

Clean Space

ESA's solution for a sustainable space sector

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ESA ESTEC

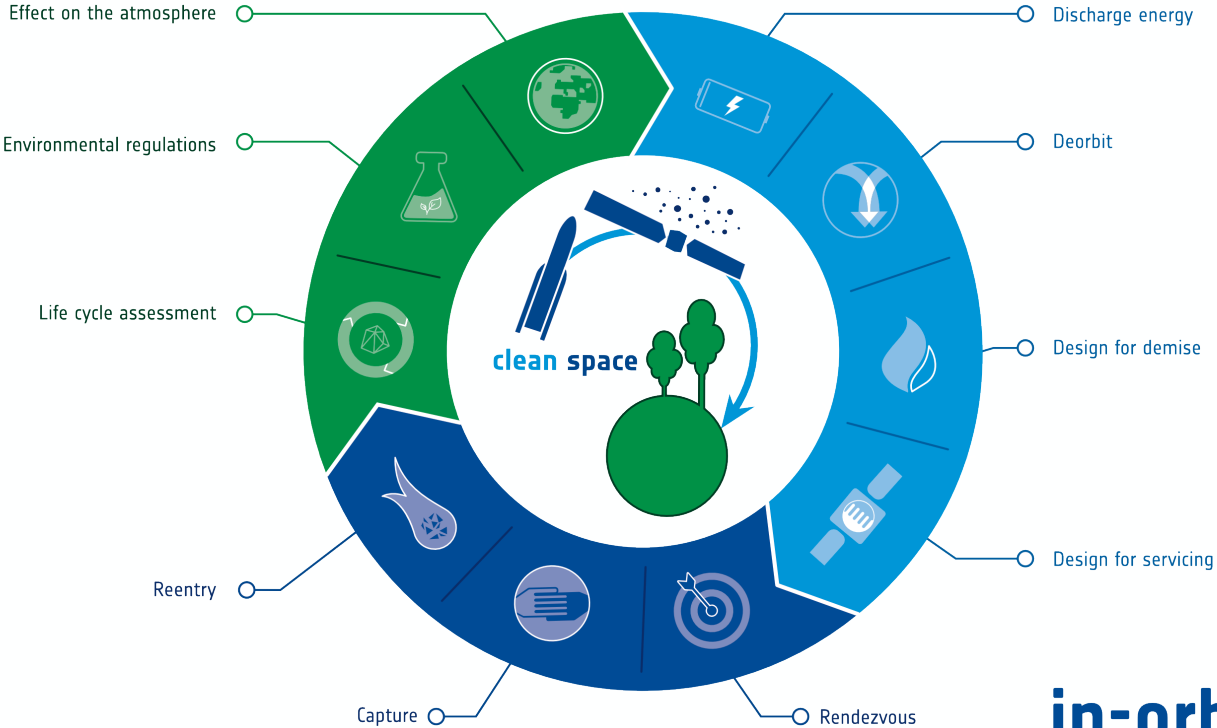
23/05/2022

ecodesign

→ REDUCING IMPACTS

management of end of life

→ SPACE DEBRIS REDUCTION




in-orbit servicing

→ ACTIVE DEBRIS REMOVAL



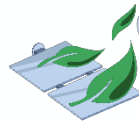


 **ecodesign**
is necessary to **understand how much space activities pollute** on Earth and to identify alternatives **to reduce the environmental impacts**



LCA (Life Cycle Assessment)

Assessing the environmental impact of the space missions during the whole life cycle (ISO-standardised)



Ecodesign

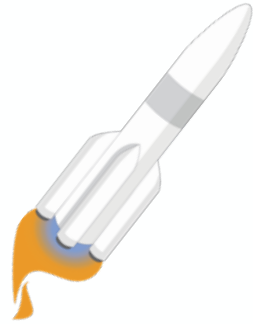
Identifying alternative processes or technologies that can be used to reduce these impacts



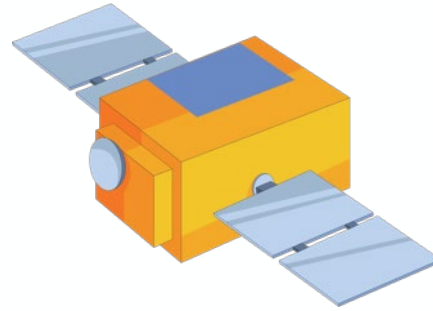
Environmental regulation

Finding alternatives to abide by legislations and avoid costly disruptions

Life Cycle Assessment - Framework



LCA Launch Segment



LCA Space Segment

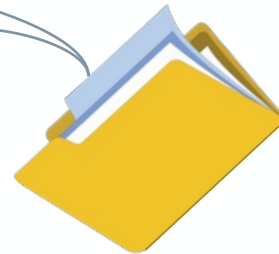


LCA Ground Segment



Available under request
by email to
cleanspace@esa.int

1st of its kind
published by ESA
end 2016



ESA LCA Handbook



LCA Database



Available under ESA
contract



→ GREEN TECHNOLOGIES

→ ESA PROJECTS

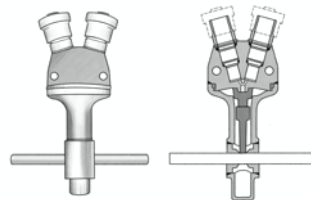
Environmental Footprint

Ex: Efficient use of Ge



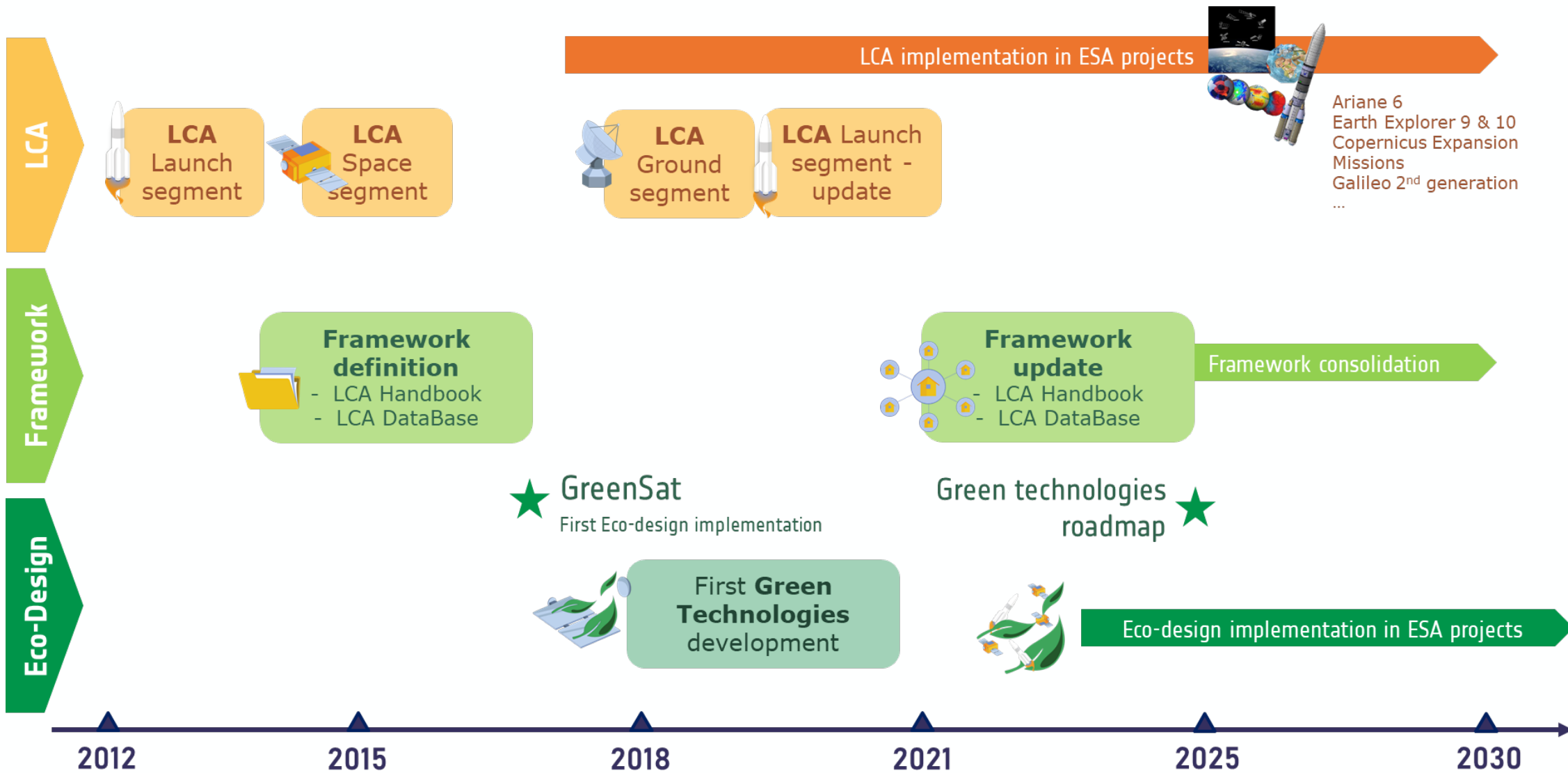
Environmental Regulation

Ex: Replacement of pyrotechnic powders



- Ariane 6
- Earth Explorer 9 (Forum - phase A/b1& B2/C/D and SKIM Phase A/B1) & EE10 (Harmony)
- Copernicus Std platform
- Copernicus Expansion Missions
- Galileo 2nd generation
- ...

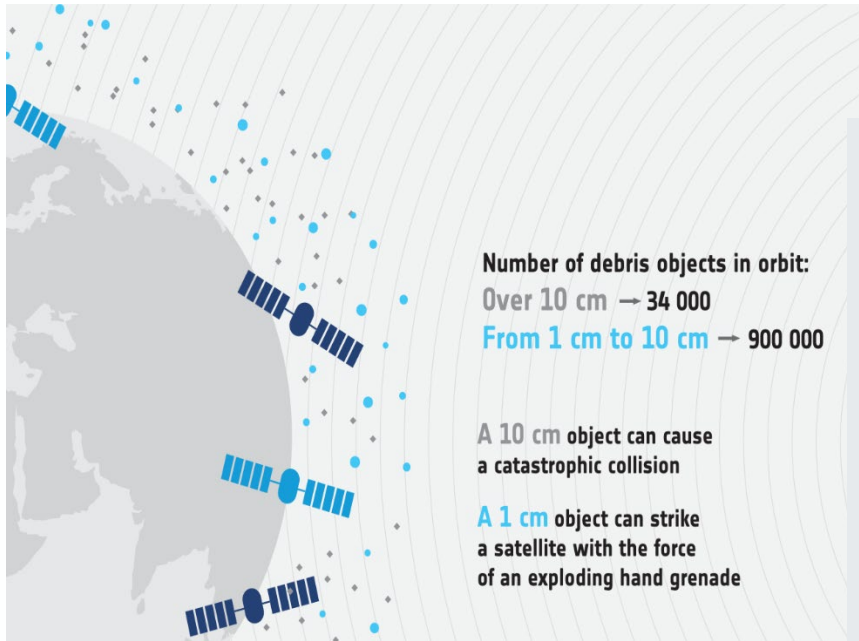
LCA & Ecodesign roadmap



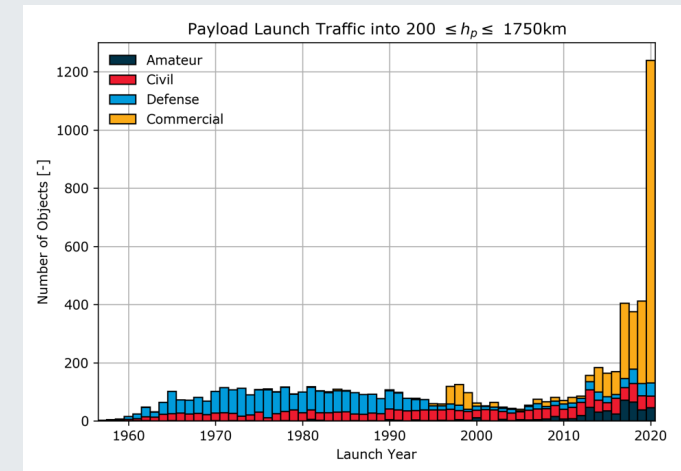
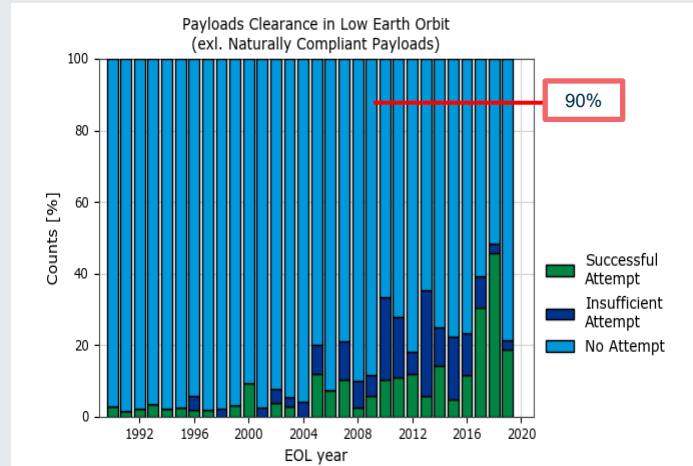
Management of End of Life



Clean Space: Save the orbits now!



Successful SDM application in LEO still below 30% while the current requirement is 90%



In the next 3 years there will be more satellites launched than in the past 60 years

Space Debris Mitigation requirements have to become more demanding

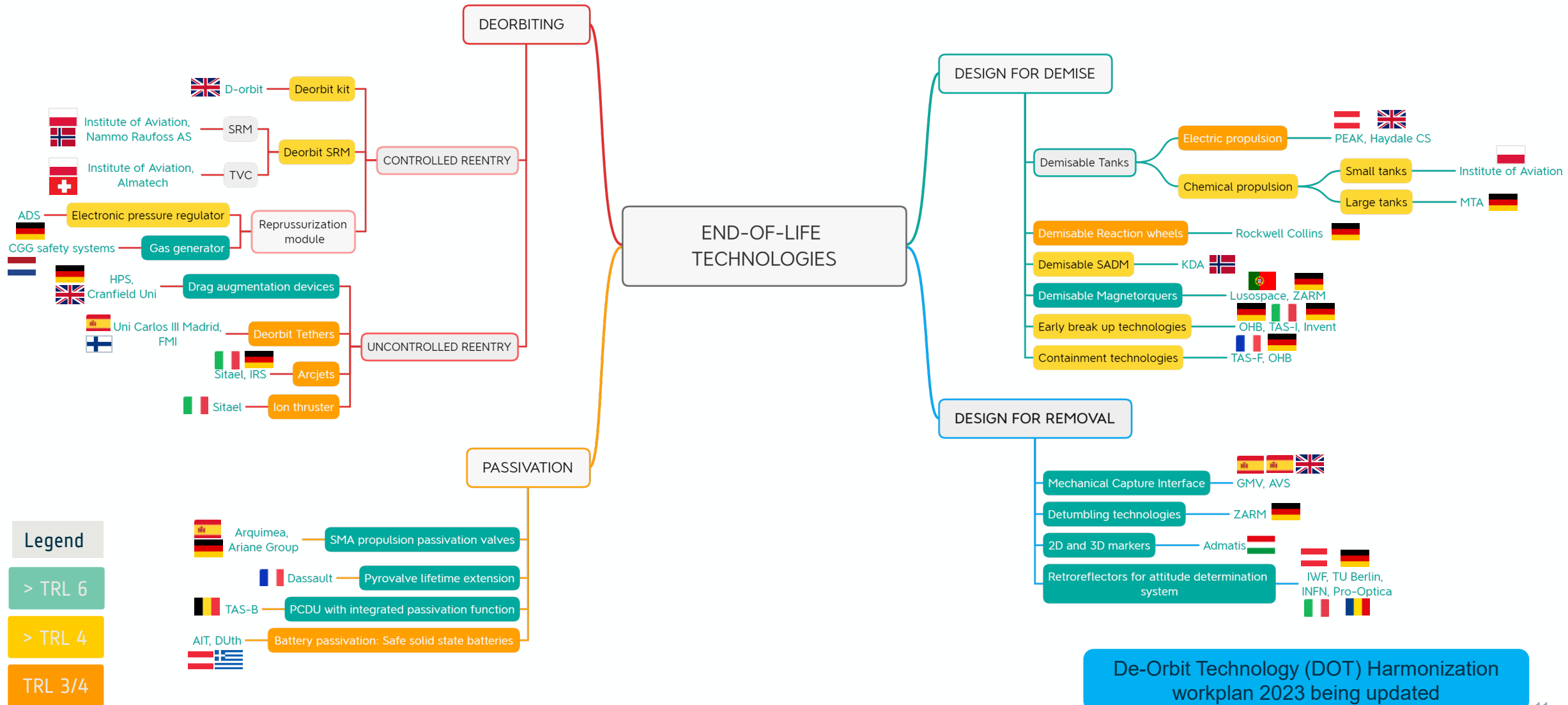
In view of the increase in traffic, IADC already advises probability of successful disposal is significantly above 90% (with a goal of 99%) and remaining orbital lifetimes after disposal well below 25 years



“In ESA we are implementing a policy that by 2030, we have a ‘net zero pollution’ strategy for objects in space, by consistently and reliably removing them from valuable orbits around Earth immediately after they cease operations. We need to lead by example here.”

ESA Director General, Josef Aschbacher

End of Life technologies



Legend

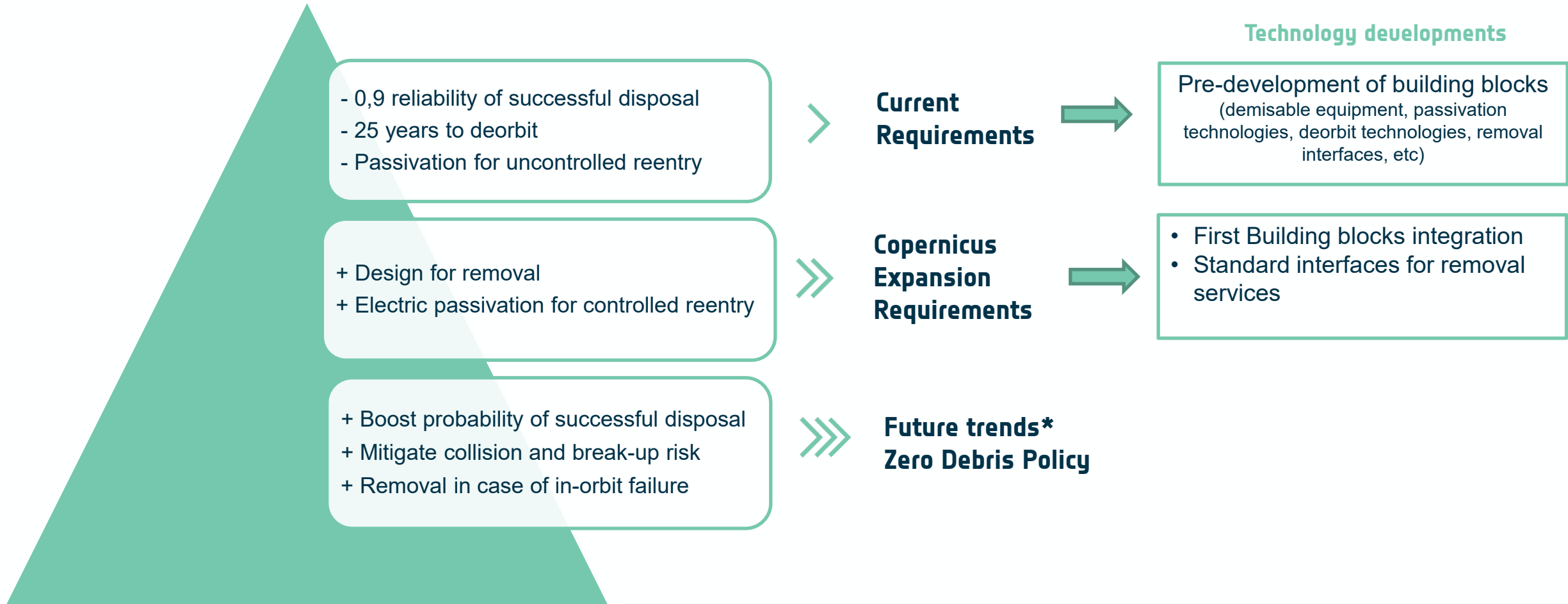
- > TRL 6
- > TRL 4
- TRL 3/4

De-Orbit Technology (DOT) Harmonization workplan 2023 being updated



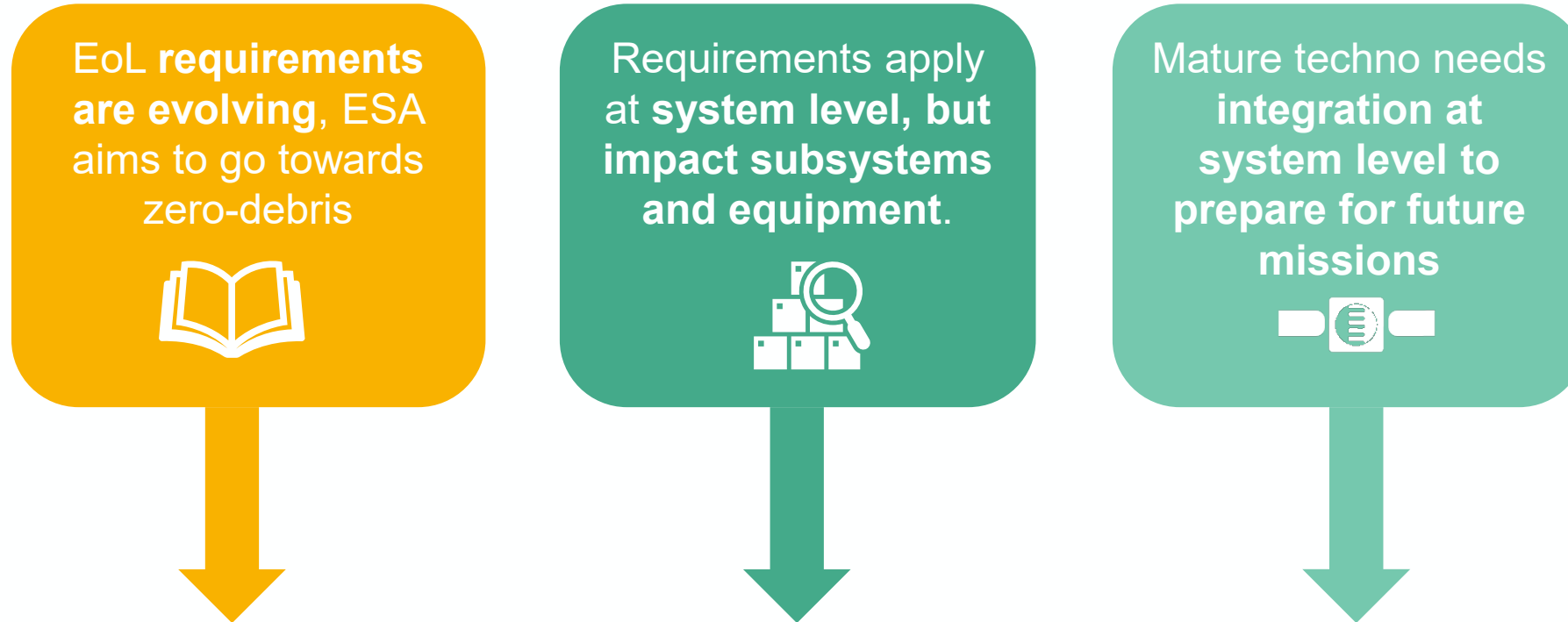


Steps towards Zero Debris Approach



** In view of the increase in traffic, IADC already advises probability of successful disposal is significantly above 90% (with a goal of 99%) and remaining orbital lifetimes after disposal well below 25 years*

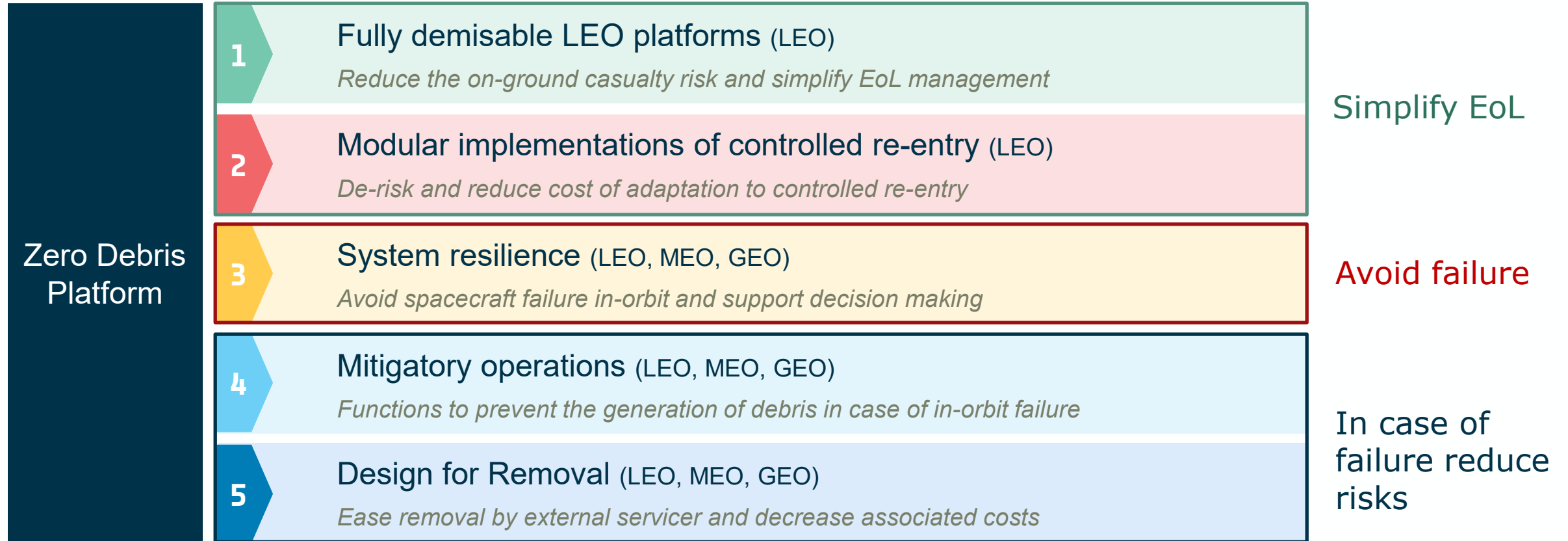
Next Steps – The European platforms need to evolve



Zero-debris Platform activity

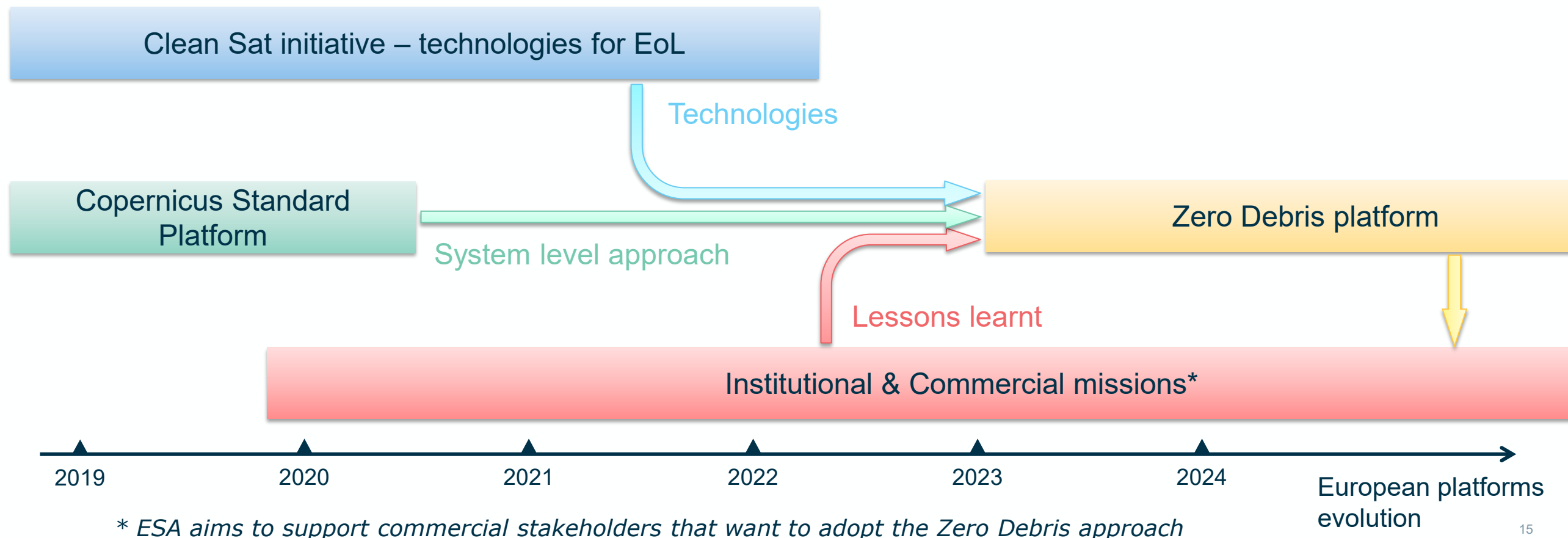
- ✓ To “bridge” the non-recurrent costs and prepare future missions.
- ✓ Coordinated work with integrators and suppliers for evolution of the European product lines

ESA strategy for Zero-debris platforms evolution structured in 5 main goals:



The European platforms need to evolve

- Platform level activity will be proposed in CM22 through Space Safety Program (COSMIC) in close collaboration with EOP-Φ.
 - Discussions on-going with other programmes and possible partners



Eco-design

- ✓ In the past years, ESA has developed a pioneer **Eco-design framework for space**, based on LCA.
- ✓ Quantification of the environmental impacts is **required in missions across the Agency**
- ✓ **Roadmap for Green Technologies** will be derived from the work with projects in line with their needs

End of Life technologies:

- ✓ **ESA aims to lead by example** and implementing a Zero-debris policy by 2030, this requires a leap forward and work at system level to integrate innovative EoL technologies in the future missions.
 - ✓ A **Zero-debris platform evolution activity is being prepared** within S2P COSMIC in close cooperation with EOP-Φ. Discussions on-going with other programmes.
 - ✓ ESA is available to support industry for the evolutions of their platforms and products to achieve a full compliance SDM and an alignment to Zero-debris policy