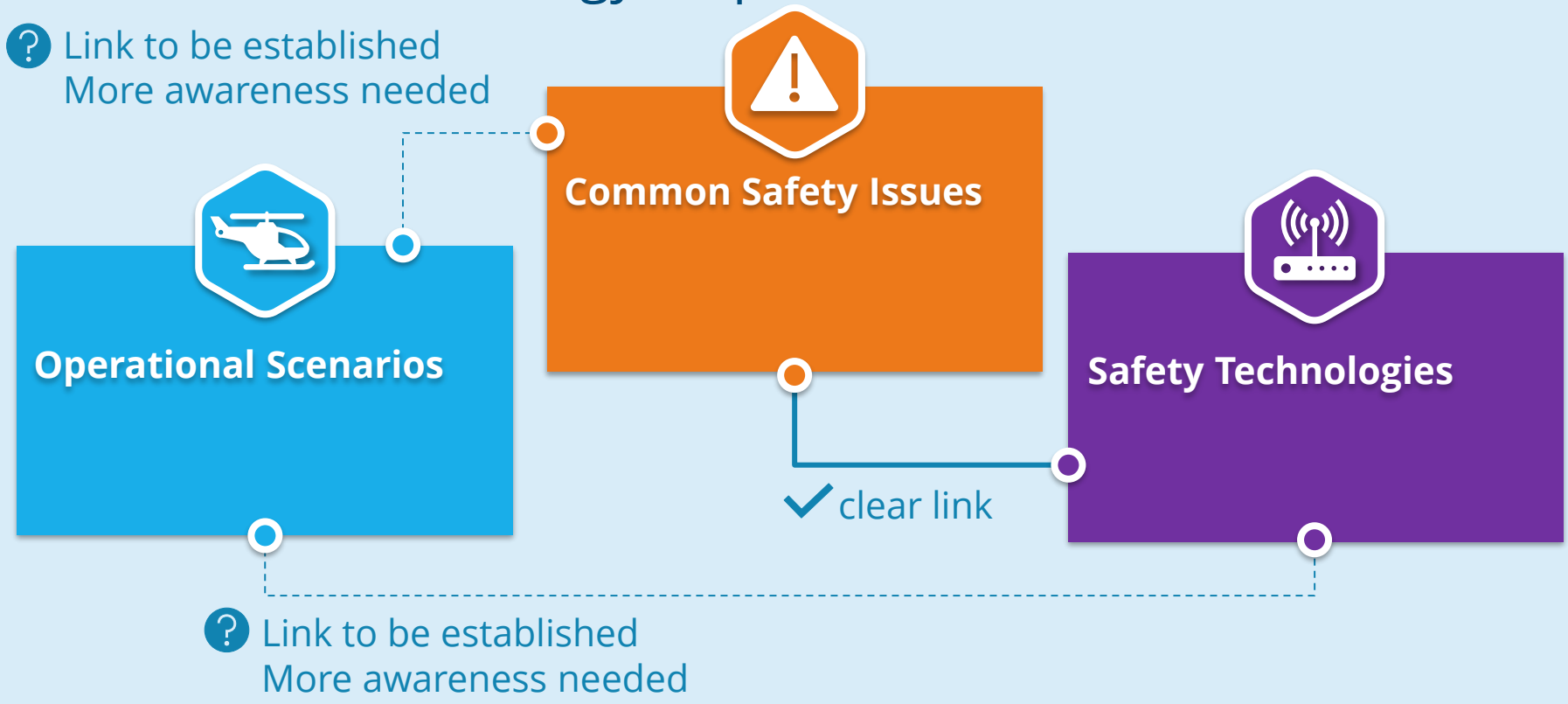
Safety Above All

www.vast.aero

How does technology help?



How does technology help me?



An example

Operational scenario

Operation: Sightseeing flights
Rotorcraft: Single piston/turboshaft engine helicopter in the light-end of the market
Operator: fleet of 4-9 helicopters, offers various services including VIP transport, aerial film/photography, training flights,...

Common Safety Issues

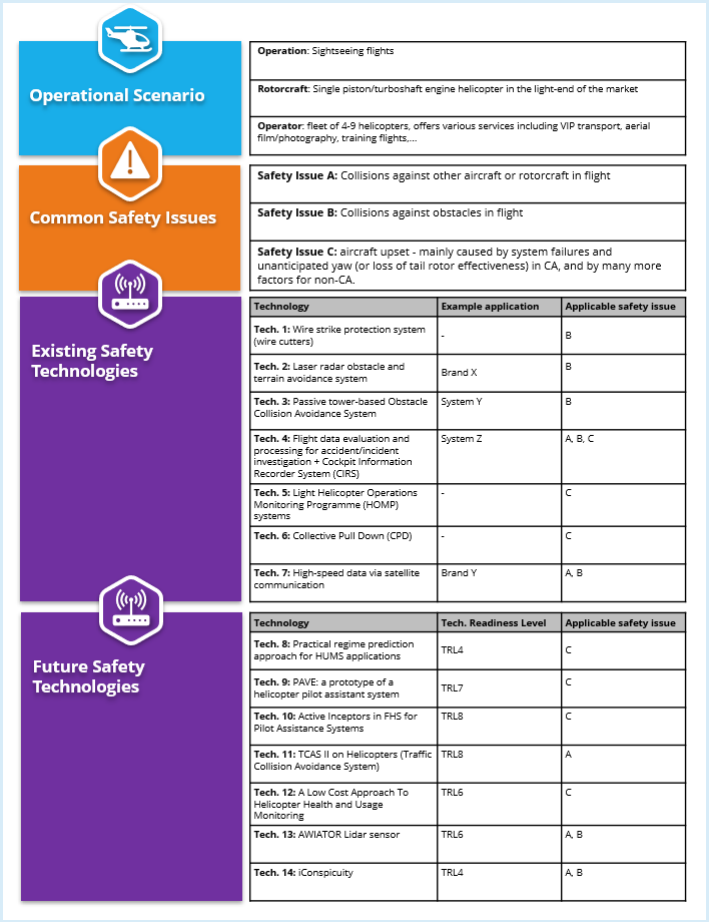
Safety Issue A: Collisions against other aircraft or rotorcraft in flight
Safety Issue B: Collisions against obstacles in flight
Safety Issue C: aircraft upset - often caused by system failures and unanticipated yaw in CA, but also by many other factors in non-CA

Existing Safety Technologies

Technology	Example application	Applicable safety issue
Tech. 1: Wire strike protection system (wire cutters)	-	B
Tech. 2: Laser radar obstacle and terrain avoidance system	Brand X	B
Tech. 3: Passive tower-based Obstacle Collision Avoidance System	System Y	B
Tech. 4: Flight data evaluation and processing for accident/incident investigation + Cockpit Information Recorder System (CIRS)	System Z	A, B, C
Tech. 5: Light Helicopter Operations Monitoring Programme (HOMP) systems	-	C
Tech. 6: Collective Pull Down (CPD)	-	C
Tech. 7: High-speed data via satellite communication	Brand Y	A, B

Future Safety Technologies

Technology	Tech. Readiness Level	Applicable safety issue
Tech. 8: Practical regime prediction approach for HUMS applications	TRL4	C
Tech. 9: PAVE: a prototype of a helicopter pilot assistant system	TRL7	C
Tech. 10: Active Inceptors in FHS for Pilot Assistance Systems	TRL8	C
Tech. 11: TCAS II on Helicopters (Traffic Collision Avoidance System)	TRL8	A
Tech. 12: A Low Cost Approach To Helicopter Health and Usage Monitoring	TRL6	C
Tech. 13: AWIATOR Lidar sensor	TRL6	A, B
Tech. 14: iConspicuity	TRL4	A, B



Operation: Sightseeing flights

Rotorcraft: Single piston/turboshaft engine helicopter in the light-end of the market

Operator: fleet of 4-9 helicopters, offers various services including VIP transport, aerial film/photography, training flights,...

Safety Issue A: Collisions against other aircraft or rotorcraft in flight

Safety Issue B: Collisions against obstacles in flight

Safety Issue C: aircraft upset - mainly caused by system failures and unanticipated yaw (or loss of tail rotor effectiveness) in CA, and by many more factors for non-CA.

Technology	Example application	Applicable safety issue
Tech. 1: Wire strike protection system (wire cutters)	-	B
Tech. 2: Laser radar obstacle and terrain avoidance system	Brand X	B
Tech. 3: Passive tower-based Obstacle Collision Avoidance System	System Y	B
Tech. 4: Flight data evaluation and processing for accident/incident investigation + Cockpit Information Recorder System (CIRS)	System Z	A, B, C
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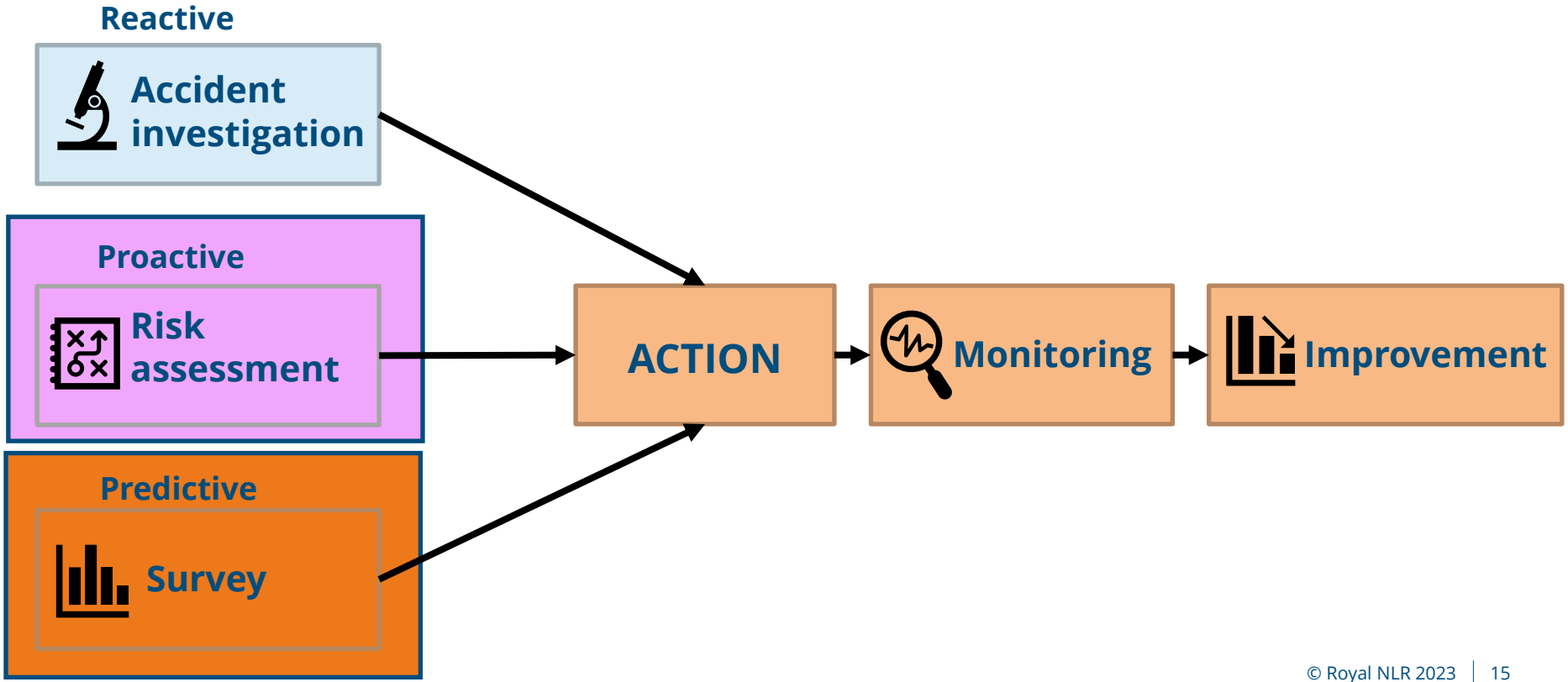
Does this bring any added value to you?

Does this help to think about which technologies could help you?

Safety Actions – Technology Implementation



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Future trends

Reflect

Trends

1. Automation
2. Flight guidance
3. Connectivity
4. Training by simulation
5. New propulsion technologies
6. New VTOL concepts
7. Data usage
8. Phasing out of traditional flight controls and instruments
9. Autonomy
10. Increase in traffic density and multimodality
11. Increase of urban operations
12. More integration between pilots and air traffic management

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Future safety risks

Reflect

Risks

- Functionality loss if technologies cannot replace each other 1:1
- Vandalism (e.g. spoofing)
- Remote pilots feeling detached from aircraft
- Loss of important signals (e.g. GPS)

1. Automation
2. Flight guidance
3. **Connectivity**
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Risks

- Fly-by-wire
- Increased risks during training
- Fires due to batteries
- Increased VRS risk
- Operations in unfavourable weather conditions

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2. Flight guidance
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4. Training by simulation
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6. **New VTOL concepts**
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Risks

- Too much trust in technology
- Software errors
- Integration manned-unmanned (e.g. U-Space)
- Loss of important signals (e.g. GPS)
- Significant change for ATM

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Overview trends

1. Automation
2. Flight guidance
3. Connectivity
4. Training through simulation
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#	RISKS	TREND
1	Fly-by-wire	1, 6, 8
2	Conflict between what the pilot and the computer want	1, 2
3	Pilot does not understand the computer's intention	1, 2
4	Too much trust in technology	1, 2, 4, 7, 8, 9
5	Functionality loss if technologies cannot replace each other 1:1	3
6	Increasing risks during training	4, 6
7	Fires due to batteries	5, 6
8	Increased VRS risk	6
9	New regulations needed	all
10	Incomplete or outdated datasets	7
11	Too much or insufficient information	8
12	Software errors	8, 9
13	Increased chance of collisions	10, 11
14	Static electricity / EMC	5
15	Decrease in standards	4, 10
16	Vandalism and disrespect of rules	3, 10, 11
17	Remote pilots feeling detached from aircraft	3
18	Operations in turbulence	11
19	Operations in unfavourable weather conditions	6
20	Integration manned-unmanned (e.g. U-Space)	9, 10
21	Loss of important signals (e.g. GPS)	3, 9, 10, 11
22	Significant change for ATM	9, 10, 11, 12
23	Dependence on new energy sources	5
24	Increased number of emergency landings	10, 11

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Thank you!

Questions?

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Fully engaged

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