

# Offshore Helicopter Safety Solakonferansen 2021

## Safety Management System in a Design Organization

*Emanuele Bufano*  
*Leonardo Helicopter Division - Head of Airworthiness*

Sep 21<sup>ST</sup> 2021





# Agenda

- > Leonardo World Wide Fleet AW139, AW169, AW189 in 2021
- > What is “Safety” and a Safety Management System in a Design Organization
- > How SMS has been deployed within LH Design Organization
- > SMS Design Organization Implementation Phase
- > Q&A



# Some numbers logged in 2021

## Flight Hours

**1100+ Helicopters 81 Countries**

**3,100,000+** Fleet

**15,400+** Fleet Leader

**30.000 +** Fleet Monthly Rate

**190.000+** Operator Leader

**AW139**



**84+ Helicopters 20 Countries**

**115,000+** Fleet

**5,000+** Fleet Leader

**1,800+** Fleet Monthly Rate

**23,000+** Operator Leader

**AW189**



**115+ Helicopters 25 Countries**

**90,000+** Fleet

**3,000+** Fleet Leader FH

**1.100+** Fleet Monthly Rate

**7,800+** Operator Leader FH

**AW169**



*10%+ FH logged on the overall fleet in 2021 despite the pandemic world wide situation ...*



# Agenda

- > Leonardo World Wide Fleet AW139, AW169, AW189 in 2021
- > What is “Safety” and a Safety Management System in a Design Organization
- > How SMS has been deployed within LH Design Organization
- > SMS Design Organization Implementation Phase
- > Q&A







## AVIATION SAFETY MANAGEMENT SYSTEM RECENT BACKGROUND

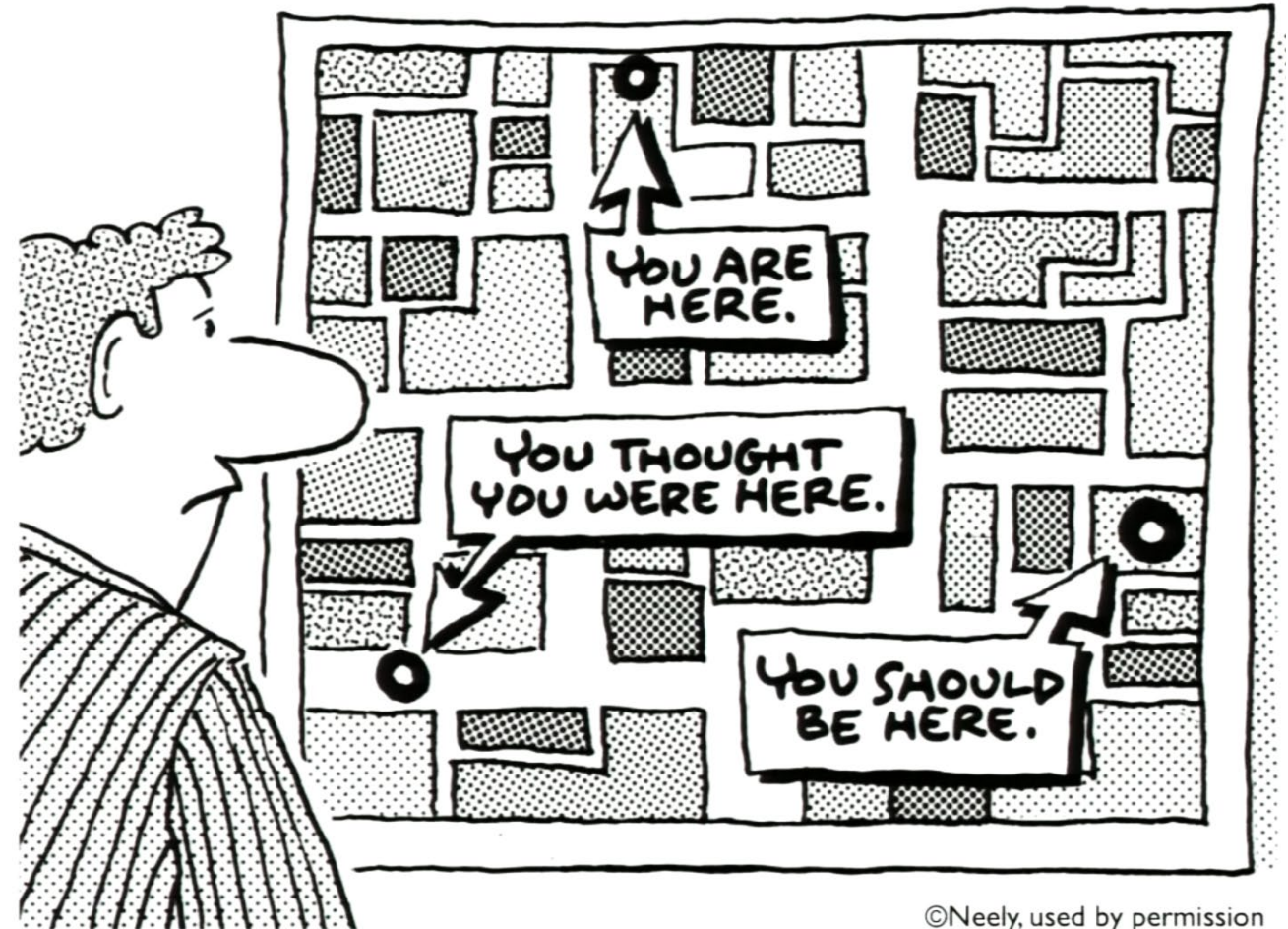
- ICAO Annex 19 (first issue: 2013, 2<sup>nd</sup> Edition: 2016)
- European Plan for Aviation Safety (EPAS):
  - RMT.0251, SubTask 2 (NPA 2019-05)
    - Embodiment of **Safety Management System** requirements into Commission Regulations (EU) No. 1321/2014 (Part-145) and 748/2012 (Part-21);
    - introduction of **Design Management System** in lieu of current **DAS**
  - RMT.0262 (ToR, NPA 2015-03, ED Decision 2019/018/R)
    - Embodiment of Level of Involvement (LOI) and **Safety Management System (SMS)** requirements into Part-21
- LH Aviation Safety Management Systems Governance has been established in 2020 and the Design Organization set up a proper internal system in 2021.





## Yes but... What does safety really mean?

- A brief History of Safety example
- An actual case study
- A safety model



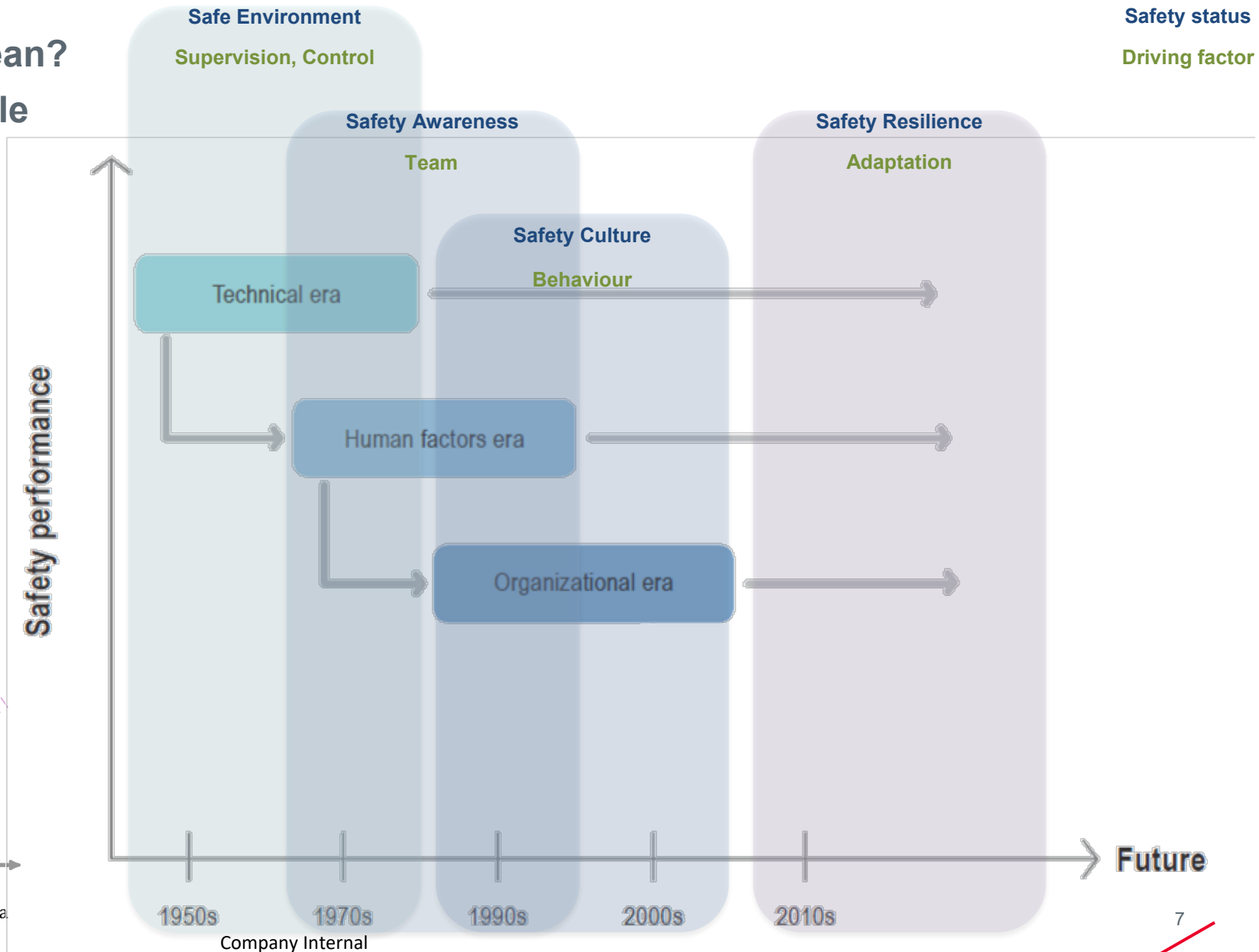
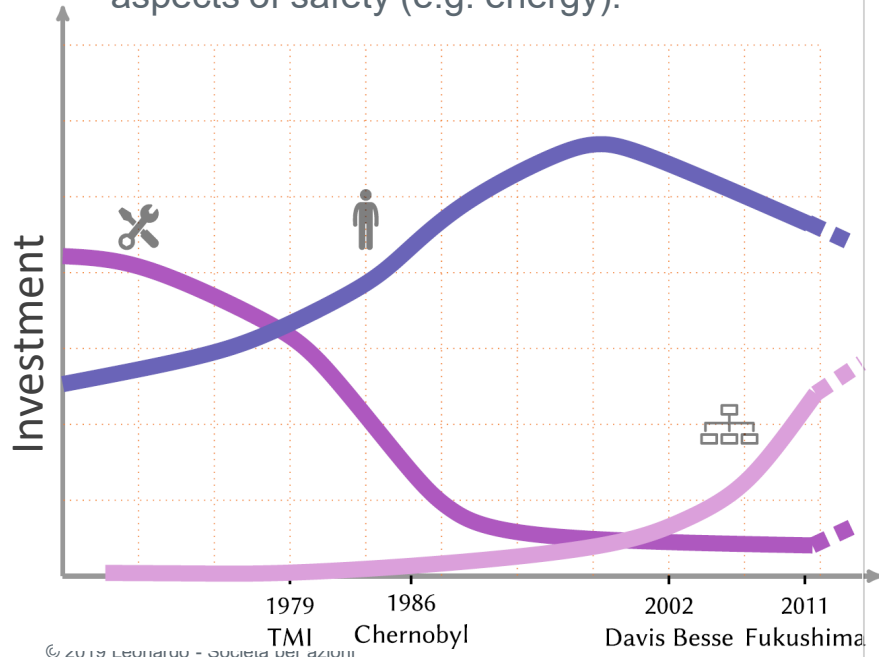
©Neely, used by permission



## Yes but... What does safety really mean?

- A brief History of Safety example
- An actual case study
- A safety model

- Safety Management Systems (SMS) are the result of a continuing **evolution of safety**, *not only* for the *Aviation* industry.
- Proportion of safety attention paid to technical, human and organizational aspects of safety (e.g. energy):







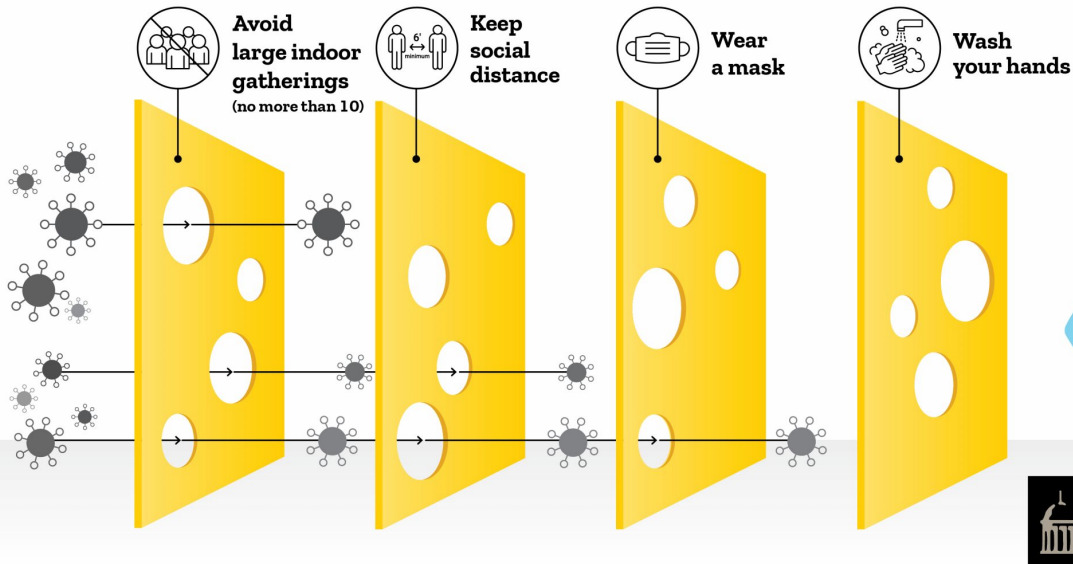
## Yes but... What does safety really mean?

- A brief History of Safety example
- **An actual case study**
- A safety model

### HOW TO STOP COVID-19: THE SWISS CHEESE MODEL

The more steps  
the safer you are against C

→ [uihc.org/covid-toolkit](https://uihc.org/covid-toolkit)



Safety Risk	Severity <i>Intensive care saturation</i>				
	A	B	C	D	E
$R_t$ Probability					
5	5A	5B	5C	5D	5E
4	4A	4B	4C	4D	4E
3	3A	3B	3C	3D	3E
2	2A	2B	2C	2D	2E
1	1A	1B	1C	1D	1E



April 2021

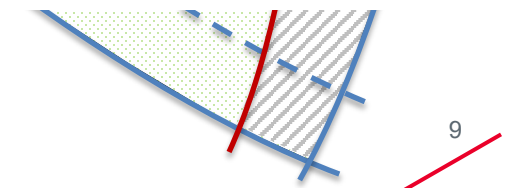
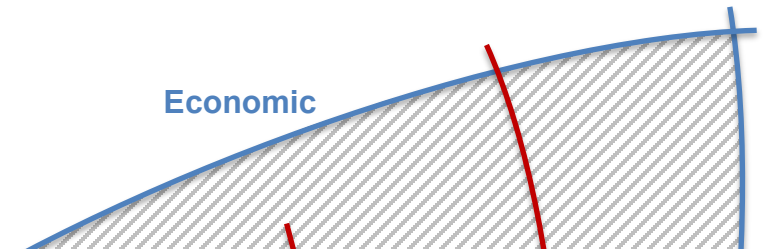




## Yes but... What does safety really mean?

- A brief History of Safety example
- An actual case study
- **A safety model**

- **Rasmussen's system model** (1997), 3-boundaries:
  - *economic* failure
  - unacceptable *workload*
  - *performance* limits
  
- **Resilience of Complex systems:** able to react, adapt, learn, anticipate
  - Operating point with management pressure for *economic efficiency* and for *least effort*: **practical drift** from original *design* towards the *accident boundary*!
  - need to apply counter-gradient (e.g. new rules, recent accident, safety campaigns)
  
- **Flirting with the margin of safety**
  
- Perspective change : *Why accidents happen?* vs. *Why they don't?*
  
- **System safety:** what might happen, where the operating point actually is, where the accident boundary actually is, what we do under pressure





# What is a “Safety Management System”?

- ICAO:
  - a systematic approach to managing safety, including the necessary organizational structures, accountabilities, policies and procedures.
- FAA:
  - the formal, top-down, organization-wide approach to managing safety risk and assuring the effectiveness of safety risk mitigations. It includes systematic policies, procedures, and practices for the management of safety risk.
- ATM Service Providers:
  - a systematic and explicit approach defining the activities by which safety management is undertaken by an organization in order to achieve acceptable or tolerable safety.



## Safety Management System (SMS)

Aviation safety needs to be managed proactively by all actors. Safety management benefits the total aviation system by strengthening traditional risk control practices and ensuring safety risks are managed in a systematic way. Safety management allows room for innovation and flexibility: It is less about describing what to ‘do’ and more about how to ‘achieve safety’.

**Patrick Ky - EASA Executive Director**



# SMS Framework in a Design Organization





Safety Policy & Objectives	Safety Risk Management
Safety Assurance	Safety Promotion

# 1. Safety Policy and Objectives

- An **Organizational Culture** that continuously strives to improve
- **Safety Policy**, SMS documentation and procedures
- A **communication comprehensive, transparent, non-punitive**



- Appointment of **Key Safety Personnel**
- **Safety accountabilities in all levels of the Organization:** employees are responsible for identifying hazards and reporting them.
- **Commitment and Responsibility of the Management**
  - A top-down commitment from management to all employees to achieve safety performance goals;
  - To establish the SMS (Management) and allocate resources to support and maintain it effective
  - To implement, maintain and adhere the SMS processes





## 2. Safety Risk Management

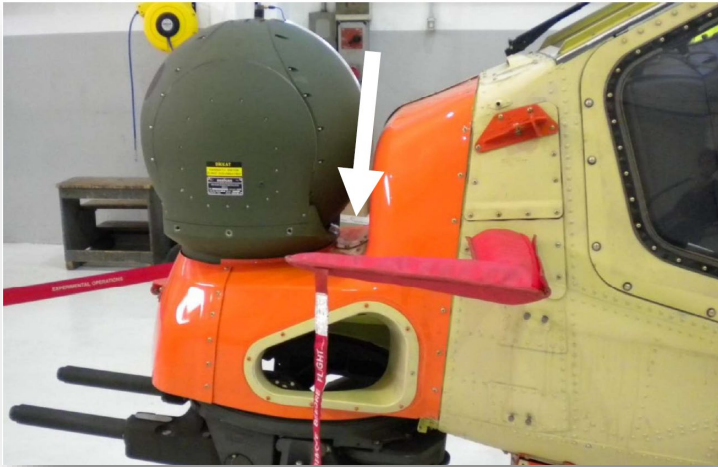
**HAZARD IDENTIFICATION** through **reactive, proactive and predictive methods**

- **Past experience analysis:** *Accidents / Incidents / Occurrence Reports*
- **Day-to-day operation:** *Voluntary Report, Near-misses, Survey, Authority Request*
- **Look into the future:** *Flight Data Monitoring Project, Analysis of actual procedure and/or Hazardous Scenario, Change Management.*



## 2. Safety Risk Management

### Examples...



**HAZARD: PRESENCE OF FOREIGN OBJECT DEBRIS IN FLIGHT AREA AROUND HELICOPTER WHICH COULD POTENTIALLY CAUSE DAMAGE.**

- The "Flight Logbook" placed inside the interspace between FLIR and the fairing of the helicopter was not intercepted before the next flight.



**HAZARD: CLEANING CLOTH MATERIAL FORGOTTEN DURING MAINTENANCE ACTIVITIES**

- En route, the Pilot informed ATC that he had a problem and then, almost immediately, reported that he would have to make an emergency landing..
- Some cleaning cloth material was found entangled on the long tail rotor drive-shaft, between the first and second bearing.

The Investigation concluded that the cloth induced out-of-balance forces on the shaft, causing the drive-shaft had completely severed just forward of the second bearing, thus cutting off the vital drive to the tail rotor gearbox.

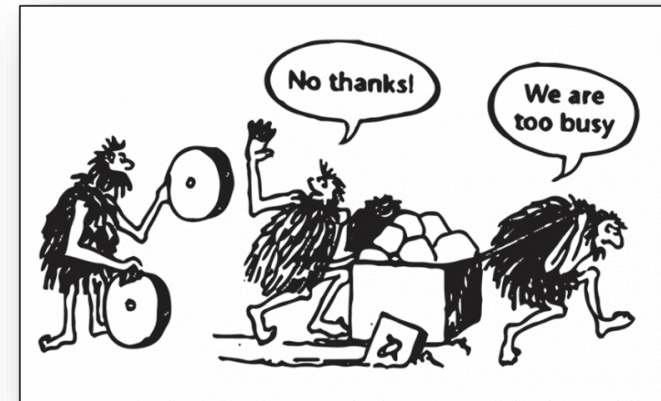


Safety Policy & Objectives	Safety Risk Management
<b>Safety Assurance</b>	Safety Promotion

### 3. Safety Assurance

Processes and activities undertaken to:

- determine if the SMS is operating according to expectations and requirements,
- obtain highest possible safety standard for everyone involved and better performance.
- **Safety performance monitoring and measurement (KPIs, Risk Register,..)**
- **Management of change**



- **Continuous improvement of SMS:** constant progression of safety performance in a positive direction



Safety Policy & Objectives	Safety Risk Management
Safety Assurance	<b>Safety Promotion</b>

## 4. Safety Promotion

Improving safety all across aviation spectrum (reactive / proactive / preventive approach), through:

- Training
- Education
- Communication







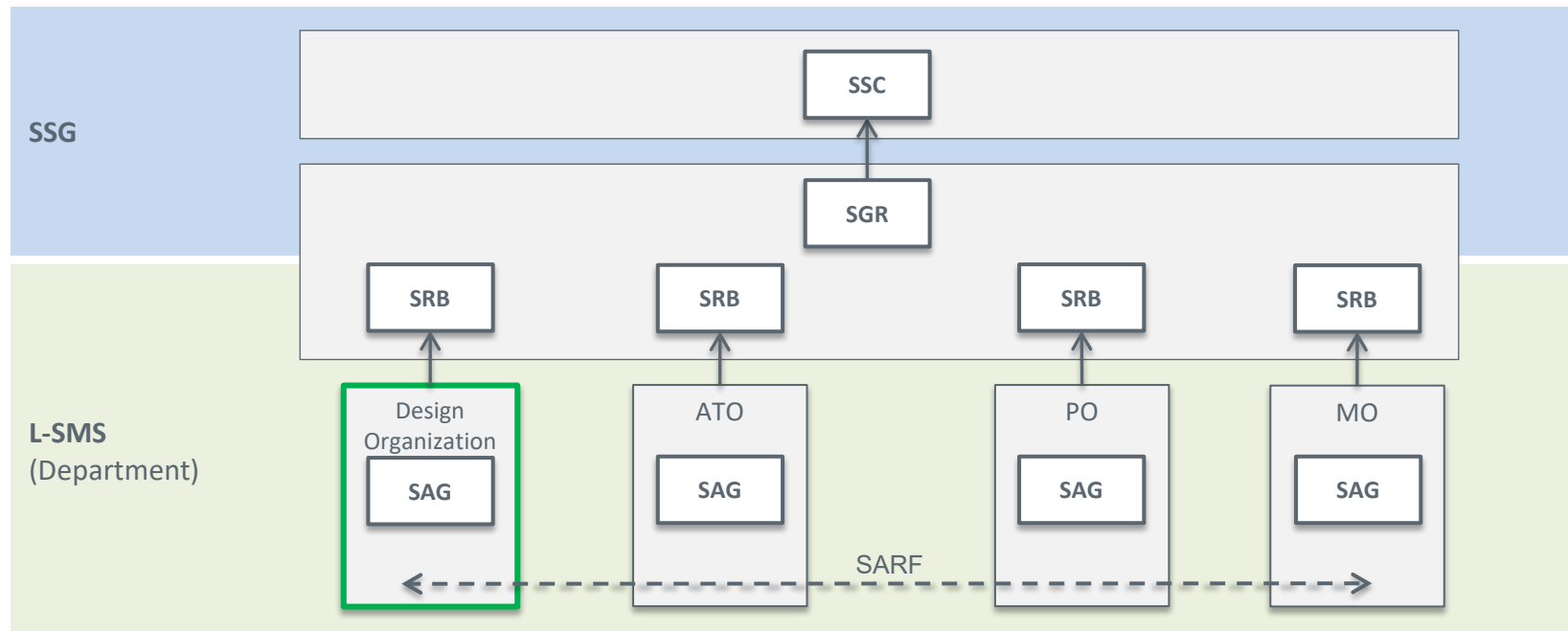
# Agenda

- > Leonardo World Wide Fleet AW139, AW169, AW189 in 2021
- > What is “Safety” and a Safety Management System in a Design Organization
- > How SMS has been deployed within LH Design Organization
- > SMS Design Organization Implementation Phase
- > Q&A





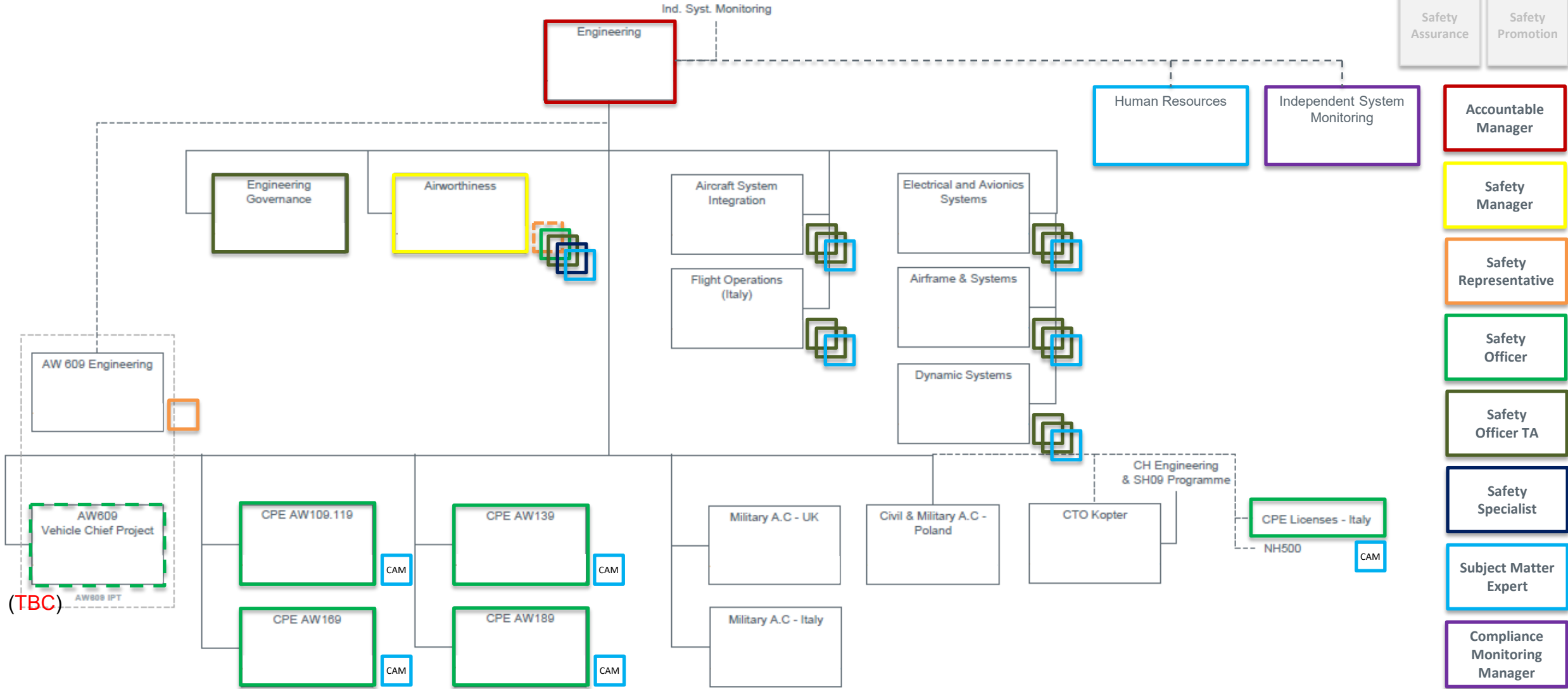
- Since **2020 Safety System Governance (SSG)** ensures an integrated approach to Safety Management for safety analyses and risk-based decision making between Departments (**Local SMS**).
- Specific boards to guarantee the commitment to an effective SMS: **Safety Governance Review (SGR)**, **Safety Steering Committee (SSC)**.
- Operational Structure of L-SMS for each approved company level certification (i.e. PO, DO, MO, ATO etc.) for SMS implementation, with the identification of the key managers.
- Each Department works through **Safety Review Board (SRB)** and **Safety Action Group (SAG)**.



\* Safety Risks that may impact other Organizations (e.g. potential consequences, or mitigating actions) to be communicated between interfacing Organizations through **Safety Action Request Form (SARF)**



# 1. Safety Policy and Objectives – LH DO SMS





## 2. Safety Risk Management – LH DO SMS



- OR O
- Analys
- Accid
- Trai
- LH

The screenshot shows an EASA Safety Information Bulletin (SIB No.: 2020-18) titled "Nickel-Cadmium Batteries - Risk of Capacity Reduction during Aircraft Parking and Storage". It is issued on 14 October 2020. Below the bulletin is a screenshot of the SKYbrary website, which features a navigation menu, a search bar, and a grid of safety-related topics including Air Ground Communication, Airspace Infringement, Wildlife Strike, Controlled Flight Into Terrain, Fire Smoke & Fumes, Ground Operations, Airworthiness, and Level Bust.

VOR Voluntary Occurrence Report

Results of Accident HAS Project application

OEM Accident Investigation

External inputs

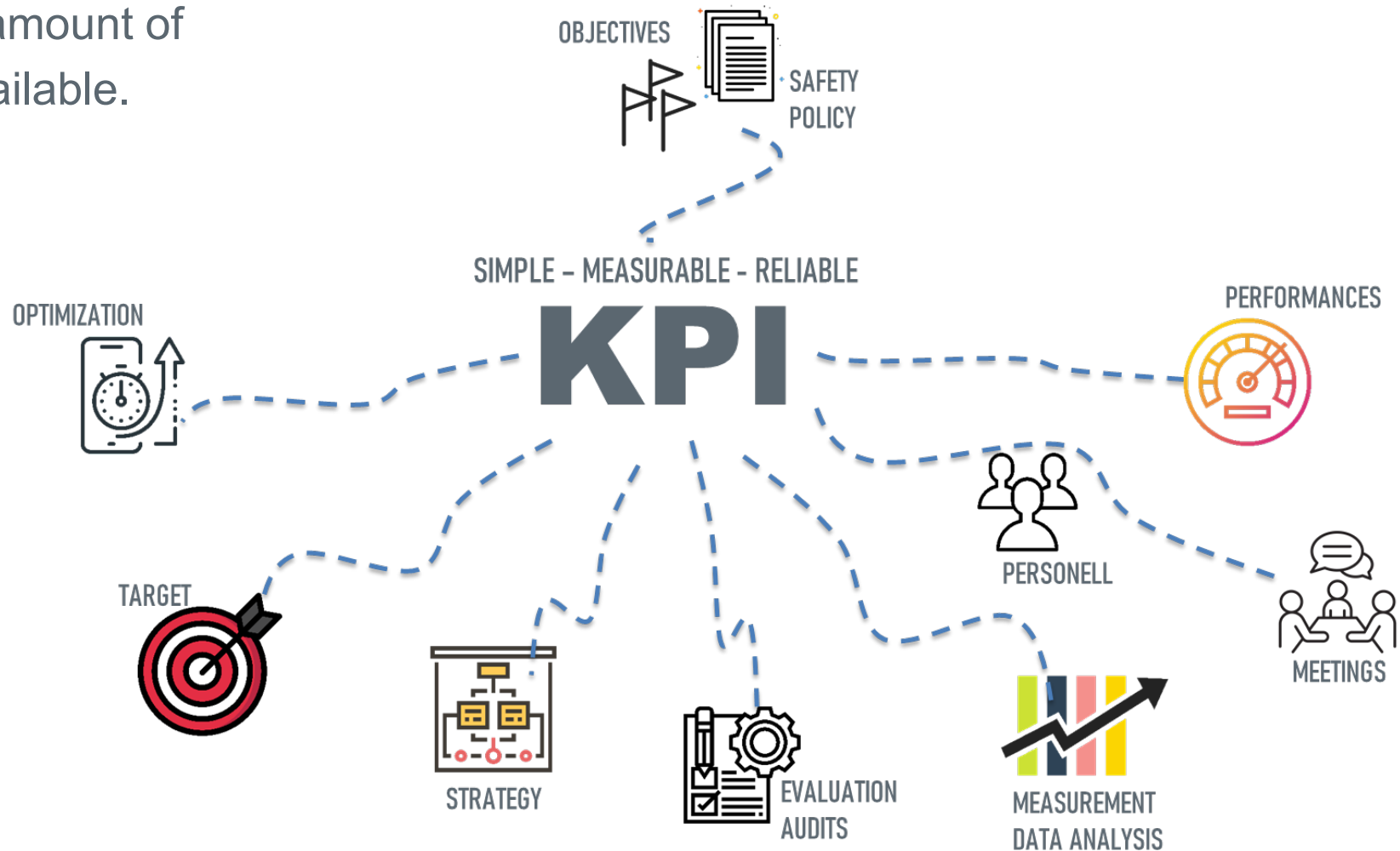




Safety Policy & Objectives	Safety Risk Management
<b>Safety Assurance</b>	Safety Promotion

### 3. Safety Assurance – LH DO SMS

- Based on the amount of safety data available.





Safety Policy & Objectives	Safety Risk Management
Safety Assurance	<b>Safety Promotion</b>

# 4. Safety Promotion – LH DO SMS

- **LH DO SMS internal courses:**
  - SMS personnel
  - «Safety Induction» for the entire DOA population and new-employees (e.g e-learning TBD)
- **LH DO SMS Newsletter**
  - Interviews
  - Real-cases events
  - Articles and insights
- **Workshops** (incidents case studies; etc.)







# Agenda

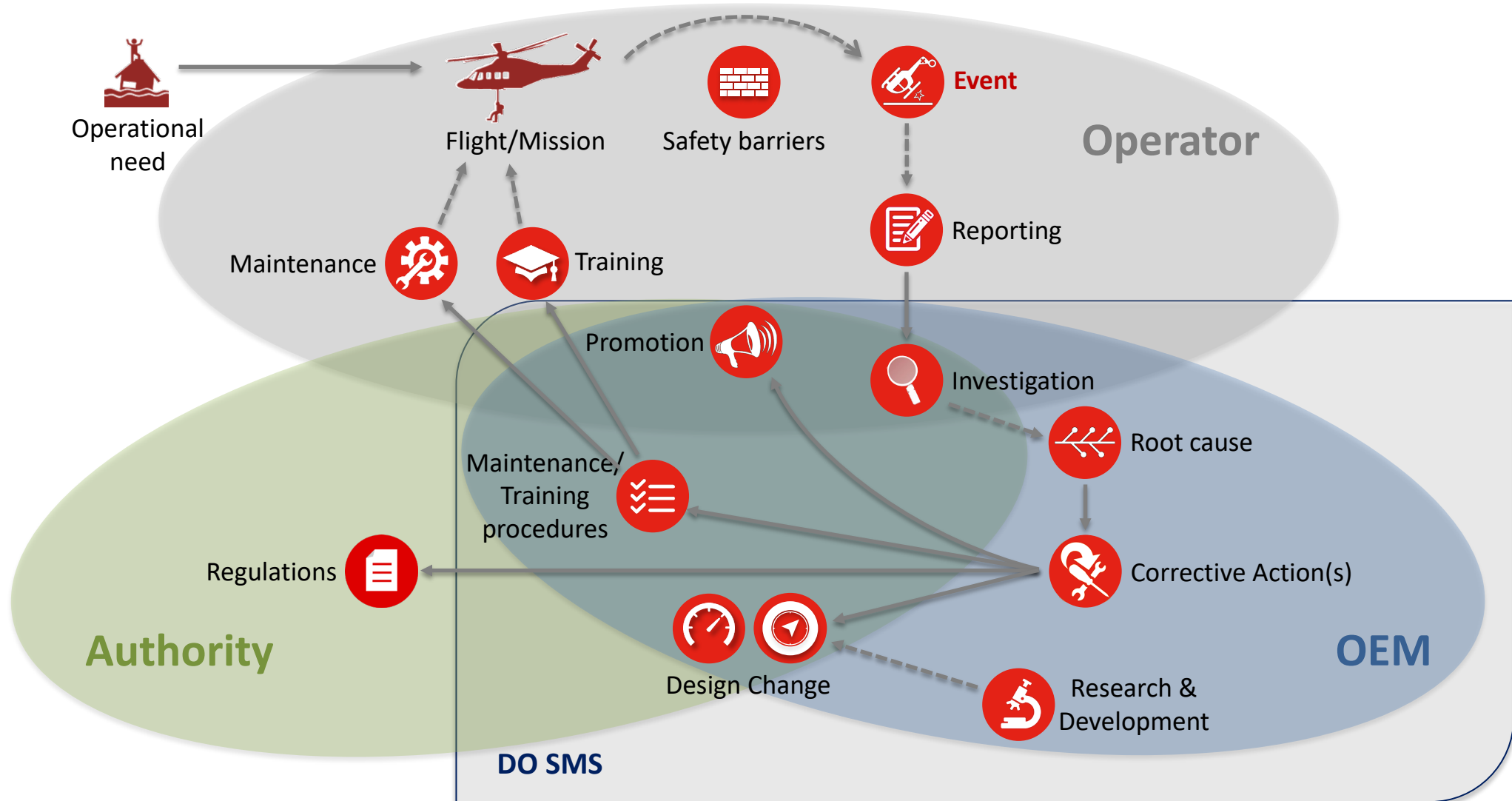
- > Leonardo World Wide Fleet AW139, AW169, AW189 in 2021
- > What is “Safety” and a Safety Management System in a Design Organization
- > How SMS has been deployed within LH Design Organization
- > SMS Design Organization Implementation Phase
- > Q&A





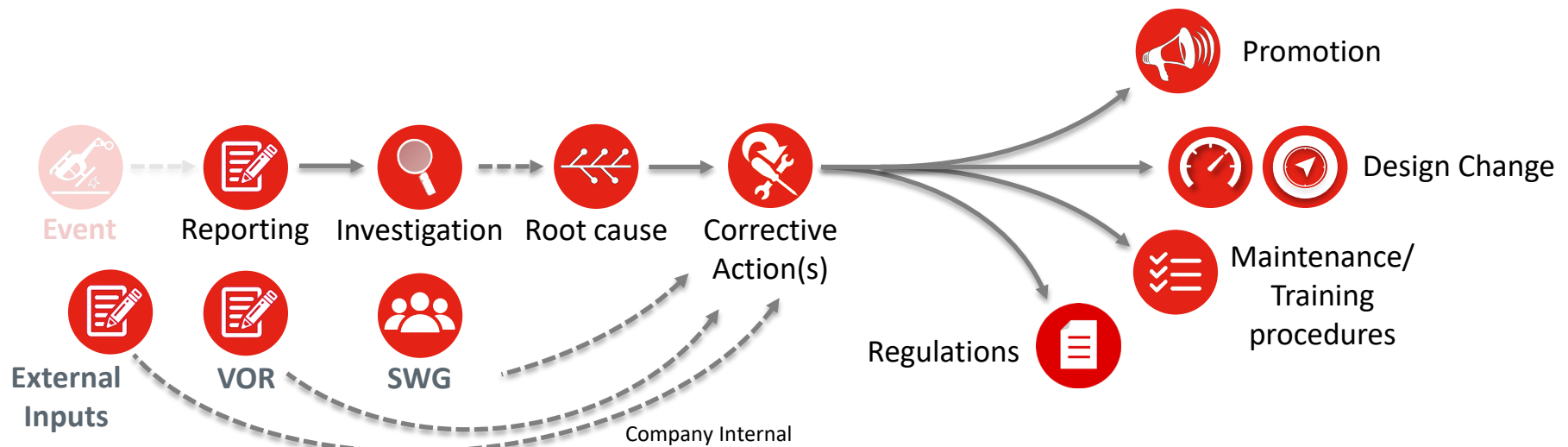
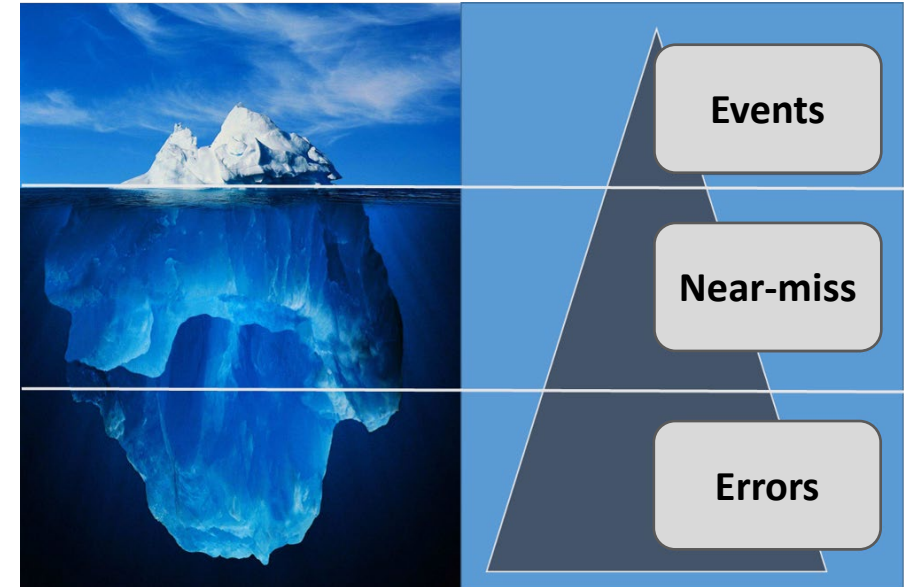
# Safety Environment vs. DO SMS

Can/should lead to   
Shall lead to 



# Proactive & Preventive Safety Approach

- **Hazards/Risks management & control, *in advance*:**
  - Accident prevention
  - Safety Planning
- **Main differences vs. current Design Assurance System (DAS):**
  - Risk trend analysis
  - Safety early warnings
  - Tools and meetings available within Organization's procedures & processes
  - Encourage staff to report for potential errors (e.g. VOR, Safety Culture)
  - Increase data source of risk analysis (e.g. assessment of Organizational changes)
  - Safety recording & archiving







## Initial achievements

- **Human Hazard Assessment**

The collaboration with Heli offshore and all the other stakeholders set up a new sensibility in the design phase of new projects in Leonardo both for each single change or subsystem and for an entire **new helicopter** such as **AW249**.



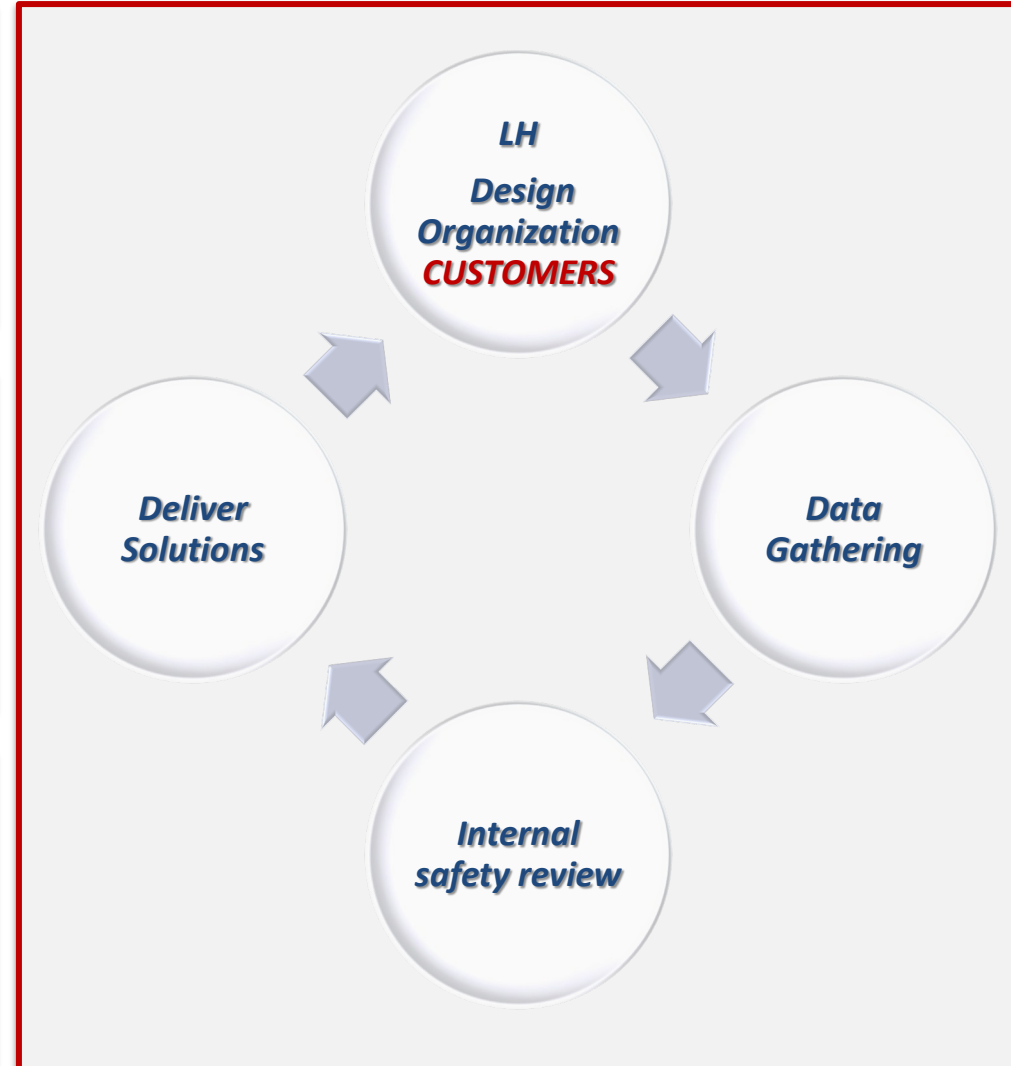
- **HTAWS – Offshore mode**

The approach to the bid **data-lake** adopted during the certification phase to the HTAWS mode for AW139 and AW189 has been introduced. It has preliminary requirements to have a deep dive analysis on each single new change, that shall use in-service data to better set its own **certification safety target**.



- **EASA RMT Tasks and White Papers proposal.**

The interactions with EASA, FAA, and all the other NCAAs is now reviewed internally through a **dedicated safety board** in order to tailor Leonardo initiatives with a specific focus on **safety improvements**.





## Others to come ...

- **PBN: Safety Benefit and Improved Operational Flexibility**

The implementation of PBN navigation infrastructures specifically designed for rotorcraft together with Leonardo PBN training services and solutions will greatly **increase the safety of rotorcraft flight operations providing customers an unique operational flexibility.**

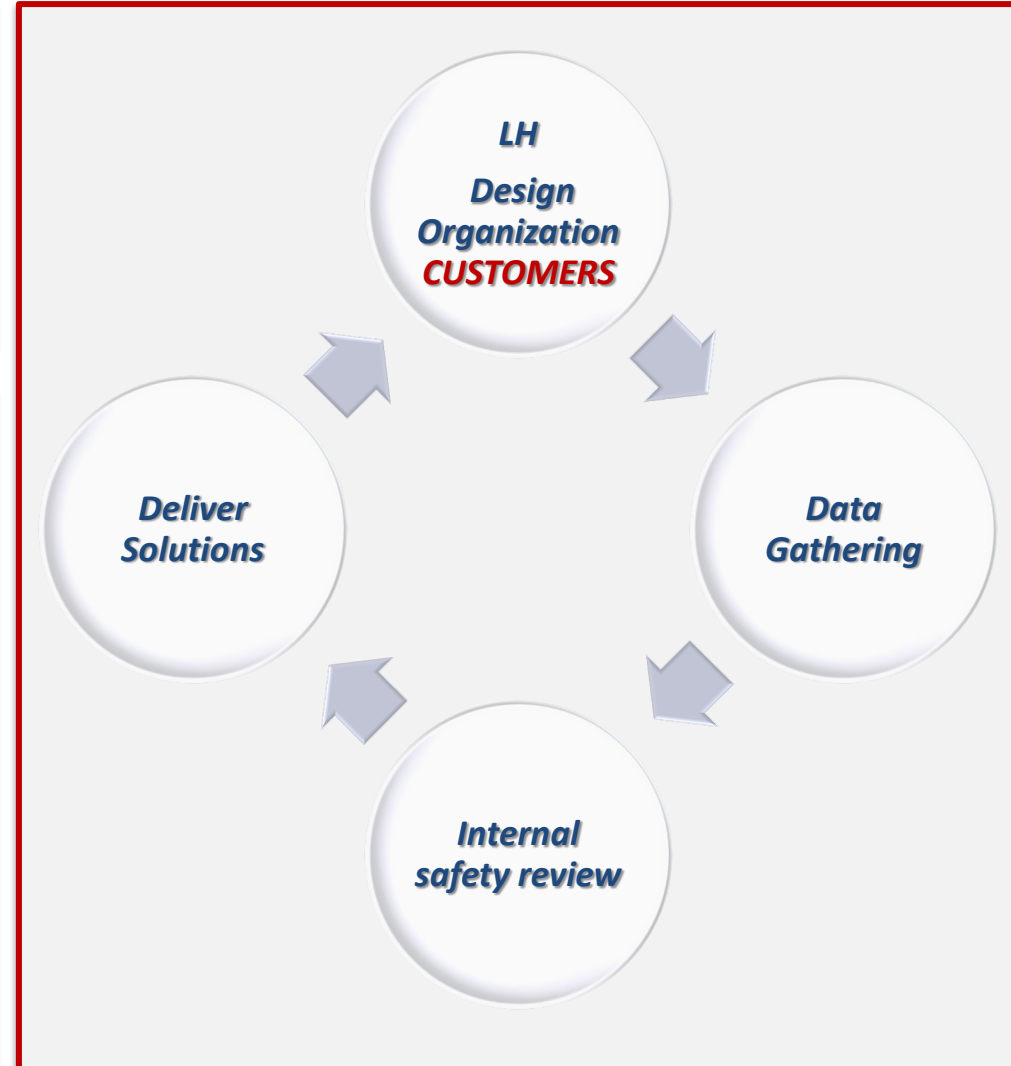


- **Helicopter FIVE STAR Project**

The Potential of Technologies to Mitigate Helicopter Accident Factors (ref. **NLR-TP-2018-470 Nov 2018**).

Each technology is rated based on its “Impact” and “Applicability”, where the “Impact” is a measure of how well the particular technology can mitigate the specific safety concern and the “Applicability” is the measure indicating whether the technology can be utilized for a specific safety concern and against what (relative) cost.

The combination of the “Theoretical Safety Coefficient” and the “Practical Safety Coefficient” finalizes the Safety Barrier Assessment, also called, “**Net Safety Benefit**”, providing the final scoring for each of safety barriers when analyzed with respect to the relevant threat and therefore cause.





Q & A



*Thank you...*

*«Safety is sharing»*

Leonardo Helicopter Head of Incident Accident Investigation & Prevention Dept.