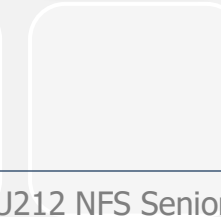
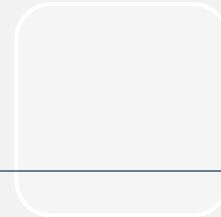
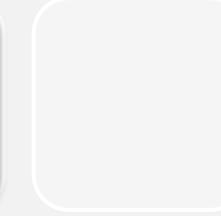
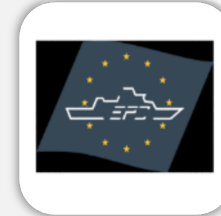
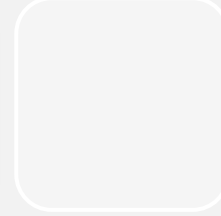
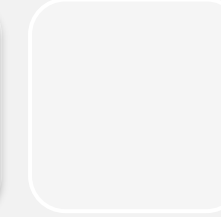
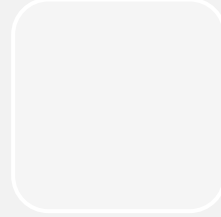


NFS Programme

Damage Control Plan



Agenda

1. OCCAR programmes
2. U212NFS Programme overview
3. The damage control approach for U212NFS
 - Damage control on Integrated Platform Control System
 - Materials' improvement
 - Intrinsically safe systems: Lithium Battery System (LBS)
 - Human Machine Interface applied to damage control procedures
4. Rescue System's Compliancy
5. Conclusions



OCCAR programmes overview



(**O**rganisation **C**onjointe de
Coopération en matière d'**A**rmement)

- International Organisation for the management of cooperative defence equipment programmes
- More than 20 countries delegated OCCAR to manage their programmes

Current Member States:



BE



DE



ES



FR



IT



UK

Programme Participating States (including Programmes under integration):



FI



LT



LU



NL



PL



SE



TR



SL



GR



ES



RO



PO



NO

Observer States:



AU



BR



JP



OCCAR programmes overview



A400M



NVC



TIGER



Observer



BOXER



Observer



COBRA



MUSIS



ESSOR



Co-funded by the European Union



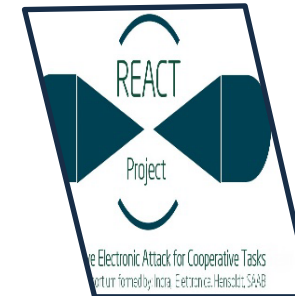
MALE RPAS



Co-funded by the European Union



Observer



Responsive Electronic Attack for Cooperative Task (REACT)



Responsive Electronic Attack for Cooperative Tasks
Project formed by: Indra, Eutelsat, Hansdot, S&SB

OCCAR programmes overview



Horizon /FREMM



LWT



MMCM



European Hypersonic Defence Interceptor (EU-HYDEF)



PPA



FSAF-PAAMS



MAST-F



Light Armoured Vehicle (VBAE)



U212-NFS



European Patrol Corvette (EPC)



LSS



Observer



Hypersonic Defence Interceptor Study (HYDIS)



OCCAR programmes overview (programmes under integration)



Wide Wet Gap Crossing (WWGC)



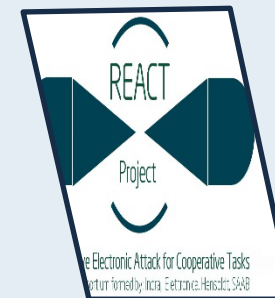
GA10 MLU and ISS



European Defence Fund projects



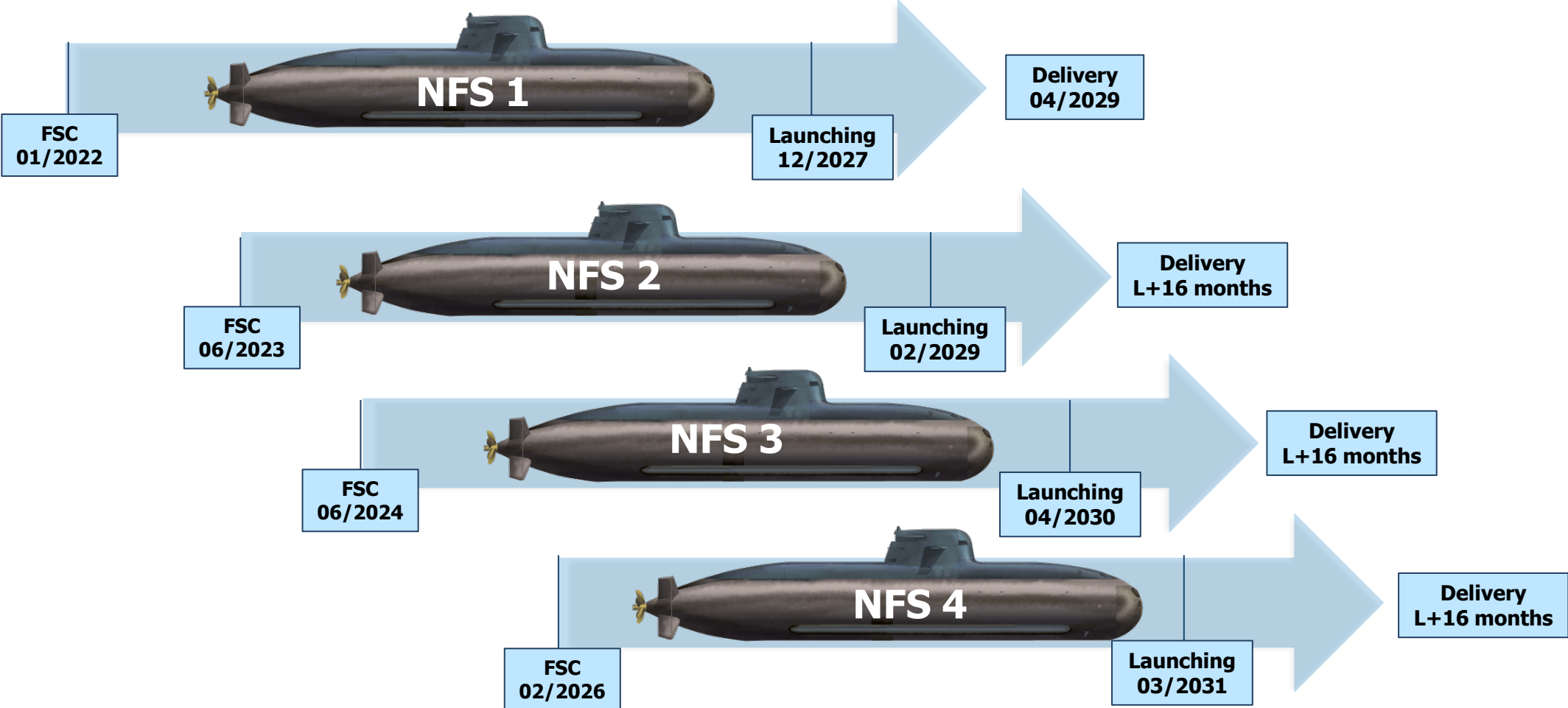
European Naval Collaborative Surveillance Operational Standard (E-NACSOS)



Responsive Electronic Attack for Cooperative Task (REACT II)



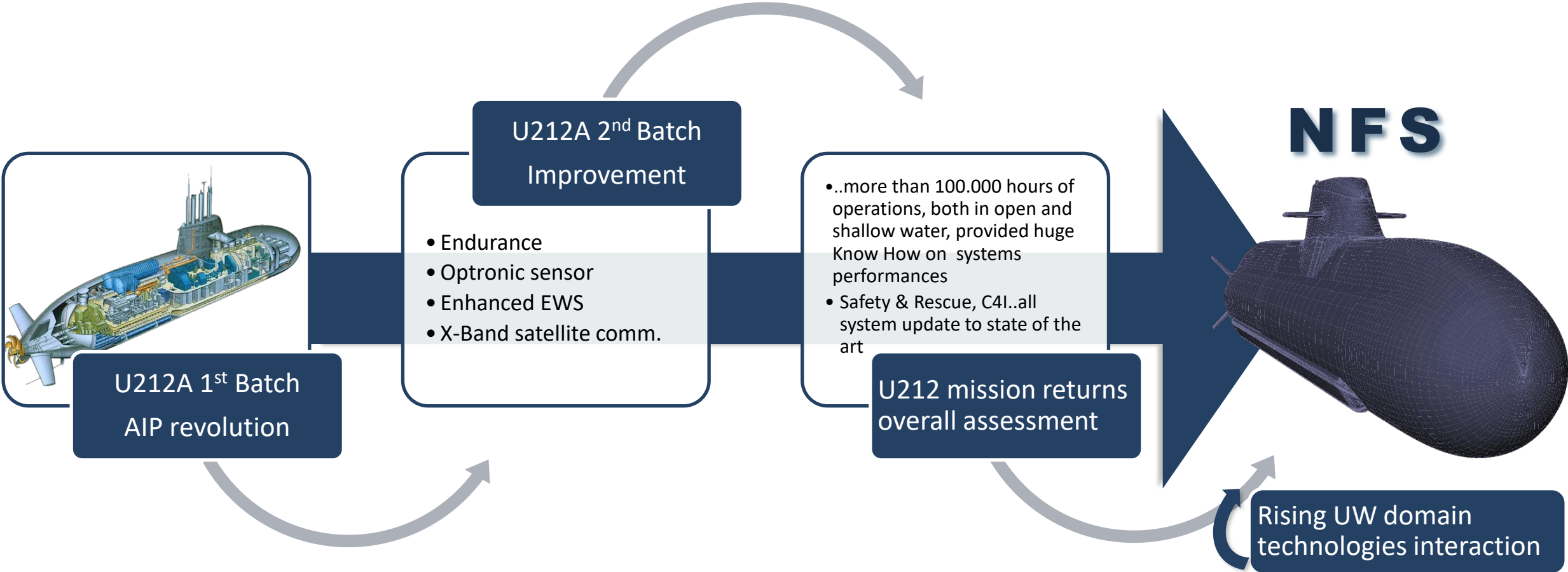
U212 NFS Programme overview



T0=26.02.2021
Contract signature



U212 NFS Programme overview

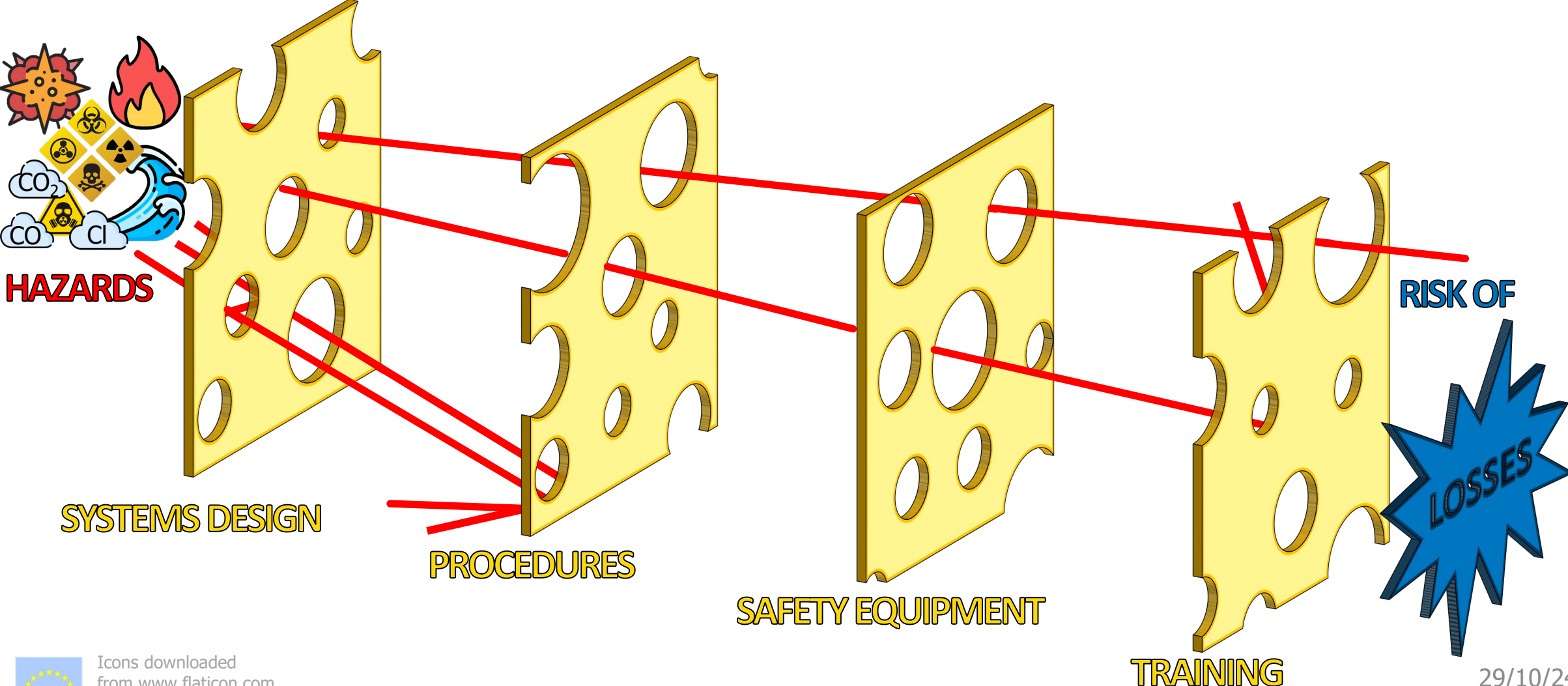


U212 NFS Programme overview

- ❖ BV0120/MIL-STD-461G Electromagnetic compatibility (EMC)
- ❖ BV0230/MIL-S-901D Shock resistance/shock tests
- ❖ BV0240 Vibration resistance
- ❖ BV1830 Equipment and safety equipment
- ❖ MIL-STD-810 resistance of defense material against atmospheric agents
- ❖ IEC62619/62620/61508 series .. Safety requirements and functional safety for lithium batteries
- ❖ MIL-STD-882 System safety
- ❖



Damage control approach



Icons downloaded from www.flaticon.com

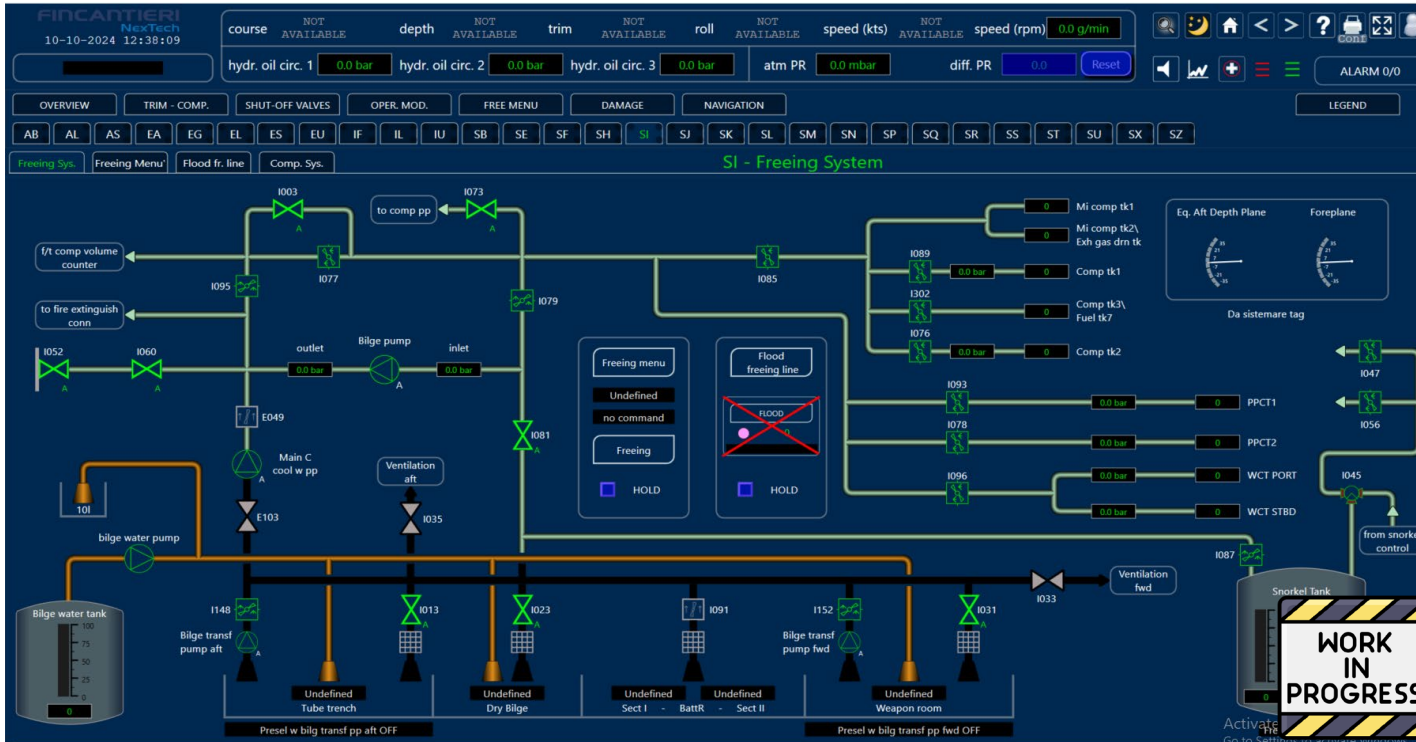
Damage control on Integrated Platform Control System

The screenshot displays the 'Damage Control' section of the Fincantieri NexTech IPCS. At the top, there are status indicators for 'course', 'depth', 'trim', 'roll', 'speed (kts)', and 'speed (rpm)'. Below this, there are three 'hydr. oil circ.' indicators (1, 2, 3) all showing '0.0 bar', and 'atm PR' at '0.0 mbar'. A 'diff. PR' indicator shows '0.0' with a 'Reset' button. The interface includes a navigation menu with buttons for 'OVERVIEW', 'TRIM - COMP.', 'SHUT-OFF VALVES', 'OPER. MOD.', 'FREE MENU', 'DAMAGE', and 'NAVIGATION'. A 'LEGEND' button is also present. Below the menu, there are buttons for 'AB', 'AL', 'AS', 'EA', 'EG', 'EL', 'ES', 'EU', 'IF', 'IL', 'IU', 'SB', 'SE', 'SF', 'SH', 'SI', 'SJ', 'SK', 'SL', 'SM', 'SN', 'SP', 'SQ', 'SR', 'SS', 'ST', 'SU', 'SX', 'SZ'. The main area is titled 'Damage Control' and shows 'Operation mode' set to 'Free oper'. There are several system control panels: 'Fire alarm fire extinguishing system', 'Ventilation system', 'Boat atmospheric monitoring', 'Freeing system', 'EG2180 Snorkel system' (with 'HOISTING SNORKEL' and 'Outer snorkel system DRAINED' buttons), 'SI4310 Freeing system' (with 'FLOOD' and 'Connect FCP' buttons), 'EG2110 Power generating set' (with 'DE READY TO START', 'DE START', and 'DE OFF' buttons), and 'Safety valve E167' (with three 'Cool SW line 1' and 'Reset' buttons). A 'Check list' on the right contains 13 items, all with unchecked checkboxes. A 'WORK IN PROGRESS' warning sign is located in the bottom right corner of the interface.



Pictures Licensed by Fincantieri/Nextech - Icons downloaded from www.flaticon.com

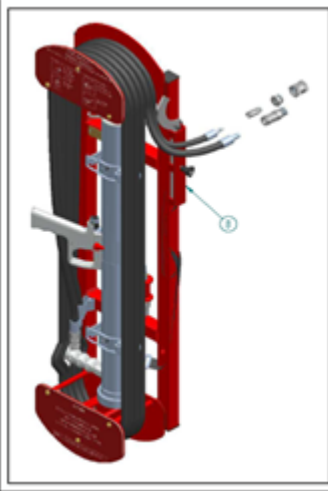
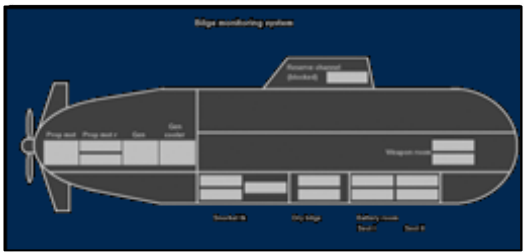
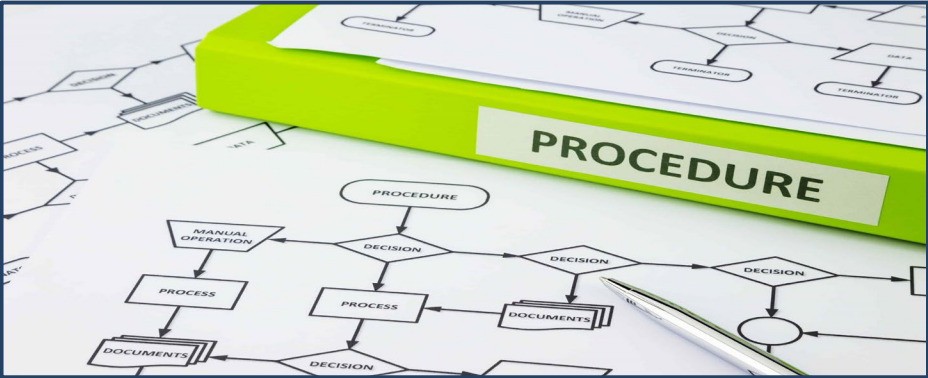
Damage control on Integrated Platform Control System



DAMAGE CONTROL PAGE

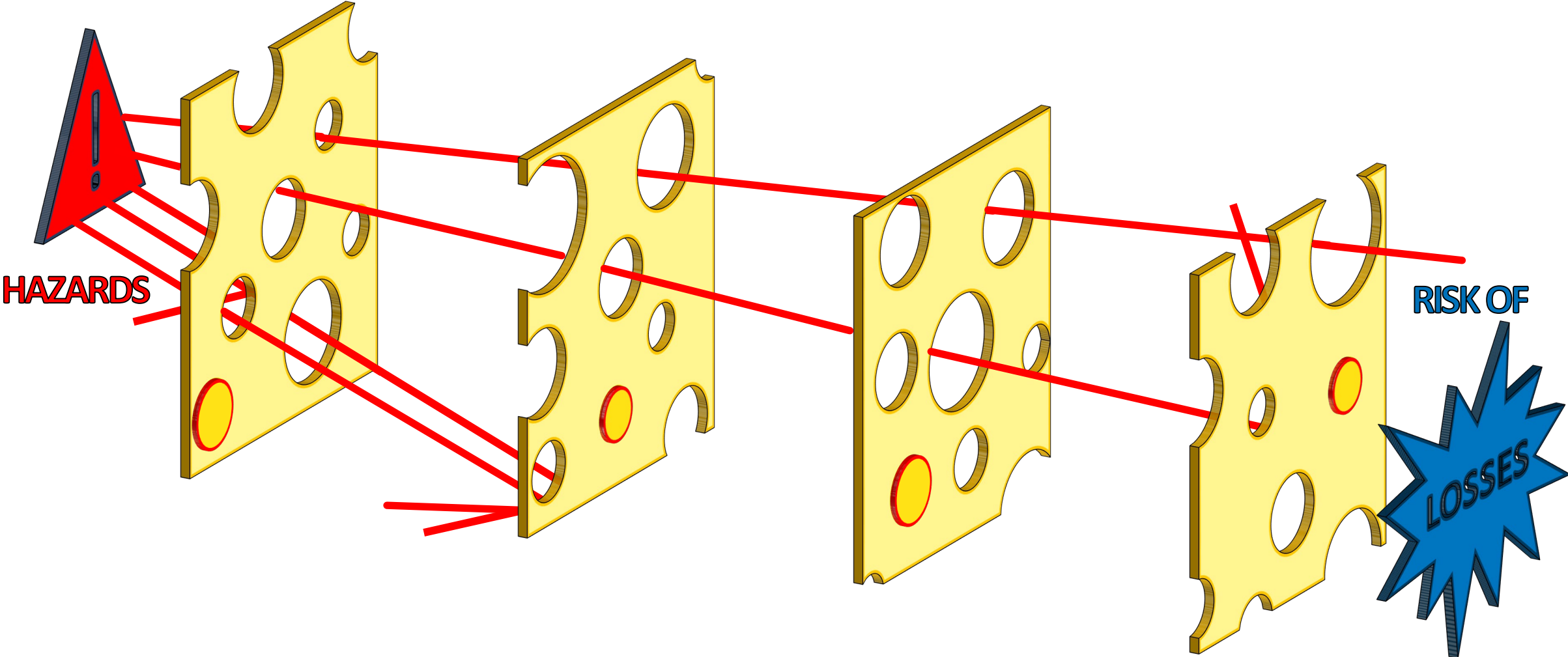
- ❖ Fire alarm/fire extinguishing system
- ❖ Control for Boat Atmospheric Measuring system
- ❖ Ventilation System
- ❖ Cooling sea water system
- ❖ Freeing System

Damage control approach



29/10/24

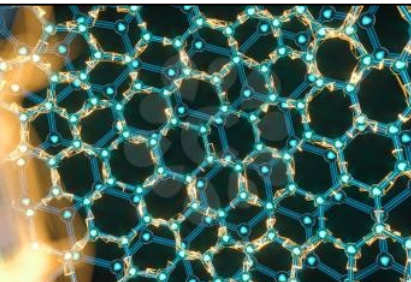
Damage control approach



Damage control approach



Systems Intrinsically safe



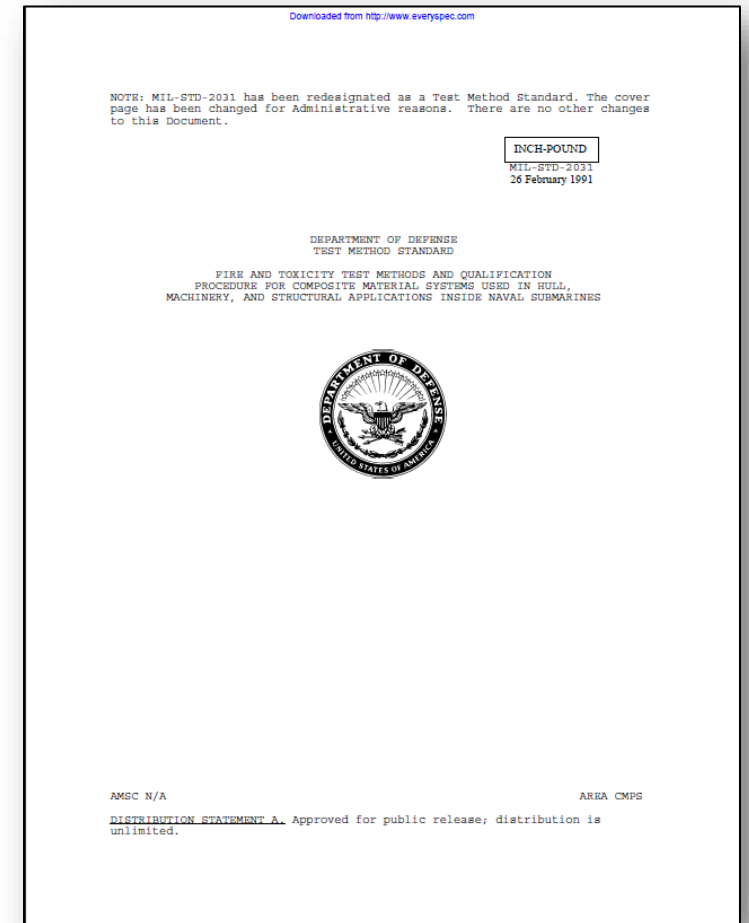
Materials

HMIs



Materials' improvement

- ❖ **MIL-STD-2031: FIRE AND TOXICITY TEST METHODS AND QUALIFICATION PROCEDURE FOR COMPOSITE MATERIAL SYSTEMS USED IN HULL, MACHINERY, AND STRUCTURAL APPLICATIONS INSIDE NAVAL SUBMARINES.**
 - Fire resistance
 - ignitability
 - heat release
 - burn through
 - Smoke toxicity
 - smoke obscuration
 - combustion gas generation
 - N-gas smoke



Materials' improvement



Downloaded from
<https://www.formula1.com/en/racing/2024/italy>



Materials' improvement

New Platform and Combat System consoles composite material: C-Preg400

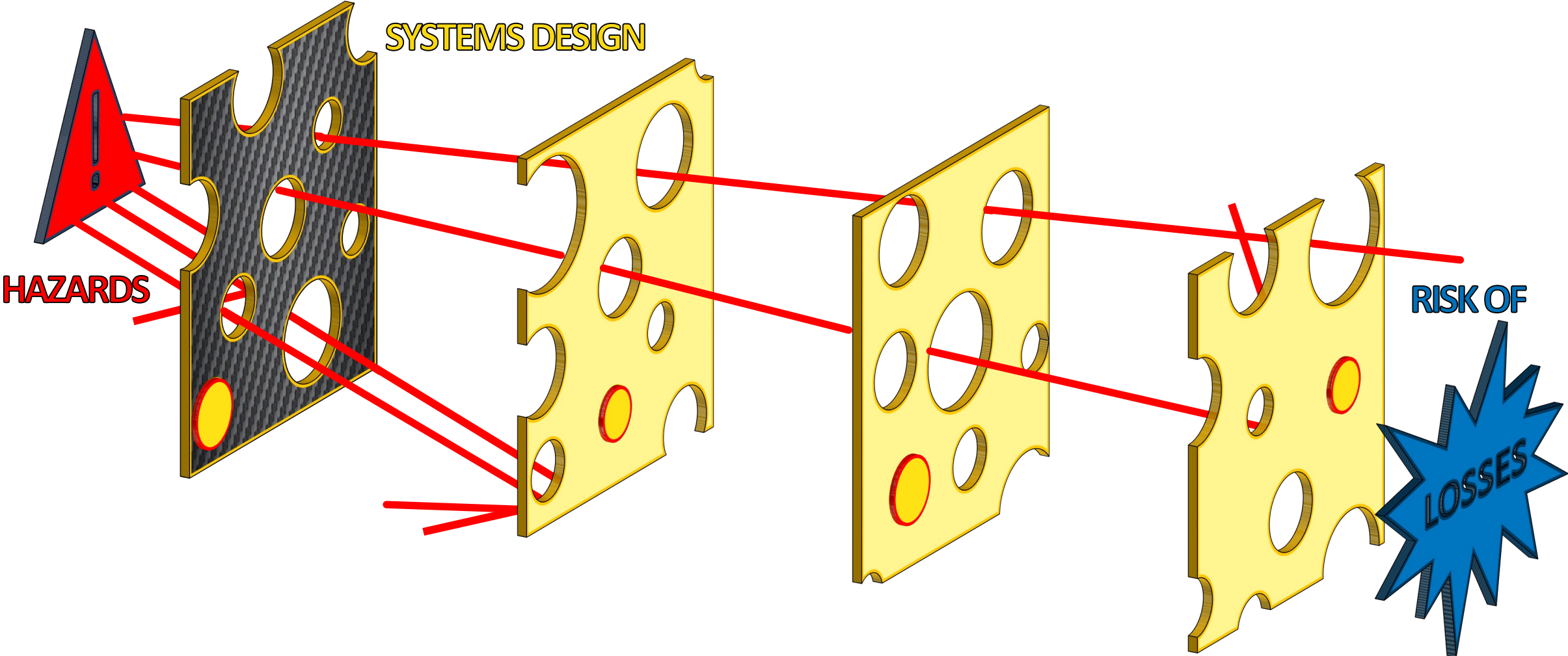
Developed Features:

- New carbon based composite material;
- Fire resistant - Flame retardant;
- Neither Toxic nor Harmful;
- Compliancy to MIL-STD-2031 tested.

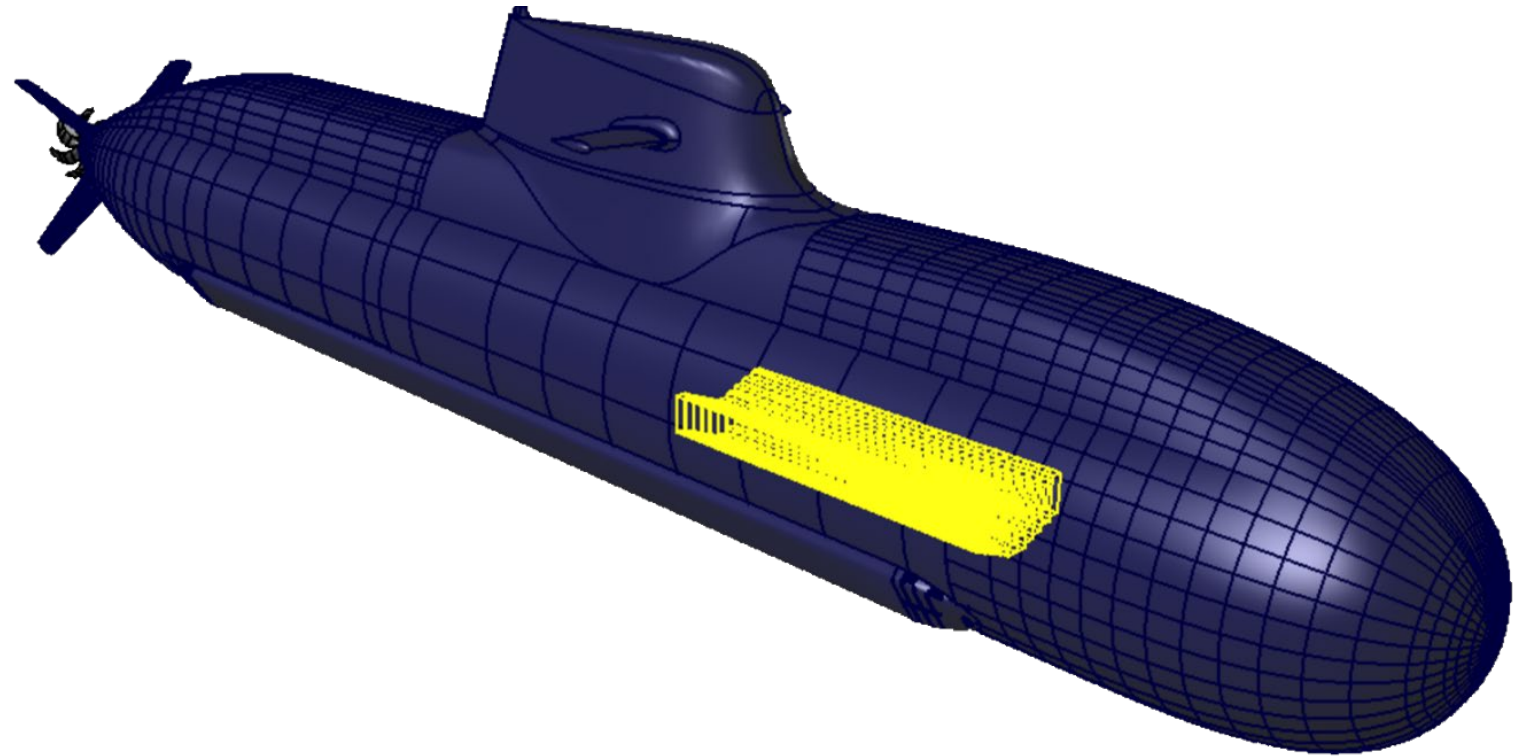


A wide range of possible applications in future submarine systems design

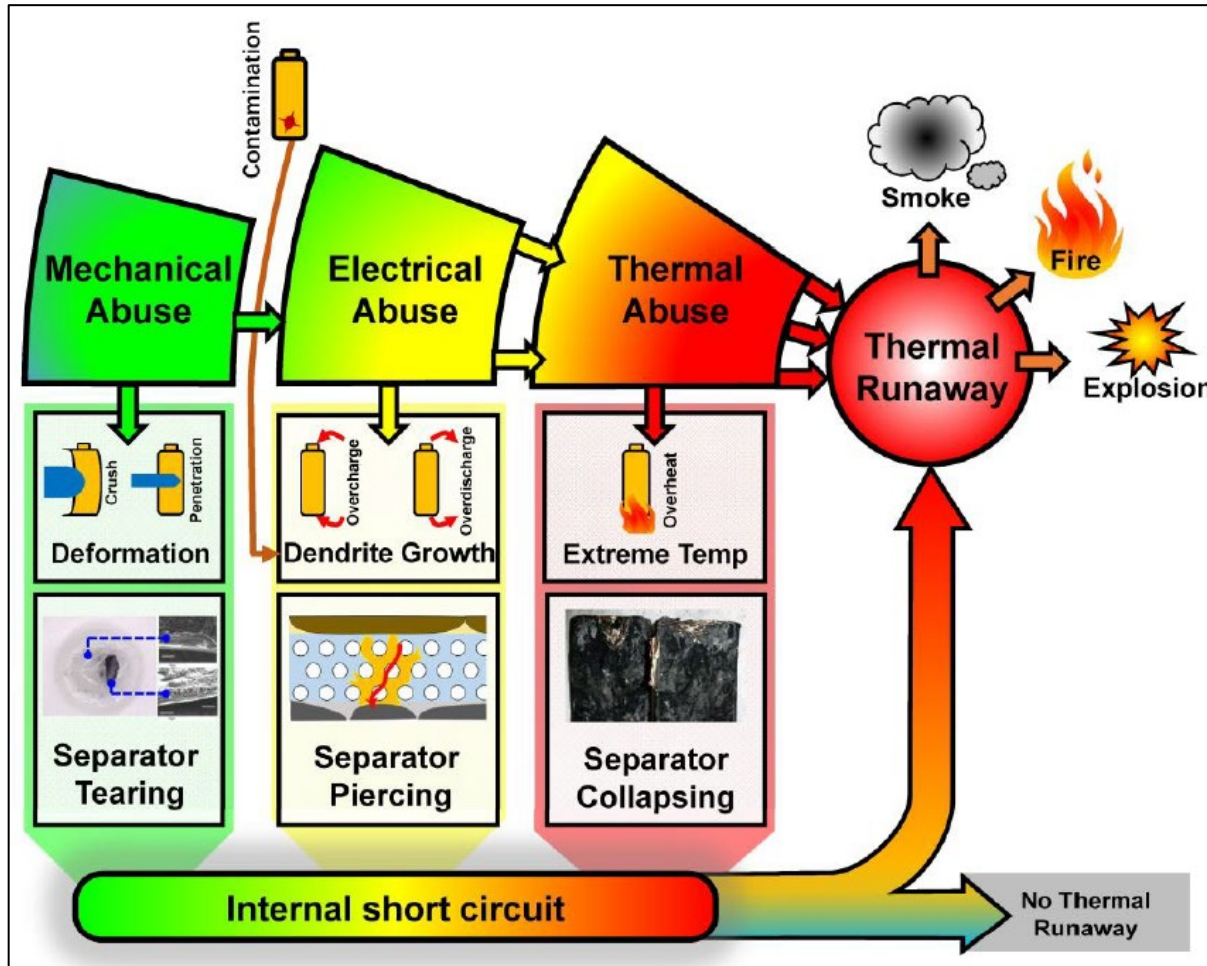
Materials' improvement



Intrinsically Safe Systems: Lithium Battery System (LBS)

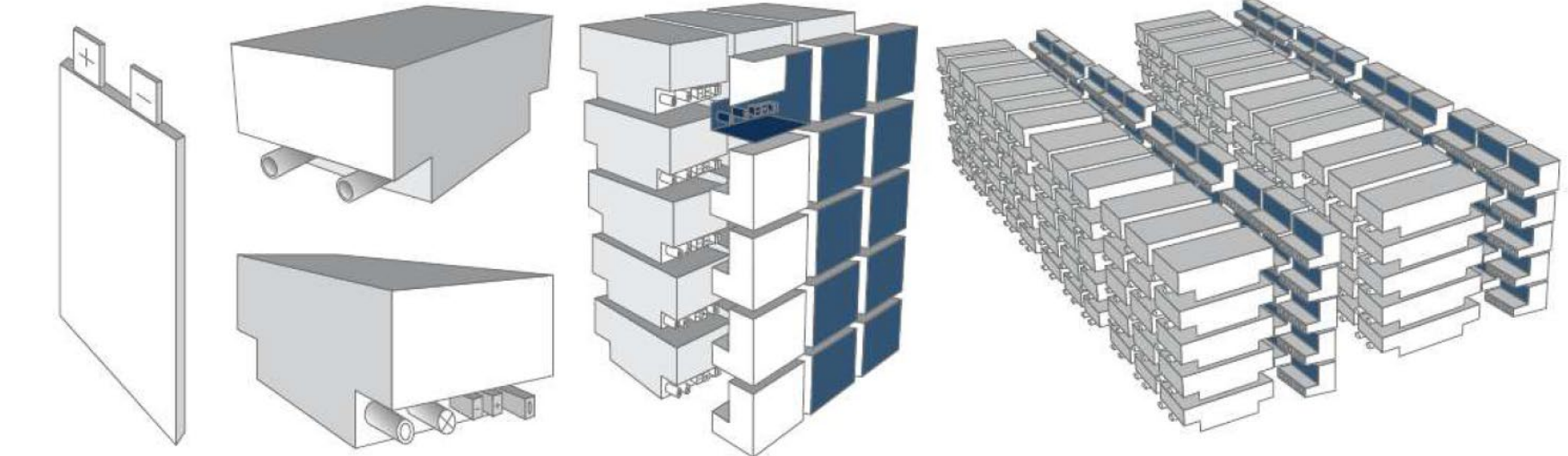
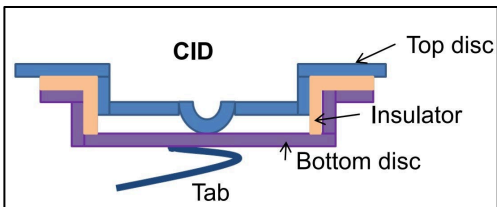
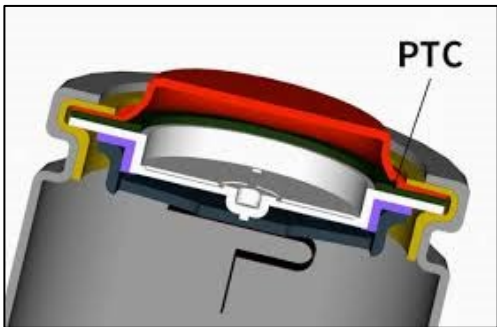


Intrinsically Safe Systems: Lithium Battery System (LBS)



| Safety Integrity Level | Safety | Probability of Failure on Demand | Risk Reduction Factor |
|------------------------|-----------------|----------------------------------|-----------------------|
| SIL 4 | > 99.99% | 0.001% to 0.01% | 100,000 to 10,000 |
| SIL 3 | 99.9% to 99.99% | 0.01% to 0.1% | 10,000 to 1,000 |
| SIL 2 | 99% to 99.9% | 0.1% to 1% | 1,000 to 100 |
| SIL 1 | 90% to 99% | 1% to 10% | 100 to 10 |

Intrinsically Safe Systems: Lithium Battery System (LBS)



CELL

- ✓ Chemistry;
- ✓ PTC;
- ✓ CID.

MODULE

- ✓ Module fuses
- ✓ Overpressure valves;
- ✓ BMS-M

STRING

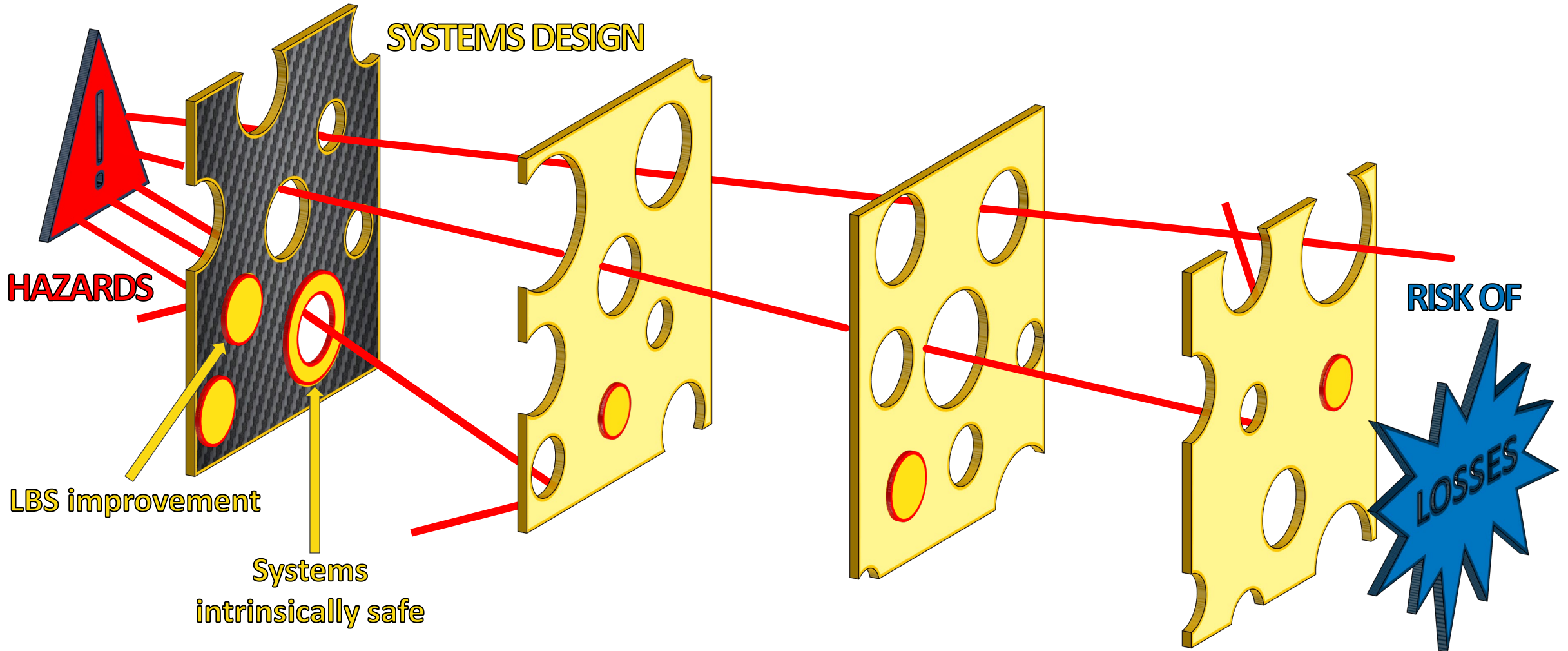
- ✓ SSC architecture;
- ✓ String fuse;
- ✓ BMS-S.

BATTERY

- ✓ System layout;
- ✓ Bus bar layout;
- ✓ BMS-B.

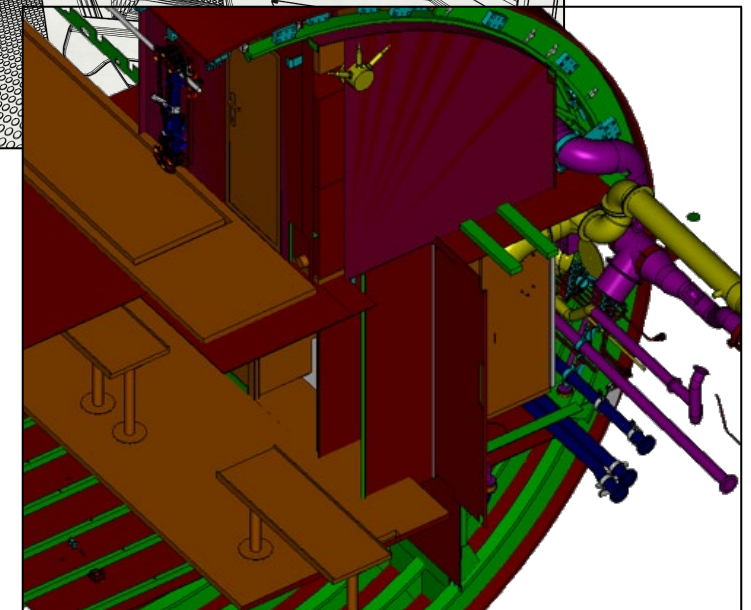
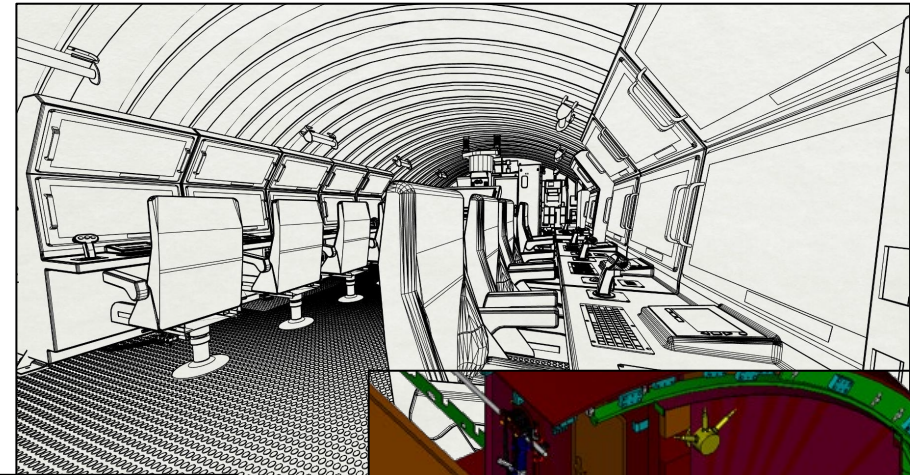
Increased AIP range, evasion capacity, stealth navigation capabilities, performance at high speed

Intrinsically Safe Systems: Lithium Battery System (LBS)



Human Machine Interface applied to damage control procedures

Environmental design (clearances, lights, moving)

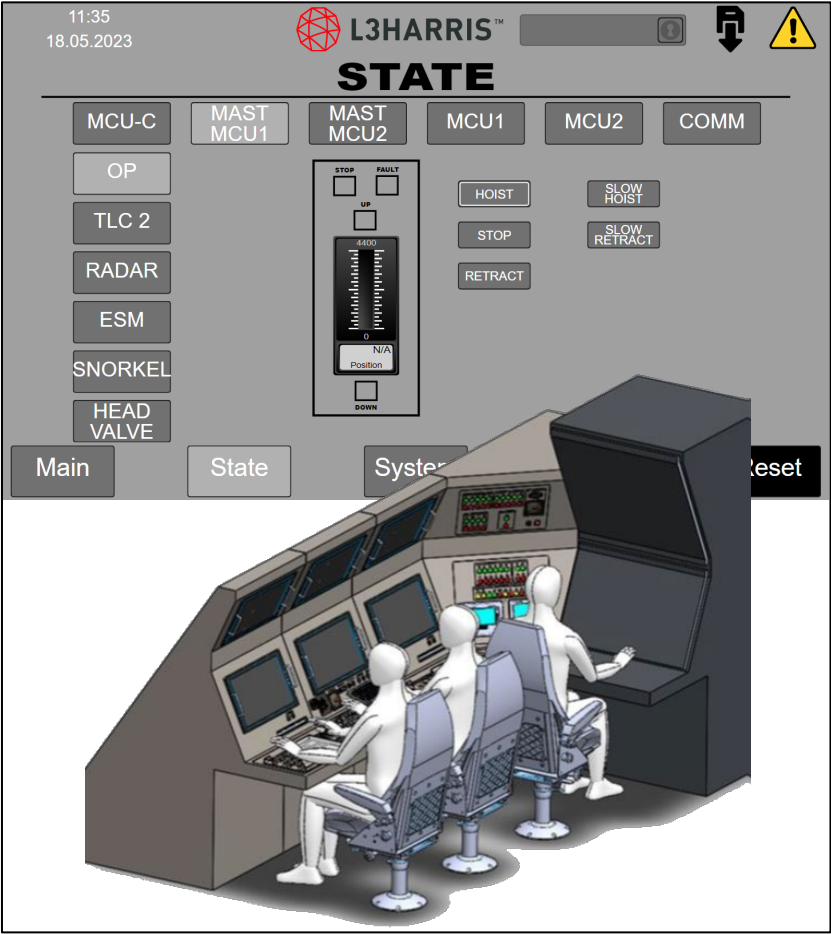
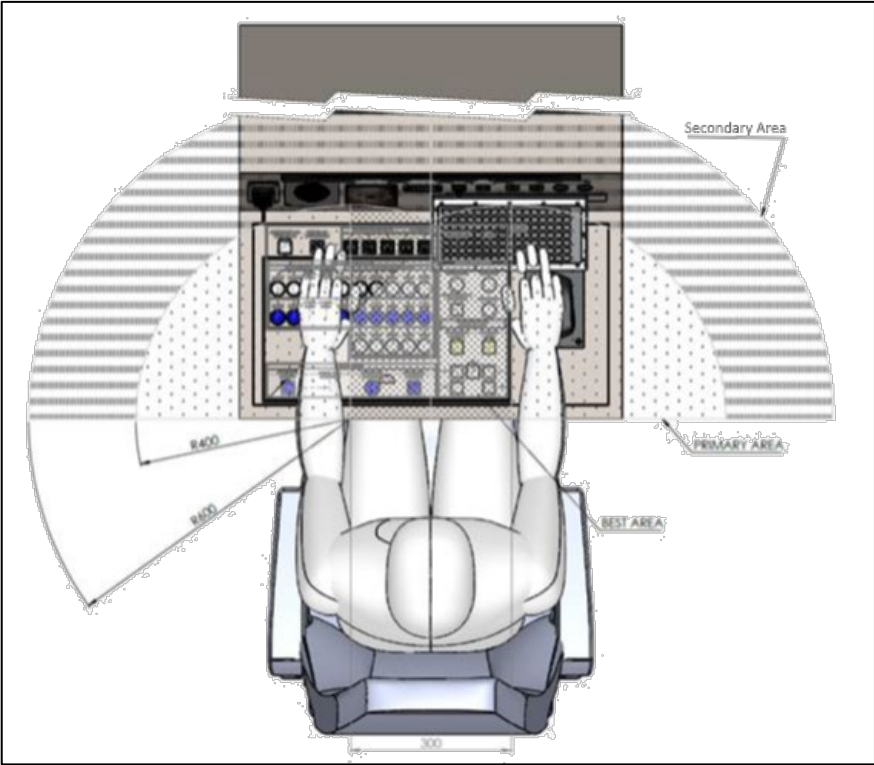


Human Machine Interface applied to damage control procedures

HF design applied to new development systems

New Platform systems

- Integration and modularity
- Fault tolerance

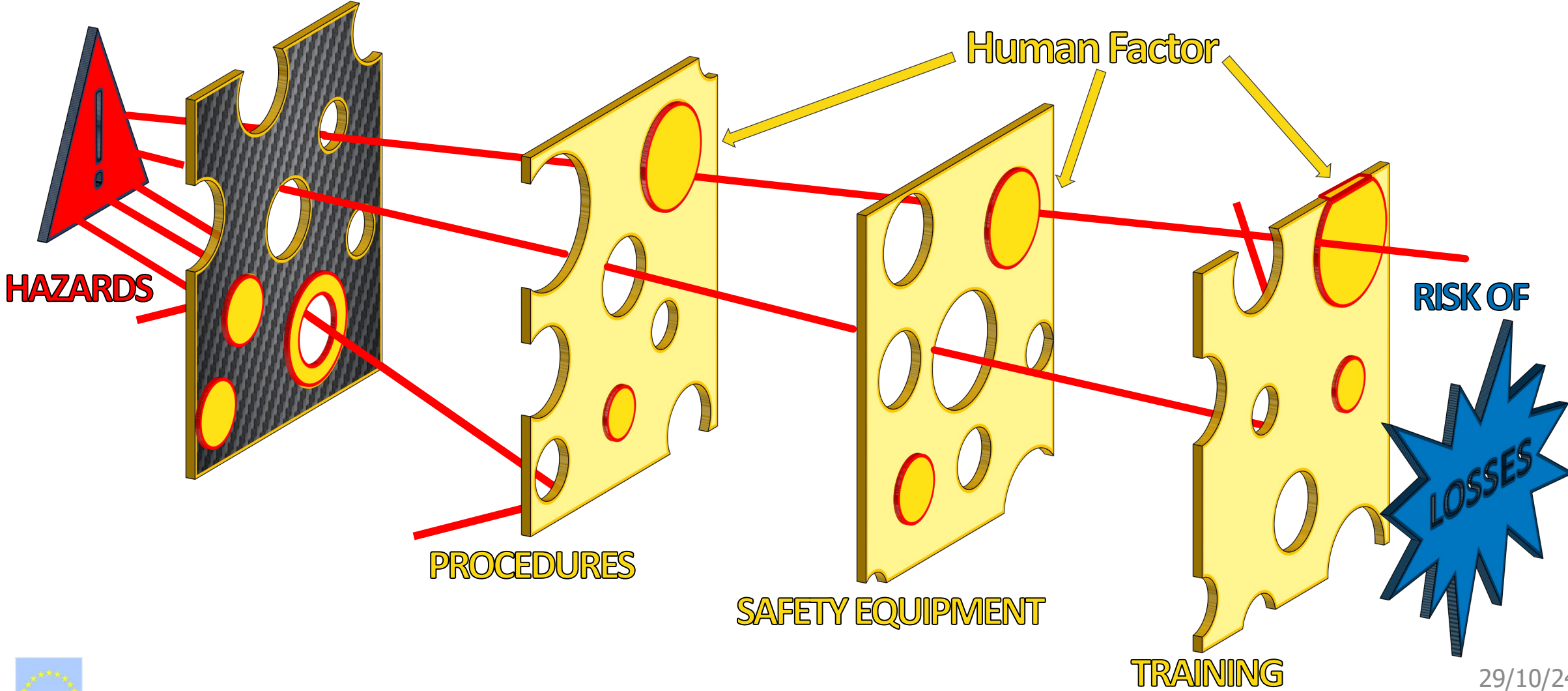


Human Machine Interface applied to damage control procedures

Environmental design (clearances, lights, moving)

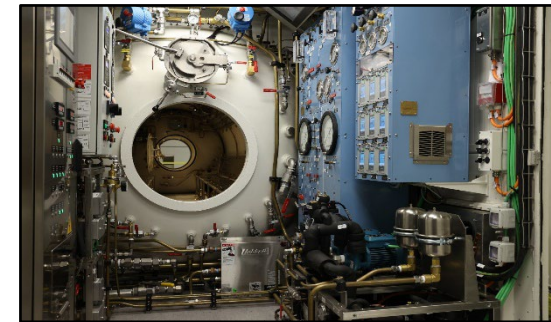
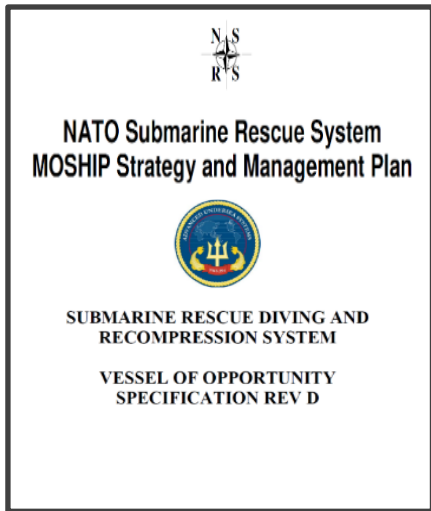


Human Machine Interface applied to damage control procedures



Rescue system's compliancy

- ❖ NFS is compliant with NATO and US Navy rescue standards
- ❖ NFS is optimized for new developments in underwater technology (ROV applications) for submarine rescue as IT Navy rescue multifunctional tethered system (S.A.V.E.R.)



System evolution to more unmanned operations determines NFS design evolution for interoperability

Near Future Submarine



evolution at the state of the art

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